Epidemiology and treatment of mental disorders in a rapidly developing urban region in China

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CHAPTER 2

The Tianjin Mental Health Survey (TJMHS): study rationale, design and methods

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ABSTRACT

Mental health in China is of growing concern to both policy makers and researchers. The Tianjin Mental Health Survey (TJMHS) was conducted between July 2011 and March 2012 to assess the prevalence and risk factors of mental disorders in the context of recent economic growth and other sociodemographic changes in Tianjin, a municipality of 13 million on China's eastern seaboard. A multistage cluster random sample selected using probability proportionate to size methods participated in a two-phase screening procedure: 11,748 subjects 18 or older were screened for risk of psychopathology and then an enriched risk-proportional subsample of 4,438 subjects was interviewed by psychiatrists using an expanded Chinese version of the Structured Clinical Interview for Diagnostic and Statistical Manual (DSM)-IV Axis I disorders (SCID). The study also collected information about the impairment associated with mental disorders, mental health knowledge, the stigmatization of mental disorders, and help-seeking behavior for psychological problems. This paper provides a detailed overview of the study rationale, objectives, field procedures, and pattern of response. It highlights several of the methodological challenges of maintaining quality control of a complex epidemiological study in the Chinese setting, issues that are relevant to other community-based epidemiological studies in low- and middle-income countries.

KEYWORDS

BACKGROUND

Over the last 30 years, China has undergone rapid economic growth and witnessed fast-paced urbanization[1,2]. The Tianjin Municipality (administratively equivalent to a Chinese province) is one of the most important engines of China's economic growth: from 1995 to 2010 the population increased by 40% (from 9.4 to 13.0 million), the proportion of the population that were immigrants from other regions of China increased 4.5-fold (from 5.3% to 23.8%) and the per capita Gross Domestic Product (GDP) increased 7.5-fold (from ￥9,769to ￥72,994)[3].

Rapid development has been associated with social problems[4] that may lead to increased rates of mental illnesses[5,6], so China's economic transformation has presented difficult challenges for the Chinese mental health care system[7,8]. The two national surveys of mental health in China conducted in 1982[9] and in 1993[10] are too old to reflect the effect of more recent social changes on the prevalence of mental disorders and do not consider the effect of uneven economic development in different parts of the country. Realizing this, the national government has recently recommended that provinces conduct mental health epidemiological studies every 5 years[11]. Several regional surveys have been published[12–15], but there has, as yet, been no epidemiological report from the Tianjin municipality. However, studies in Tianjin have shown that psychiatric services are unevenly distributed across different municipal districts and that some communities have no mental health services whatsoever[16,17], so local epidemiological data are needed to formulate municipality-specific policies for improving mental health services. To address this issue, the Tianjin Mental Health Survey (TJMHS) was conducted between July 2011 and March 2012. The objectives of the study were as follows:

1) Estimate the1-month ('current') and lifetime prevalence of DSM-IV mental disorders and their sociodemographic determinants in adults aged 18 years of age and older.

2) Assess the demographic and clinical characteristics, family history, quality of life, and level of disability in individuals affected by different types of mental disorders.

3) Assess mental health knowledge and the level of the stigmatization of mentally ill individuals among community members.

4) Assess help-seeking behavior for psychological problems across formal and informal care settings and the level of unmet need for mental health services among individuals with and without mental disorders.

5) The current paper provides a detailed overview of the sampling methods, instruments, and survey procedures used in the TJMHS.

STUDY DESIGN

Methodological considerations

To ensure the clinical validity of the final diagnoses, psychiatrists administered the Chinese version of the Structured Clinical Interview for Diagnostic and Statistical Manual (DSM-IV) Axis I disorders (SCID)[18,19] to selected adult community members. To maximize the use of relatively limited psychiatric manpower, we increased the proportion of individuals with mental disorders among individuals administered the SCID by using a two-phase design[13,20]. The first screening phase used an expanded version of the General Health Questionnaire (GHQ) to identify an enriched sample of individuals at risk of mental disorders; the second diagnostic phase involved the administration of the SCID to determine whether or not a DSM-IV diagnosis was present. The results were then weighted back to the sample population (Tianjin adults 18 and over) to provide community-based prevalence estimates. This approach was previously used successfully in a large, four-province study by Phillips and colleagues[13].

Sample

The minimally required sample size (n) was calculated using the formula $n=\mu_\alpha^2 \, p \, (1-p)/\delta^2$, where μ_α=the one-sided magnitude of the confidence level (at α=0.05,μ_α =1.96),p=expected proportion of the outcome of interest(the prevalence of schizophrenia – the least prevalent disorder of interest—estimated as 0.8%[13], was used), and δ=Margin of Error(δ=0.8%×0.2=0.0016). The calculated necessary minimum sample size was 11,909. To account for non-response, the number of subjects to be approached was set 30% higher, at 15,482.

Multistage sampling methods were used to obtain are presentative sample of adult, non-institutionalized, community residents. In the first stage, two to four streets or townships were selected using the Probability Proportionate to Size (PPS) sampling method from each of the 15 urban districts and 3 rural counties in Tianjin. In

the second stage, one to four neighborhoods or villages (primary sampling units, PSUs) were chosen using the PPS method from each of the streets or townships. Next, the total expected sample for the survey was apportioned to each district and country based on their relative populations and the number of households required in each PSU (ranging from 30 to 300) was determined based on the proportion of the population in all PSUs in the district or country that resided in the specific PSU. Then selected households were identified by a simple random method: 1) all households in the PSU were enumerated and assigned sequential numbers (1, 2, 3, etc.); 2) the selection interval ('X') was determined by dividing the total number of households in the PSU by the number of households required in the PSU; 3) a random number ('Y') between 1 and X was selected using the Excel 'randbetween(1,X)' function; 4) households with sequence numbers Y, Y+X, Y+2X, Y+3X, and so forth were selected as study households and each selected household was given a unique sequential study number (1001, 1002, 1003, etc.).

Finally, in each selected household one adult household resident was randomly selected to be a study participant: 1) all individuals in the household were listed sequentially by age by the interviewer; 2) the number of persons 18 and older who had lived in the household for at least half of the time over the prior 6 months – potential respondents – was determined and each of them was assigned a sequential number based on their age (1 for the eldest, 2 for the second eldest, etc.); 3) the interviewer then identified the sequence number of the subject who would be selected as the study respondent by consulting a table generated for the study with rows for the number of potential respondents in the household (1,2,3, etc.), columns with the last digit of the household's unique 4-digit study number (0 to 9), and cells with randomly selected numbers ranging from 1 to the number of potential respondents (i.e., the row number).

Using this procedure, 71 urban neighborhoods and 29 rural villages (i.e., 100 primary sampling sites) were identified and 15,538 households were selected, 11,573 from urban neighborhoods and 3,965 from rural villages. As shown in the flowchart for the study (Figure 1 and 2), 12,610 potential respondents were identified from these households and 11,748 of them completed the screening phase of the survey.

Ethics

The study protocol was approved by the medical ethics committee of Tianjin Mental Health Center. All respondents signed informed consent.

