## RESEARCH



# Mechanism for meeting the care of older adults in rural China—relying on spouse, offspring or community?

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## Abstract

**Background** Within the population aging and the trend of aging in place on the rise, it is crucial to explore how care needs are being met for this demographic within the community.

**Methods** This study utilizes data from the 2019–2021 survey on 1,126 rural older adults aged 60 years and above across 11 provinces and 31 villages in China. This study aims to examine the influence of spouse, offspring, and community status on the extent to which the care needs of rural older adults are met. Furthermore, it seeks to clarify the underlying mechanism of influence, as well as the change that occurs throughout the life cycle, using a multiple linear regression analysis.

**Results** This study demonstrates that the health status of spouses, the education level of offspring, the relationship with offspring, and the living with offspring significantly and positively influence the meeting of care needs among rural older adults. Notably, older adults with healthier spouses experience a 14.5% greater fulfillment of care needs compared to those without partners. Furthermore, those living with their offspring experience a 10.6% higher degree of care met. Additionally, the construction and operation of community senior care facilities, indicative of community quality, significantly enhance the meeting of care needs among rural older adults, with a 16.0% increase in met needs for those residing in communities equipped with such facilities compared to those without. From a life cycle perspective, the aforementioned significant effects are only observed among rural older adults aged 60–74 years or those in better health.

**Conclusion** Our results indicate the meeting of the care needs among rural older adults is influenced by the quality of their spouse, offspring, and community, with these effects diminishing later in the life cycle.

Keywords Care met, Meeting mechanism, Rural older adults, Spouse, Offspring, Community

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## Introduction

With the irreversible aging of the world's population, meeting the growing needs of older adults for care has become an important challenge for all countries. As the world's second largest country in terms of population, China has been experiencing the challenges of an aging society since the early years of the twenty-first century. The long-term effects of industrialization and urbanization in China have led to a significant migration of young rural labourers to urban areas. The issue of aging in China's rural areas is even more serious,



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with the proportion of older adults aged 65 and over in China's rural areas reaching 17.72% in 2020. Consequently, meeting the growing care needs of older adults has become a serious challenge in rural areas of China, where the population is experiencing a significant degree of aging [1, 2].

The Human Needs Theory points out that physical and mental health are basic human needs and that these needs must be met to some degree for individuals to participate effectively in their own lives [3]. For older adults, the provision of care services is the prerequisite for meeting their basic needs in old age, and it is of great practical significance to explore the care needs met by older adults. Initially, care support for older adults falls under the responsibility of the family, with spouses and offspring being the primary family members. The Altruism Theory posits that when older family members become incapacitated and require assistance, family members, encompassing spouses and offspring, will offer care and support out of genuine altruism. With industrialization and the introduction of the Welfare Pluralism Theory, the responsibility for the care of older adults has been extended from family to society. The Welfare Pluralism Theory regards the care benefits that the older adults receive as a collective outcome, stemming from the combined efforts of the family, the market, and the state. Amid escalating health-care resource constraints and a growing preference for aging in place, many countries are prioritizing the advancement of community-based home care for the older adults, recognizing the crucial roles of the government, market, and family in this collaborative effort [4-8].

At present, in China, the primary sources of care support for rural older adults are the family and the community, and this care model is influenced by the prevailing concept of aging in place, which emphasizes the desire of older adults to remain in their familiar rural environments [9]. The prevailing inadequacy of institutional senior care services underscores the heightened dependency on family- and community-based support mechanisms [10]. A study revealed that in 2018, in rural China, more than 72.7% of older adults relied on their spouses and offspring for care, some were dependent on community care, only a small portion of the older adults, less 2% relied on the institutionalized care [11]. Therefore, it is relevant to explore the roles played by spouses, offspring and communities in meeting the care needs of rural older adults. To this end, this study aims to investigate the following questions through both theoretical analysis and empirical evidence: To what extent are the care needs of the rural older adults met? How do contributions from spouses, offspring, and communities address the care needs of rural older adults, and how does this mechanism evolve throughout the life cycle?

## Influence mechanism analysis Theoretical basis

The meeting level of older adults care is influenced by both supply side and demand side factors. On the supply side, the meeting level of older adults care depends on the amount of care received, which in turn depends on the capacity of various care providers and the availability of care from different sources. The Human Resource Endowment Theory states that family members are the direct producers of family care and that the human resource endowment of spouses and offspring determines the total stock of family care. The availability of care services for older adults has been shown to be related to the presence of spouses and offspring, as well as the health status, financial capacity, care hours, and living arrangements [2, 12, 13]. The Structural Function Theory suggests that social care can complement and support family care, despite the incomparable nature of family care, and that the availability of social care is related to the ability of the community to provide senior services [11].

On the demand side, as older adults experience a decline in health they need more assistance from family, friends, and the surrounding community. Therefore, the extent to which older adults' care needs are met is related to factors such as their age, health status, marital status, education level, and economic level [14–16]. In addition, Grossman's Health Needs Theory states that an individual's health stock decreases with the passage of time and the backwards movement of the life cycle, meaning that the care needs of older adults continue to change throughout the life cycle based on their ability to care for themselves. Therefore, the Human Resource Endowment Theory, Structural Function Theory, and Health Needs Theory, the following will explore in detail the mechanisms of the role of spouses, offspring and communities in meeting the care needs of rural older adults and their influence by the life cycle.

