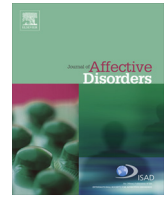




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Research report

Prevalence of major depressive disorder and socio-demographic correlates: Results of a representative household epidemiological survey in Beijing, China



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ABSTRACT

Background: Major depressive disorder (MDD) is the most prevalent mental disorder in the general population and has been associated with socioeconomic factors. Beijing has undergone significant socioeconomic changes in last decade, however no large-scale community epidemiological surveys of MDD have been conducted in Beijing since 2003.

Aims: To determine the prevalence of MDD and its socio-demographic correlates in a representative household sample of the general population in Beijing, China.

Method: Data were collected from the 2010 representative household epidemiological survey of mental disorders in Beijing. The multistage cluster random sampling method was used to select qualified subjects in 18 districts and counties, and then face-to-face interviews were administered using the Chinese version of Structured Clinical Interview for DSM-IV-TR Axis I Disorders-Patient Edition (SCID-I/P) during November 1, 2010 to December 31, 2010.

Results: 19,874 registered permanent residents were randomly identified and 16,032 (response rate=80.7%) completed face-to-face interviews. The time-point and life-time prevalence rates of MDD were estimated to be 1.10% (95% CI: 0.94–1.26%) and 3.56% (95% CI: 3.27–3.85%) respectively. Significant differences were found in sex, age, location of residence, marital status, education, employment status, personal/family monthly income, perception of family environment and relationship with others, when comparing residents with MDD to those without MDD.

Those who were female, aged 45 or above, reported low family income, or reported an “average” or “poor” family environment were associated with a higher risk of MDD.

Conclusions: The prevalence of MDD reported in this survey is relatively lower than that in other western countries. Female sex, age older than 45, low family income, and poor family environment appear to be independent risk factors for MDD.

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1. Introduction

Major depressive disorder (MDD) is the most prevalent and mental disorder globally, and is a seriously impairing and often a lifelong disorder (The WHO World Mental Health Survey Consortium, 2004; Gonzalez et al., 2010; Kessler et al., 2010a). The Global Burden of Diseases, Injuries, and Risk Factors Study

2010 (GBD 2010) found that mental and substance use disorders were the leading cause of years lived with disability (YLDs), and depressive disorders accounted for 40.5% of disability-adjusted life years (DALYs) caused by mental and substance use disorders (Whiteford et al., 2013).

Traditionally, depression in China has been considered to be a less common disorder than that in many western countries, partly because a number of Chinese epidemiological surveys (Collaborative Group of Epidemiological Study of Mental Illness, 1986; Guo et al., 1994; Zhang et al., 1998) adopted a rather narrowly-defined set of criteria: the second edition of the Chinese classification of mental disorders (CCMD-2). The most-cited national survey was undertaken in twelve regions of China in 1982 ($n=38,136$) (Twelve Region Psychiatric

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Epidemiological Study Work Group, 1986), and repeated with almost identical case ascertainment strategies in seven regions in 1993 ($n=19,223$). In the 1982 survey, the point and lifetime prevalence of affective disorder was 0.037% and 0.076% (Zhao et al., 1986); in the 1993 survey, the point and lifetime prevalence of affective disorder was 0.052% and 0.083%, and no evidence of an increase was found in the prevalence of affective disorders (Wang et al., 1998).

To address the lack of data, especially after the turn of the century, a few large-scale epidemiological studies were conducted. These were well-designed, population-based surveys that used structured psychiatric interviews. They have indeed found higher rates of depression in China, though the comparability to older studies is limited. For example, Shen et al. (2006) reported a psychiatric epidemiological survey in Beijing and Shanghai (the two largest metropolitan cities in China). They interviewed 5201 subjects (2633 in Beijing and 2568 in Shanghai respectively) using a multistage household probability sampling method, and all subjects were also assessed with a Chinese version of the World Health Organization World Mental Health WHO Composite International Diagnostic Interview (WHO MH-CIDI). They found that the 12-month prevalence of any DSM-IV mental disorder in metropolitan China was 7.0%, with major depressive disorder (2.0%) being the most common. These studies suggest that, although it is not as common as that in Western populations, depression in the Chinese population is still a relatively common mental disorder which deserves more attention.