MEASUREMENTS

An overview of the assessments made in the Phase 1 screening assessment and the Phase 2 diagnostic assessment is shown in Panel 1. All instruments used in this survey were interviewer-administered. Some of the instruments have been used as self-completion scales in other studies, but we expected that a substantial minority of the sample would be illiterate or semi-literate (24% of the final sample had had 6 or less years of formal education) who would, thus, either need to be excluded or read the instruments by the interviewer. To ensure that we could include the most representative sample possible and to avoid the methodological problem of combining data collected by different methods (i.e. self-completion and interviewer-completion), we standardized the data collection method by converting self-completion instruments to interviewer-completion instruments but having the interview read the items of these scales to respondents and recording their responses.
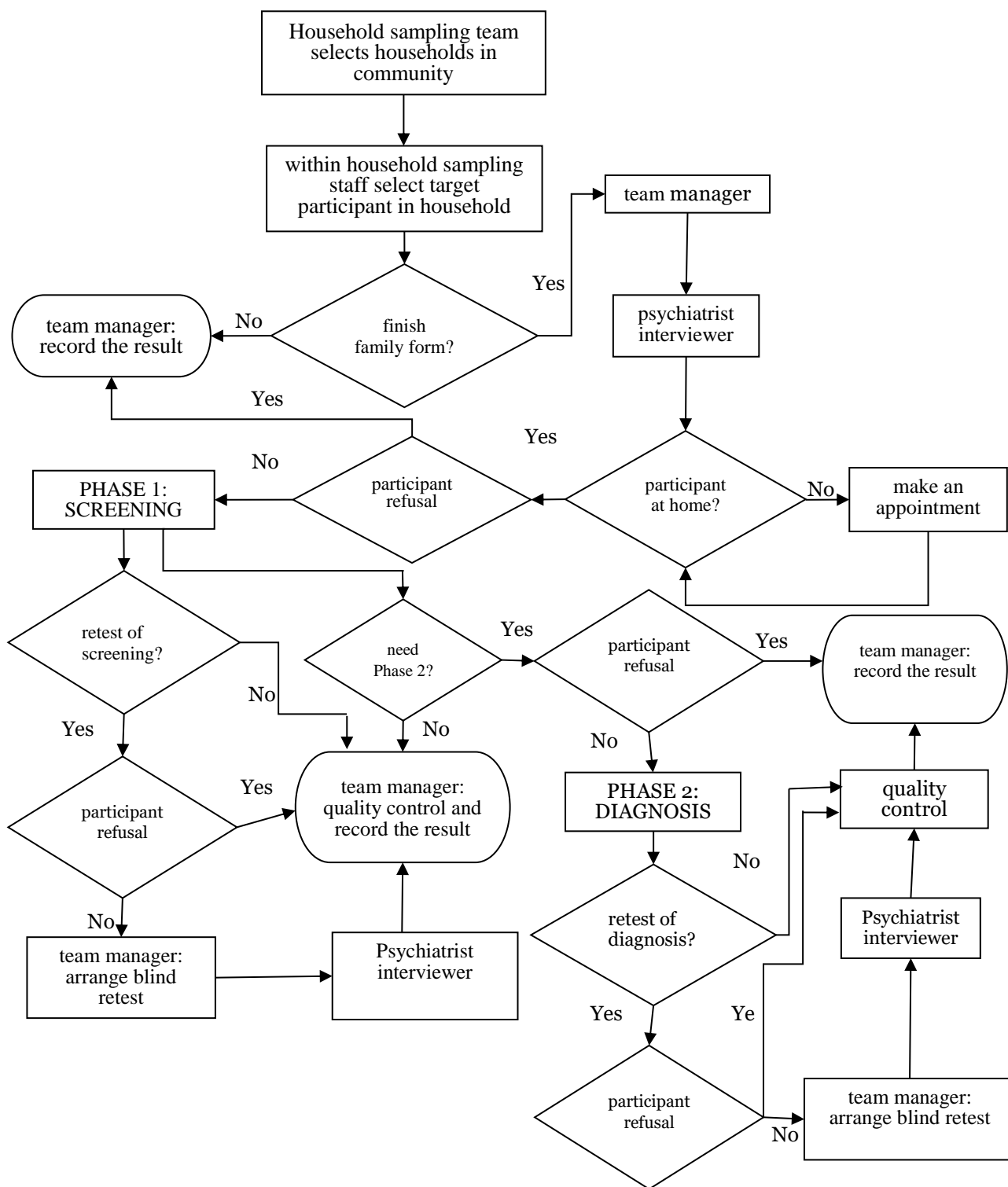
Figure 1: Flowchart of fieldwork procedures of the Tianjin Mental Health Survey
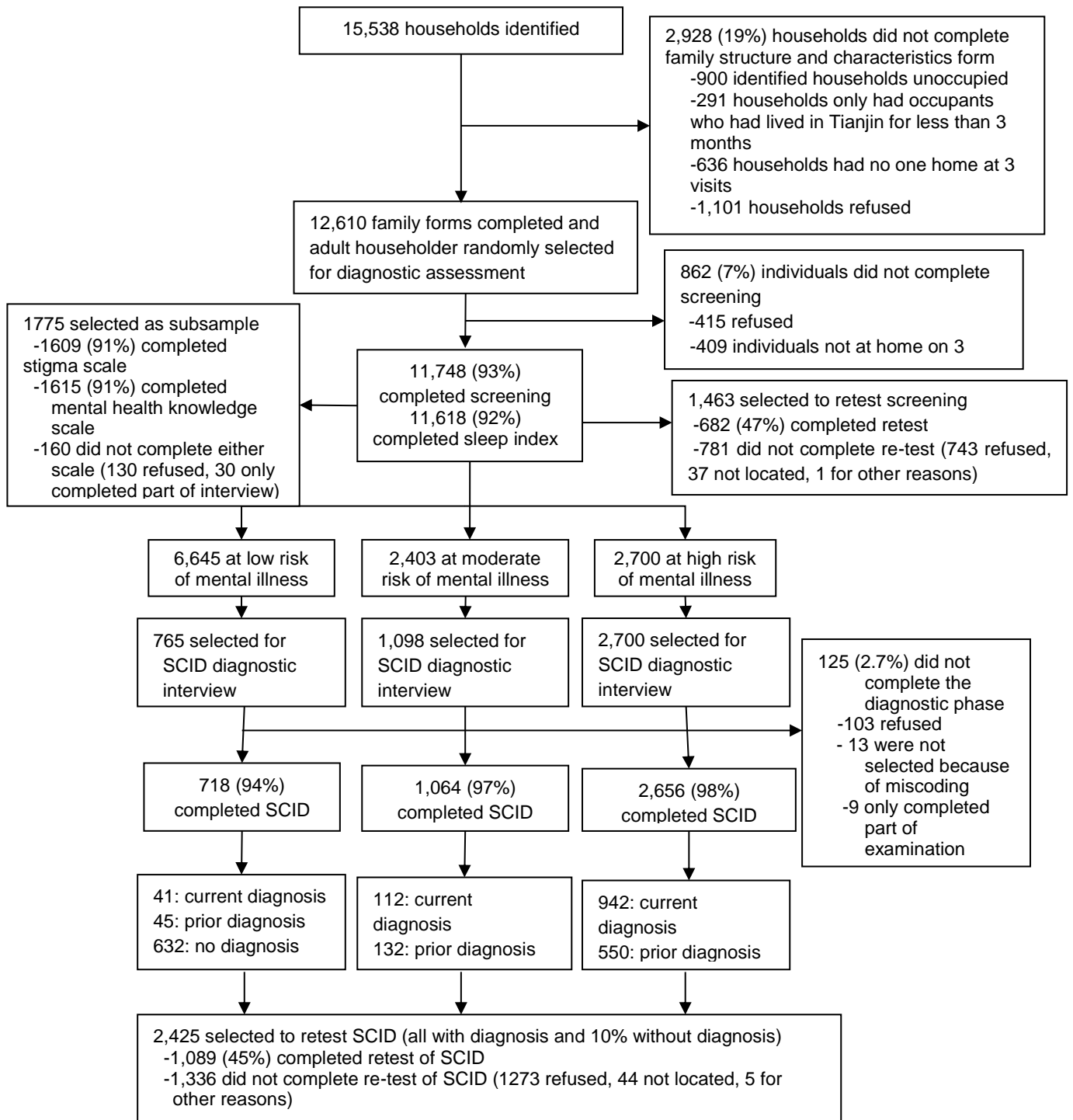
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┌─────────────────────────────┐          ┌──────────────────────────────────────┐
│ 15,538 households identified │          │ 2,928 (19%) households did not complete│
└─────────────────────────────┘          │ family structure and characteristics form│
              │                           │     -900 identified households unoccupied│
              │                           │     -291 households only had occupants  │
              │                           │      who had lived in Tianjin for less than 3│
              │───────────────────────────▶     months                            │
              │                           │     -636 households had no one home at 3│
              │                           │      visits                            │
              │                           │     -1,101 households refused          │
              ▼                           └──────────────────────────────────────┘
┌─────────────────────────────┐
│ 12,610 family forms completed and│      ┌──────────────────────────────────────┐
│ adult householder randomly selected│     │ 862 (7%) individuals did not complete │
│ for diagnostic assessment   │          │ screening                              │
└─────────────────────────────┘          │     -415 refused                      │
              │───────────────────────────▶     -409 individuals not at home on 3  │
              │                           └──────────────────────────────────────┘
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15,538 households identified

