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The impact of community health care services on the mental health of older adults in China

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Abstract

Background Population aging is the predominant global demographic trend of the contemporary era. However, the mental health of many older adults is not as good as it could be. Ensuring the rights and well-being of older adults is crucial for achieving sustainable and healthy aging. Numerous countries have implemented healthcare integration services tailored to their unique contexts. In 2016, China initiated community health care services for older adults.

Methods We used panel data derived from the China Health and Retirement Longitudinal Study from 2015 to 2018 and analyses were performed using STATA, version 17. Our study employed a difference-in-differences model to assess the association of community health care services with mental health of older adults and conducted a placebo test to assess the reliability of the difference-in-differences model estimations. Additionally, subgroup regression analyses were conducted to investigate whether community health care services exert differing effects on the mental well-being of older adults across subgroups by sex, age groups, and education level.

Results Community health care services significantly improved depression levels and cognitive function in older adults. Notably, these services exerted a more pronounced effect on alleviating depression symptoms among male older adults and more positively affected cognitive function among female older adults. Additionally, the services demonstrated greater effectiveness in improving both depression levels and cognitive function among older adults with lower educational attainment, while maintaining positive impacts on younger older adults.

Conclusions Community health care services played a crucial role in enhancing the mental health of older adults, with varying degrees of impact across demographic groups. Our study underscores the importance of such services in promoting healthy aging and provides a foundation for the further development of hierarchical community health care services. This development is conducive to advancing community health care services, enhancing the mental well-being, and fostering healthy aging for Chinese older adults.

Keywords Community health care services, Older adults, Mental health

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Introduction

Population aging represents the predominant global demographic trend of contemporary times. According to the World Population Prospects 2023, projections indicate that by 2050, the population aged 65 and above will surpass 1.6 billion individuals. Currently, regions such as the Europe, North America, Australia, New Zealand, and large parts of East and Southeast Asia grapple with profound population aging. Notably, in 2021, 14.2% of China's population was aged 65 and older [1]. Moreover, 2019 statistics reveal that around 14% of individuals aged 60 and above live with one or more types of mental disorder, with 27.2% of suicide deaths occurring within this age group [2]. In China, nearly one-third of older adults experience symptoms of depression [3]. Safeguarding the rights and well-being of older individuals is imperative for achieving sustainable and healthy aging. Various nations have implemented healthcare integration services tailored to their specific contexts. Examples include the Program for All-around Care for the Elderly (PACE) in the United States, the Enhanced health in care homes (EHCH) model in the United Kingdom, and in-home intermediate care in Japan [4, 5]. In 2016, China initiated community health care services for older adults. These encompass a range of services including health management, home hospital bed services, in-home care services, medical services, and psychological and spiritual support services [6].

The mental health of older adults has garnered significant attention across various sectors of society, prompting extensive scholarly research in this area. Investigations have predominantly focused on elucidating the determinants of mental health for older adults, considering factors such as individual characteristics, economic status, lifestyle habits, and social networks. Research has highlighted disparities in mental health status among older adults based on gender, age, and educational attainment [7–9]. Moreover, income levels and social security benefits exhibit close associations with older mental health outcomes [10, 11]. Additionally, sedentary behavior, gambling, and inadequate sleep duration have been identified as detrimental to older mental well-being [12–14]. Conversely, social support, informal caregiving, and interpersonal relationships emerge as crucial influencers of older adults' mental health [15–18].

Community health care services, one type of social support for older adults, have the potential to serve as a critical avenue for promoting healthy aging among older adults. Scholars have explored the correlation between community health care services and the mental well-being of older adults. Sen and Lei posited that community health care services, including life care assistance, meal support, companionship, and emotional guidance, positively impact older adults' loneliness, cognitive functioning, life satisfaction, and social engagement [19]. Similarly, Lee et al. assert that community health care services effectively mitigate cognitive decline in older adults [20]. Scholars attribute this to the enhancement of older adults' quality of life through the services and consequent improvement in mental health [21, 22]. However, an opposing view exists among scholars, with some disputing the efficacy of community health care services in enhancing older mental health. Some of these scholars contend that such services fail to yield improvements in older mental health due to inadequate supply and lack of professionalism in their early developmental stages [23–25]. Lämås et al. argue that older individuals receiving home-based services experience heightened loneliness and isolation when the environment inside and outside the home is unsuitable, exacerbating mental health challenges [26]. Therefore, the impact of community health care services on the mental health of older adults remains inconclusive.

In this study, we aimed to investigate the following questions: Does community health care services influence the mental health of older adults in China? If so, what specific impact does it exert? Furthermore, does this impact vary among different demographic groups of older adults?

