

# Familial Pathways to Early-Onset Suicide Attempt

## Risk for Suicidal Behavior in Offspring of Mood-Disordered Suicide Attempters

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**Background:** Although adoption, twin, and family studies have shown that suicidal behavior is familial, the risk factors for familial transmission from parent to child remain unclear.

**Methods:** A high-risk family study was conducted comparing the offspring of 2 mood-disordered groups: suicide attempters and nonattempters. Recruited from 2 sites, probands were 81 attempters and 55 nonattempters, with 183 and 116 offspring, respectively. Offspring were assessed by investigators masked to proband status. Probands and offspring were assessed with respect to psychopathologic findings, suicide attempt history, impulsive aggression, and exposure to familial environmental stressors.

**Results:** Offspring of attempters had a 6-fold increased risk of suicide attempts relative to offspring of nonattempters. Familial transmission of suicide attempt was

more likely if (1) probands had a history of sexual abuse and (2) offspring were female and had a mood disorder, substance abuse disorder, increased impulsive aggression, and a history of sexual abuse.

**Conclusions:** The offspring of mood-disordered suicide attempters are at markedly increased risk for suicide attempts themselves. Familial transmission of suicidal behavior in families with mood disorders almost always requires transmission of a mood disorder and is also related to the offspring's impulsive aggression and the familial transmission of sexual abuse. Early treatment of mood disorders and targeting impulsive aggression and sexual trauma may be helpful in the prevention and treatment of suicidal behavior in families with mood disorders.

*Arch Gen Psychiatry.* 2002;59:801-807

**S**UICIDE ATTEMPTS are among the most serious complication of mood disorders. Although most completed and attempted suicides occur in the context of a mood disorder, most individuals with mood disorders never engage in suicidal behavior.<sup>1</sup> Therefore, there must be factors other than the mood disorder that predispose an individual to suicidal behavior. For example, familial genetic or nongenetic factors increase the likelihood that a suicide attempt will occur in the context of an episode of mood disorder.<sup>2,3</sup>

Adoption, family, and twin studies have demonstrated the familial transmission of suicide and suicidal behavior. Biological, but not adoptive, relatives of adoptees who commit suicide show a 6-fold higher risk for suicide compared with the biological relatives of living control adoptees.<sup>4</sup> A related adoption study showed a 15-fold greater risk of suicide in the biological relatives of probands with mood

disorders, with the highest rate in the relatives of probands with *affect reaction*, a condition akin to borderline personality disorder.<sup>5</sup> Family studies<sup>2-16</sup> of probands who completed or attempted suicide report a 4- to 6-fold greater risk of suicide or suicidal behavior in their relatives compared with the relatives of community or patient controls. There is greater concordance for monozygotic compared with dizygotic twins for completed and attempted suicide.<sup>17-19</sup> In a large, representative sample of Australian twins, the heritability of serious suicide attempts was 55%.<sup>19</sup>

The familial transmission of suicidal behavior may involve a common liability for both completed and attempted suicide insofar as the rates of attempted suicide are elevated in the relatives of completers<sup>2,6,7,18</sup> and the rates of completed suicide are elevated in the relatives of attempters.<sup>11,13,16,20</sup> Familial transmission of suicidal behavior is not explained by transmission of mental disorders alone, since increased risk for suicide or suicidal be-

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havior persists even after controlling for familial transmission of mood disorder.<sup>2,6,7,10,12,19</sup>

Little is known about the factors responsible for familial transmission of suicidal behavior. Familial transmission of mood disorders is thought to be important but not sufficient for familial transmission of suicidal behavior.<sup>8</sup> Impulsive aggression and violent suicidal behavior in suicide attempters or completers are associated with much greater family loading for suicidal behavior.<sup>6</sup> Aggressive traits and mood disorders may be familially transmitted by genetic or nongenetic factors. Likewise, familial factors predisposing an individual to suicidal behavior can be environmental or genetic.<sup>11-13</sup> Family discord increases the risk for suicide attempt and completion in young people.<sup>2,3,21</sup> Maltreatment, particularly sexual abuse, conveys a markedly increased risk for suicide and suicidal behavior.<sup>22-26</sup> Family discord and abuse may also be explained by increased rates of parental mental disorder, tendency to impulsive aggression, and suicide attempt in abusive parents.<sup>15,27,28</sup> Nevertheless, even after controlling for other family problems, sexual abuse accounts for almost 20% of the population-attributable risk for suicide attempt in young people.<sup>23,24</sup> Imitation is not a major mechanism in familial transmission, given the results of adoption and twin studies and prospective studies of exposure to suicide.<sup>4,5,19,29,30</sup>

