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# The impact of widowhood on the quality of life of older adults: the mediating role of intergenerational support from children

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## Abstract

**Background** China's transition into an aging society is accelerated by the simultaneous decline in fertility rates and the prolonged life expectancy of older adults. The impact of widowhood, a significant stressor in old age, has emerged as a crucial factor affecting the quality of life among the elderly.

**Methods** This study is based on data from the 2018 China Health and Aging Tracking Survey. Multiple linear regression models were employed to investigate the influence of widowhood on the quality of life of older adults in China. Additionally, Bootstrap mediation effects were utilized to assess the mediating role of intergenerational support, considering both financial and emotional support from children.

**Results** The findings indicate a substantial reduction in the quality of life index among older adults following widowhood. Moreover, the impact is more pronounced among older men compared to older women. Rural older adults experience a significant decline in quality of life post-widowhood, while the effect on urban counterparts is not statistically significant.

**Conclusions** Intergenerational financial support was identified as a partial mediator between widowhood and the quality of life among older adults. This underscores the importance of familial financial assistance in mitigating the adverse effects of widowhood on the well-being of the elderly. These results offer valuable insights into the nuanced impact of widowhood on the quality of life among older adults in China, emphasizing the need for targeted interventions, especially in rural areas.

**Clinical trial** Not applicable.

**Keywords** Widowhood, Quality of life, Intergenerational support, Mediating effects

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## Background

With the growing trend of population aging, the number of widowhood is increasing annually. Data from the sixth national census indicate that the nationwide count of widowed individuals over the age of 60 has reached a staggering 47.74 million. Projections estimate that by the mid-century, China's elderly widowhood population will soar to 118 million [1]. Widowhood is widely acknowledged as one of life's most distressing events [2, 3], often resulting in a loss of health, financial stability, and social support, thereby impeding the daily lives of older individuals [4]. Numerous international studies have demonstrated that widowhood heightens the risk of mortality among older adults, a phenomenon also observed in China [5]. Widowhood is considered a significant threat to the quality of life for the elderly [6–8]. However, little research has been conducted on the impact of widowhood on the quality of life of older adults within the context of evolving familial dynamics and increasing population aging in China. Existing studies have emphasized the positive influence of robust social support, primarily from family members (spouses and children), while the role of friends' support appears insignificant [9, 10]. Regarding family support's association with quality of life, spousal support remains a primary source of reassurance for older adults in their later years [11, 12].

Active aging theory posits that to improve the quality of life in old age, it is essential to maximize the opportunities for health, participation, and security [13]. Health is the foundation, participation is the prerequisite, and security is the guarantee. Considering the current situation in China, where the trends of a social aging and increasingly elderly population are becoming more evident and severe [14], we believe that intergenerational support from children can significantly enhance the quality of life for the elderly [15]. Widowhood is likely to negatively impact the quality of life for the elderly, and intergenerational support from children may be crucial in mitigating these effects. When widowed elderly individuals experience declining physical function and diminishing self-care abilities, support from their children can effectively improve their physical and mental well-being. Economic support, emotional comfort, and daily care provided by children are key factors in ensuring the quality of life for the elderly [16]. However, the relationship between intergenerational support and the quality of life for widowed elderly individuals remains underexplored. Therefore, this study, based on the current realities in China and utilizing large-scale social survey data, investigates the impact of widowhood on the quality of life for the elderly. It further analyzes the mechanism through which intergenerational support acts as a mediating variable in this relationship.

## Literature review and research hypothesis

### Bereavement experience and quality of life

The World Health Organization (WHO) classifies widowed older adults as a vulnerable population. The loss of a spouse has a profound impact on the lives of older adults, presenting significant challenges related to identity, roles, and social adjustment. Attachment theory suggests that the severance of emotional bonds gives rise to negative emotions [17, 18]. Prolonged grief and psychological stress can cause substantial harm to one's well-being [19, 20]. Extensive research has consistently shown a strong link between bereavement and the heightened risk of mortality in older adults, with a higher incidence of death among widowed individuals compared to those with living spouses. Furthermore, bereavement impairs the ability of older adults to adapt to later stages of life, resulting in increased health issues and a subsequent decline in their quality of life [21]. Studies have revealed that older adults are prone to experiencing complex grief reactions following negative life events, such as widowhood. These complex grief reactions can significantly compromise their immune function and, in severe cases, pose a life-threatening risk [22], thereby profoundly impacting the quality of life of older adults. Bereavement is a common and often challenging experience in late life. Bereavement puts a significant proportion of people at risk of adverse effects on their physical and mental health, including death. At the same time, bereavement may be a risk factor for cognitive decline in this population [23].

