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Suicidal Ideation and Attempts among Rural Chinese Aged 16–34 Years - Socio-demographic Correlates in the Context of a Transforming China

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Abstract

Background—The distinctive epidemiologic profile of suicide in China, with notably high rates among rural young adult females, invites examination of possible underlying risk factors.

Although there are accumulating data regarding the epidemiology of suicide among youth and young adults in China, there are meager data on suicidal ideation and attempts despite its importance.

Methods—Our study in 2005–06 sought to identify all potentially suitable rural participants, aged 16–34 years, from 10 representative villages in rural Sichuan Province. We conducted structured interviews regarding a range of socio-demographic characteristics and suicidal morbidity.

Results—1654 of a potential 3008 participants participated; lifetime and one-year prevalence were: suicidal ideation (18.8%, 5.2%), serious ideation (8.6%, 2.3%), planning (5.8%, 1.5%), and attempt (2.7%, 0.5%). Comparisons among strata of socio-demographic characteristics showed more prevalent suicidal ideation associated with: female gender, lower education, poorer financial perception, greater rurality of residence, and marital status of “never married” or “others”. Suicidal attempt was associated with: female gender and a marital status of “others”.

Limitations—The study was carried out in one province and caution is required when considering other rural regions of China. There were a substantial number of unapproachable subjects because of their migrant work at distant sites.

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Conflict of interest

All the authors declare that they have no conflict of interest.

Contributors

J. Dai, H.F.K. Chiu, K.R. Conner, S.S.M. Chan, E.D. Caine designed and wrote the protocol. J.Dai, Z.J. Hou, X. Yu co-ordinated the field work. J. Dai, H.F.K. Chiu, K.R. Conner and E.D. Caine contributed to the analysis of data and the first draft of the manuscript. All authors contributed to and had approved the final manuscript.

Conclusions—Our results revealed an apparently higher prevalence for suicide ideation and planning compared with residents of other countries, but a lower prevalence for attempts. These data suggests that the relatively high rate of suicide in rural China reflects an elevated case fatality ratio due to chosen methods. The results also revealed unique patterns for correlates with the occurrence of ideation and attempts.

Keywords

Suicide Morbidity; Prevalence; Socio-demographic Correlates; Rural Community; China

Nearly 900,000 people die by suicide each year. China accounts for approximately 21% of the world's population, yet 44% of the world's suicides among males and 56% of all suicides among females (Phillips et al, 1999). The toll of suicide in China is especially high among youth and young adults aged 15–34 years, where it is the leading cause of death. Unique to China, the suicide rate is higher in women than men, mainly driven by the high suicide rate of women aged 15–34 years in rural areas. More than 90% of suicides in China are carried out by individuals from rural regions. Indeed the suicide rate for rural women and men aged 15–34 years is alarmingly high (37.8 and 22.8 per 100,000, respectively) (Phillip et al., 2002a) These data necessitate a focus on suicide prevention among youth and young adults in rural areas including a focus on women.

Although there are accumulating data regarding the epidemiology of suicide among youth and young adults in rural China, there are meager data on suicidal ideation and attempts. Determining whether risk factors for attempted suicide and suicidal ideation are similar to those for suicide will contribute to formulating future prevention efforts. Suicidal ideation, even if it is brief, is a pre-condition for suicide. Ideation of greater severity, including “serious ideation” and “suicide planning”, are potent risk factors of suicide (Beck et al., 1999; Kessler et al., 1999), and suicide attempt is arguably the single best predictor of eventual suicide (Moscicki 1997; Harris 1997). Suicidal ideation and attempts also signal great personal distress, including psychological pain and hopelessness, which in themselves warrant attention (Knox et al., 2004). Suicidal attempts in rural China, even when they do not prove lethal, can result in serious and lasting consequences (Fleischmann et al., 2005). Therefore, research on suicidal ideation along the continuum of severity and suicide attempts is needed to inform suicide prevention efforts.

At the present time, China presents a unique setting where the apparent separation between suicide attempts and suicide completion is less evident when compared to western countries. First, ingestion (*of lethal pesticides*) is the most common method in rural China for both attempted suicide and suicide completion (Phillip et al., 2002b; Phillips & Yang, 2004; Phillips et al., 2004; Eddleston & Phillips, 2004; Fleischmann et al., 2005;), quite different from the situation in more developed countries where a much greater proportion of suicides use violent methods (firearms, hanging) (Langlois et al., 2002; Beautrais et al., 2001). Second, the age and gender pattern of suicide and suicide attempt in China is consistent that both the rates of suicide and suicide attempt peak among female and those 15–34 years old (Phillips et al., 2002a; Phillips & Yang, 2004). This contrasts with the U.S., for example, where age and gender related rates of suicide attempt and suicide differ markedly from one another (Langlois et al., 2002; Spicer et al., 2000). Taken together, these findings further support the potential value of data on non-lethal acts of suicide to inform suicide prevention efforts in China.

This study begins to address the gap in the literature on suicidal ideation across the spectrum of severity including suicidal ideation, serious ideation and planning, and suicide attempts (together also called “suicidal morbidity” in this paper) among rural Chinese aged 16–34

years. The present report focuses on lifetime and one-year prevalence of suicidal morbidity, examined across a range of socio-demographic characteristics. To our knowledge, this is the first comprehensive study of suicidal ideation across a spectrum of severity as well as the first study of suicide attempt using large representative rural communities where great effort was expended to reach all potential respondents.

