

Prevalence and Associated Factors of Depression Among Middle-Aged and Older
Chinese Adults
by

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Thesis submitted in partial fulfillment of
the requirements for the degree of
Master of Science in Duke Global Health Institute
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ABSTRACT

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Abstract

Background and Aim: Depression is a growing burden in China. There is limited national data on epidemiological studies of depression in China, as well as consistent estimates on the prevalence of depression. Therefore, we used data from two nationwide surveys to estimate prevalence of depression among middle-aged and older Chinese adults (by pre-determined subgroups). We also used multivariate analysis to explore main factors associated with depression among Chinese adults.

Method: A nationally representative cross-sectional sample of 15,011 adults aged 45 to 79 years from the China Health and Retirement Longitudinal Study (CHARLS) and 8,140 adults aged 80 years and above from the Chinese Longitudinal Healthy Longevity Survey (CLHLS). Depressive symptoms were measured by the 10-item Center for Epidemiologic Studies Depression Scale (CESD-10), while probable depression was indicated by a CESD-10 score over 10. Prevalence rates of depression were estimated by age group (45-65, 65-79, 80+), sex (male, female), residence (rural, urban), and education level (no, some), incorporating sample weights. The associations between depression and marital status (married living with spouse, widowed, others including separated, unmarried), drinking status (never, former, current drinker), smoking status (never, former, current smoker), and any self-report disease (i.e., have at least one from hypertension, diabetes, cancer, lung disease, heart disease, stroke, arthritis, dyslipidemia,

liver disease, kidney disease, digestive disease or not) were examined in multivariate logistic regression and linear regression.

Results: There was high prevalence of depression in middle-aged and older Chinese adults and a big difference between the two surveys, 35.0% for those aged 45-79 in CHARLS and 30.5% for those aged 80+ in CLHLS. Female, rural adults without any education had higher prevalence of depression in all age groups (45-64, 65-79, 80+). Being married but not living with spouse temporarily, separated, divorced, never married, self-reported any chronic disease were associated with higher odds of having probable depression and higher CESD-10 scores at all ages. In both age groups, being current drinker was associated with lower odds of having depression and lower CESD-10 scores. Smoking had little association with having depression in both age groups; but being a former smoker was associated with higher CESD-10 scores in CHARLS and lower scores in CLHLS.

Conclusion: More attention should be devoted to the mental health of middle-aged and older Chinese adult, rural elderly women in particular. Future studies should also be aware of systematic difference when analyzing secondary data from different surveys.

Dedication

I dedicate it to my mom.

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Acknowledgements

I show my greatest acknowledgement to my supervisor Prof. Lijing L. Yan for supporting my academic progress with her scientific attainments and dedication, and for relating to me personally with her inspiring spirit.

I also show great acknowledgement to my thesis committee: Prof. Henry S. Lynn for his thorough and appealing talks on “data”, Prof. Truls Ostbye for his insightful suggestions.

I thank all faculties, staffs and classmates at DKU Global Health Program for gifting me a wonderful experience of graduate study in the time of COVID-19.

I thank my coach, Yunfan Ge, for his kindness and candor that landed me safely into the real world.

I thank my undergraduate supervisor, Dr. Richard Carciofo, for his meticulous and enlightenment that prepared me for further education.

Special thanks to researchers in CHARLS and CLHLS studies for their hard work at the front.

1. Introduction

Depression is a common psychological disorder that has increasingly been a disease burden in China. Studies on Chinese adults found that depression is associated with physical morbidity (Zhou et al., 2017), poorer quality of life (of their family) (Cui, 2015, Singh et al., 2009), higher risk of suicide (Dong et al., 2018), and twice the risk of death (Yu et al., 2016). In 2019, the disability-adjusted life years (DALYs) of depression have increased by 48% since 1990, accounting for nearly 2% of China's total DALYs (Institute for Health Metrics and Evaluation, 2019). Meanwhile, of Chinese adults with major depressive episodes, one thirds did not seek any social support or psychotherapy (Yu et al., 2015, Lee et al., 2009).

Reliable estimates of its prevalence could help monitor the epidemiology of depression; but there is limited national data on epidemiological studies of depression in China. Recent nationwide studies found inconsistent results about the prevalence of depression in Chinese adults aged 45 years and older, ranging from around 4% (Huang et al., 2019a) to 26% (Li et al., 2018). Based on regional epidemiological studies in the past decade, higher prevalence rates were reported in empty-nested elderlies in Hunan (75%) (Xie et al., 2010) and Shanxi (64%) (Zhang et al., 2019a, Xiao et al., 2018), whereas relatively lower frequencies of depression were described in adults in Jiangsu (0.6%) (Lu et al., 2018), Anhui (2%) Beijing (13%) (Li et al., 2011), and Shanghai (13%) (Xiao et al., 2018). Such variation may be attributed to different diagnostic criteria; for instance,

depression could be defined as major depressive disorder or clinically significant depressive symptoms, and measured by Geriatric Depression Scale, Self-Rating Depression Scale, Patient Health Questionnaire, or Hospital Anxiety and Depression Scale, *etc.* Different sample characteristics (i.e., subgroups) may also contribute to fluctuating prevalence rate of depression.

Evidence suggests that prevalence of depression vary across groups of people. First, Chinese of older age group (i.e. aged over 55 years) reported a higher all-age prevalence rate of depression and an increasing trend in the past few decades, while the prevalence decreased in those aged under 54 years (Ren et al., 2020). Second, the prevalence rate of females was found to be significantly higher than that of males in China (Ren et al., 2020, Qin et al., 2018). Third, previous research also identified urban and rural differences of depression prevalence that urban residents had higher prevalence of depression in developed countries (Purtle et al., 2019, Devylder et al., 2018); however, a few studies conducted in China found significantly higher prevalence among rural residents (Su et al., 2012, Li et al., 2016).

Other potential risk factors of depression have also been revealed in the literature. Individuals with physical morbidity (e.g., cardiovascular diseases) and cognitive impairment showed higher prevalence of depression (Huang et al., 2019b, Donovan et al., 2017, Penninx et al., 1999, Blazer, 2003), while psychological resilience, higher education level and socioeconomic status, engagement in social activities, and social

support were shown to be protective factors of depression (Chen et al., 2005, Fiske et al., 2009, Ni et al., 2017). Figure 1 presents the conceptual framework of factors related to depression. The uneven distribution and numerous determinants of depression make it vital for policy-makers and mental health professionals to anticipate the needs of key groups with depression.

