

# Childhood Predictors of Completed and Severe Suicide Attempts

## Findings From the Finnish 1981 Birth Cohort Study

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**Context:** To our knowledge, no prospective, population-based study in existence examines predictive associations between early or middle childhood psychopathologic disorders and later completed suicides.

**Objective:** To study predictive associations between childhood psychopathologic disorders at the age of 8 years and later completed suicides and severe suicide attempts.

**Design:** Birth cohort study of individuals 8 to 24 years old.

**Setting:** Finland.

**Participants:** The sample includes 5302 Finnish people born in 1981 who were examined at the age of 8 years to gather information about psychopathologic conditions, school performance, and family demographics from parents, teachers, and children.

**Main Outcome Measures:** National register-based lifetime information about completed suicides and suicide attempts that prompted hospital admission.

**Results:** Of all 24 deaths among males between 8 and 24 years of age, 13 were suicides, whereas of 16 deaths among females, only 2 were suicides. Fifty-four males and fe-

males (1%) had either completed suicide or made a serious suicide attempt, defined as a suicide attempt that prompted hospital admission. Of 27 males with completed or serious suicide attempts, 78% screened positive on parent or teacher Rutter scales at the age of 8 years, whereas of 27 females only 11% screened positive. Among males, completed or serious suicide attempt outcome was predicted at the age of 8 years by living in a nonintact family; psychological problems as reported by the primary teacher; or conduct, hyperkinetic, and emotional problems. However, self-reports of depressive symptoms at the age of 8 years did not predict suicide outcome. No predictive associations between the study variables measured at the age of 8 years and suicide outcome were found among females. Male suicide outcome was predicted most strongly by comorbid conduct and internalizing problems.

**Conclusions:** Most males who completed suicide and/or made serious suicide attempts in adolescence or early adulthood had psychiatric problems by the age of 8 years, indicating a trajectory that persists throughout their lives. However, female severe suicidality is not predicted by psychopathologic disorders at the age of 8 years. The results give additional support to the importance of early detection and treatment of psychiatric problems in males.

*Arch Gen Psychiatry.* 2009;66(4):398-406

**S**UICIDE AMONG ADOLESCENTS and young adults is a major public health concern worldwide.<sup>1</sup> The rates of mortality by suicide have been found to be high among those with medically serious suicide attempts.<sup>2,3</sup> For effective prevention, knowledge of the key risk factors for suicide is essential.<sup>2,4-6</sup> The main target of effective prevention of youth suicides is to reduce suicide risk factors.<sup>7-9</sup> Previous studies<sup>10-13</sup> have shown that most youths who attempt or think about suicide in a community setting have a psychiatric disorder. Similarly, psychological autopsy studies<sup>5,12,14,15</sup> have shown that psychopathologic disorders are strongly associated with completed suicide. Mood,

anxiety, disruptive, and substance use disorders, severity or prolonged course of psychiatric problems, and previous suicide-spectrum behavior have all been identified as risk factors for suicide attempts and completed suicides. The findings on risk factors for eventual suicide in follow-up studies of child and adolescent psychiatric patients and patients who attempt suicide are similar to the findings reported in psychological autopsy studies.<sup>2</sup>

Psychological autopsy studies<sup>5,15,16</sup> rely on a procedure for retrospectively reconstructing the life history, behavior, and social and psychological features of the deceased person, as well as the events preceding the suicide, using interviews with key persons who knew the deceased person. However,

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the methodologic problems of psychological autopsy include the possibility of incomplete information and difficulties in the assessment of the psychopathologic disorder.<sup>17,18</sup> Furthermore, the problems connected with reliable retrospective information about childhood problems are clear. Therefore, despite mounting evidence of a link between psychopathologic disease and suicidality in youth, several important questions remain unanswered.

First, the longitudinal nature of the relationship between completed suicide and serious, life-threatening suicide attempts and childhood psychopathologic disorders remains unclear. Only a few prospective, population-based cohorts have provided information about childhood psychopathologic disorders that extend into adulthood. Most longitudinal studies on risk factors for suicidality focus on adolescents. However, such a focus represents a limitation to our understanding of the full picture, particularly because the externalization of problems often starts before adolescence.

Second, previous birth cohort studies have examined the relationship between childhood psychopathologic disorders and suicide ideations and/or attempts. To our knowledge, no prospective, population-based study examining predictive associations between early or middle childhood psychopathologic disorders and later completed suicide exists. This is understandable because suicide is a rare phenomenon, and the number of individuals in most previous prospective psychiatric birth cohort studies that include information about psychopathologic disorders in childhood and suicidality in adulthood does not exceed approximately 1000. However, it is unclear whether findings from longitudinal studies about childhood antecedents of suicidal ideations and suicidal acts, which usually do not require medical attention, can be generalized to completed suicides or severe suicide attempts (ie, attempts requiring patient admission to the hospital).

