Predictors of Low-Intent and High-Intent Suicide Attempts in Rural China

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Suicide in China is an urgent public health problem. From 1995 to 1999 the suicide rate was estimated to be 23 per 100 000 individuals,[1] approximately double that of the United States.[2] Suicide is the fifth leading overall cause of death in China and the most common cause of death among individuals aged 15–34 years.[1] China is 1 of the only countries where the rate of suicide among women is higher than the rate among men,[1,3] although the gap may be narrowing.[3] Rural dwellers have a 3 times higher rate of suicide than urban dwellers,[1,3] which underscores the critical need to examine suicide in rural areas.

Self-poisoning with pesticides is the predominant method of suicide in China and accounts for approximately 58% of suicide deaths.[4] Pesticides are the predominant cause of suicide attempts that lead to intensive hospital treatment.[4,5] In most pesticide suicides, category 1 organophosphates are used[4]; these are the most potent pesticides and have been banned in many countries. Investigations of rural dwellers who attempt suicide and seek hospital treatment show that females outnumber males by approximately 2.5 to 1.[4] Data on attempted suicide in China are less clear than data on suicide, because there is not a national monitoring system.

In China and elsewhere, acts of suicide are heterogeneous with respect to the level of suicide intent. Signs and symptoms that indicate suicide risk may be displayed for weeks before high-intent acts are committed,[6] and strategies that seek to identify individuals at risk (e.g., depression screening)[7,8] may be required. Low-intent acts of suicide may happen quickly, which leaves little time for risk recognition.[6] One strategy for reducing suicidal behavior is to reduce access to methods of suicide,[9] for example, impose handgun restrictions,[10] promote safe storage of firearms,[11] restrict the number of tablets in some over-the-counter medications,[12] or—especially relevant to China—enforce stricter control of

Objectives. Acts of suicide are heterogeneous with respect to level of intent. Data on correlates of intent are overwhelmingly from Western samples. We sought to identify correlates of low-intent and high-intent suicide attempts in China.

Methods. We compared 277 adult case patients who presented to the emergency department in a rural hospital because of attempted suicide to 277 community control individuals, pair-matched for age, gender, and location of residence. Attempted suicides were stratified into 3 levels of suicide intent: low, intermediate, and high. Paired logistic regression analyses were used to analyze the data.

Results. High-intent acts of suicide were associated with major depression, chronic stress, and a relative or associate who had a history of suicidal behavior. These correlates were not associated with low-intent acts of suicide.

Conclusions. High-intent acts of suicide in China are the culmination of long-standing difficulties or symptoms including depression, chronic stress, and previous exposure to suicidal behavior. Prevention of high-intent acts of suicide should include a focus on these domains. (*Am J Public Health.* 2007;97: 1842–1846. doi:10.2105/AJPH.2005.077420)

pesticides. Creating additional strategies for preventing suicidal behavior depends on a better understanding of its determinants.[6]

Studies conducted in Western countries support the finding that suicide intent is associated with depression,[13,14] hopelessness,[15,16] and lethality of the act.[15,17–19] There are limited data on other correlates of intent, which indicate the need for more research that could be used to design tailored prevention programs. Moreover, the ability to generalize data on intent to non-Western countries is unclear. A study of completed suicide in China did not show an association between depression and level of planning the act, which is a component of suicide intent.[20]

Suicide intent is a complicated construct that comprises 2 major elements: (1) the level of planning and forethought preceding an act of suicide (objective planning), and (2) the intended outcome and perceived lethality of the act (perceived intent).[21,22] Although objective planning and perceived intent are related variables, they are not redundant.[21,22] For example, less-planned acts of suicide may be accompanied by high perceived intent, as documented in a case series of individuals in London who attempted suicide by jumping in

front of a railway train. Interviews with survivors of the attempts determined that the acts were preceded by little planning yet there was high perceived intent to die.[23] It has been argued that the study of planning in particular can inform suicide prevention policy.[9,18] Supporting this viewpoint, an investigation of suicide in China showed less-planned suicides were especially likely to be carried out by individuals who ingested pesticides stored in the home, which suggests that measures to restrict home storage of pesticides in China may have the largest effect on suicides carried out impulsively.[20] The primary purpose of our study was to identify correlates of level of intent of suicide attempts among individuals who lived in rural areas of China and attempted suicide. We also sought to examine correlates of planning and perceived intent among individuals who lived in rural China and attempted suicide.