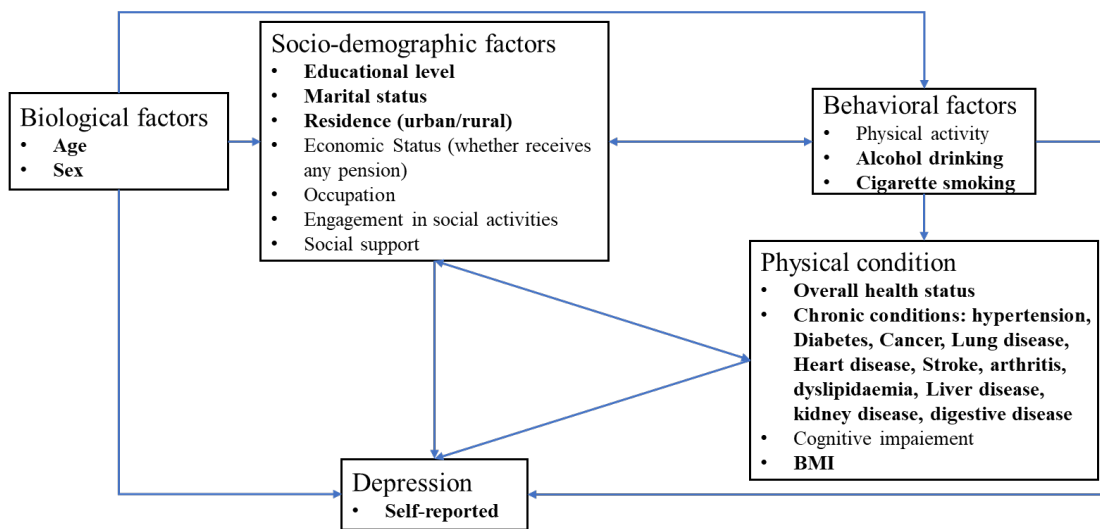


Figure 1 Conceptual framework of factors related to depression

Due to extended life expectancy and declined fertility rates, China's population is aging rapidly. In 2019, the number of adults aged 65 years old or above was about 160 million constituting almost 12% of the total population of China, much higher than ~6% in the 1990s (World Bank, 2021). Older adults were more likely to suffer from more severe consequences of depression, including higher risk of physical, cognitive and social limitations, compared with the younger population (Meeks et al., 2011, Haigh et al., 2018, Mitchell and Subramaniam, 2005, Chui et al., 2015). Depression among older adults is also potentially more preventable than that among younger counterparts

(Purtle et al., 2019). Therefore, it may offer insights into the early intervention of depression to study its distribution and associated factors among Chinese older adults.

The China Health and Retirement Longitudinal Study (CHARLS) and the Chinese Longitudinal Healthy Longevity Survey (CLHLS) are two nationwide longitudinal studies involving middle-aged and older Chinese adults (Zhao, 2020) (CLHLS, 2020). The CHARLS gathered a fairly representative sample of Chinese adults aged 45-80 years, while the CLHLS put more emphasis on the number and quality of centenarians, nonagenarians and octogenarians. They both conducted their latest wave in 2018, and used the 10-item Center for Epidemiologic Studies Depression Scale (CESD-10) to measure depressive symptoms and psychological wellbeing of the participants. Data from the CHARLS found relatively stable prevalence of probable depression (i.e., significant depressive symptoms defined by a CESD-10 score over 10) among middle-aged and older adults in China at 32% to 37% from 2008 to 2015 (Wang and Tian, 2018). To make use of the best data available in China, we aim to include samples aged 45-79 from the CHARLS and 80+ from the CLHLS to examine:

What is the estimated prevalence of depression among middle-aged and older Chinese adults?

How did the prevalence differ by pre-determined subgroups, including age group, sex, residence and education level, in bivariate analysis?

What are main factors associated with depression among Chinese adults in multivariate analysis?

2. Method

2.1 Study design and study population

The study analyzed cross-sectional data from the CHARLS in 2018 and the CLHLS in 2018.

2.2 Data source: CHARLS

CHARLS is an ongoing longitudinal study to collect a nationally representative sample of community-dwelling Chinese residents aged 45 years and older. The first national baseline survey was fielded between June 2011 and March 2012 and follow-up surveys performed every 2 years for a total of 4 waves from 2011 to 2018. The baseline study involved respondents who were chosen randomly in 450 villages (in rural areas) or neighborhoods (in urban areas), 150 counties or districts, 28 provinces.

CHARLS applied multistage stratified sampling, the four levels being county/district, village/neighborhood, household and individual. Details of the survey have been published elsewhere (Li et al., 2015, Feng et al., 2014). The medical ethics committee approved the CHARLS study, and all interviewees were required to sign informed consent. Ethics approval for the data collection in CHARLS was obtained from the Biomedical Ethics Review Committee of Peking University (IRB00001052–11015).

The total number of participants in the 2018 wave of CHARLS was 19816. In the present study, we excluded participants who did not report age or sex ($n = 322$), had more than 2 missing items for CESD-10 ($n = 2,214$), did not report sample weight

(n=1,536). This led to an analytic sample of 15,744. The number of observations for the age group of 45 to 79 years was 15,011.

2.3 Data source: CLHLS

CLHLS is an ongoing national longitudinal study to collect extensive data on Chinese oldest-old. The baseline survey was conducted in 1998 and follow-up surveys conducted every 2-3 years thereafter. The survey areas were randomly selected from half of all counties and cities in 22 provinces of China, the latter covering over 85% of China's population.

CLHLS tried to include all centenarian volunteers and over-sampled those oldest old aged 80 years and older. For each centenarian, a sub-sample of younger elders of predetermined age and sex were recruited, consisting of one nearby octogenarian and one nearby nonagenarian. Replacement samples were recruited in follow-ups for the deceased. Details of the survey have been published elsewhere (Zeng et al., 2017). The CLHLS study was approved by the Biomedical Ethics Committee of Peking University (IRB00001052-13074). All participants or their legal representatives signed written consent forms in the baseline and follow-up surveys.

The total number of participants in the 2018 wave of CLHLS was 15,896. In the present study, we excluded participants who did not report age or sex (n = 8), had more than 2 missing items for CESD-10 (n = 2,311), did not report sample weight (n=236). This

led to an analytic sample of 13,341. The number of observations for the age group of 80 years and older was 8,140.

2.4 Missing data

In each age group of either CHARLS or CLHLS, there was little difference in the baseline characteristics among the original sample, the sample excluding those missing CESD-10, and the analytic sample additionally excluding those missing weights.

Appendix 1 presents the baseline sample characteristics by age group and exclusion of missing data.

2.5 Measurements

2.5.1 Depression

The 10-item Center for Epidemiologic Studies Depression scale (CESD-10) was used to measure depressive symptoms. The CESD-10, developed by Andresen (1994), is a shortened version of a 20-item screening instrument for symptoms of depressed mood in older adults (Radloff, 1977). Each item has four-category response to depressive mood with two positive mood items reversely scored; the score is the sum of all item scores ranging from 0 to 30, higher scores representing a more depressed mood (Andresen et al., 1994). Respondents were asked to indicate the frequency of the symptoms using a scale of 0 '<1 day', 1 '1-2 days', 2 '3-4 days' and 3 '5-7 days' against a time frame of the past week. A person is considered to have probable depression if he/she scored higher than 10 in the CESD-10. This threshold of 10 has been validated in depression

measurement in Chinese elders, regardless of their age and dementia status (Cheng and Chan, 2005, Cheng and Chan, 2008).