2,928 (19%) households did not complete family structure and characteristics form
 -900 identified households unoccupied
 -291 households only had occupants who had lived in Tianjin for less than 3 months
 -636 households had no one home at 3 visits
 -1,101 households refused

12,610 family forms completed and adult householder randomly selected for diagnostic assessment

862 (7%) individuals did not complete screening
 -415 refused
 -409 individuals not at home on 3

1775 selected as subsample
 -1609 (91%) completed stigma scale
 -1615 (91%) completed mental health knowledge scale
 -160 did not complete either scale (130 refused, 30 only completed part of interview)

11,748 (93%) completed screening 11,618 (92%) completed sleep index

1,463 selected to retest screening
 -682 (47%) completed retest
 -781 did not complete re-test (743 refused, 37 not located, 1 for other reasons)

6,645 at low risk of mental illness

2,403 at moderate risk of mental illness

2,700 at high risk of mental illness

765 selected for SCID diagnostic interview

1,098 selected for SCID diagnostic interview

2,700 selected for SCID diagnostic interview

125 (2.7%) did not complete the diagnostic phase
 -103 refused
 - 13 were not selected because of miscoding
 -9 only completed part of examination

718 (94%) completed SCID

1,064 (97%) completed SCID

2,656 (98%) completed SCID

41: current diagnosis
45: prior diagnosis
632: no diagnosis

112: current diagnosis
132: prior diagnosis

942: current diagnosis
550: prior diagnosis

2,425 selected to retest SCID (all with diagnosis and 10% without diagnosis)
 -1,089 (45%) completed retest of SCID
 -1,336 did not complete re-test of SCID (1273 refused, 44 not located, 5 for other reasons)

Figure 2: Flowchart of sampling results for the Tianjin Mental Health Survey

Family Structure and Characteristics Form

This form is completed by the interviewer using information provided by any adult householder. All people living in the selected household for more than three of the last six months were ranked by age on the form and the following information was collected for each individual: sex, age, marital status, years of education, work status, whether or not a formal resident of Tianjin based on the 'hukou' (an individual's official, government-based household registration), days unable to work due to physical disease in the past year, and whether they had seen a doctor because of a psychological problem in their lifetime. Additional information about the living conditions and economic status of the household was also obtained.

Phase 1 screening assessments

Detailed demographic and behavioral characteristics of selected participant

After the selected participant is identified and provides written informed consent to participate in the survey, more detailed demographic and behavioral information about the participant (beyond that recorded in the Family Structure and Characteristics Form) is obtained by the interviewer. A brief form specifically developed for this survey was used to record the following variables: income; ethnicity; location of residence permit; time living in Tianjin; religion; medical insurance status; use of tobacco, alcohol, and illicit drugs; gambling behavior; and history and effect of chronic medical problems.

Expanded version of the General Health Questionnaire (GHQ-12)

The modified GHQ[13] consists of the original Chinese version of the GHQ-12[21] (Cronbach's alpha coefficient [α]=0.75; test-retest reliability interclass correlation coefficient [ICC]= 0.72) and 9 additional items. This expanded version of the GHQ-12 was used in the screening phase of the survey because the added items have been shown to increase the instrument's sensitivity for SCID diagnoses[13,22]. The 9 additional items included the following: 1) respondents' subjective report of their physical health in the past month (rated as excellent, very good, good, fair, poor); 2) respondents' subjective report of their psychological health in the past month (rated as excellent, very good, good, fair, poor); 3) obsessive thoughts or compulsive behaviors in the last month (rated as never, seldom, sometimes, frequent); 4)

restriction of activities because of phobias in the past month (rated as never, seldom, sometimes, frequent); 5) feelings of extreme nervousness or anxiety in the last 6 months (never, seldom, sometimes, frequent); 6) social problems due to drinking in the last year (never, seldom, sometimes, frequent); 7) any previous treatment for psychological problems (yes or no); 8) previous suicidal ideation or behavior (yes or no); and 9) observed 'significant psychiatric or cognitive problems' during the screening interview by the interviewing psychiatrist (yes or no). Responses of 'poor', 'frequent' or 'yes' were coded '1' (positive); all other responses were coded '0' (negative).

The original 12 GHQ-items covered a range of health-related questions and were scored as follows: 0='better than usual', 0='as usual', 1='less than usual' and 1='much less than usual', so the total score ranged from 0 to 12. Respondents with a GHQ-12 score of at least 4 or a positive score on any of the 9 additional items were classified as 'high-risk' for mental disorder; those with a GHQ-12 score of 1-3 and no endorsement of any of the 9 additional items were classified as 'moderate-risk', and those with no endorsement of any GHQ-12 items or any of the 9 additional items were classified as 'low-risk'. All high-risk individuals, a 40% random selection of moderate-risk individuals, and a 10% random sample of low-risk individuals were subsequently selected for the Phase 2 diagnostic assessments.

Quality of Life Scale

This scale consists of six questions to assess how respondent rate their physical health, mental health, work status, economic status, relationship with family members, and relationships with other people in the past month. Each question is answered on a 5-point scale (1='very poor', 2='poor', 3='fair', 4='good' and 5='very good'). The scores are summed up and transformed to a 0-100 scale (total score= [(sum scores-5)/25]*100), with higher scores indicating a higher quality-of-life. This simple-to-use scale was specifically developed for use in China; several studies employing the scale over the last decade report good psychometric properties and find that the results of the scale (i.e. the total quality of life score) help discriminate different groups of respondents[23–26]. In the current study, the Cronbach's α for the six items in the scale was 0.81 and the intraclass correlation coefficient (ICC) for the test-retest reliability of the total score was 0.64.

Pittsburg Sleep Quality Index (PSQI)

The Chinese version of this 19-item scale[27] is used to assess sleep quality over the prior 30 days. The scale assesses seven aspects of sleep and the total score has a theoretical range of 0 to 57. A total score >7 is considered the cutoff for poor sleep quality. The results of using this scale in the current study are already published in Chinese [28].

Subsample administered three additional scales

A random subsample of about 12% of the respondents who participated in the Phase 1 screening was administered three additional scales. These individuals were identified as follows: all selected households in each PSU were assigned a unique sequential study number (1001, 1002, 1003, etc.), so study numbers in which the last two digits of the 4-digit number ranged from 'xx00' to 'xx11' accounted for approximately 12% of all study numbers; subjects who completed the Phase I screening who came from households with these study numbers were potential participants in this subsample.

1) **General Mental Health Knowledge Scale**: a 20-item questionnaire developed by the National Health and Family Planning Commission of China which includes 16 dichotomous response ('yes'/'no') items that assess knowledge about basic mental health issues and 4 items that ask respondents whether or not they are aware of annual days related to mental health (e.g., world mental health day). The total score ranges from 0 to 20 with higher scores representing better mental health knowledge. The translation of this scale and the scoring methods are shown in Appendix 1. The results of using the scale in the current study have been published in Chinese[29]. The psychometric properties of this scale have not been assessed.