Few studies have examined the risk factors for familial transmission, which can provide insight into the causes of suicidal behavior and offer potential targets for intervention. We describe a high-risk prospective family study to examine the rate of and risk factors for suicidal behavior in the offspring of 2 groups of parents with mood disorders: those with and those without a history of suicide attempt. We tested 2 main hypotheses: (1) the offspring of attempters, compared with the offspring of nonattempters, will show a higher rate of suicide attempt, greater levels of impulsivity and aggression, and greater exposure to family environmental stressors; and (2) the familial transmission of suicide attempt will be explained by proband and offspring impulsivity and aggression and family environmental stressors, not just by the transmission of mood disorder.

## SUBJECTS AND METHODS

### SAMPLE AND RECRUITMENT METHODS

Two proband groups were recruited from inpatient units, namely, depressed suicide attempters and a comparison group of depressed nonattempters, and their biological offspring. All probands were classified as attempters or nonattempters based on their report of a suicide attempt defined as "self-injurious behavior with intent to die." Attempters were required to have made an attempt with a Medical Damage Lethality Scale rating of at least 2, indicating physical threat or sequelae that required medical evaluation or treatment.<sup>31</sup> A proportion (43%) of the probands were recruited from a pool of previous participants in biological studies of suicidal behavior, last assessed 4 to 8 years previously, with a recruitment rate of 23%. Despite the low participation rate, participants and nonparticipants were similar with regard to Axis I and II diagnoses, impulsive aggression, and indices of severity of suicidal behavior. Participants were more likely to be female ( $P = .008$ ) and married ( $P = .03$ ).

The remainder of the samples ( $n = 77, 57%$ ) in Pittsburgh, Pa, and New York, NY, was recruited from inpatient units following the same inclusion and exclusion criteria as the original cohort, with an acceptance rate of 75%. Proband provided contact information for offspring and biological coparents of offspring. In total, 299 offspring were recruited, with an acceptance rate of 88%. For the 146 biological coparents, information was provided by direct interview for 47% and by the proband for 29%, and no information was available for 36%. Similar proportions of coparents of attempter and nonattempter probands were directly interviewed (36% vs 50%). Informed consent for all interviews was obtained as approved by the institutional review boards of the University of Pittsburgh, Pittsburgh, St Francis Medical Center, Pittsburgh, and the New York State Psychiatric Institute in New York City.