Phillips et al. (2009) used a Chinese version of the Structured Clinical Interview for Diagnostic and Statistical Manual (DSM)-IV axis I disorders (SCID-I/P) and a two-stage screening process to define the prevalence and characteristics of mental disorders in 4 provinces (Shandong, Zhejiang, Qinghai, and Gansu provinces) from 2001 to 2005. They reported the adjusted one-month prevalence of a major depressive episode (MDE) was 1.55% and 2.60% for men and women, respectively. Another study, conducted in Beijing in 2003 involved a much larger sample ($N=5926$ adults) and also used the WHO MH-CIDI (version 1.0). They reported the time-point prevalence rate of depressive disorder was 3.31% while the life-time prevalence rate was 6.87%. Unfortunately, the study was interrupted and forced to end prematurely due to the unexpected outbreak of the severe acute respiratory syndrome (SARS) in Beijing in 2003. 15.69% of the target respondents did not complete the interview (Ma et al., 2007). The impact of the outbreak on the results is unknown, and given the large number of incomplete interviews, the data may not generalize to the greater Beijing population.

After more than two decades of the economic reform and “opening-up” policies, China has become the most rapidly growing economy in the world and has been experiencing the challenge of rapid social and economic developments and an increase in social problems (Phillips et al., 1999). The Gross Domestic Product (GDP) in Beijing has increased from 34,892 RMBs per capita in 2003 (Beijing Municipal Bureau of Statistics, 2003) to 75,943 RMBs per capita (The dollar-RMB exchange rate is 6.12) in 2010 (Beijing Municipal Bureau of Statistics and NBS Survey Office in Beijing, 2010). The process of urbanization has gone faster and 86.2% of Beijing's current population are urban dwellers (Beijing Municipal Bureau of Statistics, 2014). Given that socioeconomic development and mental health status of the population are inter-related, some even speculate that modern environments may cause an epidemic of mental illness (Lee et al., 2007; Hidaka, 2012). To address the mental health issues related to this new socioeconomic reality, the Ministry of Health (MOH) of China (now part of the newly established National Health and Family Planning Commission), the Ministry of Civil Affairs, the Ministry of Public Security and the China Disabled Persons Federation have worked closely to formulate China's mental health work plan (2002–2010). This has

started to have a positive impact in the field of mental health care in China and more targeted efforts are expected, pending the data regarding prevalence, public attitude and mental health resources obtained from well-designed studies.

Given this background, it was particularly important to conduct an updated epidemiologic study and compare the data with that in 2003. This study was part of a large-scale, cross-sectional epidemiologic study on mental disorders among urban and rural residents in 2010 in Beijing, China. The objectives of this survey included: (1) to investigate the prevalence of MDD in a population-based sample in both urban and rural areas of Beijing; and (2) to determine the socio-demographic correlates of MDD.

2. Methods

2.1. Subjects and sample selection

Beijing is the capital city of the People's Republic of China, and the political, cultural, economic and educational center of the country. It has a population of 19.6 million permanent residents and consists of 8 central districts and 10 peripheral districts (The Leading Group Office of the sixth nationwide census in Beijing, 2011). This study was part of a large-scale cross-sectional epidemiologic study on mental disorders, and the calculation of sample size was based on the relative low prevalence of schizophrenia. According to the survey data of mental disorders in 1991 in Beijing, the lifetime prevalence of schizophrenia was 0.721% (Guo et al., 1994). The sample size of this survey was determined to be 16,562 using the sample size formula ($\alpha=0.01$, $U=1.645$, $\delta=0.15P$). Taking into account the possibility that some would refuse or be unable to participate, we increased the sample size by 20%, resulting in a total of 19,874 residents to be identified. The household was the basic sampling unit in this survey. The average number of residents in each urban household was 2.4, and in each rural household was 2.6. Therefore, 9185 households were to be selected in order to reach 19,874 potential respondents.

Neighborhood committees (urban) and village committees (rural) are basic community organizations. Residents were divided into urban dwellers or rural dwellers according to the classification of household-registration requirements of China's Ministry of Public Security. The urban population lives in the urban districts or urban areas of the suburban districts; while the rural population lives in the rural areas. According to the Beijing Statistical Yearbook 2009 (The Beijing statistics yearbook, 2009), there were 18 districts or counties, 2609 neighborhoods and 3951 village communities.