Methods

Sampling

The study was approved by the Survey and Behavioral Ethics Committee of The Chinese University of Hong Kong. The Study involved collaboration with the Mianyang Center for Disease Control and Prevention (CDC) and its regional CDCs. The project was conducted in the vicinity of Mianyang Region, Sichuan Province (Southwestern China). We chose to study rural regions in the vicinity of Mianyang, Sichuan Province, in the southwestern part of China. This area is typical of many rural regions in China, in terms of having a large population of out-going migrants, a fast pace of urbanization, and geographic complexity. In addition, the authors had built a strong network with the local officials that could facilitate our research. Mianyang Region is comprised by two districts, six counties, and 1 city, all including both rural and urban areas. It has a population of 5.3 million, among which 1.2 million are registered as urban and 4.1 million as rural. According to 2004 statistics, the average annual net income of its rural residents was RMB2551 (approximately USD308) (Mianyang Bureau of Statistics 2004), and our sample has a weighted average annual income of RMB2740 (approximately USD330).

China's administrative division is a three-tier system, dividing the country into provinces, counties/cities and towns in hierarchy. A village is the most fundamental rural unit of Chinese administrative system – a small rural community. A town is composed of a group of villages (rural) and a small township area (urban). Multistage cluster sampling was used to randomly select towns and then villages. Once selected, we sought to recruit all individuals aged 16–34 within villages that had been chosen. Specifically, twenty-four (24) towns were selected randomly from the region's potential pool of 277. Of the 266 villages in these 24 towns, 11 were selected randomly, scattered among ten towns. One of these was chosen randomly for pilot testing and as a training site for interviewers. From the other 10 villages, 3008 possible subjects aged 16–34 years were identified using comprehensive enumeration of individuals included in the Chinese household registration system (*hukou*).

The *hukou* registration serves as the foundation for the Chinese Mortality Registry System (MRS) and the Disease Surveillance Point System (DSP) – the two national systems related with suicide.

Pre-study visits by the investigative team revealed that it was common for a very large portion of the potential study population to be working in distant urban settings where most visited home only during Lunar Chinese New Year. Thus we decided to divide recruitment into two “waves,” late-summer/early-fall 2005, before the busy fall harvest time, and Lunar New Year holiday period of January-February 2006. This also offered the opportunity to begin to examine the impact of migrant work status on suicidal morbidity -- a potentially very powerful socio-demographic factor.

Recruitment

Local government and health officials (especially town and village “doctors,” non-physician health providers) played an important role in the recruitment of subjects, in collaboration with the CDCs, as part of an “on-the-ground” community network that addressed recruitment challenges, including very rugged terrain in high mountainous villages, low

population densities, muddy dirt roads, lack of precise addresses, *hukou* mismatches, and large numbers of residents temporarily or permanently living away from their homes.

We sought to notify every potential participant using a written notice and in-person notice/telephone calls/broadcasting beforehand. During specific interview days in each village, interviewers approached possible subjects by calling them to the interview sites or making family visits. All participants signed the “Consent Form” before interview and were compensated for their time, RMB10 (about USD1.25) during “Wave 1” and RMB20 (about USD2.50) during “Wave 2”. We doubled the compensation in wave 2 because it was during the major holiday period when participants may have had other commitments as well. The investigation usually cost 40–60 minutes for each respondent. All of the 16–34 year old residents in the selected 10 villages were eligible, with the exception of individuals who were mentally or physically impaired, and could not communicate with the raters to finish the protocol, as confirmed either by village doctors or villages leaders. The villages were visited frequently during both recruiting periods to assure multiple opportunities to enroll potential subjects. During early 2006 we contacted individuals unobtainable during 2005 at least twice. Those who were away from their *hukou* on all occasions were defined as “unapproachable.” The *hukou* lists provided gender and age for each of the unapproachable residents; family members, village heads/doctors, or other informants provided other basic information (e.g. reasons for being unapproachable).

Interviewer Training, Quality Control, and Interview Setting

A total of 24 interviewers selected from experienced, locally connected CDC field staff completed 7 days of intensive training. As part of the training program, they took part in final stages of our pilot testing of patient recruitment and interview procedures in our ‘pilot’ village. The training program involved a formal manual-based approach to assure maximum fidelity, and the specific training agenda included: 1) familiarizing with the instruments and fieldwork details, including how to find possible subjects and coordinate with local helpers; 2) developing basic skills--e.g., learning appropriate methods for obtaining informed consent, appreciating the importance of subject confidentiality, developing sufficient comfort to ask potentially sensitive questions about suicidal ideation and attempts, and knowing the response protocol when dealing with individuals deemed to be acutely at risk for suicide; 3) demonstrating standardized interviews, first with two CDC staff and then with two psychiatric patients; 4) conducting repeated standardized, supervised interviews with each other; 5) discussing of the instruments and interview concerns based on the aforementioned activities; and 6) conducting inter-rater reliability testing and a paper examination regarding ethical issues, study content, and interview skills. We selected interviewers based on training performance and the results of the inter-rater reliability testing and the paper examination. Wave 1 used 10 interviewers, while Wave 2 used 20, given the relatively brief window of time available for recruiting subjects; interviewers received booster training prior to taking part in the second phase of recruitment. Eight of the first 10 interviewers took part in Wave 2, plus another 12 from the training pool.

Each rater’s interview was audited repeatedly (with consent from the respondents), with later feedback. All interview protocols were reviewed in the evening of each day with the entire team working together. Three (3) percent of the interviewed subjects were randomly selected for re-interview by another rater to continuously check inter-rater reliability. The lead author conducted quality control meetings for the entire team on the afternoon of every fifth working day—to report progress, to discuss any difficulties/challenges encountered, and to develop consensus strategies to address these issues.