Third, previous studies<sup>19,20</sup> have suggested that internalizing and externalizing combinations of psychopathologic disorders appear to increase the share of severe outcomes. However, the only existing large-scale, population-based study examining predictive associations between comorbid psychopathologic disorders and suicidal ideations and suicide attempts is the Great Smoky Mountains Study.<sup>19</sup> The study shows that depression is a major proximal risk factor, especially in association with anxiety or disruptive disorders.

To our knowledge, this is the first longitudinal, population-based study that examined the predictive association between early childhood psychopathologic disorders and completed suicides and serious suicide attempts requiring admission to the hospital. Because suicide attempts that result in the need for hospital treatment and completed suicides are rare phenomena, and previous findings show that the characteristics of the 2 groups of people who perform these actions are similar,<sup>3</sup> to pool these groups together was justified. This new information will provide the opportunity to address the question of whether it is possible to identify high-risk groups for future severe suicidality as early as 8 years of age. The large sample size made it possible to perform all analyses separately for males and females.

This investigation is part of the nationwide Finnish 1981 Birth Cohort Study. The Joint Commission on Ethics of Turku University and Turku University Central Hospital approved the research plan. Informed consent was obtained from the children's parents at baseline. The combination of information from questionnaires and registry data was analyzed in such a way that the patient could not be identified.

More details about the methods of the study have been reported previously.<sup>21-23</sup> The original representative study sample was drawn from the total population of Finnish children born during 1981 ( $n=60\,007$ ). The first assessment was conducted in October and November 1989. Of the selected 6017 children, 5813 (96.6%) took part in the study in 1989. The personal identification numbers of 5351 patients could be linked with the Finnish Population Register. Altogether, 462 identification numbers had been either lost or inappropriately documented. According to the population register, 50 patients had moved permanently from Finland before December 31, 2005. All of these patients, except 1 who had been admitted to the hospital because of a suicide attempt while living in Finland, were excluded from the analysis. Therefore, the number of patients in the present study was 5302 (88.1% of the original target sample and 91.2% of those who participated in the study in 1989). The number of males was 2700 (93.1% of those who participated in the 1989 study), and the number of females was 2602 (89.7%).

#### MENTAL HEALTH PROBLEMS AT THE AGE OF 8 YEARS

Behavior at the age of 8 years was assessed using information collected from 3 different sources: parents, teachers, and the children themselves. Data collection was organized through teachers. The teacher sent parent questionnaires via the child to the parents, and the parents returned the questionnaires to the teacher in sealed envelopes.

Parents and teachers evaluated psychopathologic disorders through the Rutter questionnaire, which is a validated child psychiatric instrument and widely used in child psychiatric research. The parent version of the Rutter scale<sup>24</sup> consists of 31 items and the teacher version<sup>25</sup> consists of 26 items rated on a scale of 0 to 2. The total score cutoff points, 13 in the parent scale and 9 in the teacher scale, have been widely used internationally and in Finland.<sup>21</sup> Being above the clinical cutoff point in parent or teacher total scores was used in the present study as a major indicator of possible disturbance.

The parent and teacher questionnaires include 3 subscales: conduct, hyperkinetic, and emotional symptom domains. The conduct scale inquires about behaviors such as disobedience, defiance, fits of temper, aggression or cruelty toward others, destruction of property, stealing, and lying. The hyperactivity scale includes questions related to inattentive behavior, short attention span, distractibility, restlessness, and hyperactivity. The emotional scale asks about shyness, anxiety, and withdrawal behaviors. Parent and teacher information was combined to generate a sum score of conduct, hyperkinetic, and emotional scales.

Children completed the Children's Depression Inventory (CDI) by self-report, which assesses depression symptoms in children.<sup>26</sup> The questionnaire consists of 27 items rated on a scale of 0 to 2. The question concerning suicide was excluded because of the age of the study group and because there was no clinical follow-up after the self-reports in the classroom. Thus, the Finnish version of the CDI consisted of 26 questions.