Of note, while CHARLS applied the widely validated Chinese version of CESD-10 providing four answers for each item at a time frame of last week (Boey, 1999, Cheng and Chan, 2008), CLHLS specified five answers for the frequency of symptoms and asked in a simple present tense. For example, CHARLS asked the frequency of “I was bothered by small things” during the last week, while CLHLS asked “do you get bothered by small things”. Another example is that, CHARLS asked the frequency of “my sleep was restless” during the last week, while CLHLS asked “how is your sleep quality”. CLHLS used a scale of 0 ‘rarely or never’, 1 ‘seldom’, 2 ‘sometimes’, 3 ‘often’, 4 ‘always’ for nine items, and a scale of 0 ‘very good’, 1 ‘good’, 2 ‘fair’, 3 ‘bad’, 4 ‘very bad’ for one (sleep quality). We recoded the scale by combining ‘seldom’ and ‘rarely or never’, resulting in a scale exactly ranging from 0 to 30. The questionnaires and scoring criteria are presented in Appendices 2 and 3.

2.5.2 Subgroups

The study included the following subgroups: age group (45-64, 65-79, 80+), sex (male, female), residence (urban, rural hukou), and education (no, some education). For the education level, respondents in CHARLS were asked to select their highest educational degree from ‘no formal education (illiterate)’, ‘did not finish primary school’,

'elementary school' and 'middle school', while those in CLHLS were asked to report the number of years of schooling.

2.5.3 Covariates

Covariates were selected on the premise that they were potential risk factors of depression in the literature, and meanwhile were items applied to similar coding strategies in both databases. Cruder classifications were chosen in case of different expressions. Consequently, the study included the following socio-demographic factors, physical conditions and behavioral factors as covariates: marital status (married and living with spouse, widowed, other status including married but not living with spouse temporarily for reasons such as work, separated, divorced, or never married), any self-reported physical chronic diseases (hypertension, diabetes, cancer, lung disease, heart disease, stroke, arthritis, dyslipidemia, liver disease, kidney disease, and digestive disease), alcohol drinking status (never drinker, former drinker, current drinker), tobacco smoking status (never smoker, former smoker, current smoker). In both CHALRS and CLHLS, all covariates received more than 97% of all responses.

2.5.4 Weights

The study included individual weights from both CHARLS and CLHLS. CHARLS provided individual weights with household and individual response adjustment, while CLHLS calculated the individual weights based on the estimated

numbers of elderly persons by age, sex, rural/urban residence in 2018 derived from the 1% random sampling mini-census in 2015.

2.6 Statistical Analysis

Sample weights were incorporated in all analyses to achieve precise estimation on the target population. Baseline characteristics were described using means and standard deviations for continuous variables, and counts and percentages for categorical variables. Pearson chi-square tests were used to compare the socio-demographic, health and behavioral factors between those with and without probable depression. We also used chi-square tests to compare the prevalence of depression by subgroups under each age group. The association between covariates and depression was further assessed using multivariable logistic regression and linear regression models; both of them adjusted for age, sex, residence, education, marital status, drinking, smoking and any chronic disease. The outcome variable for logistic regression was dichotomized depression defined by a CESD-10 score over 10, while that for linear regression was continuous CESD-10 scores. We square-rooted CESD-10 scores to solve the skewness, normality and heteroscedasticity issues. A two-tailed *P*-value of less than 0.05 was considered statistically significant (Brown et al., 2001). All analyses were performed using STATA/MP 16.0.

3. Results

3.1 Characteristics of study population

Table 1 summarizes the unweighted sample and weighted population characteristics of adults aged 45 to 79 years in CHARLS and adults aged 80 years and older in CLHLS. Most weighted proportions were largely similar to the unweighted values with a less than 5% difference, except for residence (+7%) in CHARLS, education (+7%), marital status (+14%) and any chronic disease (+7%) in CLHLS.

In CHARLS, a total of 15,011 participants aged between 45 and 79 years were included with a mean age of 60.87 (SD=8.40) years; 52% were female and 80% were rural residents. After using weights, the adult population derived from CHARLS had a mean age of 60.74 (SD=8.59) years; 51% were female and 73% were rural residents. The majority of the population had received some education (weighted percentage: 83%), were married and living with spouse (82%), had never drunk alcohol (62%) or smoked cigarette (59%), did not report any of the eleven chronic diseases (57%).

In CLHLS, a total of 8,140 participants aged between 80 to 117 years were included with a mean age of 90.73 (SD=7.21) years; 57% were female and 71% were rural residents. The population derived from using weights had a mean age of 84.24 (SD=7.00) years; 56% were female and 73% were rural residents. The majority of the population were widowed (weighted percentages: 57%), had never drunk alcohol (74%) or smoked cigarette (69%), self-reported at least one chronic disease (71%).

Compared with the CHARLS population, the elderly population from CLHLS was older, more likely to be female, have not received any education, be widowed, not be a current drinker, not be a current smoker, self-report chronic diseases. The urban-rural proportions were largely the same for both populations.

Table 1 Unweighted sample and weighted population characteristics by age group

Factors	CHARLS 45~79 (N=15,011)			CLHLS 80~117 (N=8,140)		
	n (a)	Unweighted	Weighted	n (a)	Unweighted	Weighted
Age, mean (SD)	15011	60.87 (8.40)	60.74 (8.59)	8140	90.73 (7.21)	84.24 (7.00)
Sex						
Male	7177	48%	49%	3523	43%	44%
Female	7834	52%	51%	4617	57%	56%
Residence						
Urban hukou	2883	20%	27%	2336	29%	27%
Rural hukou	11899	80%	73%	5791	71%	73%
Education						
No education	2958	20%	17%	4075	50%	43%
Some education	12053	80%	83%	4053	50%	57%
Marital status						
Married, living with spouse	12278	82%	82%	2114	26%	40%
Widowed	1495	10%	9.6%	5752	71%	57%
Other (b)	1238	8%	7.9%	187	2%	2.8%
Drinking						
Never drinker	9428	63%	62%	6015	76%	74%
Former drinker	1451	10%	10%	929	12%	12%
Current drinker	4118	27%	28%	1020	13%	13%
Smoking						
Never smoker	8723	60%	59%	5700	71%	69%
Former smoker	2104	14%	14%	1242	16%	16%
Current smoker	4170	28%	27%	1063	13%	15%
Any chronic disease (c)						
No	8660	58%	57%	2829	36%	29%
Yes	6339	42%	43%	5077	64%	71%

Abbreviation: SD = standard deviation. a. Unweighted number of observations. b Other marital status included married but not living with spouse temporarily for reasons such as work, separated, divorced, or never married. c Any chronic disease was defined as self-report of at least one of the eleven diseases including hypertension, diabetes, cancer, lung disease, heart disease, stroke, arthritis, dyslipidemia, liver disease, kidney disease, digestive disease.

