Suicide Ideation, Plan, and Attempt in the Mexican Adolescent Mental Health Survey

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ABSTRACT

Objective: No representative data among adolescents in Mexico exist on the prevalence and risk factors for suicide ideation, plan, and attempt despite a recent increase in suicide deaths. **Method:** Data are presented from the Mexican Adolescent Mental Health Survey, a representative household survey of 3,005 adolescents ages 12 to 17 in metropolitan Mexico City who were gathered in 2005, regarding lifetime prevalence and age-of-onset distributions of suicide ideation, plan, and attempt and demographic and psychiatric disorders risk factors. **Results:** Lifetime ideation was reported by 11.5% of respondents, whereas 3.9% reported a lifetime plan and 3.1% a lifetime suicide attempt. Onset of suicidality started around age 10 and at age 15 showed the highest hazards. Suicide ideators were more likely to report a plan and attempt within the first year of onset of ideation. Suicidality was more likely to occur among females. The presence of one or more mental disorders was strongly related to suicide ideation, plan, and attempt. Among ideators only dysthymia was consistently related to a plan and attempt. **Conclusions:** Intervention efforts should focus on assessment and target adolescents with mental disorders, particularly mood disorders, to be effective in prevention. *J. Am. Acad. Child Adolesc. Psychiatry,* 2008;47(1):41–52. **Key Words:** epidemiology, mental disorders, prevalence, risk factors, suicide, attempt.

Mexico has shown the highest rate of increase in suicide (61.9%) among several countries for the periods 1981–1983 and 1993–1995, according to the World Health Organization.[1] The increase between 1990 and 2000 was 150% for Mexican youth ages 5 to 14 years old and 74% for those 15 to 24 years old, representing one of the largest increases among 28 countries examined.[2] The Mexican adolescent population is now especially affected, accounting for 17% of all suicides in 2003.[3]

Nonlethal suicidal thoughts and behaviors are immediate precursors to death from suicide and strong independent risk factors for subsequent suicide attempts and death.[4] Even when not lethal, suicide attempts can lead to serious long-term physical injury or psychological suffering. Data on suicidality, which here includes suicide ideation, suicide plan, and suicide attempt, are necessary for planning national health care policy as well as for evaluating efforts to reduce the rate of suicide.[5] Nevertheless, research on suicide and suicidality among adolescents is scarce in Mexico and mostly limited to selected samples of adolescents attending middle school and high school. For this population a lifetime prevalence of suicide ideation in the 1.0% to 40.7% range and a lifetime prevalence of suicide attempts in the 1.4% to 10.1% range, with females more likely to report both outcomes, were

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reported.[6] Because only about 41% of the adolescent population finishes high school in Mexico, student samples are not representative of adolescents overall. No data are available on the ages-of-onset (AOO) of suicidality for the Mexican adolescent population, but a limited amount of research suggests that suicidal behavior may be a common problem among samples of youth attending school in Mexico City.[7] Finally, despite the recent increase in suicide and corresponding new proposed programs to address the problem in the country,[8] no representative data among adolescents in Mexico are available on potentially important risk factors, such as the presence of preexisting psychiatric disorders.

The purpose of the present report is to address this knowledge gap by reporting data on the prevalence, AOO, and risk factors for suicidality among Mexican adolescents. The focus is on the lifetime prevalence of suicide ideation, plans, and attempts, the occurrence of onset throughout the life course, and the strength of association of these outcomes with retrospectively reported preexisting psychiatric and demographic factors.

METHOD

Participants

The Mexican Adolescent Mental Health Survey (MAMHS) was designed to be representative of the 1,834,661 adolescents ages 12 to 17 years that are permanent residents of private housing units in the Mexico City metropolitan area. The population of the Mexico City metropolitan area is almost 20 million, nearly 2 million of which are adolescents between 12 and 17 years, and represents one fifth of the entire Mexican population. Being a permanent resident refers to individuals who normally eat, sleep, prepare meals, and shelter themselves in private household units, thus excluding institutionalized adolescents. The final sample included 3,005 adolescent respondents selected from a stratified multistage area probability sample. In all of the strata, the primary sampling units were census count areas, or groups of them, similar to U.S. census tracts, cartographically defined and updated by the Instituto Nacional de Estadística, Geografía e Informática.[9] Secondary sampling units were city blocks (or groups of them) selected with probability proportional to size. All of the households within these city block units with adolescents ages 12 to 17 years were selected. One eligible member from each of these households was randomly selected using the Kish method of random number charts. The response rate of eligible respondents was 71%.

Procedures

Fieldwork involving face-to-face interviews in the homes of the selected participants was carried out from March through August 2005. A verbal and written explanation of the study was given to both parents and adolescents. Interviews were administered only to those participants for whom a signed informed consent from a parent and/or legal guardian and the adolescent was obtained. All of the study participants were given a mental health resources card with the contact information for different institutions where they could seek services should they wish to do so. The Human Subjects Committee of the National Institute of Psychiatry approved the recruitment, consent, and field procedures.

A number of actions were taken for quality assurance, such as extensive interviewer training, elaboration of field manuals, and continuous feedback and independent supervision of field managers, supervisors, and interviewers. Finally, quality control programs were used to identify possible errors regarding the dating of events (e.g., onset and recency, age consistency), as well as possible missing patterns, and to introduce corrected values when possible.

Measures

Suicide ideation, plan, attempt, and potential risk factors were assessed in the MAMHS using the World Mental Health computer-assisted adolescent version of the Composite International Diagnostic Interview (WMH-CIDI-A). The translation of the adolescent instrument was done according to the translation and back-translation recommendations of World Health Organization (WHO). The WMH-CIDI-A[10] was chosen for several reasons. There are advantages afforded by a computer-assisted version in which the interview is administered via a laptop computer, allowing for consistency checks, computer-programmed complex skip patterns, and the elimination of error bias due to double data entry. In addition, the WMH-CIDI-A is easily administered by trained lay interviewers and affords us the opportunity to compare our data with the other participating countries in the World Mental Health Consortium and with the Mexican adult population from the Mexican National Comorbidity Survey (M-NCS.[11] The WMH-CIDI-A is a downward extension of the adult version WMH-CIDI 3.0 used in the M-NCS; the adult version has been validated in diverse countries and cultures,[12] and reappraisal studies of the adolescent version are underway in both the United States and Mexico. The diagnostic sections of the adolescent version are similar to the adult version except that language was simplified to be more understandable to younger respondents, the examples were made more age appropriate (e.g., trouble in school instead of at work), and criteria were changed when there was a corresponding caveat in the *DSM-IV* for adolescents that was different from adults (e.g., in a major depressive episode mood can be predominantly irritable in adolescents rather than sad). The fieldwork was conducted by Berumen and Associates, an established survey research firm in Mexico that employed a group of interviewers who had received training in the CIDI according to the WHO protocol stipulated for participating WMH countries.