The different childhood psychopathology domains (conduct, hyperkinetic, emotional, and depressive) were studied

separately as categorical and linear variables. To generate easily interpretable measures of psychopathologic disorders, results of the 4 mental health scales were categorized into below or above the 90th percentile. The sex-specific cutoff points were based on the distribution of scores in the baseline sample. Of note, scoring above these cutoff points has been shown to predict a large number of adversities 10 to 15 years later.<sup>27</sup>

Furthermore, we studied comorbid psychopathologic disorders at the age of 8 years and suicide outcome. We collapsed the 16 combinations of the 4 psychopathology domains into 6 groups to define clinically meaningful types according to our previous report<sup>27</sup>: (1) children who screened negative (below the 90th percentile) on all 4 scales (this group was used as the reference group in the statistical analyses); (2) children who screened positive on the conduct and emotional or CDI scales (conduct-emotional group), which indicated that they had a high level of symptoms in conduct and emotional domains; (3) children who screened positive on the conduct scale and negative on the Rutter parent or teacher emotional and CDI scales (conduct-only group); (4) children with hyperactivity problems but without conduct problems (attention/hyperactive group); (5) children with parent- or teacher-reported emotional problems who screened negative on conduct and attention scales (emotional-only group); and (6) children who reported high depressive symptoms but who screened negative on all 3 scales based on parent or teacher reports (invisible group; ie, depressiveness was not recognized by parents or teachers).

Additional data at the age of 8 years were collected on the following: (1) parental education level: completion of at least 12 years of education by the father or mother (in Finland, compulsory education consists of 9 years of comprehensive school, after which education can be continued in vocational school or upper secondary school); (2) family structure: families were classified as intact (2-biological-parent families) or nonintact (others); (3) general psychological health: the teacher questionnaire included the question, "Is the child psychologically healthy?" (1 = yes, 2 = I don't know, 3 = no; alternatives 2 and 3 were pooled); and (4) school performance: teachers reported whether the child's academic performance was better than average (1), average (2), or poor (3); alternatives 1 and 2 were pooled.

#### FOLLOW-UP INFORMATION ABOUT COMPLETED SUICIDES AND SEVERE SUICIDE ATTEMPTS

Follow-up data through December 31, 2005, were obtained from different data sources. The information from 2 registers was linked using the personal identification number that has been assigned to each resident of Finland by the Finnish Population Register since 1971. The information sources used in this study consist of those described in the following paragraphs.

##### Statistics: the Finnish Cause of Death Register

Information about deaths and the causes of death of cohort members before the end of 2005 were collected from Statistics Finland and further ascertained from death certificates. Statistics Finland produces statistics on causes of death and the development of mortality. It also maintains an archive of death certificates from which information or copies of death certificates can be obtained for research purposes prescribed by law. The statistics on causes of death are compiled from data obtained from death certificates, which are supplemented with data from the population information system of the Population Register Center. The statistics on causes of death cover persons who have died in Finland or abroad during the calendar year and who, at the time of death, were domiciled in Finland.<sup>28</sup> The causes

of death were coded according to the *International Classification of Diseases, Ninth Revision (ICD-9)*<sup>29</sup> before the year 1996 and according to the *International Statistical Classification of Diseases, 10th Revision (ICD-10)*<sup>30</sup> from 1996 onward.

The Finnish Hospital Discharge Register was used to identify all patients who had a hospital admission with a diagnosis of suicide attempt during the years 1994 to 2005. The computerized discharge register includes, among other things, data on the date of all hospital admissions, discharge diagnoses, and types of unintentional injuries. The Finnish Hospital Register was established in 1967, and its good validity is widely documented in the field of epidemiologic research.<sup>31,32</sup>

#### Copies of Death Certificates From Forensic Medical-Legal Investigations

Death certificates, which are completed by pathologists, include additional information about cause and manner of death. For example, in fatal poisonings, the most important toxicologic finding is indicated in the death certificate by a code that states the underlying cause of death.

#### MAIN OUTCOME MEASURE

The main outcome measure was severe suicidal behavior: a completed suicide and/or serious suicide attempt. A serious suicide attempt was defined as a suicide attempt that required patient admission to the hospital, consistent with previous reports.<sup>32</sup> In the Finnish Hospital Discharge Register, the diagnostic codes for suicide attempts were *ICD-9* codes E950-E959, V156, or V658 between 1994 and 1995 and *ICD-10* codes X60-X84, Z72.8, or Z91.5 between 1996 and 2005.

Death by suicide was defined as any death certificate diagnosis of suicide. The method of suicide was classified as hanging, shooting, drowning, deliberate traffic accident, jumping from a high place, or intoxication (poisoning or gas). The cohort members who had died of causes other than suicide were excluded. All forensic medical documents of suicide and unintentional death were reviewed by 3 specialists in psychiatry, 2 of whom (A.S. and S.N.) are coauthors of this study. Only in 1 case was there disagreement. However, after a consensus discussion, this case was categorized as an unintentional death according to the forensic medical document classification.