Methods

Data sources

We used data from the China Health and Retirement Longitudinal Study (CHARLS), encompassing 28 provinces across China and targeting individuals aged 45 and above. The dataset comprises information concerning the demographic profiles, health status, healthcare utilization, and social security of middle-aged and older adults. Because the pilot program for community health care services was initiated in China in 2016, we selected two periods of databases in 2015 and 2018 to better analyze the impact of the implementation of community health care services on the mental health of older adults. And the two-period databases were vertically merged to form panel data on the basis of single-period decentralized database merging. Specifically, this study focuses on individuals aged 60 and above residing in familial households. Therefore, the irrelevant sample is those under 60 years of age and those living in hospitals or nursing homes. To thoroughly examine the missing data mechanism, we conducted a series of comprehensive diagnostic tests, including the independent t-test, Levene's test for homogeneity of variance, and Little's test. The results indicated significant differences between the missing and retained samples, suggesting that the missing data may not satisfy the assumption of missing completely at random (MCAR) and are more likely to follow a missing at random (MAR) or missing not at random (MNAR)

mechanism. Consequently, we employed the multiple imputation (MI) method, generating multiple imputed datasets to enhance the robustness of the estimates. Finally, the analysis yields a total of 12,020 valid sample.

Dependent variables

The explanatory variables in this study encompassed the mental health of older adults, gauged through their levels of depression and cognitive functioning. Depression levels were assessed using scores from the Center for Epidemiologic Studies Depression Scale (CESD) Scale sourced from the CHARLS data. The CESD scale comprises 10 questions, with two pertaining to positive emotions and eight to negative emotions. Scores on the CESD scale range from 0 to 30, where higher scores denote lower levels of depression and better mental health among older adults. Additionally, cognitive function was evaluated using the Minimum Mental State Examination (MMSE) scale, which comprises sections on Orientation (5 points), Memory (3 points), Attention and Numeracy (5 points), Recall (3 points), and Graphic Sketching (1 point). MMSE scores range from 0 to 17, with higher scores indicating better cognitive functioning in older adults.

Independent variable

The selection of indicators for community health care services was based on the "Guidelines for Home and Community Integration of Healthcare and Elderly Care Services (Trial)" issued by the National Health Commission of China [27]. While the guidelines outline a comprehensive range of services including health education, health management, medical visits, family bed services, home medical services, traditional Chinese medicine services, psychological support, and referral services, this study specifically focuses on the medical service aspects of community healthcare integration. This focused approach was adopted for several practical reasons. First, traditional Chinese medicine services are limited by the scarcity of specialized practitioners in community settings. Second, professional psychological support services are rarely available at the community level, as China currently has only about 40,000 professional psychological counselors [28], making it impractical to provide such services extensively in communities. Third, referral services are seldom provided at the community level. Therefore, considering the practical implementation status and survey results, this study selected four key indicators: regular physical examination (representing medical visits), family beds, community nursing (representing home medical services), and health management [29]. These indicators reflect the most commonly available and practically implemented aspects of community healthcare integration services in China's current context.

The explanatory variable examined whether or not community health care services was utilized in the past two years. To generate the explanatory variable, exploratory factor analysis was conducted on four indicators: regular medical checkups, family beds, community care, and health management. Among them, family beds are beds designed to assist patients' recovery according to their therapeutic needs and bed-ridden habits, and with the home as the place of treatment and care, and are able to meet the multiple needs of treatment, rehabilitation and care. Health management is a process of comprehensively managing the health risk factors of individuals or populations. Its purpose is to mobilize individual and collective motivation and effectively use limited resources to achieve maximum health outcomes. As shown in Table 1, The Kaiser-Meyer-Olkin (KMO) test yielded a value of 0.587, and Bartlett's test of sphericity yielded a value of 1710.773 ($p < 0.001$), indicating the suitability of the data for factor analysis. Utilizing the criterion that eigenvalues exceeding 1, the common factor(eigenvalue = 1,473) is selected, and the composite score is computed using the factor score and factor weight [30]. Sample variables with results greater than 0 in the composite score were assigned a value of 1, indicating use of more community health care services, while those with results less than or equal to 0 in the composite score were assigned a value of 0, indicating no or low use of community health care services, and the variable community health care services were formed.

