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ABSTRACT

Objectives: Mental health literacy (MHL) refers to knowledge and beliefs about mental health disorders that aid in their recognition, management, or prevention. Past assessment of MHL was mainly vignette-based, which was disease-specific and absent of subscale, thus not reflecting a comprehensive picture of MHL. The present study aims to assess MHL using a standardized 20-item instrument developed by the Chinese Ministry of Health among a rural Chinese population.

Methods: A total of 2052 residents aged 18-60 selected from 8 naturalistic teams in Liuyang county completed the survey by face-to-face interviews. Participants completed the 20-item Mental Health Knowledge Questionnaire (MHKQ) along with the Self-Rated Health Measurement Scale (SRHMS), the Patient Health Questionnaire (PHQ-9) and the Generalized Anxiety Disorder Scale (GAD-7).

Results: Correct response rates for the 20 MHKQ items ranged from 19 to 94%, with a mean rate of 58%. Most people had inaccurate beliefs about the etiology of mental illness, thinking that mental illness was caused by ethically incorrect thinking (76.4%) or the arousal of violent emotions (72.7%). Less than a quarter of respondents had heard about the World Sleep Day, World Mental Health Day, and World Suicide Prevention Day. Younger age, higher education and higher income were associated with higher MHL, which in turn was associated with better physical, mental, and social health.

Conclusions: MHL in the rural areas of Liuyang is lower than that reported in urban areas of China. There is much room for improvement with regard to mental health literacy promotion in rural areas of China. Younger age, higher education and higher income are the three robust factors related to higher MHL, so cohort-specific educational intervention efforts may be indicated.

Article summary:

Strengths

- Assessing population level mental health literacy (MHL) in rural China using a multifaceted measurement tool---the mental health knowledge questionnaire (MHKQ) instead of the western vignette.
- Exploring the relationship between MHL and a range of health outcomes, which is a substantially underdeveloped area in the research.

Limitations

- Lack of comprehensive psychometric testing of the MHKQ
- The Cross-sectional study design makes it impossible to determine causal relationship.

INTRODUCTION

Mental health literacy (MHL) refers to knowledge and beliefs about mental health disorders that aid in their recognition, management, or prevention [1]. First introduced in 1997 by Australian researchers Jorm and colleagues, this definition has now become a gold standard within research and practice on MHL [2]. According to Jorm et al., MHL includes seven key components: (1) the ability to recognise specific disorders; (2) knowledge of how to seek mental health information; (3) knowledge of risk factors of mental illness; (4) knowledge of causes of mental illness; (5) knowledge of self-treatments; (6) knowledge of professional help available; and (7) attitudes that promote recognition and appropriate help-seeking. Based on Jorm et al.'s definition, O'Connor et al. grouped the seven key components of MHL into recognition, knowledge of factors relating to mental health, and attitudes and beliefs about mental disorders [2]. Of the various aspects of mental health literacy, recognition of mental disorders is the most common attribute measured in MHL since it is the first step towards mental health literacy and forms a prerequisite for measurement of other attributes.

Ever since the definition of MHL was first proposed, the concept has drawn extensive attention to the public's low level of MHL, with growing evidence showing low recognition rate of common mental disorders among various populations in both developed and developing countries. For example, the recognition rate of depression

is less than 50% among adolescents [3] and college students [4] in the US, and is only 11% among cancer patients and 25% among lay people in Japan [5]. One study among Portuguese youth reported the recognition rate of schizophrenia or psychosis as 42.17% and 22.21%, respectively [6], while another study amongst resettled Iraqi refugees found that only 14.2% of participants recognized posttraumatic stress disorder. Further investigation of the factors related to MHL has found that female gender [7-9], higher education [10, 11], younger age [10-12] and being employed [11] are associated with higher MHL. The importance of MHL in help-seeking behavior has also been studied, with evidence indicating that lack of MHL is a main challenge that patients and families face in seeking help [13, 14], especially in Asian cultures where utilization of mental health services are lower across the board [15]. There is also growing evidence showing that higher MHL is associated with better access to and utilization of mental health services [16, 17]. Moreover, increasing MHL can improve help-seeking behavior, the quality of mental health service and as a result, patients' symptoms [18, 19].

Despite the rich and abundant research on MHL all over the world, it is important to note that there are two major limitations in existing studies on MHL.

First, existing assessment of MHL mainly relies on a vignette interview approach, which may not comprehensively reflect respondents' understanding of mental health. In the vignette interview approach, a vignette is presented that describes an individual with a mental health difficulty and asks a series of questions related to participants' understanding of what is "wrong" with the individual in the vignette [1, 20]. The

vignette interview approach usually targets on one specific mental disorder without reflecting understanding of the multifaceted concept of MHL, thus evaluation of MHL based on the vignette interview approach may be incomplete. Besides, the vignette interview approach does not provide for a total or subscale score to be generated, nor would it allow for subscales to be included, making it impossible to make individual-level comparisons on each specific attribute of the seven-component MHL [2]. Moreover, the questions of the vignette are not independent, with the answer to the first question forming the basis for the answers to the remaining questions, which may not reflect the respondent's true knowledge of the aetiology and treatment of mental disorders[2].

Second, most of previous research has focused on the current situation of MHL and its association with demographics characteristics such as gender, age, education and employment, without noticing the potential impact of MHL on a series of health outcomes including physical, mental, and social health. Although improved MHL has been proved to generate improved mental health at the individual level in two intervention studies [21, 22], whether this could be translated into gains at the population level remains to be answered [23]. Even less is known about the impact of improved MHL on other domains of health such as physical and social health.

In light of these gaps, in the current study we administered a 20-item instrument developed by the Chinese Ministry of Health —the Mental Health Knowledge Questionnaire (MHKQ) [24]—to assess MHL in a representative sample of rural adults living in Liuyang City of Hunan Province, China. The MHKQ was used as a

nationwide golden standard to assess the public's MHL, after the issue of "2002-2010 China Mental Health Work Plan"[25] by the Ministry of Health, with the purpose of increasing public's MHL to 50% by 2010. The present study aims to measure the current level of MHL in the rural areas of Liuyang county in Hunan province, and to explore its association with social-demographics and a series of health outcomes including physical, mental, and social health.

METHODS

Participants

The target population were residents aged 18-60 who have lived in the rural areas of Liuyang County, Hunan Province for over 6 months. The survey was conducted from November 2010 to August. A multistage cluster-sampling method was adopted to identify subjects (See Figure 1). Two towns (Gaoping and Yongan) were randomly selected from 33 towns of Liuyang county, and then two villages were randomly selected from each town, followed by two teams randomly selected from each village, leading to a total sampling frame of 8 naturalistic teams. Those who were not living in the areas during research period, those with difficulty in communication due to serious physical or mental illness, and those who were cognitively impaired or actively psychotic were excluded, leading to a final sample of 2052 residents.

Interviewers visited each household and conducted face-to-face interview to each eligible respondent after providing written informed consent. The total interview took approximately 1 hour, and each household was reimbursed with small gifts such as

kitchen utensils ($2). After respondents completed the survey, they were checked by a quality control person to ensure that there were no inconsistencies or missing items. Ethics approval was granted by the Institutional Review Board of the School of Public Health of Central South University.

Instruments

MHKQ The Mental Health Knowledge Questionnaire (MHKQ) is a 20-item self-report questionnaire developed by the Chinese Ministry of Health (MOH) in 2009 to assess public knowledge and awareness of mental health. The 20 items are shown in Table 1, which cover various aspects of MHL including the characteristics of mental illnesses (items 1, 3, 5, 8, 11, 13 and 14), causes of mental illnesses (items 2, 4, 12, 15 and 15), prevention of mental illnesses (items 6, 7, 9 and 10), and mental health promotion activities (items 17-20). Items 1-16 are statements about mental health that require respondents to choose "true", "false", or "unknown"; correct responses are ‘true’ for items 1, 3, 5, 7, 8, 11, 12, 15 and 16, and ‘false’ for items 2, 4, 6, 9, 10 13 and 14. 1 point is given to each correct answer, with incorrect or unknown responses receiving 0 point. Items 17-20 ask about whether the respondents have heard of four mental health promotion days, with 1 or 0 points given to those answering "yes" and "no", respectively. Past psychometric testing of the scale has reported internal consistency (Cronbach’s α coefficients) ranging from 0.57 to 0.73 [10 11 26] and 2-week test–retest reliability as measured by intra-class correlation coefficients being 0.68 [26]. The MHKQ used in the present study had a Cronbach’s α

coefficient of 0.61.

SRHMS The Self-Rated Health Measurement Scale (SRHMS) is a 48-item scale developed and revised by Xu et al.[27 28] to assess self-rated health in both hospitalized and general populations. It is a comprehensive scale measuring 9 domains of health including physical symptoms and organ functions (B1), daily physical activities (B2), physical mobility (B3), psychological symptoms and negative emotions (M1), positive emotions (M2), cognitive function (M3), role activity and social adaptability (S1), social resource and social contact (S2), and social support (S3), which are grouped into three categories in the present study: physical health (BZT), mental health (MZT) and social health (SZT). Each item is rated on a 10-point scale from 1 = "extremely poor health" to 10 = "extremely good health". Items 4, 5, 7, 24, 25, 26, 27, 28, 29, and 30 are reversed scored and a cumulative score is obtained by adding individual scores. The SRHMS has widespread use in China [27, 29, 30] and demonstrated good internal consistency in the current study, with a Cronbach's α coefficient of 0.91.

PHQ-9 The Patient Health Questionnaire (PHQ-9) is one of the most widely used screening tool for depression for adults. The 9-item questionnaire was based on criteria for depressive disorders in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV)[31]. Respondents are asked whether they have been bothered by 9 symptoms in the past two weeks on a 4-point Likert scale from 0 = "not at all," to 3

= "nearly every day", with higher scores indicating higher depression. A total score is calculated by adding the scores of each item and ranges from 0 to 27.The Chinese version of PHQ-9 has been well validated in multiple studies [32-34] and showed good internal consistency in the current study, with a Cronbach's α coefficient of 0.81.

GAD-7 The Generalized Anxiety Disorder Scale (GAD-7) is a 7-item self-report scale developed by Spitzer et al. [35] to assess symptoms of and screen for generalised anxiety disorder in primary care settings. Respondents are asked to choose how often they have been bothered by anxiety symptoms on a 4-point Likert scale from 0 = "not at all" to 3 = "nearly every day". A total score is calculated by adding the scores of each item and ranges from 0 to 21, with higher scores indicating higher anxiety. The GAD-7 has been widely used and well validated in both psychiatric settings [36] and general populations [37] and demonstrated good internal consistency in the current study with a Cronbach's α coefficient of 0.88.

Data analysis

Data were analyzed using STATA software version 12.0. Socio-demographic characteristics of the sample were examined using descriptive statistics. T-tests and ANOVA were used to compare the MHL score of respondents by gender, age, ethnicity, education, employment, income, marriage and religion, followed by a multiple linear regression to identify the characteristics of respondents that were independently related to the assessed level of MHL. The association between MHL

and self-rated mental health, physical health, social health, self-esteem, depression and anxiety were analyzed using *t*-test by grouping respondents into high MHL group and low literacy group using the median score of MHL as the cut-point.