#### STATISTICAL ANALYSIS

Rates of serious suicide attempts and completed suicide were compared among the groups defined by risk factors at the age of 8 years. The statistical significance of risk factors on outcome variables was tested with logistic regression analysis. Respectively, odds ratios (ORs) and 95% confidence intervals (CIs) were estimated using logistic regression. Because of small frequencies, the tests and calculations of CIs were performed using exact conditional logistic regression technique.<sup>33</sup> Logistic regression analyses were preferred to Cox analyses because of the possibility of using exact statistical techniques. A set of indicator variables described comorbid psychiatric status at the age of 8 years; the group of children who screened negative on each of the screens at the age of 8 years was defined as the reference group.

The survival curve estimates were calculated with the Kaplan-Meier technique. Significant differences between Rutter screen-positive and screen-negative groups were tested using Cox regression analyses and quantified using hazard ratios (HRs). For patients with several attempts, the first event was used in the estimation. All analyses were performed using a commercially available software program (SAS for Windows, release 9.1/2006; SAS Institute Inc, Cary, North Carolina).

**Table 1. Methods of Suicide and Serious Suicide Attempts**

Suicide or Suicide Attempt Method	Completed Suicides, No. (%)		Serious Suicide Attempts, No. (%)	
	Males (n=13) <sup>a</sup>	Females (n=2)	Males (n=17) <sup>a</sup>	Females (n=25)
Running into traffic or jumping	5 (38)	1 (50)	3 (18)	1 (4)
Drug overdose or poisoning	4 (31)	0	11 (65)	23 (92)
Hanging	3 (23)	1 (50)	0	0
Shooting	1 (8)	0	1 (6)	0
Other	0	0	2 (12)	1 (4)
Repeated attempts requiring patient admission to hospital			2 (12)	5 (20)
Later completed suicide			3 (18)	0

<sup>a</sup>Three males who attempted suicide also belong to the completed suicide group.

## RESULTS

### DEATH BETWEEN THE AGES OF 8 AND 24 YEARS

Of all 24 deaths among males, 13 (54%) were suicides. Other reasons for male deaths were unintentional injuries (n=7, 29%) and homicide (n=3, 13%). Only 1 male died because of physical illness. Among females, of 16 deaths only 2 (13%) were suicides. The cause of death of 7 females (44%) was unintentional: in 5 cases (31%) physical illness and in 2 cases (13%) homicide. For all deaths, the mean age of males was 20.8 years (SD, 3.7 years; range, 9.7-24.8 years) and the mean age of females was 16.3 years (4.5; 9.3-23.8 years). The mean age of males who completed suicide was 21.3 years (SD, 2.2 years; range, 17.3-23.7 years), whereas the 3 females were 14 and 16 years old.

### HOSPITAL ADMISSIONS BECAUSE OF SUICIDE ATTEMPTS

During the study period, 42 patients (17 males and 25 females) were admitted to the hospital because of a suicide attempt. Three of these males completed suicide later. Furthermore, 2 males and 5 females had 2 hospital admissions because of suicide attempts. The mean age at the first hospital admission because of a suicide attempt was 19.7 years among males (SD, 2.6 years; range, 14.6-22.7 years) and 20.1 years among females (3.2; 15.0-24.4). The mean length of stay in the hospital after a suicide attempt was 4.3 days among males (SD, 5.4; range, 1.0-22.0 days) and 5.0 days among females (5.8; 1.0-27.0).

### METHODS OF COMPLETED AND ATTEMPTED SUICIDES

Altogether, 54 patients (27 males and 27 females) comprising 1% of the sample had either completed suicide or a serious suicide attempt that required patient admission to the hospital. **Table 1** gives the descriptive data of completed and attempted suicides for males and females. When information about methods of completed and attempted suicides was pooled, intoxication or poisoning was the method used in 85% of acts of suicide by

females and 50% of those by males (Fisher exact test,  $P=.006$ ), whereas the figures for running into traffic or jumping were 7% and 27%, respectively ( $P=.08$ ). Males were responsible for 3 of 4 hangings and for the 2 shootings. The 7 persons who had repeated hospital admissions because of suicide attempts used similar methods at different time points.

### PREDICTORS AT THE AGE OF 8 YEARS

Of the 27 males, 21 (78%) (OR, 8.5; 95% CI, 3.4-21.2) who completed or attempted suicide screened positive on either the parent or teacher Rutter scale at the age of 8 years, whereas only 3 of the 27 females (12%) (OR, 0.9; 95% CI, 0.3-3.2) screened positive on these measures. As indicated in **Table 2**, among males, nonintact family, screen-positive status on parent or teacher Rutter scales, and psychological problems as reported by the primary teacher predicted suicide outcome. Poor school performance did not predict the outcome. When psychopathology domains were studied, conduct, hyperkinetic, and emotional problems predicted the outcome among males. However, self-reported depressive symptoms did not predict the outcome. When psychopathology domains were studied as linear variables, the results remained the same; conduct scale (OR, 2.0; 95% CI, 1.5-2.5 for 1-SD change;  $P<.001$ ), hyperkinetic (1.8; 1.4-2.4;  $P<.001$ ), and emotional scales (1.7; 1.3-2.3;  $P<.001$ ) strongly predicted suicide outcome among males. The results remained similar when parent and teacher symptom scales were studied separately. However, among females, none of the explanatory variables at the age of 8 years (family structure, parental education level, or psychopathology scales analyzed categorically or linearly) predicted suicide group status at follow-up.