Therefore, this study posits the following hypothesis: Bereavement diminishes the quality of life index among older adults.

### The mediating role of intergenerational child support

Widowhood entails a loss of economic or emotional support from a spouse, which can lead to a decline in the quality of life for the elderly. Previous studies have shown that intergenerational support from children significantly protects the quality of life for widowed elderly individuals [24, 25]. Children's attitudes, frequency of contact, and visits directly influence the emotional well-being of the elderly. Financial support from children effectively mitigates the material risks faced by the elderly, thereby enhancing their quality of life. The health demand theory, originating from Grossman's (1972) health demand model [26], is based on human capital theory and Becker's household production theory. It posits that health capital is a unique form of capital, distinct from other types of human capital. Aligning with the "Healthy China 2030" initiative, we define health demand as the need for individuals to maintain a good physical, psychological, and social adaptive state to improve their quality of life and maximize utility [27]. According to this theory,

individuals require health investments to enhance their quality of life after experiencing health losses. Intergenerational support from children ensures that elderly individuals have the capacity to invest in their health [11]. Thus, the economic and emotional support provided by children offers both material and psychological security [28]. However, previous research rarely integrates widowhood, intergenerational support, and quality of life into a single systematic framework.

Therefore, this study proposes the following hypothesis: intergenerational support mediates the relationship between widowhood and quality of life.

## Methods

### Data sources

The data for this study were obtained from the 2018 China Health and Retirement Longitudinal Survey (CHARLS) project. This survey is a collaborative initiative undertaken by the China Social Science Survey Center of Peking University and the Peking University Youth League Committee. It employs a random sampling approach to select households and individuals aged 45 years and older in China as data participants. The survey encompasses various fields of study and aims to analyze population aging and other associated concerns. The sample comprises 19,000 respondents, ensuring a high level of representativeness. In alignment with the research focus of this paper, the study subjects were specifically chosen as elderly individuals who had reached the age of 60 by 2018. Samples that did not meet the specified criteria were excluded, resulting in a final dataset of 4,555 participants. Among these, there were 2,238 male participants, 2,317 female participants, 1,027 participants from rural areas, and 3,528 participants from urban areas.

### Study design

#### *Dependent variables and their measurement*

The explanatory variable in this paper is the quality of life of the elderly, and the EQ-5D scale is mainly used to measure the level of quality of life of the elderly. The EQ-5D scale mainly consists of 5 dimensions: mobility, self-care, daily activities, pain/discomfort, and anxiety/depression, and each dimension contains 3 levels: no difficulty, some difficulty, and extreme difficulty.

The questionnaire uses “Do you have difficulty bending over, bending your knees or squatting?” to measure the mobility of older adults; “Do you have difficulty cooking because of health and memory reasons?” for measuring self-care ability of older adults; “Do you have difficulty doing household chores because of health and memory?” for measuring older adults’ ability to perform daily activities; “Do you often struggle with physical pain?” for measuring pain/discomfort in older adults; “Feeling

low in mood.” for measuring anxiety/depression in older adults. We consider adopting the utility value method because the effect value indicator is not influenced by sample size. It represents the magnitude of differences between overall means under different treatments, facilitating comparisons across different studies and aiding our understanding of whether statistically significant differences have practical significance. Therefore, we utilize the EQ-5D-3 L utility value integration system constructed by Zhou Ting et al. [29] to calculate health utility values, with the calculation formula as follows:  $U = 1 - (0.039 + 0.099 * MO2 + 0.105 * SC2 + 0.074 * UA2 + 0.092 * PD2 + 0.086 * AD2 + 0.246 * MO3 + 0.208 * SC3 + 0.193 * UA3 + 0.236 * PD3 + 0.205 * AD3 + 0.022 * N3)$ .

The threshold range of the Chinese version of EQ-5D-3 L health utility values is [-0.149, 1].