2) **Geriatric Mental Health Problems Scale**: a 10-item dichotomous response scale ('yes'/'no') questionnaire developed by the National Health and Family Planning Commission of China was used to assess knowledge about geriatric mental health problems. The total score for the scale ranged from 0 to 10, with higher scores representing greater awareness of geriatric mental health problems. The psychometric properties of this scale have not been assessed. The

translation of this scale and scoring methods are shown in Appendix 1 (more information about the scale is available at: http://www.nhfpc.gov.cn).

3) **Perceived Discrimination and Devaluation Scale** (PDD): Originally developed by Link and colleagues[30,31], this scale has six items that assess the presence of devaluation and discrimination experienced by current or former psychiatric patients and six items that assess the absence of devaluation and discrimination. The Chinese version of the PDD, which uses the same items as the original version but has a slightly different response set (adding the option 'not sure') was previously shown to have acceptable psychometric properties[32]. The results of using the scale in the current study have been published in Chinese[33].

Phase 2 diagnostic assessments

Structured Clinical Interview for the Diagnostic and Statistical Manual (SCID)

The Chinese version of the SCID[18,19] includes all common diagnoses in the fourth edition of the DSM. It also includes the 'not otherwise specified' (NOS) diagnostic categories of mental illnesses for individuals who have clinically significant symptoms combined with social dysfunction but do not meet full criteria for a specific disorder. The TJMHS was the first study to use the SCID module on impulse control disorders not elsewhere classified[34]. Most diagnoses can be recorded as 'lifetime' (i.e. met diagnostic criteria at any time in the individual's lifetime) or 'current' (i.e. met diagnostic criteria at any time in the previous month). The full list of diagnoses considered is shown in Panel 1. Multiple comorbid diagnoses can be recorded; when more than one diagnosis is present, the examiner ranks them based on their clinical importance. The Chinese SCID has been shown to be reliable and valid[13].

Mini-Mental State Examination (MMSE)

The Chinese version of the Mini Mental State Examination (MMSE)[35] was incorporated into the Chinese version of SCID to assess cognitive impairment in respondents. MMSE results are combined with questions about the history of cognitive problems to determine the diagnoses of (probable) mental retardation and dementia. The theoretical total score for MMSE is 39; total scores below 24 in illiterate respondents, below 28 in respondents with a primary school education (i.e. 5 or 6 years of formal schooling), and below 32 in respondents who had completed middle school (i.e. 8 or 9 years of formal education) were considered indicative of

cognitive impairment. The ICC for the test-retest reliability of the MMSE total score in this study was 0.91.

Global Assessment of Functioning (GAF)

The GAF[36] was used to assess the level of dysfunction in the previous month due to mental illness. This measure is defined in DSM-IV and assessed by the diagnosing clinician as part of the SCID interview; the clinician uses clinical judgment to rate the most severe level of functional impairment caused by the psychiatric condition over the last month and on a 0 to 100 scale, with lower scores representing worse functioning. A disability weight was estimated using the GAF score (disability weight= (100-GAF score)/100), and individuals with a disability weight of 0.40 or greater were defined as 'moderately to severely disabled'.

Respondent's subjective report of functional impairment due to psychological problems

We also assessed respondents' subjective view about the extent to which the psychological symptoms they had experienced affected their functioning over the prior month. The areas of functioning considered included work or study, daily life, psychological functioning, social interactions, and self-management. The degree of impairment over the prior month was rated as 'none', 'mild', 'moderate', 'severe', or 'very severe'. Four other, more objective measures of impairment were obtained by asking respondents to indicate the number of days over the prior month and over the prior year in which psychological problems had hampered their ability to function or made it completely impossible to carry out their usual activities. The psychometric properties of these two measures have not, as yet, been assessed.

Family History Form

If the respondent reported that any biological relative had experienced a mental illness, additional information was collected about the relative's relationship with the participant, the diagnosis (if available), the treatment history, and suicidal behavior.

Help-Seeking Questionnaire

A detailed questionnaire to assess respondents' attitudes about help seeking for psychological problems and their actual help-seeking behavior for psychological problems was included in the expanded Chinese version of the SCID[19] and

administered to all respondents (whether or not they had a SCID diagnosis). Twenty-three potential sources of help for psychological problems are considered (listed in Panel 1). For each potential source of help, participants were asked if they had ever went to the provider for problems with emotions, nerves, mental health, or the use of alcohol or drugs (response scale: 'yes'/'no'). Next, respondents who had used this type of provider were asked detailed questions about their experience including the number of times they had employed the service, the person(s) who recommend they use the service, the types of diagnoses and treatment recommendations (if any) they received, the travel time to use the service, the cost of the services, and their satisfaction with the result. Respondents who had not used a particular type of provider were asked if they thought this type of provider would be helpful for persons with mental health problems (response scale: 'not effective', 'possibly effective', and 'certainly effective').

Panel 1: Assessments at each selected household in the Tianjin Mental Health Survey

Family Structure and Characteristics Form: Any available adult household member is administered this form that records basic demographic characteristics of all household residents (sex, age, marital status, years of education, employment situation) and the living conditions and economic status of family.

Identify 'selected participant' who is informant for remainder of survey: Based on information in the Family Structure and Characteristics Form, interviewer randomly selects one adult household member 18 years of age or older who has lived in the household most of the time over the prior 6 months.

COMPONENTS OF PHASE 1 SCREENING ASSESSMENT OF SELECTED PARTICIPANTS

Record detailed demographic and behavioral characteristics of selected participant: Using a form specifically designed for this study, interviewer records the following variables: income; ethnicity; location of residence permit; time living in Tianjin; religion; medical insurance status; use of tobacco, alcohol, and illicit drugs; gambling behavior; and history and effect of chronic medical problems.

Expanded version of the 12-item General Health Questionnaire (GHQ-12): Used to classify the selected participant as being at 'high', 'moderate' or 'low' risk of having a mental disorder. Result is used to determine whether or not selected participant should be administered the Phase 2 diagnostic assessment.

Quality of Life Scale: Assesses six components of quality of life over the prior month.

Pittsburg Sleep Quality Index: 19-item scale to assess quality of sleep over prior 30 days.

Assessments conducted in a random subsample of 12% of the selected participants:

    General Mental Health Knowledge Scale: 20-item scale developed by National Health and Family Planning Commission of China that assesses knowledge about mental health problems.

    Geriatric Mental Health Problems Scale: 10-item scale developed by National Health and Family Planning Commission of China that assesses awareness of mental health issues in the elderly.

    Perceived Discrimination and Devaluation Scale: 12-item scale that assesses respondent's attitude about the presence of devaluation and discrimination of current or former psychiatric patients.

COMPONENTS OF PHASE 2 DIAGNOSTIC ASSESSMENT OF SELECTED PARTICIPANTS

Chinese version of Structured Clinical Interview for DSM-IV (SCID): Current (1-month) and lifetime diagnoses considered include (A) **Mood disorders**: Bipolar I disorder, Bipolar II disorder, Other bipolar disorders, Major depressive disorder, Dysthymic disorder(only current diagnosis), Depressive disorder NOS; (B) **Anxiety disorders**: Panic disorder, Agoraphobia without panic, Social phobia, Specific phobias, Obsessive-compulsive disorder, Post-traumatic stress disorder, Generalized anxiety disorder (only current diagnosis), Anxiety disorder NOS; (C) **Substance use disorders**: Alcohol use disorders, Sedative/hypnotic/anxiolytic drug use disorders, cannabis use disorders, Other substance use disorders; (D) **Psychotic disorders**: Schizophrenia, Schizophreniform disorder: Schizoaffective disorder, Delusional disorder, Brief psychotic disorder, Psychotic disorder NOS; (E) **Organic mental disorders:** Mood disorder due to GMC, Substance-induced mood disorder, Substance-induced mood disorder, Substance-induced anxiety disorder, Psychotic disorder due to GMC, Substance-induced psychotic disorder); and (F) **Other mental disorders**: Somatization disorder(only current diagnosis), Pain disorder(only current diagnosis), Somatoform disorder NOS, Hypochondriasis (only current diagnosis), Adjustment disorder(only current diagnosis), eating disorders, impulse control disorders not elsewhere classified

Mini-Mental Status Examination (MMSE): Used to assess degree of cognitive impairment and, in conjunction with questions about history of cognitive problem, to diagnose (probable) mental retardation and dementia.