RESULTS

Sample characteristics

A total of 2052 residents completed the questionnaires with a response rate of 95.1%, and their demographic characteristics were summarized in Table 1. The median age of the sample was 42 with a range of 18-59, there were more female (55.80%) than male (44.20%). Most of the sample were of Han ethnicity (99.5%), married (90.98%), and non-religious (90.01%), with low education (middle school and below: 84.75%). 61.11% of the sample were employed, and over two thirds had a monthly income of lower than 300 RMB.

Table 1 Socio-demographics of the sample (N=2052)[$]

Characteristics		n	%
Gender	Male	907	44.20
	Female	1145	55.80
Age (years)	18-25	227	11.06
	26-35	344	16.76
	36-45	687	33.48
	46-60	794	38.69
Ethnicity	Han	2042	99.51
	Non-Han	10	0.49
Education	Primary school or lower	814	39.67
	Middle school	925	45.08
	High school and above	313	15.25
Employment	Unemployed	797	38.84
	Employed	1254	61.11
Income	150 or less	936	45.61
(RMB/Month/person)	151-300	475	23.15

	300 or greater	575	28.02
Marital Status	Never married	145	7.07
	Married/cohabiting	1867	90.98
	Divorced/separated/widowed	40	1.95
Religion	Yes	205	9.99
	No	1847	90.01

Abbreviation: RMB, Ren Ming Bi

[$] Some percentages don't add up to 100 due to missing values

Correct response rate of the MHKQ

In this sample, the correct response rate of the 20 items ranged from 18.7 to 94.1%, with a mean correct response rate of 58.1%. The computed MHL score ranged from 0 to 20 and the mean (SD) value was 11.6 (2.9). Awareness rate of the four international festivals ranged from 18.7% to 56.8% with "International Day Against Drug Abuse and Illicit Trafficking" as the most widely recognized mental health promotion (56.8%). Less than one-quarter of respondents had heard about the World Sleep Day (20.3%), World Mental Health Day (24.5%), and World Suicide Prevention Day (18.7%). Of the 16 true-false questions, the items that were most likely to be answered correctly were Item 11 "An optimistic attitude towards life, good inter-personal relationships, and healthy living habits are helpful to maintain mental health" (94.1%), Item 5 "The main content of mental health includes normal intelligence, stable emotion, good mood, and harmonious inter-personal relationships" (87.9%), and Item 1 " Is mental health an integral part of health?" (87.2%). Items with the lowest correct response rates were Item 2 "Mental illnesses are caused by ethically (or politically) incorrect thinking" (23.59%), Item 4 "All the mental disorders are due to arousal of violent emotion" (27.34%), and Item 9 "Psychological/psychiatric

disorders can never be prevented" (41.81%). The correct response rate of each question was displayed in table 2.

Table 2. Correct response rate of MHKQ (N=2052)

Item	Question[correct response]	%
16 true-false questions		
11	Positive attitudes, good interpersonal relationships and a healthy life style can help maintain mental health. [true]	94.15
5	Components of mental health include normal intelligence, stable mood, a positive attitude, quality interpersonal relationships, and adaptability. [true]	87.87
1	Mental health is a component of health. [true]	87.23
7	Psychological or psychiatric services should be sought if one suspects the presence of psychological problems or a mental disorder. [true]	86.01
16	Mental problems or disorders may occur when an individual is under psychological stress or facing major life events (e.g. death of family members). [true]	79.68
8	Psychological problems can occur at almost any age. [true]	78.65
3	Many people have mental problems but do not realize it. [true]	76.27
15	Individuals with a bad temperament are more likely to have mental problems. [true]	74.12
13	Psychological problems in adolescents do not influence academic grades. [false]	72.86
12	Individuals with a family history of mental disorders are at a higher risk for psychological problems and mental disorders. [true]	63.99
6	Most mental disorders cannot be cured. [false]	54.04
10	Even for severe mental disorders (e.g. schizophrenia), medications should be taken for a given period of time only; there is no need to take them for a long time. [false]	48.15
14	Middle-aged or elderly individuals are unlikely to develop psychological problems and mental disorders. [false]	46.73
9	Mental disorders and psychological problems cannot be prevented. [false]	41.81
4	All mental disorders are caused by external stressors. [false]	27.34
2	Mental disorders are caused by incorrect thinking. [false]	23.59
4 mental health promotion activities		
18	Have you heard about the International Day against Drug Abuse and Illicit Drug Trafficking? [true]	56.77
17	Have you heard about International Mental Health Day? [true]	24.46
20	Have you heard about World Sleep Day? [true]	20.27
19	Have you heard about the International Suicide Prevention Day? [true]	18.71

Association between social-demographics and MHL

The mean total score of the sample was 11.63 ± 2.9. Table 3 showed the mean MHKQ score for different demographic groups of subjects. There were statistically significant differences in the scores by age, education, employment, income, and marital status. Univariate analyses showed that younger age, higher education, being employed, higher income, and being single is associated with higher mental health knowledge. Subsequent multiple linear regression with all demographics factors included showed that age, education, and income were independently associated with MHL. Participants with younger age, higher education and higher income had better MHL (table 4).

Table 3 Univariate analysis of the MHKQ score

Item		n	Mean score	T/F	*p*
Total		2052	11.63		
Gender	Male	907	11.74		
	Female	1145	11.54	1.58	0.11
Nationality	Han	2042	11.62		
	Non-han	10	12.8	-1.26	0.21
Age	18-25	227	12.48		
	26-35	344	12.54		
	36-45	687	11.58		
	46-60	794	11.01	29.97	<0.01
Education	Primary school or less	814	10.45		
	Middle school	925	12.06		
	College and above	313	13.42	151.88	<0.01
Employment	Unemployed	797	11.41		
	Employed	1254	11.76	2.66	0.01
Income	150 or less	936	11.29		
(RMB/Month)	151-300	475	11.81		
	300 or greater	575	12.07	13.84	<0.01
Marital Status	Married/cohabited	1867	11.58		
	Divorced/separated/widowed	40	11.35		
	Never married	145	12.37	5.02	0.01
Religion	Yes	205	11.42		

No	1847	11.65	-1.04	0.30

Table 4 Multiple linear regression of the MHKQ scale score

	Coef.	Std. Coef.	t	$p>\|t\|$	95%CI
Age	-0.02	-0.087	-3.6	0.000**	(-0.04, -0.01)
Gender	-0.006	-0.001	-0.04	0.965	(-0.28, 0.26)
Ethnicity	0.27	0.032	1.54	0.125	(-0.07, 0.61)
Education	1.35	0.32	13.61	0.000**	(1.16, 1.55)
Marriage	0.21	0.021	0.94	0.345	(-0.23, 0.66)
Occupation	-0.22	-0.037	-1.61	0.108	(-0.49, 0.05)
Income	0.21	0.061	2.83	0.005**	(0.064, 0.35)
Religion	-0.04	-0.004	-0.20	0.842	(-0.44, 0.36)

**significant at p=0.01

Association between MHL and health outcomes

We further classified the MHKQ into two categories according to the median score 12----low MHKQ and high MHKQ group, and compared the self-rated health status, depression, and anxiety between the two groups. Our results show that people with higher MHL enjoyed better physical, mental and social health, and also had lower depression and anxiety than those with lower MHL.

Table 5 Comparison of health outcomes between low and high MHKQ score group

Health outcome score		Low MK (n=963)	High MK (n=1089)	T/Z	p
SRHMS	Physical health	8.27	8.49	-4.52	0.00**
	Mental health	7.69	7.92	-3.64	0.00**
	Social health	6.73	7.41	-9.98	0.00**
	Total health	7.60	7.96	-7.62	0.00**
PHQ	Depression	0.43	0.38	2.53	0.01**
GAD	Anxiety	0.42	0.36	2.62	0.01**

**significant at p=0.01

DISCUSSION

The study was conducted to assess mental health literacy in rural areas after the issue of "2002-2010 China Mental Health Work Plan"[25] by the Ministry of Health, which aims to increase public awareness rate of the characteristics and prevention of mental disorders to 50% by 2010. The current study in the rural areas of Liuyang is based on a protocol developed by the China Ministry of Health, which produced data on community members' mental health literacy to provide guidance and a basis for future mental health advocacy and education. The mean overall correct response rate of mental health literacy identified in this study is 58%, suggesting that the goal of "2002-2010 China Mental Health Work Plan" has been achieved in rural areas of Liuyang. However, this rate is lower than those reported in urban areas of China such as Shanghai (72%)[10], Guangzhou (60.2%)[38], Changsha (68.5%)[11], and Xi'an (70.3%)[39]. This may be explained by the less developed economy in the rural areas of China. Mental health literacy in less developed rural areas is in need of improvement through both population wide interventions and individual training programs [23].

Compared to the 57% awareness rate of the "International Day Against Drug Abuse and Illicit Trafficking", the awareness rate of World Mental Health Day, World Suicide Prevention Day, and World Sleep Day are much lower. The reason may be that the government has put much greater emphasis on drug abuse and trafficking, due to its greater potential to threaten and endanger social safety and stability compared to other mental health problems such as sleep disorders and suicide. Promotion efforts on the other three days need to be strengthened by the government to arouse public

awareness on these issues and popularize knowledge about them. Most people (over 70%) held misbeliefs about the etiology of mental illness, thinking that ethically incorrect thinking or the arousal of violent emotions causes mental illnesses. These misattributions are consistent with reports in previous studies in China [10, 11], implying that misattribution of mental illness is prevalent all over the country. The misconception of the causes of mental illness may be an important antecedent for the pervasive negative attitudes towards mentally ill patients. Future targeted intervention should start with educating the public on accurate recognition of causes of mental illness.

Significant differences in the mental health literacy score between different demographic groups of respondents were found in the current study. Multivariate linear regression indicated that younger age, higher education, and higher income were the most robust factors associated with higher mental health literacy. These results are consistent with previous studies [10-12]. Higher education, as an indicator of higher health literacy, can be seen as an indirect indicator of MHL and thus is associated with higher MHL. Higher income, usually accompanied with higher education, can also be seen as related to higher MHL. What is interesting is that being younger, instead of being older is associated with higher MHL. The reason may be related to the different social political environments that the different generations have experienced. During the Chinese Cultural Revolution (1966–1976), education was not valued by the Chinese government and a lot of people were not educated when they were young. It was not until 1986 when the government introduced the

nine-year compulsory education policy that education became popularized to citizens all over the nation. Since then, the educational level of people has increased throughout China. The negative correlation found between age and MHL may reflect China's political history.

The positive impact of high MHL on a series of health outcomes including physical, mental, and social health is established in the present study. The result that people with higher MHL also enjoyed better physical and social health is a new finding that has not been reported before. The mechanism behind this association may be related to the improved help-seeking behavior that has been widely documented among people with higher MHL [16-19], which may lead to increased general health outcomes including physical health and social health. The finding that increased MHL is associated with increased general health provides us with a strong motivation to enhance population MHL through a series of educational campaigns.

One limitation of the present study is the unfavorable internal consistency of the 20-items MHKQ scale (alpha=0.61), which is consistent with previous studies showing weak to acceptable internal consistency [10, 11, 26]. However, this may be due to the fact that for knowledge scales measuring various factors of a construct, knowing the correct answer of one item does not necessarily lead to the right recognition of another item, thus a very high internal consistency may not be expected. Indeed, as a standardized government document developed by the Chinese Ministry of Health (MOH) to assess the public knowledge and awareness of mental health, the MHKQ has been popularized as a national gold standard to compare MHL across the

country. The purpose of the present study is not to test the psychometric properties of the MHKQ, but to compare the level of MHL in the rural areas of Liuyang with other parts of China. As a result, the psychometric properties of the MHKQ are not of primary importance, given that the scale is comparable across different studies.