#### *Explanatory variables and their measurement*

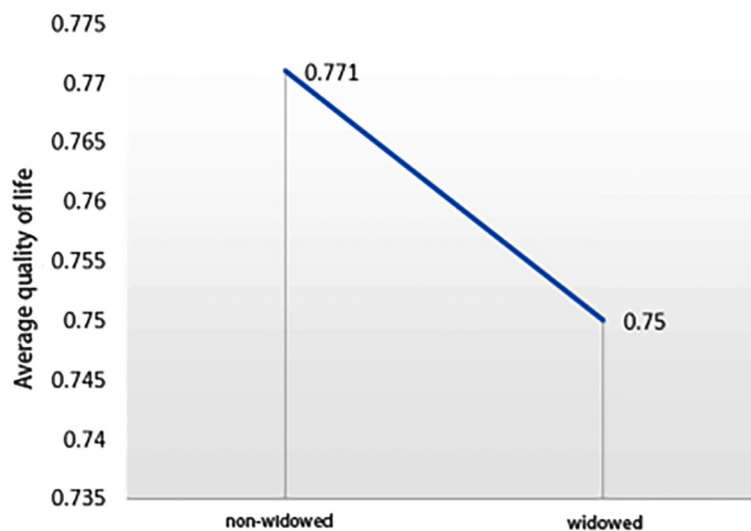
The primary independent variable of interest is marital status, specifically widowhood. In the questionnaire, marital status is captured by the question regarding “current marital status.” For this study, samples indicating divorce, separation, or never having been married were excluded from the analysis. The mediating variables pertain to intergenerational support from children, encompassing both intergenerational economic support and intergenerational emotional support. Intergenerational emotional support is primarily assessed using the following question: “How frequently do you meet your children?” (1=never; 2=at least once a year; 3=at least once a month; 4=at least once a week; 5=almost every day). Intergenerational economic support is primarily measured through the question: “In the past 12 months, have any of your children provided you with money, food, or gifts? If so, what was the total value of these contributions?” (1=never received; 2=¥1-¥1999; 3=¥2000-¥3999; 4=¥4000-¥5999; 5=¥6000-¥7999; 6=¥8000-¥9999; 7=¥10,000 and above). In addition, this study incorporates several control variables. These variables include individual characteristics such as age, gender, educational attainment, and place of residence. Health-related variables encompass self-rated health and the presence of chronic illnesses. Lifestyle variables comprise smoking habits and alcohol consumption. Table 1 provides an overview of the defined and measured variables utilized in this study.

#### *Research methodology*

This study employs OLS regression models to analyze the impact of widowhood and intergenerational support on the quality of life of the elderly across overall, gender-specific, and urban-rural samples. OLS regression allows for the control of other variables, providing an accurate method to quantify the relationship between these social

**Table 1** Variables and assignments

Variable Name	Definition and Assignment
Quality of life	Overall quality of life in old age
Widowhood or not	0 = No; 1 = Yes
Intergenerational emotional support	How often do you see your children? 1 = No; 2 = At least once a year; 3 = At least once a month; 4 = At least once a week; 5 = Almost every day
Intergenerational financial support	In the past 12 months, has a child given you money, food, or gifts and how much is the total value of these possessions? 1 = No; 2 = ¥1-199; 3 = ¥200-¥499; 4 = ¥500-¥999; 5 = ¥1,000-¥1,999; 6 = ¥2,000-¥3,999; 7 = ¥4,000-¥6,999; 8 = ¥7,000-¥11,999; 9 = \$12,000 and above
Age	Age of the respondent
Gender	0 = female; 1 = male
Education level	0 = below elementary school; 1 = elementary school; 2 = junior high school; 3 = high school and above
Place of residence	0 = rural; 1 = urban
Self-rated health	0 = unhealthy; 1 = suboptimal; 2 = healthy
Chronic disease or not	0 = no; 1 = yes
Smoking	0 = No; 1 = Yes
Alcohol consumption	0 = No; 1 = Yes



**Fig. 1** Average quality of life status under different marital status

factors and quality of life [30–32]. The results offer a deeper understanding of the multifaceted influences on quality of life and provide empirical evidence for developing and optimizing strategies to enhance their quality of life [33, 34].

Furthermore, the study uses bias-corrected percentile Bootstrap tests to examine mediation effects. The Bootstrap method was chosen for its robustness in handling non-normal distributions and outliers, and its ability to provide confidence intervals without assuming normality [35]. This approach is used to analyze the mediating roles of intergenerational emotional and financial support between widowhood and the quality of life of the elderly.