## ASSESSMENT

### Axis I Disorder

All subjects older than 18 years were assessed for the presence of lifetime and current *DSM-IV*<sup>32</sup> psychiatric disorders using the Structured Clinical Interview for *DSM-IV* (SCID-I).<sup>33</sup> Biological coparents not directly interviewed were assessed with regard to diagnosis and history of suicidal and assaultive behavior using the Family History Research Diagnostic Criteria<sup>34</sup> (with criteria modified to *DSM-IV*) reported by either the proband or a biological relative. Offspring between the ages of 10 and 17 years were assessed with regard to Axis I disorders using the School Aged Schedule for Affective Disorders and Schizophrenia, Present and Lifetime Version (K-SADS-PL).<sup>35</sup> For offspring aged 2 to 9 years ( $n = 67, 22%$ ), subjects were assessed solely with the parent-report questionnaire, the Child Behavior Checklist (CBCL).<sup>36</sup> History of suicidal behavior was assessed using the Columbia University Suicide History Form, the Medical Damage Lethality Rating Scale, and the Beck Suicide Intent Scale for the current and most severe attempts in probands and all offspring 10 years and older.<sup>31,37</sup> Personality disorders were diagnosed using the Structured Clinical Interview for the *DSM-IV* Diagnosis of Personality Disorders (SCID-II) in all subjects older than 14 years.<sup>38</sup> Aggression was rated using the 11-item Brown-Goodwin Lifetime History of Aggression (BGLHA) in all subjects.<sup>39</sup> Tendency to impulsive aggression was assessed by the Buss-Durkee Hostility Inventory (BDHI) in all subjects older than 14 years.<sup>40</sup> In children aged 10 to 13 years, the downward extension of the BDHI, the Children's Hostility Inventory (CHI), was used.<sup>41</sup> In subjects older than 18 years, impulsivity was assessed using the Barratt Impulsivity Scale (BIS).<sup>42</sup> In subjects aged 10 to 17 years, the 5-item impulsivity subscale of the Iowa Conners Parent Physical Report was used.<sup>43</sup> In subjects older than 18 years, a history of physical and sexual abuse was assessed from a series of screening questions in our demographic questionnaire. As part of a 1-year follow-up, a subset of subjects older than 18 years ( $n = 201$ ) were reassessed with a self-report measure of child trauma, the Child Experiences Questionnaire.<sup>44</sup> Reliability with the initial assessment was moderate for physical abuse ( $\kappa = 0.41, SE = 0.11$ ) and high for sexual abuse ( $\kappa = 0.74, SE = 0.11$ ). For children aged 10 to 17 years, a history of physical and sexual abuse was assessed using the Psychosocial Schedule, an interview with the parent and child about home and family environment.<sup>45</sup> Patterns of maladaptive parenting were assessed using the child report of the Conflict Tactics Scale (CTS).<sup>46</sup> This scale assesses the degree of 3 response patterns: reasoning, verbal aggression, and physical violence following family conflicts. Family adaptability and cohesion were assessed by the 20-item questionnaire Family Adaptability and Cohesion Evaluation Scales (Version II), which were filled out by the child.<sup>47</sup>

### Diagnostic Procedure

All interviewers were at least master's degree-level clinicians or psychiatric nurses who received extensive training in the ad-

**Table 1. Demographic and Clinical Characteristics of Probands\***

Characteristic	Attempters (n = 81)	Nonattempters (n = 55)	Statistical Test	P Value
<b>Probands</b>				
Mean ± SD age, y	43.3 ± 11.6	47.1 ± 12.6	$t_{134} = -1.81$	.07
Female	79	75	$\chi^2 = 0.37$	.54
White	63	80	$\chi^2 = 4.52$	.03
Non-Catholic	85	61	$\chi^2 = 10.17$	.001
<b>Marital status</b>				
Single	12	11	$\chi^2_2 = 3.57$	.17
Married	43	59		
Separated, divorced, or widowed	44	30		
College education	62	64	$\chi^2 = 0.05$	.82
Currently employed	36	40	$\chi^2 = 0.25$	.62
Current income ≥\$50 000/y	25	35	$\chi^2 = 1.62$	.20
<b>Axis I</b>				
Unipolar major depression	84	89	$\chi^2 = 0.72$	.40
Dysthymia	11	13	$\chi^2 = 0.08$	.77
Bipolar I or II	11	9	$\chi^2 = 0.16$	.69
Any anxiety	58	55	$\chi^2 = 0.12$	.73
Posttraumatic stress disorder	36	15	$\chi^2 = 7.72$	.006
Attention-deficit/hyperactivity disorder	6	2	FET	.40
Alcohol or substance abuse or dependence	53	36	$\chi^2 = 3.68$	.054
<b>Axis II†</b>				
Cluster A	3	2	FET	>.99
Cluster B	37	8	$\chi^2 = 14.37$	<.001
Cluster C	8	11	$\chi^2 = 0.34$	.56

\*All data are percentage of probands unless otherwise indicated. FET indicates Fisher exact test.

†Sample sizes were reduced to 76 (attempters) and 53 (nonattempters) for Axis II.

ministration of semistructured interviews. Assessments of offspring and probands were conducted blind to each other. Best-estimate diagnoses were made by consensus and used all available sources in diagnostic consensus conferences. Within-site and cross-site reliability on the SCID-I and SCID-II, K-SADS-PL, suicide history, and the BGLHA were high (intraclass correlation coefficient=0.82-0.98,  $\kappa$ =0.86-0.95).