Another limitation is the cross-sectional design of the study, making it impossible to evaluate temporal sequence of MHL and health outcomes, and causal relationships cannot be determined. However, according to the scale's design, the SRHMS assesses self-rated health in the past four weeks [27, 28], and the PHQ [31] and GAD [35] measure depression and anxiety in the past two weeks, while the MHKQ measures an individual's lifetime knowledge and belief about mental health, which may take root in a person's early life. We could infer a potential causal relationship between MHL and health outcomes.

In conclusion, MHL in the rural areas of Liuyang is lower than that reported in urban areas of China. More efforts are needed to increase public awareness of mental health promotion activities and more population-level intervention programs are needed to educate the public about the correct attribution of mental disorders. Younger age, higher education, and higher income are the three strongest factors related to higher MHL, so educational interventions may need to be cohort-specific with special attention paid to those who are older, poorer, and less educated. Higher MHL is related to better general health including physical, mental, and social health, suggesting that improvement of MHL may enhance overall population health, which warrants future exploration.

Ethical Statement

This study was approved by the Institutional Review Boards of the School of Public Health of Central South University and was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. All participants in the present study gave their informed consent prior to their inclusion in the study. Details that might disclose the identity of the subjects under study were omitted and all data collected were unidentified.

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Conflicts of interest statement

The authors have no conflicts of interest to declare.

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Figure 1. Flowchart of subject enrollment

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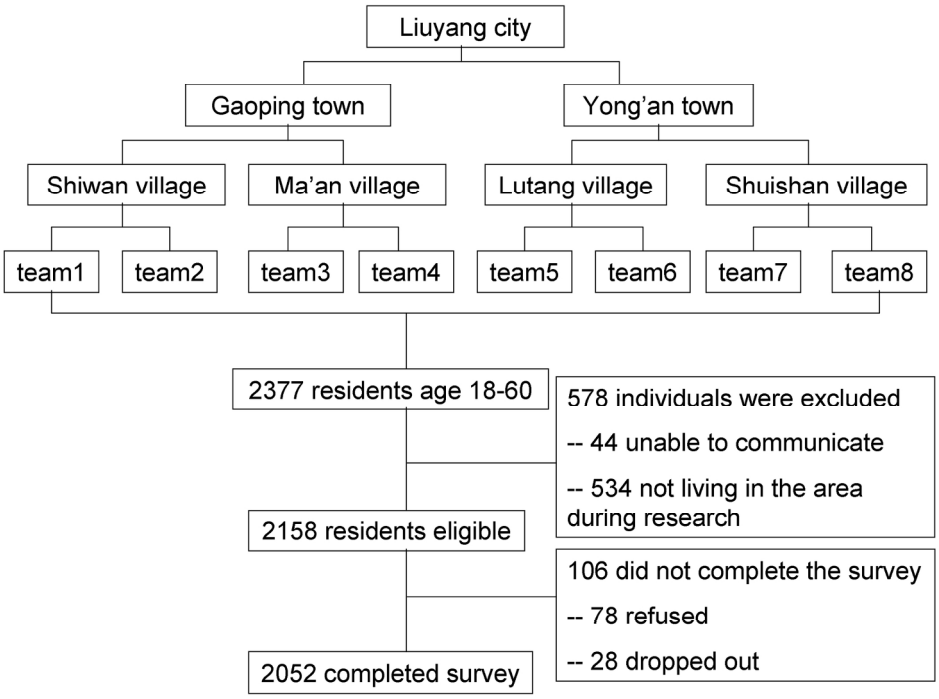

Flowchart of subject enrollment
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Assessment of Mental Health Literacy Using a Multifaceted Measure among a Chinese Rural Population

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Assessment of Mental Health Literacy Using a Multifaceted Measure among a Chinese Rural Population

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ABSTRACT

Objectives: Mental health literacy (MHL) refers to knowledge and beliefs about mental health disorders that aid in their recognition, management, or prevention. Past assessment of MHL was mainly vignette-based, which was disease-specific and devoid of subscales, thus not reflecting a comprehensive picture of MHL. The present study aims to assess MHL using a standardized 20-item instrument developed by the Chinese Ministry of Health among a rural Chinese population.

Methods: A total of 2052 residents aged 18-60 selected from 4 villages in Liuyang county completed the survey by face-to-face interviews. Participants completed the 20-item Mental Health Knowledge Questionnaire (MHKQ) along with the Self-Rated Health Measurement Scale (SRHMS), the Patient Health Questionnaire (PHQ-9), and the Generalized Anxiety Disorder Scale (GAD-7).

Results: Correct response rates for the 20 MHKQ items ranged from 19 to 94%, with a mean rate of 58%. Most people had inaccurate beliefs about the etiology of mental illness, thinking that mental illness was caused by ethically incorrect thinking (76.4%) or the arousal of violent emotions (72.7%). Less than a quarter of respondents had heard about World Sleep Day, World Mental Health Day, and World Suicide Prevention Day. Younger age, higher education, and higher income were associated with higher MHL, which in turn was associated with better physical, mental, and social health.

Conclusions: MHL in the rural areas of Liuyang is lower than that reported in urban areas of China. There is much room for improvement with regard to mental health literacy promotion in rural areas of China. Younger age, higher education, and higher income are the three robust factors related to higher MHL, so cohort-specific educational intervention efforts may be indicated.

Article summary

Strengths

- Broadening the definition of mental health literacy (MHL) to include both "illness literacy", as well as "health literacy".
- Assessing population level MHL in rural China using a multifaceted measurement tool---the mental health knowledge questionnaire (MHKQ) instead of vignettes based in Western cultural contexts.
- Exploring the relationship between MHL and a range of health outcomes, which is a substantially underdeveloped area of research.

Limitations

- Lack of comprehensive psychometric testing of the MHKQ.
- The cross-sectional study design makes causal relationships undeterminable.
- Lack of comparison between MHKQ with other multifaceted scales intending to measure MHL as the MHKQ has not be utilized outside of China.

INTRODUCTION

Mental health literacy (MHL) refers to knowledge and beliefs about mental health disorders that aid in their recognition, management, or prevention [1]. First introduced in 1997 by Australian researchers Jorm and colleagues, this definition has become a gold standard within research and practice on MHL [2]. According to Jorm et al., MHL includes seven key components: (1) the ability to recognise specific disorders; (2) knowledge of how to seek mental health information; (3) knowledge of risk factors of mental illness; (4) knowledge of causes of mental illness; (5) knowledge of self-treatments; (6) knowledge of professional help available; and (7) attitudes that promote recognition and appropriate help-seeking. Based on Jorm et al.'s definition, O'Connor et al. grouped the seven key components of MHL into recognition, knowledge of factors relating to mental health, and attitudes and beliefs about mental disorders [2]. Of the various aspects of mental health literacy, recognition of mental disorders is the most common attribute measured in MHL as it is the first step towards mental health literacy and forms a prerequisite for measurement of other attributes.

Ever since the definition of MHL was first proposed, the concept has drawn extensive attention to the public's low level of MHL, with growing evidence showing low recognition rate of common mental disorders among various populations in both developed and developing countries. For example, the recognition rate of depression is less than 50% among adolescents [3] and college students [4] in the US, and is only 11% among cancer patients and 25% among lay people in Japan [5]. One study among Portuguese youth reported the recognition rate of schizophrenia or psychosis

as 42.17% and 22.21%, respectively [6], while another study amongst resettled Iraqi refugees found that only 14.2% of participants recognized posttraumatic stress disorder. Further investigation of the factors related to MHL has found that female gender [7-9], higher education [10 11], younger age [10-12] and being employed [11] are associated with higher MHL. The importance of MHL in help-seeking behavior has also been studied, with evidence indicating that lack of MHL is a main challenge that patients and families face in seeking help [13 14], especially in Asian cultures where utilization of mental health services are lower across the board [15]. There is also growing evidence showing that higher MHL is associated with better access to and utilization of mental health services [16 17]. Moreover, increasing MHL can improve help-seeking behavior, the quality of mental health service and as a result, patients' symptoms [18 19].

Despite the rich and abundant research on MHL all over the world, it is important to note that there are three major limitations in existing studies on MHL.

First, the most widely used definition of MHL by Jorm is problematically narrow in its scope. Based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), Jorm's definition of MHL is illness-oriented, neglecting the fact that health-oriented literacy including self-regulation strategies and techniques to improve mental health should also be incorporated as an important component of MHL [20]. Kusan [21] and Wei et al. [22] have suggested a broader definition of MHL including knowledge to enhance and maintain good mental health, knowledge of mental disorders and their treatments, decreased stigma against mental disorders, and

enhanced help-seeking efficacy, however, this definition is rarely used in research related to MHL.

Second, existing assessment of MHL mainly relies on a vignette interview approach, which may not comprehensively reflect respondents' understanding of mental health. In the vignette interview approach, a vignette is presented that describes an individual with a mental health difficulty and asks a series of questions related to participants' understanding of what is "wrong" with the individual in the vignette [1, 23]. The vignette interview approach usually targets one specific mental disorder without reflecting understanding of the multifaceted concept of MHL. It is especially lacking in assessment of people's health literacy, thus evaluation of MHL based on the vignette interview approach may be incomplete. Furthermore, the vignette interview approach does not provide for a total or subscale score to be generated, nor does it allow for subscales to be included, making it impossible to make individual-level comparisons on each specific attribute of the multifaceted MHL [2]. Moreover, the questions of the vignette are not independent, with the answer to the first question forming the basis for the answers to the remaining questions, which may not reflect the respondent's true knowledge of the etiology and treatment of mental disorders[2].

Third, most of previous research has focused on the current situation of MHL and its association with demographics characteristics such as gender, age, education and employment, without noticing the potential impact of MHL on a series of health outcomes including physical, mental, and social health. Although improved MHL has

been proven to generate improved mental health at the individual level in two intervention studies [24, 25], whether this could be translated into gains at the population level remains to be seen [26]. Even less is known about the impact of improved MHL on other domains of health such as physical and social health.

In light of these gaps, in the current study, we administered a 20-item instrument developed by the Chinese Ministry of Health —the Mental Health Knowledge Questionnaire (MHKQ) [27]—to assess MHL in a representative sample of rural adults living in Liuyang City of Hunan Province, China. Based on the broader definition Of MHL raised by Kusan and Wei [21-22], MHKQ assesses both "disorder literacy" and "health literacy" of individuals. The MHKQ was used as a nationwide gold standard to assess the public's MHL, after the "2002-2010 China Mental Health Work Plan" [28] was issued by the Ministry of Health, with the purpose of increasing public's MHL to 50% by 2010. The present study aims to measure the current level of MHL in the rural areas of Liuyang county in Hunan province, and to explore its association with social-demographics and a series of health outcomes including physical, mental, and social health.

METHODS

Participants

The target population was residents aged 18-60 who have lived in the rural areas of Liuyang County, Hunan Province for over 6 months. The survey was conducted from November 2010 to August 2011. A multistage cluster-sampling method was adopted

to identify subjects (See Figure 1). Two towns (Gaoping and Yongan) were randomly selected from 33 towns of Liuyang county, and then two villages were randomly selected from each town, followed by two samples randomly selected from each village, leading to a total sampling frame of 8 samples. Those who were not living in the areas during the research period, those with difficulty in communication due to serious physical or mental illness, and those who were cognitively impaired or actively psychotic were excluded, leading to a final sample of 2052 residents.

