



# Influencing factors of psychological pain among older people in China: A cross-sectional study

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## ABSTRACT

Limited research has focused on the psychological pain among older people and factors associated with psychological distress in older adults also remain to be evaluated. This study aims to examine the status and correlates of psychological pain among older people from urban and rural areas in China. This cross-sectional study analyzed data from 4312 samples which extracted from the dataset of China's Health-Related Quality of Life Survey for Older Adults 2018. Psychological pain was assessed by the Chinese version of the Psychache Scale (PAS). Multiple linear regression models were established to examine the associations between demographic characteristics and psychological pain. The average score of PAS among older people was  $41.79 \pm 14.52$ , and the average score of PAS among urban older people was higher than rural ones in this study. For rural older people, age ( $B_{\geq 80} = 2.55$ ), gender ( $B_{\text{Female}} = 1.27$ ), educational level ( $B_{\text{Primary school}} = 1.63$ ;  $B_{\geq \text{Middle school}} = 0.27$ ), smoking ( $B_{\text{yes}} = 0.83$ ), number of chronic diseases ( $B_{\geq 2} = 3.19$ ) and personal social capital ( $B_{\text{BRC}} = 0.27$ ) were positively related to psychological pain, while family per-capita annual income ( $B_{15,000-30,000} = -2.52$ ;  $B_{> 30,000} = -3.44$ ), living arrangement ( $B_{\text{With spouse}} = -3.40$ ;  $B_{\text{With children}} = -2.89$ ;  $B_{\text{Others}} = -3.82$ ) and personal social capital ( $B_{\text{BOC}} = -0.36$ ) were negatively associated with psychological pain ( $p < 0.05$ ). Moreover, for urban older people, gender ( $B_{\text{Female}} = 0.98$ ), current occupation ( $B_{\text{With occupation}} = 1.13$ ) and smoking ( $B_{\text{yes}} = 2.14$ ) were positively related to psychological pain, whereas age ( $B_{\geq 80} = -1.45$ ), family per-capita annual income ( $B_{> 30,000} = -3.63$ ), living arrangement ( $B_{\text{With spouse}} = -1.31$ ), BMI ( $B_{\text{normal}} = -2.62$ ) and personal social capital ( $B_{\text{BOC}} = -0.16$ ) were negatively associated with psychological pain ( $p < 0.05$ ). The present study sheds light on the worrying state of psychological pain experienced by Chinese older people. The results suggest that targeted interventions and social support, should be taken to alleviate the psychological pain among older people, especially urban older people.

## 1. Introduction

Psychological pain is defined as a distressing psychological experience stemming from the unfulfilled key psychological needs, such as affiliation, control, and self-esteem [1,2]. Distinct from physical pain, it mainly refers to emotional and cognitive pain experiences

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[3]. More specifically, psychological pain is manifested primarily as adverse affective states such as sadness, guilt, despair and anxiety [4]. Neurobiological evidence also suggests that psychological pain may be related to cognitive decline [5]. Additionally, it is noted that previous studies demonstrate robust associations between psychological pain and suicide [6–10], as severe psychological pain can serve as a primary motivation and impetus for suicide [3,11]. Chronic psychological pain can lead to a variety of psychological health problems associated with suicide risk such as depression, anxiety, personality disorders [12], and can weaken an individual's coping abilities, making it difficult for them to effectively cope with life's difficulties and pressures, which can lead them to consider suicide as a means of escaping reality [13]. Therefore, it is beneficial to further study the psychological pain, because the relationship between psychological pain and suicide offers valuable insight for suicide research and prevention efforts.

Extent research on psychological pain has mainly examined 1) the assessment of psychological pain. Shneidman [11] first compiled the scale of psychological pain, and Holden et al. [2] further developed the psychological pain scale. Scholars like Yang et al. [14] and Jorge et al. [15] have also localized the psychological pain scale building on Holden's contributions; and 2) the relationship between psychological pain and related constructs, such as depression [16,17], anxiety [18,19], and quality of life [20,21]. However, most studies have concentrated on the groups of students [17,22,23], and patients with specific diseases [24,25], with a paucity of research interrogating psychological pain among older people. Considering the physiological, cognitive and socio-psychological changes that come with aging, older people may be prone to psychological suffering manifesting as loneliness, helplessness and other maladaptive affective states [18]. Current studies indicate that higher socioeconomic status (e.g., educational level, income, occupation) [26,27], better health condition (e.g., Body Mass Index, chronic diseases) [10,28] and positive health behaviors (e.g., smoking and drinking) [29,30] can significantly help to relieve the negative emotions (e.g., depression, anxiety) in later life. Additionally, older people who were female and living alone appear more susceptible to experiencing emotional and cognitive pain [10, 31]. Greater social interactions (e.g., social capital) [32–34] also demonstrate utility in reducing negative emotions among older adults. Thus, factors like socioeconomic status, health condition, health behaviors and social interaction may share significantly correlated to older people's psychological pain and it is necessary to conduct the survey to examine the related factors associated with psychological pain among older people.