The sampling method in this survey followed a stratified, multistage household systematic selection design, with an equal probability of each eligible person being selected from the target population. 1–2 neighborhood or village committees were randomly identified as the investigation sites in each district or county. 19 neighborhood committees in urban areas were randomly selected, while 14 village committees were selected in rural areas. The sample size selected within the specific neighborhood committees or village committees was determined according to the urban and rural population ratios, respectively, in each district or county. Random sampling methods were used to identify target households from the household registry at the local government. The sampled population covered 12,299,000 residents which accounted for 1.62% of the registered population in Beijing. The detail is shown in Fig. 1.

The inclusion criteria for respondents were: (1) adults aged 18 years or above and consented to participate in the study; (2) permanent residents in Beijing; (3) residents who co-habitated with

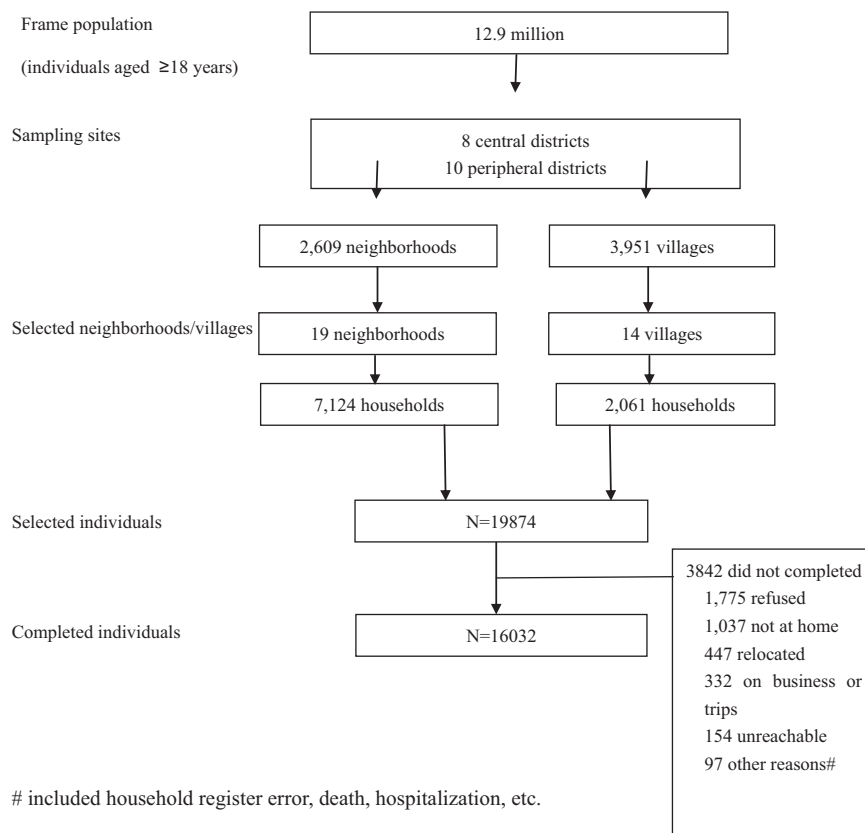


Fig. 1. Sampling flow chart.

at least one family member (in order to verify the information); (4) residents who understood the interview questions.

The exclusion criteria were: (1) residents who refused to sign the informed consent; (2) residents who could not be reached after three attempts of house visits; (3) residents with any family members in the household who were unable to or refused to consent. In other words, for a single household to be included in the study, all of its members were required to participate.

2.2. Assessment tools and procedures

The assessment of this study includes two parts. The social-demographic information and other relevant information of the respondents were recorded using a questionnaire which included the respondent's demographic data (age, sex, education, marital status), location of residence (rural vs urban), employment status; personal monthly income, family monthly income, family environment (good/average/poor); and, relationships with others (good/average/poor). To ensure the accuracy of the information collected, all demographic data were verified using the information in the household registry cards. Other information was based on self-report.

The assessment and diagnostic instrument used in this survey was the SCID-I/P (First et al., 2002; Zhang et al., 2007). The SCID-I/P is a semi-structured diagnostic screening interview that covers thirty-three psychiatric disorders described in the fourth edition of the Diagnostic and Statistical Manual (DSM-IV) of the American Psychiatric Association (1994). The SCID was first introduced to China in 1994 and translated into Chinese (Mandarin) (Li et al., 1994; Zhou et al., 1995). It was revised to include sections on mental retardation and dementia and psychiatric family history, based on the 2002 English version (First et al., 2002; Zhang et al., 2007). Currently it is widely used in diagnostic evaluation, clinical

research, and in the training of mental health professionals in China and has been shown to be reliable and valid (Phillips and Liu, 2011).