Table 2 compares the weighted selected characteristics of population with or without probable depression. Of the weighted population aged 45-79 in CHARLS and aged 80+ in CLHLS, we found that adults with probable depression were more likely to

be female, have rural hukou, have not received any education, be widowed, have never drunk alcohol, have never smoked cigarette, self-report at least one chronic physical disease ($P_s < .01$). There was no significant difference in age between those with or without probable depression in each age group.

Table 2 Weighted selected population characteristics by having depression or not

Factors	CHARLS 45~79 (N=15,011) (a)		CLHLS 80~117 (N=8,140) (a)	
	No depression (b) (n=307,608,686) (c)	Depression (b) (n=165,812,908) (c)	No depression (b) (n=1,874) (c)	Depression (b) (n=823) (c)
Age, mean (SD)	60.43 (8.42)	61.33 (8.87)	84.21 (7.04)	84.32 (6.92)
Female sex	46%	61%	53%	65%
Rural hukou	69%	81%	71%	76%
Some education	86%	77%	60%	51%
Marital status				
Married, living with spouse	85%	78%	42%	34%
Widowed	7.9%	13%	55%	62%
Others (d)	7.4%	9%	2.5%	3.6%
Drinking				
Never drinker	59%	68%	72%	79%
Former drinker	9.1%	10%	13%	11%
Current drinker	32%	21%	15%	9.6%
Smoking				
Never smoker	56%	64%	66%	75%
Former smoker	15.0%	12%	17%	13%
Current smoker	29%	24%	16%	12%
Any chronic disease (e)				
No	62%	50%	32%	23%
Yes	38%	50%	68%	77%

Abbreviation: SD = standard deviation. Comparison for smoking in CHARLS $P < .05$; all other comparisons $P < .001$ P -values were calculated from chi-square tests or analysis of variance. a. Unweighted number of observations. b. Probable depression was defined by a CESD-10 score over 10. c. Weighted number of adults. d. Other marital status included married but not living with spouse temporarily for reasons such as work, separated, divorced, never married. e. Any chronic disease was defined as self-report of at least one of the eleven diseases including hypertension, diabetes, cancer, lung disease, heart disease, stroke, arthritis, dyslipidemia, liver disease, kidney disease, digestive disease.

3.2 Prevalence of depression

Table 3 presents the weighted prevalence rates of probable depression by age group and subgroup. Based on the results from CHARLS, the prevalence of depression was 35.0% (95% CI: 33.5-36.6) for adults aged 45-79, that by age group was higher for

those aged 65-79 (37.0%; 95% CI: 35.0-39.2), compared with those aged 45-64 (34.0%; 95% CI: 32.2-35.8). For CLHLS, the prevalence of depression was 30.5% (95% CI: 29.1-31.9) for adults aged 80+. Rural female adults without any education had higher prevalence of depression in all age groups.

Table 3 Weighted prevalence and 95% CI of depression in China by subgroup (a)

Subgroup	CHALRS			CLHLS
	45~79	45-64	65-79	80~117
Total	35.0% (33.5-36.6)	34.0% (32.2-35.8)	37.0% (35.0-39.2)	30.5% (29.1-31.9)
Sex				
Male	28.1% (26.3-30.0)	27.3% (25.3-29.5)	29.5% (27.1-31.9)	24.7% (22.9-26.7)
Female	41.6% (39.8-43.5)	40.1% (38.1-42.1)	44.7% (41.8-47.6)	35.0% (33.0-37.0)
Residence				
Urban	25.0% (22.7-27.4)	23.8% (20.9-27.0)	26.7% (23.5-30.1)	26.7% (24.3-29.3)
Rural	39.1% (37.3-40.9)	37.8% (35.8-39.8)	41.6% (39.3-43.9)	32.0% (30.3-33.7)
Education				
No education	48.0% (45.4-50.6)	47.3% (43.8-50.8)	48.7% (45.3-52.1)	34.9% (32.7-37.2)
Some education	32.4% (30.8-34.0)	32.0% (30.3-33.9)	33.1% (31.0-35.3)	27.2% (25.5-29.1)

Abbreviation: CI = confidence interval. a. Probable depression was defined by a CESD-10 score over 10.

3.3 Relationship between depression and covariates by age group

Table 4 presents the associations between probable depression and covariates based on multivariate-adjusted regressions. In the logistic model, we dichotomized the CESD-10 scores using a cutoff point of 10 to indicate having or not having probable depression. In both surveys, compared with those who were males, had urban hukou, had received some education, were married and living with spouse, did not report any chronic disease, individuals who were female, had rural hukou, had not received any education, were widowed or in other marital status (i.e., married but not living with spouse temporarily, separated, divorced, never married), self-reported any chronic

disease were more likely to have probable depression; compared with never drinkers, and those former drinkers were more likely to have depression but those current drinkers were less likely to have depression. These associations were all statistically significant with $P_s < .05$, except for widowhood and former drinker in CLHLS (OR = 1.18, 95% CI = 1.00-1.39; OR = 1.01 95% CI = 0.80-1.27). Among adults aged 45-79 in CHARLS, individuals of older age were more likely to have depression, compared with their younger counterparts (OR = 1.01, 95% CI = 1.00-1.02), while age was shown to have no significant association with depression in adults aged 80+ in CLHLS (OR = 1.00, 95% CI = 0.98-1.01). Being a former or current smoker was associated with higher odds of depression in CHARLS (OR = 1.12, 95% CI = 0.94-1.32; OR = 1.33, 95% CI = 1.12, 1.57), but lower odds in CLHLS (OR = 0.82, 95% CI = 0.66-1.03; OR = 0.82, 95% CI = 0.65, 1.03). The results were largely the same with sensitivity analysis using a score of 12 to indicate depression (Appendix 5).

In the linear model where the outcome was the severity of depressive symptoms indicated continuously by CESD-10 scores, the associations between depression and covariates all remained in the same direction as in the logistic model with similar significance. In both surveys, individuals who were older, female, had rural hukou, have received some education, were in other marital status, were former drinker, self-reported any chronic disease were associated with a higher CESD-10 score (i.e., greater depressive symptoms), compared with the reference groups. The associations between

depression and smoking were consistent with the results of logistic regression, suggesting that were former or current smokers were associated with greater depressive symptoms compared with those never smokers in CHARLS and less depressive symptoms in CLHLS. The coefficients were 0.12 (95% CI: 0.02-0.22), 0.21 (95% CI: 0.12, 0.31), -0.11 (-0.2, -0.03), -0.07 (-0.16, 0.01), respectively.