The WMH-CIDI-A contains a module that assesses suicide ideation ("Have you ever seriously thought about committing suicide?"), suicide plans ("Have you ever made a plan for committing suicide?"), and suicide attempts ("Have you ever attempted suicide?"), consistent with prior recommendations and definitions.[13] Based on evidence that reports of such potentially embarrassing behaviors are higher in self-administered than interviewer-administered surveys,[14] these questions were printed in a self-administered booklet and referred to by letter. Interviewers asked respondents to report whether the experiences had ever happened to them and, if so, to report the AOO. Respondents who reported "experience C" (i.e., a suicide attempt) were presented with three statements and asked to give the number of the statement that best described their experience. The three statements were "1. I made a serious attempt to kill myself and it was only luck that I did

not succeed; 2. I tried to kill myself, but knew that the method was not foolproof; 3. My attempt was a cry for help. I did not intend to die." Questions were read to respondents who were unable to read. Consistent with contemporary definitions of suicide attempt that highlight the importance of requiring the presence of at least some intent to die from one's behavior,[13,15] only respondents who endorsed statements 1 or 2 were considered suicide attempters. Attempters with a plan are those that reported both a suicide attempt and a plan, and attempters without a plan are those that despite not having made a plan to commit suicide nonetheless reported an attempt.

Risk Factors

Interviews also examined three sets of risk factors: sociodemographic factors, characteristics of suicidality, and mental disorders defined by *DSM-IV* criteria. The sociodemographic factors included sex, age/cohort, education, current school attendance, employment history, marital history, ever had a child, and parental education. Educational attainment, marital status, employment, and having a child may vary within a given individual over time. Information was obtained in the MAMHS on timing of marital histories (i.e., ages of marriage), allowing marital status to be coded for each year of each respondent's life. The same procedure was applied to history of employment, marital history, and child bearing. Information on years of education was also coded as a time-varying predictor by assuming an orderly educational history for each respondent in which 8 years of education corresponds to being a student up to age 14 and other lengths of education are associated with ages consistent with this benchmark (e.g., 12 years of education is assumed to correspond to being a student up to age 18). This variable was later categorized as 9 or fewer years (up to middle school in Mexico) or 10 or more years. Currently attending school was used as a fixed variable, measured only at the time of the interview. AOO of ideation, time since onset of ideation, presence of a suicide plan, and time since onset of plan were also considered in models for plan and attempt among suicide ideators.

Respondent disorders were assessed by the WHM-CIDI-A according to *DSM-IV* criteria for mood (major depressive disorder, dysthymia, and bipolar disorder), anxiety (panic disorder, agoraphobia without panic disorder, specific phobia, social phobia, generalized anxiety disorder, posttraumatic stress disorder, and separation anxiety disorder), impulse-control (oppositional-defiant disorder, conduct disorder, and attention deficit/hyperactivity disorder), and substance use (alcohol abuse, drug abuse, alcohol abuse with dependence, and drug abuse with dependence) disorders. Respondents meeting criteria for a disorder at any time in their lives were then asked the AOO of the disorder and how recently they have experienced symptoms. Prior studies using clinical reappraisal interviews found CIDI diagnoses to have generally good concordance with blinded diagnoses based on the Structured Clinical Interview for *DSM-IV*[16] in a probability subsample of respondents from the U.S. survey[17] and elsewhere.[12]

Statistical Analysis

Cross-tabulations were used to estimate lifetime prevalence of suicide ideation, plan, and attempt. Discrete-time survival analysis with time-varying covariates[18] was used to study retrospectively assessed sociodemographic and diagnostic correlates of each outcome. Survival coefficients were converted to odds ratios (ORs) for ease of interpretation. The 95% confidence intervals of the ORs are also reported and have been adjusted for design effects. Standard errors and significance tests were estimated using the Taylor series method[19] with SUDAAN-2002 software[20] to adjust for the weighting and clustering of the data. Multivariate significance was evaluated using Wald χ^2 tests based on design-corrected coefficient variance-covariance matrices. Statistical significance was evaluated using two-tailed 0.05-level tests.

RESULTS

Lifetime Prevalence of Suicidality

The lifetime prevalence of suicidality in the MAMHS was 11.5% for suicide ideation, 3.9% for suicide plan, and 3.1% for suicide attempt (Table 1). Among suicide ideators, 34.1% reported a plan and 27.2% reported an attempt. The transition from suicide ideation to attempt is much higher among those with a plan (53.3%) than among those without a plan (13.7%). Females report higher lifetime prevalence of all outcomes than men.

Sociodemographic Risk Factors

Few consistent associations between suicidality and demographic factors were found. Being female was

TABLE 1
Lifetime Prevalence of Suicide-Related Outcomes: Mexico City Adolescents, 2005

	Ideation			Plan			Attempt			Plan Among Ideators (n = 339)			Attempt Among Ideators (n = 339)			Attempt Among Ideators Without a Lifetime Plan (n = 226)			Attempt Among Ideators With a Lifetime Plan (n = 113)		
	Total Sample (N = 3,005)																				
	%	SE	n	%	SE	n	%	SE	n	%	SE	n	%	SE	n	%	SE	n	%	SE	n
Male	7.6	0.8	105	2.3	0.4	31	1.6	0.4	23	29.5	5.1	31	20.8	4.0	23	11.3	4.1	9	43.5	8.4	14
Female	15.3	1.0	234	5.6	0.8	82	4.7	0.8	69	36.3	4.4	82	30.4	3.9	69	15.1	2.9	22	57.2	6.7	47
Total sample	11.5	0.6	339	3.9	0.4	113	3.1	0.4	92	34.1	3.0	113	27.2	3.2	92	13.7	2.2	31	53.3	5.6	61