There is limited literature on psychological pain among older people in China since research is primarily centered on the overall mental health status. More importantly, China has entered a moderately aging society. According to the statistics of the seventh national census in China in 2020, population aged 60 and over is about 264 million, accounting for 18.5 % of the total population [35]. The number of Chinese people aged 60 and above will reach 487 million, which consists of 34.9 % of total population by 2050 [10]. Against this backdrop, China's "Health China 2030 Plan" has prioritized preventing and managing mental disorders and psycho-behavioral problems among older adults. Thus, it is crucial to understand the status of older people's mental health, especially psychological pain. Given the disparities across urban and rural regions in economic development, cultural customs, and attitudes, the potential associated factors associated with psychological pain may vary between these two regions, accordingly. Therefore, this study was aimed to explicate the factors associated with psychological pain among rural and urban older people from the demographic characteristics (age, gender, educational level, marital status, family per-capita annual income, current occupation, living arrangement), health status (BMI, chronic diseases), health behaviors (smoking and drinking) and social interaction (social capital). This study will also provide targeted policy recommendations to reduce psychological pain among older people. The hypotheses of our study are that 1) the associated factors with psychological pain among rural older people may be significantly different from urban older people; 2) based on previous research [26–30,32–34], higher level of demographic characteristics (age, educational level, family per-capita annual income), other demographic characteristics (male, being married, not living alone, not working any more), better health conditions (normal BMI, no chronic diseases), impletementing more health behaviors (no smoking/drinking) and more social interaction (social capital) may be negatively associated with psychological pain among rural and urban older people.

## 2. Materials and methods

### 2.1. Data source and participants

The data source of this study was China's Health-related Quality of Life Survey for Older Adults 2018 (CHRQLS-OA 2018) [36], which was designed and conducted by Global Health Institute of Wuhan University during the Spring Festival in 2018. Older people was defined as individuals who aged 60 years old and over in this study, according to *the Law of the People's Republic of China on the Protection of the Rights and Interests of the Elderly* [37]. The CHRQLS-OA 2018 was a cross-sectional investigation and aimed to elucidate the health status of Chinese older people by collecting data of socio-ecological factors, personal social capital, health-related behaviors, health-related quality of life, mental health and so on [38]. To maximize participation, this survey employed convenience sampling. Specifically, the investigator posted the questionnaire link on various social networks such as WeChat and QQ groups (both WeChat and QQ are well-known social media apps in China and have a large number of users). The investigator also conducted household surveys and encouraged older respondents who had already completed the questionnaire to invite their friends to participate in the survey. There were 5442 valid samples included in the final dataset. The effective rate of survey was 85.26 %.

In the present study, we excluded 1130 subjects with missing data on demographic characteristics, personal social capital, and psychological pain. This resulted in a final sample of 4312 individuals aged 60 years and older who were included in the analysis.

## 2.2. Measures

### 2.2.1. Demographic characteristics

The participants' demographic information of this study included age, gender, educational level, marital status, family per-capita annual income (Chinese Yuan, CHY), current occupation, living arrangement. Age was set as continuous variable. Gender was divided into male and female. Educational level was categorized as illiteracy, primary school and  $\geq$ middle school. Marital status was classified into married and single. Family per-capita annual income was classified into  $\leq 15,000$ , 15,000–30,000 and  $>30,000$ . The current occupational status of older people, that is, whether they remain economically active or inactive, includes those who continue paid employment after retirement and those who do not work anymore after retirement. Living arrangement was divided into four categories: alone, with spouse, with children and others.

In addition, we also added health conditions including Body Mass Index (BMI), number of chronic diseases; health-related behaviors including smoking and drinking as covariates. BMI was categorized as underweight (weight/height  $<18.5$  kg/cm<sup>2</sup>), normal (weight/height 18.5–24 kg/cm<sup>2</sup>) and overweight (weight/height  $>24$  kg/cm<sup>2</sup>). Number of chronic diseases was composed of 0, 1 and  $\geq 2$ . Smoking was categorized into the binary options of smoking (individuals who smoke at least one cigarette per week) or not smoking (individuals who have never smoked or have quit smoking), while drinking was similarly classified into the binary options of drinking (individuals who drink more than onetime per week) or not drinking (individuals who never drank in the past or have quit drinking).