METHODS

Individuals who were treated for suicide attempts (reported by the patient or family members) in the emergency room of Yuncheng County People's Hospital, from February 1999

to June 2002, were selected as part of a multi-site study sponsored by the World Health Organization.[5,24] This hospital is 1 of the 5 county-level general hospitals that serve the 1.1 million rural residents of Yuncheng County, Shandong Province, in northeastern China. Emergency room staff recorded demographic information for all individuals who attempted suicide. After the patient was medically stable, a trained researcher (attending psychiatrist) came to the emergency room to interview the patient and his or her accompanying family members (in virtually all instances in China, family members accompany the patient to the emergency room).

The comprehensive suicide attempt interview schedule used in the study was refined over a 2-year period and represents the third revision of the schedule. It includes 3 sections that take 2 hours to complete: (1) an open-ended, tape-recorded interview about the causes of the suicide attempt; (2) a detailed structured questionnaire that is independently administered to the patient and to an accompanying family member to assess the circumstances surrounding the attempt and the socioeconomic environment in which the patient lives; and (3) a semistructured psychiatric examination.

Among the 528 individuals (patients) identified during the enrollment period, 40 were younger than 18 years and 3 were treated for 2 separate suicide attempts (only the first attempt recorded during the enrollment period was considered). Among the remaining 485 patients, 200 (41%) were not approached by the research team (primarily because they left the emergency room before the researchers could arrive), 4 (1%) refused to participate, 4 (1%) did not provide all of the data needed for analysis, and 277 (57%) completed the interview.

Case patients (patients who were enrolled in the study) were significantly more likely to have ingested pesticides than the patients who were not enrolled (80% vs 55%), and they were less likely to have ingested medications (17% vs 42%); 3% of each group used noningestion suicide methods ($X^2 = 38.1$, $P<.001$). Suicide attempts by ingesting pesticides are, in general, more medically serious than suicide attempts by ingesting medications, so the latter were more likely to be

discharged before researchers could arrive, which accounts for the lower proportion of patients who ingested medications compared with pesticides. There were no differences in gender or age between case patients and patients who attempted suicide but who were not enrolled in the study. Case patients were interviewed within a few days after the suicide attempt (median 3 days; range 2–5 days).

For each case patient, potential control participants of the same age (within 3 years) and gender were identified from the list of residents of the village or neighborhood in which the case patient lived, and a random number table was used to select the specific control participants to be interviewed. If the individual identified had made a previous suicide attempt or refused to participate, another control subject was selected from the list. Control patients were interviewed in their homes, with family members present; the interview was administered using a modified version of the instrument that was used for case patients.

Seventy-six percent of case patients and control participants were women, 64% were younger than 35 years, 27% were aged 35–54 years, and 9% were aged 55 years and older. Almost all suicide attempts were carried out by ingestion (272, 98%) and most involved pesticides used in agriculture and to control rodents (222, 80%). All participants provided informed consent for the interview.

Degree of suicide intent was assessed using total scores on the Beck Suicide Intent Scale (SIS).[21] One item on the SIS was deleted from the planning subscale (discussion of suicidal thoughts or intent with someone before making an attempt) because this item had a low item-total correlation on the scale in our study, a finding that is consistent with previous research that showed the item has poor validity.[22] Deletion of this item yielded a total SIS score based on 14 items (range 0–28) and a planning scale based on 7 items (range 0–14), along with the 7-item perceived intent scale (range 0–14). Items were scored 0, 1, or 2. Internal consistency of the scales was high (total score [$\alpha=0.90$], planning scale [$\alpha=0.81$], perceived intent scale [$\alpha=0.86$]). The planning and perceived intent scales were highly correlated ($r=0.76$, $P<.001$).

Terciles were used on total scores to divide case patients into subgroups according to low intent (SIS<10, n=85, 31%), intermediate intent (SIS 10–15, n=98, 35%), and high intent (SIS>15, n=94, 34%). Terciles were also used to divide case patients into 3 levels of objective planning (<3, 3–6, >6) and into 3 levels of perceived intent (<7, 7–10,>10).