Interviewers visited each household and conducted face-to-face interview with each eligible respondent after obtaining written informed consent. Each interview took approximately 1 hour, and each household was reimbursed with small gifts such as kitchen utensils ($2). Completed surveys were checked by a quality control person to ensure that there were no inconsistencies or missing items. Ethics approval was granted by the Institutional Review Board of the School of Public Health of Central South University.

Instruments

MHKQ The Mental Health Knowledge Questionnaire (MHKQ) is a 20-item self-report questionnaire developed by the Chinese Ministry of Health (MOH) in 2009 to assess public knowledge and awareness of mental health. The 20 items are shown in Table 2. Items 1-16 are statements about mental health that require respondents to choose ‘true’, ‘false’, or ‘unknown’; correct responses are ‘true’ for items 1, 3, 5, 7, 8, 11, 12, 15 and 16, and ‘false’ for items 2, 4, 6, 9, 10 13 and 14. 1 point is given to

each correct answer, with incorrect or unknown responses receiving 0 points. Items 17-20 ask about whether the respondents have heard of four mental health promotion days, with 1 or 0 points given to those answering 'yes' and 'no', respectively. Past psychometric testing of the scale has reported internal consistency of Cronbach's α coefficients ranging from 0.57 to 0.73 [10, 11, 29] and a 2-week test–retest reliability as measured by intra-class correlation coefficients of 0.68 [29]. However, there has been inconsistency regarding subscales of the MHKQ, with four [11, 29] and five subscales [10] being reported in various studies. In the present study, the MHKQ had a Cronbach's α coefficient of 0.61. An exploratory factor analysis yielded a three-factor solution, which covers three aspects of MHL including knowledge of the characteristics of mental health and mental disorders (items 1, 2, 3, 5, 7, 8, 11, 12, 15 and 16), belief in the epidemiology of mental disorders (items 4, 6, 9, 10, 13 and 14), and awareness of mental health promotion activities (items 17-20), with Cronbach's α coefficients ranging from 0.62 to 0.67.

SRHMS The Self-Rated Health Measurement Scale (SRHMS) is a 48-item scale developed and revised by Xu et al. [30, 31] to assess self-rated health in both hospitalized and general populations. It is a comprehensive scale measuring 9 domains of health including physical symptoms and organ functions (B1), daily physical activities (B2), physical mobility (B3), psychological symptoms and negative emotions (M1), positive emotions (M2), cognitive function (M3), role activity and social adaptability (S1), social resource and social contact (S2), and social support

(S3), which are grouped into three categories in the present study: physical health (BZT), mental health (MZT) and social health (SZT). Each item is rated on a 10-point scale from 1 = 'extremely poor health' to 10 = 'extremely good health'. Items 4, 5, 7, 24, 25, 26, 27, 28, 29, and 30 are reversed scored and a cumulative score is obtained by adding individual scores. The SRHMS has widespread use in China [30, 32, 33] and demonstrated good internal consistency in the current study, with a Cronbach's α coefficient of 0.91for the total scale and 0.80-0.82 for its three subscales.

PHQ-9 The Patient Health Questionnaire (PHQ-9) is one of the most widely used screening tools for depression in adults. The 9-item questionnaire was based on criteria for depressive disorders in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) [34]. Respondents are asked whether they have been bothered by 9 symptoms in the past two weeks on a 4-point Likert scale from 0 = 'not at all' to 3 = 'nearly every day', with higher scores indicating higher depression. A total score is calculated by adding the scores of each item and ranges from 0 to 27. The Chinese version of PHQ-9 has been well validated in multiple studies [35-37] and showed good internal consistency in the current study, with a Cronbach's α coefficient of 0.81.

GAD-7 The Generalized Anxiety Disorder Scale (GAD-7) is a 7-item self-report scale developed by Spitzer et al. [38] to assess symptoms of and screen for generalised anxiety disorder in primary care settings. Respondents are asked to choose how often they have been bothered by anxiety symptoms on a 4-point Likert scale

from 0 = 'not at all' to 3 = 'nearly every day'. A total score is calculated by adding the scores of each item and ranges from 0 to 21, with higher scores indicating higher anxiety. The GAD-7 has been widely used and well validated in both psychiatric settings [39] and general populations [40] and demonstrated good internal consistency in the current study with a Cronbach's α coefficient of 0.88.

Data analysis

Data were analyzed using STATA software version 12.0. Socio-demographic characteristics of the sample were examined using descriptive statistics. *t*-tests and ANOVA were used to compare the MHL score of respondents by gender, age, ethnicity, education, employment, income, marriage, and religion, followed by multiple linear regression to identify the characteristics of respondents that were independently related to the assessed level of MHL. The association between MHL and each of the health outcomes including self-rated mental health, physical health, social health, depression and anxiety were analyzed using separate multiple linear regression models adjusted for all demographics.

RESULTS

Sample characteristics

A total of 2052 residents completed the questionnaires with a response rate of 95.1%, and their demographic characteristics are summarized in Table 1. The median age of the sample was 42 with a range of 18-59, with more female (55.80%) than male

(44.20%) participants. Most of the sample were of Han ethnicity (99.5%), married (90.98%), and non-religious (90.01%), with low education (middle school and below: 84.75%). 61.11% of the sample were employed, and over two-thirds had a monthly income of lower than 300 CNY.

Table 1 Socio-demographics of the sample (*N*=2052)[a]

Characteristics		*n*	%
Gender	Male	907	44.20
	Female	1145	55.80
Age (years)	18-25	227	11.06
	26-35	344	16.76
	36-45	687	33.48
	46-60	794	38.69
Ethnicity	Han	2042	99.51
	Non-Han	10	0.49
Education	Primary school or lower	814	39.67
	Middle school	925	45.08
	High school and above	313	15.25
Employment	Unemployed	797	38.84
	Employed	1254	61.11
Income	150 or less	936	45.61
(CNY/Month/person)	151-300	475	23.15
	300 or greater	575	28.02
Marital Status	Never married	145	7.07
	Married/cohabiting	1867	90.98
	Divorced/separated/widowed	40	1.95
Religion	Yes	205	9.99
	No	1847	90.01

Abbreviation: CNY, Chinese Yuan

[a] Some percentages don't add up to 100 due to missing values

Correct response rate of the MHKQ

In this sample, the correct response rate of the 20 items ranged from 18.7% to 94.1%, with a mean correct response rate of 58.1%. The computed MHL score ranged from 0 to 20 and the mean (SD) value was 11.6 (2.9). Awareness rate of the four international

mental health awareness days ranged from 18.7% to 56.8% with "International Day Against Drug Abuse and Illicit Trafficking" as the most widely recognized mental health promotion day (56.8%). Less than one-quarter of respondents had heard about World Sleep Day (20.3%), World Mental Health Day (24.5%), and World Suicide Prevention Day (18.7%). Of the 16 true-false questions, the items that were most likely to be answered correctly were Item 11, "An optimistic attitude towards life, good inter-personal relationships, and healthy living habits are helpful to maintain mental health" (94.1%), Item 5, "The main content of mental health includes normal intelligence, stable emotion, good mood, and harmonious inter-personal relationships" (87.9%), and Item 1, " Is mental health an integral part of health?" (87.2%). Items with the lowest correct response rates were Item 2, "Mental illnesses are caused by ethically (or politically) incorrect thinking" (23.59%), Item 4, "All the mental disorders are due to arousal of violent emotion" (27.34%), and Item 9, "Psychological/psychiatric disorders can never be prevented" (41.81%). The correct response rate of each question was displayed in table 2.

Table 2. Correct response rate of MHKQ (*N*=2052)

Item	Question [correct response]	%
16 true-false questions		
11	Positive attitudes, good interpersonal relationships and a healthy life style can help maintain mental health. [true]	94.15
5	Components of mental health include normal intelligence, stable mood, a positive attitude, quality interpersonal relationships, and adaptability. [true]	87.87
1	Mental health is a component of health. [true]	87.23
7	Psychological or psychiatric services should be sought if one suspects the presence of psychological problems or a mental disorder. [true]	86.01
16	Mental problems or disorders may occur when an individual is under psychological stress or facing major life events (e.g. death of family	79.68

	members). [true]	
8	Psychological problems can occur at almost any age. [true]	78.65
3	Many people have mental problems but do not realize it. [true]	76.27
15	Individuals with a bad temperament are more likely to have mental problems. [true]	74.12
13	Psychological problems in adolescents do not influence academic grades. [false]	72.86
12	Individuals with a family history of mental disorders are at a higher risk for psychological problems and mental disorders. [true]	63.99
6	Most mental disorders cannot be cured. [false]	54.04
10	Even for severe mental disorders (e.g. schizophrenia), medications should be taken for a given period of time only; there is no need to take them for a long time. [false]	48.15
14	Middle-aged or elderly individuals are unlikely to develop psychological problems and mental disorders. [false]	46.73
9	Mental disorders and psychological problems cannot be prevented. [false]	41.81
4	All mental disorders are caused by external stressors. [false]	27.34
2	Mental disorders are caused by incorrect thinking. [false]	23.59
4 mental health promotion activities		
18	Have you heard about the International Day against Drug Abuse and Illicit Drug Trafficking? [true]	56.77
17	Have you heard about International Mental Health Day? [true]	24.46
20	Have you heard about World Sleep Day? [true]	20.27
19	Have you heard about the International Suicide Prevention Day? [true]	18.71

Association between social-demographics and MHL

The mean total score of the sample was 11.63 ± 2.9. Table 3 shows the mean MHKQ scores for different demographic groups of subjects. There were statistically significant differences in the scores by age, education, employment, income, and marital status. Univariate analyses showed that younger age, higher education, being employed, higher income, and being single is associated with higher mental health knowledge. Subsequent multiple linear regressions controlling for all demographics factors showed that age, education, and income were independently associated with MHL (Table 4). Participants with younger age, higher education, and higher income

had better MHL. When age increases by one year, the MHKQ score decreases by a slight 0.02 points. When education increases from primary school to middle school and college, MHKQ score increases by 1.38 and 2.69 points, respectively. When income increases from below 300 CNY/month to above 300 CNY/month, MHKQ score increases by 0.41 points.