### 2.2.2. Personal social capital

We adopted the personal social capital to evaluate the social interaction of older people. Personal social capital refers to the resources, information and support that individuals obtain through their social connections [39]. The assessment tool of personal social capital in this study was the Chinese version of the 16-item Personal Social Capital Scale (PSCS-16) [40]. The PSCS-16 is used to evaluate two main types of personal social capital, including bonding social capital (BOC) and bridging social capital (BRC). BOC consists of four components (network size, trustworthiness, resource ownership and reciprocity), while BRC also consists of four components (network size, resource ownership, trustworthiness and reciprocity) [41]. Each two items in PSCS-16 make up one component, and a five-point Likert scale (1 = all, 2 = most, 3 = some, 4 = a few and 5 = none) is employed for all items. We made a reverse-coded to the 16 items in the dataset in order to be consistent with the measurement of psychological pain. Therefore, the ranges of total score of BOC and BRC are from 8 to 40 and the higher score means the higher personal social capital. The PSCS-16 has been confirmed to have good reliability and validity by many Chinese researchers [41,42], and the values of Cronbach's alpha and KMO in our study are 0.964 and 0.966, respectively.

### 2.2.3. Psychological pain

The psychological pain of older people was evaluated by the Chinese version of the Psychache Scale (PAS). Holden et al. developed the origin version of PAS [2] and Yang et al. in Tianjin University was the first user of the PAS in China [14]. PAS is composed of 13 items, 9 of which reflect the pain frequency and the remaining 4 reflect pain intensity. A five-point Likert scale was utilized throughout the PAS, from 1 (never) to 5 (always) for the former 9 items and from 1 (strongly disagree) to 5 (strongly agree) for latter 4 items. The total scores range from 13 to 65, with higher scores representing higher psychological pain. Many Chinese scholars have proven the reliability and validity of the Chinese version of PAS [10,43]. In our study, the Cronbach's alpha was 0.964 and KMO was 0.967 (more details about the questionnaires can be seen in the supplementary document).

## 2.3. Statistical analysis

All statistical analyses were conducted using SPSS software, version 22.0 (SPSS Inc., Chicago, IL, USA). The significance level was established as  $\alpha = 0.05$ . The descriptive information was summarized for total sample and stratified by rural versus urban samples. Chi-square tests (for categorical variables) and t-tests (for continuous variables) were used to explore the univariate relationships of these demographic information by rural and urban areas. We used t-tests to compare the difference of psychological pain between rural and urban areas. One-way analysis of variance (ANOVA) and t-test were used to compare the differences in psychological pain across different characteristics. Pearson correlation was adopted to measure the correlation between two normally-distributed continuous variables (age, BOC, BRC and psychological pain all meet the standard of normal distribution). Considering the psychological pain is a continuous variable that conforms to a normal distribution as demonstrated through normality testing and exhibits an absence of collinearity among predictors (all VIF  $<3$ ), a linear regression approach was utilized to examine the associated relationship between psychological pain and demographic characteristics among older people.

## 2.4. Ethical statement

The CHRQLS-OA 2018 was conducted based on the Declaration of Helsinki and the protocol was reviewed and approved by the Institutional Review Board of School of Public Health and Faculty of Medical Sciences, Wuhan University (IRB number: 2019YF2050). All volunteers were fully informed of the consent for inclusion before they participated in this survey and each of them participated willingly.

### 3. Results

#### 3.1. Descriptions of participants' demographic information

Table 1 shows the characteristic information of the samples. A total of 4312 participants were involved in this study, with 60.02 % from rural areas and 39.98 % from urban areas. The average age of total participants was 71.02. Over half (50.39 %) participants were female, and over two-thirds (67.02 %) were married. About one-third of the participants had no education, and 40.28 % older people had a per-capita annual family income over 30,000 yuan. There were 30.36 % of the participants still economically active by continuing paid employment past the conventional retirement age, while 11.41 % lived alone. Over half (63.47 %) of the participants had a normal BMI, while over half (52.46 %) also suffered from chronic diseases. The mean scores for personal social capital, BOC, and BRC were 41.79, 22.60, and 19.18, respectively. There were significant differences between participants from rural and urban areas in all demographic characteristics and social capital ( $p < 0.05$ ). Details are presented in Table 1.

