Are suicidal behaviors more prevalent among rural-to-urban migrants than non-migrant rural and urban residents in Wuhan, China? –Evidence from a GIS/GPS-assisted probability sample

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Keywords: Rural-to-urban migrants, Suicidal ideation, Suicidal attempt, Probability sample, China

Posted Date: January 27th, 2020

DOI: https://doi.org/10.21203/rs.2.21891/v1

Abstract

Background There is a lack of solid data on suicide among rural-to-urban migrants in China, a large and rapid growing population currently totaling 280 million. The study aims to investigate whether suicidal behaviors are more prevalent among the rural migrants than the non-migrant rural and urban residents.

Methods Data from a probability sample (N=3951, 32.65% rural-to-urban migrants) were analyzed. The sample was selected in Wuhan, China using the GIS/GPS-assisted multistage probability sampling method. Suicidal ideation and attempt in the past year were measured. Prevalence rate [95% CI] was calculated using survey estimation method, considering the sampling design with sample clusters, disproportionate probabilities, and weights. Adjusted odds ratio (AOR) [95% CI] was used to compare the difference of rural migrants with rural and urban residents in suicidal behaviors controlling for covariates.

Results Among rural migrants, 5.74% [4.81, 6.68] reported having suicidal ideation, compared to 4.74% [3.07, 6.42] and 3.65% [2.64, 4.65] for rural and urban residents, respectively. The migrant-urban resident difference was significant with AOR =1.93 [1.26, 2.94] while the migrant-rural resident difference was not with AOR= 0.87 [0.46, 1.67]. The prevalence rate of suicidal attempt was 5.47% [4.57, 6.36] for rural migrants, significantly higher than 1.14% [0.43, 1.85] for rural residents with AOR=2.89 [1.12, 7.43]; and 2.01% [1.21, 2.82] for urban residents with AOR =3.97 [2.15, 7.34].

Conclusions Rural migrants are at higher risks for suicide comparing to rural and urban residents. Additional research is needed to examine factors related to the increased risk of suicidal behaviors among rural migrants in China.

Introduction

Suicide and suicidal behaviors

Suicide is death caused by self-injurious behaviors with the intention of taking one's own life. Suicide is one of the leading causes of death, presenting a challenging public health problem in countries all over the world, including China (1). China has witnessed a dramatic decline in suicide in the past several decades from among the countries with the highest suicide rate of more than 20 per 100,000 population before the economic reform, to 17.4 in 2000, and further to 8.5 in 2015 (2). Despite the declining trend, the estimated number of annual suicide deaths in China was 134,000, accounting for approximately 17% of the world total (3).

Suicide is resulted from a cascade of behaviors starting with suicidal ideation, followed by plan, attempt and actual suicide death. Among various suicidal behaviors, suicidal ideation and attempt are two common precursors of suicide (4). Suicidal ideation is defined as thinking about, considering or planning suicide; while a suicidal attempt is defined as a non-fatal, self-directed, and potentially injurious behavior with the intention to die (4). Individuals with suicidal ideation and attempt are at increased risk of dying by suicide. Of the persons with a suicidal ideation in lifetime, one-third will go on to make a suicidal plan;

of those with a plan, three-fourths will attempt to kill themselves (4); and of those who attempted suicide, 10-15% will eventually die from suicide (5).

Suicide among domestic migrants in China

Since the economic reform in 1980s in China, a large and increasing number of rural residents migrated to urban areas. The number of these domestic rural-to-urban migrants reached 282 million in 2016, accounting for 20% of total population in China. Different from the international immigrants who move from one country to another, domestic migrants in China often move between rural areas to urban areas within the country (6).

Data from a meta-analysis indicated that the lifetime prevalence rates of suicidal ideation and attempt in the Chinese population in general are 3.9% and 0.8%, respectively (7). However, there is no consensus regarding suicidal behaviors among migrants in China. One group of studies suggest a higher risk of suicide of the rural migrants than the general population (8–10). For example, the prevalence rate of past-year suicidal ideation was 9.6% for rural migrants in Guiyang, a city in Western China (8), 17.4% for construction migrant workers in Changsha, Central China (9), and 14.1% for young rural migrants in Wenzhou, Southeast China (10).

On the contrary, another group of studies reported a lower risk of suicide among the rural migrants than the general population in China. For example, one study conducted in Sichuan, Western China reported a lower prevalence of suicidal ideation among rural migrants than the non-migrant residents (1.3% vs. 3.0%) (11). Another study conducted in Southeast China indicated lower suicidal attempt rate among rural migrants than the rural residents (1.5% vs. 2.1%) and urban residents (1.5% vs. 1.6%) (12).

A further review of these published studies revealed several vital limitations. First, none of these published studies used data from representative samples. The external validity of these study findings is questionable. Second, a majority of these published studies compared migrant suicidal behavior with the general population, which also contain a large number of rural migrants. Third, there is only one study compared the risk of suicide among rural migrants with rural and urban residents (12), however, the sample was not a probability sample, limiting the validity of its conclusion.