Global Assessment of Functioning (GAF): Assesses level of dysfunction due to mental illness in prior month based on the clinical judgment of the psychiatric interviewer who conducts the SCID.

Respondent's subjective report of functional impairment due to psychological problems: The level of dysfunction in the previous month due to psychological problems is assessed by the respondent on 5 dimensions (work/study ability, daily life, psychological functioning, social communication, and self-management).Respondent also reports the number of days in the prior month and in the prior year in which psychological problems made it difficult to carry out normal activities and, separately, the number of days psychological problems made it impossible to carry out normal activities.

Family History Form: Based on the report of the selected participant, this form (developed for the current study) collects information on the occurrence, treatment, and associated disability of prior or current mental disorders, substance abuse, and suicidal behavior in all blood relatives (living or deceased) of the participant.

Help-Seeking Questionnaire: This detailed questionnaire obtains information about respondents' attitudes about the use of 23 potential sources of help for psychological problems and about their actual use of such services (if any). Sources of help considered include relatives, colleagues/friend/neighbors, a private doctor of western medicine, a private doctor of Traditional Chinese Medicine (TCM), a witch doctor, a Qigong practitioner, an internal medicine clinic in a general hospital, a neurology clinic in general hospital, a psychiatric clinic in a general hospital, inpatient treatment in a general hospital, an outpatient clinic in a TCM hospital, inpatient treatment in a TCM hospital, a regular clinic in a psychiatric hospital, a specialized clinic in a psychiatric hospital, inpatient treatment in a psychiatric hospital, a community psychotherapy institute, a community health center, a community pharmacy, a temple, writing letters to get counselling, a newspaper article or magazine, an internet support group, and a (mental health) hotline.

FIELDWORK

Fieldwork staff and training

The fieldwork staff consisted of different teams of trained specialists.

- Six 'field supervisors' were experienced fieldwork interviewers. They trained the TJMHS staff and supervised sampling, data collection and recording, and interview quality.

- The 'household sampling team' consisted of 6 psychiatric nurses who were trained for 7 days about the overall design and goals of the study, about the process of enumerating and selecting households at each PSU, and about the steps needed to prepare the sites for the survey. They were responsible for visiting every sampling site to contact local officials, for randomly selecting households, for identifying local guides, and for disseminating information about the survey prior to the arrival of the survey teams.

- 'Local guides' were local officials responsible for providing information about the sampling sites and helping the field workers enter selected households. They were instructed by the household sampling team about the purpose and the procedures of the survey.

- The 'within-household sampling staff' consisted of 6 psychiatric nurses and 6 psychiatrists who were given 5 days of training about introducing the study to householders, recording all individuals living in selected households, and randomly selecting an eligible individual from the household. Their responsibility was to visit identified households, complete the first part of the household structure form (i.e. sex and age of all residents), and randomly select a household member as the target respondent for the main survey.

- The 'psychiatrist interviewers' included 44 psychiatrists with a minimum of 3 years of clinical experience from 18 mental health institutes in Tianjin. They participated in two training sessions: a 5-day initial training session about the design of the project and the screening procedures, and a rigorous 15-day training session in the administration of the household structure form and the screening and diagnostic instruments. After the training, they were tested to ensure they had mastered the required content; one participant was excluded because of his failure in the test.

- Twelve of the 44 psychiatrists were selected as 'SCID quality control evaluators'. The decision about which psychiatrists were best suited for this role was made by the study principle investigator at the end of the training based on their skill in administering the SCID and on their willingness and ability to identify and correct problems in the administration of the SCID by their fellow psychiatrists.

- The 'team managers' were 12 psychiatric nurses. They were trained for 7 days in the overall goals and methods of the study with a focus on the responsibilities of different participants and the methods of ensuring quality control of the project. They were responsible for coordinating the interview fieldwork, monitoring the quality of the screening forms, recording the required information in the management forms, uploading voice recordings of the interviews, and assigning clinicians to complete the retesting evaluations.

Each of the six fieldwork teams included 2 within-household sampling staff members, 2 team managers, 1 or 2 local guides, and 7-8 psychiatrist interviewers (2 of whom were also responsible for SCID quality control).

Pilot study

A pilot study was conducted in two communities (n=1000) for 13 days to help the fieldworkers get acquainted with the procedures and to detect any potential problems. The pilot study found that having the same psychiatrist select the target respondent and administer the SCID resulted in a biased sample because psychiatrists almost always selected individuals who were currently available in the household. To ensure that the sample selection was based on all household members (whether or not they were in the household at the time of the Phase 1 screening), in the main study the target respondent was first randomly selected by the independent 'within-household sampling staff' (as described above in the 'Sampling' section) and then the interviewer psychiatrist completed the remainder of the family structure form and the SCID.

Fieldwork procedures

An outline of the fieldwork procedures is shown in Figure 1. At least one week prior to the interviews at each PSU, the household sampling team contacted the local guides, who helped them enumerate all households at the sampling site and assign each household a unique sequential number (1,2,3,etc.). In many cases the housing lists

available at local administrative offices had to be updated due to the construction of new buildings, the vacancy of housing units, or other types of changes. Each household in multiple-household units (e.g., apartment buildings) was assigned a unique number. As described above in the Methods section, a simple random method was used to select the required number of households, and then each selected household was given a sequential study identification number (1001, 1002, 1003, etc.) and assigned to the interview team that would subsequently visit the site.

Three or 4 members of the interview team would visit each household assigned to their team. If no one was at home, they revisited the address on three different days at different times of the day to locate a family informant; if none were located after three visits, the household was classified as 'unoccupied' or 'residents not present'.

When an adult householder was available:

1) the local guide introduced the project and the team members;

2) the within-household sampling staff person randomly selected one adult resident as a target subject using a random number table;

3) the psychiatrist interviewer completed the family structure form;

4) if the target subject was present and provided written informed consent for the interview, the psychiatrist interviewer conducted the Phase 1 screening interview immediately, if the subject was not available, an appointment for the interview was made;

5) if the Phase 1 screening interview was completed, the team manager determined a) whether the three subsample forms should be completed (as described in the 'Methods' section above, individuals for whom the last two digits of the study number ranged from '00' to '11' complete these forms); b) whether an independent retest of the screening interview should be arranged (see 'Quality control', below), and c) based on the results of the expanded GHQ-12, whether a Phase 2 diagnostic assessment was required;

6) if the diagnostic SCID assessment was required, the psychiatrist interviewer either conducted it immediately after the screening interview or made an appointment to conduct it later;

7) if the SCID interview was completed, the team manager determined whether or not an independent retest of the SCID diagnostic assessment should be arranged (see 'Quality control', below).

All interviews with selected participants were administered at the participants' homes in a separate room without disturbance from other people (if at all possible). If the subject had dementia, mental retardation, or a psychological disturbance that limited his/her participation in the interview, a caregiver who could provide detail information about the subject was asked to take part in the interview. The median (interquartile range) duration of the Phase 1 screening interview was 10 minutes (10-15 minutes) for individuals who did not complete the 3 supplementary scales and 15 minutes (12-20 minutes) for those who did complete the 3 supplementary scales. The median duration of the Phase 2 diagnostic interview was 35 minutes (30-40 minutes) for individuals without any lifetime diagnosis and 40 minutes (30-60 minutes) for individuals with any lifetime diagnosis.

All interviews were audio recorded for later quality control.