TABLE 2
Sociodemographic Risk Factors for First Onset of Suicide-Related Outcomes: Mexico City Adolescents, 2005

		Ideation		Plan		Attempt	
		Total Sample (N = 3,005)					
Sociodemographic	Sociodemographic Category	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Sex	Female	2.1[a]	(1.5–2.9)	2.5[a]	(1.4–4.4)	3.0[a]	(1.6–5.8)
	Male	1.0		1.0		1.0	
	χ^2_1 [p]	23.0[b]	[0.000]	11.0[b]	[0.001]	11.8[b]	[0.001]
Cohort	12–14	1.5[a]	(1.2–1.8)	1.2	(0.8–1.8)	1.6	(0.9–2.7)
	15–17	1.0		1.0		1.0	
	χ^2_1 [p]	12.8[b]	[0.000]	0.6	[0.444]	2.8	[0.096]
Education, y	≤9	1.5	(0.6–3.8)	3.4[a]	(1.0–11.5)	3.5	(0.5–26.0)
	10+	1.0		1.0		1.0	
	χ^2_1 [p]	0.8	[0.383]	4.0[b]	[0.045]	1.6	[0.208]
Attending school	No	1.3	(0.9–1.9)	1.6[a]	(1.0–2.5)	1.9[a]	(1.0–3.4)
	Yes (ref)	1.0		1.0		1.0	
	χ^2_1 [p]	2.7	[0.100]	4.0[b]	[0.044]	4.5[b]	[0.033]
Ever employed	Yes	1.2	(0.7–2.2)	1.6	(0.9–3.2)	1.5	(0.6–3.9)
	No (ref)	1.0		1.0		1.0	
	χ^2_1 [p]	0.5	[0.465]	2.4	[0.118]	0.7	[0.399]
Ever married	Yes	1.5	(0.3–6.9)	1.9	(0.2–17.3)	1.5	(0.6–3.8)
	No (ref)	1.0		1.0		1.0	
	χ^2_1 [p]	0.3	[0.614]	0.4	[0.546]	0.7	[0.406]
Ever had a child	Yes	0.9	(0.3–3.2)	0.2	(0.0–3.7)	0.9	(0.4–2.3)
	No (ref)	1.0		1.0		1.0	
	χ^2_1 [p]	0.0	[0.874]	1.2	[0.282]	0.0	[0.850]
Maximum parental education	None/elementary school	0.9	(0.5–1.4)	0.7	(0.3–1.4)	0.8	(0.4–1.5)
	Junior high school	0.8	(0.5–1.2)	0.4[a]	(0.2–0.7)	0.4[a]	(0.2–0.7)
	High school	1.0	(0.7–1.6)	1.5	(0.8–2.6)	1.2	(0.7–2.0)
	University +	1.0		1.0		1.0	
	χ^2_3 [p]	2.5	[0.479]	24.0[b]	[0.000]	17.4[b]	[0.001]
AOO of ideation	Early						
	Middle						
	Late						
	χ^2_2 [p]						
Time since onset of ideation	0						
	1+						
	χ^2_1 [p]						
Having a plan	Yes						
	No						
	χ^2_1 [p]						
Time since onset of plan	0						
	1+						
	χ^2_1 [p]						

Note: AOO = age of onset. Blank spaces = not used as a predictor in the model. Results are based on multivariate discrete-time survival model with person-year as the unit of analysis.

[a] OR significant at the 0.05 level, two-sided test.

[b] Significant at the 0.05 level, two -sided test.

associated with suicide ideation, plan, and attempts in the total sample only (Table 2). Younger adolescents were more likely to report ideation and attempts without a plan among ideators. Those with less educational attainment were positively associated with a suicide plan in the total sample and with plan and attempts without a plan among ideators. Those not currently attending school had larger ORs for a suicide

Plan Among Ideators (*n* = 339)		Attempt Among Ideators (*n* = 339)		Attempt Among Ideators Without a Lifetime Plan (*n* = 226)		Attempt Among Ideators With a Lifetime Plan (*n* = 113)	
OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
1.4	(0.7–3.0)	1.3	(0.6–2.7)	1.3	(0.5–3.5)	1.5	(0.5–4.2)
1.0		1.0					
0.8	[0.357]	0.6	[0.422]	0.3	[0.591]	0.6	[0.437]
0.8	(0.5–1.4)	1.6	(0.7–3.9)	0.9	(0.2–4.5)	4.0[a]	(1.0–16.0)
1.0		1.0		1.0		1.0	
0.6	[0.444]	1.2	[0.269]	0.0	[0.851]	4.2[b]	[0.039]
5.8[a]	(1.4–23.8)	1.9	(0.3–11.3)	4.4[a]	(1.5–12.7)	2.1	(0.1–37.6)
1.0		1.0		1.0		1.0	
6.4[b]	[0.011]	0.5	[0.489]	8.3[b]	[0.004]	0.3	[0.604]
1.5	(0.9–2.4)	1.6	(0.8–3.5)	1.8	(0.6–5.8)	1.8	(0.7–4.7)
1.0		1.0		1.0		1.0	
2.6	[0.107]	1.8	[0.180]	1.1	[0.289]	1.8	[0.184]
1.8	(0.7–4.2)	1.1	(0.4–3.1)	5.9[a]	(2.2–16.1)	0.2[a]	(0.1–0.9)
1.0		1.0		1.0		1.0	
1.7	[0.188]	0.1	[0.787]	13.2[b]	[0.000]	5.0[b]	[0.026]
1.4	(0.3–6.1)	1.1	(0.3–4.4)	1.9	(0.2–16.3)	1.6	(0.3–10.2)
1.0		1.0		1.0		1.0	
0.3	[0.605]	0.0	[0.877]	0.4	[0.544]	0.3	[0.581]
0.2	(0.0–1.7)	1.1	(0.2–5.2)	1.3	(0.3–6.9)	1.9	(0.4–9.0)
1.0		1.0		1.0		1.0	
2.3	[0.126]	0.0	[0.911]	0.1	[0.724]	0.7	[0.400]
0.8	(0.3–1.9)	1.1	(0.4–3.0)	1.0	(0.1–7.4)	2.0	(0.6–6.0)
0.4[a]	(0.2–0.9)	0.7	(0.2–1.8)	0.5	(0.1–4.0)	0.6	(0.1–2.6)
2.0	(0.9–4.5)	1.1	(0.4–2.5)	2.1	(0.3–16.0)	0.9	(0.3–2.9)
1.0		1.0		1.0		1.0	
12.2[b]	[0.007]	2.0	[0.583]	13.9[b]	[0.003]	6.2	[0.104]
0.2[a]	(0.0–0.9)	1.1	(0.1–12.4)	0.3	(0.1–1.2)	3.2	(0.5–22.4)
0.2	(0.1–1.2)	1.8	(0.2–19.0)	0.2[a]	(0.0–0.7)	12.9[a]	(1.9–87.7)
1.0		1.0		1.0		1.0	
4.8	[0.090]	1.6	[0.443]	6.2[b]	[0.045]	11.1[b]	[0.004]
6.3[a]	(3.1–12.7)	7.5[a]	(2.9–19.8)	8.7[a]	(3.5–21.5)		
1.0		1.0		1.0			
28.2[b]	[0.000]	18.1[b]	[0.000]	23.9[b]	[0.000]		
		7.1[a]	(4.1–12.2)				
		1.0					
		54.2[b]	[0.000]			6.4[a]	(2.2–19.0)
						1.0	
						12.4[b]	[0.000]