Differences in suicidal behaviors by demographic factors

In addition to the overall level, suicidal behavior among migrants may differ by demographic and socioeconomic factors. Data from one group of migrant studies reported higher rates of suicidal behaviors and deaths among females than their male counterparts (13), migrants with younger ages (14), not unmarried (15), lower income (16), and unemployed (15). Inconsistent results are also reported, such as high risk of suicidal behaviors for migrants who were middle aged (16,17), married (13) with more education (17) and higher income (10,17).

We believe that differences in the risk of suicidal behavior among rural migrants in China is primarily driving by the motivation to make adequate amount of money. Thus, risk of suicide could be high for

younger migrants because of the lack of experience, and older and married migrants because of increased burden from family. The risk would also be particularly high for migrants with moderate level of education (e.g., high school graduates in China) not competent for high-pay job but also neither accept nor satisfied with low-pay jobs. High risk of suicidal behavior is also expected for migrants who do not know what to do if they failed in the current city and do not know where to go.

Purpose of the study

The study aims to estimate the prevalence rates of suicidal ideation and attempt among rural-to-urban migrants using data collected from a probability sample, and compare estimated rates with non-migrant rural and urban residents. The ultimate goal is to provide data supporting future research to promote suicide prevention intervention among the large number of rural-to-urban migrants in China.

Methods

Study population and participants

Data used in the study were from a cross-sectional health behavior survey conducted in Wuhan, China. The target population of the study was rural-to-urban migrants who were 18-45 years old, who had a legal rural residence, stayed in the current city for at least one month, and the main purpose of migration was to earn money.

Non-migrant rural and urban residents were selected as comparison groups. Rural residents were people who aged 18-45, had legal rural residence, and had not migrated to any cities in the past 12 months. Non-migrant urban residents were people who were also within the same age range, had legal urban residence, and had lived in the current city for five years or more. All participants were selected in Wuhan City, the capital of Hubei Province in the Central China. Wuhan has a total population of 10 million and per capita GDP of $17,000 in 2015; and the estimated total number of rural migrants was greater than one million.

Probability sample selected using GIS/GPS-assisted method

Selection of rural migrants

Study participants were selected using the GIS/GPS-assisted sampling method (18) (see Figure 1). To sample the rural-to-urban migrants, four stages were used. First, the targeted urban area of Wuhan was divided into mutually exclusive 100×100m geographic units (named as geounits). The primary sampling frame (PSF) was then constructed using these geounits after exclusion of all non-residential geounits, such as rivers, lakes, mountains, factories, streets and other public places. Second, a total of 60 geounits were randomly selected from the PSF stratified by the seven Districts of the city. Third, a research team consisting of a project coordinator, a GPS expert and a research staff went to the field to

physically locate each selected geounit with the assistance of a GPS receiver. Fourth, on a pre-scheduled date and time, a data collection team were dispatched to the located geounit, one at a time, to recruit participants and collect data.

From each selected geounits, only 20 participants (10 male and 10 female) were randomly selected which was pre-determined from a pilot study. This step was completed through random route technique with a natural marker, and then enumerated the selected households to form the secondary sampling frame (SSF). With the SSF, one participant per gender was selected for one household. For household with more than one eligible participants, the Kish Table would be used to randomly select one.

Selection of non-migrant urban and rural residents.

For effective comparison purposes, non-migrant urban residents were selected from the same geounits where the rural migrants were sampled and recruited using the exact the same method described above.

It is practically difficult to select non-migrant rural residents from where the rural migrants in this study come from, because the rural migrants included in this study came from almost all other parts of China. Since most of the migrants in Wuhan come from the surrounding counties, the following protocol was used to sample non-migrant rural residents. First, the target geographic area for rural residents was defined as a band region surrounding Wuhan with the inner radius of 50 kilometers and outer radius of 75 kilometers, covering the place where most rural migrants in Wuhan originated from. Second, the band area was divided into mutual exclusive, 1 km×1km geounits; and the PSF was thus formed after exclusion of the non-residential geounits. Third, the band range was divided into 40 strata using five co-centric bands with 5 kilometers apart and four lines (north-south, west-east, northwest-southeast, and northeast-southwest). Fourth, one geounit was randomly selected from each stratum with a total of 40 geounits. Fifth, the households within the selected geounit formed the SSF, and 30 participants (15 male and 15 female) per geounit were randomly selected from SSF.

<Insert Figure 1 here>

To ensure enough participants enrolled, additional 20% geounits were included. Written informed consent was obtained from all participants. Among the approached 4,215 eligible participants, 6% refused to participate with a final 3951 participants enrolled.

Data collection

Data collection was completed during 2011 to 2013. The Migrant Health and Behavior Survey, a pilot-tested survey was delivered to the participants through the Audio Computer-Assisted Self Interviewing (ACASI). The survey was anonymous and confidential. Participants were asked to complete the survey independently in a designated room either in the participants' home or in the local community health center. When completion of the survey, each participant received a $6 reward. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as

revised in 2008. All procedures involving human subjects/patients were approved by the Institutional Review Board (IRB) at Wayne State University and Wuhan CDC, and the data analysis was approved by the IRB at University of Florida.