Table 1 Results of exploratory factor analysis of community health care services

Measurement items	Project Definition	Average value	(statistics) standard deviation	Factor score
Regular check-up	Yes = 1; No = 0	0.163	0.370	0.257
Family ward	Yes = 1; No = 0	0.001	0.038	0.383
Community care	Yes = 1; No = 0	0.005	0.071	0.473
Health management	Yes = 1; No = 0	0.157	0.124	0.492
Eigenvalue (math.)	1.473			
Cumulative variance explained	0.368			
KMO test value	0.587			
Bartlett's test of sphericity	1710.773			

Covariates

Considering the multitude of factors influencing the mental health of older adults, we drew on previous research and selected individual characteristics, lifestyle habits, social security, and economic status as covariates to mitigate potential estimation errors arising from other influencing factors [10–12, 14, 16]. Individual characteristics encompass gender, age, marital status, education level, and urban or rural residency. Lifestyle habits are operationalized as regular exercise, while economic status comprises medical insurance, pension insurance, personal income, and financial support from children. Detailed definitions of these variables are provided in Table 2. Meanwhile, Table 3 shows the specifics of all variables.

Statistical analysis

Analyses were performed using STATA, version 17. Given that healthcare integration in China was piloted in 2016, our study employed a difference-in-differences (DID) model to assess the association of community health care services with mental health of older adults. To address the issue of omitted variables, the model incorporated province fixed effects, individual fixed effects, and time fixed effects. Prior to the DID model we performed a parallel trend test via time trend plots. To assess the reliability of the DID model estimations, a parallel trend test and a placebo test ware conducted. This involved randomly selecting 937 older adults as the treatment group in each cycle, ensuring consistency with the actual number of older adults receiving community health care services. This procedure was repeated for a total of 1,000 cycles.

Additionally, subgroup regression analyses were conducted to investigate whether community health care services exert differing effects on the mental well-being of older adults across subgroups by sex, age groups, and education level. For the heterogeneity analysis by age, the group was divided into two sub-groups based on the age limit of 70 years. Considering China's historical context, participants with illiteracy or elementary school education were classified as lower-education individuals, while those with junior high school education and higher were categorized as higher-education individuals.

Results

Table 3 presents the descriptive statistics for the primary variables. A relatively small number of older adults utilized community health care services in the 2018 survey, with only 1827 participants, accounting for approximately one-fifth of the respondents. Regarding the mental well-being of older adults, the average CSED score for the 2015 sample was 21.442, and the average MMSE score was 12.484. In contrast, the average CSED score of older adults in the 2018 sample was 21.041 and the average MMSE score was 11.521. Overall, the respondents exhibited good mental health.

Figure 1 A and B show the average trends in depression levels and cognitive function in older adults, respectively. Not surprisingly, the results are consistent with the parallel trend test. Table 4 presents the results of DID model assessing depression levels and cognitive function among older adults receiving community health care services. Each unit of increase in the interaction term DID was associated with a 0.590-point increase in the CESD scores ($p < 0.001$). Similarly, the MMSE scores of older

Table 2 Definition of variables

Components	Variables	Definition
Dependent variable	Depression levels	CSED score status, 0–30 points[a]
	Cognitive functioning	MMSE scoring profile, 0–17 points[b]
Independent variables	Community health care services	No access to community health care services = 0, access to community health care services = 1
	DID	The interaction term between the time dummy variable and community health care services
Individual characteristics	Gender	Male = 1, Female = 2
	Age	Age at time of interview
	Marital status	Not cohabiting with spouse = 1, cohabiting with spouse = 2
	Education level	Illiteracy = 0, Elementary school = 1, Middle school = 2, High school or vocational high school = 3, University or college = 4, Masters and above = 5
	Urban or rural areas	Rural = 1, area combining urban and rural areas or township-village area = 2, city or town center = 3
Lifestyle habits	Exercise regularly	Did not perform daily exercise = 1, did perform daily exercise = 2
Social security	Medical insurance	Without health insurance = 1, with health insurance = 2
	Pension insurance	Without pension insurance = 1, with pension insurance = 2
Economic status	Personal income	No personal income = 1, with personal income = 2
	Children's financial support	Logarithm of the amount of financial support received from children in the last 12 months