Table 4 Study-specific adjusted odds ratios and coefficients of depression associated with covariates (weighted) (a)

Factors	CHARLS 45-79 (N=14,380) (b)		CLHLS 80+ (N=7,542) (b)	
	OR (95% CI)	Coef. (95% CI)	OR (95% CI)	Coef. (95% CI)
Age	1.01 (1.00, 1.01)*	0.00 (0.00, 0.01)*	1.00 (0.98, 1.01)	0.01 (0.00, 0.01)
Female sex	1.93 (1.69, 2.21)***	0.41 (0.33, 0.50)***	1.30 (1.08, 1.56)**	0.13 (0.06, 0.19)***
Rural hukou	1.87 (1.60, 2.19)***	0.41 (0.32, 0.51)***	1.32 (1.12, 1.55)**	0.15 (0.09, 0.22)***
Some education	0.77 (0.69, 0.87)***	-0.22 (-0.29, -0.15)***	0.85 (0.73, 1.00)*	0.00 (-0.06, 0.06)
Marital status				
Married, living with spouse	<i>Reference.</i>	<i>Reference.</i>	<i>Reference.</i>	<i>Reference.</i>
Widowed	1.36 (1.19, 1.55)***	0.24 (0.16, 0.32)***	1.18 (1.00, 1.39)	0.01 (-0.05, 0.08)
Other (c)	1.28 (1.11, 1.48)**	0.17 (0.09, 0.25)***	1.88 (1.24, 2.85)**	0.20 (0.04, 0.36)*
Drinking				
Never drinker	<i>Reference.</i>	<i>Reference.</i>	<i>Reference.</i>	<i>Reference.</i>
Former drinker	1.24 (1.06, 1.45)**	0.15 (0.07, 0.23)***	1.01 (0.80, 1.27)	0.05 (-0.03, 0.14)
Current drinker	0.81 (0.72, 0.92)**	-0.15 (-0.22, -0.08)***	0.75 (0.59, 0.95)*	-0.21 (-0.30, -0.12)***
Smoking				
Never smoker	<i>Reference.</i>	<i>Reference.</i>	<i>Reference.</i>	<i>Reference.</i>
Former smoker	1.12 (0.94, 1.32)	0.12 (0.02, 0.22)*	0.82 (0.66, 1.03)	-0.11 (-0.2, -0.03)**
Current smoker	1.33 (1.12, 1.57)**	0.21 (0.12, 0.31)***	0.82 (0.65, 1.03)	-0.07 (-0.16, 0.01)
Chronic diseases (d)	1.67 (1.51, 1.83)***	0.33 (0.28, 0.39)***	1.65 (1.41, 1.94)***	0.18 (0.12, 0.24)***

Abbreviation: OR = odds ratios. CI = confidence interval. Coef. = coefficient. *** P < 0.001, ** P < 0.01, * P < 0.05. P-values were calculated from chi-square tests or analysis of variance. a. Probable depression was defined by a CESD-10 score over 10. b. Unweighted number of observations. c. Other marital status included married but not living with spouse temporarily for reasons such as work, separated, divorced, never married. d. Any chronic disease was defined as self-report of at least one of the eleven diseases including hypertension, diabetes, cancer, lung disease, heart disease, stroke, arthritis, dyslipidemia, liver disease, kidney disease, digestive disease.

4. Discussion

4.1 Summary of findings

In this cross-sectional study based on two national surveys, we aimed to explore the prevalence of probable depression in middle-aged and older Chinese adults (by subgroup), and its associated socio-demographic, health and behavioral factors. In summary, our results revealed high prevalence of probable depression in middle-aged and older Chinese adults, 35.0% for those aged 45-79 in CHARLS and 30.5% for those aged 80+ in CLHLS. Female, rural adults without any education had higher prevalence of depression in all age groups (45-64, 65-79, 80+). Being married but not living with spouse temporarily, separated, divorced, never married, self-reported any chronic disease were associated with higher odds of having probable depression and higher CESD-10 scores at all ages. In both age groups, being current drinker was associated with lower odds of having depression and lower CESD-10 scores. Smoking had little association with having depression in both age groups; but being a former smoker was associated with higher CESD-10 scores in CHARLS and lower scores in CLHLS.

4.2 Prevalence

The current study identified high overall prevalence of depression. The adult population aged 45 to 79 years in CHARLS 2018 reported a high prevalence of depression (35.0%), which is largely consistent with that reported in CHARLS 2011 (36.8%) (Ouyang and Sun, 2018) and 2015 (35.9%) (Zhang et al., 2019b). The CLHLS

population aged 80 and older reported a prevalence of 30.5%, which is higher than that from recent studies on older Chinese adults: 22.7% (95% CI: 19.4-26.4%) (Zhang et al., 2012) and 23.6% (95% CI: 20.3-27.2%) (Li et al., 2014).

Regarding the study methodology, there can be two features contributing to the higher prevalence in our current study. First, studies may have used different measuring tools. Some tools may have been validated in the community-dwelling elderly population in China to measure probable depression or clinically significant depressive symptoms, e.g., the Center for Epidemiologic Studies Depression Scale (CESD) we used (Cheng and Chan, 2005, Cheng and Chan, 2008) and the Geriatric Depression Scale (GDS) (Lai et al., 2010, Lin et al., 2017a), while other may apply to clinical diagnosis in the psychiatric, e.g., the Composite International Diagnostic Interview (CIDI) (Lu et al., 2015) and the Patient Health Questionnaire (Sun et al., 2020). Comparison study found that the 30-item GDS reported significantly higher prevalence of depression than the 20-item CESD (Li et al., 2014), and the CIDI 3.0 reported significantly lower prevalence rates (3.6%, 95% CI: 3.0-4.2) (Huang et al., 2019a). Epidemiological measurements including CESD and GDS can only reveal the prevalence of probable or high risk of depression, which do not meet the full criteria for clinically significant depressive disorders (e.g., major depressive disorders) as measured by Diagnostic and Statistical Manual of Mental Disorders (DSM-5) or the International Classification of Diseases (ICD-10) (Chen et al., 1999). (Huang et al., 2019a) to 26% (Li et al., 2018). Second, the prevalence estimated

from the same instrument may be altered by using different criteria. As mentioned, the current study used a CESD-10 score of 10 as the cutoff point for depression as is validated in many studies in Chinese adults. There are other CHARLS studies using a score of 12 as cutoff point, achieving a prevalence of 26.2% in 2011 (Li et al., 2018), 25.2% in 2015 (Wang et al., 2019).

We also revealed a large difference in prevalence of depression between CHARLS and CLHLS. We found higher prevalence in CHARLS and lower prevalence in CLHLS, even though CLHLS had an older population. Meanwhile, we observed higher prevalence of depression among older people within each survey, and higher prevalence among adults from the same age group of 65-79 in CHARLS than those aged 65-79 in CLHLS (Appendix 4). Although we did not aim to compare between the two age groups, there are contradictory findings in the literature arguing a positive or negative association between depression and older age (Blazer et al., 1991, Xu et al., 2016). Such large difference in the current study caught our attention.