The diagnosis of MDD was established using SCID through a one-stage screening process. The household interviews were conducted by 148 mental health professionals who were selected from Beijing Anding hospital and from the mental health centers in each district or county in Beijing. All investigators were required to have at least three years of clinical experience in psychiatry, and all of them received seven days of training which included 58 h of lectures and 12 h of practice training. The training included three major components: (1) General skills: including how to approach a household, how to build rapport, and how to overcome common obstacles. Skills involving advertising the importance of the survey and educating potential respondents were also taught and discussed; (2) Use of interview instruments: this included the field interview procedure, the proper usage of the assessment instruments and possible issues; (3) Clinical interview training at a psychiatric hospital: This was conducted at a psychiatric hospital involving actual patients.

Before the official start of the survey, all interviewers were required to watch videos of interviews of psychiatric disorders including MDD and dysthymic disorder to improve inter-rater reliability. The interviewers' SCID diagnoses were then compared with the expert-consensus diagnoses. The kappa value for the 148 interviewers was 0.85.

As a measure of quality control, a subset of respondents were re-assessed: 5% of positive respondents and 1% of negative respondents underwent secondary assessment in order to minimize the false positive and false negative results. A total of 1284 respondents completed secondary SCID assessments, and the diagnostic consistency of MDD between the two sets of assessments was 95%. In addition, the expert panel consisting of five

senior psychiatrists discussed all difficult cases involving diagnostic inconsistency to reach diagnostic consensus.

In this study, the recruitment, consent, and field sample procedure were all approved by the Ethics Committee (IRB) of Beijing Anding Hospital, Capital Medical University. All participants signed the informed consent before the interview began. Interviews were administered face to face by trained mental health professionals at the homes of the respondents from November 1, 2010 to December 31, 2010.

2.3. Statistical analysis

The study's data were double-entered and validated with Epidata 3.0 and then analyzed with the Statistical Package for the Social Sciences Windows Version 17.0 Descriptive Statistical Methods. Data were processed using descriptive analysis and factor analysis. Prevalence estimates related to age, sex and location of residence were calculated and described for the total sample and for subgroups. Univariate regression analysis and multivariate factor regression analysis with the stepwise method were used to explore the association between MDD and socio-

demographic variables, respectively. Statistical significance was based on two-tailed tests and level of significance was set at 0.05.

3. Results

This study was conducted during November 1, 2010 to December 31, 2010. In total 19,874 subjects were identified, and 16,032 subjects successfully completed interviews, generating a response rate of 80.7%. The reasons for failing to participate included: 1775 subjects refused to participate; 1037 subjects' current addresses were different from the ones on the household registry; 447 subjects had been relocated, 332 subjects were traveling; 154 subjects could not be reached; and 97 subjects were due to other reasons (household register information discrepancy, death, hospitalization, etc.). There were no statistically significant differences in sex, age, or location of residence between the participants and non-participants.

The socio-demographic distributions of the samples are presented in Table 1. 7917 (49.38%) were man, and 12,282 (76.61%) lived in rural communities. The point and the lifetime prevalence of MDD by sex, location of residence and age group are presented in Tables 2 and 3. The overall point and lifetime prevalence estimates for MDD were 1.10% (95% CI: 0.94–1.26%) and 3.56% (95% CI: 3.27–3.85%) respectively.

Table 4 shows the crude odds ratios for MDD (time point prevalence) and each socio-demographic variables (reference group in each category listed in Table 4). Univariate regression analysis showed that sex, age, location of residence, marital status, education, employment status, personal and family monthly income, relationships with family, and relationships with others were all significantly associated with MDD.

Multivariate factor regression analysis showed that sex, age, family monthly income and the family relationship were all associated with MDD. MDD was more common in female than in male respondents. Older age for respondents was associated with greater risks for MDD as compared to younger age; the group with the lowest family monthly income had the highest risk for MDD; and the group reporting an "average" or "poor" relationship with family or others was associated with an increased risk of depressive disorder.

