Liu J, Ge P, Lu Y, *et al*. Prevalence and related factors of subthreshold depression among Chinese residents: A national cross-sectional study. *Health Psychol Res*. 2025;13(3):e81240036.
https://doi.org/10.14440/hpr.2696189

Research Article

Prevalence and Related Factors of Subthreshold Depression among Chinese Residents: A National Cross-sectional Study

Jiaxin Liu[1†], Pu Ge[2†], Yingbing Lu[3], Qin Han[4], Ke Lyu[5], Chen Hu[6], Lutong Pan[7], Yuqian Deng[1], Ying Tang[8], Yuan Luo[9], Haiye Ran[1], Qiyu Li[10], Wenying Hong[11], Xiangle Zeng[12], Yibo Wu[13]*, Liping Zhao[1]*

[1]Department of Clinical Nursing Teaching and Research Section, The Second Xiangya Hospital, Central South University, Changsha 410011, Hunan, China

[2]School of Traditional Chinese Medicine, Beijing University of Chinese Medicine, Beijing 100029, China

[3]School of Management, Beijing University of Chinese Medicine, Beijing 100029, China

[4]College of Health Management, Shandong University of Traditional Chinese Medicine, Jinan 250355, Shandong, China

[5]China Medical University, Shenyang 110122, Liaoning, China

[6]Zijin College of Nanjing University of Technology, Nanjing 210048, Jiangsu, China

[7]Tsinghua Shenzhen International Graduate School, Shenzhen 518055, Guangdong, China

[8]School of Pediatrics, Chongqing Medical University, Chongqing 400016, China

[9]School of Nursing, Capital Medical University, Beijing 100069, China

[10]School of Medical Humanities, China Medical University, Shenyang 110122, Liaoning, China

[11]Faculty of Health Sciences, University of Macau, Macau 999078, China

[12]School of Management, Hubei University of Chinese Medicine, Wuhan 430065, Hubei, China

[13]Department of Nursing, the Fourth Affiliated Hospital of School of Medicine, and International School of Medicine, International Institutes of Medicine, Zhejiang University, Yiwu 322000, Zhejiang, China

[†]*These authors contributed equally to this work.*

Keywords: Prevalence, Related factors, Subthreshold depression, Mental health, Primary prevention

Health Psychology Research

Vol. 13, 2025

Background

Subthreshold depression (SD) impairs quality of life and escalates the risks of progression to major depression. However, it is frequently overlooked in primary healthcare settings.

Objective

This study investigates the prevalence of SD and its associated factors among Chinese residents.

Methods

In this cross-sectional study, we recruited 9,546 residents over the age of 18 from 120 cities across China. Data from sociodemographic questionnaires and validated scales (SD, self-efficacy, social support, family health, self-rated quality of life, and health literacy) were analyzed using Chi-square, Mann–Whitney *U* tests, and logistic regression. Model performance was assessed through receiver operating characteristic curves.

Results

The prevalence of SD was 34.4%. SD was less likely to occur among residents who were male and older and had better perceived social support, greater family health, better self-rated quality of life, and higher levels of health literacy. In contrast, individuals with debt, siblings, or chronic diseases, and those who were unmarried, divorced, or widowed were at higher risk. The model showed moderate predictive accuracy (area under the curve = 0.68, 95% confidence interval: 0.67–0.70).

***Corresponding authors:**
Liping Zhao
Department of Clinical Nursing Teaching and Research Section, The Second Xiangya Hospital, Central South University, Changsha 410011, Hunan, China E-mail: zhaolp0818@csu.edu.cn
Yibo Wu
Department of Nursing, the Fourth Affiliated Hospital of School of Medicine, and International School of Medicine, International Institutes of Medicine, Zhejiang University, Yiwu 322000, Zhejiang, China E-mail: wuyiboism@zju.edu.cn

Conclusion

The study highlights a high prevalence of SD (34.4%) among Chinese residents, influenced by sociodemographic and psychosocial factors. Protective factors included male gender, older age, stronger social support, better family health, greater self-rated quality of life, and higher levels of health literacy. Conversely, having debts, being unmarried/divorced/widowed, having chronic diseases, and having siblings increased the risk. Targeted prevention strategies should address modifiable factors, such as social support and health literacy. The moderate predictive efficacy of the model suggests potential for early screening but warrants further exploration of additional predictors.

1. INTRODUCTION

Subthreshold depression (SD), or subclinical depression, refers to a condition that significantly diminishes people's quality of life and increases the likelihood of progressing to major depressive disorder.[1] SD is characterized by the presence of two to four depressive symptoms persisting at least 2 weeks, accompanied by at least one of the core symptoms (anhedonia or depressed mood), but fails to meet the criteria for any specified depressive disorder diagnosis in the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition. Despite not meeting criteria for major depressive disorder or other depressive diagnoses, SD represents a prevalent mental health concern within populations.[2] Prevalence rates have been reported to be higher among the elderly over 60 years (12.95%) compared to adults aged 18 to 60 (8.92%).[3] Screening conducted on adults in Guangdong Province, China, in 2021 identified a 14.7% prevalence of SD.[4]

Research has shown a strong correlation between SD and impaired social and psychological functioning, as well as an increased risk of developing major depression.[3] Furthermore, SD is linked to an increased risk of mortality and imposes substantial socioeconomic and healthcare burdens, making it a critical public health issue.[5] Presumably, tailored interventions should be employed to reduce the occurrence of SD and prevent the onset of major depression episodes. However, this requires the expansion of our knowledge of the related factors of SD. Exploring and identifying the factors associated with SD among residents should encompass various dimensions, such as individual health as well as familial and societal factors.