The interview was conducted in a site that was most convenient for respondents, including their home, their place of working, the offices of village officials, village clinics, village

primary schools, or other places that participants identified. Several strategies were adopted to improve subject comfort, including ongoing interviewer support and training, selecting confidential settings for individual interviews, assigning subjects to same-sex interviewers whenever possible, asking questions in a friendly and direct manner, and using careful wording of questions to maximize subject comprehension and acceptability, especially in light of the low education level of some subjects. Interviewers also were trained to ask follow-up questions, or reframe questions as needed, to maximize the detection and quality of suicidal ideation and attempts and related morbidities. Each of the interviewers was equally fluent in local dialect as well as Mandarin.

Measures

All subjects were asked about general suicidal ideation with the question, “Have you ever thought about committing suicide?” As well, each was queried about serious suicide ideation, suicide plan, and suicide attempt, items taken directly from the National Comorbidity Survey, with one minor addition (see *italics*) to the item of suicide plan (Kessler et al., 1999). These items were: “Have you ever seriously thought about committing suicide?” “Have you ever made a plan for committing suicide, *or even taken steps to prepare for this plan?*” “Have you ever attempted suicide?” For each item endorsed, the interviewer would ask, “When was the last time?” If a response was affirmative for any time during the prior 12 months, it was recorded as “past year;” all other affirmative responses were logged as “lifetime.”

The current report focuses on socio-demographic correlates of ideation and attempts, including age, gender, education, marital status, occupation, perceived financial situation, and degree of rurality. These data were categorized for analyses. Degree of rurality of each village was based on a modification of a previously published instrument (Leduc 1997). It included: remoteness from basic and advanced medical referral centers and town government, population of the town, and average annual income of the village.

We chose in this study to ask respondents to self-identify a single occupation, aware that there might be the potential for individuals to have more than one (e.g., a part-time farmer who also might be a migrant worker for some portion of the year). We stratified marital status as: never married; currently married (first time); and “other,” which included married again, divorced, widowed, co-habituating, and separated. Among the 173 people with “other” marital status, 64% (111) was separated from their spouses because of migrant work.

Data Management and Analysis

Data was double entered by independent research staff using EpiData 3 (EpiData Association 2005); discrepancies were resolved by a third group. The data were managed and analyzed using SAS (version 9.1, 2004) and SPSS (version 15, 2006). Univariate logistic regression was used to analyze the associations of socio-demographic variables with suicidal outcomes. Variables examined in univariate analysis were then entered together in multiple logistic regression to account for covariates in the demographic domain. We used Generalized Estimating Equations (GEE) (Diggle et al., 2002) to account for clustering in villages. Odds ratios and 95% confidence intervals for risk factors of outcomes were computed based on the logistic model with GEE estimates, and their asymptotic normal distributions of parameters of the logistic model (Agresti 1990; Stokes et al., 2001).

We aimed to analyze the relationship of lifetime (including more than one year ago and within past year) and one-year suicidal morbidity with socio-demographic features separately, yet a comparison showed that there is no significant difference between more than one year ago and within one year, so we just keep the analysis of lifetime suicidal

morbidity and used the group as a whole. Level of significance was set at 5% throughout the paper.

Results

Participation

Figure 1 depicts the study's sampling results.

Distribution of Socio-demographic Features

Table 1 shows the distribution of socio-demographic features of the sample.

Prevalence of Suicidal Ideation and Attempts

Table 2 shows the prevalence of lifetime and one-year outcomes with rates for female and male included. The figures indicated that female rate is generally higher than male rate across all suicidal measures.

Associations of lifetime suicidal ideation, serious ideation, plan and attempts with socio-demographic characteristics

Univariate findings are presented in Table 3. The univariate analysis revealed that female gender (OR=1.48), lowest education level (OR=1.86), 'other' marital status (OR=1.96), lowest level of financial perception (OR=2.73), and highest degree of rurality (OR=1.82), were significant factors associated with elevated prevalence of suicidal ideation. For serious ideation, the middle range of the age group (OR=0.39 for 20–24 and OR=0.60 for 25–29) were protective factors, whereas farmer (OR=1.65), lowest education level (OR=2.98), lowest level of financial perception (OR=2.42), and highest degree of rurality (OR=2.01) were significant risk factors. Female gender (OR=1.80), lowest education level (OR=2.95) and lowest level of financial perception (OR=1.99) were associated with suicide plan significantly. Similar significant factors as in suicide plan were found for suicide attempt, but 'other' marital status (OR=3.61) was included as a significant factor and financial perception was excluded.

Although occupation as a whole was not significant across the suicidal measures with the exception of serious ideation, the strata of occupation did show interesting result in suicide ideation and serious ideation. Within the strata of occupation, students were more likely to have a history of suicidal ideation, but not for suicide attempt. Farmers had a higher prevalence of serious suicidal ideation compared with migrant workers.

To account for covariates in the demographic domain together, all variables in Table 3 were forced to enter in multiple logistic regressions. Figures were presented in Table 4. The findings are comparable to the univariate associations in financial perception and degree of rurality. Female gender was significant across all suicidal measures. Increase in age and less education level could increase the risks in suicidal ideation and in serious ideation. 'Others' marital status had highest risk in suicidal ideation and in suicide attempt, whereas the 'never married' status became the highest risk in serious ideation and in suicide plan. Occupation became insignificant across all suicidal measures.

Discussion

Comparison of Prevalence with Other Studies

Based on data collected from nine countries/regions with items similar to ours Weissman et al reported lifetime prevalence of suicide ideation, ranging from 2.09% to 18.51%, and lifetime prevalence of suicide attempt, ranging from 0.72% to 5.93% (Weissman et al.,

1999). In comparison to the above data, the lifetime prevalence of suicide ideation of our sample (18.8%) was at the higher end; while our prevalence of suicide attempt (2.8%) was at the low end of the data reported by Weissman et al. Mindful of substantial differences in sampling methods and sample composition, the work of Kessler and colleagues (Kessler et al., 1999; Kessler et al., 2005) in the U.S. provides another perspective. Compared with their results, our sample showed higher lifetime and one-year prevalence of suicide ideation and planning, and a lower lifetime prevalence of attempts.