Table 3 Univariate analysis of the MHKQ score

Item		n	Mean score	t/F	*p*
Total		2052	11.63		
Gender	Male	907	11.74		
	Female	1145	11.54	1.58	0.11
Nationality	Han	2042	11.62		
	Non-Han	10	12.8	-1.26	0.21
Age	18-25	227	12.48		
	26-35	344	12.54		
	36-45	687	11.58		
	46-60	794	11.01	29.97	<0.01
Education	Primary school or less	814	10.45		
	Middle school	925	12.06		
	College and above	313	13.42	151.88	<0.01
Employment	Unemployed	797	11.41		
	Employed	1254	11.76	2.66	0.01
Income (CNY/Month)	150 or less	936	11.29		
	151-300	475	11.81		
	300 or greater	575	12.07	13.84	<0.01
Marital Status	Married/cohabited	1867	11.58		
	Divorced/separated/widowed	40	11.35		
	Never married	145	12.37	5.02	0.01
Religion	Yes	205	11.42		
	No	1847	11.65	-1.04	0.30

Table 4 Multiple linear regression of MHKQ scale scores

Variable		Coef.	Std. Coef	t	p>|t|	95%CI
Age (continuous)		-0.02	0.01	-3.51	<0.001**	(-0.04, -0.01)
Gender	Male (ref)					
	Female	-0.00	0.14	-0.00	0.997	(-0.27, 0.27)
Nationality	Han (ref)					
	Non-han	1.34	0.87	1.53	0.125	(-0.37, 3.06)
Education	Primary school or less(ref)					
	Middle school	1.38	0.14	9.53	<0.001**	(1.10, 1.66)
	College and above	2.69	0.21	13.03	<0.001**	(2.41, 3.23)
Employment	Unemployed(ref)					
	Employed	-0.22	0.14	-1.60	0.109	(-0.49, 0.05)
Income	150 or less(ref)					
(CNY/Month)	151-300	0.25	0.16	1.63	0.104	(-0.05, 0.56)
	300 or greater	0.41	0.15	2.73	0.006**	(0.12, 0.70)
Marital Status	Married/cohabited (ref)					
	Divorced/separated/widowed	0.13	0.26	0.49	0.624	(-0.39, 0.65)
	Never married	0.58	0.53	1.09	0.276	(-0.46, 1.63)
Religion	Yes(ref)					
	No	-0.04	0.21	-0.21	0.837	(-0.45, 0.36)

**significant at p=0.01

Association between MHL and health outcomes

To explore the association between MHL and health outcomes, we conducted multiple linear regression for SRHMS, PHQ, and GAD independently, adjusting for all demographics. Our results showed that MHL was independently positively associated with self-rated general health (r=2.31, p<0.01), including physical health (r=0.46, p<0.01), mental health (r=0.54, p<0.01), and social health (r=1.07, p<0.01), regardless of demographics. A one-point increase in MHL will lead to an increase of 2.31 points in self-rated general health. MHL was also independently negatively associated with depression (r= -0.09, p<0.01) and anxiety (r= -0.07, p<0.05), regardless of demographics. A one point increase in MHL leads to 0.09 point decrease in depression scores and 0.07 point decrease in anxiety scores.

Table 5 Association between MHL and each health outcome (SRHMS, PHQ and GAD) using multiple linear regression models adjusted for demographics

Health outcomes		Coef.	Std. Coef.	t	p>|t|	95%CI
SRHMS	Physical health	0.46	0.15	3.14	0.002**	(0.17, 0.75)
	Mental health	0.54	0.17	3.20	0.001**	(0.21, 0.87)
	Social health	1.07	0.14	7.56	<0.001**	(0.80, 1.35)
	Total health	2.31	0.40	5.79	<0.001**	(1.53, 3.09)
PHQ	Depression	-0.09	0.03	-2.81	0.005**	(-0.15, -0.03)
GAD	Anxiety	-0.07	0.03	-2.50	0.013*	(-0.13, -0.02)

*significant at p=0.05, **significant at p=0.01

DISCUSSION

The study was conducted to assess mental health literacy in rural areas after the Ministry of Health issued the "2002-2010 China Mental Health Work Plan" [28], which aims to increase public awareness rate of the characteristics and prevention of mental disorders to 50% by 2010. The current study in the rural areas of Liuyang is based on a protocol developed by the China Ministry of Health, which produced data on community members' mental health literacy to provide guidance and a basis for future mental health advocacy and education. The mean overall correct response rate of mental health literacy identified in this study is 58%, suggesting that the goal of "2002-2010 China Mental Health Work Plan" has been achieved in rural areas of Liuyang. However, this rate is lower than those reported in urban areas of China such as Shanghai (72%) [10], Guangzhou (60.2%) [41], Changsha (68.5%) [11], and Xi'an (70.3%) [42]. This may be explained by the less developed economy in the rural areas of China. Mental health literacy in less developed rural areas is in need of improvement through both population wide interventions and individual training

programs [26].

Compared to the 57% awareness rate of the "International Day Against Drug Abuse and Illicit Trafficking", the awareness rate of World Mental Health Day, World Suicide Prevention Day, and World Sleep Day are much lower. The reason may be that the government has put much greater emphasis on drug abuse and trafficking, due to its greater potential to threaten and endanger social safety and stability compared to other mental health problems such as sleep disorders and suicide. Promotion efforts on the other three days need to be strengthened by the government to increase public awareness of these issues and popularize knowledge about them. Most people (over 70%) held misbeliefs about the etiology of mental illness, thinking that ethically incorrect thinking or the arousal of violent emotions causes mental illnesses. These misattributions are consistent with reports in previous studies in China [10, 11], implying that misattribution of mental illness is prevalent all over the country. The misconception of the causes of mental illness may be an important antecedent for the pervasive negative attitudes towards mentally ill patients. Future targeted intervention may benefit from starting with educating the public on accurate recognition of causes of mental illness.

Significant differences in the mental health literacy score between different demographic groups of respondents were found in the current study. Multivariate linear regression indicated that younger age, higher education, and higher income were the most robust factors associated with higher mental health literacy. These results are consistent with previous studies [10-12]. Higher education, as an indicator

of higher health literacy, can be seen as an indirect indicator of MHL and thus is associated with higher MHL. Higher income, usually accompanied with higher education, is also related to higher MHL. Interestingly, being younger, instead of being older is associated with higher MHL. The reason may be related to the different social political environments that the different generations have experienced. During the Chinese Cultural Revolution (1966–1976), education was not valued by the Chinese government, leading to many people not receiving an education when they were young. It was not until 1986 when the government introduced the nine-year compulsory education policy that education became popularized to citizens all over the nation. Since then, the educational level of people has increased throughout China. The negative correlation found between age and MHL may reflect China's political history.

The positive impact of high MHL on a series of health outcomes including physical, mental, and social health is established in the present study. The result that people with higher MHL also enjoy better physical and social health is a novel finding that has not been reported before in existing literature. The mechanism behind this association may be related to the improved help-seeking behavior that has been widely documented among people with higher MHL [16-19], which may lead to increased general health outcomes including physical health and social health. The finding that increased MHL is associated with increased general health provides strong motivation to enhance population MHL through a series of educational campaigns.

One limitation of the present study is the unfavorable internal consistency of the 20-items MHKQ scale (Cronbach's α =0.61), which is consistent with previous studies showing weak to acceptable internal consistency [10, 11, 29]. However, this may be due to the fact that for knowledge scales measuring various factors of a construct, knowing the correct answer of one item does not necessarily lead to the right recognition of another item, thus a very high internal consistency may not be expected. Indeed, as a standardized government document developed by the Chinese Ministry of Health (MOH) to assess the public knowledge and awareness of mental health, the MHKQ has been popularized as a national gold standard to compare MHL across the country. The purpose of the present study is not to test the psychometric properties of the MHKQ, but to compare the level of MHL in the rural areas of Liuyang with other parts of China. As a result, the psychometric properties of the MHKQ are not of primary importance, given that the scale is comparable across different studies.

Another limitation is the cross-sectional design of the study, which precludes evaluation of temporal sequence of MHL and health outcomes, and causal relationships cannot be determined. However, according to the scale's design, the SRHMS assesses self-rated health in the past four weeks [30, 31], the PHQ [34] and GAD [38] measure depression and anxiety in the past two weeks, while the MHKQ measures an individual's lifetime knowledge and belief about mental health, which may take root in a person's early life. We could infer a potential causal relationship between MHL and health outcomes.

A third limitation is a lack of comparison between MHKQ with other multifaceted scales intending to measure MHL. The fact that MHKQ is developed and used only in China makes it difficult to compare the psychometric properties of the Chinese version of MHKQ with other scales used in other populations outside China, since psychometric testing is also sample-dependent [43]. Future research may benefit from applying the English version of the MHKQ together with other scales in the same study to compare its feasibility and psychometric properties.

In conclusion, MHL in the rural areas of Liuyang is lower than that reported in urban areas of China. More efforts are needed to increase public awareness of mental health promotion activities and more population-level intervention programs are needed to educate the public about the correct attribution of mental disorders. Younger age, higher education, and higher income are the three strongest factors related to higher MHL, so educational interventions may need to be cohort-specific with special attention paid to those who are older, poorer, and less educated. Higher MHL is related to better general health including physical, mental, and social health, suggesting that improvement of MHL may enhance overall population health, warranting future exploration.

Ethical Statement

This study was approved by the Institutional Review Boards of the School of Public Health of Central South University and was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. All

participants in the present study gave their informed consent prior to their inclusion in the study. Details that might disclose the identity of the subjects under study were omitted and all data collected were unidentified.

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Conflicts of interest statement

The authors have no conflicts of interest to declare.

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Figure 1. Flowchart of subject enrollment