Quality control

We wanted to retest the Phase 1 screening instrument in a random sample of 5% of the screened respondents so we initially invited individuals in whom the last two digits of the sequential study number ranged from '20' to '26' (i.e., approximately 7% of all respondents) to participate in a re-assessment. However, the refusal rate for repeating the Phase 1 screening part of the survey was over 50%, so to ensure that enough participants repeated the screening part of the survey, we subsequently expanded the selection to include individuals in whom the last 2 digits of the study number ranged from '20' through '39'. The team manager arranged for the repeat assessment by someone who was not involved in (and did not know the result of) the initial screening assessment within 2 to 5 days after the initial assessment.

Among individuals administered the SCID, all individuals with a current or past mental disorder and a random selection of 10% of those without a mental disorder were selected for retesting with the SCID. The team manager arranged for a psychiatrist who was blind to the initial interview to conduct the screening retest and/or diagnostic retest within 2 to 5 days after the initial evaluation. The team manager recorded all the information about each interview in a management form, and conducted quality control of the screening interview by ensuring that all items in the forms were filled out.

Two psychiatrists in each interview team were responsible for confirming the accuracy of diagnoses recorded on the SCID by checking the interview recording

form. If a problem was identified, the quality-control psychiatrist discussed the case with the interviewer and listened to the tape recording of the interview to correct the problem. In cases where a second SCID examination was conducted, quality-control psychiatrists compared the diagnoses made in the first and retest interviews; if different, they listened to the recorded interviews, discussed the case with the two psychiatrists, and determined the final diagnosis.

Field supervisors monitored the interview quality throughout the study. In the first two weeks, a field supervisor accompanied each team, randomly monitoring the interview technique of each psychiatrist on the team. From the third week onward, a field supervisor joined each team for two days each week to monitor the administration of the surveys and answer team members' questions about the conduct of the interviews.

All non-identified data collected in the survey were double-entered and checked using Epidata 3.0. The data were then transferred to SPSS format and multiple cleaning steps were undertaken prior to conducting the analysis.

STATISTICAL METHODS

Post stratification weights

First, results from the diagnostic sample were weighted up to reflect the number of individuals in each research site. This was done for each risk-stratum by multiplying the proportion of screened respondents in each stratum per neighborhood/village with the total number of individuals in the neighborhood/village and dividing this number by the number of SCID interviews in the stratum. These weights were truncated at 2 standard deviations above the mean weight to minimize the influence of extreme weights. Next, post-stratification weights were created to make the weighted sociodemographic distribution of the sample comparable in terms of location of residence (urban vs. rural), gender, and age-group (18-29 years, 30-39 years, 40-49 years, 50-64 years, and 65+ years) to that of the 2010 Tianjin population reported in the Sixth National Population Census of China.

Statistical analyses

Univariate and multivariable logistic regression analyses were used to compare the association of target participants' age, sex, urban/rural residence, marital status, employment status, education, income, and household size with non-completion of

the Phase 1 screening and Phase 2 diagnostic assessments. Weighted test-retest kappa values were calculated for the three levels of risk of a mental illness (i.e. low, moderate, and high risk) and for different classes of current mental disorders (affective disorders, anxiety disorders, substance abuse disorders, psychotic disorders, and organic mental disorders). Design-adjusted standard errors were estimated by Taylor series linearization to account for the unequal sampling across risk strata and possible homogeneity within sampling-sites (clusters). Weighted and unweighted results were compared. Analyses were conducted using SPSS v23.0.

RESULTS

Response rates

Figure 2 illustrates the breakdown of the TJMHS sample. In total, 2,928 (18.8%) of the selected households were excluded, more than half of which were excluded because the household was unoccupied. A much higher proportion of the selected urban households were excluded than the selected rural households – 21.6% (2,501/11,573) versus 10.7% (427/3,965). The family screening form was successfully completed and an adult householder was identified as the target respondent for 12,610 (81.2%) households. However, 862 (6.8%) of these identified respondents did not complete the screening interview. Thus 11,748 individuals completed the Phase 1 screening interview; slightly less than the estimated sample size required of 11,909. The test-retest assessment of the Phase 1 screening was completed in 46.6% (682/1,463) of individuals selected for retesting.

Based on screening with the expanded GHQ, 56.6% of respondents were classified as low-risk of a mental disorder, 20.4% as moderate-risk, and 23.0% as high-risk. All high-risk individuals, a 45.7% random sample of moderate-risk individuals, and a 11.5% random sample of low-risk individuals were selected for participation in the Phase 2 diagnostic assessment. Of the 4,563 selected individuals, 4,438 (97.3%) participated in the expanded SCID interview. The test-retest assessment of the SCID was completed in 44.9% of individuals selected for retesting.

Respondent characteristics

Table 1 compares the sociodemographic characteristics of target respondents who did and did not complete the Phase 1 screening. Most of the characteristics assessed were significantly different between the two groups. In the univariate analysis,

individuals who completed the screening were more likely to be female; living in urban areas; older; less well educated; married, divorced or widowed; to have above-median per capita family incomes; to have fewer adult household members; and to be retired. After including all of these variables in the multivariate analysis, female gender, urban residence, above median income, and having fewer household members remained significantly associated with successful completion of the Phase 1 screening interview.

Table 2 shows compares the characteristics of individuals selected for the Phase 2 diagnostic assessment who did and did not complete the interview. There were few significant differences between the groups. In the univariate analysis, the oldest age group (65 or older) was significantly more likely to complete the interview than the youngest age group (18-29 years of age), and individuals currently employed in non-agricultural jobs were significantly less likely to complete the interview than individuals whose employment status was classified as 'housewife'. In the multivariate analysis, employment in non-agricultural jobs and being 40-49 years old were significantly associated with completion of the diagnostic assessment.

Test-retest reliability

Overall, 682 respondents were retested with GHQ and 1089 were retested with SCID. The weighted test-retest kappa value for the three levels of risk of a mental illness was 0.60. The test-retest kappa values for a current diagnosis (yes/no) based on the SCID assessments were 0.76 for affective disorders, 0.82 for anxiety disorders, 0.80 for substance abuse disorders, 0.93 for psychotic disorders, and 0.64 for organic mental disorders.

Characteristics of weighted samples

Table 3 shows the distribution of demographic variables in the study sample before and after weighting. Both the Phase 1 sample and the Phase 2 sample were weighted to have the same gender-by-age-by-residence (urban versus rural) distribution as that of persons 18 years of age or older in Tianjin reported in the 2010 census: 46.6% females, 81.0% living in urban communities, and a weighted mean (sd) age of 42.1 (16.2) years. The crude mean years of education in the Phase 1 sample was 9.6 (4.4) years and the weighted mean years of education was 10.8 (4.0) years. The weighted median (interquartile range) per capita family monthly income in the

Phase 1 sample was￥1,333 (￥950-￥2,000) (excluding data for 186 individuals who refused to report family income).

Table 1: Comparison of the characteristics of individuals who did and did not complete Phase 1 screening for the Tianjin Mental Health Survey