Measures

Suicidal ideation

Suicidal ideation was measured based on the response to the question: “In the past 12 months, have you thought about killing yourself?” with answer options of “1=Yes, 0=No”.

Suicidal attempt

Suicidal attempt was measured based on the response to the question: “In the past 12 months, have you tried to kill yourself?” with answer options of “1=Yes, 0=No”.

Socio-economic variables

Socio-economic variables in the study include age (in years, and categorized into 25 or less, 26-35, >35), gender (male/female), marital status (married/unmarried/divorced/widowed, and categorized into married/not married), education attainment (primary or less/middle school/high school/college or more), monthly income (<1000/1000-2000/2000-4000/>4000), number of family members (3 or less/4-5/6 or more), if unemployed in the past 12 months (yes/no), and the intention to move in the next six months (likely/unsure/unlikely).

Statistical analysis

Descriptive analysis (frequency, proportion, mean and standard deviation) was used to describe the study sample and to assess the prevalence rate of the two suicidal behaviors. Survey method for descriptive statistics were used to obtain point estimates for means and prevalence rate and 95% confidence interval (CI). The survey methods are needed to consider the complex GIS/GPS-assisted probability sampling design, including stratification, clustering, unequal probability, and sample weights. The estimated 95% CI of the estimated prevalence rates was used for comparison with no overlap of two estimated 95% CI as the evidence of significant differences at the level of $p < 0.05$.

Second, to compare the difference in the suicide risk between migrants and non-migrant rural and urban residents while controlling for demographic factors, the survey method of multivariate logistic regression was used. We first compared the rural migrants with rural residents; followed by the comparison of rural migrants with urban residents. Adjusted odds ratio (AOR) with 95% CI was estimated, and the 95% CI not covering one indicates significant differences at the level of $p < 0.05$.

All statistical analyses were conducted using SAS 9.4 (SAS Institute, Cary, NC). PROC SURVEYMEANS were used for descriptive analysis, and PROC SURVEYLOGIUSTIC was used for multivariate logistic regression analysis.

Results

Demographic characteristics of the study sample

Results in Table 1 show that among the total sample, 1290 (32.65%) were rural migrants, and 1290 (32.65%) rural residents and 1371 (34.70%) urban residents. Among the rural migrants, nearly half were male with mean age of 32.33 years old (SD = 7.97). More than two-thirds were married, and more than 30% had a high school or more education. Other information can be found in the table.

Table 1
Characteristics of the study sample

Variables	Rural migrants	Non-migrants		
		Rural residents	Urban residents	Total
Total, n (%)	1290 (32.65)	1290 (32.65)	1371 (34.70)	3951 (100.00)
Age in years, n (%)				
25 or less	324 (25.12)	185 (14.34)	184 (13.42)	693 (17.54)
26–35	468 (36.28)	297 (23.02)	462 (33.70)	1227 (31.06)
>35	498 (38.60)	808 (62.64)	725 (52.88)	2031 (51.40)
Mean (SD)	32.33 (7.97)	36.02 (7.71)	35.19 (7.51)	34.53 (7.88)
Gender, n (%)				
Male	658 (51.01)	638 (49.46)	640 (46.68)	1936 (49.00)
Female	632 (48.99)	652 (50.54)	731 (53.32)	2015 (51.00)
Marital status, n (%)				
Not married	293 (22.77)	137 (10.62)	323 (23.56)	753 (19.07)
Married	994 (77.23)	1153 (89.38)	1048 (76.44)	3195 (80.93)
Education, n (%)				
Primary or less	178 (13.83)	385 (29.64)	58 (4.23)	621 (15.73)
Middle school	694 (53.92)	691 (53.57)	308 (22.47)	1693 (42.88)
High school	332 (25.80)	191 (14.81)	480 (35.01)	1003 (25.41)
College or more	83 (6.45)	23 (1.78)	525 (38.29)	631 (15.98)
Income, n (%)				
<1000	268 (20.78)	376 (29.15)	286 (20.86)	930 (23.54)
1000–2000	549 (42.56)	395 (30.62)	654 (47.70)	1598 (40.45)
2000–4000	388 (30.08)	391 (30.31)	318 (23.19)	1097 (27.77)
>4000	85 (6.59)	128 (9.92)	113 (8.24)	326 (8.25)
Family size, n (%)				
3 or less	401 (31.09)	303 (23.49)	920 (67.10)	1624 (41.10)
4–5	650 (50.39)	791 (61.32)	386 (28.15)	1827 (46.24)