In a case–control study of completed suicide that accounted for age, gender, rural or urban residence, and research site, Phillips et al.[25] identified the following risk factors for suicide in China: (1) chronic stress, (2) acute stress, (3) quality of life, (4) severity of depressive symptoms, (5) previous history of attempted suicide, (6) blood relative with a history of suicidal behavior, (7) friend or associate with a history of suicidal behavior, and (8) severe negative life event in the 2 days before death. We used these predictors for our analyses with the exception of previous history of suicidal behavior (because our control participants had no history of attempts). In addition, history of suicidal behavior in a blood relative was combined with history of suicidal behavior in an associate to create a summary measure of exposure to suicidal behavior.

The quality of life score included in the predictors was derived from a rating of 6 characteristics over the past month (physical health, psychological health, economic circumstances, work, family relationships, relationships with non-family) on a scale of 1 (very poor) to 5 (excellent). The chronic stress score and the acute stress score were derived from a 60-item life event scale (past year). The chronic stress score was the product of the duration (in months) and perceived severity of the psychological effect of each negative life event that occurred in the past year, summed for all negative life events. The acute stress score was the product of the perceived severity of the psychological effect of the negative life event and the inverse of the time from the life event to death, summed for all negative life events. These measures showed high interrater reliability in Phillips et al.'s study of suicide in China.[25] Specifically, a comparison of scores obtained from interviews with family members of case patients and independent, masked interviews regarding the case patient (carried out by another

investigator with no knowledge of the results of the other interview) with friends of case patients showed high agreement (intraclass correlation coefficient [ICC] of quality of life score=0.83, ICC acute stress score=0.67, ICC chronic stress score=0.69). A life event scale was also used to identify the presence of an acute stressful life event in the 2 days before death for case patients (or 2 days before the interview for control participants). The investigators operationalized this type of event as an acute interpersonal crisis that the individual found intensely stressful. Acute stress scores and the presence of acute stressful life events were highly correlated (r [point biserial]=0.82, $P<.001$).

In Phillips et al.'s study of completed suicide,[25] continuous depression scores based on symptom intensity and duration were derived. In our investigation, to facilitate communication with clinicians (who rely on diagnoses more so than on continuous scores on depression scales), we used diagnosis of major depression (present or absent). The diagnostic interview used to identify depressive episodes was an adaptation of the *Structured Clinical Interview for DSM-IV Axis I Disorders, SCID-IV*.[26] The scale adapted for China used both the standard questions and additional questions that were designed to improve the sensitivity of the assessment of depressive symptoms. Psychiatrists in China were shown videotapes of interviews that used the adapted scale to independently assess each symptom of depression and to assign overall diagnoses that could be compared with the diagnoses established in the research interview; reliability was shown to be high (ICC=0.87).

A series of univariate analyses of risk factors for suicide were conducted among the case patients and matched control participants within each tercile of planning by using conditional logistic regression.[27] Predictors included quality of life, chronic stress, and acute stress scores (dichotomized at their medians), and dichotomous measures of major depression, acute stressful life event, and suicidal behavior in a relative or associate. In instances when there were no discordant pairs (when no pair was represented by a depressed control and a nondepressed case patient), a hypothetical discordant pair[1] was substituted. A secondary, multivariate analysis of suicide intent, defined as a continuous outcome variable, was conducted using only case patients. This analysis was conducted with both acute stress variables (acute stress scores, stressful life event) included in the model and, given a concern about colinearity of these measures, with acute stress scores deleted. All analyses were conducted with SAS version 8.2 (SAS Institute Inc, Cary, NC).

RESULTS

Results of paired analyses for overall suicide intent scores are presented in Table 1. Discrepant pairs in which a case patient is exposed to a risk factor and a paired control subject is not exposed (and vice versa) contribute data to the analysis. Odds ratios were derived by dividing the 2 values. Data on consonant pairs, in which both members of a pair are either exposed or unexposed, are not presented in the table, because they do not contribute to the analysis.