[a] *CSED* the Center for Epidemiologic Studies Depression Scale

[b] *MMSE* the Minimum Mental State Examination

Table 3 Descriptive statistics of variables

Variables	Sample of 2015		Sample of 2018		Total sample	
	mean (SD)	*n* (%)	mean (SD)	*n* (%)	mean (SD)	*n* (%)
Depression levels	21.442		21.041		21.216	
	(6.327)		(6.093)		(6.200)	
Cognitive functioning	12.484		11.521		11.943	
	(3.263)		(2.815)		(3.080)	
Community health care services						
No		8180(100.00%)		8681(82.61%)		16,861(90.22%)
Yes		0(0.00%)		1827(17.39%)		1827(9.78%)
Gender						
Male		4109(50.23%)		5369(51.09%)		9478(50.72%)
Female		4071(49.77%)		5139(48.91%)		9210(49.28%)
Age	68.779		67.7		67.8	
	(6.920)		(5.817)		(6.101)	
Marital status						
No		1841(22.51%)		2557(24.33%)		4398(23.53%)
Yes		6339(77.49%)		7951(75.67%)		14,290(76.47%)
Education level						
Illiteracy		2408(29.44%)		3233(30.77%)		5641(30.19%)
Elementary school		3769(46.08%)		4658(44.33%)		8427(45.09%)
Middle school		1305(15.95%)		1623(15.45%)		2928(15.67%)
High school or vocational high school		543(6.64%)		837(7.97%)		1380(7.38%)
University or college		152(1.86%)		152(1.45%)		304(1.63%)
Masters and above		3(0.04%)		5(0.05%)		8(0.46%)
Urban or rural areas						
Rural		6109(74.68%)		7755(73.80%)		13,864(74.19%)
area combining urban and rural areas or township-village area		530(6.48%)		688(6.55%)		1218(6.52%)
city or town center		1541(18.84%)		2065(19.65%)		3606(19.30%)
Exercise regularly						
No		4126(50.44%)		1335(12.70%)		5461(29.22%)
Yes		4054(49.56%)		9173(87.30%)		13,227(70.78%)
Medical insurance						
No		735(8.99%)		304(2.89%)		1039(5.56%)
Yes		7445(91.01%)		10,204(97.11%)		17,649(94.44%)
Pension insurance						
No		7164(87.58%)		8326(79.23%)		15,490(82.89%)
Yes		1016(12.42%)		2182(20.77%)		3198(17.22%)
Personal income						
No		7163(87.57%)		16,392(87.71%)		16,392(87.71%)
Yes		1017(12.43%)		2296(12.29%)		2296(12.29%)
Children's financial support	4.337		4.107		4.208	
	(4.104)		(4.069)		(4.086)	

adults within the experimental group showed improvement, with an increase of 0.282 points relative to the control group ($p < 0.001$). Consequently, it can be founded that these services positively contribute to the mental health well-being of older adults.

Figure 2A illustrates the results of the placebo test examining the impact of community health care services on the depression levels of older adults. The mean coefficient value of the DID term after randomization is −0.108, significantly smaller than the actual coefficient of 0.587. Additionally, most of the *P*-values exceed 0.1. Similarly, Fig. 2B displays the results of the placebo test on the influence of community health care services on the cognitive function of older adults. The mean coefficient value of the DID term after randomization is −0.073, substantially lower than the true coefficient of 0.374. Additionally, the majority of *P*-values are greater than 0.1. These findings indicate that the DID estimates regarding the impact of community health care services on both