There are two published studies that offer some comparison using China samples. The WHO SUPRE-MISS study reported lifetime prevalence of 18.5% for suicide thoughts, 7.4% for plans, and 2.4% for attempts for its Chinese sub-sample (Bertolote et al., 2005). This study administered nearly the same items for serious suicide ideation, planning, and attempt in our study to probe suicide “thoughts”, “plans” and “attempts”. Its Chinese sub-sample came out from a county with the target population 1,200,000 and sample size 503. Although its sample was older (mean age=43), and the authors did not describe how they dealt with unapproachable subjects, the results were comparable to ours, provided we consider its reported prevalence of “suicidal thoughts” as roughly equivalent to our reported prevalence of “suicidal ideation.” Similar to our results, its Chinese sub-sample had a higher prevalence of ideation and planning, yet it sat among the study’s 10 sub-samples at the lower end of the prevalence for suicide attempt. Feng et al reported a lifetime, one-year and one-week prevalence of 23.6%, 13.4% and 4.8% for suicide ideation (Feng et al., 2006). The sample came from a town with target population 58,883 and sample size is 853. However it excluded people who were out of the village for six months or more, i.e., excluding a large portion of potential subjects. Moreover, their one-week reported prevalence of suicidal ideation was extraordinarily high, inconsistent with ours and others.

Nock *et al.* (2008) recently reported from 17 countries the lifetime prevalence of suicide ideas, plans, and attempts as 9.2%, 3.1% and 2.7%. Overall our sample had a higher prevalence of reported suicidal ideas and plans, yet a lower prevalence of attempts. Apparently, it is in this context of apparently fewer attempts that rural Chinese residents die from suicide more often.

We must be careful making interpretations based upon studies using the types of methods that others and we have used. Nonetheless, our data suggest that when rural Chinese people act on their suicidal ideas and plans – i.e., initiate an attempt to kill themselves – they like others tend to select locally available methods. This choice of means to die is powerfully determinative of eventual outcome; most rural Chinese choose relatively lethal and readily available agricultural pesticides (Eddleston et al., 2004; Conner et al., 2005), and such ingestions frequently lead to death.

The implications of this finding contrast with those based on post-mortem studies: Those data have suggested that the relatively high rates of suicide in rural China often have resulted from sudden or unplanned suicide attempts occurring when individuals encounter adverse life events (World Health Organization 2002; Pearson et al., 2002). In general, the latter explanation is built upon reports of near-term, antecedent disappointments or arguments, lower levels of diagnosed psychopathology, and apparently sudden actions (Conner et al., 2005). Our data underscore that the morbidity associated with suicide, such as thoughts, plans, and attempts, are relatively common in the general population. Thus, the apparent “impulsive” nature of many suicides does not mean that the decedent had not previously contemplated killing her/himself. Many of the respondents in our study had considered the thought of suicide, and a sizable proportion had contemplated plans. Rehearsing suicide in one’s mind, whether recent or distant, may serve as a primer for future actions (Joiner 2002).

We also are mindful that China (and Sichuan) apparently is in the midst of a decade-long decline in its rate of suicide (Yip et al., 2005; Tang et al., 2005), potentially contributing to our current findings. Perhaps most important, our data point to important socio-demographic factors that are associated with such thoughts, plans, and actions, which together underscore the potential for addressing contextual or social factors that potentially could promote prevention.

Education, Financial Status, Rurality, and Marital Status

Comparisons within the sample showed elevated rates—most reaching statistical significance—across the spectrum of severity among individuals who were women, and who had the lowest education levels; never married; were members of the “other” marriage category (primarily people separated due to migrant work); individuals with lowest perceived financial wellbeing; and who were from communities with the highest level of rurality.

Seen together these findings begin to form a more coherent picture of the “setting” or “social context” for suicidal morbidity among those whom we surveyed—it occurs most often among more disadvantaged individuals who apparently face an array of chronic stresses. Many rural Chinese live in relatively distant and disconnected communities with low income and limited resources, and in turn may be especially susceptible to the buffets and disruptions associated with the rapid economic and social transformations now underway in China.

It is intriguing to consider our findings regarding the apparent relationships between suicidal morbidity, and rurality and economic status, in light of recent overall changes in the suicide rate in China. China has seen a decrease in overall suicide rates in recent years during its surge to urbanization. Perhaps the opportunities associated with Chinese urbanization may serve as protective factors for suicide. As well, in urban settings individuals are less likely to store highly toxic pesticides in their home, which may also offer protection. Those continuing to live in rural or less developed regions may not enjoy these benefits, or may in fact face greater risk in the future if “urbanization” actually implies the movement of socio-demographically healthier people to the cities. This phenomenon may not be unique to China. Singh and Siahpush described the rising suicide rate with increasing levels of rurality in the US from 1990-97 across the 10-category rural-urban continuum (Singh 2002).

Gender and Occupation

The higher prevalence of suicide ideation (*female-to-male* ratio of 1.5:1) and suicide attempts (*female-to-male* ratio of 2.9:1) of females in our sample appears to be consistent with findings from reported Chinese data regarding attempts (*female-to-male* ratio of 2.5:1) (Phillips et al., 2004) and suicide deaths (*female-to-male* ratio of 1.7:1 for rural people ages 15–34) (Phillips et al., 2002a). For nine countries/regions that have a similar gender ratio for both suicide ideation (un-weighted *female-to-male* ratio of 1.5:1, ranging from 1.2–2.3:1) and suicide attempts (un-weighted *female-to-male* ratio of 2.4:1, ranging from 1.2–3:1) (Weissman et al., 1999), the gender ratio for death from suicide (*female-to-male* ratio of 1:2–7) (World Health Organization 2010) is opposite to China. This suggests that Chinese women have a higher mortality risk for each attempt, likely attributable to the ingestion for toxic agents and a relative lack of immediate access to emergency services.