#### 3.2. Difference of psychological pain among total, rural and urban older people

The psychological pain scores of participants is displayed in Table 2. Rural older people had higher level of psychological pain than urban older people.

#### 3.3. Differences between different variables and psychological pain

Among rural older adults, psychological pain scores differed significantly by gender, marital status, family per-capita annual

**Table 1**  
Participants' demographic characteristics, health conditions, health-related behaviors and personal social capital.

Characteristic	Total (4312)	Rural areas (2588)	Urban areas (1724)	p-value
Age, Mean $\pm$ SD	71.02 $\pm$ 7.64	70.74 $\pm$ 7.53	71.45 $\pm$ 7.72	0.003
Gender, n (%)				0.961
Male	2134 (49.49)	1280 (49.46)	854 (49.54)	
Female	2178 (50.51)	1308 (50.54)	870 (50.46)	
Educational level, n (%)				<0.001
Illiteracy	1371 (31.79)	1160 (44.82)	211 (12.24)	
Primary school	1496 (34.69)	888 (34.31)	608 (35.27)	
$\geq$ Middle school	1445 (33.51)	540 (20.87)	905 (52.49)	
Marital status, n (%)				<0.001
Married	2939 (68.16)	1684 (65.07)	1255 (72.80)	
Single	1373 (31.84)	904 (34.93)	469 (27.20)	
Family per-capita annual income (CHY), n (%)				<0.001
$\leq$ 15,000	1507 (34.95)	1236 (47.76)	271 (15.72)	
15,000–30,000	1068 (24.77)	781 (30.18)	287 (16.65)	
>30,000	1737 (40.28)	571 (22.06)	1166 (67.63)	
Current occupation, n (%)				<0.001
Without occupation	3003 (69.64)	1572 (60.74)	1431 (83.00)	
With occupation	1309 (30.36)	1016 (39.26)	293 (12.00)	
Living arrangement, n (%)				<0.001
Alone	492 (11.41)	366 (14.14)	126 (7.31)	
With spouse	1461 (33.88)	779 (30.10)	682 (39.56)	
With children	1627 (37.73)	929 (35.90)	698 (40.49)	
Others	732 (16.98)	514 (19.86)	218 (12.65)	
BMI, n (%)				<0.001
Underweight	430 (9.97)	300 (11.59)	130 (7.54)	
Normal	2737 (63.47)	1693 (65.42)	1044 (60.56)	
Overweight	1145 (26.55)	595 (22.99)	550 (31.90)	
Smoking, n (%)				<0.001
No	2909 (67.46)	1642 (63.45)	1267 (73.49)	
Yes	1403 (32.54)	946 (36.55)	457 (26.51)	
Drinking, n (%)				0.305
No	2355 (54.62)	1397 (53.98)	958 (55.57)	
Yes	1957 (45.38)	1191 (46.02)	766 (44.43)	
Number of chronic diseases, n (%)				<0.001
0	2055 (47.66)	1161 (44.86)	894 (51.86)	
1	1169 (27.11)	724 (27.98)	445 (25.81)	
$\geq$ 2	1088 (25.35)	703 (27.16)	385 (22.33)	
PSC total, Mean $\pm$ SD	41.79 $\pm$ 14.52	37.23 $\pm$ 13.75	48.62 $\pm$ 12.88	<0.001
BOC, Mean $\pm$ SD	22.60 $\pm$ 7.19	20.64 $\pm$ 7.18	25.55 $\pm$ 6.12	<0.001
BRC, Mean $\pm$ SD	19.18 $\pm$ 8.23	16.60 $\pm$ 7.50	23.07 $\pm$ 7.74	<0.001

Note: Single included the status of unmarried, divorced, and widowed; Others included the status of living with grandchildren, neighbor, or nursing home; SD, standard deviation; BMI, body mass index; PSC, personal social capital; BOC, bonding social capital; BRC, bridging social capital.

**Table 2**  
Psychological pain scores in participants Among Total, Rural and Urban Older People (Mean  $\pm$  S.D).

Variables	Total	Rural areas	Urban areas	t	p-value
PAS score	22.10 $\pm$ 9.43	23.43 $\pm$ 9.93	20.09 $\pm$ 8.23	12.008	<0.001

income, occupation, living arrangements, smoking, and number of chronic diseases ( $p < 0.05$ ). Rural older people's age, BOC and BRC were positively related to psychological pain ( $p < 0.05$ ). Similarly, among urban older adults, psychological pain scores differed significantly by gender, marital status, family per-capita annual income, occupation, living arrangements, BMI, smoking, and number of chronic diseases ( $p < 0.05$ ). BOC and BRC of urban older people were negatively related to psychological pain. Relationships between variables and psychological pain were largely consistent between rural and urban older adults. Details are presented in [Table 3](#).