To study the independent predictive associations between childhood factors and suicide outcome among males, family structure, parent education level, conduct, hyperkinetic, and emotional scales were included in the multivariate analysis. Because of the small number of cases in the suicide group, the psychopathology variables were analyzed as linear scales. Conduct (OR, 1.8 for 1-SD increase in the scale; 95% CI, 1.4-2.4;  $P<.001$ ) and emotional scales (1.5; 1.1-2.0) independently predicted suicide outcome.

**Table 2. Childhood Predictors at the Age of 8 Years and Completed Suicide or Severe Suicide Attempts Before the Age of 25 Years<sup>a</sup>**

Predictor	Boys				Girls			
	Total No.	Completed Suicide or Severe Suicide Attempt(s), No. (%) (n=27)	P Value	OR (95% CI)	Total No.	Completed Suicides or Severe Suicide Attempt(s), No. (%) (n=27)	P Value	OR (95% CI)
Family structure			<.001				.64	
Two biological parents	2174	15 (0.7)			2132	21 (1.0)		
Other	432	11 (2.5)		3.8 (1.7-8.2)	403	5 (1.2)		1.3 (0.5-3.4)
Parent educational level			.92				.36	
Completion of upper secondary or higher	915	17 (1.9)			889	7 (0.8)		
Less than completion of upper secondary	1654	9 (0.5)		1.1 (0.5-2.4)	1617	19 (1.2)		1.5 (0.6-3.6)
Rutter parent total scores			<.001				.51	
Screen negative (<13 points)	2240	12 (0.5)			2336	23 (1.0)		
Screen positive (≥13 points)	379	15 (4.0)		7.7 (3.6-16.5)	204	3 (1.5)		1.5 (0.4-5.0)
Rutter teacher total scores			<.001				.68	
Screen negative (<9 points)	2105	11 (0.5)			2423	25 (1.0)		
Screen positive (≥9 points)	564	16 (2.8)		5.6 (2.6-12.0)	148	1 (0.7)		0.7 (0.1-4.8)
Rutter parent and teacher total scores			<.001				.93	
Screen negative	1849	6 (0.3)			2206	22 (1.0)		
Screen positive (either/or rule)	779	21 (2.7)		8.5 (3.4-21.2)	317	3 (0.9)		0.9 (0.3-3.2)
Psychological problems as reported by teacher			.01				.55	
No	2246	18 (0.8)			2434	24 (1.0)		
Yes	413	9 (2.2)		2.8 (1.2-6.2)	127	2 (1.6)		1.6 (0.4-6.9)
School performance as reported by teacher			.37				.35	
Good or moderate	2232	21 (0.9)			2308	24 (1.0)		
Poor	422	6 (1.4)		1.5 (0.6-3.8)	248	1 (0.4)		0.4 (0.1-2.9)
Conduct scale			<.001				.56	
<90th percentile	2327	17 (0.7)			2222	23 (1.0)		
≥90th percentile	264	10 (3.8)		5.4 (2.4-11.8)	295	2 (0.7)		0.7 (0.2-2.8)
Hyperkinetic scale			<.001				.76	
<90th percentile	2329	17 (0.7)			2229	21 (0.9)		
≥90th percentile	246	8 (3.3)		4.3 (1.9-10.0)	265	3 (1.1)		1.2 (0.4-4.1)
Emotional scale			<.001				.31	
<90th percentile	2265	17 (0.8)			2249	21 (0.9)		
≥90th percentile	320	10 (3.1)		4.3 (1.9-9.4)	248	4 (1.6)		1.7 (0.6-5.1)
Self-report of depressive symptoms (CDI)			.93				.88	
<90th percentile	2331	24 (1.0)			2269	23 (1.0)		
≥90th percentile	308	3 (1.0)		0.9 (0.3-3.2)	271	3 (1.1)		1.1 (0.3-3.7)

Abbreviations: CDI, Children's Depression Inventory; CI, confidence intervals (calculated using exact conditional logistic regression technique); OR, odds ratio.  
<sup>a</sup>Results of univariate logistic regression analysis.