There are other lessons in our data, when they are taken together with those from other countries. The prevalence patterns were remarkably similar in several key respects: In seven of nine countries/regions (Weissman 1999) and in our sample, there was a lower *female-to-male* ratio of suicide ideation versus suicide attempts. Put another way, while women have

more frequent ideation than their male counterparts, they have an even greater degree of attempts, suggesting that they act on what they think more often. When coupled with the easy availability of lethal means, it is possible to better understand the unique *female-to-male* ratio of suicide that characterizes rural China. As a result, an important focus of prevention should include efforts to reduce the likelihood and deadliness of attempts. This finding reinforces proposal to promote means control, such as limiting access to lethal pesticides, and invites development of alternatives for the expression of personal distress or interpersonal conflict, as well as longer-term efforts to improve more basic social conditions. Meanwhile, the similarity of our data to Western data challenges former qualitative data which in general portray Chinese women under great distress in the context of a family oriented culture and gender discrimination (Zhang et al., 1998). Indeed, Chinese women's social status has been much improved during the last half century.

Farmers showed elevated risk compared to migrant workers for serious ideation in univariate analyses, but not in the multivariate analyses that adjusted for other socio-demographic correlates. We must be very careful interpreting whether this is, in any way, an occupation-specific finding rather than an observation related to factors such as lower education, high degrees of rurality, and low perceived financial status.

Nearly half of our recruited sample (46%, n=758) identified themselves as migrant workers, while 65% (n=1073) of the sample had migrant work experience. Moreover, among unapproachable subjects (n=1284) for whom we obtained basic profile (n=995), 74% (n=811) were unavailable due to being engaged in migrant work elsewhere. China's economic transformation now includes approximately 200 or more million migrant workers who reside in faraway urban cities or nearby township enterprises, and another 150 million surplus laborers in rural areas. Those aged 16–40 years comprise 89% of the migrant work force, of whom 66% are men (Study Group, Academic Office, State Council of the People's Republic of China 2006). Thus, it will be essential for any research that seeks to understand the mortality and morbidity associated with suicide to address the challenges posed when studying migrant workers, especially as this group is composed largely of the youth and young adults that we studied.

Limitations, Lessons, and Future Directions for Research

It is important when reviewing our results to be mindful of the potential limitations, as well as lessons that have implication for future research. 1) It was carried out in one province and must be viewed with caution when considering other rural regions, given the diversity of China. At the same time, examination of both DSP and MRS data for Sichuan Province when compared with national statistics revealed that the Patterns for age, gender and rural-urban distributions of suicide were the same (Dai J, unpublished data, November 2006). 2) Despite great efforts to enhance enrollment, there were a substantial number of “unapproachable” potential subjects, most living outside the communities because of migrant work at distant sites. Meanwhile, this is the first study to consider the large portion of mobile population in rural China and adopt response protocol to address this challenge. 3) Given the multitude of analyses in this study and the modest sample size, we should be mindful of looking for broader patterns of coherent associations when judging the results because of sparse data on the outcomes (especially for suicide attempt).

Despite its limitations, this study offers an important view of self-reported suicidal ideation, planning, and attempts in a community sample from a rural region of China. It has strengths that grow from the collaborative local network on which it was built, from its comprehensive enumeration of potential subjects using random selection of villages, from its rigorous training and supervision of locally connected interviewers, and from the

excellent cooperation of participants. It is the first epidemiologic study of suicide-related morbidity to address the issue of migrant workers and level of rurality.

Taking into account the potential impact of a high level of migrant workers can be challenging, while it appears to be powerful effects of either being migrant workers or being left behind. We know of no other studies examining suicidal thoughts or attempts that have specifically sought to incorporate information, or construct its sampling strategy to deal with this challenge. Other published studies typically have used less developed regions adjacent to larger cities, such as Beijing, to establish a “rural” sample and then drawn on those who were present at the time of survey (Ma et al, 2009). In contrast, the currently reported work used locations in more distant regions of Sichuan Province, as well as seeking participation specifically at a time when there was a markedly increased likelihood of recruiting those who were listed in the *hukou* but absent for significant portions of the year.

Our focus on social and demographic features serves as a complement to research that addresses psychiatric and individual-level biological variables. This type of work allows a clearer understanding of circumstances that have the potential to shift the overall exposure of populations to stressful or potentially protective, life circumstances. It also supports the notion that similar socio-demographic factors are associated with suicide and suicidal morbidity in this population, and thus may be especially worthwhile targets for longer-term prevention efforts.

Inevitably researchers will continue to confront the dynamic, transforming quality of rural China. Indeed, it is this quality that also underpins many of the social situations that potentially contribute to personal distress among some, and protective social mobility among others. However much China transforms, China will have a residual rural population in the hundreds of millions that will dwarf the total populations of every other country in the world except India. Thus there will continue to be great urgency to better understand the personal and social risk and protective factors that lay on the path to suicide among its rural residents. It is through such knowledge that one can hope to develop and test programs that can effectively reduce the morbidity and mortality associated with suicide, attempted suicide, and their antecedent risk factors. Future work with this dataset will explore whether there are any discernible differences in life stresses, social situations, or psychopathological features that may illuminate these issues.