#### The role of spouses in meeting the older adults care

In China, spouses play a crucial role in meeting the care needs of older adults, especially in rural areas where there is a significant outflow of young adults from the labour force, and only in the case of divorce or widowhood do the primary caregivers of older adults change to their offspring. The traditional Chinese proverb "Young couple, old companions" reflects the understanding that couples need each other's care and support, both in practical aspects of life and in emotional well-being, especially during old age. The study found that having a spouse has a positive effect on the health maintenance of

older adults, with a higher probability of recovery from physical incapacity and increased healthy life expectancy compared to those without spouses [17]. The study found that in China, among the older adults with spouses, 40.84% of rural older adults and 44.80% of urban older adults were dependent on their spouses, while only 13.04% rural and 14.74% of urban older adults were dependent on their offspring; for the older adults without spouses, the proportions of rural older adults and urban older adults who were dependent on their offspring increased to 57.46% and 52.87%, respectively [18]. However, as the life cycle progresses and both spouses age, the likelihood of spouses providing care decreases due to declining physical functioning. A study found that the proportion of older adults with spouses relying on their care declined with age, with 56.3%, 33.5%, and 11.2% of older adults aged 65-74, 75-84, and 85 and over relying on their spouses for care, respectively [19]. In addition, the extent to which spouses meet their care needs is also influenced by the closeness of their relationships. When older adults have lower closeness with their spouses, they are less likely to receive care from their spouses [20].

## The role of offspring in meeting the older adults care

Offspring caregiving is a typical intergenerational feedback pattern, and guided by the Chinese culture of filial piety, offspring support for paternal caregiving resources still plays a significant role in modern society [2, 21]. A higher number of offspring is associated with a reduced demand for market-oriented older adults' services and the higher the quality of old age [22, 23]. Driven by the process of urbanization, a large number of young and middle-aged labourers from rural areas have migrated to urban areas. The migration affects the availability of care support provided by offspring, which is influenced by their economic status, education level, living arrangements, geographic proximity and parent-child relationship [24, 25]. The higher income levels and education of the offspring, as well as closer relationships with their parents, are associated with increased care support for the older adults and a higher level of care needs being met for their parents [26]. The older adults living with their offspring receive more frequent and high-quality daily care compared to those living alone, which reduces the risk of their care needs going unmet [27, 28]. As the life cycle progresses, events such as widowhood or divorce increase the probability of older adults living with their offspring, which, in turn, affects the level of caregiving support they receive [29].

## The role of communities in meeting the older adults care

Although family resources remain the main source of care resources for rural older adults, community-based

formal care resources should not be ignored in the context of miniaturisation of household size and the urban migration of young people. Within the community, with the establishment of senior care facilities, the provision of care services for older adults can increase their level of meeting with care, especially for those lacking family care [30, 31]. According to data from the China Civil Affairs Statistical Yearbook 2022, by the end of 2021, China's rural communities had 215,600 senior care facilities, and based on the 490,000 village committees during the same period, the coverage of senior service facilities within rural communities reached 43.99%. These figures highlight the progress made in building senior care facilities in rural areas. However, challenges such as limited funding, insufficient care teams, and the dispersed residence of rural older adults have hindered the sustainable operation of rural community senior care facilities, and the phenomenon of community senior care facilities being discontinued and left unused is serious [32, 33].

## **Research review and analytical framework**

Previous research has provided the groundwork for this investigation into the factors influencing the meeting of care needs among rural older adults. However, there are also several limitations in previous studies that warrant further exploration. First, while studies have examined the individual roles of caregivers such as spouses, offspring, and communities in older adults' care, there is fewer study focusing on multiple caregivers. Second, most of studies have focused on the mere presence or quantity of caregivers, with scant attention paid to an in-depth analysis of their caregiving capacity. Third, few research was conducted on care needs of older adults from a life-cycle perspective.

Therefore, based on the above analyses, this study aims to explore and simultaneously examine the relationships among spouses, offspring, and the community in terms of meeting rural older adults' care needs and their variations throughout different stages of the life cycle. Figure 1 illustrates the analytical framework for meeting the care needs of the rural older adults in this study. Specifically, Fig. 1 demonstrates that factors at the spouse level (marital status, health status, relationshp with spouse), offspring level (number of offspring, education level of offspring, relationship with offspring, living with oftspring), and community level (construction and operation of senior care facilities) may impact the meeting level of older adults care. Moreover, the effects of these factors may also be influenced by life cycle changes. Therefore, this study also embedded age and health status groupings to examine the role of the life cycle through heterogeneity analysis.



Fig. 1 Analytical framework for meeting the care of rural older adults

## **Materials and methods**

## Data sources

The sample for this study was drawn from the Survey on Senior Services for the Rural Older Adults in China, hosted by the School of Public Administration of Northwest University. This field research targeted rural individuals aged 60 years and older, thereby establishing this age threshold as the inclusion criterion. Individuals below the age of 60 and urban older adults were excluded from the survey. This survey was conducted during the period of 2019-2021, and it employed a multistage stratified random sampling approach, building upon the methodology of a previous study. To ensure a representative sample, 1,126 rural older adults were randomly selected from 11 provinces, 18 cities, and 31 villages in China, and the sample covered three major economic regions of eastern, central, and western China [14]. This survey was conducted in two stages, July-August 2019 and December 2020-January 2021. The first stage of the survey was before the occurrence of the COVID-19 pandemic, and 559 samples were obtained; the second stage of the survey was during the COVID-19 pandemic, and 567 samples were obtained, but because the surveyed areas were in rural areas, which were less affected by the COVID-19 pandemic due to their low population density and dispersed residence. Thus, findings based on the survey data may be influenced by the COVID-19 pandemic, but this effect was relatively small. The sampling process involved several steps: first, 3-4 provinces were randomly selected in the eastern, central, and western regions of China; second, 1-3 cities were randomly selected in each sample province; third, 1–2 districts or counties were randomly selected in each sample city; and, finally, 1–6 villages were randomly selected in each sample district or county. Approximately 30 rural older adults aged 60 years and above were randomly selected from each village.