#### DATA ANALYSIS

Data for the 2 sites were combined after ascertaining that differences between sites were not contributing to any risk factor-by-site interactions with regard to familial transmission. The morbid risks of a suicide attempt history in the offspring of attempters and nonattempters were compared using the Kaplan-Meier estimate.<sup>48</sup> Characteristics of offspring who attempted and those who did not, as well as the characteristics of their parents, were compared using the  $\chi^2$  test for dichotomous variables and *t* tests for continuous variables. The variables that discriminated between offspring of probands who did and did not attempt suicide were entered into a mixed-effects nominal logistic regression model along with site (Pittsburgh vs New York) and recruitment source (old vs new sample).<sup>49</sup> A mixed-effects model was used to account for clustering of offspring within families, with covariates included as fixed effects. Because the data had previously been examined for a midpoint analysis,  $\alpha$  was set at .025 for hypothesis-testing analyses. As a further check, we conducted a separate set of analyses that treated the family as the analytic unit.

## RESULTS

### PROBANDS

**Table 1** gives the demographic and clinical characteristics of the probands. Probands were middle-aged, mostly

female, and had mood disorders. Proband attempters made their first attempt around the age of 30 years (mean ± SD, 31.5 ± 14.1 years). More than half had made multiple attempts (56%), with high maximum intent (mean ± SD, 16.4 ± 5.6) and lethality (43.6 ± 1.8). Attempters compared with nonattempters were more likely to be nonwhite and non-Catholic and have diagnoses of posttraumatic stress disorder and cluster B disorder. Probands recruited from Pittsburgh were younger (40.7 ± 9.7 vs 51.6 ± 12.7 years, Mann-Whitney *U* test=1092.0,  $P < .001$ ), less likely to be college educated (49% vs 85%,  $\chi^2_1=17.57$ ,  $P < .001$ ), had higher rates of posttraumatic stress disorder (35% vs 15%,  $\chi^2_1=6.15$ ,  $P = .01$ ), and had higher rates of any alcohol or substance abuse (56% vs 31%,  $\chi^2_1=8.19$ ,  $P = .004$ ) than the probands from New York. However, these 4 variables conveyed similar risks for offspring attempt in Pittsburgh and New York. Therefore, for subsequent analyses the samples were combined. Coparents of attempters were younger (45.8 ± 10.6 vs 50.5 ± 12.5 years,  $t_{92}=1.98$ ,  $P = .05$ ) and more likely to be nonwhite (34% vs 12%,  $\chi^2_1=5.64$ ,  $P = .02$ ), but were otherwise similar.

### OFFSPRING

Offspring were on average in early adulthood, with age distribution depicted in **Table 2**. Offspring of attempters and nonattempters showed similar rates of Axis I and II disorders, both lifetime (Table 2) and current disorders.

There was a higher rate of suicide attempt in the offspring of attempters than in the offspring of nonattempters (12% vs 2%,  $\chi^2_1=6.96$ ,  $P = .008$ ). Per family analyses also revealed a higher rate of offspring attempt in at-

**Table 2. Demographic and Clinical Characteristics of Offspring\***

Characteristic	Offspring of Attempters (N = 183)	Offspring of Nonattempters (N = 116)
Mean ± SD age, y	20.4 ± 12.3	18.5 ± 10.6
Age distribution, y		
2-9	22	22
10-14	19	12
15-18	15	17
≥19	44	48
Female	45	48
White†	59	77
Axis I (lifetime)‡		
Any disorder	59	52
Any mood disorder	35	38
Any anxiety	23	16
Alcohol or substance abuse or dependence	29	24
Attention-deficit/hyperactivity disorder	16	9
Axis II (lifetime only)§		
Cluster A	1	0
Cluster B	10	7
Cluster C	2	5

\*All data are percentage of offspring unless otherwise indicated.

† $\chi^2 = 9.91$ ;  $P = .002$ .

‡Sample sizes were reduced to 141 (attempters) and 87 (nonattempters).

§Sample sizes were reduced to 108 (attempters) and 74 (nonattempters) for Axis II.

tempter vs nonattempter families (20% vs 2.1%, Fisher exact test,  $P = .005$ ). There was also a higher morbid risk of attempt in offspring of attempters using the Kaplan-Meier procedure ( $0.21 \pm 0.05$  vs  $0.03 \pm 0.02$ ; Generalized Savage  $\chi^2_1 = 7.89$ ;  $P = .005$ ; odds ratio [OR], 6.2; 97.5% confidence interval [CI], 1.2-33.4). The **Figure** shows that the peak age of incident attempt was between 15 and 30 years, with a median age of onset of 16 years. On 1-year follow-up, 5 of 39 nonattempter probands made a first suicide attempt. When data were reanalyzed with these probands reclassified, the results were essentially the same (OR, 5.4; 97.5% CI, 1.0-28.9).