### 3.4. Factors associated with Chinese older People's psychological pain

To further identify the main influencing factors of psychological pain among older people in China, multivariate linear regression analyses were conducted ([Table 4](#)).

In terms of the rural participants, the results showed that higher family per-capita annual income ( $B_{15,000-30,000} = -2.51$ ,  $SE = 0.44$ ;  $B_{>30,000} = -3.40$ ,  $SE = 0.50$ ), living with people ( $B_{\text{with spouse}} = -3.54$ ,  $SE = 0.70$ ;  $B_{\text{with children}} = -2.80$ ,  $SE = 0.63$ ;  $B_{\text{others}} = -3.84$ ,  $SE = 0.66$ ), having higher BOC ( $B = -0.36$ ,  $SE = 0.04$ ) are negatively associated with psychological pain ( $p < 0.05$ ). Rural older people who are female ( $B = 1.31$ ,  $SE = 0.48$ ), higher age ( $B = 0.10$ ,  $SE = 0.03$ ), smoking ( $B_{\text{yes}} = 0.76$ ,  $SE = 0.49$ ), having over 2 chronic

**Table 3**  
Psychological pain scores in participants with different places of residence (Mean  $\pm$  S.D/Rs).

Variables	Rural areas	p-value	Urban areas	p-value
Age (Rs)	0.109	<0.001	-0.023	0.346
Gender (Mean $\pm$ S.D)				
Male	23.04 $\pm$ 9.95	0.044	19.43 $\pm$ 7.82	0.001
Female	23.83 $\pm$ 9.93		20.72 $\pm$ 8.57	
Educational level (Mean $\pm$ S.D)				
Illiteracy	23.43 $\pm$ 9.72	0.092	20.83 $\pm$ 9.07	0.139
Primary school	23.89 $\pm$ 10.10		19.62 $\pm$ 7.56	
$\geq$ Middle school	22.70 $\pm$ 10.11		20.23 $\pm$ 8.45	
Marital status (Mean $\pm$ S.D)				
Married	22.71 $\pm$ 9.73	<0.001	19.40 $\pm$ 7.84	<0.001
Single	24.79 $\pm$ 10.18		21.95 $\pm$ 8.94	
Family per-capita annual income (Mean $\pm$ S.D)				
$\leq$ 15,000	25.19 $\pm$ 10.70	<0.001	23.53 $\pm$ 9.64	<0.001
15,000-30,000	22.65 $\pm$ 9.09		22.82 $\pm$ 8.87	
$>$ 30,000	20.70 $\pm$ 8.48		18.62 $\pm$ 7.26	
Current occupation (Mean $\pm$ S.D)				
Without occupation	23.94 $\pm$ 10.01	0.001	19.89 $\pm$ 8.06	0.028
With occupation	22.65 $\pm$ 9.72		21.05 $\pm$ 8.98	
Living arrangement (Mean $\pm$ S.D)				
Alone	27.13 $\pm$ 11.89	<0.001	23.35 $\pm$ 9.68	<0.001
With spouse	22.49 $\pm$ 9.37		19.26 $\pm$ 7.59	
With children	23.20 $\pm$ 9.49		19.94 $\pm$ 8.09	
Others	22.64 $\pm$ 9.45		21.30 $\pm$ 9.20	
BMI (Mean $\pm$ S.D)				
Underweight	24.20 $\pm$ 9.93	0.051	22.89 $\pm$ 10.12	<0.001
Normal	23.09 $\pm$ 9.94		19.41 $\pm$ 7.70	
Overweight	24.03 $\pm$ 9.91		20.73 $\pm$ 8.53	
Smoking (Mean $\pm$ S.D)				
No	23.14 $\pm$ 9.71	0.049	19.67 $\pm$ 7.89	<0.001
Yes	23.94 $\pm$ 10.30		21.26 $\pm$ 9.05	
Drinking (Mean $\pm$ S.D)				
No	23.23 $\pm$ 9.67	0.258	20.41 $\pm$ 8.34	0.070
Yes	23.67 $\pm$ 10.24		19.69 $\pm$ 8.08	
Number of chronic diseases (Mean $\pm$ S.D)				
0	22.33 $\pm$ 10.34	<0.001	19.50 $\pm$ 8.34	<0.001
1	22.58 $\pm$ 8.63		20.01 $\pm$ 7.79	
$\geq$ 2	26.13 $\pm$ 10.03		21.57 $\pm$ 8.30	
Personal social capital (Rs)				
BOC	0.120	<0.001	-0.213	<0.001
BRC	0.020	<0.001	-0.191	<0.001

Note: Single included the status of unmarried, divorced, and widowed; Others included the status of living with grandchildren, neighbor, or nursing home; SD, standard deviation; Rs, correlation coefficient; BMI, body mass index; PSC, personal social capital; BOC, bonding social capital; BRC, bridging social capital.