## Variable selection Dependent variable

To measure the meeting level of older adults care, this study drew on existing research and reflects it in terms of the subjective care needs of older adults, which were refined into four care programmes: hygiene care, dietary care, medical care and psychological care. The measurement procedure was as follows: First, the rural older adults were asked about their need level of each care programme, which was assigned as "no need"=1, "little need"=2, "some need"=3, and "great need"=4. Second, reverse scoring was utilized to transform the need level of care programmes into the meeting level of care programmes (refer to Table 1), with the meeting level of care being assigned the values of "great met"=4, "some met"=3, "little met"=2, "unmet"=1, and the higher the score, the higher the level of care being met for the rural older adults.

Table 1 shows the meeting level of older adults care. As shown in Table 1, the meeting level at which the care of the rural older adults were generally good. The highest level of meeting the care programme of the rural older adults was for dietary care and hygiene care, with more than 80% of the rural older adults choosing "great met" and "some met" for both programmes. The meeting level

Care programme	Unmet	Little met	Some met	Great met	Total
Hygiene care (Help clean body, clothes and room)	7.3	12.1	18.3	62.3	100
Dietary care (Help with cooking, eating and dishwashing)	7.3	12.3	17.5	62.9	100
Medical care (Accompanying for medical treatment and hospitalization)	17.1	25.0	15.6	42.3	100
Psychological care (Psychological counselling, chatting to relieve boredom)	20.1	31.0	13.5	35.4	100

Table 1 The meeting level of the care programme of rural older adults (%)

of the medical care of the rural older adults was relatively low, with 42% of the rural older adults in the programme choosing "unmet" or "little met". Notably, the lowest meeting level of the psychological care was found among the older adults, with 51% of them choosing "unmet" and "little met" in the programme.

## Independent variables

The independent variables of this study were categorized into three levels: spouse, offspring, and community. First, the spouse level contained three variables-marital status, spouse health status, and relationship with spousewith the latter two variables measuring samples of older adults with spouses. The marital status variable was a dichotomous variable assigned a value of 1 for "have a spouse" and 0 for "without spouse", and "without spouse" included unmarried, divorced, and widowed individuals. The spouse health status variable was a fixed-order variable, with health status assigned a value of "better"=1, "general" = 2, and "poorer" = 3. The relationship with spouse variable was obtained by asking the rural older adults "Who do you usually talk to first when you are happy or sad?", and the rural older adults who answered spouse were considered to be close to their spouse, while those who answered others were considered not close to their spouse.

Second, the offspring level included four variables: number of offspring, education level of offspring, relationship with offspring, and living arrangement. All variables were continuous variables except for living arrangement. The number of offspring variable was further subdivided by gender into the number of sons and the number of daughters. The education level of offspring variable was measured by the average years of education of all offspring. The variable of relationship with offspring was obtained by asking the rural older adults about their relationship with their sons (daughters) in the last six months, and the options were assigned as "neither close"=1, "mostly not close"=2, "half close and half not close"=3, "mostly close"=4, and "all close"=5, after which the degree of closeness to the son and the degree of closeness to the daughter were averaged. The living arrangement variable was designed to investigate the influence of co-residence with offspring on the extent to which the caregiving needs of the rural older adults are met. To this end, living arrangement was a dichotomous variable assigned a value of 1 for older adults living with their offspring and 0 for older adults not living with their offspring.

Third, the community-level variable was the condition of community senior care facilities, which was designed to reflect the construction and operation of community senior care facilities. This information was obtained by posing two questions to older adults: "Is there a facility in the village that specializes in providing senior services (e.g., rural happiness homes)?" and "Is the senior care facility in the village operating properly?" The options used were "yes" = 1 and "no" = 0. Next, the two responses above were integrated, and the samples that answered both yes were assigned a value of 1, while the others were assigned a value of 0. Finally, we obtained the variable "condition of community senior care facilities", which was a dichotomous variable, with a value of 1 if there was an senior service facility in the community and it is in operation and a value of 0 otherwise.

## Covariates

Based on existing research, this study also controlled for factors influencing older adults at the individual and village levels. Five variables were controlled at the individual level: gender, age, health status, years of education, and income. The health status variable referred to self-assessed physical health, with options categorized as poorer, general, and better, assigned values of 1–3, respectively, with higher scores indicating better health status. The income variable was represented by the logarithm of the individual's annual income. To control for the effects of rural community-based senior care services and the accessibility of county healthcare senior care resources services, three variables were controlled at the village level: village topography, distance of the village from the county and region [34–37]. The village topography variable was intended to characterize the terrain of the villages inhabited by the older adults. It was assigned a value of 1 for plains and 0 for non-plain, such as hills or mountains. The variable of distance from the village to the county was a continuous variable measured in kilometers, intended to gauge the proximity of the older adults' villages to the county seat. The variable of region was categorized according to the three major economic zones in China, which include the Eastern region, the Central region, and the Western region. The Eastern region boasts the highest level of economic development, while the Western region has the lowest. Table 2 shows the descriptive statistics of all the variables in this study.