As presented in the results, CHARLS and CLHLS varied in sample and population characteristics. The elderly from CLHLS was more likely to be older, female, have not received any education, be widowed, not be a current drinker, have smoked cigarette, self-report chronic disease than the CHARLS population; but these characteristics were all shown to be associated with higher odds of depression and higher CESD-10 scores in our regression analyses. Such contradictory results can

indicate potential systematic differences between the two national surveys. CHARLS was designed to be nationally representative while CLHLS – albeit large in scale – was not. As described in the method section, CHARLS asked a four-category frequency during the past week, while CLHLS asked a five-category frequency at a simple present tense. In addition, survival effect for adults aged 80 and above may work in two ways to affect their prevalence of depression: those who survived may be more healthy and less depressed, or they may see their loved ones die and be more depressed.

4.3 Subgroups

In both surveys, we observed similar sex, residence and education differences (i.e., higher in females with rural hukou and no education) in prevalence of depression. After adjusting for covariates, women with rural hukou remained as the highlight in all age groups. A higher risk of depression for women than men was observed in most previous studies (Xu et al., 2016). These results aligned to findings from previous CHARLS study (Guo et al., 2017), and confirmed our hypothesis that prevalence may concentrate in certain subgroups.

4.3.1 Rural hukou

Our study defined rural residence by individuals' hukou status, which was perceived by many as an indicator of socioeconomic status, and a major barrier to socioeconomic mobility and urban-rural health equity in China (Guo et al., 2017).

Consistent findings in the literature could support the higher prevalence of depression in rural Chinese population (Dong and Simon, 2010, Li et al., 2011, Su et al., 2012, Li et al., 2016, Hou et al., 2015, Meeks et al., 2011, Zhang et al., 2012, Yu et al., 2015, Xiao et al., 2018); such vulnerability may be attributed to their low socioeconomic status featuring less opportunity, earnings and occupational attainment (Guo et al., 2017, Kröger et al., 2015). For migrants living in urban areas but lack local hukou, their mental health may be influenced by having lower access to local health care (Qin et al., 2014), more social stigmatization (Li et al., 2008), and acculturative stress (Zhong et al., 2016).

The large number of empty-nested elderly population in many rural areas may be another possible explanation to the higher prevalence of depression in rural China, as they may lack social support (Zhang et al., 2020). According to the Buffer Theory, social support can benefit people through buffering the potential impact of psychosocial adversity on precipitating episodes of illness (Alloway and Bebbington, 1987). Great social support could improve physical and mental health and prevent depression through obtaining and maintaining individual's self-value, information, material and emotional support (George et al., 1989, Grav et al., 2012, Uchino, 2006).

4.4 Covariates

In both logistic and linear regression, we found a protective effect of being married and living with spouse on probable depression and severity of depressive symptoms. This is consistent with findings of recent studies in China (Zhou et al., 2016,

Zhou et al., 2019, Zhang et al., 2019b), and may also be attributed to the level of social support as introduced above. The association between depression and chronic diseases is also supported by numerous existing evidences, potentially explained by the limitation on their daily activities and impairment on life quality (Li et al., 2015, Zhang et al., 2016, Lou et al., 2012).

We found a protective effect of being a current drinker on depression and depressive symptoms in both studies. Despite that many previous studies revealed a positive association between alcohol intake and depressive symptoms (Sexton et al., 1999, Boden and Fergusson, 2011), our results can be supported by research on alcohol drinkers with lower average amount of intake (Gea et al., 2013). It was believed that depression may share common pathophysiological mechanisms with coronary heart disease, including its association with a low amount of alcohol intake (Boden and Fergusson, 2011, Sanchez-Villegas and Martínez-González, 2013, Gea et al., 2013).

The association between smoking and greater depressive symptoms in CHARLS were consistent with previous findings (Kendler et al., 1993, Bainter et al., 2020), while it seemed paradoxical for being a former smoker (Coef. = -0.11, 95% CI = -0.2, -0.03) and current smoker (Coef. = -0.07, 95% CI = -.016, 0.01) to show a protective effect on depressive symptoms in elderly age 80+ in CLHLS. First, age may be a contributor to such different results of the two populations. Previous research found that some harmful health outcomes of smoking (e.g., inflammation) on younger adults

disappeared or became potentially protective on elderly aged 80 and above (Levine and Crimmins, 2013). It may suggest distinct biological advantages such as protection or repairing mechanisms among those long-lived chronic smokers. Second, our study found that former drinkers in CLHLS reported significantly fewer depressive symptoms than never smokers, the effect was more significant than the protective effect of never smoking. Some previous studies found that association between smoking cessation in late life and increased all-cause mortality, while others found reduced health risk amongst middle-aged and younger-aged older adults (Lin et al., 2017b, He et al., 2014). Therefore, a possible explanation for our results is that older elderly in CLHLS may have quitted smoking at an earlier age, while the subsequent benefit from smoking cessation could accumulate for years (He et al., 2014, Wen et al., 2005). Third, the expressions of smoking had slight differences between CHARLS and CLHLS, potentially affecting the results. CLHLS asked if the respondent “smoke cigarette” in general in the past and in the present, while CHARLS specified the question as “have you ever chewed tobacco, smoked a pipe, smoked self-rolled cigarettes, or smoked cigarettes/cigars”, “do you still have the habit or have you totally quit” (Appendix 6). The rougher inclusion of tobacco products in CLHLS may explain its higher percentage of never smokers than that in CHARLS (59%).

4.5 Strengths and Limitations

The methodologic strengths of this study are the inclusion of two nationwide surveys to gather a nationally representative sample of the Chinese aged 45 years and above, the large sample size, the consideration of age groups, subgroups and covariates, the use of weights. However, the current study also has several limitations. First, we did not use a clinical diagnosis for the measurement of depression; however, the CESD-10 we used to measure depressive symptoms is a validated instrument in population-based studies in Chinese elders (Cheng and Chan, 2005, Cheng and Chan, 2008). Second, using a cross-sectional sample, although well-suited for aims 1 and 2 to estimate prevalence (by subgroup), we could only draw correlational results between depression and associated factors cannot for aim 3. However, it can be toned down for some variables, e.g., biological sex. Being a female poses greater risk of depression on Chinese adults. Third, our variables were limited by their availability in both datasets, while the two were not compatible. Minor change in the expression may result in different responses. But CHALRS and CLHLS were the most recent and largest samples; and we were able to examine a wider age group of all adults above 45 years old by including both. We call for more caution for future research when using national datasets.

5. Conclusions

In conclusion, the current study found stably high prevalence of depression in middle-aged and older Chinese adults in China compared with previous research. The prevalence was higher in female with rural residence. Our results have strong policy implications. Considering the high prevalence of depression and its personal and social consequences, more attention should be devoted to middle-aged and older Chinese adults' mental health, particularly to elderly women with rural residence because they are more vulnerable to mental health problems and their problems may often be neglected. As people often have difficulty access to quality mental health care in rural China, we should deepen the improvement of prevention of mental illness, psychiatric services, training of professionals, psychiatric hospitals, mental health education on general population, research, and surveillance (Wong et al., 2014, Liu et al., 2011).