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References

- Agresti, A. Categorical Data Analysis. New York: Wiley; 1990.
- Beautrais AL. Suicides and serious suicide attempts: two populations or one? Psychol Med. 2001; 31:837–845. [PubMed: 11459381]

- Beck AT, Brown GK, Steer RA, et al. Suicide ideation at its worst point: a predictor of eventual suicide in psychiatric outpatients. *Suicide Life Threat Behav.* 1999; 29:1–9. [PubMed: 10322616]
- Bertolote JM, Fleischmann A, De Leo D, Bolhari J, Botega N, Silva D, Thanh HTT, Phillips M, Schlebusch L, Varnik A, Vijayakumar L, Wasserman D. Suicide attempts, plans, and ideation in culturally diverse sites: the WHO SUPRE-MISS community survey. *Psychol Med.* 2005; 35:1457–1465. [PubMed: 16164769]
- Conner KR, Phillips MR, Meldrum S, Knox KL, Zhang Y, Yang G. Low-planned suicides in China. *Psychol Med.* 2005; 35:1197–1204. [PubMed: 16116945]
- Diggle, PJ.; Heagerty, P.; Liang, KY.; Zeger, S. *The analysis of Longitudinal Data.* 2nd ed.. Oxford England: Oxford University Press; 2002.
- Eddleston M, Phillips M. Self poisoning with pesticides. *BMJ.* 2004; 328:42–44. [PubMed: 14703547]
- EpiData Association. EpiData Version 3.1. Odense, Denmark: 2005. [Computer software]
- Feng SS, Xiao SY, Zhou L. Risk Factors of Suicidal Ideation in a Rural Community Sample of Hunan. *Chinese Mental Health Journal (in Chinese).* 2006; 20:326–329.
- Fleischmann A, Bertolote JM, De Leo D, Botega N, Phillips M, Sisask M, Vijayakumar L, Malakouti K, Schlebusch L, De Silva D, Nguyen VT, Wasseman D. Characteristics of attempted suicides seen in emergency-care settings of general hospitals in eight low- and middle-income countries. *Psychol Med.* 2005; 35:1467–1474. [PubMed: 16164770]
- Harris EC, Barraclough B. Suicide as an outcome for mental disorders. *Br J Psychiatry.* 1997; 170:205–228. [PubMed: 9229027]
- Joiner TE Jr. The trajectory of suicidal behavior over time. *Suicide Life Threat Behav.* 2002; 32:33–41. [PubMed: 11931009]
- Kessler RC, Berglund P, Borges G, Nock M, Wang PS. Trends in suicide ideation, plans, gestures, and attempts in the United States, 1990–1992 to 2001–2003. *JAMA.* 2005; 293:2487–2495. [PubMed: 15914749]
- Kessler D, Lloyd K, Lewis G, Gray DP. Cross sectional study of symptom attribution and recognition of depression and anxiety in primary care. *BMJ.* 1999; 318:436–439. [PubMed: 9974461]
- 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. [PubMed: 10401507]
- Knox KL, Conwell Y, Caine ED. If suicide is a public health problem, what are we doing to prevent it? *Am J Public Health.* 2004; 94:37–45. [PubMed: 14713694]
- Langlois S, Morrison MF. Suicide deaths and suicide attempts. *Health Rep.* 2002; 13:9–22. [PubMed: 12743953]
- Leduc E. Defining rurality: a General Practice Rurality Index for Canada. *Can J Rural Me.* 1997; 2:125–131.
- Ma X, Xiang YT, Cai ZJ, Li SR, Ziang YQ, Guo HL, Hou YZ, Li ZB, Li ZJ, Tao YF, Dang WM, Wu XM, Dang J, Chan SSM, Ungvari GS, Chiu HFK. Life time prevalence of suicide ideations, plans and attempts in rural and urban regions of Beijing, China. *Aust NZ J Psychiatry.* 2009; 43:158–166.
- Mianyang Bureau of Statistics. *Mianyang Yearbook of Statistics (in Chinese).* Mianyang: Wen Hua Color Press; 2004.
- Moscicki EK. Identification of suicide risk factors using epidemiologic studies. *Psychiatr Clin North Am.* 1997; 20:499–517. [PubMed: 9323310]
- Nock MK, Borges G, Bromet EJ, Alonso J, Angermeyer M, Beautrais A, Bruffaerts R, Chiu WT, De Girolamo G, Gluzman S, De Graaf R, Gureje O, Haro JM, Huang Y, Karam E, Kessler RC, Lepine JP, Levinson D, Medina-Mora ME, Ono Y, Posada-Villa J, Williams D. Cross-national prevalence and risk factors for suicidal ideation, plans and attempts. *Br J Psychiatry.* 2008; 192:98–105. [PubMed: 18245022]
- Pearson V, Liu M. Ling's death: ethnography of a Chinese woman's suicide. *Suicide Life Threat Behav.* 2002; 32:347–358. [PubMed: 12501960]
- Phillips MR, Liu HQ, Zhang YP. Suicide and social change in China. *Cult Med Psychiatry.* 1999; 23:25–50. [PubMed: 10388942]