**Table 4**  
Multiple linear regression analysis on the potential factors associated with subjects among rural and urban areas.

Variables	Rural areas			Urban areas		
	B	S.E	p-value	B	S.E	p-value
Age	0.10	0.03	<0.001	-0.01	0.03	0.021
Gender (ref: Male)						
Female	1.31	0.48	0.006	1.01	0.45	0.026
Educational level (ref: Illiteracy)						
Primary school	1.54	0.46	0.001	0.39	0.67	0.561
≥Middle school	1.30	0.57	0.023	1.21	0.67	0.068
Marital status (ref: Single)						
Married	0.35	0.49	0.477	-0.84	0.52	0.103
Family per-capita annual income (ref: ≤15,000)						
15,000–30,000	-2.51	0.44	<0.001	-0.63	0.66	0.338
>30,000	-3.40	0.50	<0.001	-3.62	0.56	<0.001
Current occupation (ref: Without occupation)						
With occupation	-0.20	0.41	0.622	1.01	0.51	0.045
Living arrangement (ref: Alone)						
With spouse	-3.54	0.70	<0.001	-1.46	0.85	0.031
With children	-2.80	0.63	<0.001	-1.56	0.79	0.051
Others	-3.84	0.66	<0.001	-0.56	0.91	0.535
BMI (ref: Normal)						
Underweight	0.36	0.60	0.546	2.59	0.74	<0.001
Overweight	0.74	0.46	0.105	-1.21	0.42	0.062
Smoking (ref: No)						
Yes	0.76	0.49	0.049	2.01	0.51	<0.001
Drinking (ref: No)						
Yes	0.50	0.46	0.273	0.32	0.46	0.482
Number of chronic diseases (ref: 0)						
1	0.30	0.46	0.514	-0.47	0.47	0.319
≥2	3.13	0.46	<0.001	0.79	0.50	0.113
Personal social capital						
BOC	-0.36	0.04	<0.001	-0.15	0.05	0.001
BRC	0.27	0.04	<0.001	-0.03	0.04	0.503
R <sup>2</sup>	0.114		0.122			

Note: Ref, reference; B, unstandardized coefficients; CI, confidence interval; SE, standard error; Beta, standardized coefficients; BMI, body mass index; BOC, bonding social capital; BRC, bridging social capital. Single included the status of unmarried, divorced, and widowed; Others included the status of living with grandchildren, neighbor, or nursing home; \*\*\*:  $p < 0.001$ ; \*\*:  $p < 0.01$ ; \*:  $p < 0.05$ .

diseases ( $B = 3.13$ ,  $SE = 0.46$ ), with higher education level ( $B_{\text{primary school}} = 1.54$ ,  $SE = 0.46$ ;  $B_{\geq \text{middle school}} = 1.30$ ,  $SE = 0.57$ ) and having higher BRC score ( $B = 0.27$ ,  $SE = 0.04$ ) were positively associated with psychological pain ( $p < 0.05$ ).

For urban participants, higher age ( $B = -0.01$ ,  $SE = 0.03$ ), higher family per-capita annual income ( $B_{> 30,000} = -3.62$ ,  $SE = 0.56$ ), living with spouse ( $B_{\text{with spouse}} = -1.46$ ,  $SE = 0.85$ ) and lower BOC ( $B = -0.15$ ,  $SE = 0.05$ ) had negative relationship for psychological pain ( $p < 0.05$ ). While urban older people who were female ( $B_{\text{female}} = 1.01$ ,  $SE = 0.45$ ), underweight ( $B_{\text{underweight}} = 2.59$ ,  $SE = 0.74$ ) still working ( $B_{\text{with occupation}} = 1.01$ ,  $SE = 0.51$ ) and smoking ( $B_{\text{yes}} = 2.01$ ,  $SE = 0.51$ ) had a positive relationship to psychological pain ( $p < 0.05$ ).