Appendix 1 Baseline sample characteristics by age group and exclusion of missing data

	CHARLS 45~79			CLHLS 80~117			CHARLS 65~79			CLHLS 65~79		
Factors	Sample N=18,135	Dropp ed missin g CESD 10 N=16,421	Dropp ed missin g weight s N=15,011	Sampl e N=10,437	Dropp ed Missin g CESD 10 N=8,287	Dropp ed Missin g weight s N=8,140	Sampl e N=6,351	Dropp ed Missin g CESD 10 N=5,579	Dropp ed Missin g weight s N=5307	Sampl e N=5,356	Dropp ed Missin g CESD 10 N=5,201	Dropp ed missin g weight s N=5,201
Age, mean (SD)	60.63 (8.70)	60.41 (8.57)	60.87 (8.40)	92.33 (7.76)	91.04 (7.52)	90.73 (7.21)	70.40 (4.10)	70.21 (4.00)	70.23 (4.00)	72.48 (4.30)	72.43 (4.29)	72.43 (4.29)
Sex												
Male	8658 (48%)	7857 (48%)	7177 (48%)	4180 (40%)	3555 (43%)	3523 (43%)	3111 (49%)	2783 (50%)	2654 (50%)	2699 (50%)	2635 (51%)	2635 (51%)
Female	9477 (52%)	8564 (52%)	7834 (52%)	6257 (60%)	4732 (57%)	4617 (57%)	3240 (51%)	2796 (50%)	2653 (50%)	2657 (50%)	2566 (49%)	2566 (49%)
Residence												
Urban hukou	3582 (20%)	3290 (21%)	2883 (20%)	2840 (27%)	2357 (28%)	2336 (29%)	1396 (22%)	1283 (23%)	1169 (22%)	1471 (28%)	1450 (28%)	1450 (28%)
Rural hukou	14049 (80%)	12753 (79%)	11899 (80%)	7510 (73%)	5917 (72%)	5791 (71%)	4891 (78%)	4248 (77%)	4105 (78%)	3828 (72%)	3742 (72%)	3742 (72%)
Education												
No education	3676 (20%)	3131 (19%)	2958 (20%)	5593 (54%)	4173 (50%)	4075 (50%)	1922 (30%)	1578 (28%)	1513 (29%)	1206 (23%)	1155 (22%)	1155 (22%)
Some education	14459 (80%)	13290 (81%)	12053 (80%)	4802 (46%)	4102 (50%)	4053 (50%)	4429 (70%)	4001 (72%)	3794 (71%)	4143 (77%)	4040 (78%)	4040 (78%)
Marital status												
Married, living with spouse	14635 (81%)	13377 (81%)	12278 (82%)	2328 (23%)	2124 (26%)	2114 (26%)	4804 (76%)	4260 (76%)	4065 (77%)	3742 (71%)	3672 (71%)	3672 (71%)
Widowed	1831 (10%)	1594 (10%)	1495 (10%)	7715 (75%)	5888 (72%)	5752 (71%)	1260 (20%)	1072 (19%)	1016 (19%)	1291 (25%)	1254 (24%)	1254 (24%)
Other	1669 (9%)	1450 (9%)	1238 (8%)	233 (2%)	188 (2%)	187 (2%)	287 (5%)	247 (4%)	226 (4%)	228 (4%)	222 (4%)	222 (4%)
Drinking												
Never drinker	11424 (63%)	10296 (63%)	9428 (63%)	7843 (77%)	6135 (76%)	6015 (76%)	3956 (63%)	3431 (62%)	3265 (62%)	3588 (69%)	3490 (69%)	3490 (69%)
Former drinker	1757 (10%)	1569 (10%)	1451 (10%)	1139 (11%)	938 (12%)	929 (12%)	862 (14%)	754 (14%)	710 (13%)	628 (12%)	618 (12%)	618 (12%)
Current drinker	4886 (27%)	4537 (28%)	4118 (27%)	1176 (12%)	1035 (13%)	1020 (13%)	1509 (24%)	1390 (25%)	1328 (25%)	992 (19%)	986 (19%)	986 (19%)
Smoking												
Never smoker	10575 (59%)	9565 (58%)	8723 (58%)	7497 (73%)	5822 (71%)	5700 (71%)	3536 (56%)	3079 (55%)	2920 (55%)	3395 (65%)	3306 (65%)	3306 (65%)
Former smoker	2517 (14%)	2274 (14%)	2104 (14%)	1499 (15%)	1253 (15%)	1242 (16%)	1181 (19%)	1032 (19%)	990 (19%)	767 (15%)	753 (15%)	753 (15%)
Current smoker	4975 (28%)	4563 (28%)	4170 (28%)	1214 (12%)	1075 (13%)	1063 (13%)	1509 (24%)	1464 (26%)	1393 (26%)	1064 (20%)	1051 (21%)	1051 (21%)
Any chronic disease												
No	10279 (57%)	9355 (57%)	8660 (58%)	3858 (38%)	2901 (36%)	2829 (36%)	3273 (52%)	2913 (52%)	2831 (53%)	1539 (30%)	1511 (30%)	1511 (30%)
Yes	7806 (43%)	7050 (43%)	6339 (42%)	6199 (62%)	5145 (64%)	5077 (64%)	3057 (48%)	2662 (48%)	2472 (47%)	3665 (70%)	3581 (70%)	3581 (70%)

Appendix 2 CES-D-10 in CHARLS

[The 10 items below refer to how you have felt and behaved during the last week. Choose the appropriate response 下面 10 道问题是有关您上周的感觉及行为，每道题目的答案都是一样的，包括很少或者根本没有，不太多，有时或者说有一半的时间还是大多数的时间，请您选择合适的答案]

DC009 I was bothered by things that don't usually bother me. 我因一些小事而烦恼。

DC010 I had trouble keeping my mind on what I was doing. 我在做事时很难集中精力。

DC011 I felt depressed. 我感到情绪低落。

DC012 I felt everything I did was an effort. 我觉得做任何事都很费劲。

DC013 I felt hopeful about the future. 我对未来充满希望。

DC014 I felt fearful. 我感到害怕。

DC015 My sleep was restless. 我的睡眠不好。

DC016 I was happy. 我很愉快

DC017 I felt lonely. 我感到孤独。

DC018 I could not get "going". 我觉得我无法继续我的生活。

Answers (DC013 and DC016 reversely scored):

1. Rarely or none of the time (< 1 day) 很少或者根本没有 (< 1 天)
2. Some or a little of the time (1 – 2 days) 不太多 (1 – 2 天)
3. Occasionally or a moderate amount of the time (3 – 4 days) 有时或者说有一半的时间 (3 – 4 天)
4. Most or all of the time (5 – 7 days) 大多数的时间 (5 – 7 天)

Appendix 3 CES-D-10 in CLHLS

B3 抑郁量表 (此部分问题必须由老人亲自回答)

B3-1 Are you bothered by small things? 您会因一些小事而烦恼吗?