Variables	Rural migrants	Non-migrants		
		Rural residents	Urban residents	Total
6 or more	239 (18.53)	196 (15.19)	65 (4.74)	500 (12.66)
Unemployed, past 12 months, n (%)				
Yes	726 (56.28)	NA	939 (68.49)	1665 (62.57)
No	564 (43.72)	NA	432 (31.51)	996 (37.43)
Intention to move, n (%)				
Likely	249 (19.30)	185 (14.34)	131 (9.56)	565 (14.30)
Unsure	230 (17.83)	152 (11.78)	152 (11.09)	534 (13.52)
Unlikely	811 (62.87)	953 (73.88)	1088 (79.36)	2852 (72.18)

<Insert Table 1 here>

Prevalence of suicidal ideation among rural migrants

The prevalence rate [95% CI] of suicidal ideation estimated using the survey method in Table 2 indicate that 5.74% [4.81, 6.68] of the rural migrants reported having had suicidal ideation in the past years. The estimated prevalence rates varied dramatically across different demographic and socioeconomic factors as detailed in Table 2. The difference was particularly large by age, gender, education, income, and intention to move.

Table 2
The prevalence rates of suicidal ideation among rural-to-urban migrants and non-migrant rural and urban residents, overall and by demographic and other covariates, % [95%CI]

Variables	Rural migrants	Non-migrants	
		Rural residents	Urban residents
Total	5.74 [4.81, 6.68]	4.74 [3.07, 6.42]	3.65 [2.64, 4.65]
Age in years			
25 or less	3.67 [0.88, 6.46]	2.03 [0.00, 4.53]	1.55 [0, 00, 3.15]
26–35	0.79 [0.02, 1.56]	7.94 [2.70, 13.18]	5.42 [3.14, 7.71]
>35	11.51 [9.61, 13.41]	4.35 [2.44, 6.25]	3.03 [1.88, 4.17]
Gender			
Male	9.95 [8.43, 11.46]	5.13 [2.88, 7.39]	5.51 [3.69, 7.32]
Female	1.48 [0.34, 2.62]	4.38 [1.95, 6.81]	1.87 [0.95, 2.79]
Marital status			
Not married	2.90 [0.40, 5.40]	4.17 [0.81, 7.53]	4.89 [2.45, 7.32]
Married	6.24 [5.23, 7.26]	4.80 [3.00, 6.59]	3.38 [2.38, 4.49]
Education			
Primary or less	4.10 [0.00, 8.30]	4.73 [1.84, 7.62]	2.94 [0.00, 6.60]
Middle school	1.55 [0.49, 2.61]	5.23 [2.66, 7.81]	3.09 [1.08, 5.11]
High school	13.58 [12.27, 14.89]	2.08 [0.00, 4.21]	4.72 [2.96, 6.47]
College or more	0.90 [0.00, 2.59]	11.85 [0.00, 25.08]	3.01 [1.34, 4.68]
Income (RMB)			
<1000	2.10 [0.00, 4.32]	5.41 [2.02, 8.80]	3.74 [1.33, 6.14]
1000–2000	10.61 [9.11, 12.11]	4.74 [1.85, 7.64]	3.48 [2.06, 4.91]
2000–4000	2.21 [0.16, 4.26]	5.27 [1.92, 8.63]	3.32 [1.65, 5.00]
>4000	0.91 [0.00, 2.53]	1.21 [0.00, 2.79]	5.22 [0.61, 9.82]
Family size			
3 or less	6.63 [5.48, 7.78]	4.60 [2.22, 6.99]	3.57 [2.31, 4.83]

Note: The prevalence rate [95% CI] were estimated using the survey estimate method to consider the complex sampling design and different sample weight (see text for more details about the method).

Variables	Rural migrants	Non-migrants	
		Rural residents	Urban residents
4–5	2.32 [0.50, 4.14]	4.63 [2.47, 6.79]	3.81 [2.04, 5.58]
6 or more	10.03 [7.96, 12.09]	5.55 [0.27, 10.83]	3.60 [0.00, 8.54]
Unemployed, past 12 months			
Yes	7.43 [6.26, 8.61]	NA	2.92 [1.94, 3.90]
No	2.10 [0.61, 3.59]	NA	5.38 [2.92, 7.85]
Intention to move			
Likely	0.95 [0.00, 2.02]	6.74 [1.04, 12.44]	6.54 [2.93, 10.15]
Unsure	15.12 [11.79, 18.45]	4.18 [1.21, 7.16]	5.60 [1.15, 10.05]
Unlikely	4.96 [3.75, 6.17]	4.49 [2.57, 6.41]	3.03 [2.01, 4.05]
Note: The prevalence rate [95% CI] were estimated using the survey estimate method to consider the complex sampling design and different sample weight (see text for more details about the method).			

<Insert Table 2 here>

Comparison with non-migrant rural and urban residents

Results in Table 2 further indicate that the estimated prevalence rates of suicidal ideation for rural migrant sample were higher than the non-migrant rural resident sample. The differences present for the overall sample and by demographic factors, although not all of the differences were statistically significant. For example, among those aged 26–35, the estimated prevalence rate was 0.79% [0.02, 1.56] for rural migrants but 7.94% [2.70, 13.18] for rural residents, indicating a 10-fold difference. After adjusting the demographic variables (see Fig. 2), the difference in suicidal ideation was not statistically significant between rural migrants and rural residents with AOR = 0.88 [0.46, 1.67].