#### MEASURES OF IMPULSIVITY AND AGGRESSION

The offspring aged 14 years or older of attempters had higher scores on the BDHI assaultive subscale compared with offspring of nonattempters ( $4.2 \pm 2.6$  vs  $3.3 \pm 2.3$ ,  $t_{170} = 2.39$ ,  $P = .02$ ). Similarly, younger offspring of attempters had higher scores on the CHI assaultive subscale compared with offspring of nonattempters ( $8.8 \pm 1.4$  vs  $7.6 \pm 1.0$ ,  $t_{39} = 2.74$ ,  $P = .009$ ). However, there were no differences noted in the BGLHA or either of the measures of impulsivity (BIS or the Iowa Conners Impulsivity Subscale). Among younger children, the CBCL scores were not different with respect to total score or internalizing or externalizing subscales.

#### FAMILY ENVIRONMENTAL STRESSORS

Proband attempters were more likely to have been exposed to sexual abuse compared with proband nonat-



Cumulative proportion of suicide attempts among offspring of attempters vs nonattempters (Generalized Savage:  $\chi^2 = 7.89$ ;  $P = .005$ ; odds ratio, 6.2; 97.5% confidence interval, 1.2-33.4).

tempters (39% vs 18%,  $\chi^2_1 = 6.52$ ,  $P = .01$ ), although there were no differences between the 2 groups with regard to history of physical abuse (35% vs 35%;  $P = .96$ ). Neither sexual (9% vs 4%;  $P = .24$ ) nor physical abuse (9% vs 6%;  $P = .41$ ) was more common in offspring of attempters compared with offspring of nonattempters. Among the subset of offspring living with a parent ( $n = 93$ ), offspring of attempters were exposed to lower family cohesion ( $51.6 \pm 11.7$  vs  $60.9 \pm 10.7$ ,  $t_{89} = 3.73$ ,  $P < .001$ ) and lower adaptability ( $41.1 \pm 9.2$  vs  $45.6 \pm 7.4$ ,  $t_{88} = 2.41$ ,  $P < .02$ ) compared with offspring of nonattempters. There were no group differences on any subscales of the CTS.

#### RISK FACTORS FOR FAMILIAL TRANSMISSION OF SUICIDAL BEHAVIOR

Nineteen of the offspring attempted suicide, of whom 6 were pairs of siblings. Offspring who themselves attempted suicide were much more likely to have a parent who had attempted suicide and who reported a history of sexual abuse (**Table 3**). Offspring characteristics associated with an attempt were female sex; lifetime diagnoses of mood, anxiety, alcohol or other substance abuse, and cluster B disorder; a history of sexual abuse; exposure to more psychological aggression; and higher impulsive aggression. Parent sexual abuse was associated with offspring sexual abuse (OR, 6.4; 97.5% CI, 1.8-27.5). A mixed-effects logistic regression was conducted, including site (New York vs Pittsburgh), recruitment source (old vs new sample), and all the significant variables noted herein, except for offspring cluster B personality disorder and continuous measures, for which sample sizes were reduced. Neither site nor recruitment source contributed significantly to the models. Proband sexual abuse (adjusted OR [AOR], 23.8; 97.5% CI, 2.0-289.5), offspring sex (AOR, 17.1; 97.5% CI, 1.6-183.6), and offspring alcohol and/or other substance abuse (AOR, 8.7; 97.5% CI, 1.2-64.6) were significant risk factors. Analysis of these data using Cox regression yielded nearly identical results. Of the 19 offspring who attempted suicide, 17 (90%) were the offspring of suicide attempters, and so risk factors for offspring attempt were examined just within the offspring of attempters, with very similar results. A logistic regression conducted with offspring of attempters also identified parental history of sexual abuse, offspring substance abuse, and offspring female sex as predictors of familial transmission of suicidal behavior.