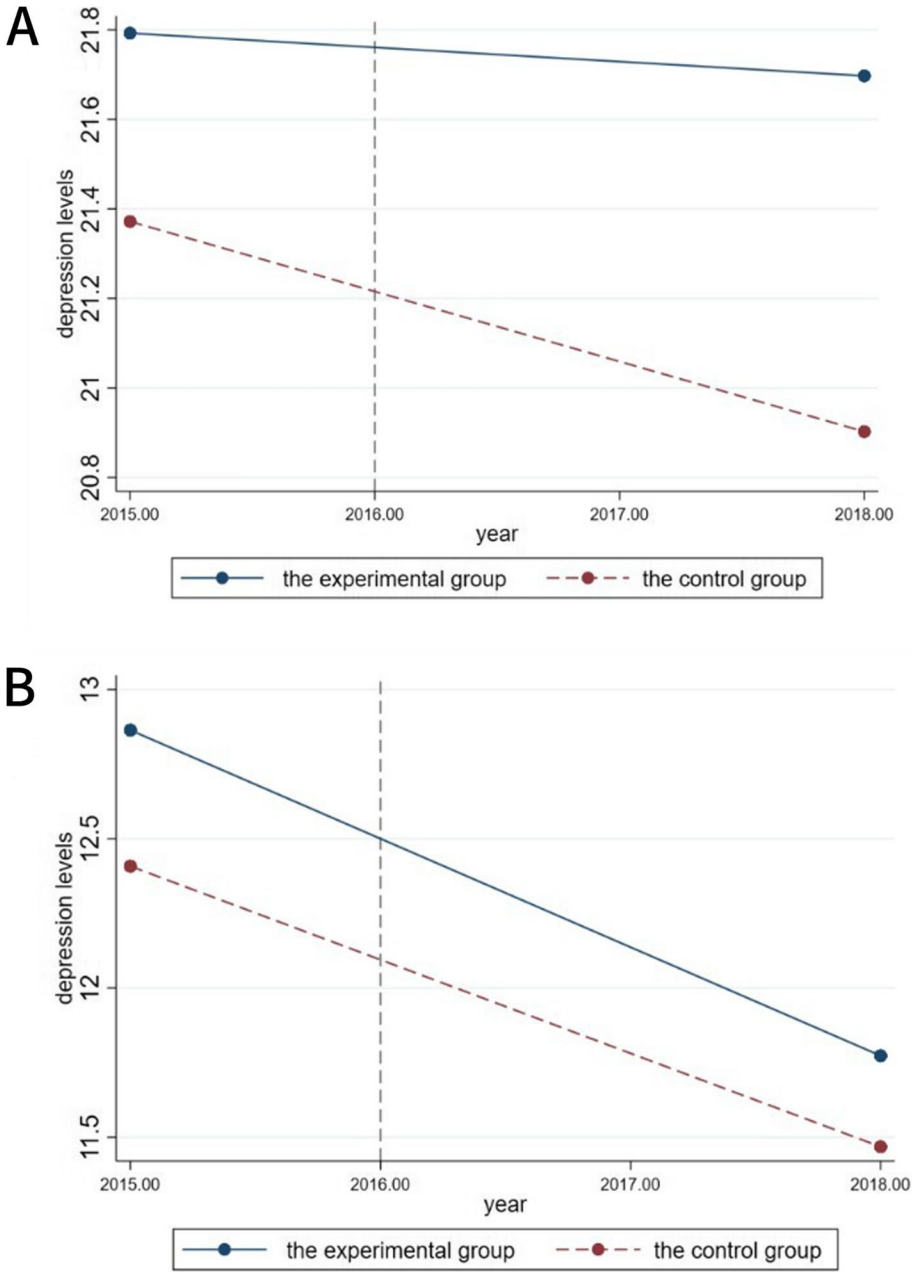

Fig. 1 Parallel trend test Note: A and B show the average trends in depression levels and cognitive function in older adults, respectively, with the dashed line indicating the control group of older adults and the solid line indicating the experimental group of older adults in the figure

depression levels and cognitive function among older adults are reliable.

Table 5 delineates the divergent influence of community health care services on the mental well-being of older adults across gender, life cycle, and educational attainment. Upon controlling for various variables, a particularly noteworthy finding is that the interaction term DID showed a strong positive effect on depression levels among male older adults (coef = 0.851, $p < 0.01$), while this effect was not statistically significant for female older adults (coef = 0.277,$p = 0.177$). This suggests that community health care services are particularly effective in alleviating depressive symptoms among elderly men. Both gender groups showed significant improvements in cognitive functioning, though with different magnitudes (male: coef = 0.221, $p < 0.01$; female: coef = 0.326, $p < 0.01$). Notably, the interaction term DID exhibited a strong positive impact on both depression (coef = 0.8111, $p < 0.01$) and cognitive functioning (coef = 0.393, $p < 0.01$) among older adults aged 60–69 years, while this impact weakened among those aged 70 years and older (depression: coef = 0.374, $p = 0.077$; cognitive functioning: coef

Table 4 Impact of integrated health care services on the mental health of older adults

Variables	Depression levels		cognitive functioning	
	(I)	(II)	(III)	(IV)
Period [a]	−0.543***	−0.783***	−1.047***	−1.037***
	(0.093)	(0.099)	(0.046)	(0.040)
Treat [b]				
DID [c]	0.704***	0.590***	0.389***	0.282***
	(0.158)	(0.152)	(0.077)	(0.061)
Gender		1.650***		0.522***
		(0.0947)		(0.038)
Age		0.00812		−0.051***
		(0.00674)		(0.003)
Marital status		1.001***		0.468***
		(0.110)		(0.044)
Education level(Illiteracy = 0)				
Elementary school		0.497***		2.560***
		(0.109)		(0.044)
Middle school		1.326***		3.410***
		(0.151)		(0.061)
High school or vocational high school		1.817***		3.671***
		(0.197)		(0.079)
University or college		1.701***		3.865***
		(0.363)		(0.146)
Masters and above		1.913		3.419***
		(2.056)		(0.827)
Urban or rural areas		0.666***		0.382***
		(0.0659)		(0.027)
Exercise regularly		0.382***		0.068
		(0.103)		(0.041)
Medical insurance		−0.421**		−0.772***
		(0.188)		(0.076)
Pension insurance		1.285***		0.626***
		(0.142)		(0.057)
Personal income		0.937***		0.219***
		(0.134)		(0.054)
Children's financial support		−0.0188*		0.041***
		(0.0110)		(0.004)
Province fixed effect	control	control	control	control
Individual fixed effect	control	control	control	control
Time fixed effect	control	control	control	control
Sample size	18,688	18,688	18,688	18,688
R2	0.050	0.131	0.077	0.430

***, **, * denote 1%, 5%, and 10% significance levels, respectively, and standard error(S.E.) are in parentheses

[a]Period = The time dummy variable

[b]Treat = The variables of community health care services

[c]DID = The interaction term between the time dummy variable and community health care services

= 0.093, p = 0.293). Furthermore, an important finding emerged regarding educational attainment: community health care services showed stronger positive effects among less educated older adults, significantly improving both depression (coef = 0.624, p < 0.01) and cognitive function (coef = 0.415, p < 0.01). In comparison, highly educated older adults experienced relatively modest improvements in depression (coef = 0.475, p = 0.095) and cognitive function (coef = 0.335, p < 0.01), suggesting that these services may be particularly beneficial for older adults with lower educational attainment.