Likewise, results in Table 2 also showed large differences in the estimated prevalence rates of suicidal ideation between rural migrants and non-migrant urban residents. Overall, only 3.65% [2.64, 4.65] of the urban residents reported past-year suicidal ideation, significantly lower than the rate of rural migrants. In addition, the estimated prevalence rate for urban residents varied in a smaller range comparing to the range of rural migrants. After adjusting the demographic variables (Fig. 2), rural migrants showed a significantly higher risk of suicidal ideation than urban residents with AOR = 1.93 [1.26, 2.94].

<Insert Fig. 2 here>

Prevalence of suicidal attempt among rural migrants

Table 3 shows that 5.47% [4.57, 6.36] of rural migrants have reported suicidal attempt in the past 12 months. In addition, among the rural migrants who had suicidal ideation, 88.11% [78.16, 98.07] reported suicidal attempt, significantly higher than 18.60% [6.33, 30.88] for rural residents, and 50.77% [36.83, 64.72] for urban residents.

Table 3
The prevalence rates of suicidal attempt among rural-to-urban migrants and non-migrant rural and urban residents, overall and by socio-economic variables, % [95%CI]

Variables	Rural migrants	Non-migrants	
		Rural residents	Urban residents
Total	5.47 [4.57, 6.36]	1.14 [0.43, 1.85]	2.01 [1.21, 2.82]
Age in years			
25 or less	2.51 [0.77, 4.25]	0.77 [0.00, 1.88]	0.00 [0.00, 0.00]
26–35	0.74 [0.00, 1.51]	3.79 [0.25, 7.33]	3.38 [1.49, 5.27]
>35	11.36 [9.41, 13.31]	0.54 [0.13, 0.95]	1.61 [0.71, 2.51]
Gender			
Male	9.08 [8.09, 10.07]	1.90 [0.47, 3.34]	3.37 [1.86, 4.89]
Female	1.80 [0.24, 3.36]	0.43 [0.12, 0.73]	0.72 [0.15, 1.28]
Marital status			
Not married	2.39 [0.69, 4.09]	3.57 [0.00, 7.89]	2.93 [0.90, 4.96]
Married	6.01 [5.00, 7.02]	0.91 [0.25, 1.58]	1.82 [0.95, 2.69]
Education			
Primary or less	2.53 [0.00, 5.42]	0.24 [0.00, 0.52]	3.00 [0.00, 6.05]
Middle school	0.97 [0.29, 1.66]	1.33 [0.22, 2.44]	2.50 [0.55, 4.46]
High school	14.35 [12.25, 16.44]	2.29 [0.00, 5.20]	2.17 [0.96, 3.38]
College or more	1.10 [0.00, 2.80]	3.87 [0.00, 11.40]	1.36 [0.10, 2.62]
Income (RMB)			
<1000	1.65 [0.00, 3.73]	1.18 [0.00, 2.92]	2.37 [0.25, 4.48]
1000–2000	10.07 [8.85, 11.30]	0.69 [0.09, 1.28]	1.80 [0.65, 2.95]
2000–4000	1.32 [0.03, 2.60]	1.41 [0.04, 2.78]	1.57 [0.47, 2.68]
>4000	3.81 [0.00, 9.54]	1.47 [0.00, 3.26]	3.57 [0.12, 7.03]
Family size			

Note: The prevalence rate [95% CI] were estimated using the survey estimate method to consider the complex sampling design and different sample weight (see text for more details about the method). N/A: not applicable.

Variables	Rural migrants	Non-migrants	
		Rural residents	Urban residents
3 or less	7.27 [5.43, 9.11]	1.30 [0.11, 2.49]	2.10 [1.02, 3.17]
4–5	1.35 [0.24, 2.45]	0.50 [0.10, 0.89]	1.82 [0.62, 3.01]
6 or more	9.38 [7.77, 11.00]	4.07 [0.00, 8.65]	2.22 [0.00, 5.60]
Unemployed			
Yes	6.71 [5.92, 7.51]	NA	1.19 [0.60, 1.70]
No	2.78 [0.52, 5.04]	NA	3.99 [1.70, 6.28]
Intention to move			
Likely	1.11 [0.00, 2.25]	3.31 [0.00, 7.88]	4.42 [1.30, 7.53]
Unsure	15.25 [11.90, 18.61]	2.43 [0.00, 4.93]	3.23 [0.00, 7.112]
Unlikely	4.47 [3.34, 5.60]	0.56 [0.25, 0.87]	1.56 [0.80, 2.32]
Suicidal ideation			
No	0.43 [0.00, 1.06]	0.27 [0.00, 0.64]	0.17 [0.03, 0.31]
Yes	88.11 [78.16, 98.07]	18.60 [6.33, 30.88]	50.77 [36.83, 64.72]

Note: The prevalence rate [95% CI] were estimated using the survey estimate method to consider the complex sampling design and different sample weight (see text for more details about the method). N/A: not applicable.