**Table 3. Childhood Psychiatric Comorbidity and Completed Suicide or Severe Suicide Attempts Before the Age of 25 Years**

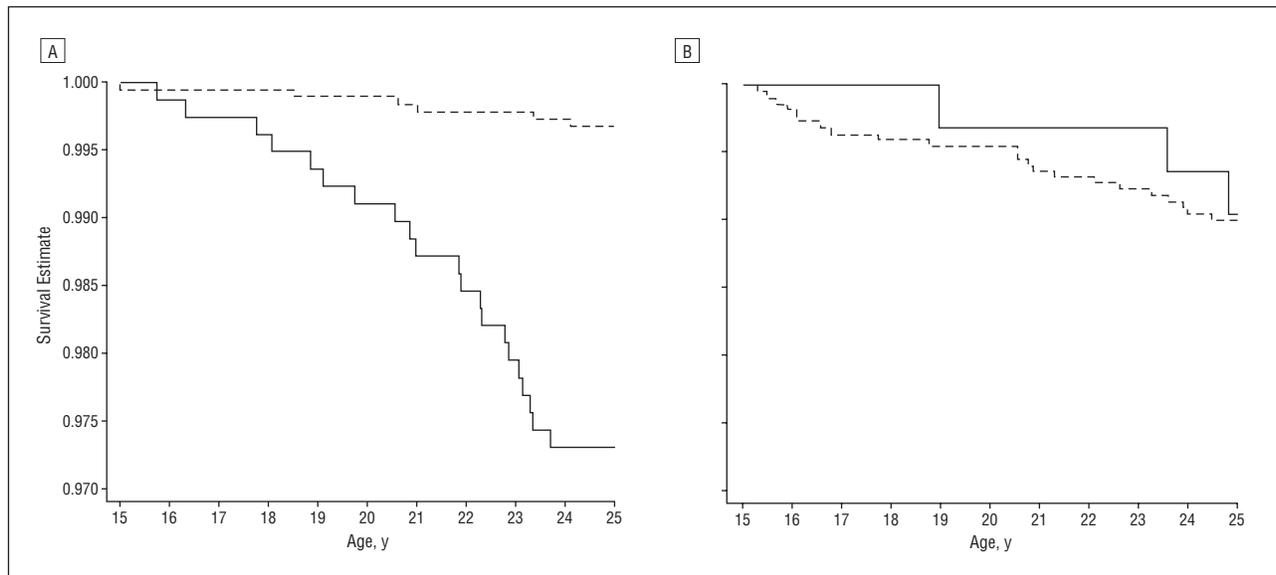
Psychiatric Comorbidity	Boys				Girls			
	Total No.	Completed Suicide or Severe Suicide Attempt(s), No. (%) (n=26)	P Value	OR (95% CI)	Total No.	Completed Suicide or Severe Suicide Attempt(s), No. (%) (n=24)	P Value	OR (95% CI)
Reference	1772	8 (0.5)			1725	17 (1.0)		
Conduct only	146	4 (2.7)	.003	6.2 (1.8-20.9)	192	1 (0.5)	.55	0.5 (0.1-4.0)
Conduct-emotional	110	5 (4.6)	<.001	10.5 (3.4-32.7)	86	1 (1.2)	.87	1.2 (0.2-9.0)
Attention/hyperactive	101	2 (2.0)	.06	4.5 (0.9-21.2)	136	2 (1.5)	.59	1.5 (0.3-6.6)
Emotional only	242	6 (2.5)	.002	5.6 (1.9-16.3)	163	2 (1.2)	.77	1.2 (0.3-5.5)
Invisible	163	1 (0.6)	.77	1.4 (0.2-11.0)	138	1 (0.7)	.76	0.7 (0.1-5.6)

Abbreviations: CI, confidence intervals (calculated using exact conditional logistic regression technique); OR, odds ratio.

### COMORBID GROUPS

When the predictive associations between comorbid psychopathology groups and suicide outcome were studied, among males, conduct problems with and without inter-

nalizing problems and having problems of a solely emotional nature (mostly anxiety) predicted the outcome. As indicated in **Table 3**, the strongest predictor for suicide outcome among males was conduct-emotional status at the age of 8 years. Remarkably, approximately 1 in 20 males



**Figure.** Survival estimates of completed suicide or first hospital admission because of suicide attempt. A, Survival estimates among Rutter screen-positive (solid line) and Rutter screen-negative (dashed line) males (hazard ratio, 8.4; 95% confidence interval, 3.4-20.8;  $P < .001$ ). B, Survival estimates among Rutter screen-positive (solid line) and Rutter screen-negative (dashed line) females (hazard ratio, 1.0; 95% confidence interval, 0.3-3.2;  $P = .94$ ).

with comorbid conduct and emotional problems at the age of 8 years completed or seriously attempted suicide during adolescence or early adulthood compared with only 1 in 250 males in the reference group. Among females, no predictive associations between comorbid psychopathology and suicide outcome were found.