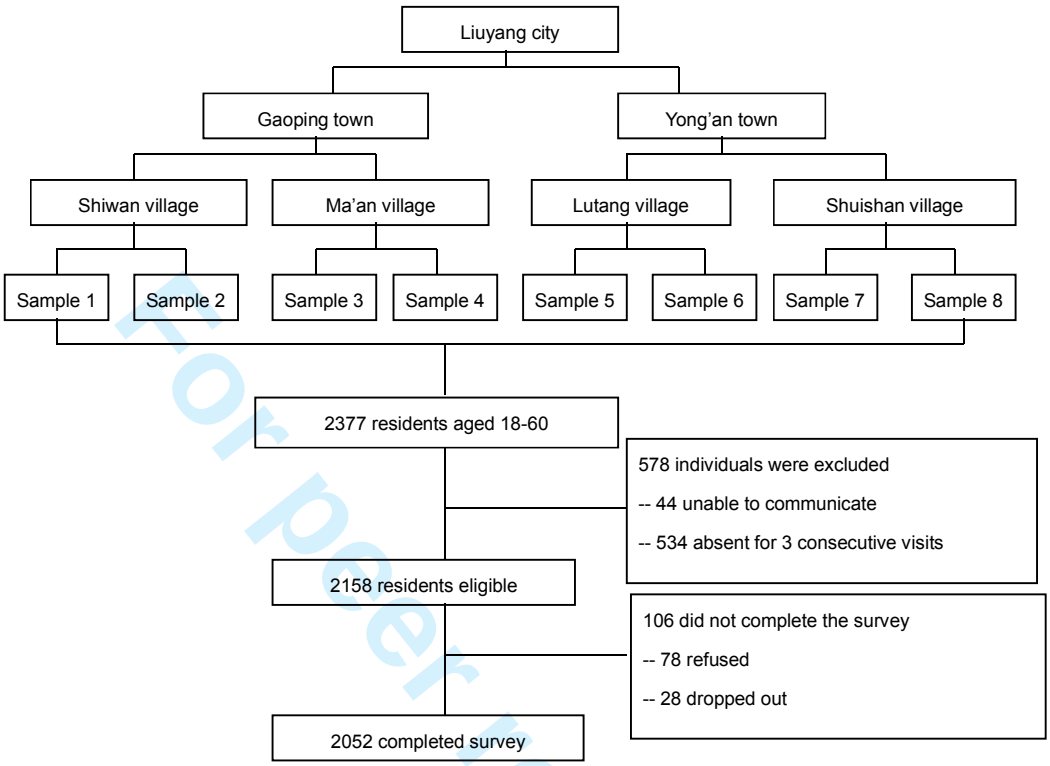

Figure 1. Flowchart of subject enrollment

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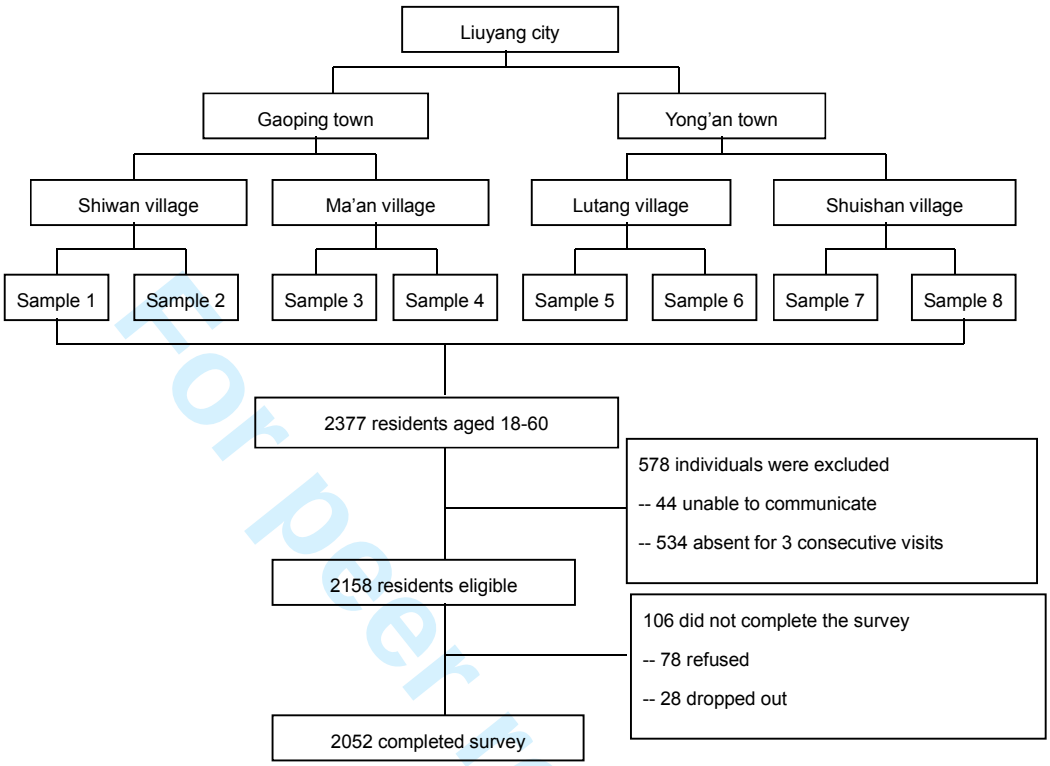

Figure 1. Flowchart of subject enrollment

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Assessment of Mental Health Literacy Using a Multifaceted Measure among a Chinese Rural Population

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Primary Subject Heading:	Mental health
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Assessment of Mental Health Literacy Using a Multifaceted Measure among a Chinese Rural Population

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ABSTRACT

Objectives： The present study aims to assess Mental health literacy (MHL) using a standardized multifaceted 20-item instrument called Mental health knowledge questionnaire(MHKQ) developed by the Chinese Ministry of Health among a rural Chinese population.

Setting: Four villages in Liuyang county of Hunan province, China

Participants: This was a cross-sectional study. A multistage cluster-sampling method was adopted, leading to a final sampling frame of 2377 residents aged 18-60 from 4 villages of Liuyang county. Inclusion criteria were all residents aged 18-60 living in the village for at least half a year; exclusion criteria were those who were not living in the areas during the research period, those with difficulty in communication due to serious physical or mental illness, and those who were cognitively impaired or actively psychotic. Finally, 2052 completed the survey.

Primary and secondary outcome measures: Primary outcome was correct response rate of the MHKQ, secondary outcome measures were association between socio-demographics and MHL, and association between MHL and health outcomes.

Results: Correct response rates for the 20 MHKQ items ranged from 19 to 94%, with a mean rate of 58%. Younger age(r= -0.02, p<0.01), higher education(r: 1.38 - 2.69,

p<0.01), and higher income (r= 0.41, p<0.01) were independently associated with higher MHL. MHL was independently associated with self-rated general health (*r*=2.31, *p*<0.01), depression (r= -0.09, p<0.01) and anxiety (r= -0.07, p<0.05).

Conclusions: MHL in the rural areas of Liuyang is lower than that reported in urban areas of China. There is much room for improvement with regard to mental health literacy promotion in rural areas of China. Younger age, higher education, and higher income are the three robust factors related to higher MHL, so cohort-specific educational intervention efforts may be indicated.

Article summary

Strengths

- Broadening the definition of mental health literacy (MHL) to include both "illness literacy", as well as "health literacy".
- Assessing population level MHL in rural China using a multifaceted measurement tool---the mental health knowledge questionnaire (MHKQ) instead of vignettes based in Western cultural contexts.
- Exploring the relationship between MHL and a range of health outcomes, which is a substantially underdeveloped area of research.

Limitations

- Lack of comprehensive psychometric testing of the MHKQ.
- The cross-sectional study design makes causal relationships undeterminable.

- Lack of comparison between MHKQ with other multifaceted scales intending to measure MHL as the MHKQ has not be utilized outside of China.

INTRODUCTION

Mental health literacy (MHL) refers to knowledge and beliefs about mental health disorders that aid in their recognition, management, or prevention [1]. First introduced in 1997 by Australian researchers Jorm and colleagues, this definition has become a gold standard within research and practice on MHL [2]. According to Jorm et al., MHL includes seven key components: (1) the ability to recognise specific disorders; (2) knowledge of how to seek mental health information; (3) knowledge of risk factors of mental illness; (4) knowledge of causes of mental illness; (5) knowledge of self-treatments; (6) knowledge of professional help available; and (7) attitudes that promote recognition and appropriate help-seeking. Based on Jorm et al.'s definition, O'Connor et al. grouped the seven key components of MHL into recognition, knowledge of factors relating to mental health, and attitudes and beliefs about mental disorders [2]. Of the various aspects of mental health literacy, recognition of mental disorders is the most common attribute measured in MHL as it is the first step towards mental health literacy and forms a prerequisite for measurement of other attributes.

Ever since the definition of MHL was first proposed, the concept has drawn extensive attention to the public's low level of MHL, with growing evidence showing low recognition rate of common mental disorders among various populations in both developed and developing countries. For example, the recognition rate of depression

is less than 50% among adolescents [3] and college students [4] in the US, and is only 11% among cancer patients and 25% among lay people in Japan [5]. One study among Portuguese youth reported the recognition rate of schizophrenia or psychosis as 42.17% and 22.21%, respectively [6], while another study amongst resettled Iraqi refugees found that only 14.2% of participants recognized posttraumatic stress disorder. Further investigation of the factors related to MHL has found that female gender [7-9], higher education [10 11], younger age [10-12] and being employed [11] are associated with higher MHL. The importance of MHL in help-seeking behavior has also been studied, with evidence indicating that lack of MHL is a main challenge that patients and families face in seeking help [13 14], especially in Asian cultures where utilization of mental health services are lower across the board [15]. There is also growing evidence showing that higher MHL is associated with better access to and utilization of mental health services [16 17]. Moreover, increasing MHL can improve help-seeking behavior, the quality of mental health service and as a result, patients' symptoms [18 19].

Despite the rich and abundant research on MHL all over the world, it is important to note that there are three major limitations in existing studies on MHL.

First, the most widely used definition of MHL by Jorm is problematically narrow in its scope. Based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), Jorm's definition of MHL is illness-oriented, neglecting the fact that health-oriented literacy including self-regulation strategies and techniques to improve mental health should also be incorporated as an important component of MHL [20].

Kusan [21] and Wei et al. [22] have suggested a broader definition of MHL including knowledge to enhance and maintain good mental health, knowledge of mental disorders and their treatments, decreased stigma against mental disorders, and enhanced help-seeking efficacy, however, this definition is rarely used in research related to MHL.

Second, existing assessment of MHL mainly relies on a vignette interview approach, which may not comprehensively reflect respondents' understanding of mental health. In the vignette interview approach, a vignette is presented that describes an individual with a mental health difficulty and asks a series of questions related to participants' understanding of what is "wrong" with the individual in the vignette [1, 23]. The vignette interview approach usually targets one specific mental disorder without reflecting understanding of the multifaceted concept of MHL. It is especially lacking in assessment of people's health literacy, thus evaluation of MHL based on the vignette interview approach may be incomplete. Furthermore, the vignette interview approach does not provide for a total or subscale score to be generated, nor does it allow for subscales to be included, making it impossible to make individual-level comparisons on each specific attribute of the multifaceted MHL [2]. Moreover, the questions of the vignette are not independent, with the answer to the first question forming the basis for the answers to the remaining questions, which may not reflect the respondent's true knowledge of the etiology and treatment of mental disorders[2].

Third, most of previous research has focused on the current situation of MHL

and its association with demographics characteristics such as gender, age, education and employment, without noticing the potential impact of MHL on a series of health outcomes including physical, mental, and social health. Although improved MHL has been proven to generate improved mental health at the individual level in two intervention studies [24, 25], whether this could be translated into gains at the population level remains to be seen [26]. Even less is known about the impact of improved MHL on other domains of health such as physical and social health.

In light of these gaps, in the current study, we administered a 20-item instrument developed by the Chinese Ministry of Health —the Mental Health Knowledge Questionnaire (MHKQ) [27]—to assess MHL in a representative sample of rural adults living in Liuyang City of Hunan Province, China. Based on the broader definition Of MHL raised by Kusan and Wei [21-22], MHKQ assesses both "disorder literacy" and "health literacy" of individuals. The MHKQ was used as a nationwide gold standard to assess the public's MHL, after the "2002-2010 China Mental Health Work Plan" [28] was issued by the Ministry of Health, with the purpose of increasing public's MHL to 50% by 2010. The present study aims to measure the current level of MHL in the rural areas of Liuyang county in Hunan province, and to explore its association with social-demographics and a series of health outcomes including physical, mental, and social health.

METHODS

Participants

This was a cross-sectional study. The target population was residents aged 18-60 who have lived in the rural areas of Liuyang County, Hunan Province for over 6 months. The survey was conducted from November 2010 to August 2011. A multistage cluster-sampling method was adopted to identify subjects (See Figure 1). Two towns (Gaoping and Yongan) were randomly selected from 33 towns of Liuyang county, and then two villages were randomly selected from each town, followed by two samples randomly selected from each village, leading to a total sampling frame of 8 samples. Those who were not living in the areas during the research period, those with difficulty in communication due to serious physical or mental illness, and those who were cognitively impaired or actively psychotic were excluded, leading to a final sample of 2052 residents.

Interviewers visited each household and conducted face-to-face interview with each eligible respondent after obtaining written informed consent. Each interview took approximately 1 hour, and each household was reimbursed with small gifts such as kitchen utensils ($2). Completed surveys were checked by a quality control person to ensure that there were no inconsistencies or missing items. Ethics approval was granted by the Institutional Review Board of the School of Public Health of Central South University.