Characteristic	Phase 1 screening status		univariate analysis OR (95%CI)[a]	multivariate analysis[b] OR(95%CI)[a]
	completed (n=11,748)%	not completed (n=862) %		
Sex				
male	44.6%	56.8%	1.00	1.00
female	55.4%	43.2%	**1.64 (1.42-1.88)**	**1.39 (1.20-1.62)**
Residence				
rural	27.7%	33.1%	1.00	1.00
urban	72.3%	66.9%	**1.29 (1.11-1.49)**	**1.25 (1.03-1.51)**
Age range				
18-29	12.9%	20.2%	1.00	1.00
30-39	16.4%	24.7%	1.04 (0.84-1.28)	0.91 (0.70-1.18)
40-49	20.3%	24.9%	**1.27 (1.03-1.56)**	1.14 (0.87-1.50)
50-64	31.8%	20.3%	**2.45 (1.97-3.04)**	**1.49 (1.11-2.00)**
65+	18.6%	9.9%	**2.94 (2.25-3.85)**	1.32 (0.89-1.95)
Years of education				
0-6	23.8%	18.8%	1.00	1.00
7-9	33.0%	31.8%	**0.82 (0.67-1.00)**	1.15 (0.91-1.44)
10-12	23.2%	26.0%	**0.70 (0.57-0.87)**	1.04 (0.81-1.34)
13+	20.0%	23.4%	**0.67 (0.54-0.83)**	1.15 (0.86-1.52)
Per capita family income				
below median	47.3%	38.1%	1.00	1.00
above median	51.1%	56.6%	**1.38 (1.91-1.59)**	**1.28 (1.09-1.54)**
unknown	1.6%	5.3%	**0.33 (0.24-0.46)**	**0.37 (0.26-0.53)**
Marital status				
never married	8.2%	13.1%	1.00	1.00
married/co-habiting	80.3%	79.5%	**1.61 (1.31-1.99)**	1.18 (0.88-1.58)
divorced/widowed	11.5%	7.4%	**2.46 (1.79-3.39)**	0.83 (0.55-1.26)
Number of adults in household (age≥18)				
1	11.6%	5.5%	1.00	1.00
2	55.8%	48.6%	**0.54 (0.40-0.73)**	**0.55 (0.39-0.79)**
3	21.1%	28.7%	**0.34 (0.25-0.47)**	**0.40 (0.28-0.58)**
4 or above	11.5%	17.3%	**0.31 (0.22-0.44)**	**0.33 (0.23-0.49)**
Employment status				
housewife	9.0%	5.5%	1.00	1.00
farmer	11.5%	66.8%	0.88 (0.60-1.29)	1.03 (0.69-1.54)
other employed	41.9%	11.1%	**0.38 (0.28-0.51)**	**0.39 (0.28-0.54)**
unemployed	9.3%	8.7%	**0.64 (0.44-0.93)**	**0.64 (0.44-0.94)**
retired	28.3%	7.9%	**1.53 (1.08-2.19)**	1.04 (0.81-1.55)

[a] confidence intervals in bold type are statistically significant at the p<0.05 level

[b] the multivariate logistic regression includes all the variables in the table

Table 2: Comparison of the characteristics of individuals selected for the Phase 2 diagnostic assessment for the Tianjin Mental Health Survey who did and did not complete the assessment

Characteristic	Phase 2 assessment status		univariate analysis OR (95%CI)[a]	multivariate analysis[b] OR (95%CI)[a]
	completed (n=4,438)%	not completed (n=125)%		
Sex				
male	42.5%	44.8%	1.00	1.00
female	57.5%	55.2%	1.10 (0.77-1.57)	0.96(0.66-1.41)
Residence				
rural	24.8%	27.0%	1.00	1.00
urban	75.2%	73.0%	0.89 (0.59-1.34)	0.76(0.45-1.28)
Age range				
18-29	9.8%	15.2%	1.00	1.00
30-39	14.3%	15.2%	1.47(0.77-2.80)	1.87(0.92-3.80)
40-49	19.8%	17.6%	1.74(0.94-3.26)	**2.23(1.09-4.55)**
50-64	33.1%	36.0%	1.43(0.83-2.47)	1.48(0.73-3.02)
65+	23.1%	16.0%	**2.24(1.18-4.24)**	2.11(0.86-5.19)
Years of education				
0-6	28.4%	28.8%	1.00	1.00
7-9	33.0%	33.6%	1.00(0.64-1.57)	1.34(0.80-2.24)
10-12	22.2%	20.0%	1.13(0.67-1.89)	1.66(0.91-3.02)
13+	16.3%	17.6%	0.94(0.54-1.61)	1.55(0.78-3.09)
Per capita family income				
below median	45.2%	40.8%	1.00	1.00
above median	53.0%	57.6%	1.20(0.84-1.73)	1.38(0.91-2.11)
unknown	1.8%	1.6%	1.22(0.30-5.08)	1.24(0.30-5.18)
Marital status				
never married	6.5%	7.2%	1.00	1.00
married/co-habiting	77.8%	80.0%	1.07(0.54-2.14)	0.59(0.26-1.39)
divorced/widowed	15.7%	12.8%	1.35(0.59-3.09)	0.92(0.33-2.53)
Number of adults in household (age≥18)				
1	13.9%	15.2%	1.00	1.00
2	54.3%	52.8%	1.12(0.67-1.88)	1.70(0.86-3.34)
3	20.3%	23.2%	0.95(0.53-1.71)	1.40(0.69-2.83)
4 or above	11.4%	8.8%	1.42(0.67-3.01)	2.15(0.90-5.18)
Employment status				
housewife	9.2%	4.8%	1.00	1.00
farmer	11.9%	9.6%	0.65 (0.24-1.74)	0.59(0.21-1.66)
other employed	35.3%	48.0%	**0.39 (0.17-0.90)**	**0.32(0.13-0.78)**
unemployed	11.6%	12.8%	0.48 (0.18-1.22)	0.46(0.18-1.21)
retired	32.0%	24.8%	0.68 (0.28-1.63)	0.60 (0.23-1.53)

a confidence intervals in bold type as statistically significant at the p<0.05 level

b the multivariate logistic regression includes all the variables in the table

Table 3: Sample characteristics before and after weighting

Characteristic	Phase 1 screening assessment			Phase 2 diagnostic assessment		
	n	unweighted %	weighted %	n	unweighted %	weighted %
Sex						
male	5,238	44.6%	53.4%	1,884	42.5%	53.4%
female	6,510	55.4%	46.6%	2,554	57.5%	46.6%
Residence						
rural	3,253	27.7%	19.0%	1,199	27.0%	19.0%
urban	8,495	72.3%	81.0%	3,239	73.0%	81.0%
Age range						
18-29	1,519	12.9%	30.6%	434	9.8%	30.6%
30-39	1,932	16.4%	18.4%	636	14.3%	18.4%
40-49	2,379	20.3%	19.2%	878	19.8%	19.2%
50-64	3,734	31.8%	22.1%	1,467	33.1%	22.1%
65+	2,184	18.6%	9.8%	1,023	23.1%	9.8%
Years of education						
0-6	2,796	23.8%	15.1%	1,261	28.4%	15.3%
7-9	3,874	33.0%	29.4%	1,466	33.0%	31.9%
10-12	2,725	23.2%	26.3%	987	22.2%	26.8%
13+	2,348	20.0%	29.2%	724	16.3%	26.1%
Pre capital family income						
below median	6,005	51.1%	50.8%	2,354	53.1%	48.8%
above median	5,557	47.3%	47.5%	2,004	45.2%	49.7%
Unknown	186	1.6%	1.6%	80	1.8%	1.5%
Marital status						
never married	966	8.2%	17.9%	290	6.5%	15.5%
married/co-habiting	9,433	80.3%	76.7%	3,451	77.8%	78.3%
divorced/widowed	1,348	11.5%	5.4%	697	15.7%	6.1%
Number of adults in household (age≥18)						
1	1,367	11.6%	4.3%	619	13.9%	5.3%
2	6.559	55.8%	47.5%	2,411	54.3%	52.7%
3	2,473	21.1%	30.1%	900	20.3%	25.6%
4 or above	1,349	11.5%	18.0%	508	11.4%	16.4%
Employment status						
housewife	1,061	9.0%	10.1%	407	9.2%	9.2%
farmer	1,351	11.5%	8.4%	528	11.9%	8.1%
other employed	4,923	41.9%	54.8%	1,568	35.3%	54.2%
unemployed	1,088	9.3%	9.4%	515	11.6%	11.0%
retired	3,325	28.3%	17.3%	1,420	32.0%	17.5%

DISCUSSION

The TJMHS is the first large-scale representative survey of mental disorders in Tianjin, one of Chinas most rapidly developing mega-cities. The results will be relevant for several other highly urbanized areas of China (and, possibly, urban areas of other low- and middle-income countries) that have experienced rapid growth, economic development, and an influx of rural migrants. The survey provides detailed epidemiological, attitudinal, and care-seeking data about mental health disorders that is essential to the development and assessment of targeted mental health policies and programs. Moreover, the methods and results of this survey can serve as a baseline for future research aimed at monitoring the implementation of China's new national mental health law37 and of the recent national Mental Health Plan for 2015-202011.