**Table 3. Risk Factors for Offspring Suicide Attempt\***

Characteristic	Attempters (n = 19)	Nonattempters (n = 213)	Statistical Test	P Value	OR (95% CI)
Proband characteristics, %					
Proband attempt	90	59	$\chi^2_1 = 6.96$	.008	6.0 (1.3-26.6)
Proband sexual abuse	79	24	$\chi^2_1 = 25.19$	<.001	11.6 (3.7-36.6)
Offspring characteristics, %					
Female	90	45	$\chi^2_1 = 14.07$	<.001	10.6 (2.5-45.4)
White	47	72	$\chi^2_1 = 5.19$	.02	2.9 (1.1-7.5)
Any mood disorder (lifetime), %	84	32	$\chi^2_1 = 20.95$	<.001	11.6 (3.3-41.0)
Any alcohol or substance abuse (lifetime), %	58	24	$\chi^2_1 = 9.87$	.002	4.3 (1.6-11.2)
Cluster B, %	31	7	Fisher exact test	.007	6.4 (1.9-21.7)
Offspring sexual abuse, %	42	4	Fisher exact test	<.001	18.5 (5.9-58.7)
Psychological aggression, mean $\pm$ SD, %	18.4 $\pm$ 9.1	6.4 $\pm$ 6.2	$t_{91} = 4.76$	<.001	1.2 (1.1-1.4)
Cohesion, mean $\pm$ SD, %	42.1 $\pm$ 11.3	55.8 $\pm$ 11.7	$t_{89} = 2.97$	.004	0.9 (0.8-0.98)
Impulsivity or aggression					
Buss-Durkee Hostility Inventory and Child Hostility Inventory, mean $\pm$ SD	0.55 $\pm$ 0.81	-0.25 $\pm$ 0.92	$t_{213} = 3.46$	<.001	2.6 (1.4-4.7)

\*OR indicates odds ratio; CI, confidence interval. Sample sizes were reduced for offspring cluster B (n = 16 attempters, n = 166 nonattempters); psychological aggression (n = 7 attempters, n = 86 nonattempters); cohesion (n = 7 attempters, n = 84 nonattempters); and Buss-Durkee Hostility Inventory and Child Hostility Inventory (n = 17 attempters, n = 198 nonattempters).

### TIMING OF PROBAND AND OFFSPRING ATTEMPT

The relationship between the timing of the most recent parent attempt and earliest offspring attempt was examined and did not show any evidence of time clustering. In 4 parent-child pairs, the offspring attempt actually preceded the parent attempt by 1.8 to 9.4 years. In 4 parent-child pairs, the offspring attempts occurred more than 20 years after the last parent attempt. In only 2 parent-offspring pairs did the attempts occur within 12 months of one another. In addition, there were 3 sibling pairs of attempters whose first attempts occurred within 10 months, 18 months, and 14 years of one another.

### COMMENT

This high-risk family study found a strong and specific familial transmission of early-onset suicidal behavior from parent to child. Offspring of attempters had a 6-fold increased risk for a suicide attempt, relative to offspring of nonattempters, comparable to rates reported in adoption, twin, and family studies of suicide and suicidal behavior.<sup>2,4-20</sup> An essential but not sufficient component of familial transmission of suicidal behavior was the transmission of a mood disorder because 82% of familial offspring suicide attempts occurred in the context of an offspring mood disorder. In addition to the transmission of a mood disorder, the familial transmission of suicidal behavior was related to the familial transmission of sexual abuse and to increased impulsive aggression in offspring.

Sexual abuse in both parent and child played an important role in transmission of suicidal behavior. A history of reported parental sexual abuse increased the risk of attempt in offspring, regardless of the offspring's reported abuse status. In addition, a history of sexual abuse in the proband increased the likelihood that their offspring would be sexually abused, which in turn was also associated with increased likelihood of offspring at-

tempt. The intrafamilial transmission of sexual abuse has been described previously,<sup>50</sup> but to our knowledge, this is the first report linking the familial transmission of reported sexual abuse with the familial transmission of suicide attempt. At present, we cannot determine how parent and child sexual abuse were related in this sample, although other studies<sup>51,52</sup> suggest that abused parents may be less vigilant and more likely to choose an abusive partner. Other family environmental correlates of suicide attempt in offspring, namely, increased parental psychological aggression directed toward the child and decreased family cohesion, are consistent with previous reports and are often important family correlates of sexual abuse.<sup>51-53</sup>