## Model construction

In this study, the dependent variable "the meeting level of older adults care" was a continuous variable, and the independent variables were categorized into three levels—spouse, offspring and community—and the number of independent variables was more than two. This study also controlled for variables at the individual and village levels for older adults. Therefore, this study constructed a multiple linear regression model to analyse the effects of spouses, offspring and the community on meeting the care needs of rural older adults. Subsequently, given that the study's target population was the rural older adults aged 60 years and above, and considering that all survey samples met this criterion, the entire sample was included in the analysis. The multiple linear regression formula was set up as follows:

$$Y = \alpha + \beta_1 x_1 + \beta_2 x_2 + \dots + \beta_n x_n + \gamma \operatorname{Control} + \varepsilon$$
(1)

In Eq. (1), *Y* is the dependent variable,  $\alpha$  is the model constant,  $x_1 \sim x_n$  are the independent variables at the spouse, offspring, and community levels,  $\beta_1 \sim \beta_n$  are the coefficients of the independent variables,  $\gamma$  are the coefficients of the control variables, and  $\varepsilon$  is the residual term.

## Results

## Influencing factors on meeting the care of rural older adults

Table 3 includes a total of four models that present the regression results for the effects of spouse, offspring, and community status on meeting the care of rural older adults. Models 1 to 4 all controlled for individual and community level variables.

At the spouse level, the effect of marital status and relationship with spouse variables on meeting the care of rural older adults was not found to be statistically significant, and the effect of the spouse health status variable

## Table 2 Descriptive statistics of variables

Variable	Mean/N	SD (%)	
Dependent variable			
The meeting level of older adults care	3.1	0.8	
Independent variables			
Marital status			
Without spouse†	297	26.4%	
With spouse	829	73.6%	
Spouse health status			
Without spouse†	297	26.4%	
Better	395	35.1%	
General	238	21.1%	
Poorer	196	17.4%	
Relationship with spouse			
Without spouse†	297	26.4%	
Close	626	55.6%	
Not close	203	18.0%	
Number of offspring	3.0	1.2	
Number of sons	1.6	0.9	
Number of daughters	1.5	1.0	
Education level of offspring	9.7	2.6	
Relationship with offspring	4.7	0.6	
Living arrangement			
Not living with offspring †	692	61.5%	
Living with offspring	434	38.5%	
Condition of community senior care facilities			
Not constructed or operational†	991	88.0%	
Constructed and operational	135	12.0%	
Covariates			
Gender			
Female†	605	53.7%	
Male	521	46.3%	
Age	69.7	6.7	
Health status			
Poorer†	269	23.9%	
General	379	33.6%	
Better	478	42.5%	
Years of education	3.9	3.5	
Income	8.6	0.9	
Village topography			
Non-plain (hilly or mountainous) †	512	45.5%	
Plains	614	54.5%	
Distance from the village to the county (km)	15.1	14.0	
Region			
Westernt	621	55.2%	
Central	273	24.2%	
Eastern	232	20.6%	
		= =	

<sup>†</sup> Reference levels in the regressions; SD standard deviation

Variable	Model 1	Model 2	Model 3	Model 4
Independent variables				
Marital status				
Without spouse†				
With spouse	0.074 (0.058)	0.075 (0.058)		
Spouse health status				
Without spouse†				
Better			0.145 <sup>*</sup> (0.065)	
General			0.037 (0.073)	
Poorer			-0.017 (0.075)	
Relationship with spouse				
Without spouse†				
Close				0.081 (0.060)
Not close				0.054 (0.074)
Number of offspring	0.026 (0.023)		0.027 (0.023)	0.027 (0.023)
Number of sons		0.023 (0.030)		
Number of daughters		0.029 (0.026)		
Education level of offspring	0.022 <sup>*</sup> (0.010)	0.022 <sup>*</sup> (0.010)	0.021* (0.010)	0.022* (0.010)
Relationship with offspring	0.087 <sup>**</sup> (0.033)	0.086 <sup>44</sup> (0.033)	0.087** (0.033)	0.088** (0.033)
Living arrangement				
Not living with offspring †				
Living with offspring	0.106 <sup>*</sup> (0.048)	0.106 <sup>*</sup> (0.048)	0.106* (0.048)	0.104 <sup>*</sup> (0.049)
Condition of community senior care facilities Not constructed or operational				
Constructed and operational	0.163 <sup>*</sup> (0.073)	0.163 <sup>*</sup> (0.073)	0.160 <sup>*</sup> (0.073)	0.162 <sup>*</sup> (0.073)
Covariates				
Gender				
Female†				
Male	-0.027 (0.051)	-0.028 (0.052)	-0.020 (0.051)	-0.027 (0.051)
Age	-0.022** (0.004)	-0.021 <sup>**</sup> (0.004)	-0.021 <sup>**</sup> (0.004)	-0.022 <sup>**</sup> (0.004)
Health status				
Poorer†				
General	0.168 <sup>**</sup> (0.062)	0.168 <sup>**</sup> (0.062)	0.154 <sup>*</sup> (0.063)	0.168 <sup>**</sup> (0.062)
Better	0.303 <sup>**</sup> (0.060)	0.303 <sup>**</sup> (0.060)	0.268 <sup>**</sup> (0.062)	0.303 <sup>**</sup> (0.060)
Years of education	0.007 (0.007)	0.007 (0.007)	0.007 (0.007)	0.007 (0.007)
Income	-0.054 (0.029)	-0.054 (0.029)	-0.053 (0.029)	-0.055 (0.029)