Instruments

MHKQ The Mental Health Knowledge Questionnaire (MHKQ) is a 20-item self-report questionnaire developed by the Chinese Ministry of Health (MOH) in 2009

to assess public knowledge and awareness of mental health. Items 1-16 are statements about mental health that require respondents to choose 'true', 'false', or 'unknown'; correct responses are 'true' for items 1, 3, 5, 7, 8, 11, 12, 15 and 16, and 'false' for items 2, 4, 6, 9, 10 13 and 14. 1 point is given to each correct answer, with incorrect or unknown responses receiving 0 points. Items 17-20 ask about whether the respondents have heard of four mental health promotion days, with 1 or 0 points given to those answering 'yes' and 'no', respectively. Past psychometric testing of the scale has reported internal consistency of Cronbach's α coefficients ranging from 0.57 to 0.73 [10, 11, 29] and a 2-week test–retest reliability as measured by intra-class correlation coefficients of 0.68 [29]. However, there has been inconsistency regarding subscales of the MHKQ, with four [11, 29] and five subscales [10] being reported in various studies. In the present study, the MHKQ had a Cronbach's α coefficient of 0.61. An exploratory factor analysis yielded a three-factor solution, which covers three aspects of MHL including knowledge of the characteristics of mental health and mental disorders (items 1, 2, 3, 5, 7, 8, 11, 12, 15 and 16), belief in the epidemiology of mental disorders (items 4, 6, 9, 10, 13 and 14), and awareness of mental health promotion activities (items 17-20), with Cronbach's α coefficients ranging from 0.62 to 0.67.

SRHMS The Self-Rated Health Measurement Scale (SRHMS) is a 48-item scale developed and revised by Xu et al. [30, 31] to assess self-rated health in both hospitalized and general populations. It is a comprehensive scale measuring 9

domains of health including physical symptoms and organ functions (B1), daily physical activities (B2), physical mobility (B3), psychological symptoms and negative emotions (M1), positive emotions (M2), cognitive function (M3), role activity and social adaptability (S1), social resource and social contact (S2), and social support (S3), which are grouped into three categories in the present study: physical health (BZT), mental health (MZT) and social health (SZT). Each item is rated on a 10-point scale from 1 = 'extremely poor health' to 10 = 'extremely good health'. Items 4, 5, 7, 24, 25, 26, 27, 28, 29, and 30 are reversed scored and a cumulative score is obtained by adding individual scores. The SRHMS has widespread use in China [30, 32, 33] and demonstrated good internal consistency in the current study, with a Cronbach's α coefficient of 0.91for the total scale and 0.80-0.82 for its three subscales.

PHQ-9 The Patient Health Questionnaire (PHQ-9) is one of the most widely used screening tools for depression in adults. The 9-item questionnaire was based on criteria for depressive disorders in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) [34]. Respondents are asked whether they have been bothered by 9 symptoms in the past two weeks on a 4-point Likert scale from 0 = 'not at all' to 3 = 'nearly every day', with higher scores indicating higher depression. A total score is calculated by adding the scores of each item and ranges from 0 to 27. The Chinese version of PHQ-9 has been well validated in multiple studies [35-37] and showed good internal consistency in the current study, with a Cronbach's α coefficient of 0.81.

GAD-7 The Generalized Anxiety Disorder Scale (GAD-7) is a 7-item self-report scale developed by Spitzer et al. [38] to assess symptoms of and screen for generalised anxiety disorder in primary care settings. Respondents are asked to choose how often they have been bothered by anxiety symptoms on a 4-point Likert scale from 0 = 'not at all' to 3 = 'nearly every day'. A total score is calculated by adding the scores of each item and ranges from 0 to 21, with higher scores indicating higher anxiety. The GAD-7 has been widely used and well validated in both psychiatric settings [39] and general populations [40] and demonstrated good internal consistency in the current study with a Cronbach's α coefficient of 0.88.

Data analysis

Data were analyzed using STATA software version 12.0. Socio-demographic characteristics of the sample were examined using descriptive statistics. *t*-tests and ANOVA were used to compare the MHL score of respondents by gender, age, ethnicity, education, employment, income, marriage, and religion, followed by multiple linear regression to identify the characteristics of respondents that were independently related to the assessed level of MHL. The association between MHL and each of the health outcomes including self-rated mental health, physical health, social health, depression and anxiety were analyzed using separate multiple linear regression models adjusted for all demographics.

RESULTS

Sample characteristics

A total of 2052 residents completed the questionnaires with a response rate of 95.1%, and their demographic characteristics are summarized in Table 1. The median age of the sample was 42 with a range of 18-59, with more female (55.80%) than male (44.20%) participants. Most of the sample were of Han ethnicity (99.5%), married (90.98%), and non-religious (90.01%), with low education (middle school and below: 84.75%). 61.11% of the sample were employed, and over two-thirds had a monthly income of lower than 300 CNY.

Table 1 Socio-demographics of the sample (*N*=2052)[a]

Characteristics		*n*	%
Gender	Male	907	44.20
	Female	1145	55.80
Age (years)	18-25	227	11.06
	26-35	344	16.76
	36-45	687	33.48
	46-60	794	38.69
Ethnicity	Han	2042	99.51
	Non-Han	10	0.49
Education	Primary school or lower	814	39.67
	Middle school	925	45.08
	High school and above	313	15.25
Employment	Unemployed	797	38.84
	Employed	1254	61.11
Income	150 or less	936	45.61
(CNY/Month/person)	151-300	475	23.15
	300 or greater	575	28.02
Marital Status	Never married	145	7.07
	Married/cohabiting	1867	90.98
	Divorced/separated/widowed	40	1.95
Religion	Yes	205	9.99
	No	1847	90.01

Abbreviation: CNY, Chinese Yuan

[a] Some percentages don't add up to 100 due to missing values

Correct response rate of the MHKQ

In this sample, the correct response rate of the 20 items ranged from 18.7% to 94.1%, with a mean correct response rate of 58.1%. The computed MHL score ranged from 0 to 20 and the mean (SD) value was 11.6 (2.9). Awareness rate of the four international mental health awareness days ranged from 18.7% to 56.8% with "International Day Against Drug Abuse and Illicit Trafficking" as the most widely recognized mental health promotion day (56.8%). Less than one-quarter of respondents had heard about World Sleep Day (20.3%), World Mental Health Day (24.5%), and World Suicide Prevention Day (18.7%). Of the 16 true-false questions, the items that were most likely to be answered correctly were Item 11, "An optimistic attitude towards life, good inter-personal relationships, and healthy living habits are helpful to maintain mental health" (94.1%), Item 5, "The main content of mental health includes normal intelligence, stable emotion, good mood, and harmonious inter-personal relationships" (87.9%), and Item 1, "Is mental health an integral part of health?" (87.2%). Items with the lowest correct response rates were Item 2, "Mental illnesses are caused by ethically (or politically) incorrect thinking" (23.59%), Item 4, "All the mental disorders are due to arousal of violent emotion" (27.34%), and Item 9, "Psychological/psychiatric disorders can never be prevented" (41.81%). The correct response rate of each question was displayed in table 2.

Table 2. Correct response rate of MHKQ (*N*=2052)

Item	Question [correct response]	%
16 true-false questions		
11	Positive attitudes, good interpersonal relationships and a healthy life style can help maintain mental health. [true]	94.15

5	Components of mental health include normal intelligence, stable mood, a positive attitude, quality interpersonal relationships, and adaptability. [true]	87.87
1	Mental health is a component of health. [true]	87.23
7	Psychological or psychiatric services should be sought if one suspects the presence of psychological problems or a mental disorder. [true]	86.01
16	Mental problems or disorders may occur when an individual is under psychological stress or facing major life events (e.g. death of family members). [true]	79.68
8	Psychological problems can occur at almost any age. [true]	78.65
3	Many people have mental problems but do not realize it. [true]	76.27
15	Individuals with a bad temperament are more likely to have mental problems. [true]	74.12
13	Psychological problems in adolescents do not influence academic grades. [false]	72.86
12	Individuals with a family history of mental disorders are at a higher risk for psychological problems and mental disorders. [true]	63.99
6	Most mental disorders cannot be cured. [false]	54.04
10	Even for severe mental disorders (e.g. schizophrenia), medications should be taken for a given period of time only; there is no need to take them for a long time. [false]	48.15
14	Middle-aged or elderly individuals are unlikely to develop psychological problems and mental disorders. [false]	46.73
9	Mental disorders and psychological problems cannot be prevented. [false]	41.81
4	All mental disorders are caused by external stressors. [false]	27.34
2	Mental disorders are caused by incorrect thinking. [false]	23.59
4 mental health promotion activities		
18	Have you heard about the International Day against Drug Abuse and Illicit Drug Trafficking? [true]	56.77
17	Have you heard about International Mental Health Day? [true]	24.46
20	Have you heard about World Sleep Day? [true]	20.27
19	Have you heard about the International Suicide Prevention Day? [true]	18.71

Association between social-demographics and MHL

The mean total score of the sample was 11.63 ± 2.9. Table 3 shows the mean MHKQ scores for different demographic groups of subjects. There were statistically significant differences in the scores by age, education, employment, income, and marital status. Univariate analyses showed that younger age, higher education, being

employed, higher income, and being single is associated with higher mental health knowledge. Subsequent multiple linear regressions controlling for all demographics factors showed that age, education, and income were independently associated with MHL (Table 4). Participants with younger age, higher education, and higher income had better MHL. When age increases by one year, the MHKQ score decreases by a slight 0.02 points. When education increases from primary school to middle school and college, MHKQ score increases by 1.38 and 2.69 points, respectively. When income increases from below 150 CNY/month to above 300 CNY/month, MHKQ score increases by 0.41 points.

Table 3 Univariate analysis of the MHKQ score

Item		n	Mean score	t/F	*p*
Total		2052	11.63		
Gender	Male	907	11.74		
	Female	1145	11.54	1.58	0.11
Nationality	Han	2042	11.62		
	Non-Han	10	12.8	-1.26	0.21
Age	18-25	227	12.48		
	26-35	344	12.54		
	36-45	687	11.58		
	46-60	794	11.01	29.97	<0.01
Education	Primary school or less	814	10.45		
	Middle school	925	12.06		
	College and above	313	13.42	151.88	<0.01
Employment	Unemployed	797	11.41		
	Employed	1254	11.76	2.66	0.01
Income	150 or less	936	11.29		
(CNY/Month)	151-300	475	11.81		
	300 or greater	575	12.07	13.84	<0.01
Marital Status	Married/cohabited	1867	11.58		
	Divorced/separated/widowed	40	11.35		
	Never married	145	12.37	5.02	0.01
Religion	Yes	205	11.42		
	No	1847	11.65	-1.04	0.30

Table 4 Multiple linear regression of MHKQ scale scores

Variable		Coef.	Std. Coef	t	p>|t|	95%CI
Age (continuous)		-0.02	0.01	-3.51	<0.001**	(-0.04, -0.01)
Gender	Male (ref)					
	Female	-0.00	0.14	-0.00	0.997	(-0.27, 0.27)
Nationality	Han (ref)					
	Non-han	1.34	0.87	1.53	0.125	(-0.37, 3.06)
Education	Primary school or less(ref)					
	Middle school	1.38	0.14	9.53	<0.001**	(1.10, 1.66)
	College and above	2.69	0.21	13.03	<0.001**	(2.41, 3.23)
Employment	Unemployed(ref)					
	Employed	-0.22	0.14	-1.60	0.109	(-0.49, 0.05)
Income	150 or less(ref)					
(CNY/Month)	151-300	0.25	0.16	1.63	0.104	(-0.05, 0.56)
	300 or greater	0.41	0.15	2.73	0.006**	(0.12, 0.70)
Marital Status	Married/cohabited (ref)					
	Divorced/separated/widowed	0.13	0.26	0.49	0.624	(-0.39, 0.65)
	Never married	0.58	0.53	1.09	0.276	(-0.46, 1.63)
Religion	Yes(ref)					
	No	-0.04	0.21	-0.21	0.837	(-0.45, 0.36)

**significant at p=0.01

Association between MHL and health outcomes

To explore the association between MHL and health outcomes, we conducted multiple linear regression for SRHMS, PHQ, and GAD independently, adjusting for all demographics. Our results showed that MHL was independently positively associated with self-rated general health (r=2.31, p<0.01), including physical health (r=0.46, p<0.01), mental health (r=0.54, p<0.01), and social health (r=1.07, p<0.01),

regardless of demographics. A one-point increase in MHL will lead to an increase of 2.31 points in self-rated general health. MHL was also independently negatively associated with depression (r= -0.09, p<0.01) and anxiety (r= -0.07, p<0.05), regardless of demographics. A one point increase in MHL leads to 0.09 point decrease in depression scores and 0.07 point decrease in anxiety scores.