This significant cross-sectional study was conducted across all provinces in China to assess the prevalence of SD among Chinese residents and factors (personal characteristics, socioeconomic status, and interpersonal networks) related to SD. The goal is to provide guidance and recommendations for the early prevention of SD among residents and to promote better healthcare management approaches.

2. METHODS

2.1. ETHICAL CONSIDERATIONS

After informing participants of the purpose, benefits, risks, confidentiality of the information, and the voluntary nature of the study, written consent was obtained from each participant. The participation of respondents in the study was voluntary, and participants were informed that they could refuse or stop at any point during the interview. Ethical approval was granted by the Key Research Base of Philosophy and Social Sciences in Shaanxi and the Health Culture Research Center of Shaanxi (JKWH-2021-01).

2.2. STUDY DESIGN AND SAMPLE

This study employed a multistage sampling approach between July 10, 2021, and September 15, 2021.[6] The quota sampling method was used to collect data from selected residents in 120 cities, matching the sociodemographic characteristics of the population according to the published "Seventh National Census of 2021." Gender, age, and urban-rural distribution were considered as quota attributes.[7] The inclusion criteria were defined as follows: (i) individuals aged 18 years or older; (ii) individuals of Chinese nationality; (iii) individuals who are permanent residents in China whose annual abroad time does not exceed one month; (iv) individuals who provided informed consent to voluntarily participate in the study; and (v) individuals who completed the questionnaire either by themselves or with the assistance of an investigator if they had sufficient cognitive ability but insufficient practical ability. Participants were excluded if they were: (i) in a coma, experiencing prolonged unconscious states, or having severe mental disorders (such as schizophrenia or bipolar disorder); and (ii) participating in other comparable research studies.

The research was conducted using the online questionnaire platform Questionnaire Star (https://www.wjx.cn/), with the investigators distributing the questionnaires directly to the residents on a one-on-one basis. Participants were fully informed of the research, and the investigators offered assistance for any difficulties in filling out the questionnaire. This survey comprised 9,546 participants from 11,031 residents in 120 cities across China, yielding an effective rate of 86.5%. Figure 1 depicts the screening process. All participants signed an informed consent form before participating in the study. Neither the patients nor the public were involved in the design, conduct, reporting, or dissemination plans of this study.

2.3. MEASUREMENTS

2.3.1. SOCIODEMOGRAPHIC QUESTIONNAIRE

Sociodemographic variables included gender, age, location, residential status, educational level, employment status, household income per capita, debt status, marital status, presence of siblings, and chronic diseases.

2.3.2. SD

The Patient Health Questionnaire-9 (PHQ-9) aligns with the nine depressive symptom criteria in the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, making it an efficient screening method for depressive symptoms.[8] It includes nine items, with a score range of 0–27 points, where 0–4 points indicate no depression, 5–9 points signify SD, and scores of 10 or above suggest depression.[9,10]

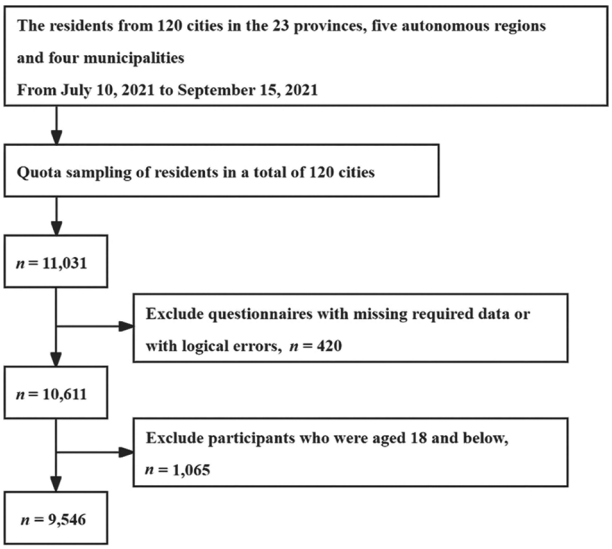

Figure 1. The process of participant recruitment

Greater scores imply more severe depressive symptoms. The PHQ-9 has demonstrated good psychometric properties in the general Chinese population with a Cronbach's α coefficient of 0.86.[11] In this study, it achieved a similar internal consistency reliability with a coefficient of 0.853.

2.3.3. SELF-EFFICACY

The New General Self-Efficacy Scale (NGSES) is a valid measure of residents' level of self-efficacy in various situations. It assesses their perceived ability to perform specific behaviors, using a total of eight items. Scores on the NGSES range from 8 to 40, with higher scores indicating greater levels of self-efficacy.[12] In this study, the scale achieved a Cronbach's α coefficient of 0.949, indicating excellent internal consistency.