 Table 3
 Regression analysis of the impact on meeting the care of rural older adults

## Table 3 (continued)

Variable	Model 1	Model 2	Model 3	Model 4
Village topography				
Non-plain (hilly or mountainous) †				
Plains	-0.007 (0.050)	-0.007 (0.050)	-0.015 (0.050)	-0.005 (0.050)
Distance from the village to the county (km)	0.008 <sup>**</sup> (0.002)	0.008 <sup>**</sup> (0.002)	0.008 <sup>**</sup> (0.002)	0.008 <sup>**</sup> (0.002)
Region				
Western†				
Central	-0.106 (0.060)	-0.106 (0.060)	-0.099 (0.060)	-0.103 (0.060)
Eastern	0.117 (0.063)	0.117 (0.063)	0.124 <sup>*</sup> (0.063)	0.120 (0.063)
Constant	3.957 <sup>**</sup> (0.408)	3.954 <sup>**</sup> (0.409)	3.966 <sup>**</sup> (0.408)	3.958 <sup>**</sup> (0.409)
R <sup>2</sup>	0.113	0.113	0.118	0.113

<sup>†</sup> Reference levels in the regressions; standard error in brackets, p < 0.05; p < 0.01

was significant (see Table 3). Models 1 and 2 indicated that rural older adults with spouses had a higher meeting level of care compared to those without spouses, but these findings did not reach statistical significance. Model 3 showed that rural older adults with spouses in better health had significantly higher meeting level of care by 14.5% compared to rural older adults without spouses, and there was no significant change in the meeting level of care for rural older adults with spouses in general or poorer health. Model 4 demonstrated that rural older adults with spouses and close relationships with spouses had greater meeting level of care compared to those without spouses, but this effect did not reach statistical significance.

At the offspring level, the variables of number of offspring, number of sons and number of daughters were not found to have a significant effect on meeting the care of older adults, while the variables of education level of offspring, relationship with offspring and living arrangement were found to have a significant effect on meeting the care of older adults (see Table 3). Models 1 to 4 demonstrated that although the number of offspring had a positive effect on meeting the care of older adults, the effect was not significant. Even after subdividing the number of offspring variable into two variables, the number of sons and the number of daughters, the results were still not significant. Models 1 to 4 also showed that the higher the education level of the rural older adults' offspring and the closer the relationship with their offspring, the greater the level of meeting the care of rural older adults. Compared with those who did not live with their offspring, those who lived with their offspring had a significantly higher level of care being met by 10.6%.

At the community level, the variable indicating the status of community senior service facilities had a significant positive effect on meeting the care of rural older adults (see Table 3). Models 1 to 4 consistently indicated that rural older adults in communities with constructed and operational senior care facilities had a higher level of care met compared to those in communities without such facilities or where the facilities had ceased operation.

## Heterogeneity analysis

The ability of spouses and offspring to provide care to older adults changes as they, their spouses and their offspring age, and their physical abilities decline, as affected by the later stages of the life cycle [22]. To examine whether the impact of each caregiving subject on meeting the care of rural older adults is affected by life cycle changes and varies among different groups of older adults with varying ages and health statuses, this study categorized rural older adults according to their age and health status, and further analysed the group differences in the impacts of spouses, offspring, and community status on meeting the care needs of rural older adults.

First, the grouping is based on age, as shown in Table 4. In 2022, the World Health Organization (WHO) proposed new criteria for age grouping, defining older adults aged 60–74, 75–89, and 90 years and above as young, senior, and long-lived older adults, respectively. Therefore, this study set the age boundary at 75 years old, and divided the sample older adults into the group of younger older adults (60–74 years old) and the group of senior older adults (75 years old and above). Second, the grouping is based on health status, as shown in Table 5. Based on the self-assessed health status, rural older adults who