plan and attempts in the total sample only. Being employed, married, and having a child early in life were not consistently associated with suicidality. There were no consistent associations between socioeconomic background (as measured by parents' educational level) and suicidality, but those that had parents with less educational attainment showed lower odds for plan and attempt in the total sample.

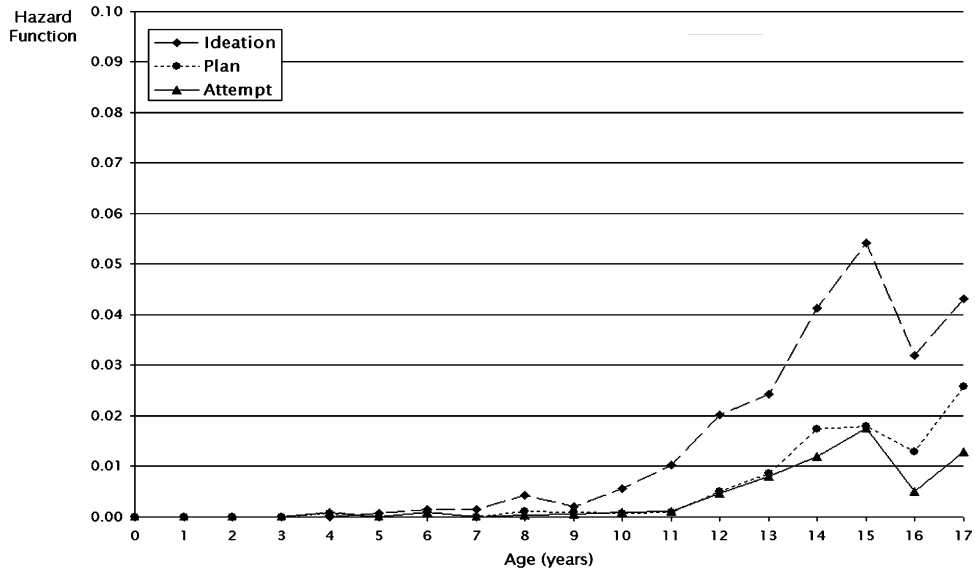

Fig. 1 Hazard functions of first onset of suicide ideation, plan, and attempt by age (years). Mexico City adolescents, 2005 (N = 3,005).

Those with suicide ideation were classified into tertiles based on AOO of this variable and used to examine the relation between AOO and risk of plans and attempts. Ideators with early AOO of ideation were less likely than those with later onsets to report a plan and to make an attempt without a plan, but showed increased odds for making a planned attempt. Time since onset of ideation was strongly associated with a plan and an attempt, with risk extremely elevated within the first year of onset of ideation and decreasing thereafter. Having a suicide plan was associated with a significantly higher risk of an attempt among ideators, although a substantial proportion of first attempts were described as unplanned. Among those with a plan, the likelihood to report a suicide attempt was highest within the first year of having a plan.

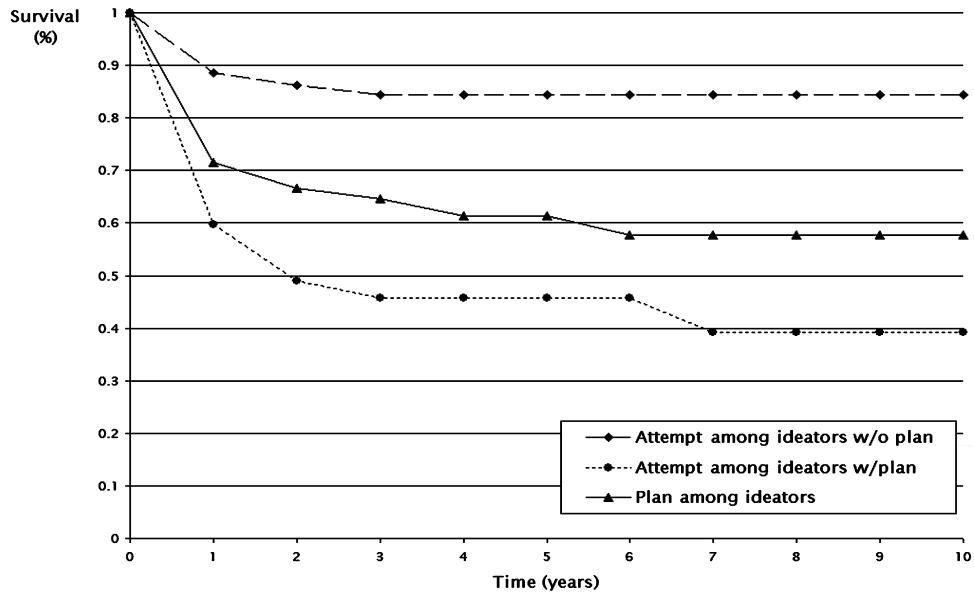

Fig. 2 Conditional (%), cumulative speed of onset of suicide plan among ideators (n = 339), suicide attempt among ideators without a plan (n = 226), and suicide attempt among ideators with a plan (n = 113) by time (years). Mexico City adolescents, 2005.