- Phillips MR, Li XY, Zhang YP. Suicide rates in China, 1995-99. *Lancet*. 2002a; 359:835–840. 2002. [PubMed: 11897283]
- Phillips MR, Pearson V, Li F, Xu M, Yang L. Stigma and expressed emotion: a study of people with schizophrenia and their family members in China. *Br J Psychiatry*. 2002b; 181:488–493. 2002. [PubMed: 12456518]
- Phillips MR, Yang G, Zhang Y, Wang L, Ji H, Zhou M. Risk factors for suicide in China: a national case-control psychological autopsy study. *Lancet*. 2002c; 360:1728–1736. 2002. [PubMed: 12480425]
- Phillips MR, Yang G. Suicide and attempted suicide--China, 1990–2002. *MMWR Morb Mortal Wkly Re*. 2004; 53:481–484.
- Phillips MR, Yang G, Li S, Li Y. Suicide and the unique prevalence pattern of Schizophrenia in mainland China: a retrospective observational study. *Lancet*. 2004; 364:1062–1068. [PubMed: 15380965]
- SAS version 9.1. Cary, NC: SAS Institute Inc; 2004. [Computer software]
- Singh GK, Siahpush M. Increasing rural-urban gradients in US suicide mortality, 1970–1997. *Am J Public Health*. 2002; 92:1161–1167. [PubMed: 12084702]
- Spicer RS, Miller TR. Suicide acts in 8 states: incidence and case fatality rates by demographics and method. *Am J Public Health*. 2000; 90:1885–1891. [PubMed: 11111261]
- SPSS version 15. Chicago, IL: SPSS Inc; 2006. [Computer software]
- Stokes, M.; Davis, C.; Koch, G. *Categorical Data Analysis Using the SAS System*. 2nd ed.. Cary, NC: SAS Institute, Inc; 2001.
- Investigation Report of Chinese Migrant Workers (in Chinese). Beijing: Chinese Yuan-Shi Press; Study Group, Academic Office, State Council of the People's Republic of China, 2006. Preface.
- Tang XF, Song Y, Wu XP. Epidemiological Analysis on Suicide in DSPs of Sichuan, 1993–2002. *Journal of Preventive Medicine Information* (in Chinese). 2005; 21:276–279.
- Weissman MM, Bland R, Canino GJ, Greenwalk S, Hwu HG, Joyce PR, Karam EG, Lee CK, Lellouch J, Lepine JP, Newman SC, Rubio-Stipec M, Wells JE, Wickramaratne PJ, Wittchen HU, Yeh EK. Prevalence of suicide ideation and suicide attempts in nine countries. *Psychol Med*. 1999; 29:9–17. [PubMed: 10077289]
- World Health Organization. First ever global report on violence and health released. 2002. <press release>
- World Health Organization. Suicide prevention and special programmes: Country reports and charts. 2010. Available from: URL: http://www.who.int/mental_health/prevention/suicide/country_reports/en/index.html
- Yip PS, Liu KY, Hu J, Song SM. Suicide rates in China during a decade of rapid social changes. *Soc Psychiatry Psychiatr Epidemiol*. 2005; 40:792–798. [PubMed: 16205852]
- Zhang J, Jin S. Interpersonal relations and suicide ideation in China. *Genet Soc Gens Psychol Monog*. 1998; 124:79–94.

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Table 1

Distribution of Socio-demographic Features

Variables	Strata	N	%
Age	All	1654	100
	15–19	354	21.4
	20–24	219	13.2
	25–29	338	20.4
	30–34	743	44.9
Gender	Female	871	52.7
	Male	783	47.3
Marital Status	Others	173	10.5
	Never married	528	31.9
	Currently Married	953	57.6
Occupation	Student	182	11.0
	Farmer	599	36.2
	Others	115	7.0
	Migrant	758	45.8
Education	0–3	191	11.5
	4–6	458	27.7
	7–9	711	43.0
	≥10	294	17.8
Financial Perception	≤Bad	244	14.8
	Moderate	1170	70.7
	≥Good	240	14.5
Degree of rurality	High	401	24.2
	Moderate	572	34.6
	Low	681	41.2

Table 2

Prevalence of Suicidal Ideation and Attempt among 1654 Rural Residents

Outcomes	Lifetime Prevalence			One-Year Prevalence				
	N	% (95% CI)	F %	M %	N	% (95% CI)	F %	M %
Suicide ideation	311	18.8(16.95–21.77)	21.58	15.71	86	5.20 (4.18–6.38)	6.54	3.70
Serious ideation	143	8.65 (7.34–10.10)	9.76	7.41	38	2.30 (1.63–3.14)	2.99	1.53
Suicide plan	94	5.68 (4.62–6.91)	7.12	4.09	25	1.51 (0.98–2.22)	1.95	1.02
Suicide Attempt	46	2.78 (2.04–3.09)	4.12	1.40	9	0.54 (0.25–1.03)	0.80	0.26

Note. "F" means "Female", "M" means "Male".

Table 3
Univariate Analysis of Demographic Features and Lifetime Suicide Morbidity