Similar to the rate of suicidal ideation in Table 2, the estimated rate of suicidal attempt also varied dramatically across the demographic and socioeconomic factors, particularly age, gender, education, income and intention to move to another city.

<Insert Table 3 here>

Comparison with non-migrant rural and urban residents

Results in Table 3 further indicate that rural migrants had significantly higher prevalence rate of suicidal attempt than non-migrant rural residents, overall (5.47% [4.57, 6.36] vs. 1.14% [0.43, 1.85]) and by demographic variables, including age, gender, marital status, education, income and intention to move. Results in Fig. 2 indicate that the difference remained significant after adjusting for the demographic variables with AOR = 2.89 [1.12, 7.43].

Results in Table 3 also show that the prevalence rate of suicidal attempt among rural migrants was significantly higher than that of urban residents, overall (5.47% [4.57, 6.36] vs. 2.01% [1.21, 2.82]) and by

demographic variables. The variation of the prevalence rate of suicidal attempt was smaller than that among rural migrants. Results in Fig. 2 indicate that the difference remained significant after adjusting for the demographic variables with AOR = 3.97 [2.15, 7.34].

Discussion And Conclusions

In this study, we documented the prevalence rates of two suicidal behaviors (ideation and attempt) among rural migrants in China using data collected from a probability sample. We also compared the prevalence rates of these two behaviors in rural migrants with the non-migrant rural and urban residents respectively. To the best of our knowledge, this is the first suicidal behavior study of rural migrants in China with a probability sample, and a systematic comparison of the rural migrants with to both non-migrant residents in rural area where most of the rural migrants come from and non-migrant urban residents where the rural migrants work and live with. Findings of the study fill the data gap regarding suicidal behaviors among rural-to-urban migrants in China; and provide basic evidence for future research to examine factors associated with suicide for risk reduction.

Rural migrants are at increased risk of suicide

First of all, findings of this study help clarify the contradictory findings regarding suicide risk among rural migrants, particularly findings suggesting lower risk of suicide among rural migrants than others but did not use probability samples (11,12). Suicide is more prevalent among rural migrants in Wuhan, a typical city with large number of rural migrants come from almost all parts of China.

Findings of our study are more valid than others in several ways. First, results from our study were derived from a probability sample that can be generalized to the whole migrant population. Second, in our study the samples of rural migrants and rural residents shared a similar environment in rural areas where the migrants come from, we can conclude that the increased risk of suicide for rural migrants is related to the process of migration and the work and living in urban settings. Last, the sample of rural migrants and urban residents were selected from exactly the same geographic areas in the city, further demonstrating the increased risk of suicide among migrant is due to migration, including the process of settling down in the urban areas and challenges to adapt urban working settings and lifestyles.

The estimated rate of suicidal ideation and attempt from this study indicate that in Wuhan with one million rural migrants, every year approximately 57,000 of them may have considered suicide, 55,000 tried, and 5,500-8,250 eventually die from suicide, assuming 10–15% of suicide attempters eventually kill themselves (5,19). If the same rates were applied to the total of 282 million rural migrants in China, every year, an estimate of 16 million of them will consider suicide, 15 million try, and 1.5–2.25 million will die from suicide. Great efforts are needed for suicide prevention among rural migrant population in China.

Characteristics of the suicidal behaviors among Chinese rural migrants

Relative to the migrants aged 26–35, migrants who were 25 or young, and 36 and older showed higher risk of suicide. The young migrants may be less experienced and more impulsive and ambitious about their future. These obstacles may have prevented them from making adequate amount of money, putting them at increased risk of suicide because of the discrepancy between the aspiration and reality (20). While for the older migrants, many of them were married with the hope to make money to support old parents and young children, the money they earned may meet the needs, exposing them at increased risk of suicide (21). The same principle may also explain the increased risk of suicide among rural migrants who were married, as reported in many other studies (15–17). The same principle can also be used to explain the increased risk of suicidal behavior among migrants with large family sizes observed in this study.

This study found a higher risk of suicide among males than females, which was inconsistent with a few migrant studies conducted in other countries (13,15–17). One explanation for the gender difference could be that the male rural migrants are still ascribed to the traditional value of “a man is the backbone and a woman is complementary of a family” while in reality many female migrants can find a better job and/or make the same or even more amount of money. The disapproval of the superiority male over female may make male rural migrants to discredit themselves, leading to increased risk of suicide (2).

One unique finding of this study is that rural migrants with high school education and low-middle level income are at the highest risk of suicide compared to those with either lower or higher levels of education and income. In rural area, a person with a high school education is very competitive, he/she will thus be very proud of him/herself and respected by others. However, a person with high school education would not be competent at all to a decent job to make money in the urban. The unrealistic expectation (2), the lack of competence, and the low-middle level income consists of the main strains (21), rendering high risk for these migrants. Following the same principle, the lower risk for migrants with less education/low income could be due to a lower expectation and higher satisfactory of these migrants, despite the limited competence/income (2).