Table 1 shows major depression is associated with high-intent suicide attempts but not with low- or intermediate-intent suicide attempts. High chronic stress and history of suicide by a relative or associate are associated with high- and intermediate-intent suicide attempts but not with low-intent suicide attempts. High acute stress score, recent negative life event, and low quality of life are

TABLE 1—Odds Ratios (ORs) for Attempted Suicide Associated With Risk Factors Across Levels of Suicide Intent: Yuncheng County, China, February 1999–June 2002

Risk Factor	Level of Intent	No. of Discordant Pairs[a] for Exposure to Risk Factors		OR[b] (95% CI)
		Case Patient Exposed, Control Patient Unexposed	Control Patient Exposed, Case Patient Unexposed	
High chronic stress[c]	Low	16	21	0.8 (0.4, 1.5)
	Intermediate	31	17	1.8 (1.0, 3.3)
	High	56	2	28.0 (6.8, 115)
High acute stress[d]	Low	74	0	74.0 (10.3, 523)
	Intermediate	76	1	76.0 (10.6, 546)
	High	54	5	10.8 (4.3, 27.0)
Recent negative life event	Low	77	0	77.0 (10.7, 554)
	Intermediate	84	0	84.0 (11.7, 603)
	High	42	0	42.0 (5.8, 305)
Major depression	Low	0	1	1.0 (0.1, 16.0)
	Intermediate	7	1	7.0 (0.9, 56.9)
	High	69	0	69.0 (9.6, 497)
Low quality of life[e]	Low	26	6	4.3 (1.8, 10.5)
	Intermediate	37	10	3.7 (1.8, 7.4)
	High	59	5	11.8 (4.7, 29.4)
Suicide in associate or relative	Low	23	22	1.1 (0.6, 1.9)
	Intermediate	32	18	1.8 (1.0, 3.2)
	High	34	14	2.4 (1.3, 4.5)

Note. CI = confidence interval. Chronic stress, acute stress, and quality of life scores were dichotomized at their medians to create categories (high and low).
[a] There are 85 (31%) low-intent, 98 (35%) intermediate-intent, and 94 (34%) high-intent matched pairs.
[b] When there were 0 observations, the value 1 was substituted to derive the OR.
[c] The chronic stress score was the product of the duration (in months) and perceived severity of the psychological effect of each negative life event that occurred in the past year, summed for all negative life events
[d] The acute stress score was the product of the perceived severity of the psychological effect of the negative life event and the inverse of the time from the life event to death, summed for all negative life events.
[e] The quality of life score was derived from a case patient's rating of 6 characteristics over the past month (physical health, psychological health, economic circumstances, work, family relationships, relationships with non-family) on a scale of 1 (very poor) to 5 (excellent).

Risk Factor	b	b (SE)	P
High chronic stress[a]	1.56	0.61	.011
Recent negative life event[b]	−1.63	0.64	.011
Major depression	8.12	0.69	<.001
Low quality of life[c]	0.87	0.62	.164
Suicide in associate or relative	1.44	0.48	.003

Note. df = 1 for all risk factors. Analysis is only of individuals who attempted suicide and went to the hospital emergency room. Chronic stress, acute stress, and quality of life scores were dichotomized at their medians to create categories (high and low).
[a]The chronic stress score was the product of the duration (in months) and perceived severity of the psychological effect of each negative life event that occurred in the past year, summed for all negative life events.
[b]Analysis excludes acute stress score because of colinearity with acute stressful life event.
[c]The quality of life score was derived from a case patient's rating of 6 characteristics over the past month (physical health, psychological health, economic circumstances, work, family relationships, relationships with non-family) on a scale of 1 (very poor) to 5 (excellent).

associated with suicide attempts regardless of the level of intent.

The result of the multivariate linear regression analysis within case patients is presented in Table 2. Based on the R^2 values, the model accounts for 61% of the variance in suicide intent and indicates that general risk factors for suicide also account for most of the variance in suicide intent. Our model excludes acute stress scores for 2 reasons. First, in testing a multivariate model that included both acute life events and acute stress scores, inclusion of the latter contributed less than 1% of the variance in planning. Second, the inclusion of acute stress scores in this model served to suppress the association of stressful life events and planning (P=.083 in the model with acute stress; P=.011 in the model excluding acute stress). The results shown in Table 2 indicate that major depressive episode, chronic stress, and suicidal behavior in a relative or associate are associated with higher suicide intent, and that acute stressful events are associated with lower suicide intent. Low quality of life does not show an association with level of intent after control for other variables in the model.