2.3.4. PERCEIVED SOCIAL SUPPORT

The Perceived Social Support Scale was employed to assess the convictions and levels of perceived social support from family, friends, and other significant individuals, including relatives and colleagues, among the residents.[13] Scores ranged from 12 to 84, with higher scores indicating an increased perception of social support. The Cronbach's α coefficient of this scale was 0.962, demonstrating good reliability.

2.3.5. FAMILY HEALTH

The Short Form of the Family Health Scale (FHS-SF) offers a comprehensive portrayal of residents' family health.[14] All 10 items were summed to obtain a score ranging from 10 to 50, with higher scores indicating better family health. In this study, FHS-SF had a Cronbach's α of 0.856.

2.3.6. SELF-RATED QUALITY OF LIFE

The EuroQol-Visual Analog Scale (EQ-VAS), a component of the five-level EuroQol five-dimensional questionnaire, is a user-friendly vertical Visual Analog Scale frequently used to help respondents provide an objective rating of their overall health status.[15] The score ranges from 0 (representing the worst imaginable health state) to 100 (representing the best imaginable health state), with numbers indicating utility values. As EQ-VAS consists of only one item, the study did not provide an assessment of its reliability.

2.3.7. HEALTH LITERACY

The respondents' health literacy level was measured using the Short-form Health Literacy Instrument (HLS-SF12).[16] The scale comprises three dimensions: health promotion, disease prevention, and health care, which have a total of 12 items. Higher scores, ranging from 12 to 48 points, indicated a higher level of health literacy. HLS-SF12 showed strong internal consistency in our study (Cronbach's α = 0.945).

2.4. DATA ANALYSIS

The Statistical Package for the Social Sciences 25.0, IBM, United States software was utilized for data entry and analysis. Descriptive statistics were used to calculate the frequency and percentage (n [%]) of categorical variables, as well as the median and interquartile range (median, [lower quartile, upper quartile]) of non-normally distributed continuous variables. The Chi-square test and Mann–Whitney U test were applied to compare differential factors related to SD in residents. Multivariate binary stepwise logistic regression was applied to appraise factors linked with SD in residents. The criteria for variable inclusion and exclusion were set at p=0.05 and p=0.10, respectively. In the regression analysis, the dependent variable was the PHQ-9 score of the respondents. The regression analysis for factors linked with SD was conducted solely on subjects with PHQ-9 assessment scores between 0 and 9. A significance level of 0.05 or below was applied (two-tailed). The precision of the multivariate binary logistic regression model in anticipating SD was measured using receiver operating characteristic curve analysis and the computation of the area under the curve (AUC).

3. RESULTS

3.1. PREVALENCE AND UNIVARIATE ANALYSIS OF SD IN RESIDENTS

Among the 9,546 residents screened, 3,284 were identified with SD (PHQ-9 score ranging from 5 to 9), resulting in a prevalence rate of 34.4%, while 4,426 (57.4%) were deemed to have a normal status (PHQ-9 score ranging from 0 to 4). A total of 1,836 (8.2%) subjects scored more than nine points. Statistically significant differences were observed across all sociodemographic characteristics, excluding place of residence (p<0.05), as indicated in Table 1. The results of the Mann–Whitney U test indicate significant statistical differences (p<0.001) in self-efficacy, perceived social support, family health, self-rated quality of life, and health literacy levels between individuals with SD and those without (Table 2).

3.2. MULTIVARIATE BINARY LOGISTIC REGRESSION AND RECEIVER OPERATING CHARACTERISTIC CURVE ANALYSIS FOR SD IN RESIDENTS

To enhance the resilience of the model, this study constructed three models. Model 1 used the social demographic characteristics of the respondents as independent variables, Model 2 used the scale scores of the respondents as