Lastly, in addition to confirm the widely accepted research that unemployment put migrants at risk for suicide (15), we found in this study that rural migrants were at the highest suicide risk when they do not know/unsure if they are intent to move or not. It is a common practice for a migrant to move from one place to another to avoid difficulties in the current settings and to look for better opportunities/environments. Therefore, it is not the intention to more or not, but the uncertainty or the dilemma of whether or not to move that renders high suicide risk. Although there is hope for moving, but it is not without risk; if not move, the current setting is not good; how should I do?

Differences in suicidal behavior between the rural domestic migrants in China and international immigrants in other countries

Findings from this study indicate high rates of suicidal behaviors among the domestic rural migrants in China than the international immigrants in many developed countries (22). Although reversed findings are reported in a few studies (22).

The extra suicide risk rendered for domestic migrants in China than international immigrants need further research since no published studies have ever compared the risk of suicide between the two. We believe that increased suicide risk among Chinese rural migrants could be due to its unique characteristics although these migrants move within the same country. For example, relative to immigrants in other countries, the rural migrants are less educated, more likely to migrate alone, with expectation to support families.

Limitations

There are several limitations. First, data used for this study were collected in one city in China. Caution is needed when generating the findings of this study to other places within and outside of China. Second, suicidal behaviors were measured based on self-report, underreport is likely leading to misclassification because of the obvious sensitivity of the topic area. Third, this study was cross-sectional in nature, and no causal relationship could be warranted. Last, rural resident sample was from a band region where most, but not all rural migrants come from because of practical limitations. Potential difference in suicidal behaviors among rural residents in the sampled area and all areas where the sampled migrants come from may confound the comparison of migrants with rural residents, although the impact may be a minimum. Despite these limitations, this is the first study to document the prevalence of suicidal behaviors among rural migrants with a probability sample, and contrast the results with comparable non-migrant rural and urban residents. Findings of the study provide basic data for suicide prevention planning and decision making, and evidence supporting future etiological research to understand factors associated with increased suicide risk among rural migrants for evidence-based prevention intervention programing.

Declarations

Ethics approval and consent to participate

All procedures involving human subjects/patients were approved by the Institutional Review Board (IRB) at Wayne State University and Wuhan CDC, and the data analysis was approved by the IRB at University of Florida. Signed informed consents were collected from all participants.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

None.

Funding

This work was supported by the National Institutes of Health (grant number R01 MH08632). The funding body has no role in the design of the study and collection, analysis, and interpretation of data and in writing the manuscript.

Authors' contribution

BY conducted the study design, data analysis, results interpretation, and manuscript writing, XC contributed to the study design, results interpretation and review of the manuscript.

Acknowledgements

We thank Dr. Dunjin Zhou, Dr. Jie Gong, Dr. Fang Li and other staffs from Wuhan Center for Disease Prevention and Control for data collection and processing. The work would not be possible without their efforts.