Discussion

The emergence of community health care services addresses the challenge of insufficient comprehensive health care options for older adults across home,

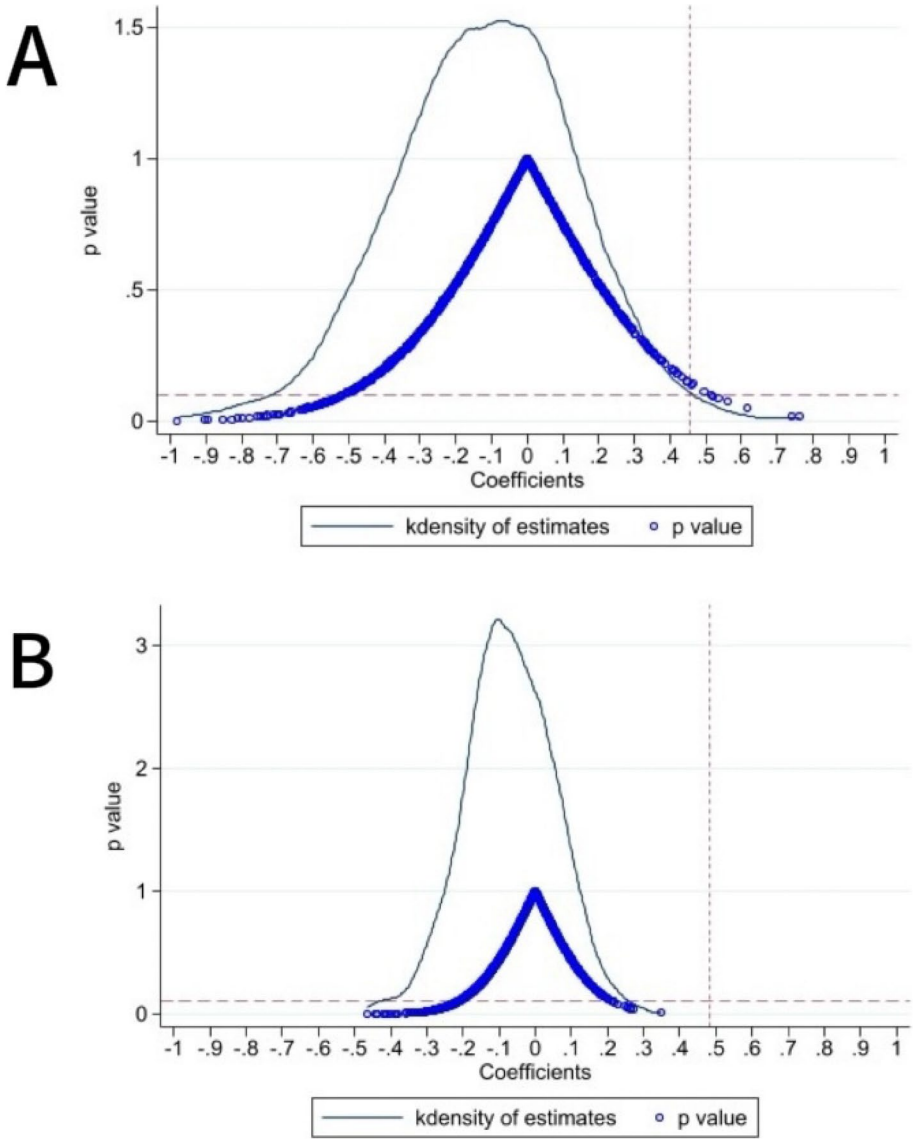

Fig. 2 Placebo test Note: A and B show the results of placebo tests of the effects of community health care services on depression levels and cognitive functioning in older adults respectively, and report the *p*-values and coefficients for the interaction term between the time dummy variable and community health care services in 1000 models, whereas the vertical dashed lines represent the true coefficients for the interaction term between the time dummy variable and community health care services in the difference-in-differences model, and the horizontal dashed line represents a *p*-value of 0.1

community, and residential care settings. However, there remains a lack of consensus among scholars regarding the impact of these services on the mental health of older adults. Leveraging two-period data from CHARLS, this study employs the DID model to assess the association of community health care services with older adults' mental health. Building upon this analysis, our study explores the differing impacts of community health care services on distinct groups of older adults. We observed that the association between community health care services and mental health of older adults differed across gender, age, and education groups.