TABLE 3

DSM-IV Disorders as Risk Factors for First Onset of Suicide-Related Outcomes: Mexico City Adolescents, 2005

		Ideation		Plan		Attempt		Plan Among Ideators		Attempt Among Ideators		Attempt Among Ideators Without a Lifetime Plan		Attempt Among Ideators With a Lifetime Plan	
		Total Sample (N = 3,005)						(n = 339)		(n = 339)		(n = 226)		(n = 113)	
Disorder	Disorder Category	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Anxiety	Panic disorder	2.3[a]	(1.2–4.4)	1.0	(0.3–3.8)	1.6	(0.5–5.8)	0.3	(0.0–3.0)	2.1	(0.5–8.3)	0.4	(0.0–16.9)	4.4	(0.5–36.9)
	Generalized anxiety disorder	4.0[a]	(1.6–10.4)	3.4	(0.7–17.8)	7.8[a]	(2.7–22.8)	1.0	(0.2–5.0)	4.6[a]	(1.3–15.9)	4.7	(0.2–96.8)	16.4[a]	(3.1–87.7)
	Specific phobia	2.0[a]	(1.5–2.7)	1.8[a]	(1.1–3.0)	1.7[a]	(1.1–2.6)	0.9	(0.5–1.5)	0.9	(0.5–1.6)	0.7	(0.3–1.6)	1.1	(0.4–3.0)
	Social phobia	2.5[a]	(1.8–3.6)	2.9[a]	(1.6–5.1)	2.8[a]	(1.6–5.0)	1.3	(0.7–2.2)	1.1	(0.7–2.0)	0.9	(0.3–2.9)	1.2	(0.5–2.8)
	Posttraumatic stress disorder	2.2	(0.8–6.0)	1.0	(0.2–5.8)	2.5	(0.4–15.8)	0.4	(0.1–1.5)	3.1	(0.7–14.2)	2.4	(0.3–16.1)	4.2	(0.4–49.1)
	Separation anxiety	2.0[a]	(1.3–3.2)	3.1[a]	(1.6–6.0)	2.9[a]	(1.7–5.0)	1.5	(0.7–3.2)	1.3	(0.7–2.7)	2.4	(0.7–8.6)	1.3	(0.5–3.3)
	Any anxiety disorders	2.3[a]	(1.8–2.9)	2.1[a]	(1.3–3.4)	2.1[a]	(1.2–3.7)	1.0	(0.6–1.7)	1.1	(0.5–2.5)	0.9	(0.3–2.4)	1.2	(0.4–3.7)
Mood	Major depressive episode	4.3[a]	(2.8–6.5)	4.5[a]	(3.0–6.7)	3.3[a]	(2.4–4.7)	1.5[a]	(1.0–2.1)	0.8	(0.6–1.2)	0.8	(0.2–2.6)	1.2	(0.6–2.5)
	Dysthymia	7.4[a]	(3.5–16.0)	18.6[a]	(8.9–38.7)	19.1[a]	(7.0–52.1)	5.4[a]	(3.2–9.0)	3.6[a]	(1.4–9.2)	4.1[a]	(1.0–17.0)	3.7	(0.8–18.7)
	Bipolar disorder (broad)	2.8[a]	(1.8–4.4)	2.2[a]	(1.1–4.3)	2.6[a]	(1.2–5.6)	1.1	(0.5–2.2)	0.9	(0.4–2.1)	0.8	(0.2–3.3)	1.4	(0.5–4.5)
	Any mood disorders	3.9[a]	(2.7–5.6)	4.0[a]	(2.6–6.2)	3.7[a]	(2.4–5.7)	1.5	(0.9–2.6)	0.9	(0.6–1.5)	0.7	(0.3–2.2)	1.6	(0.8–3.3)
Impulse-control	Oppositional-defiant disorder	3.1[a]	(2.0–4.7)	3.3[a]	(1.7–6.4)	3.3[a]	(1.6–6.7)	1.1	(0.5–2.5)	1.1	(0.5–2.8)	0.7	(0.3–1.9)	2.2	(0.7–7.0)
	Conduct disorder	4.6[a]	(2.7–7.9)	6.0[a]	(3.4–10.5)	6.8[a]	(2.9–16.0)	1.8	(0.8–4.2)	1.6	(0.6–4.2)	0.9	(0.1–6.2)	2.7	(0.8–9.1)
	Attention-deficit/ hyperactivity disorder	2.1	(0.9–5.2)	2.8	(0.8–9.1)	2.5[a]	(1.0–5.8)	1.5	(0.6–3.5)	1.2	(0.4–3.1)	[b]	[b]	3.1	(0.7–12.5)
	Intermittent explosive disorder	3.0[a]	(2.2–4.2)	3.7[a]	(2.1–6.5)	2.8[a]	(1.7–4.6)	1.5	(0.7–3.1)	0.8	(0.4–1.6)	0.5	(0.2–1.7)	1.0	(0.5–2.2)
	Any impulse-control disorders	3.5[a]	(2.4–5.2)	5.1[a]	(2.8–9.1)	4.4[a]	(2.6–7.3)	1.7[a]	(1.0–2.9)	1.2	(0.6–2.6)	0.6	(0.2–1.4)	2.0	(0.8–4.6)

(Continued on next page)

TABLE 3
(Continued)