#### ADDITIONAL ANALYSIS

Among screen-positive males, the product-limit survival estimate (completed suicide or first hospital admission because of suicide attempt) depreciated along the follow-up time (**Figure**, A). The difference between screen-positive and screen-negative males was statistically significant (HR, 8.4; 95% CI, 3.4-20.8;  $P < .001$ ). Among girls (**Figure**, B), there was no similar difference between screen-positive and screen-negative cases (HR, 1.0; 95% CI, 0.3-3.2). However, the number of screen-positive girls who attempted or completed suicide was 3, so the survival function for this group estimate is artificial.

Furthermore, no significant interactions between conduct, hyperkinetic, emotional, and depressive scales and suicide outcome were found. Finally, no significant differences in psychopathology variables at the age of 8 years were found among males who completed suicide or made only a serious attempt. Of note, both females who died by suicide screened negative on both parent and teacher Rutter scales.

#### COMMENT

To our knowledge, there is no comparable prospective, population-based study that examines childhood predictors of later completed suicides or serious, life-threatening suicide attempts. As such, the study has several strengths: nationwide sample, low attrition rate, combination of information about childhood psychopathologic disorders based on validated and multi-

informant measurements, and use of national registers.

The main finding of our study is that severe suicidality in adolescence and early adulthood has different childhood trajectories among males and females. This finding is in line with previous observations, which indicates that there is a complex association between sex and suicidality.<sup>32,34-39</sup> In most countries, one of the most consistent findings in suicide research is that females make more suicide attempts than males, but males are more likely to die by suicide than females.<sup>10,35</sup> As suicide attempts become medically more serious, the percentage of males involved in attempts increases and the sex differences in attempt rates are reduced. Psychopathologic factors, psychosocial differences, and sex-related method preferences are considered to contribute to this pattern of sex differences.<sup>34,35</sup>

The present study shows that among males severe suicidality (ie, completed suicide or serious, life-threatening attempts) shows a pathway of persistence throughout the life cycle, starting in early childhood. Four of 5 of these males showed a high level of psychiatric symptoms at the age of 8 years. Parent and teacher reports of conduct and emotional (mostly anxiety) symptoms had the strongest predictive association with suicide outcome. These findings have considerable public health significance. Previous research has suggested that one of the main targets of effective prevention of youth suicides is to reduce suicide risk factors.<sup>7-9,40,41</sup> Therefore, our findings suggest that early recognition and effective treatment of early childhood psychiatric problems among males may have an effect on the risk of later severe suicidal behavior.

However, among females, no predictive associations were found between the outcomes of severe suicide attempts and psychopathologic disorder or childhood family factors at the age of 8 years. Female suicide-spectrum problems are strongly associated with affective disorders. There is a sharp increase in affective disorders after onset

of puberty among girls.<sup>42</sup> This is most likely why psychopathologic disorders as early as the age of 8 years did not predict severe suicidality among girls. In addition, previous reports<sup>43</sup> have indicated that the risk conveyed by conduct or antisocial disorder is greater among males.

Because our sample included so few completed suicides among females, the results among females apply only to suicide attempts. In our sample, almost all the suicide attempts by females were by intoxication or poisoning. Among males, however, the more lethal types of attempts were more common. Previous studies<sup>3,35,38,44,45</sup> have shown that suicide attempts tend to be different among males and females. Suicide attempts in males are often associated with greater suicidal intent, whereas female attempts are often used to communicate distress or to modify the behavior and reactions of others.<sup>45</sup> This sex difference may also be true for severe suicide attempts. The different outcome may explain the different trajectories we found between the sexes. In addition, the different trajectories may also be influenced by the different sex protective factors.<sup>32,43</sup> Females are more likely to seek and receive medical or social support for their psychiatric problems.<sup>34,35,46,47</sup>