This study reveals that community health care services exerted a significant positive influence on the mental well-being of older adults. Health demand theory posits that external interventions can be employed to mitigate the decline in an individual's health as they age [31]. Community health care services offer a range of cost-effective and specialized healthcare options for older adults, effectively investing in their health. These services fulfill older adults' desire to age at home, enabling them to retain their social networks [25]. This, in turn, enhances their social identity, sense of belonging, quality of life, and life satisfaction, ultimately leading to improved mental health among older adults [32, 33]. Our finding

Table 5 Heterogeneity analysis

Variables	Male sample		Female sample		Sample of 60–69 year olds		Sample aged 70 and over		Sample of low education		Sample of higher education	
	depression levels	cognitive functioning	depression levels	cognitive functioning	depression levels	cognitive functioning	depression levels	cognitive functioning	depression levels	cognitive functioning	depression levels	cognitive functioning
Period [a]	−0.760***	−0.729***	−0.790***	−1.356***	−0.689***	−1.091***	−0.914***	−1.029***	−0.787***	−0.963***	−0.848***	−1.495***
	(0.145)	(0.055)	(0.134)	(0.057)	(0.131)	(0.052)	(0.151)	(0.063)	(0.116)	(0.051)	(0.187)	(0.077)
Treat [b]												
DID [c]	0.851***	0.221***	0.277	0.326***	0.811***	0.393***	0.374*	0.093	0.624***	0.415***	0.475*	0.335***
	(0.222)	(0.085)	(0.206)	(0.088)	(0.215)	(0.085)	(0.211)	(0.088)	(0.178)	(0.078)	(0.285)	(0.117)
Covariates	control	control	control	control	control	control	control	control	control	control	control	control
Province fixed effect	control	control	control	control	control	control	control	control	control	control	control	control
Individual fixed effect	control	control	control	control	control	control	control	control	control	control	control	control
Time fixed effect	control	control	control	control	control	control	control	control	control	control	control	control
Sample size	9478	9478	9210	9210	11,534	11,534	7154	7154	14,068	14,068	4620	4620
R2	0.112	0.439	0.094	0.329	0.126	0.381	0.144	0.455	0.107	0.232	0.073	0.148

***, **, * denote 1%, 5%, and 10% significance levels, respectively, and standard error(S.E.) are in parentheses

[a] Period = The time dummy variable

[b] Treat = The variables of community health care services

[c] DID = The interaction term between the time dummy variable and community health care services

supports the significant impact of community health care services on the mental well-being of older adults and helps to raise awareness among the general public about the importance of community health care services and to facilitate the advancement of such services.

Notably, community health care services demonstrate a stronger impact on alleviating depression symptoms among male older adults, while maintaining positive effects on cognitive function for both genders. This gender difference in depression improvement may be attributed to the distinct social role transitions experienced by older men in China. Men, who traditionally derive significant social identity from their professional roles, often face more substantial psychological challenges during retirement compared to women. The loss of work-based social networks and professional identity can lead to increased vulnerability to depression among older men. Even as men gradually disengage from social activities, women continue to manage household tasks, potentially maintaining their cognitive functioning at a stable level [34].Women exhibit faster information processing and greater verbal fluency compared to men [35, 36], rendering them more receptive to community health care services. The significant improvement in male depression levels through community health care services suggests that these interventions effectively address this gender-specific vulnerability. Men may particularly benefit from the structured social interactions and purposeful activities provided by community health care services, which help fill the void left by retirement. Additionally, these services may offer men alternative channels for social engagement and emotional support that they might not traditionally seek out. This finding emphasizes the importance of gender-sensitive approaches in community health care services, particularly in addressing the mental health needs of older men who might be more susceptible to depression during their later years. For instance, developing specialized programs that help men maintain social connections and find new meaningful roles in their post-retirement life could be particularly beneficial.

Additionally, community health care services were more effective in enhancing the mental health of younger older adults relative to their older counterparts. The older adults aged 60 to 69 are more receptive and have a higher level of awareness of community health care services, and the accessibility of community health care services to the older adults aged 60 to 69 is relatively high [5]. As older adults grow older, they typically require higher-quality, specialized health care services with more convenient access. Unfortunately, the current landscape of community healthcare services, still in its nascent stages, struggles to adequately cater to this demographic due to limited supply, lack of specialization, and restricted access channels [25]. Meeting the healthcare needs of individuals in older adults aged 70 and over proves challenging. Consequently, enhancing the quality of life and mental well-being of older persons aged 60 to 69 through community health care services may prove more feasible than for older persons aged 70 and over. This finding implies that relevant departments should provide multi-tier and full-range community health care services to better cater to the needs of older adults of different age groups.