The analyses were repeated with the SIS subscales (objective planning, perceived intent) to examine correlates of these elements of suicide intent. The findings for both scales were similar to those for overall intent discussed above, so these results are not presented.

DISCUSSION

There were comparable findings for overall suicide intent and its constituent elements (perceived intent, objective planning), which suggests that the study of the elements of suicide intent in China may not yield unique information. Results support the hypothesis that acute stressful life events are more likely to precede suicide attempts associated with low suicide intent than attempts associated with high intent. Acts of suicide with low intent are a grave public health concern in China because of the wide availability of highly toxic pesticides used for agriculture and to control rodents, particularly in rural areas. The use of these agents in suicide attempts may increase the lethality of such acts.[4,5,28] In addition, although acute stressful life events were more strongly associated with low-intent acts of suicide, acute stressful events also conferred risk for high-intent acts. These results suggest that acute stressors may serve as a "last straw" in precipitating acts of suicide among individuals who have been contemplating suicide.

The data support that in China, individuals who show signs and symptoms of depression or indications of chronic stress are vulnerable to suicide attempts with high intent. Results also suggest that individuals who have 1 or more blood relatives or associates with a history of suicidal behavior are at risk for this type of attempt. The idea to commit suicide, the acceptability of this option, and a method to carry it out may be primed among exposed individuals given that the behavior has been modeled. Although exposure to an individual who has carried out an act or multiple acts of suicidal behavior may increase risk acutely,[29] such exposure may also set a suicidogenic process in motion well in advance of an acute suicidal state.[30] Such a process may build to an act of suicide and contribute to acts with high intent.[30] This association is a preliminary finding and requires further study.

We presented different correlates of low- and high-intent suicide attempts in China, and our analyses support the idea that different prevention and treatment strategies are required to address these subgroups. China may be a suitable environment in which to implement and evaluate the effectiveness of integrated prevention strategies. For example, population-based restrictions (e.g., controls on access to pesticides) that are presumed to be most effective in preventing low-intent suicide acts may be combined with interventions intended to identify and treat individuals exhibiting ongoing indications of risk (e.g., depression screening), which are presumed to be most effective in preventing high-intent acts.[20] Although successful integration of population-based and high-risk approaches has not been demonstrated in suicide prevention, such approaches have been extended successfully to combat heart disease, stroke, cancer, and HIV/AIDS.[31] Implementing prevention measures in China is challenging. Pesticides are an integral part of agriculture in China, so restricting access to their use will require a judicious combination of regulations that limit the production, sale, and storage of the most potent compounds, along with public education to improve acceptance of the new restrictions. Village-level and township-level health workers could be trained to conduct depression screening programs in rural China; however, the lack of treatment facilities and lack of knowledge about depression and its treatment among rural residents would require progress in addressing these issues for screening to be effective.

Study limitations were (1) that measures of impulsivity and hopelessness were not examined, (2) that the influences of age and gender on intent could not be examined given the matching procedure, and (3) that the study examined individuals who attempted suicide and were treated at a rural hospital in China, with unclear generalization to other settings. Strengths of the study were (1) that the analyses built upon a study in China that identified risk factors for suicide,[25] (2) that the SIS may be considered the gold-standard measure of suicide intent and showed high reliability, (3) that the matching procedure maximized comparability of case patients to

control participants, and (4) that the large sample size facilitated stratification by suicide intent.

Approximately 30% of suicides worldwide take place in China, and most of these deaths occur in rural areas. Therefore, results may inform suicide prevention efforts where they are needed most. Our data suggest that the advancement of efforts to identify and treat depression is critical to preventing high-intent acts of suicide in rural China but that focusing on depression may have little effect on low-intent acts, which require different prevention strategies. Interventions to prevent low-intent acts in China need to be developed. For example, a recent report showed less-planned suicides in China were especially likely to be carried out with pesticides that were stored in the home,[20] which suggests that limiting home access to pesticides would reduce this type of suicide. Other strategies should also be evaluated, including interventions to address interpersonal conflict and reaction to stress. The overall pattern of findings is consistent with theory and empirical findings based on Western samples and, therefore, seems likely to inform research and prevention efforts beyond China. ∎

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