4. Discussions

4.1. Methodological considerations of this survey

As an important assessment tool, the SCID has been widely used in clinical research since its publication. However, few large-scale epidemiological studies have utilized the SCID as a diagnostic tool on a global scale. Different from the WHO MH-CIDI, the SCID was designed to be administered by a clinician or trained mental health professional, which can be very costly. In fact, so far only large-scale epidemiological studies conducted in China (Phillips et al., 2009) have used the SCID as an assessment tool. Two major differences between those by Phillips et al. (2009) and the current one are worth pointing out: First, the studies by Phillips et al. (2009) involved a two-stage screening process. In the first stage all subjects were screened with the 12-item General Health Questionnaire (GHQ) and classified into three risk strata for mental disorder, and in the second-stage all high-risk respondents and a random selection of moderate or low risk respondents were assigned to complete the diagnostic assessment using the SCID. Second, only less than one third (28%) of the study subjects completed the assessment with the SCID. To the best of our knowledge, our study is the first large-scale representative community epidemiological survey in which all respondents were

Table 1
Socio-demographic characteristics of the study population (n=16,032).

	N	%
Gender		
Male	7917	49.38
Female	8115	50.62
Residence location		
Rural	12,282	76.61
Urban	3750	23.39
Age (years)		
18–29	2134	13.31
30–44	4132	25.77
45–59	4886	30.48
60–74	3389	21.14
75+	1491	9.30
Degree of education		
Illiterate/primary school	800	4.99
Secondary school	1612	10.05
High school	4078	25.44
College and above	3841	23.96
Marital status		
Unmarried	2084	13.00
Married/cohabitating	12,535	78.19
Widowed/divorced/separated	1413	8.81
Employment status		
Student	544	3.39
Employment	6853	42.75
Peasant	1809	11.28
Unemployment	1867	11.65
Retired	4959	30.93
Personal monthly income (RMB)		
0–1499	5393	33.64
1500–2999	6191	38.62
3000–4999	3325	20.74
5000–7999	884	5.51
≥ 8000	239	1.49
Family monthly income (RMB)		
0–2999	3660	22.83
3000–5999	5543	34.57
6000–9999	4711	29.38
10,000–20,000	1847	11.52
20,000+	271	1.69

Comment: The dollar-RMB exchange rate is 6.1408.

Table 2
The point prevalence of major depressive disorder by age, sex.

Whole sample	Male (7917)	Female (8115)	Total (16,032)
	Percentage (95% CI)	Percentage (95% CI)	Percentage (95% CI)
18–29	0.18% (0.07–0.43)	0.19% (0.07–0.46)	4/2134 (0.19%)
30–44	0.29% (0.06–0.52)	0.44% (0.15–0.72)	0.36% (0.18–0.55)
45–59	1.19% (0.76–1.63)	1.83% (1.30–2.36)	1.51% (1.17–1.86)
60–74	0.83% (0.38–1.28)	2.42% (1.71–3.12)	1.68% (1.25–2.11)
75+	0.94% (0.25–1.63)	2.56% (1.42–3.69)	1.74% (1.08–2.41)
Total	0.72% (0.53–0.91)	1.47% (1.20–1.73)	1.10% (0.94–1.26)
Rural sample			
18–29	0.11% (0.11–0.34)	0.24% (0.09–0.58)	0.18% (0.02–0.18)
30–44	0.06% (0.06–0.19)	0.52% (0.16–0.87)	0.29% (0.10–0.48)
45–59	0.95% (0.50–1.40)	1.54% (0.97–2.12)	1.24% (0.88–1.61)
60–74	0.88% (0.36–1.40)	2.36% (1.58–3.15)	1.67% (1.19–2.16)
75+	0.77% (0.10–1.44)	2.94% (1.56–4.31)	1.79% (1.05–2.53)
Total	0.57% (0.38–0.76)	1.43% (1.13–1.73)	1.00% (0.83–1.19)
Urban sample			
18–29	0.43% (0.42–1.29)	0	0.23% (0.22–0.69)
30–44	1.02% (0.13–1.90)	0.19% (0.19–0.58)	0.60% (0.12–1.07)
45–59	1.87% (0.82–2.92)	2.54% (1.38–3.70)	2.22% (1.44–3.01)
60–74	0.63% (0.24–1.49)	2.62% (1.02–4.23)	1.71% (0.75–2.67)
75+	2.04% (0.76–4.84)	1.22% (0.46–2.90)	1.53% (0.04–3.01)
Total	1.24% (0.72–1.75)	1.57% (1.02–2.12)	1.41% (1.04–1.79)

Table 3
The life prevalence of major depressive disorder by age, sex and region.