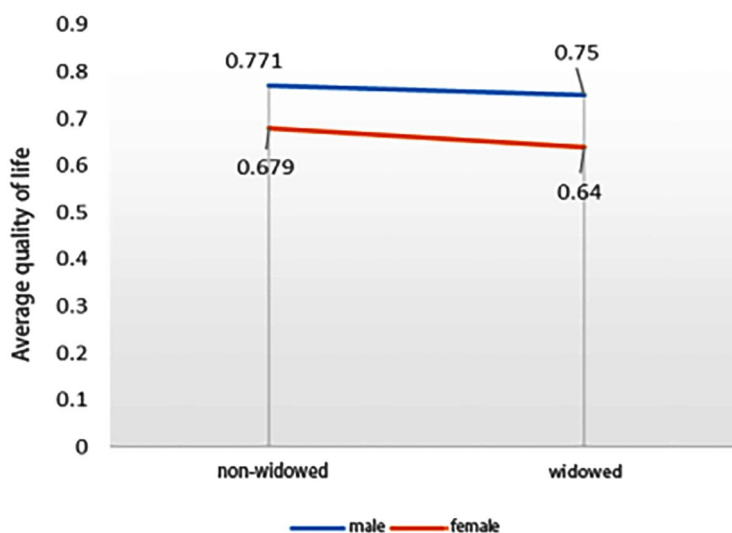
**Empirical results and analysis**

**Descriptive analysis**

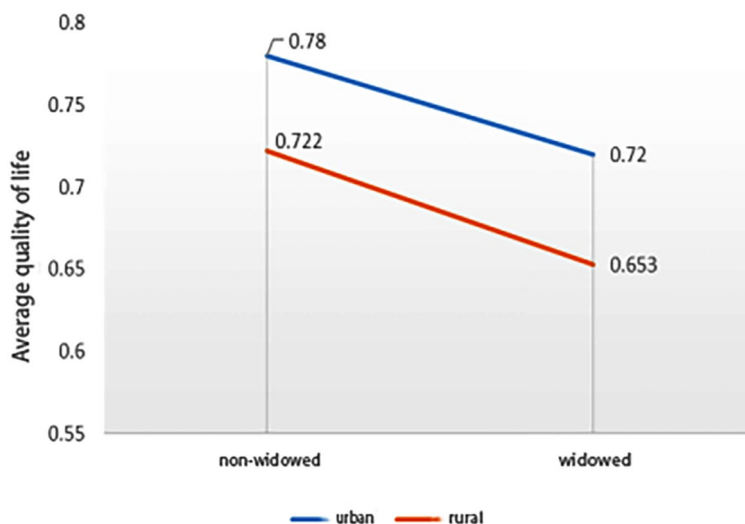
Figures 1, 2 and 3 display the average levels of quality of life for the overall sample, the gender-specific sample,

and the urban-rural sample, respectively, based on the two marital states. Upon comparing these three sample groups, it becomes evident that the average quality of life among older adults is lower after widowhood, compared to those who are not widowed. Additionally, by comparing Figs. 2 and 3, we observe that the average quality of life for elderly males surpasses that of elderly females in both marital states, and the average quality of life for urban elderly individuals exceeds that of their rural counterparts.

Table 2 presents the fundamental information and descriptive statistical analysis of the variables utilized in this study, along with showcasing the characteristics of gender-based and urban-rural subgroups. Regarding the quality of life, the overall score for older adults was 0.715, with male older adults exhibiting a higher mean score (0.77) than their female counterparts (0.664), and urban older adults reporting a higher mean score (0.754)



**Fig. 2** Average quality of life status in different marital status (by gender)



**Fig. 3** Average quality of life status in different marital status (by urban and rural areas)

compared to rural older adults (0.703). Concerning widowhood status, female older adults (0.40) scored higher than male older adults (0.15), while urban older adults (0.30) scored higher than rural older adults (0.27). In terms of intergenerational support, male older adults received greater financial assistance from their children (1.88) than female older adults (1.81), and urban older adults received more financial support (1.90) compared to rural older adults (1.83). Regarding emotional support, children provided significantly more support to female older adults (2.99) than to male older adults (2.89), and the emotional support extended to urban older adults (3.19) was significantly higher than that provided to rural older adults (2.86). Concerning the individual characteristics of the interviewed older adults, the study sample had an average age of 71.66 years, with a slightly higher

representation of female older adults (50.9%) compared to their male counterparts (49.1%). Additionally, 77.5% of the respondents hailed from rural areas. The educational attainment of the older adults interviewed was generally low, with comparatively lower levels observed among female and rural older adults. Regarding health status, self-rated health scores were marginally higher for male older adults than for females, and urban older adults reported slightly better self-rated health compared to their rural counterparts. No significant gender differences were observed in terms of chronic disease conditions, although urban older adults exhibited slightly higher rates compared to the overall older adult population. Smoking and alcohol consumption were more prevalent among male older adults than among females, and urban older adults exhibited higher rates of both