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Figures

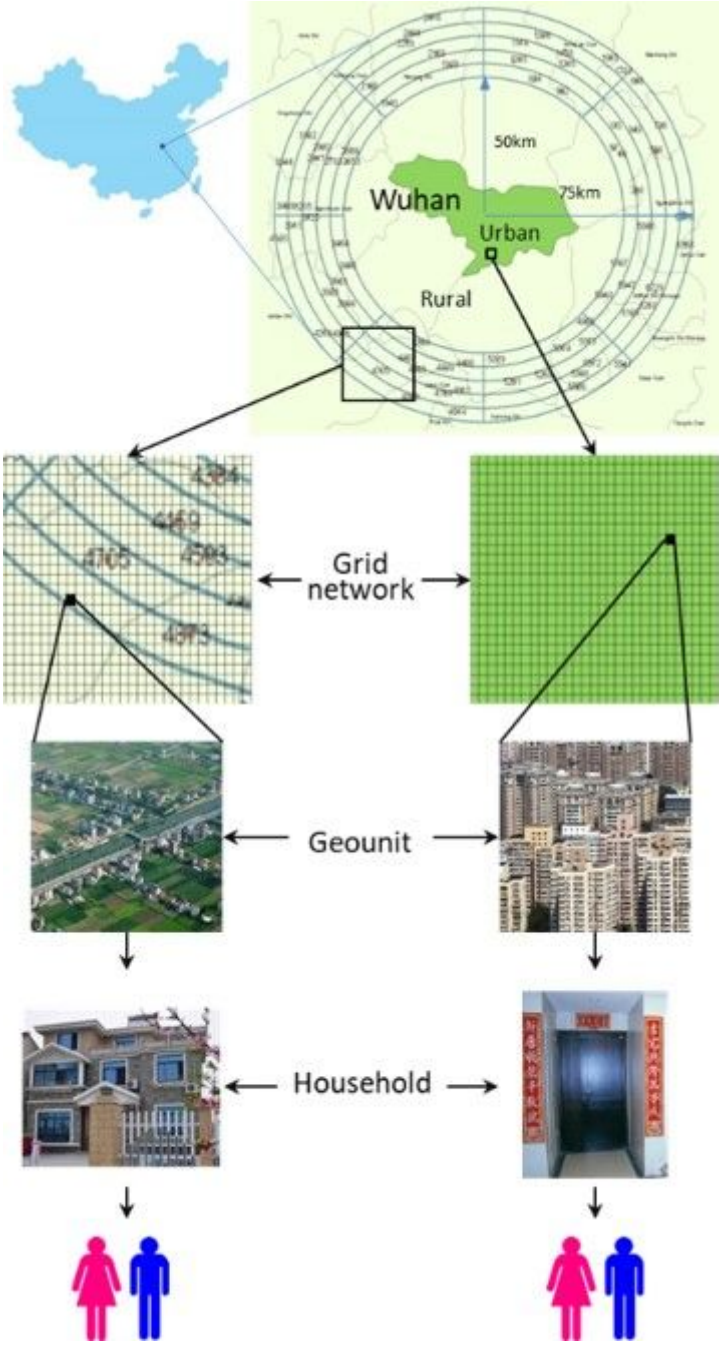

Figure 2

Conceptual diagram of the GIS/GPS-assisted probability sampling method

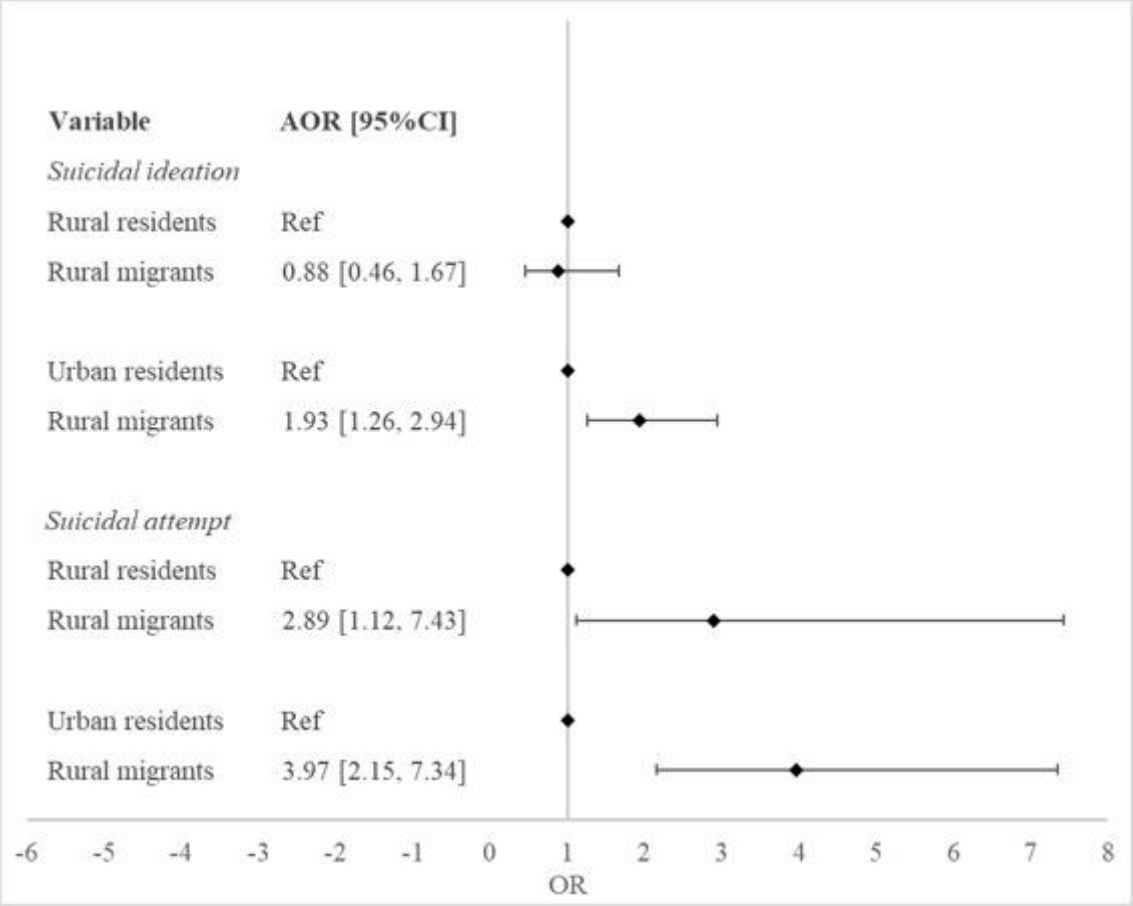

Figure 4

Risk of suicidal ideation and attempt among rural-to-urban migrants compared to non-migrant rural and urban residents Note: 1Age, gender, marital status, education, income, and family size were controlled in the multivariate logistic model. 2 PROC SURVEYLOGISTIC was used for data analysis.