#### 4. Discussion

Our study is intended to screen out the potential vulnerable older people who may suffer from psychological pain. To our knowledge, this study could be the first study which focusing on the factors associating the differences in psychological pain among urban and rural older people in China. We found that age, gender, family annual income per-capita, educational level, living status, current occupation, BMI, smoking condition, chronic diseases, and personal social capital were the main associated factors of psychological pain among rural and urban older adults.

In our study, we found that, older people in rural areas had higher level of psychological pain, compared with urban older people. As many existing literatures have shown, the psychological condition of rural older people is poorer than that of urban older people [30,44–46]. Because most of them lack sufficient living security and the company of their children, their quality of life needs to be improved [36]. Therefore, it is worth paying attention to the fact that the level of psychological pain among rural older people is lower than that of urban older people. The government should formulate policies to improve the welfare treatment of older people and reduce the inequalities between urban and rural areas. Society should also provide more social support for rural older people.

In this study, gender emerged as a significant correlate of psychological pain among older adults. Both female rural and urban older people were more likely to suffer from psychological pain which were corroborated in previous study [47], which also verifies our hypothesis. This is understandable that family status, economic level of women are generally lower than men's in China, especially among older people [48]. In addition, women are often burdened with daily chores in daily family life, such as doing laundry, cooking, and taking care of children. This makes women more likely to have negative emotions and suffer from psychological pain. The result highlights the importance to pay more attention to the female older people. For example, the local community can call on males in the



family to participate actively in the daily chores and encourage older female people ask for support from family members, friends and psychological experts.

We also found an association between age and psychological pain among older adults. Specifically, older people with higher age living in rural areas had a positive association with psychological pain, while those with higher age living in urban areas had a negative one. For rural older people, most of them would feel lonely because of being less accompanied by children and losing their relatives and friends [49,50]. Moreover, they may suffer from many chronic diseases [51]. Both poor physical and mental health could increase their psychological pain. While for urban older people, we speculate that due to urban samples having a higher proportion of high education level, they can relieve themselves because education is widely seen as a major indicator of measuring mental health, so they have higher acceptance of new challenges. And cities have more health resources than the countryside [52]. Thus older urban people can get access easily which leads to less psychological pain. Urban older adults also have more opportunity to experience social activities (various recreational activities for older people) to improve their mental health.

Our study revealed that educational level was positively associated with psychological pain among rural older people, which differed from our hypothesis. Generally, the number of older people with higher education levels in rural areas in China is lower than in the city [35]. Thus, people with higher education may have the sense of psychological entitlement [53], which refers to a stable and universal subjective belief or perception that one feels entitled to preferential treatment and is exempt from social responsibility. Research found that people with higher education had a higher level of psychological entitlement [8], and people with higher psychological entitlement may be more likely to do negative actions [54]. Therefore, older rural people with higher educational levels may feel psychological pain. While urban older people who are still working were found to be more likely to experience psychological pain in our study. It is possible that older people in urban areas should have retired, but have to get back to work, indicating their bad living conditions. This may exacerbate their psychological pain. Thus, it is recommended that the government should further refine the existing care security system for older people and increase the level of security subsidies for them. The local government can build several psychological counseling institutions and invite older people to conduct a consultation.

In line with previous studies, our studies found that older people with higher income were negatively associated with psychological pain [45,52,55,56]. Results from the present study showed that older adults living alone were positively connected with psychological pain. With the level of cognition and mobility declining, older adults are more likely to need companionship and care [57]. But it is hard for caregivers to accompany and care for the older people because most of them need to be engaged in work and do not have enough time [58], which leads to many “empty nest older people” [59], especially in rural areas. Such a situation leaves the older people with a psychological gap, which can lead to psychological pain [60]. Thus, it is necessary to appeal to older people’s children and community volunteers to visit older people frequently, especially older people in rural areas.

Our study, consistent with our hypothesis, found a positive association between underweight urban older people and their experience of psychological pain. This may be attributed to the fact standard BMI is closely relevant to better mental health and quality of life [61]. Previous research has found that underweight individuals had higher risk of developing depression [62], which may cause psychological pain. Therefore, we should encourage older people to keep normal BMI. We also found smoking, no matter rural or urban older people, has a positive correlation with psychological pain. A study conducted in the United States demonstrated that older tobacco users had higher levels of depression and anxiety, which may also result in psychological pain [63]. This study demonstrated that rural older people with comorbidity of chronic diseases have higher risk of experiencing psychological pain than those without chronic diseases. Consistent with previous study [55], it is true that older people with chronic diseases have poorer mental health [44, 64], which may lead to psychological pain, because they also need to suffer from physical pain. In addition, health resources in rural areas may not be sufficient as in urban areas, and the annual income of rural older people generally lower than urban older people in our sample, these factors also affect rural older people addressing psychological pain. Local communities should make health education to teach older people to keep healthy lifestyles.