		Ideation		Plan		Attempt		Plan Among Ideators		Attempt Among Ideators		Attempt Among Ideators Without a Lifetime Plan		Attempt Among Ideators With a Lifetime Plan	
		Total Sample (N = 3,005)						(n = 339)		(n = 339)		(n = 226)		(n = 113)	
Disorder	Disorder Category	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Substance use	Alcohol abuse	3.4[a]	(1.4–8.5)	1.9	(0.4–8.3)	3.4	(0.7–16.6)	0.6	(0.2–2.7)	1.8	(0.3–10.7)	2.1	(0.3–13.6)	0.7	(0.0–9.0)
	Alcohol abuse with dependence	3.3	(0.4–25.8)	24.5[a]	(3.3–184.5)	5.4	(0.3–94.3)	[b]	[b]	2.6	(0.3–22.2)	[b]	[b]	0.7	(0.0–15.8)
	Drug abuse	3.0	(0.9–10.4)	9.2[a]	(2.5–33.4)	5.1[a]	(1.0–27.4)	6.8[a]	(2.9–15.8)	0.9	(0.1–6.6)	[b]	[b]	0.4	(0.0–4.4)
	Drug abuse with dependence[c]														
	Any substance use disorders	4.1[a]	(1.8–9.1)	2.5	(0.7–8.4)	3.3	(0.8–13.6)	0.8	(0.3–2.2)	1.3	(0.3–5.5)	1.4	(0.2–8.6)	0.5	(0.1–4.9)
Any	Any disorders	3.1[a]	(2.4–4.1)	3.9[a]	(2.1–7.2)	3.1[a]	(1.7–5.6)	1.5	(0.8–2.8)	1.1	(0.4–2.6)	0.8	(0.3–1.9)	1.4	(0.4–5.2)
	1 disorder	1.7[a]	(1.2–2.4)	1.6	(0.7–3.8)	1.4	(0.5–3.6)	1.1	(0.5–2.5)	1.1	(0.3–3.8)	0.9	(0.3–3.2)	1.3	(0.3–6.4)
	2 disorders	2.6[a]	(1.9–3.6)	2.9[a]	(1.4–6.2)	1.9	(0.8–4.7)	1.4	(0.6–3.1)	0.9	(0.3–3.1)	0.4	(0.0–2.8)	1.5	(0.3–6.9)
	3+ disorders	5.2[a]	(3.4–7.8)	7.2[a]	(3.5–14.9)	5.7[a]	(3.3–9.9)	1.7	(0.8–3.8)	1.1	(0.5–2.6)	0.9	(0.4–2.2)	1.4	(0.4–5.4)

Note: Results are based on multivariate discrete-time survival model. Each model controls for person-year and the sociodemographic variables from Table 2. Cases with any missing values on the suicidality AOO variables are deleted.

[a] OR significant at 0.05 level, two-sided test.

[b] No stable estimate due to few number of subjects.

[c] Disorder was omitted due to insufficient lifetime cases, but it will be included as one of the disorders in any category.

AOO Distribution

Hazard curves (Fig. 1) show that these outcomes are rarely reported before age 9. Suicide ideation starts to increase at age 10, plans and attempt at age 12, with the highest risk period around 15 years of age for ideation, plan, and attempt. Conditional AOO curves (Fig. 2) show that the likelihood of reporting the first onset of a plan and the first onset of attempt among those with a plan is highest within the first year after onset of ideation and plan; the first attempt in the absence of a plan is highest within the first year after onset of ideation.

DSM-IV Disorders as Predictors of Suicidality

A history of psychiatric disorder was common among those with suicide ideation (81%), a plan (89%), and attempt (82%). Discrete-time survival analyses revealed that retrospectively reported prior psychiatric disorders significantly predict first onset of lifetime suicide ideation, plan, and attempt (Table 3). Several points are worth mentioning. First, any lifetime psychiatric disorder was a strong risk factor for ideation, plan, and attempt. The presence of most individual disorders was positively associated with ideation, plan, and attempt. The disorder with the strongest association with suicidality varied for ideation (dysthymia), plan (alcohol abuse with dependence), and attempt (dysthymia). As a group, impulse-control and mood disorders showed larger ORs than substance abuse or anxiety disorders. Any lifetime psychiatric disorder was not associated with a plan or an attempt among ideators. Among ideators, dysthymia was the only disorder that had consistently strong associations with a plan and attempt (ORs 5.4–3.6).

In the total sample, the risk of suicidality increased significantly with increasing levels of comorbidity. Three or more disorders were associated with a 5.7 increase in the odds of suicide attempt compared to people with no disorders. Comparable increases for plan and ideation were 5.2 and 7.2, respectively. We did not find a similar trend among ideators.

DISCUSSION

Main Findings

This study reported on the lifetime prevalence of suicide ideation (11.5%), plan (3.9%), and attempt (3.1%) among adolescents living in the Mexico City metropolitan area. More than one third of ideators reported a plan, about one fourth reported an attempt, and more than half of those with a suicide plan made an attempt. Risk of suicide ideation, plan, and attempt began increasing at age 10, peaking around age 15. Females were found to have the highest risk of ideation, plan, and attempt. Among ideators, suicide attempt was also related to having a plan and was most likely to start within the first year of developing an ideation and a plan. Having met criteria for one or more *DSM-IV* disorders was a strong predictor of suicidality. The number of lifetime disorders was an especially strong predictor of suicidality in the total sample. Among ideators only dysthymia was consistently related to a plan and an attempt.

Completed suicide has been a rare event in Mexico, but this situation is changing.[8] Even when the Mexican suicide rate is low (5.4/100,000 among 15- to 24-year-olds in 2000) when compared to countries such as the United States (rate of 10.2) or Finland (rate of 19.9), Mexico had one of the largest increases in suicide between 1990 and 2000 among 28 countries examined.[2] The country has been immersed in rapid transformations that have eroded the basic structures of Mexican culture. Once a traditional society with deep rural attachments, Mexico has experienced a large migration to urban areas and profound social changes, including diminished extended family ties in favor of more nuclear ones and increases in divorce, job insecurity, and income loss. The level of education in Mexico has risen, amplifying the communication gap between adults and youths. The steady increase in the occurrence of completed suicide during the last few decades and the greater frequency of suicidality in Mexican society, especially among youth, has been a matter of great concern to the public and to health care authorities. Despite this context of rapid social change and new forms of social relationships, Mexico remains a Catholic country and suicide in all forms is regarded as a sin and shame for the family. Few programs for prevention and treatment exist. Patients and family victims have difficulties coping with the medical, legal, and psychological consequences of suicide. Our lifetime prevalence estimates are within the range of previous and more limited studies among adolescents attending schools in Mexico,[6] and are much lower than those from a review of population-based studies that were carried out mainly in the United States,[21] which reported mean lifetime prevalence of 29.9% for ideation, 15.6% for a plan, and 9.7% for attempt.

Prior studies among adults in the United States[22] and Mexico[23] that used a similar methodology also found that ideators who make a plan are likely to make an attempt, and risk is higher within the first year of ideation. Our hazard estimates peaking around the age of 15 are similar to a small study of 417 college students in the United States.[24] This study suggests that there is a basis for the concern that Mexico is experiencing a rapid increase not only in completed suicides but also in nonlethal suicidal thoughts and behaviors. A study of suicidality among adults (18–65 years old) in Mexico found prevalences below the estimates for adolescents reported in the present study. On balance, however, it is unclear whether this pattern reflects a recent increase in suicidality or a decrease in the reporting of lifetime suicidality as people age.[25,26] As in our prior studies among adults in Mexico[23] and the United States,[22] we found that the majority of those with suicide ideation made a plan and attempt within the first year of the onset of ideation.