Among males, 2 groups of boys at the age of 8 years were identified as being at particular risk of later completed suicide or serious suicide attempt: boys with conduct problems with or without emotional symptoms and boys with pure emotional symptoms. Previous research has identified at least 2 separate groups of suicidal adolescents: one characterized by the internalization of problems and a wish to die and the other characterized by externalized symptoms, impulse control problems, and symptoms of aggression.<sup>48</sup> Previous studies<sup>11,49-51</sup> show that the externalization and internalization of problems predict later suicidal ideations and acts. Our findings suggest that males with comorbid conduct and internalized problems are at particular risk of severe suicide attempts and death by suicide. Accordingly, previous psychological autopsy studies<sup>6,12,15,52,53</sup> show that psychiatric comorbidity is common among young people who attempt suicide, whether or not the attempt results in death. Symptom clusters that do not fulfill the diagnostic criteria of conduct disorder are common among child and adolescent patients who complete suicide.<sup>15</sup> Of note, in our previous report, we showed that the group of males (4% of the male sample) with comorbid conduct and internalization of problems was at highest risk for a wide range of adversities (ie, psychiatric diagnosis, criminal offenses, and substance use) in adolescence and early adulthood.<sup>27</sup> From the suicide prevention perspective, almost none of these males at high risk of severe suicide outcome had been in contact with psychiatric medical services in adolescence.<sup>27</sup> This finding is in line with a previous finding that those who make severe suicide attempts are less likely to seek help from professional consultants compared with control subjects.<sup>54</sup> This result highlights the need to increase efforts aimed at encouraging those at risk to seek help.<sup>2</sup> Effective suicide-preventive measures aimed toward this high-risk group of males should take place in early childhood.

Self-reported depressive symptoms did not predict suicide outcome. Interestingly, in our previous report based on this same sample of males, self-reports of depressive

symptoms at the age of 8 years were much stronger predictors for suicidal ideation or acts at the age of 18 years than parent or teacher reports of psychopathologic disorders at the age of 8 years.<sup>50</sup> Because youth suicide is a rare phenomenon, most previous research on childhood risk factors for suicide-spectrum problems has relied mainly on self-reports of suicide ideation and acts as outcome. The discrepancy between the present study and our previous findings underlines the differences between results if the outcome is defined as serious suicidality or as a broader group, including mostly those with only ideations or less severe attempts that usually do not require medical attention.<sup>3</sup>

Living with other than 2 biological parents at the age of 8 years predicted suicide outcome among males. This finding is in line with previous reports<sup>6,43,55</sup> from autopsy studies which indicate that adolescents who died by suicide were less likely than nonsuicidal control subjects to live with both biological parents. This association may be explained by other suicide risk factors that may be associated with divorce (eg, parental mental health problems, substance abuse, family violence, weakened parental support, and parent-child discord).

The most obvious limitation of the present study is that those who complete suicide and those who attempt suicide and thus require hospital admission were pooled together for statistical analysis. Because suicide is a rare phenomenon, even a large sample such as ours was not large enough to perform statistical analysis separately for these 2 groups. Comparison of these 2 groups among males revealed no significant differences between risk factors at the age of 8 years, although the limitations of power in the analysis is obvious. In addition, previous research shows that young people who complete suicide and young people who make serious suicide attempts are similar.<sup>3</sup> The investigation of survivors of serious suicide attempts is considered a key strategy in the study of suicidal behavior.<sup>56</sup>

Among females, there were only 2 who completed suicide. Therefore, the results of the present study apply to those females who made a serious suicide attempt, not to those who died by suicide. Further studies on possible childhood antecedents for female suicide deaths are warranted.

Information about childhood family and other environmental factors was lacking (eg, familial suicide history, parental psychopathologic disorder, parenting style, and family environment). A further limitation is that the data were available only at the age of 8 years, with no data being collected during the intervening years. The major liability of this approach is that it gives an essentially static view of the factors associated with later severe suicidal behaviors and fails to describe the developmental trajectories linking early behaviors to later outcomes.

In the present study, the definition of serious suicide attempt was a hospital admission after the attempt. Because all who attempt suicide and thus require medical attention are examined by physicians and in larger hospitals assessment includes psychiatric consultation, those admitted to the hospital for treatment represent the most serious cases of those who attempt suicide. Of note, in Finland, if the patient needs treatment or observation for more than 12 hours in the emergency unit, he or she is admit-

ted to a hospital ward. Similar to our study, in previous studies, the definition of serious suicide attempts relies on the physical danger and consequences of the suicidal acts. However, one can argue that this approach fails to take into account suicidal intent (ie, how much the individual may have wanted to die at the time of the act).

Most males who commit suicide or need hospital care after a suicide attempt have high levels of psychiatric problems at the age of 8 years. The development of measures to effectively screen, detect, and treat childhood disorders is a key issue in the effort to prevent suicide among males. This focus is particularly important among males with severe conduct problems because, during adolescence, they usually do not seek mental health services. Further studies are warranted to examine the efficacy of such preventive measures in childhood in the reduction of suicide rates among males.

**Submitted for Publication:** January 18, 2008; final revision received August 26, 2008; accepted October 1, 2008.

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**Financial Disclosure:** None reported.

**Funding/Support:** The study has been supported by a grant from the Sigrid Juselius Foundation.

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