B3-2 Do you find it hard to concentrate when doing things? 您现在做事时是不是很难集中精力?

B3-3 Do you feel upset or depressed? 您是不是感到难过或压抑?

B3-4 Do you feel less useful as you get older, that everything you do is an effort? 您是不是觉得越老越不中用, 做什么事都很费劲?

B3-5 Do you feel hopeful about your future life? 您是不是对未来的生活充满希望?

B3-6 Do you feel stressful, fearful? 您是不是感到紧张、害怕?

B3-7 Are you as happy as you were younger? 您是不是觉得与年轻时一样快活? (回答“比年轻时还快活”的, 则选“1”)

B3-8 Do you feel lonely? 您是不是觉得孤独?

B3-9 Do you feel you can't get going on your life? 您是不是感到无法继续自己的生活?

B3-10-1 How is your sleep quality 您现在睡眠质量如何?

Answers (except B3-10-1): 1. 总是 2. 经常 3. 有时 4. 很少 5. 从不 8. 无法回答

Answers for B3-10-1: 1. 很好 2. 好 3. 一般 4. 不好 5. 很不好 8. 无法回答

Note: scoring (1=4) (2=3) (3=2) (4 5=1)

Appendix 4 Weighted prevalence of depression in all age groups

Subgroup	CHALRS			CLHLS	
	45-64 (N=9,704)	65-79 (N=5,307)	80+ (N=623)	65-79 (N=5,201)	80+ (N=8,140)
Total	34.0% (32.2-35.8)	37.0% (35.0-39.2)	38.6% (33.6-43.8)	21.9% (20.7-23.2)	30.5% (29.1-31.9)
Sex					
Male	27.3% (25.3-29.5)	29.5% (27.1-31.9)	32.6% (26.5-39.3)	18.2% (16.6-19.9)	24.7% (22.9-26.7)
Female	40.1% (38.1-42.1)	44.7% (41.8-47.6)	45.4% (38.5-52.4)	25.5% (23.7-27.4)	35.0% (33.0-37.0)
Residence					
Urban	23.8% (20.9-27.0)	26.7% (23.5-30.1)	32.3% (23.5-42.6)	19.5% (17.4-21.9)	26.7% (24.3-29.3)
Rural	37.8% (35.8-39.8)	41.6% (39.3-43.9)	42.7% (37.4-48.2)	22.8% (21.3-24.3)	32.0% (30.3-33.7)
Education					
No education	47.3% (43.8-50.8)	48.7% (45.3-52.1)	40.9% (33.9-48.4)	31.1% (28.2-34.2)	34.9% (32.7-37.2)
Some education	32.0% (30.3-33.9)	33.1% (31.0-35.3)	36.9% (30.6-43.6)	19.4% (18.1-20.8)	27.2% (25.5-29.1)

Appendix 5 Sensitivity analysis on study-specific adjusted odds ratios of depression (cutoff point of 12) associated with covariates (weighted) (a)

	CHARLS 45-79 (N=14,380) (b)	CLHLS 80-117 (N=7,542) (b)
Factors	OR (95% CI)	OR (95% CI)
Age	1.01 (1, 1.02)**	1.01 (0.99, 1.02)
Female sex	2.07 (1.79, 2.39)***	1.42 (1.13, 1.77)**
Rural hukou	2.03 (1.71, 2.41)***	1.45 (1.19, 1.76)***
Some education	0.78 (0.69, 0.88)***	0.91 (0.76, 1.1)
Marital status		
Married, living with spouse	<i>Reference.</i>	<i>Reference.</i>
Widowed	1.48 (1.29, 1.7)***	1.16 (0.95, 1.4)
Other (c)	1.31 (1.11, 1.54)**	1.98 (1.24, 3.16)**
Drinking		
Never drinker	<i>Reference.</i>	<i>Reference.</i>
Former drinker	1.24 (1.05, 1.47)*	1.02 (0.78, 1.33)
Current drinker	0.73 (0.63, 0.84)***	0.66 (0.49, 0.88)**
Smoking		
Never smoker	<i>Reference.</i>	<i>Reference.</i>
Former smoker	1.19 (0.99, 1.43)	0.9 (0.69, 1.18)
Current smoker	1.39 (1.19, 1.62)***	0.98 (0.74, 1.29)
Chronic diseases (d)	1.64 (1.51, 1.79)***	1.6 (1.32, 1.94)***

Abbreviation: OR = odds ratios. CI = confidence interval. Coef. = coefficient. *** P < 0.001, ** P < 0.01, * P < 0.05. P-values were calculated from chi-square tests or analysis of variance. a. Probable depression was defined by a CESD-10 score over 12. b. Unweighted number of observations. c. Other marital status included married but not living with spouse temporarily for reasons such as work, separated, divorced, never married. d. Any chronic disease was defined as self-report of at least one of the eleven diseases including hypertension, diabetes, cancer, lung disease, heart disease, stroke, arthritis, dyslipidemia, liver disease, kidney disease, digestive disease.

Appendix 6 Copied survey questions on drinking and smoking

Drinking

CHARLS

DA067 Did you drink any alcoholic beverages, such as beer, wine, or liquor in the past year?

How often? [1→yes, 2&3→no]

1. Drink more than once a month
2. Drink but less than once a month→ DA069
3. None of these→ DA069

DA069 Did you ever drink alcoholic beverages in the past? How often? [3→yes, 1&2→no]

1. I never had a drink.
2. I used to drink less than once a month.
3. I used to drink more than once a month.

Note: coding combined 2&3 for DA067, combined 1&2 for DA069.

CLHLS

D8-1 Do you often drink alcohol?

1. Yes.
2. No

D8-2 Did you often drink alcohol in the past?

1. Yes.
2. No.

Smoking

CHARLS

[INTRO: Next, I would like to ask whether you have had the habit of smoking cigarettes/smoking a pipe/chewing tobacco, now or in the past. By smoking we mean smoking more than 100 cigarettes in your life]

DA059 BRANCHPOINT:

If XRType = REIW and R reported ever smoked (Zsmoke = 1), skip to DA061_W4

If XRType = REIW and R did not report ever smoked (Zsmoke ≠ 1), or XRType = NEWIW, ask DA059

DA059 Have you ever chewed tobacco, smoked a pipe, smoked self-rolled cigarettes, or smoked cigarettes/cigars?

1. Yes
2. No→ Skip to next section

DA061 Do you still have the habit or have you totally quit?

1. Still have 仍然抽烟→ Skip to DA060 跳至 DA060
2. Quit 戒烟→ Skip to DA060 跳至 DA060

DA061_W4 Our records from your last interview show that you have ever smoked, do you still have the habit or have you totally quit?

1. Still have

2. Quit
3. Never smoked → Skip to next section

CLHLS

D7-1 Do you smoke cigarette now?

1. Yes.
2. No.

D7-2 Did you smoke cigarette in the past?

1. Yes.
2. No.

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