Variable	Strata	Suicide Ideation		Serious Ideation		Suicide Plan		Suicide Attempt	
		OR(95%CI)	P	OR(95%CI)	P	OR(95%CI)	P	OR(95%CI)	P
Age	15–19	1.03(0.75–1.40)	0.0751	0.73(0.47–1.14)	0.0144	1.31(0.80–2.16)	0.0768	0.95(0.45–2.03)	0.9584
	20–24	0.71(0.48–1.07)		0.39(0.20–0.77)		0.37(0.15–0.95)		0.77(0.29–2.05)	
	25–29	0.69(0.49–0.98)		0.60(0.37–0.97)		0.89(0.51–1.57)		0.90(0.41–1.97)	
	30–34	1.00		1.00		1.00		1.00	
Gender	Female	1.48(1.15–1.90)	0.0023	1.35(0.95–1.92)	0.0902	1.80(1.16–2.79)	0.0086	2.94(1.48–5.83)	0.0020
	Male	1.00		1.00		1.00		1.00	
Marital Status	Others	1.96(1.35–2.85)	0.0013	1.55(0.92–2.62)	0.2189	1.47(0.76–2.84)	0.2176	3.61(1.77–3.35)	0.0008
	Never	1.30(0.99–1.71)		1.22(0.83–1.77)		1.44(0.92–2.26)		1.03(0.50–2.11)	
	Currently	1.00		1.00		1.00		1.00	
	Student	1.55(1.05–2.29)	0.1568	1.37(0.77–2.43)	0.0497	1.29(0.64–2.59)	0.4990	0.18(0.02–1.38)	0.2985
Occupation	Farmer	1.18(0.90–1.56)		1.65(1.13–2.41)		1.40(0.88–2.23)		1.04(0.55–1.95)	
	Others	1.09(0.65–1.81)		0.86(0.38–1.95)		1.50(0.68–3.31)		1.52(0.56–4.10)	
	Migrant	1.00		1.00		1.00		1.00	
	0–3	1.86(1.19–2.92)	0.0235	2.98(1.57–5.68)	0.0070	2.95(1.33–6.55)	0.0448	5.93(1.63–21.54)	0.0176
Education	4–6	1.06(0.71–1.58)		1.62(0.89–2.95)		1.50(0.70–3.20)		1.94(0.52–7.24)	
	7–9	1.25(0.87–1.80)		1.60(0.91–2.83)		1.83(0.91–3.69)		3.24(0.97–10.88)	
	≥10	1.00		1.00		1.00		1.00	
	≤Bad	2.73(1.73–4.32)	0.0000	2.42(1.32–4.42)	0.0002	1.99(0.99–4.00)	0.0046	2.79(0.87–8.87)	0.1554
Financial Perception	Moderate	1.32(0.89–1.97)		1.07(0.62–1.83)		0.88(0.47–1.63)		1.61(0.56–4.59)	
	≥Good	1.00		1.00		1.00		1.00	
	High	1.82(1.34–2.48)	0.0007	2.01(1.33–3.05)	0.0020	1.29(0.77–2.16)	0.5786	1.31(0.67–2.53)	0.0741
	Moderate	1.29(0.96–1.74)		1.12(0.73–1.72)		1.03(0.63–1.68)		0.50(0.23–1.11)	
Degree of Rurality	Low	1.00		1.00		1.00		1.00	

Note. In Marital Status: “Never” means “Never Married”, “Currently” means “Currently Married”.

Table 4
Lifetime Multivariate Analysis of Demographic Features and Lifetime Suicide Morbidity

Variable	Strata	Suicide Ideation		Serious Ideation		Suicide Planning		Suicide Attempt	
		OR(95% CI)	P	OR(95% CI)	P	OR(95% CI)	P	OR(95% CI)	P
Age	15–19	0.62(0.36–1.07)	0.0472	0.37(0.17–0.79)	0.0050	0.96(0.40–2.29)	0.1303	1.42(0.42–4.82)	0.7020
	20–24	0.56(0.35–0.91)		0.29(0.13–0.63)		0.31(0.11–0.87)		0.68(0.22–2.08)	
	25–29	0.67(0.47–0.97)		0.60(0.36–0.99)		0.90(0.50–1.62)		0.94(0.41–2.16)	
	30–34	1.00		1.00		1.00		1.00	
Gender	Female	1.68(1.28–2.22)	0.0002	1.52(1.03–2.23)	0.0347	1.94(1.20–3.14)	0.0067	2.99(1.43–6.24)	0.0036
	Male	1.00		1.00		1.00		1.00	
Marital Status	Others	2.00(1.35–2.96)	0.0009	1.57(0.91–2.70)	0.0045	1.50(0.76–2.95)	0.0740	3.35(1.59–7.03)	0.0058
	Never	1.62(1.05–2.50)		2.51(1.42–4.46)		2.23(1.08–4.59)		1.45(0.49–4.32)	
	Currently	1.00		1.00		1.00		1.00	
Occupation	Student	1.95(1.11–3.43)	0.0191	1.83(0.80–4.18)	0.3684	1.14(0.45–2.88)	0.9365	0.17(0.02–1.56)	0.3959
	Farmer	0.90(0.66–1.24)		1.16(0.75–1.79)		1.16(0.68–1.98)		0.82(0.39–1.72)	
	Others	0.98(0.57–1.68)		0.79(0.34–1.85)		1.21(0.53–2.78)		1.16(0.41–3.30)	
	Migrant	1.00		1.00		1.00		1.00	
Education	0–3	1.95(1.09–3.49)	0.0179	2.68(1.16–6.18)	0.0448	3.10(1.12–8.59)	0.0851	2.88(0.67–12.45)	0.1364
	4–6	1.25(0.74–2.12)		1.52(0.69–3.34)		1.79(0.67–4.73)		1.08(0.25–4.67)	
	7–9	1.71(1.09–2.69)		1.99(1.00–3.99)		2.35(1.01–5.47)		2.02(0.56–7.33)	
	≥10	1.00		1.00		1.00		1.00	
Financial Perception	≤Bad	2.93(1.82–4.71)	0.0000	2.25(1.21–4.19)	0.0017	2.15(1.04–4.41)	0.0067	3.26(0.98–10.83)	0.1306
	Moderate	1.46(0.97–2.20)		1.07(0.62–1.86)		0.96(0.51–1.80)		1.88(0.65–5.50)	
	≥Good	1.00		1.00		1.00		1.00	
Degree of Rurality	High	1.74(1.26–2.41)	0.0035	1.76(1.14–2.72)	0.0185	1.12(0.66–1.91)	0.8661	1.29(0.64–2.59)	0.1039
	Moderate	1.27(0.93–1.72)		1.05(0.68–1.62)		0.97(0.58–1.61)		0.51(0.23–1.15)	
	Low	1.00		1.00		1.00		1.00	

Note. In Marital Status: “Never” means “Never Married”, “Currently” means “Currently Married”.