Our study also confirms prior data in Mexico on the higher prevalence of suicidality among females[7,27] and the role of substance use[28] and psychosocial distress[29,30] in suicide attempts among adolescents attending school in Mexico. The association that we found between those who have dropped out of school[31–33] and suicide plan and attempt is limited by the fact that our data on school attendance were assessed only at the time of the interview, so we cannot rule out that the school dropout followed the reported attempts.

Our data from Mexico confirm the substantial impact that a mental disorder has on the onset of suicidality found elsewhere.[2,32] Consistent with prior reports, each mental disorder assessed was associated with an increased risk for suicide-related outcomes, and comorbidity further increased this risk. Our data also point to the particular role of mood and impulse-control disorders in the occurrence of suicidality. Many prior studies have shown that depressed mood and negative thoughts are strongly associated with suicidality.[34] Although most epidemiological studies suggest that major depressive disorder is a much stronger predictor of suicidality than dysthymic disorder,[22] the present results suggest that among adolescents in Mexico, dysthymia is the strongest and most consistent predictor of suicidality. These findings require replication because prior research points to substance use disorders among adolescents as the only disorder to differentiate between suicide ideators and attempters,[35] but suggest that mild but persistent mood disorder symptoms may confer an especially high risk of suicidality among adolescents. Although many researchers and clinicians focus on the importance of mood disorders in relation to suicidality, in the present study impulse-control disorders as a group had the strongest association with suicide attempts. These findings are consistent with previous studies demonstrating the importance of impulse-control disorders in the occurrence of adolescent suicide,[36] and underscore the need for additional scientific and clinical attention to this relation.

The findings of this study must be evaluated in the context of several study limitations. The MAMHS is a household survey with a limited response rate (71%) that excluded youth who are institutionalized or living in the streets, both populations known to have a high prevalence of mental disorders and suicidal behavior.[37] An additional limitation of the survey is the inclusion of an exclusively urban and semiurban population, which precludes making inferences from these results to the Mexican rural population. It should be noted that 25% of Mexicans reside in rural areas. Second, the diagnostic instrument used in the MAMHS did not include an assessment of all of the *DSM-IV* disorders, some of which have been linked to increased risk for suicidal behavior, such as schizophrenia and other nonaffective psychoses.[22,38] Third, validity and reliability data were not obtained on the measures of ideation, plans, and attempts, and the validation of the adolescent-CIDI version used in this study is still under way. Even though several diagnostic instruments have been developed for the adolescent population[39–41], none have been validated in the Mexican population. A further related limitation is our reporting of diagnostic classifications based on only one informant, namely, the adolescent. Fourth, although we examined suicide ideation, plans, and attempts, we did not address other important self-injurious behaviors such as suicide gestures[15] and nonsuicidal self-injury.[42] In a rigorous sense, all suicide attempts, including impulsive attempts, are "planned" even if the "plan" occurred only a few seconds before the attempt. Future research should investigate this issue by debriefing "unplanned" attempters about the sequence of thoughts and decisions that led up to their attempts. Finally, these analyses used data on retrospectively reported AOOs that are subject to recall errors. This likely makes the

results reported here conservative with regard to the magnitude of the problem of nonfatal suicidality in Mexico.

Suicide and nonlethal suicidal thoughts and behaviors are an important component of the current epidemiological profile of adolescents in Mexico. Detection of those with suicide ideation, suicide plan, and mental disorders are important measures to be taken because they are important risk factors that lead to attempts. Many other risk factors may also be operating, such as negative life events and family psychopathology. Future work from our group will focus on more comprehensive models that will help us to advance further in detection and intervention for this problem.