Whole sample	Male (7917)	Female (8115)	Total (16,032)
	Percentage (95% CI)	Percentage (95% CI)	Percentage (95% CI)
18–29	0.72% (0.22–1.22)	0.68% (0.18–1.18)	0.70% (0.35–1.06)
30–44	1.35% (0.86–1.85)	2.13% (1.51–2.75)	1.74% (1.34–2.14)
45–59	3.46% (2.73–4.18)	5.82% (4.89–6.75)	4.65% (4.06–5.24)
60–74	2.87% (2.04–3.69)	7.42% (6.21–8.62)	5.31% (4.56–6.07)
75+	2.81% (1.62–3.99)	7.54% (5.64–9.44)	5.16% (4.04–6.29)
Total	2.35% (2.02–2.68)	4.74% (4.28–5.21)	3.56% (3.27–3.85)
Rural sample			
18–29	0.57% (0.07–1.07)	0.72% (0.15–1.30)	0.65% (0.27–1.03)
30–44	1.02% (0.52–1.51)	2.26% (1.52–3.00)	1.63% (1.19–2.08)
45–59	3.30% (2.47–4.13)	5.32% (4.27–6.37)	4.30% (3.63–4.97)
60–74	3.12% (2.16–4.09)	7.37% (6.02–8.72)	5.39% (4.54–6.25)
75+	2.62% (1.39–3.84)	7.94% (5.74–10.15)	5.13% (3.89–6.36)
Total	2.22% (1.85–2.58)	4.65% (4.13–5.18)	3.44% (3.11–3.76)
Urban sample			
18–29	1.30% (0.16–2.77)	0.50% (0.48–1.47)	0.93% (0.02–1.83)
30–44	2.44% (1.08–3.80)	1.75% (0.62–2.88)	2.09% (1.20–2.97)
45–59	3.90% (2.40–5.40)	7.05% (5.17–8.94)	5.56% (4.33–6.78)
60–74	1.88% (0.39–3.36)	7.61% (4.95–10.27)	4.99% (3.38–6.61)
75+	4.08% (0.16–8.00)	6.10% (2.44–9.76)	5.34% (2.62–8.07)
Total	2.81% (2.04–3.57)	5.03% (4.06–5.99)	3.97% (3.35–4.60)

screened using a one-stage investigation method with the SCID performed by mental health professionals. These are the most notable strengths of this study.

Another strength of this study was the sampling design: we adopted the cluster stratified random sampling method. The basic sampling unit was the household with all eligible members being included, rather than specific individuals from every household. This method avoided the random selection of others in the absence of the initially selected resident within each household, and decreased possible selection bias.

4.2. The prevalence of MDD

Our study estimated that the point and lifetime prevalence of DSM-IV MDD was 1.10% (95% CI: 0.94–1.26%) and 3.56% (95% CI:

3.27–3.85%) respectively. The ratio of point: lifetime prevalence was approximately 1:3, consistent with prior surveys (range 1:3–2:3) conducted in other countries (Andrade et al., 2003).

Our results are also similar to that from earlier studies conducted in Beijing and Shanghai (Shen et al., 2006; Lee et al., 2009) and that of the survey of four provinces (Phillips et al., 2009). On the other hand, our rates are lower than the survey conducted in the Zhejiang province, a relatively developed province in east China (4.3% point prevalence) (Shi et al., 2005). The results of the current study are lower than those reported by Ma et al. (2007), in which they estimated the point and life-time prevalence of ICD-10 depressive disorder to be 3.31% and 6.87%, respectively (Ma et al., 2007). As mentioned in the introduction, the study by Ma et al. (2007) used a different assessment tool (WHO MH-CIDI) and diagnostic criteria. In addition, the 2003 study was different from the current one in the following ways: (1) the 2003 study included MDD and other depressive disorders, such as dysthymia disorder and the depressive episodes of bipolar disorder, while the current study focused on MDD only; (2) the 2003 study focused specifically on depressive disorders, while this study was a part of a comprehensive study that focused on all types of mental disorders; (3) the sampling design of the survey in 2003 was to select the respondents whose date of birth was the closest to the investigation time in every selected household (Ma et al., 2007), while the sampling unit of the current study was the household unit with assessments performed on all of the family members who met the criteria in each selected household.