Table 5 Association between MHL and each health outcome (SRHMS, PHQ and GAD) using multiple linear regression models adjusted for demographics[b]

Health outcomes		Coef.	Std. Coef.	t	p>|t|	95%CI
SRHMS	Physical health	0.46	0.15	3.14	0.002**	(0.17, 0.75)
	Mental health	0.54	0.17	3.20	0.001**	(0.21, 0.87)
	Social health	1.07	0.14	7.56	<0.001**	(0.80, 1.35)
	Total health	2.31	0.40	5.79	<0.001**	(1.53, 3.09)
PHQ	Depression	-0.09	0.03	-2.81	0.005**	(-0.15, -0.03)
GAD	Anxiety	-0.07	0.03	-2.50	0.013*	(-0.13, -0.02)

[b] adjusted demographics included: age, gender, nationality, education, employment, income, marital status, and religion.

*significant at p=0.05, **significant at p=0.01

DISCUSSION

The study was conducted to assess mental health literacy in rural areas after the Ministry of Health issued the "2002-2010 China Mental Health Work Plan" [28], which aims to increase public awareness rate of the characteristics and prevention of mental disorders to 50% by 2010. The current study in the rural areas of Liuyang is based on a protocol developed by the China Ministry of Health, which produced data on community members' mental health literacy to provide guidance and a basis for future mental health advocacy and education. The mean overall correct response rate of mental health literacy identified in this study is 58%, suggesting that the goal of

"2002-2010 China Mental Health Work Plan" has been achieved in rural areas of Liuyang. However, this rate is lower than those reported in urban areas of China such as Shanghai (72%) [10], Guangzhou (60.2%) [41], Changsha (68.5%) [11], and Xi'an (70.3%) [42]. This may be explained by the less developed economy in the rural areas of China. Mental health literacy in less developed rural areas is in need of improvement through both population wide interventions and individual training programs [26].

Compared to the 57% awareness rate of the "International Day Against Drug Abuse and Illicit Trafficking", the awareness rate of World Mental Health Day, World Suicide Prevention Day, and World Sleep Day are much lower. The reason may be that the government has put much greater emphasis on drug abuse and trafficking, due to its greater potential to threaten and endanger social safety and stability compared to other mental health problems such as sleep disorders and suicide. Promotion efforts on the other three days need to be strengthened by the government to increase public awareness of these issues and popularize knowledge about them. Most people (over 70%) held misbeliefs about the etiology of mental illness, thinking that ethically incorrect thinking or the arousal of violent emotions causes mental illnesses. These misattributions are consistent with reports in previous studies in China [10, 11], implying that misattribution of mental illness is prevalent all over the country. The misconception of the causes of mental illness may be an important antecedent for the pervasive negative attitudes towards mentally ill patients. Future targeted intervention may benefit from starting with educating the public on accurate recognition of causes

of mental illness.

Significant differences in the mental health literacy score between different demographic groups of respondents were found in the current study. Multivariate linear regression indicated that younger age, higher education, and higher income were the most robust factors associated with higher mental health literacy. These results are consistent with previous studies [10-12]. Higher education, as an indicator of higher health literacy, can be seen as an indirect indicator of MHL and thus is associated with higher MHL. Higher income, usually accompanied with higher education, is also related to higher MHL. Interestingly, being younger, instead of being older is associated with higher MHL. The reason may be related to the different social political environments that the different generations have experienced. During the Chinese Cultural Revolution (1966–1976), education was not valued by the Chinese government, leading to many people not receiving an education when they were young. It was not until 1986 when the government introduced the nine-year compulsory education policy that education became popularized to citizens all over the nation. Since then, the educational level of people has increased throughout China. The negative correlation found between age and MHL may reflect China's political history.

The positive impact of high MHL on a series of health outcomes including physical, mental, and social health is established in the present study. The result that people with higher MHL also enjoy better physical and social health is a novel finding that has not been reported before in existing literature. The mechanism behind this

association may be related to the improved help-seeking behavior that has been widely documented among people with higher MHL [16-19], which may lead to increased general health outcomes including physical health and social health. The finding that increased MHL is associated with increased general health provides strong motivation to enhance population MHL through a series of educational campaigns.

One limitation of the present study is the unfavorable internal consistency of the 20-items MHKQ scale (Cronbach's α =0.61), which is consistent with previous studies showing weak to acceptable internal consistency [10, 11, 29]. However, this may be due to the fact that for knowledge scales measuring various factors of a construct, knowing the correct answer of one item does not necessarily lead to the right recognition of another item, thus a very high internal consistency may not be expected. Indeed, as a standardized government document developed by the Chinese Ministry of Health (MOH) to assess the public knowledge and awareness of mental health, the MHKQ has been popularized as a national gold standard to compare MHL across the country. The purpose of the present study is not to test the psychometric properties of the MHKQ, but to compare the level of MHL in the rural areas of Liuyang with other parts of China. As a result, the psychometric properties of the MHKQ are not of primary importance, given that the scale is comparable across different studies.

Another limitation is the cross-sectional design of the study, which precludes evaluation of temporal sequence of MHL and health outcomes, and causal

relationships cannot be determined. However, according to the scale's design, the SRHMS assesses self-rated health in the past four weeks [30, 31], the PHQ [34] and GAD [38] measure depression and anxiety in the past two weeks, while the MHKQ measures an individual's lifetime knowledge and belief about mental health, which may take root in a person's early life. We could infer a potential causal relationship between MHL and health outcomes.

A third limitation is a lack of comparison between MHKQ with other multifaceted scales intending to measure MHL. The fact that MHKQ is developed and used only in China makes it difficult to compare the psychometric properties of the Chinese version of MHKQ with other scales used in other populations outside China, since psychometric testing is also sample-dependent [43]. Future research may benefit from applying the English version of the MHKQ together with other scales in the same study to compare its feasibility and psychometric properties.

In conclusion, MHL in the rural areas of Liuyang is lower than that reported in urban areas of China. More efforts are needed to increase public awareness of mental health promotion activities and more population-level intervention programs are needed to educate the public about the correct attribution of mental disorders. Younger age, higher education, and higher income are the three strongest factors related to higher MHL, so educational interventions may need to be cohort-specific with special attention paid to those who are older, poorer, and less educated. Higher MHL is related to better general health including physical, mental, and social health, suggesting that improvement of MHL may enhance overall population health,

warranting future exploration.

Ethical Statement

This study was approved by the Institutional Review Boards of the School of Public Health of Central South University and was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. All participants in the present study gave their informed consent prior to their inclusion in the study. Details that might disclose the identity of the subjects under study were omitted and all data collected were unidentified.

Contributorship statement

Each of the listed authors meets the ICMJE criteria for authorship. Shui-yuan Xiao and Liang Zhou conceived and designed the whole study, Yu Yu, Zi-wei Liu, Mi Hu, Xi-guang Liu and Joyce P. Yang collected the data, Yu Yu and Zi-wei Liu analyzed and interpreted the data. Yu Yu drafted the article, while Shui-yuan Xiao, Liang Zhou, Mi Hu, Liu Zi-Wei, Xi-guang Liu and Joyce P. Yang critically revised it for intellectual content. All authors have got final approval of the version to be published.

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Conflicts of interest statement

The authors have no conflicts of interest to declare.

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Data sharing statement

All data underlying the findings in our study are freely available upon request, please contact Yu Yu at youxiang8864@163.com for the dataset and the analysis commands

Figure 1. Flowchart of subject enrollment

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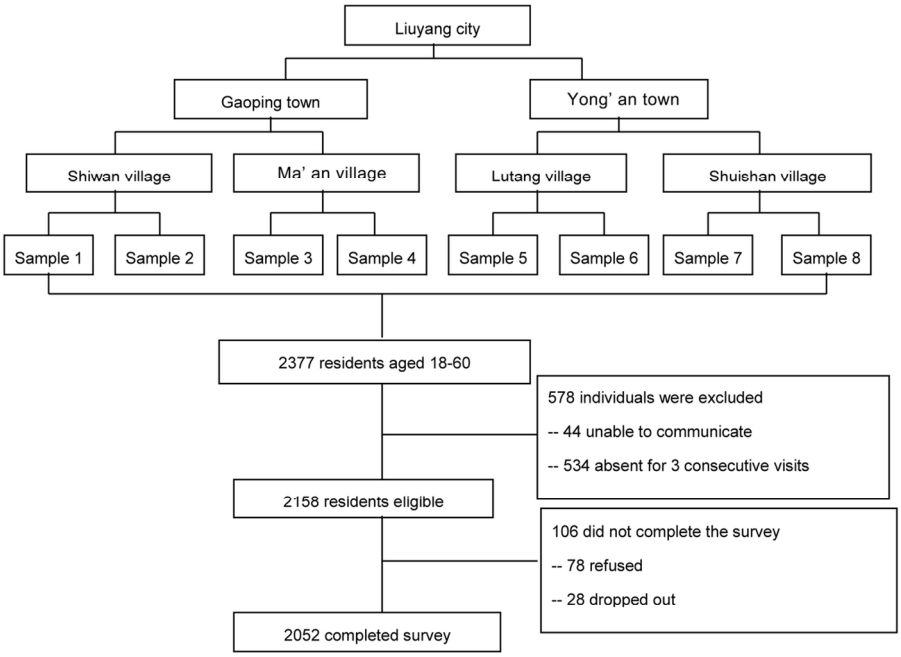

Flowchart of subject enrollment
122x90mm (300 x 300 DPI)

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation	My answer
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	YES
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	YES
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	YES
Objectives	3	State specific objectives, including any prespecified hypotheses	YES
Methods			
Study design	4	Present key elements of study design early in the paper	YES
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	YES
Participants	6	(*a*) *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	YES
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	YES
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	YES
Bias	9	Describe any efforts to address potential sources of bias	YES
Study size	10	Explain how the study size was arrived at	YES
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	YES
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	YES
		(*b*) Describe any methods used to examine subgroups and interactions	YES
		(*c*) Explain how missing data were addressed	YES
		(*d*) *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	YES
		(*e*) Describe any sensitivity analyses	NA

Continued on next page

Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	See in method
		(b) Give reasons for non-participation at each stage	See in method
		(c) Consider use of a flow diagram	See in method
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	YES
		(b) Indicate number of participants with missing data for each variable of interest	YES
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	NA
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	
		Cross-sectional study—Report numbers of outcome events or summary measures	YES
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	YES
		(*b*) Report category boundaries when continuous variables were categorized	YES
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	YES
Discussion			
Key results	18	Summarise key results with reference to study objectives	YES
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	YES
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	YES
Generalisability	21	Discuss the generalisability (external validity) of the study results	YES
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	YES

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.