**Table 2** Results of descriptive statistics of variables in this paper

Variables	Means (standard deviation)				
	Overall sample N=4555	Male sample N=2238	Female sample N=2317	Urban sample N=1027	Rural sample N=3528
Quality of life	0.715±0.236	0.77±0.219	0.664±0.241	0.754±0.222	0.703±0.239
Widowhood	0.28±0.448	0.15±0.357	0.40±0.487	0.30±0.460	0.27±0.445
Age	71.66±7.283	71.67±7.195	71.64±7.370	72.81±7.582	71.32±7.158
Gender	0.49±0.5			0.47±0.499	0.50±0.5
Education level	1.98±0.736	2.28±0.644	1.71±0.712	2.29±0.718	1.88±0.715
Place of residence	0.23±0.418	0.22±0.411	0.24±0.424		
Self-rated health	0.90±0.722	0.96±0.717	0.84±0.720	1±0.696	0.87±0.726
Chronic disease	0.39±0.487	0.39±0.488	0.39±0.487	0.41±0.492	0.38±0.486
Smoking	0.29±0.452	0.52±0.499	0.07±0.247	0.23±0.423	0.30±0.459
Alcohol consumption	0.31±0.463	0.49±0.5	0.14±0.346	0.32±0.465	0.31±0.462
Financial support	1.84±1.42	1.88±1.437	1.81±1.403	1.90±1.498	1.83±1.396
Emotional Support	2.94±1.223	2.89±1.179	2.99±1.261	3.19±1.247	2.86±1.206

**Table 3** Regression results for the overall sample of older adults' quality of life (N=4555)

Variables	Model 1 Coefficients	Model 2 Coefficients
Widowhood (reference group: not widowhood)	-0.08*** (0.007)	-0.08*** (0.007)
Age	-0.003*** (0.000)	-0.003*** (0.000)
Sex (reference group: female)	0.066*** (0.008)	0.067*** (0.008)
Educational level (reference group: elementary school and below)	0.027*** (0.005)	0.027*** (0.005)
Place of residence (reference group: rural)	0.025*** (0.008)	0.023*** (0.008)
Self-rated health (reference group: unhealthy)	0.142*** (0.004)	0.142*** (0.004)
Whether suffering from chronic diseases (reference group: no)	-0.005 (0.006)	-0.005 (0.006)
Smoking (reference group: non-smoking)	-0.007 (0.008)	-0.007 (0.008)
Alcohol consumption (reference group: no alcohol consumption)	0.023*** (0.007)	0.024*** (0.007)
Financial support (reference group: not given)		0.001*** (0.002)
Emotional support (reference group: did not meet)		0.007*** (0.002)
Cons	0.683 (0.034)***	0.671*** (0.035)
Adjusted R <sup>2</sup>	0.275	0.276

Note: \*\**p*<0.05, \*\*\* *p*<0.01, Subsequent *p*-values adhere to the same significance thresholds

behaviors compared to their rural counterparts. Overall, the variables highlighted noticeable disparities in gender and urban-rural contexts.

**Multiple regression results**

Table 3 presents the results of OLS regression analysis for the overall sample. Model 1 introduces variables related to individual characteristics, health levels, and lifestyle. The regression results indicate that widowhood significantly impacts the well-being, happiness, and life satisfaction of older adults, with the average level of subjective well-being being 0.08 lower for widowed individuals compared to those without a spouse. Age exhibits a negative correlation with the life quality index of older adults at the 1% significance level, suggesting that as individuals age, their subjective happiness and life satisfaction tend to decline. Moreover, older adults with higher levels of education enjoy a greater sense of life fulfillment, as reflected by a higher index of happiness and

well-being compared to those with lower education levels. The average level of life satisfaction is 0.027 higher for older adults with higher education. The life quality index is higher among older adults residing in urban areas in comparison to their rural counterparts, indicating a significant urban-rural disparity in subjective well-being. Notably, self-rated health status positively influences the overall life satisfaction of older adults, with higher levels of self-rated health associated with greater subjective happiness and well-being. Furthermore, older adults who consume alcohol report a higher level of life contentment, as reflected by an average increase of 0.023 in the life quality index. Incorporating the variable of intergenerational support from children into Model 1 enhances the model's explanatory power, thereby suggesting the mediating role of intergenerational emotional and financial support between widowhood and the subjective well-being of older adults.