The prevalence rates of MDD from the current and previous surveys in China are still substantially lower than those from Western surveys completed during similar time periods, although the epidemiological data on MDD vary significantly among previous studies (Patten, 2003; Chang et al., 2008; Marneros, 2009). A meta-analysis of the data from the WHO World Mental Health (WMH) Survey suggested that the 12-month MDD prevalence rate in the mainland Chinese population was 2.3%, was lower than those in developed countries (4.0–10.4%) and was similar to that in Japan (2.2%) (Kessler et al., 2010b).

Caution is needed in interpreting these differences in prevalence as there were variations in sites of survey, sampling methods, screening instruments, diagnostic criteria, types of interviewer, culture, social and economic status between the various studies (Guo et al., 2011). However, a number of speculations about the low rates of depression in Chinese have been proposed. (1) Biological factors: several previous studies indicated that the prevalence of depression among the Chinese living on mainland China is not only lower as compared to western populations, but the prevalence of depression among Chinese people living in America is also significantly lower than other ethnic groups (Gonzalez et al., 2010); (2) Cultural factors: some believe that the traditional Chinese social and cultural factors and values may play protective roles. For example, Tan (2014) reported the life-time prevalence of MDD in immigrant Chinese women was 8.5% vs 33.1% in US-born Chinese American women, suggesting the collectivist culture might play a protective role. (3) The instrument used in this study was translated from the English language, and some descriptions of emotions may be difficult to understand. It has been suggested in a previous study that the SCID could be less sensitive to the means of expressing emotion in the Chinese population. As a result, the prevalence of depression NOS is relative higher and the prevalence of MDD is relative low (Shi et al., 2005). (4) The stigmatization of the mentally ill in Chinese society is relatively prevalent. Some tend to somatize psychological problems, and those with a mental disorder may be reluctant to endorse symptoms. Longitudinal studies have demonstrated that some people with lifetime MDD fail to report their history of

Table 4
Crude odds ratios for the point prevalence of MDD according to socio-demographic data.

Factor	Level	Univariate regression analysis			Multivariate factor regression analysis		
		Odds ratio	95% CI	P value	OddsRatio	95% CI	P value
Sex	Male						< 0.001
	Female	2.052	1.494–2.818	< 0.001	1.972	1.433–2.713	0.002
Age	18~29						< 0.001
	30~44	1.940	0.643–5.853	0.239	1.838	0.609–5.551	0.280
	45~59	8.189	2.990–22.425	< 0.001	7.278	2.652–19.972	< 0.001
	60–74	9.109	3.300–25.142	< 0.001	7.873	2.846–21.781	< 0.001
	75+	9.451	3.291–27.135	< 0.001	8.220	2.855–23.664	< 0.001
Location of residence location	Rural						
	Urban	1.417	1.025–1.960	0.035			
Marital status	Married/cohabitating						
	Unmarried	0.453	0.238–0.863	0.016			
	Widowed/divorced/separated	2.317	1.583–3.391	< 0.001			
Education level	Illiterate						
	Primary school	0.655	0.383–1.119	0.122			
	Secondary school	0.393	0.240–0.645	< 0.001			
	High school	0.349	0.210–0.581	< 0.001			
	College and above	0.171	0.099–0.294	< 0.001			
Employment status	Employed						
	Student	0.314	0.043–2.286	0.253			
	Peasant	2.775	1.716–4.488	< 0.001			
	Unemployed	3.729	2.399–5.798	< 0.001			
	Retired	2.297	1.549–3.408	< 0.001			
Personal monthly income (RMBs)	0–1499						
	1500–2999	0.750	0.544–1.035	0.080			
	3000–4999	0.337	0.199–0.570	< 0.001			
	5000–7999	0.448	0.195–1.030	0.059			
	8000 and over	0.553	0.135–2.264	0.410			
Family monthly income (RMBs)	0–2999						0.002
	3000–5999	0.495	0.346–0.709	< 0.001	0.583	0.405–0.837	0.004
	6000–9999	0.428	0.289–0.635	< 0.001	0.543	0.365–0.810	0.003
	10,000–20,000	0.279	0.144–0.543	< 0.001	0.384	0.196–0.751	0.005
	20,000 and over	0.768	0.278–2.121	0.611	1.075	0.386–2.991	0.890
Relationships with family	Good						< 0.001
	Average	3.303	2.114–5.161	< 0.001	2.636	1.673–4.153	< 0.001
	Poor	4.411	2.134–9.119	< 0.001	4.591	2.197–9.596	< 0.001
Relationships with others	Good						0.099
	Average	2.357	1.591–3.490	< 0.001	1.649	1.044–2.603	0.032
	Poor	2.468	0.903–6.745	< 0.001	1.253	0.433–3.630	0.678