Personal social capital plays an important role in social support and can influence mental health [65,66]. In this study, BOC was negatively associated with psychological pain in both urban and rural older adults, while only BRC was positively associated with psychological pain in rural older adults. BOC is described as the size of the individual’s social network and the help from neighbors and friends [42]. Due to the influence of the long-term clan concept, older adults attach more importance to the relationships among the intimates (children and other relatives), because they can receive support, and care from these people, which may be less likely to feel psychological pain. While BRC means the connection between community members of different status and power [41]. Studies in Taiwan and South Korea have revealed the role of participation in social activities in promoting the mental health of older adults [67, 68]. Interestingly, our study indicated that rural older people with higher BRC feel more psychological pain but no relationship between BRC and psychological pain among urban older people. We assume that it may be caused by the fact that older people living in rural areas have fewer chances to contact friends or relatives living far from them, while it is easier for urban ones to visit unfamiliar neighbors and contact friends. In addition, rural older adults have limited opportunities to take on social activities compared with urban older people. Rural areas also have few social organizations and volunteers to take care of older people’s mental health. Another reason is that older people in China are more inclined to tolerance and passive acceptance, especially rural older adults [69,70]. Because they love face (namely, a sense of dignity or prestige in social contexts) [71,72], they feel that their inner world is unsuitable to tell the outside, which may lead to pressure accumulation and psychological pain. Thus, rural older adults with higher BRC levels are more likely to feel psychological pain. For both rural and urban older people, increasing BOC is recommended to alleviate psychological pain, such as enhancing the emotional interaction between relatives or the younger generation and older people.

In this study, the following limitations should be mentioned. Firstly, we used cross-sectional data which means that the association between demographic information and psychological pain among older people only reflects the relationship in a limited period and we can’t conduct the causal inference. Secondly, the data was obtained by self-report questionnaire, which may exist certain recall bias.

Thirdly, we adopted convenient sampling, which may lead to some representativeness biases. But we try the best to assure the quality and the validity of the data, such as deleting the questionnaire with plentiful blank responses, data double entry and logical validation. Fourthly, the degree of psychological pain of older people may be underestimated. Because respondents who are willing to take part in the study could be more optimistic than those who refused our survey. Fifthly, although prior studies have established a strong correlation between psychological pain and suicide-related variables [6–10], we did not conduct the measurements of the relationship to enhance the strength of the evidence supporting. Finally, the questionnaire is not entirely an objective research tool. Its analysis does not represent reality, but rather the opinions and feelings of the correspondents. Therefore, the results of the PAS are for reference only, and if necessary, it is necessary to consult professionals at professional institutions.

## 5. Conclusions

This study suggested that the level of psychological pain among urban older people was more serious than among rural older people. The study also offers evidence about the factors associated with psychological pain, including age, gender, family annual income per-capita, educational level, living status, current occupation, BMI, smoking condition, chronic diseases, and personal social capital. Actions, such as humanistic care and social support, should be taken to alleviate the psychological pain among older people. Specifically, the government should further improve the system of care and support for older people to ensure the geriatrics' physiological and safety needs; The local community should develop a series of social activities and health education programs to attract older people and older people's family members should also take the initiative to visit and accompany them regularly to meet older people's love and belonging needs. Finally, older people should take the initiative to be aware of and pay attention to their mental health, such as seeking regular psychological counseling to alleviate psychological pain.

This study will be the beginning of drawing the public's attention to older people's psychological pain. In addition, our study will form a basis for future research to validate our findings and explore more factors in older people's psychological pain both in China and other countries with large older populations.

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### Data availability statement

Considering that the data in the database involves the privacy of participants (including addresses, phone numbers, etc.), data will be made available on request and the data that support the findings of this study are available from the corresponding author.

### Additional information

No additional information is available for this paper.

### CRediT authorship contribution statement

**Han Zhou:** Conceptualization, Formal analysis, Validation, Writing – original draft, Writing – review & editing. **Dong Han:** Formal analysis, Investigation, Methodology, Writing – review & editing. **Haisen Zhou:** Investigation, Writing – review & editing. **Xinfeng Ke:** Formal analysis, Investigation, Writing – review & editing. **Dongdong Jiang:** Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Supervision, Validation, Writing – original draft, Writing – review & editing.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2023.e21141>.

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