**Table 4** Regression results for the gender sample of quality of life scores of older adults

Variables	Male sample N= 2238		Female sample N= 2317	
	Model 1	Model 2	Model 1	Model 2
Widowhood (reference group: not widowhood)	-0.006***(0.012)	-0.006***(0.012)	-0.004***(0.010)	-0.005***(0.010)
Age	-0.001***(0.001)	-0.001***(0.001)	-0.004***(0.001)	-0.004***(0.001)
Education level (reference group: elementary school and below)	0.030***(0.007)	0.030***(0.007)	0.025***(0.007)	0.025***(0.007)
Place of residence (reference group: rural)	0.022***(0.010)	0.020***(0.010)	0.026***(0.011)	0.028***(0.011)
Self-rated health (reference group: unhealthy)	0.129***(0.006)	0.129***(0.006)	0.154***(0.006)	0.155***(0.006)
Whether suffering from chronic diseases (reference group: no)	-0.008(0.008)	-0.009(0.008)	-0.001(0.009)	-0.001(0.009)
Smoking (reference group: non-smoking)	0.002(0.008)	0.002(0.008)	-0.035***(0.018)	-0.033(0.018)
Alcohol consumption (reference group: no alcohol consumption)	0.030***(0.008)	0.030***(0.008)	0.017(0.013)	0.017(0.013)
Financial support (reference group: not given)		0.002*** (0.003)		0.002***(0.003)
Emotional support (reference group: did not meet)		0.005*** (0.004)		0.009***(0.004)
Cons	0.663(0.050)***	0.663(0.050)***	0.754***(0.050)	0.741***(0.050)
Adjusted R <sup>2</sup>	0.223	0.224	0.257	0.258

**Table 5** Regression results of quality of life of the elderly in urban and rural areas

Variables	Urban sample N= 1027		Rural sample N= 3528	
	Model 1	Model 2	Model 1	Model 2
Widowhood (reference group: not widowhood)	0.005(0.015)	0.006(0.015)	-0.012***(0.009)	-0.012***(0.009)
Age	-0.003***(0.001)	-0.003***(0.001)	-0.002***(0.001)	-0.003***(0.001)
Sex (reference group: female)	0.077***(0.015)	0.077***(0.016)	0.063***(0.009)	0.064***(0.009)
Educational level (reference group: elementary school and below)	0.014(0.009)	0.013(0.009)	0.032***(0.006)	0.031***(0.006)
Place of residence (reference group: rural)				
Self-rated health (reference group: unhealthy)	0.143***(0.009)	0.143***(0.009)	0.142***(0.005)	0.142***(0.005)
Whether suffering from chronic diseases (reference group: no)	0.005(0.012)	0.005(0.012)	-0.007(0.007)	-0.007(0.007)
Smoking (reference group: non-smoking)	-0.014(0.016)	-0.013(0.016)	-0.005(0.009)	-0.006(0.009)
Alcohol consumption (reference group: no alcohol consumption)	0.018(0.014)	0.018***(0.014)	0.025***(0.008)	0.026***(0.008)
Financial support (reference group: not given)		0.001***(0.004)		0.001***(0.002)
Emotional support (reference group: did not meet)		0.006***(0.005)		0.007***(0.003)
Cons	0.771(0.066)***	0.758(0.067)***	0.661***(0.040)	0.650***(0.041)
Adjusted R <sup>2</sup>	0.264	0.263	0.270	0.271

Table 4 presents the results of OLS regression analysis for the quality of life among elderly individuals, categorized by gender. Within the male sample, the findings of Model 1 indicate a significant negative relationship between widowhood and the quality of life experienced by older men. Specifically, the quality of life index for widowed older men is 0.006 higher when compared to their non-widowed counterparts. Model 2, which incorporates the child intergenerational support variable into Model 1, continues to demonstrate a significant negative association between widowhood and the quality of life of older men. Additionally, the variables of intergenerational financial support and intergenerational emotional support exhibit notable influences. For the female sample, the results of Model 1 reveal a significant negative correlation between widowhood and the quality of life perceived by older women. Notably, the introduction of the child intergenerational support variable diminishes the significance of the association between smoking and the quality of life for older women. However, both variables related to child intergenerational support demonstrate positive associations with the quality of life index.