Table 1. Descriptive statistics and univariate analysis of categorical variables

Variables	Number (constituent rate, %)	Normal (prevalence rate, %)	SD (prevalence rate, %)	χ^2	*p*-values
Total participants	7,710 (100.0)	4,426 (57.4)	3,284 (42.6)		
Gender				20.00	< 0.001*
Female	4,241 (55.0)	2,338 (55.1)	1,903 (44.9)		
Male	3,469 (45.0)	2,088 (60.2)	1,381 (39.8)		
Age				39.23	< 0.001*
19–35 years old	3,404 (44.2)	1,832 (53.8)	1,572 (46.2)		
36–59 years old	3,457 (44.8)	2,048 (59.2)	1,409 (40.8)		
60 years or older	849 (11.0)	546 (64.3)	303 (35.7)		
Location				15.73	< 0.001*
Western China	1,564 (20.3)	874 (55.9)	690 (44.1)		
Central China	2,161 (28.0)	1,180 (54.6)	981 (45.4)		
Eastern China	3,985 (51.7)	2,372 (59.5)	1,613 (40.5)		
Residence				0.47	0.495
Rural	2,033 (26.4)	1,154 (56.8)	879 (43.2)		
Urban	5,677 (73.6)	3,272 (57.6)	2,405 (42.4)		
Education level				12.13	0.007*
Junior school or below	1,721 (22.3)	972 (56.5)	749 (43.5)		
Senior school or middle special school	1,246 (16.2)	750 (60.2)	496 (39.8)		
Junior college	4,203 (54.5)	2,367 (56.3)	1,836 (43.7)		
Bachelor's degree or above	540 (7.0)	337 (62.4)	203 (37.6)		
Employment status				59.87	<0.001*
Employed	3,782 (49.1)	2,254 (59.6)	1,528 (40.4)		
Student	1,623 (21.0)	833 (51.3)	790 (48.7)		
Unemployed	1,613 (20.9)	880 (54.6)	733 (45.4)		
Retired	692 (9.0)	459 (66.3)	233 (33.7)		
Per capita monthly household income, Chinese yuan				21.89	<0.001*
3,000 (USD 421.4) or below	2,082 (27.0)	1,105 (53.1)	977 (46.9)		
3,001 (USD 421.6) or above	5,628 (73.0)	3,321 (59.0)	2,307 (41.0)		
Being in debt				48.87	<0.001*
No	4,806 (62.3)	2,906 (60.5)	1,900 (39.5)		
Yes	2,904 (37.7)	1,520 (52.3)	1,384 (47.7)		
Marital status				48.72	<0.001*
Married	5,038 (65.4)	3,035 (60.2)	2,003 (39.8)		
Unmarried	2,377 (30.8)	1,245 (52.4)	1,132 (47.6)		
Divorced or widowed	295 (3.8)	146 (49.5)	149 (50.5)		
Single-child				5.89	0.015*
Yes	1,675 (21.7)	1,005 (60.0)	670 (40)		
No	6,035 (78.3)	3,421 (56.7)	2,614 (43.3)		
Chronic diseases				10.81	0.001*
No	6,338 (82.2)	3,693 (58.3)	2,645 (41.7)		
Yes	1,372 (17.8)	733 (53.4)	639 (46.6)		

Note: χ^2 test was used to compare categorical variables. Statistical significance determined at *p<0.05. Abbreviation: SD: Subthreshold depression.

independent variables, and Model 3 used the social demographic characteristics and the scale scores of the respondents as independent variables. In each regression model, the dependent variable was the occurrence of SD. The sample used for model development was 7,710 respondents with a PHQ-9 score of 9 or less.

Model 3 constituted the primary outcome of this investigation (Table 3). Results of Model 1 and Model 2, as shown in Table S1, identified factors that were largely aligned with Model 3, thus providing additional evidence for the reliability of Model 3. However, in Model 1, the model included variables such as employment status and per capita monthly household income, while location was added to Model 3, indicating a need for further investigation (Table 3).

Receiver operating characteristic curves were used to assess the predictive ability of logistic regression Models 1, 2, and 3 in predicting SD. Model 3 proved to be superior to Model 1 and Model 2. However, the overall predictive performance was only moderate, with a sensitivity of 60% and a specificity of 67% (Figure 2 and Table S2).

4. DISCUSSION

In this study, we investigated the prevalence and related factors of SD among residents in China. Gender, age, debt status, marital status, presence of siblings, chronic diseases, perceived social support, family health, self-rated quality of life, and health literacy were found to be significantly associated with SD. The related factors in this study were summarized in three perspectives: personal characteristics, socioeconomic status, and interpersonal networks, with possible important implications for developing prevention or intervention strategies against SD in residents.

The prevalence of SD was 34.4% in the present study, highlighting the severity of this mental health issue among Chinese residents. The prevalence of SD was found to be higher than the estimated global prevalence of SD by Furukawa et al.[17] (25%), as well as the prevalence in the general population of Spain (14.04%).[18] However, our result was lower than the findings in Nepal (37%).[9] The variability of estimates regarding the prevalence of SD depends on several factors, including the definition of SD (variations in depression scales or different threshold scores for identification), assessment methods (interview or self-report), time frame (current or across the lifespan), and demographic characteristics. In addition, the data on SD were gathered retrospectively for 2 weeks, potentially leading to recall bias. With this in mind, the higher prevalence observed in this study compared to most others may be attributed to such variability. In short, addressing SD and providing necessary support

Table 2. Descriptive statistics and univariate analysis for continuous variables

Scales	Median (Lower quartile, upper quartile)		*Z*
	Normal	SD	
NGSES	31 (26, 32)	28 (24, 32)	−15.64*
PSSS	64 (54, 72)	59 (48, 68)	−16.80*
FHS-SF	40 (35, 45)	37 (33, 42)	−16.79*
EQ-VAS	90 (80, 100)	82 (72, 92)	−18.98*
HLS-SF12	33.33 (31.94, 41.67)	33.33 (30.56, 34.72)	−16.19*

Note: Kolmogorov–Smirnov test was used for the normality test, *p<0.001.
Abbreviations: EQ-VAS: EuroQol-Visual Analog Scales; FHS-SF: Short-form of the Family Health Scale; HLS-SF12: Short-form of Health Literacy Instrument; NGSES: New General Self-Efficacy Scale; PSSS: Perceived Social Support Scale; SD: Subthreshold depression.