Variable	Model 5 Younger older adults	Model 6 Younger older adults	Model 7 Younger older adults	Model 8 Senior older adults	Model 9 Senior older adults	Model 10 Senior older adults
Marital status						
Without spouse†						
With spouse	0.072 (0.069)			0.137 (0.111)		
Spouse health status						
Without spouse†						
Better		0.142 (0.075)			0.269 (0.134)	
General		0.036 (0.085)			0.055 (0.158)	
Poorer		-0.022 (0.086)			0.003 (0.157)	
Relationship with spouse						
Without spouse†						
Close			0.081 (0.071)			0.137 (0.120)
Not close			0.047 (0.086)			0.137 (0.152)
Number of offspring	0.043 (0.029)	0.043 (0.029)	0.044 (0.029)	-0.023 (0.040)	-0.018 (0.040)	-0.023 (0.040)
Education level of offspring	0.026 <sup>*</sup> (0.011)	0.025 <sup>*</sup> (0.011)	0.026 <sup>**</sup> (0.011)	0.017 (0.021)	0.013 (0.021)	0.017 (0.021)
Relationship with offspring	0.073 (0.039)	0.074 (0.039)	0.074 (0.039)	0.088 (0.066)	0.084 (0.067)	0.088 (0.067)
Living arrangement						
Not living with offspring †						
Living with offspring	0.147 <sup>**</sup> (0.055)	0.153 <sup>**</sup> (0.055)	0.146 <sup>**</sup> (0.056)	0.035 (0.104)	0.013 (0.105)	0.035 (0.105)
Condition of community senior ca	are facilities					
Not constructed or operational	+					
Constructed and operational	0.122 (0.081)	0.112 (0.081)	0.122 (0.081)	0.210 (0.173)	0.255 (0.174)	0.210 (0.173)
Covariates	Control	Control	Control	Control	Control	Control
Constant	2.454 <sup>**</sup> (0.344)	2.493 <sup>**</sup> (0.344)	2.455 <sup>**</sup> (0.344)	2.291 <sup>**</sup> (0.561)	2.297 <sup>**</sup> (0.564)	2.291 <sup>**</sup> (0.562)
R <sup>2</sup>	0.086	0.092	0.087	0.104	0.115	0.104

## Table 4 Influence factors for meeting rural older adults' care by age group heterogeneity

<sup>†</sup> Reference levels in the regressions; standard error in brackets, p < 0.05;\*\*p < 0.01

rated their health status as "poorer" were classified into the group of poorer health status, and rural older adults who rated their health status as "general" or "better" were classified into the group of better health status.

According to the regression results in Table 4, comparing the regression results of Models 5 to 7 and Models 8 to 10, there were age differences in the impact of variables such as education level of offspring, and living arrangement on meeting the care of rural older adults with spouses. These variables had a significant impact only on younger older adults, while the impact on senior older adults was not significant. Our findings suggests that the meeting of younger older adults' care is more significantly influenced by the status of their offspring than their spouse. This is attributed to the fact that the spouses of younger older adults are also generally in better health, leading to a relative consistency in the care they provide. Conversely, the care provided by offspring exhibits greater variability in the extent to which care is provided by offspring, which is influenced by different education level of offspring and living arrangements.

According to the regression results presented in Table 5, a comparison between Models 11 to 13 and Models 14 to 16 indicated that, after grouping based on

Variable	Model 11 Poorer health	Model 12 Poorer health	Model 13 Poorer health	Model 14 Better health	Model 15 Better health	Model 16 Better health
Marital status						
Without spouse†						
With spouse	-0.075 (0.126)			0.126 (0.066)		
Spouse health status						
Without spouse†						
Better		0.000 (0.157)			0.196 <sup>**</sup> (0.071)	
General		-0.080 (0.172)			0.059 (0.080)	
Poorer		-0.135 (0.148)			0.039 (0.089)	
Relationship with spouse Without spouse†						
Close			-0.029 (0.133)			0.127 (0.068)
Not close			-0.193 (0.169)			0.124 (0.083)
Number of offspring	-0.047 (0.055)	-0.046 (0.055)	0.053 (0.055)	0.048 (0.026)	0.049 (0.026)	0.048 (0.026)
Education level of offspring	-0.023 (0.025)	-0.023 (0.025)	-0.023 (0.025)	0.036 <sup>**</sup> (0.011)	0.033 <sup>**</sup> (0.011)	0.036 <sup>**</sup> (0.011)
Relationship with offspring	0.120 (0.077)	0.125 (0.077)	0.124 (0.077)	0.091 <sup>*</sup> (0.037)	0.085 <sup>*</sup> (0.037)	0.091 <sup>*</sup> (0.037)
Living arrangement						
Not living with offspring †						
Living with offspring	-0.042 (0.115)	—0.039 (0.115)	—0.054 (0.115)	0.144 <sup>**</sup> (0.053)	0.144 <sup>**</sup> (0.053)	0.144 <sup>**</sup> (0.053)
Condition of community senior ca	re facilities					
Not constructed or operational	t					
Constructed and operational	0.138 (0.174)	0.137 (0.175)	0.159 (0.175)	0.171 <sup>*</sup> (0.080)	0.167 <sup>*</sup> (0.080)	0.171 <sup>*</sup> (0.080)
Covariates	Control	Control	Control	Control	Control	Control
Constant	4.813 <sup>**</sup> (0.932)	4.793 <sup>**</sup> (0.936)	4.806 <sup>**</sup> (0.932)	3.832 <sup>**</sup> (0.460)	3.866 <sup>**</sup> (0.459)	3.832 <sup>**</sup> (0.460)
R <sup>2</sup>	0.079	0.082	0.083	0.111	0.118	0.111

## Table 5 Influence factors for meeting rural older adults' care by health group heterogeneity

<sup>+</sup> Reference levels in the regressions; standard error in brackets, p < 0.05; p < 0.01

health status, all significant variables at the spouse, offspring, and community levels all had a significant positive impact on meeting the care of rural older adults in better health, but none of the effects on meeting the care of rural older adults in poorer health were significant. These findings highlighted the importance of considering health status when analysing the impact of spouse-, offspring-, and community-level variables on meeting the care of rural older adults.