The survey used a two-phase design to enable the use of a rigorous clinical diagnostic interview (SCID) on an enriched sample of individuals at high, moderate, and low risk of mental disorders. This method makes it possible to maximally use available psychiatric manpower (which is very limited in most low- and middle-income countries) to arrive at reasonably precise estimates of the prevalence of relatively uncommon conditions (such as schizophrenia). We provide exhaustive details about the study procedures and methods so other investigators can adapt the study design and procedures for their own setting. Rigorous training, sampling, and quality control methods were adopted to optimize the quality of the results generated by the TJMHS. Other steps were taken to maximize participation and increase the likelihood that respondents would trust personal information with interviewers: engaging and training community-based guides, local dissemination of information about the survey prior to conducting the survey, training interviewers to establish rapport with respondents, and having a single interviewer conduct both the Phase 1 screening and the Phase 2 diagnostic assessments.

The Phase 1 screening survey was completed in 11,748 individuals identified from the 15,538 households selected in Tianjin's 15 urban districts and 3 rural counties – a crude response rate of 75.6%. However, 900 of the selected households were permanently unoccupied (a common problem in both urban and rural China), so the adjusted response rate of 80.3% (11,748/14,638) is probably a more meaningful estimate. Among the 4,563 individuals selected to complete the Phase 2 diagnostic

interview, 4,438 (97.3%) were successfully interviewed. These response rates are higher than those reported for most countries that participated in the World Health Organization World Mental Health Surveys[12]: France (45.9%), Belgium (50.6%), Netherlands (56.4%), Japan (56.4%), Germany (57.8%), Lebanon (70.0%), United States (70.9%), Italy (71.3%), Mexico (76.6%), Nigeria (79.9%), Spain (78.6%), Ukraine (78.3%), and Colombia (87.7%).

We attribute the good response rate to the screening interview in our study to the involvement of 'local guides' who were largely local officials well-known by community residents. The very high response rate among individuals selected for the follow-up Phase 2 diagnostic interview is probably related to the good rapport the interviewer established with the respondent while conducting the screening interview. However, this good rapport did not help when respondents were asked to repeat the screening interview for the test-retest assessment (47% completion rate) or when they were asked to repeat the diagnostic interview for the test-retest assessment (45% completion rate).

Several limitations of the survey need to be acknowledged. 1) TJMHS results will not be generalizable to the whole of China because of enormous regional differences. 2) All data about lifetime mental health conditions were collected retrospectively, which – as in all such studies – is affected by recall bias[38,39]. 3) As reported in earlier surveys[40,41], non-participation in the screening interview for this survey was related to sociodemographic variables, so it is possible that the prevalence of mental disorders also differs between those who did and did not participate. One prior analysis of non-respondents in The Netherlands[42] suggests that non-respondents have higher rates of mental illness while another study from the United States[43] found no difference in the prevalence of mental disorders between respondents and non-respondents. To minimize the effect of these differences, we use post-stratification weights to make the sample of individuals who completed the Phase 1 screening and the Phase 2 diagnostic assessments comparable to the target population in terms of gender, age, and urban versus rural location of residence. 4) The psychometric properties of some of the scales employed in the study have not yet been formally assessed (e.g., the forms we developed for the study to collect demographic information, the two scales about mental health knowledge developed by the National Health and Family Planning Commission, and the Health-Seeking Questionnaire). And 5) less than half of the individuals selected to participate in

retesting with the Phase 1 screening assessment and the Phase 2 diagnostic assessment completed the retesting and the time interval between the first and second evaluations was very short (2 to 5 days) (due to the limited time the survey teams could spend at each PSU), so the assessment of the test-retest reliability of the measures may be biased.

Despite these limitations, the methodological improvements and more extended scope of the TJMHS compared to earlier psychiatric epidemiological studies in China make the TJMHS dataset a valuable addition to the literature. The study provides valuable new insights about the mental health status and the use of mental health services in Tianjin that is relevant for other rapidly developing urban regions in China. The TJMHS is a model for conducting ongoing studies of mental health conditions in rapidly changing urban communities both in China and in other low- and middle-income countries.

AUTHORS' CONTRIBUTIONS

GX and MRP designed the study. HY and MRP analyzed the data. GX, MRP, HY, RAS, and KJW contributed to the interpretation of data. HY and KJW wrote the initial draft of the paper. All authors critically reviewed the draft and helped revise the manuscript.

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DECLARATION OF INTEREST STATEMENT

The authors have no competing interests.

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Appendix 1

Translated version of two questionnaires developed by the National Health and Family Planning Commission of China about (A) basic knowledge about mental health problems and (B) about mental health problems in the elderly[a]

A. DO YOU AGREE WITH THE FOLLOWING STATEMENTS ABOUT MENTAL OR PSYCHOLOGICAL PROBLEMS?		
1. Mental health is an integral part of health.	yes	no
2. Mental illnesses result from something wrong in thought.	yes	no
3. Most people may have a mental problem, but they may not notice the problem.	yes	no
4. Mental illnesses are all caused by stresses	yes	no
5. Mental health includes normal intelligence, stable mood, harmonious relationships, and Good ability to adapt and so on.	yes	no
6. Most mental illnesses cannot be cured.	yes	no
7. If you suspect that you have mental problems or mental illnesses, you should go to a psychiatrist or psychologist for help	yes	no
8. Individuals in any age can have a mental problem.	yes	no
9. Mental illnesses or psychological problems cannot be prevented.	yes	no
10. Even though a person is diagnosed with a severe mental disorder, he/she should take medication for only a short period rather than long-term continuous.	yes	no
11. Optimistic attitude towards life, good interpersonal relationship and healthy lifestyle are helpful for us to keep good mental health.	yes	no
12. It is more possible for a person with a family history of mental disorders to develop mental disorders or mental problems.	yes	no
13. The mental problems in adolescent do not influence their academic achievement.	yes	no
14. It is less likely to have mental problems or disorders in middle-age or older adults.	yes	no
15. Someone with bad characters is more prone to have mental problems.	yes	no
16. High psychological stress or major life events could induce mental problems or disorders.	yes	no
17. Do you know/ have you heard the World Mental Health Day?	yes	no
18. Do you know/ have you heard the International Day against Drug Abuse and Illicit Trafficking?	yes	no
19. Do you know/ have you heard the World Suicide Prevention Day?	yes	no
20. Do you know/ have you heard the World Sleep Day?	yes	no

B. DO YOU AGREE WITH THE FOLLOWING STATEMENTS ABOUT THE MENTAL PROBLEMS IN OLDER ADULTS?		
1. Memory loss is the manifestation at the beginning of dementia.	yes	no
2. A good attitude, often participation in social activities may help older people to maintain mental health.	yes	no
3. Mild dementia can be cured.	yes	no
4. The most common reason of dementia is Cerebrovascular accident (stroke).	yes	no
5. Depression is the most common mental disorder in older adults.	yes	no
6. To exercise one's wits can often prevent dementia.	yes	no
7. If older adults feel upset or restless, it may be the demonstrations of depression.	yes	no
8. Paying too much attention to their physical health or having a suspicion of a physical disease without any evidence may be the manifestations of mental problem in older adults.	yes	no
9. Individuals with geriatric depression may have a variety of somatic discomfort.	yes	no
10. The main cause of geriatric depression is physical disease.	yes	no

[a] Scoring: for questionnaire (A) 1 point is given for each 'yes' on items 1, 3, 5, 7, 8, 11, 12, 15-20,and 1 point is given for each 'no' on items 2, 4, 6, 9, 10, 13 and 14; for questionnaire (B) one point is given for each 'yes' response to items 1,2,3,5-9, and one point is given for each 'no' response to items 4 and 10.