Table 3. Multivariate binary logistic regression results of factors associated with subthreshold depression (Model 3)

Variable	β	SE	Wald χ^2	p	OR	95% CI of OR	
						Lower	Upper
Gender (Female as the control group)							
Male	−0.23	0.05	22.32	<0.001*	0.79	0.72	0.87
Age (19–35 years old as the control group)							
36–59 years old	−0.25	0.07	12.27	<0.001*	0.78	0.68	0.90
60 years or older	−0.79	0.11	53.27	<0.001*	0.45	0.37	0.56
Location (Western China as the control group)							
Central China	0.07	0.07	0.98	0.323	1.07	0.93	1.23
Eastern China	−0.14	0.06	4.61	0.032*	0.87	0.77	0.99
Being in debt (No as the control group)							
Yes	0.29	0.05	32.75	<0.001*	1.33	1.21	1.47
Marital status (Married as the control group)							
Unmarried	0.23	0.07	10.50	0.001*	1.26	1.10	1.45
Divorced or widowed	0.34	0.13	6.95	0.008*	1.41	1.09	1.81
Single-child (Yes as the control group)							
No	0.22	0.06	12.34	<0.001*	1.25	1.10	1.41
Chronic diseases (No as the control group)							
Yes	0.34	0.07	22.49	<0.001*	1.41	1.22	1.62
PSSS	−0.01	0.00	14.29	<0.001*	0.99	0.99	1.00
FHS-SF	−0.03	0.01	34.28	<0.001*	0.97	0.96	0.98
EQ-VAS	−0.02	0.00	129.17	<0.001*	0.98	0.98	0.99
HLS-SF12	−0.02	0.00	37.48	<0.001*	0.98	0.97	0.99

Note: Model 3 used the social demographic characteristics and the scale scores of the respondents as independent variables. Statistical significance determined at *p<0.05.
Abbreviations: β: Regression coefficient; CI: Confidence intervals; EQ-VAS: EuroQol-Visual Analog Scales; FHS-SF: Short-form of the Family Health Scale; HLS-SF12: Short-form of Health Literacy Instrument; NGSES: New General Self-Efficacy Scale; OR: Odds ratios; PSSS: Perceived Social Support Scale; SD: Subthreshold depression; SE: Standard errors of regression coefficients.

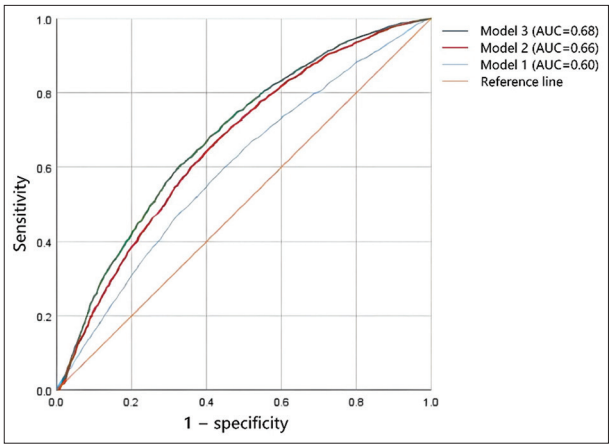

Figure 2. ROC curves of logistic regression models for predicting subthreshold depression in residents. Note: Model 1 represented the ROC curve of a logistic regression model using the social demographic characteristics of the respondents as independent variables, and the area under the curve was 0.60 (95% CI: 0.58–0.61). Model 2 used the scale scores of the respondents as independent variables to predict subthreshold depression, and the area under the curve was 0.66 (95% CI: 0.65–0.67). Model 3 used the social demographic characteristics and the scale scores of the respondents as independent variables to predict subthreshold depression, resulting in an area under the curve of 0.68 (95% CI: 0.67–0.70).
Abbreviations: AUC: Area under the curve; CI: Confidence intervals; ROC: Receiver operating characteristic.

and targeted interventions could facilitate the prevention of adverse consequences for individuals and society.

Personal characteristics were important factors affecting SD. This study suggested that gender is associated with SD, with women having a higher risk than men, which may primarily stem from biological sex differences. Women experience specific forms of depression-related disorders, such as premenstrual dysphoric disorder, postpartum depression, and postmenopausal depression. These conditions are closely linked to fluctuations in ovarian hormones and may contribute to the higher prevalence of SD among women.[19] Moreover, the simultaneous demands of family and work impose additional strain on women, resulting in heightened role conflict and SD symptoms.[20] Hence, women's psychological well-being should be prioritized, and society must accord more respect to them. Another non-modifiable factor, age, showed a negative association with the risk of SD, which is consistent with certain previous research and deviates from others. China's rapidly evolving modern society poses formidable challenges and demands on young adults, both personally and professionally, increasing their vulnerability to symptoms of SD.[21] However, it has been demonstrated that older people may have multiple chronic diseases, varying degrees of dysfunction, and other conditions, indicating that they may exhibit a greater susceptibility to SD.[22] Our investigation unveiled that residents reported superior self-rated quality of life scores, indicative of an overall elevated appraisal of their health status, which may explain the variation from prior studies. Therefore, healthcare policymakers and healthcare providers should prioritize the psychological well-being of young individuals and provide them with assistance in stress management to reduce SD symptoms. In addition, our study found an association between chronic diseases and SD, providing further evidence for this possible causal relationship. People with chronic diseases frequently experience physical, psychological, and financial distress due to persistent concerns about their health status and long-term treatment and care, consequently increasing the risk of depression in patients.[23] The correlation between SD and chronic illnesses implies that early screening for such illnesses among residents and increased awareness of their own psychological and emotional states can aid in effectively preventing SD onset. In this study, residents who had higher levels of self-rated quality of life and health literacy exhibited a decreased risk of SD. Better health status, stronger health beliefs, and greater health control all increase the likelihood of people prioritizing self-care and being aware of the need to treat mental health issues, such as stress or depression.[24] As a result, these residents are less likely to suffer from SD symptoms. However, a debt status that reflects socioeconomic status increases the risk of SD. Residents in debt often face financial burdens and reduced quality of life, which can impact emotional well-being by increasing stress from service expenses and emergency debt, ultimately leading to depressive symptoms.[25] Therefore, learning how to regulate emotions and maintain a positive mindset when facing significant financial pressures in life is crucial for SD prevention. Notably, the logistic regression model of sociodemographic characteristics and the risk of SD (Model 1), when compared to the final model, revealed that unemployed residents were more prone to SD than employed residents. In addition, residents with lower per capita monthly household income were found to experience SD more frequently. These findings align with previous research.[26] The comparison of Model 1 and Model 3 revealed that the relation between employment status, per capita monthly household income, and SD was no longer statistical significant after including the self-assessment scores. However, location was found to be associated with SD, with residents in the eastern region being less prone to SD. This indicates that the impact of these variables on the risk of SD may not be constant and necessitates further investigation. In addition, the choice of study variables and residents' reporting bias may have contributed to the modest performance of logistic regression models in predicting SD.