## Discussion

The findings of this study revealed that the spouse health status, education level of offspring, relationship with offspring, living arrangement and condition of community senior care facilities had a positive and significant effect on meeting the care of rural older adults. Embedded within the life cycle perspective, the study further revealed that the positive and significant effects of spouse health status, education level of offspring, relationship with offspring, living arrangement and condition of community senior care facilities occurred only in the group of rural older adults in better health, and that the positive and significant effects of education level of offspring and living arrangement were prominent in the group of younger older adults aged 60–74 years.

At the spouse level, only the spouse health status had a significant positive effect on meeting the care of rural older adults with spouses, while the effects of marital status and relationship with spouses were not significant. The finding on spouse health status is consistent with the finding of previous studies, which have highlighted the positive impact of the health status of caregiver on meeting the care of older adults, particularly in the case of spouses who are often the primary caregivers of older adults [13, 38]. This may be because healthy spouses are willing to provide more emotional support and caregiving assistance, stemming from a genuine concern for their partner's well-being, rather than self-interest, which is a sign of altruism. As the health of spouses declines with age, older adults are less likely to rely on them for meeting their care when their spouses are in poorer health [20]. The finding regarding marital status differs from those of previous studies, which revealed that greater levels of needs being met among older adults with spouses, unmet care needs are more common among single or divorced older adults with dementia, and those with spouses caring for them have a lower risk of death than those without spouses caring for them [12, 39–41]. The research on the impact of marital relationships on meeting the care of the older adults found that the better the relationship with their spouse, the more care the older adult receive from their spouse [42]. Two additional related studies each revealed that older adults who have better relationships with their spouse have lower levels of depression, and that the meeting level of care is positively correlated with depressive symptoms [43, 44]. Therefore, it can be inferred that the meeting level of care of older adults is correlated with the quality of their relationships with their spouses. The reasons for this difference in findings may be twofold: first, previous studies have focused mainly on the presence or absence of a spouse, with few studies exploring the impact of the spouse's health status and marital relationship on the care of older adults. In this study, which pays attention to the aforementioned factors, the impact of the spouse's health status has offset the effect of the presence or absence of a spouse; second, from a practical point of view, the relationship with the spouse affects the willingness of the spouse to provide care to older adults, while the health status of the spouse affects the ability of the spouse to provide care to older adults. However, objective capability is the foundation and prerequisite for the conversion of subjective intentions into action [45].

At the offspring level, the education level of offspring, the relationship with offspring, and the living arrangement all had a significant positive effect on meeting the care of rural older adults. Conversely, the number of offspring, the number of sons and the number of daughters did not have significant effects. Previous studies have also shown that the higher the education level of offspring and the closer the relationship with offspring, the more care support they provide to older adults [26]. Older adults living with their offspring are more likely to receive assistance with daily living, leading to a reduced risk of unmet care needs [2, 28]. Living with offspring also increases the chances that older adults will meet and have contact with their offspring, and studies have found that older adults who have frequent contact and meetings with their offspring have greater subjective well-being and lower levels of depression [43]. Drawing from the theory of altruism, there is selectivity in intergenerational care support behavior. Offspring with higher education level are more adept at identifying and addressing the needs of their elderly parents. Furthermore, a stronger relationship between offspring and their elderly parents, fosters a greater willingness among the offspring to provide care, driven by altruistic motives rather than self-interest. This tendency is particularly pronounced when the offspring choose to co-reside with their elderly parents, underscoring the expression of altruistic behavior in their caregiving decisions.

The results of previous research on the impact of the number of offspring on meeting the care of older adults fall into two categories. One category of research has shown that a greater number of offspring plays a more significant role in meeting the care of older adults [14, 22]. Another category of research has shown that families with multiple offspring tend to lack cooperation between offspring in the provision of care to parents, which can have a detrimental effect on parental care [46]. The nonsignificant effect of the number of offspring observed in this study could be attributed to the detailed examination of additional factors such as the education level of offspring, the relationship with offspring, and the living arrangement. These factors may counteract the sole impact of the number of offspring. As societal views on fertility evolve, so too have family dynamics in terms of fertility decision-making and caregiving behaviors. Concurrently, improvements on the social security system have further reduced the dependence of families on their offspring for old-age support, which has made families pay more attention to the quality rather than the quantity of offspring within families.

Becker's Quantity and Quality of Family Fertility Substitution Theory states that families transitioning from prioritizing the quantity to the quality of offspring can optimize the education and well-being of their existing offspring. This strategic shift enhances the productivity and future earning potential of the offspring, thereby more efficiently addressing the care needs of older adults. Conversely, an increase in the number of children can lead to a decrease in the family's investment per offspring, potentially reducing each offspring's capacity to care for their older parents. Consequently, the increased number of offspring may lead to a reduction in their collective caregiving contributions, thus making the effect of the number of offspring in fulfilling the caregiving needs of the older adults insignificant [47].

At the community level, the condition of community senior care facilities had a significant positive impact on meeting the care of rural older adults, with the condition encompassing both construction and operation. This result aligns with previous studies, which found that the establishment of senior care departments within the community, providing care services such as medical health and emotional comfort, have a significant positive impact on improving the well-being and satisfaction of older adults [29, 48-51]. It has also been found that the provision of hospice services for terminally ill older adults with chronic illnesses and public care services for demented older adults by the community significantly and positively impacts the meeting of their specific care needs [52, 53]. Mobilizing community resources can alleviate this problem, particularly in contexts where family caregiving resources are insufficient to meet the growing demands of older adults' care [54]. From the perspective of structural functionalism, society is a intricate system of various structures, with community-based elderly care facilities constituting part of the social structure. These facilities are designed to provide formal care services for older adults, encompassing both physical care and emotional support, and the construction and operation of community-based senior care facilities effectively fulfills this function, thereby increasing the satisfaction of the care needs among older adult. In addition, these facilities aid in maintaining the social participation of older adults, thereby meeting their emotional needs, exemplifying the structural functionalist theory of "functional mediation". From the perspective of welfare pluralism, the satisfaction of care needs among older adults relies on both informal familial care and formal community care. These two caregiving resources exhibit a complementary and substitable relationship, indicating that the family and the community are not in competition with each other but rather serve to augment each other's efforts, This synergy and collaboration are essential for more effectively meeting the care requirements of the older adults.