Moreover, the study reveals that community health care services demonstrate a more pronounced positive impact on the mental health of older adults with lower educational levels. This finding challenges the conventional assumption that higher education leads to better service utilization and outcomes. While older individuals with higher levels of education may have greater awareness of healthcare resources [5], our results suggest that those with lower educational attainment actually benefit more substantially from community health care services, both in terms of depression improvement and cognitive function enhancement. This phenomenon might be explained by several factors. First, less educated older adults typically have more limited access to diverse healthcare resources and information channels in their daily lives, making community health care services a particularly valuable intervention for this group. Second, the practical and accessible nature of community health care services may be especially effective in bridging the healthcare knowledge gap for those with lower educational levels, providing them with professional guidance and support that they might otherwise lack. Third, the structured and systematic approach of these services might help compensate for the educational disadvantages in health literacy and self-management skills [37]. These findings highlight the crucial role of community health care services in reducing health inequalities among older adults with different educational backgrounds. They also suggest that these services are particularly effective in reaching and supporting more vulnerable populations who might have fewer alternative resources for maintaining their mental health. This discovery emphasizes the importance of maintaining and strengthening community health care services as a vital tool for promoting health equity among older adults, particularly focusing on making these services more accessible and tailored to the needs of those with lower educational attainment.

The findings of this study have important implications for clinical practice and policy development in community health care services. The results highlight the need for healthcare providers to consider the diverse mental health needs of older adults across different demographic groups when designing and implementing interventions. Moreover, the positive impact of community health care services on the mental well-being of older adults

underscores the critical role these services play in promoting healthy aging. Policymakers should prioritize the development and funding of community health care services as a cost-effective and socially beneficial strategy. By incorporating the insights from this study into clinical practice and policy decisions, we can work towards building a more supportive and inclusive society that enables all older adults to age with dignity, purpose, and optimal mental health.

The CHARLS data used in this study covers 28 provinces in China, ensuring sample representativeness and generalizability of findings. Moreover, employing the DID model can avoid endogeneity problems to a large extent and enable a more precise estimation of the impact of community health care services on the mental health of older adults. However, this study has several strengths. One limitation of this study is the lack of comprehensive measurement indicators for both older mental health and community health care services, which may impact the study's outcomes. older mental health encompasses various dimensions such as loneliness, depression, cognitive function, adaptability, and interpersonal relationships. However, this paper only utilizes depression and cognitive function as measures of mental health of older adults. Additionally, the community health care services examined in this study do not encompass other essential services like psychosocial support. Moving forward, it is imperative to refine the indicators for measuring both mental health of older adults and community health care services to gain a more comprehensive understanding of their impact on both mental and physical well-being. Doing so will provide a foundation for advancing the development of community health care services and promoting healthy aging.

Conclusions and implications

This study demonstrates that community health care services positively impact the mental health of older adults. Furthermore, these services exhibit varying degrees of influence based on gender, age, and education level, showing distinct patterns of effectiveness across different demographic groups. Specifically, the services prove particularly effective in alleviating depression symptoms among male older adults while maintaining positive effects on cognitive function across genders. The services demonstrate stronger impacts on both depression and cognitive function among younger older adults (aged 60–69). Notably, contrary to conventional expectations, these services show more pronounced benefits for older adults with lower educational attainment, significantly improving both their depression levels and cognitive function. These findings not only affirm the role of community health care services in fostering healthy aging but also provide important insights for the development of targeted interventions. They suggest the need for stratified and specialized community health care services that particularly address the mental health needs of male older adults, consider age-specific requirements, and ensure enhanced accessibility for those with lower educational levels. Such differentiated approaches will facilitate the advancement of more equitable and effective integrated healthcare services, ultimately promoting healthy aging across all demographic groups.

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Authors' contributions
Study concept and design were developed by HK, XY, and YZ. Data acquisition was conducted by HK and HH. XY, HK, and YS performed the analysis and interpretation of data. HK, XY, HH, and SS contributed to drafting the manuscript. YS, XY, and HK critically revised the manuscript for important intellectual content. Final approval of the version to be published was granted by XY, HK, YS, HH, YZ, and SS. All authors read and approved the final manuscript.

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Data availability
The data that support the findings of this study are available from National School of Development, Peking University. Restrictions apply to the availability of these data, which were used under licence for this study. Data are available at https://charls.charlsdata.com/pages/data/111/en.html with the permission of National School of Development, Peking University.

Declarations

Ethics approval and consent to participate
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Consent for publication
No applicable.

Competing interests
The authors declare no competing interests.

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