In this study, we found that interpersonal network-related variables were significantly associated with SD. Research into the impact of marital status confirms the findings of this study, which demonstrated that those who were divorced or widowed had a three-fold greater likelihood of experiencing SD than married people.[27] The concern and support of spouses within middle-aged and elderly populations may diminish their negative emotional outcomes, subsequently reducing depression risk.[28] In addition, Curran *et al.*[29] discovered that SD was more common in older men and women in stressful relationships, but was only adversely correlated with spousal support in women. Such observations suggest that spousal encouragement, assistance, and companionship may influence mental health. Hence, prioritizing the maintenance of a healthy marital relationship and examining gender disparities in the impact of spousal support on SD could serve as essential measures to mitigate the risk of SD. Surprisingly, an only child is less susceptible to SD than children with siblings in this study, which aligns with previous research in China,[30] despite evidence showing only children are more prone to feeling poorer social adaptation.[31] This may be due to the individual receiving undivided attention, which can result in a heightened sense of fulfillment, security, and self-assurance. Thus, to effectively implement the

comprehensive three-child policy, it is recommended that the government, educational institutions, families, and other relevant stakeholders increase their awareness of the mental health of children with siblings and provide additional support to families with multiple children. However, research has indicated that when individuals experience significant stressful life events, those with siblings often support each other, alleviating the negative consequences of the event and reducing feelings of loneliness.[32] Therefore, further investigation is required to fully understand the impact of being an only child on SD. In addition, the study found a negative correlation between SD and family health. Families are crucial in enhancing personal health, function, and personality.[33] Higher levels of family health lead to healthier lifestyles and greater family resources for residents, enabling them to alter their mental state and maintain emotional stability during stressful events. Consequently, inhabitants must prioritize family relationships and maintain a favorable family environment, thereby improving the family's health status and reducing the likelihood of encountering SD. Furthermore, we found that reduced perception of perceived social support may suggest a higher likelihood of experiencing depressive symptoms, which is consistent with a previous study.[34] This diminished perception may impede residents' ability to utilize the companionship of family and friends and establish positive communication, ultimately increasing the risk to their psychological well-being. In contrast, individuals with a greater level of perceived social support can increasingly utilize diverse types of support in social relationships when confronted with challenges and difficulties in life. These include emotional and practical forms of assistance, which may prevent individuals from succumbing to negative emotions. These results provide a direction for the future establishment and development of interpersonal networks for residents.

The findings in this study provide valuable insights into SD management. Personal characteristics, socioeconomic status, and interpersonal networks played a significant role in the prevention, management, and control of SD. Maintaining healthy lifestyle choices, increasing health literacy, and fostering stronger social and familial relationships must be prioritized for residents receiving SD intervention. To enhance the mental well-being of residents and mitigate the risk of SD, it is advantageous to elevate health education among residents and facilitate the self-directed acquisition of mental health information. Furthermore, seeking immediate medical attention is particularly crucial if individuals have trouble managing their emotions, such as receiving cognitive behavioral therapy, which ultimately reduces the risk of SD.

Nonetheless, this study also possesses several limitations. All study variables were self-evaluated, which may result in inherent issues related to information biases. The cross-sectional design of this study limited its applicability to exploring correlational relationships of the dependent variable. Thus, our findings must be further validated through future studies employing a longitudinal design and more accurate measurements.

5. CONCLUSION

This study identified a 34.4% prevalence of SD among Chinese adults, emphasizing its significant public health burden. Protective factors (male gender, older age, social support, family health, self-rated quality of life, and health literacy) and risk factors (debt, unmarried/divorced/widowed status, siblings, and chronic diseases) highlighted modifiable psychosocial and socioeconomic intervention targets. While the predictive model (AUC = 0.68) demonstrated potential for early screening, its moderate accuracy suggests the need to incorporate additional predictors. Prioritizing health literacy promotion and social support systems could mitigate SD risks. Further longitudinal studies are warranted to establish causality and refine prevention strategies.