By incorporating a life cycle perspective and analysing subgroups of older adults with spouses within the sample based on age and health status, it was revealed that spouse health status, education level of offspring, relationship with offspring, living arrangement, and the condition of community senior care facilities had a significant positive impact on meeting the care of older adults aged 60–74 years or in better health. This implied that there was no significant difference in the level of care met among older adults when they are in the advanced or high-care needs stages of their life cycle, regardless of the status of their spouse, offspring, or community. In contrast, when older adults were in the autonomous or light care stages of the life cycle, differences emerged in the impact of differences in the status of spouses, offspring and communities on meeting their care, which on the caregiving capacity of spouses, offspring and communities. There are two interpretations here: on the one hand, this correlation arises from the fact that there are a positive association between the aging and deteriorating health of spouses and offspring and that of older adults [55]. As older adults reach an advanced age or experienced poorer health, their spouses and offspring also tend to have poorer health, thereby reducing their ability to provide care [18]; on the other hand, the care needs of older adults at this stage are greater, necessitating specialized institutional care. Despite the initial establishment of community senior care facilities in nearly half of China's rural regions, the services-predominantly life care and spiritual comfort-are still nascent and lack the capacity for medical care, with many facilities facing closure due to financial constraints [32, 56].

This study has some limitations. The first, the dependent variable "the meeting level of older adults care" was measured at a composite level, without analysing the factors influencing the meeting of each specific care programme. Second, due to the limitation of sample size, this study could not employ sample weights to adjust the representativeness and regional equilibrium of the data. Consequently, there is plan to continue to collect sample data, to achieve a more balanced regional distribution, and to form panel data for in-depth research in the next study. Future studies should collect panel data to capture changes in the meeting level of care among rural older adults. Finally, at the community level, the variables used in this study were relatively homogeneous, focusing solely on the construction and operation status of community senior care facilities. A more nuanced approach would involve exploring the specific types and number of community senior service projects available in future research.

#### Conclusion

This study explores the influence of spouses, offspring and communities multiple caregivers on meeting the care of rural older adults, as well as the underlying mechanisms and their variations a across the life cycle. Its main contribution lied in presenting empirical evidence, using a dataset from the Senior Survey of 1126 rural older adults in 11 provinces and 31 villages in China. This study highlighted that the care dependency choices of rural older adults depended on their spouses, offspring, and community status. In other words, the care dependency decisions of rural older adults are more dependent on the ability of diverse caregivers to provide care resources than on the mere existence of caregivers themselves.

Moreover, it underscored the significance of spouse quality (spouse health status), offspring quality (education level of offspring, relationship with offspring, and living arrangement), and community quality (condition of construction and operation of community senior care facilities) all had a significant positive effect on meeting the care of rural older adults. However, these effects were affected by the life cycle, which were only observed in rural older adults aged 60–74 years or in better health. Our results challenged the conventional notion that the presence of a spouse or the number of offspring is the decisive factor in determining care provision for older adults but rather the quality of spouse, the quality of offspring, and the quality of communitybased senior care services.

Our study expands the scope of older adult care research by providing a more comprehensive and innovative perspective on the meeting of older adults' care, as well as valuable insights for policy makers and service providers in the field of senior care. Moreover, this study supports the improvement of policies for the development of community home-based senior services both in China and other countries outside of China. First, it is recommended that the provision of rural pensions and medical resources be strengthened to improve the health of rural older adults and their spouses. Second, we suggest actively promoting and encouraging offspring to live with or near their older adult family members, so as to increase the frequency of intergenerational interaction and intimacy. Third, we propose to enhance construction and operational subsidies for senior service facilities, offer tax incentives, mobilize social capital, and cultivate a rural nursing workforce, thereby fostering the sustainable provision of community care services in rural areas. Fourth, efforts should be made to integrate rural medical resources and establish professional senior care institutions in rural areas, so as to provide professional institutional care for rural older adults in poorer health and with higher-level care needs.

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#### Authors' contributions

ZD and JN collected the data and conducted most of the analyses. ZD and JN wrote the draft. ZD, DL and YW contributed to the manuscript revisions. All authors provided intellectual content to the manuscript and critical feedback and approved the final version.

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#### Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

#### Declarations

#### Ethics approval and consent to participate

The study was conducted according to the guidelines of the Declaration of Helsinki. The authors obtained the data during 2019–2021 in 11 provinces, 18 cities, and 31 villages in China. This study included experimental procedures that were approved by the School of Public Administration at Northwest University. Informed consent was obtained from all participants. All the methods and procedures carried out in this study were in accordance with the relevant guidelines.

#### **Consent for publication**

N/A.

#### **Competing interests**

The authors declare no competing interests.

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