depression in cross-sectional studies (Patten et al., 2011). This can lead to an underestimation of MDD in a population-based epidemiological study (Kessler et al., 2010b).

4.3. Socio-demographic correlates of MDD

Socio-demographic factors are found to be associated with the prevalence of MDD worldwide (Gonzalez et al., 2010). Our survey indicated that females suffered from MDD twice as often as males, which is consistent with most of the previous studies across different cultures and populations (Kuehner, 2003; Waraich et al., 2004). Some hypotheses have been proposed regarding this sex difference, including that females may be more prone to depression due to biological and psychosocial factors (Desai and Jann, 2000).

Location of residence (urban vs rural) was significantly associated with MDD in single logistic regression analysis. However, multivariate analysis failed to show location of residence as an independent risk factor for MDD. This result was discrepant with the previous survey in China (Ma et al., 2009; Phillips et al., 2009).

We also found significant differences among age groups in point prevalence of MDD and demonstrated that the risk of MDD increases with age. These results are consistent with a few earlier Chinese studies (Wang et al., 1998; Ma et al., 2009) and different from the WMH survey in China in 2001 (Lee et al., 2009). Kessler et al. (2010a) suggested that this age phenomenon is seen more frequently in developed countries but not in developing countries.

Respondents with the lowest family income had the highest risk of MDD compared to respondents with higher income levels. This is in accordance with previous studies (Wilhelm et al., 2003; Park et al., 2012). Similarly, perceived family function also played a role. Subjects who perceived the family environment as “average” or “poor” had a higher rate of MDD than that in those who perceived the family environment as “good”.

This study also replicated the findings that unemployment was a strong predictor of a MDE (Lee et al., 2007). The respondents who were unemployed or retired were at greater risk of MDD than those employed. However, these results did not hold up in multi-variable analysis.

In summary, most of our findings regarding socio-demographic correlates are consistent with previous studies, especially those from the west. An older age, female sex, low family income, and poor family relationship were independent risk factors for MDD.

4.4. Limitations of this study

Despite several strengths, a few limitations should also be acknowledged when interpreting the findings:

First, this survey was only based on a sampling of Beijing residents using the household registry, and the so-called “floating population” in Beijing was not included. It is estimated that the floating population in Beijing accounted for 35.9% of the total population in 2010 (The Leading Group Office of the sixth nationwide census in Beijing, 2011), and due to their unstable living situation and other disadvantageous factors that they face (e.g. local policies unfavorable to their children’s education, housing, salary, etc.), they may be at a higher risk of having a depressive disorder compared with local residents (Zhang et al. 2013). Unfortunately, our study could not address this very important question. This is certainly an area where more research is urgently needed.

Second, since the response rate of this survey was 80.7%, 19.3% of eligible respondents were not represented in the sample. Although there were no statistical significances in sex, age, and location of residence between respondents and individuals who failed to participate, it is unclear how this missing segment of the population may have impacted the results. It is possible that those people with depression might have been more reluctant to participate than non-depressed residents, leading to an underestimation of the actual prevalence.

Third, the data on socio-demographic factors were cross-sectional and we only collected current data or data from the past 12 months. Since the onset of depression for some people might have been more than 12 months ago, the sociodemographic factors recorded for those individuals might have been different than those occurring at their onset of MDD. As in most cross-sectional studies, our findings show an association and not a causal relationship between MDD and those “risk” factors.

Within the context of these limitations, the results of this survey likely reflect the epidemiological profile of MDD in Beijing, and can provide a reference point for policy makers regarding budget and resource planning to improve mental healthcare.

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Conflict of interest

The authors have no conflict of interest.

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