ACKNOWLEDGMENTS

The authors would like to thank all those who were involved in participant recruitment.

FUNDING

This work was supported by the Natural Science Foundation of Hunan province (Grant number 2021JJ70068) and the Social Science Foundation of Hunan Province (Grant number 23YBA022).

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

AUTHOR CONTRIBUTIONS

Conceptualization: Jiaxin Liu, Ge Pu
Data curation: Yingbing Lu
Formal analysis: Ge Pu
Investigation: All authors
Methodology: Jiaxin Liu, Ke Lyu, Chen Hu, Lutong Pan
Project administration: Yibo Wu, Liping Zhao
Supervision: Yibo Wu, Liping Zhao
Validation: Yuqian Deng, Ying Tang
Writing–original draft: Jiaxin Liu, Yingbing Lu, Yuan Luo, Haiye Ran, Qiyu Li
Writing–review & editing: Jiaxin Liu, Qin Han, Wenying Hong, Xiangle Zeng

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

After informing participants of the purpose, benefits, risks, confidentiality of the information, and the voluntary nature of the study, written consent was obtained from each participant. The participation of respondents in the study was voluntary, and participants were informed that they could refuse or stop at any point during the interview. Ethical approval was granted by the Key Research Base of Philosophy and Social Sciences in Shaanxi and the Health Culture Research Center of Shaanxi (JKWH-2021-01).

CONSENT FOR PUBLICATION

All participants provided informed consent for the publication of the findings derived from this study.

DATA AVAILABILITY STATEMENT

The database is not publicly available. Data are available on request from corresponding authors.

Submitted: 29 March 2025; Accepted: 05 April 2025;
Published: 07 October 2025

REFERENCES

1. Volz HP, Stirnweiß J, Kasper S, Möller HJ, Seifritz E. Subthreshold depression - concept, operationalisation and epidemiological data. A scoping review. *Int J Psychiatry Clin Pract.* 2023;27(1):92-106. doi: 10.1080/13651501.2022.2087530

2. Rodriguez MR, Nuevo R, Chatterji S, Ayuso-Mateos JL. Definitions and factors associated with subthreshold depressive conditions: A systematic review. *BMC Psychiatry.* 2012;12:181. doi: 10.1186/1471-244X-12-181

3. Zhang R, Peng X, Song X, *et al*. The prevalence and risk of developing major depression among individuals with subthreshold depression in the general population. *Psychol Med.* 2023;53(8):3611-3620. doi: 10.1017/S0033291722000241

4. Liao DD, Dong M, Ding KR, *et al*. Prevalence and patterns of major depressive disorder and subthreshold depressive symptoms in South China. *J Affect Disord.* 2023;329:131-140. doi: 10.1016/j.jad.2023.02.069

5. Lv Q, Li X, Zhang Y, *et al*. Sex differences in subjective cognitive impairment and clinical correlates in Chinese patients with subthreshold depression. *Biol Sex Differ.* 2023;14(1):6. doi: 10.1186/s13293-023-00488-w

6. Zhang Y, Fan S, Hui H, *et al*. Privacy protection for open sharing of psychiatric and behavioral research data: Ethical considerations and recommendations. *Alpha Psychiatry.* 2025;26(1):38759. doi: 10.31083/AP38759

7. National Bureau of Statistics. *The Seventh National Population Census*; 2021. Available from: https://www.stats.gov.cn/sj/pcsj/rkpc/7rp/indexch.htm [Last accessed on 2024 Feb 12].

8. Costantini L, Pasquarella C, Odone A, *et al*. Screening for depression in primary care with patient health questionnaire-9 (PHQ-9): A systematic review. *J Affect Disord.* 2021;279:473-483. doi: 10.1016/j.jad.2020.09.131

9. Shrestha M, Ng A, Paudel R, Gray R. Association between subthreshold depression and self-care behaviours in adults with type 2 diabetes: A cross-sectional study. *J Clin Nurs.* 2021;30(17-18):2462-2468. doi: 10.1111/jocn.15741

10. Liao Y, Zhang H, Guo L, *et al*. Impact of cognitive-affective and somatic symptoms in subthreshold depression transition in adults: Evidence from depression cohort in China (DCC). *J Affect Disord.* 2022;315:274-281. doi: 10.1016/j.jad.2022.08.009

11. Wang W, Bian Q, Zhao Y, *et al*. Reliability and validity of the chinese version of the patient health questionnaire (PHQ-9) in the general population. *Gen Hosp Psychiatry.* 2014;36(5):539-544. doi: 10.1016/j.genhosppsych.2014.05.021

12. Chen G, Gully SM, Eden D. Validation of a new general self-efficacy scale. *Organ Res Methods.* 2001;4(1):62-83. doi: 10.1177/109442810141004

13. Zimet GD, Powell SS, Farley GK, Werkman S, Berkoff KA. Psychometric characteristics of the multidimensional scale of perceived social support. *J Pers Assess.* 1990;55(3-4):610-617. doi: 10.1080/00223891.1990.9674095