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REFERENCES

1. World Health Organization. *The World Health Report 2000: Health Systems: Improving Performance*. Geneva: World Health Organization; 2000.
2. Bridge JA, Goldstein TR, Brent DA. Adolescent suicide and suicidal behavior. *J Child Psychol Psychiatry*. 2007;47:372–394.
3. Secretaría de Salud. Sistema Nacional de Información en Salud: Mortalidad 2000–2005. Available at: *http://sinais.salud.gob.mx/mortalidad*. Accessed February 9, 2007.
4. Suominen K, Isometsa E, Suokas J, Haukka J, Achte K, Lonnqvist J. Completed suicide after a suicide attempt: a 37-year follow-up study. *Am J Psychiatry*. 2004;161:562–563.
5. U.S. Department of Health and Human Services. *National Strategy for Suicide Prevention: Goals and Objectives for Action*. Rockville, MD: USDHHS, Public Health Service, Office of the Surgeon General; 2001.
6. Mondragón L, Borges G, Gutiérrez R. La medición de la conducta suicida en México: estimaciones y procedimientos. *Salud Mental*. 2001; 24:4–15.
7. González-Forteza C, Villatoro J, Alcántara I, et al. Prevalencia de intento suicida en estudiantes adolescentes de la Ciudad de México: 1997 y 2000. *Salud Mental*. 2002;25:1–12.
8. Borges G, Medina-Mora ME, Zambrano J, Garrido G. *Epidemiología de la conducta suicida en México*. México, D.F.: SSA. 2006.
9. Instituto Nacional de Estadística, Geografía e Informática. *Censo General de Población y Vivienda*. Geografía e Informática, México, D.F: Instituto Nacional de Estadística. 2000.
10. Kessler RC, Ustun TB. The World Mental Health (WMH) Survey Initiative Version of the World Mental Health (WHO) Compositive International Diagnostic Interview (CIDI). *Int J Methods Psychiatr Res*. 2004;13:93–121.
11. Medina-Mora ME, Borges G, Lara C, et al. Prevalence, service use, and demographic correlates of 12-month *DSM-IV* psychiatric disorders in Mexico: results from the Mexican National Comorbidity Survey. *Psychol Med*. 2005;35:1773–1783.
12. Haro JM, Arbabzadeh-Bouchez S, Brugha TS, et al. Concordance of the composite international diagnostic interview version 3.0 (CIDI 3.0) with standardized clinical assessments in the WHO World Mental Health Surveys. *Int J Methods Psychiatr Res*. 2006;15:167–180.
13. O'Carroll PW, Berman AL, Maris R, Moscicki E. Beyond the tower of Babel: a nomenclature for suicidology. *Suicide Life Threat Behav*. 1996; 26:237–252.
14. Turner CF, Ku L, Rogers SM, Lindberg LD, Pleck JH, Sonenstein FL. Adolescent sexual behavior, drug use, and violence: increased reporting with computer survey technology. *Science*. 1998;280:867–873.
15. Nock MK, Kessler RC. Prevalence of and risk factors for suicide attempts versus suicide gestures: analysis of the National Comorbidity Survey. *J Abnorm Psychol*. 2006;115:616–623.
16. First MB, Spitzer RL, Gibbon M, Williams JBW. *Structured Clinical Interview for DSM-IV-TR Axis I Disorders, Research Version, Non-Patient Edition (SCID-I/NP)*. New York: Biometrics Research, New York State Psychiatric Institute; 2002.
17. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of *DSM-IV* disorders in the National Comorbidity Survey Replication. *Arch Gen Psychiatry*. 2005;62:593–602.
18. Efron B. Logistic regression, survival analysis, and the Kaplan-Meier curve. *J Am Stat Assoc*. 1988;83:414–425.
19. Wolter K. *Introduction to Variance Estimation*. New York: Springer-Verlag; 1985.
20. Research Triangle Institute. *Professional Software for Survey Data Analysis, release 8.0.1*. Research Triangle Park, NC: Research Triangle Institute; 2002.
21. Evans E, Hawton K, Rodham K. Factors associated with suicidal phenomena in adolescents: a systematic review of population-based studies. *Clin Psychol Rev*. 2004;24:957–979.
22. Kessler RC, Borges G, Walters EE. Prevalence of and risk factors for lifetime suicide attempts in the National Comorbidity Survey. *Arch Gen Psychiatry*. 1999;56:617–626.
23. Borges G, Nock MK, Medina-Mora ME, et al. The epidemiology of suicide-related outcomes in Mexico. *Suicide Life Threat Behav*. In press.
24. Willett JB, Singer JD. Investigating onset, cessation, relapse, and recovery: why you should, and how you can, use discrete-time survival analysis to examine event occurrence. *J Consult Clin Psychol*. 1993;61: 952–965.
25. Kessler RC, Berglund P, Borges G, Nock MK, Wang PS. Trends in suicide ideation, plans, gestures, and attempts in the United States, 1990–1992 to 2001–2003. *JAMA*. 2005;293:2487–2495.
26. Moscicki EK. Epidemiology of suicide. In: *The Harvard Medical School Guide to Suicide Assessment and Intervention*, Jacobs DG ed. San Francisco: Jossey-Bass, 1999, pp 40–51.
27. Jiménez A, González-Forteza C. Veinticinco años de investigación sobre suicidio en la Dirección de Investigaciones Epidemiológicas y Psicosociales del Instituto Nacional de Psiquiatría Ramón de la Fuente. *Salud Mental*. 2003;26:35–46.
28. López KE, Medina-Mora ME, Villatoro J, et al. La relación entre la ideación suicida y el abuso de sustancias tóxicas. Resultados de una encuesta en la población estudiantil. *Salud Mental*. 1995;18:25–32.
29. González-Forteza C, García G, Sánchez MA. Indicadores psicosociales predictores de ideación suicida en dos generaciones de estudiantes universitarios. *Salud Mental*. 1998;21:1–9.
30. González-Forteza C, Villatoro J, Pick S, Collado ME. El estrés psicosocial y su relación con las respuestas de enfrentamiento y el malestar emocional en una muestra representativa de adolescentes al sur de la ciudad de México: análisis según su nivel socioeconómico. *Salud Mental*. 1998;21:37–45.
31. Daniel S, Walsh A, Goldston DB, Arnold E, Reboussin BA, Wood FB. Suicidality, school dropout, and reading problems among adolescents. *J Learn Disabil*. 2006;39:507–514.
32. Evans E, Hawton K, Rodham K, Deeks J. The prevalence of suicidal phenomena in adolescents: a systematic review of population-based studies. *Suicide Life Threat Behav*. 2005;35:239–250.
33. Instituto Mexicano de la Juventud. *Encuesta Nacional de Juventud 2005*. México City: Instituto Mexicano de la Juventud. 2005.
34. Nock MK, Kazdin AE. Examination of affective, cognitive, and behavioral factors and suicide-related outcomes in children and young adolescents. *J Clin Child Adolesc Psychol*. 2002;31:48–58.
35. Gould MS, King R, Greenwald S, et al. Psychopathology associated with suicidal ideation and attempts among children and adolescents. *J Am Acad Child Adolesc Psychiatry*. 1998;37:915–923.

36. Shaffer D, Gould MS, Fisher P, Trautman P, Moreau D, Kleinman M. Psychiatric diagnosis in child and adolescent suicide. *Arch Gen Psychiatry*. 1996;53:339–348.
37. Gutiérrez R, Vega L. Las investigaciones psicosociales sobre la subsistencia infantil en las calles desarrolladas en el INP durante los últimos 25 años. *Salud Mental*. 2003;26:27–34.
38. Harkavy-Friedman JM, Nelson EA, Venarde DF, Mann JJ. Suicidal behavior in schizophrenia and schizoaffective disorder: examining the role of depression. *Suicide Life Threat Behav*. 2004;34:66–76.
39. Angold A, Costello EJ. The child and adolescent psychiatric assessment (CAPA). *J Am Acad Child Adolesc Psychiatry*. 2000;39:39–48.
40. Shaffer D, Fisher P, Lucas CP, Dulcan MK, Schwab-Stone ME. NIMH Diagnostic Interview Schedule for Children Version IV (NIMH DISC-IV): description, acceptability, prevalences, and performance in the MECA study. *J Am Acad Child Adolesc Psychatry*. 2000;39:28–38.
41. Goodman R, Ford T, Richards H, Gatward R, Meltzer H. The development and well-being assessment: description and initial validation of an integrated assessment of child and adolescent psychopathology. *J Child Psychol Psychiatry*. 2000;41:645–656.
42. Nock MK, Prinstein MJ. Clinical features and behavioral functions of adolescent self-mutilation. *J Abnorm Psychol*. 2005;114:140–146.