Difficulties with regulation of mood and behavior in parent and offspring were associated with offspring attempt. Offspring of probands with suicide attempts showed a greater likelihood to respond to frustration or provocation with aggression on the BDHI or its downward extension, the CHI, and also showed a higher prevalence of cluster B personality disorder. Impulsive aggression, measured dimensionally, and cluster B personality disorder were also associated with offspring suicide attempt. However, measures of impulsivity alone were not associated with offspring attempt. These data are consistent with a growing literature that associates liability to hostility or aggression in the face of stress, rather than impulsivity, with suicidal behavior.<sup>54</sup>

Our data are not consistent with imitation as an explanation for parent-to-child transmission. The time difference between parent and child attempt was highly variable, with the child attempt preceding the parent attempt in some cases. Other studies of familial transmission of suicidal behavior are also inconsistent with imitation. Studies<sup>29,30</sup> of youth exposed to suicide, including siblings, did not find imitation of suicidal behavior. Twins concordant for suicide attempt show great variability in the timing of their attempts.<sup>19</sup> Adoption studies do not support a strong role for modeling of suicide within families.<sup>4,5</sup>

The strengths of this study include a high-risk family design, allowing assessment of mechanisms of transmission from parent to child, assessment of key domains likely to be involved in the transmission of suicidal behavior, and control for mood disorder in both proband groups, so that risk factors for transmission of suicidal behavior other than mood disorder could be examined. Our assessment of sexual abuse showed high reliability with few false-negative results. In this 2-site study, the same risk factors for familial transmission of suicide attempt were observed at both sites, thereby bolstering the validity and generalization of these findings.

This study has some limitations. The proband sample, recruited from inpatient facilities, was clinically severe, so it remains to be determined whether the findings can be generalized to those with less severe mood disorders. Therefore, this sample is informative, because of its severity, rather than representative. However, other family studies<sup>6,7,10,19</sup> that used representative samples of suicide completers and attempters, although not of a high-risk design, have also found transmission of suicidal behavior. Because all the probands had mood disorders, we cannot draw conclusions about the familial transmission of suicidal behavior in those with other mental disorders, although other studies<sup>16,20</sup> suggest that familial transmission of suicidal behavior occurs in patients with alcoholism and schizophrenia. Our sample of probands contains very few male attempters, because male attempters who were inpatients often did not have access to their children. Consequently, our results are informative about familial transmission of suicidal behavior from mother to child only. However, our findings are consistent with family studies<sup>2,4-7,9,17,18</sup> of mostly male suicide completers. In this article, we only report on the presence or absence of physical or sexual abuse. More detailed assessment of abuse and exposure histories are being obtained on follow-up and will be the subject of future communications. The reliability of our assessment of physical abuse was only moderate, in keeping with the literature, and this may have obscured finding a relationship between physical abuse and suicidal behavior.<sup>55</sup> Finally, although the design of the study is prospective, in this report, we describe solely the cross-sectional relationships observed.

In conclusion, we have demonstrated familial transmission of suicidal behavior in a sample of hospitalized adults with mood disorders and their offspring using a high-risk design. These findings are consistent with previous adoption, twin, and family studies. In a clinically referred sample, parents with mood disorders who have made suicide attempts and have been sexually abused are highly likely to have children who attempt suicide. Conversely, children with mood disorders are at greater risk for an attempt if they also show evidence of impulsive aggression, have been sexually abused, and have parents with the aforementioned risk indicators. These findings provide a framework for potential targets for treatment and prevention. Future studies will attempt to validate and extend these observations through the further prospective follow-up of this cohort.

Submitted for publication May 16, 2001; final revision received August 15, 2001; Accepted for October 24, 2001.

This work was supported by National Institutes of Mental Health grants MH56612, MH56390, MH55123, and MH62185.

We thank Anabel Bejarano, PhD, Ainslie Burke, PhD, Shannon Falcone, MSW, Hope Jacob, MEd, and Kary McPherson, BSN, for conducting interviews; Joselin Mackily, BA, and Lynn Manalac-Stanley, BS, for completing data cleaning and management; Laurel Chiappetta, BS, for database development and consultation; Judith Cohen, MD, for editorial suggestions; and Satish Iyengar, PhD, for providing statistical consultation. We also thank Beverly Sughrie and Virginia Howard for their expert assistance in the preparation of this manuscript.

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