14. Crandall A, Weiss-Laxer NS, Broadbent E, *et al*. The family health scale: Reliability and validity of a short- and long-form. *Front Public Health.* 2020;8:587125. doi: 10.3389/fpubh.2020.587125

15. Jiang J, Hong Y, Zhang T, *et al*. Comparing the measurement properties of the EQ-5D-5L and the EQ-5D-3L in hypertensive patients living in rural China. *Qual Life Res.* 2021;30(7):2045-2060. doi: 10.1007/s11136-021-02786-5

16. Duong TV, Aringazina A, Kayupova G, *et al*. Development and validation of a new short-form health literacy instrument (HLS-SF12) For the general public in six Asian countries. *Health Lit Res Pract.* 2019;3(2):e91-e102. doi: 10.3928/24748307-20190225-01

17. Furukawa TA, Horikoshi M, Kawakami N, *et al*. Telephone cognitive-behavioral therapy for subthreshold depression and presenteeism in workplace: A randomized controlled trial. *PLoS One.* 2012;7(4):e35330. doi: 10.1371/journal.pone.0035330

18. Serrano D, Marti-Lluch R, Cardenas M, *et al*. Gender analysis of the frequency and course of depressive disorders and relationship with personality traits in general population: A prospective cohort study. *J Affect Disord.* 2022;302:241-248. doi: 10.1016/j.jad.2022.01.088

19. Albert PR. Why is depression more prevalent in women? *J Psychiatry Neurosci.* 2015;40(4):219-221. doi: 10.1503/jpn.150205

20. Khaled SM. Prevalence and potential determinants of subthreshold and major depression in the general population of qatar. *J Affect Disord.* 2019;252:382-393. doi: 10.1016/j.jad.2019.04.056

21. Liu X, Kurita H, Uchiyama M, Okawa M,

Liu L, Ma D. Life events, locus of control, and behavioral problems among chinese adolescents. *J Clin Psychol.* 2000;56(12):1565-1577. doi: 10.1002/1097-4679(200012)56:12<1565:AID-7>3.0.CO;2-U

22. Xiang X, Leggett A, Himle JA, Kales HC. Major depression and subthreshold depression among older adults receiving home care. *Am J Geriatr Psychiatry.* 2018;26(9):939-949. doi: 10.1016/j.jagp.2018.05.001

23. McClain AC, Xiao RS, Tucker KL, Falcón LM, Mattei J. Depressive symptoms and allostatic load have a bidirectional association among puerto rican older adults. *Psychol Med.* 2022;52(14):3073-3085. doi: 10.1017/S0033291720005139

24. Conard S. Best practices in digital health literacy. *Int J Cardiol.* 2019;292:277-279. doi: 10.1016/j.ijcard.2019.05.070

25. Gao J, Hu H, He H. Household indebtedness and depressive symptoms among older adults in China: The moderating role of social network and anticipated support. *J Affect Disord.* 2022;298(Pt A):173-181. doi: 10.1016/j.jad.2021.10.133

26. Topuzoğlu A, Binbay T, Ulaş H, Elbi H, Tanık FA, Zağlı N. The epidemiology of major depressive disorder and subthreshold depression in Izmir, Turkey: Prevalence, socioeconomic differences, impairment and help-seeking. *J Affect Disord.* 2015;181:78-86. doi: 10.1016/j.jad.2015.04.017

27. Wang D, Shi L, Li L, *et al*. Subthreshold depression among diabetes patients in beijing: Cross-sectional associations among sociodemographic, clinical, and behavior factors. *J Affect Disord.* 2018;237:80-86. doi: 10.1016/j.jad.2018.05.016

28. Eun KJ, Hong LM. Effects of individual, family and neighborhood factors on depression in elders. *Family Family Ther.* 2015;23:363-380. doi: 10.21479/KAFT.2015.23.2.363

29. Curran E, Rosato M, Ferry F, Leavey G. Prevalence and factors associated with anxiety and depression in older adults: Gender differences in psychosocial indicators. *J Affect Disord.* 2020;267:114-122. doi: 10.1016/j.jad.2020.02.018

30. Qin B, Hu Z, Liu W, *et al*. Anxiety and depression among college students during the covid-19 lockdown: A cross-sectional survey in Jiangsu, China. *Risk Manag Healthc Policy.* 2023;16:711-723. doi: 10.2147/RMHP.S404478

31. Riemann D, Krone LB, Wulff K, Nissen C. Sleep, insomnia, and depression. *Neuropsychopharmacology.* 2020;45(1):74-89. doi: 10.1038/s41386-019-0411-y

32. Chen S, Cheng Z, Wu J. Risk factors for adolescents' mental health during the covid-19 pandemic: A comparison between wuhan and other urban areas in china. *Glob Health.* 2020;16(1):96. doi: 10.1186/s12992-020-00627-7

33. Fakhari A, Tabatabavakili M, Javid YS, Farhang S. Family violence influences mental health of school girls in iran: Results of a preliminary study. *Asian J Psychiatry.* 2012;5(1):24-27. doi: 10.1016/j.ajp.2012.01.008

34. Ju YJ, Kim W, Lee SY. Perceived social support and depressive symptoms during the covid-19 pandemic: A nationally-representative study. *Int J Soc Psychiatry* 2023;69(1):47-55. doi: 10.1177/00207640211066737