Table 5 showcases the findings from the OLS regression analysis concerning the quality of life among older adults, stratified by urban and rural samples. Within the rural sample, Model 1 reveals a statistically significant association between widowhood and the quality of life experienced by rural older adults. Specifically, compared to their non-widowed urban counterparts, widowed urban older adults exhibit a 0.012 lower quality of life index. In Model 2, after introducing the variable of intergenerational support from children, both intergenerational financial support and intergenerational emotional support display positive correlations with the quality of life index. In the urban sample, Model 1 reveals no significant correlation between widowhood and the quality of life among urban older adults. With the addition of the variable of intergenerational support from children, the influence of widowhood on rural older adults remains non-significant. However, intergenerational economic support and intergenerational emotional support demonstrate a positive impact on the quality of life among rural older adults.

**Table 6** Results of mediating effects of intergenerational support for children

Effect	Coefficient	Se	LLCI	ULCI
Direct effect	-0.082	0.006	-0.094	-0.069
Indirect effects	-0.003	0.001	-0.004	-0.002
Intergenerational economy	-0.003	0.016	-0.004	-0.002
Intergenerational emotions	-0.0002	0.004	-0.0004	0.0001

**Mediating effects results**

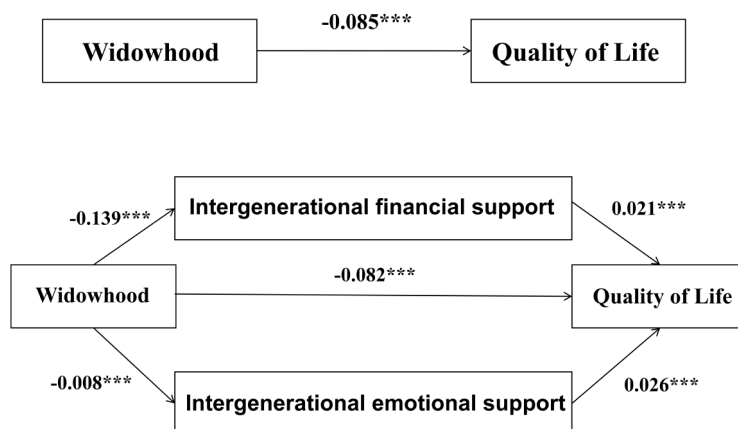
This study delves deeper into investigating the mediating effects of intergenerational support from children using the overall sample. The outcomes of the Bootstrap mediating effect test for the overall sample are displayed in Table 6. Analyzing the results in Table 6 reveals that even after incorporating the mediating variables associated with the two dimensions of intergenerational support from children, the direct effect of widowhood on the quality of life among older adults remains statistically significant (-0.094, -0.069). Additionally, the combined mediating effect of intergenerational emotional support and intergenerational economic support is found to be significant (-0.004, -0.002), with an effect size of -0.003. Within the two mediating paths, intergenerational economic support (-0.004, -0.002) plays a substantial and statistically significant mediating role with an effect size of -0.003, while the mediating role of intergenerational emotional support is deemed not statistically significant (-0.0004, 0.0001).

As depicted in Fig. 4, the impact of widowhood on the quality of life among older adults was found to be statistically significant at the  $P=0.01$  level ( $\beta = -0.085, P=0.01$ ), while controlling for other variables. Upon introducing the variable of child intergenerational support into the mediated effects model, the associations between widowhood-intergenerational economic support ( $\beta = -0.139, P=0.01$ ) and intergenerational economic support-quality of life ( $\beta=0.021, P=0.001$ ) remained significant at

the  $P=0.01$  level. Furthermore, the association between intergenerational emotional support and quality of life ( $\beta=0.026, P=0.05$ ) reached significance at the  $P=0.05$  level. The results from the mediation effect test indicate that intergenerational financial support from children partially mediates the relationship between widowhood and the quality of life among older adults. In other words, when older adults who are widowed receive greater intergenerational financial support from their children, their quality of life improves. However, the mediation effect of intergenerational emotional support was found to be non-significant.

**Research findings and discussion**

This paper analyzes the impact of widowhood experiences on the quality of life of elderly individuals against the backdrop of an aging society and employs the Bootstrap method to examine the mediating effect of intergenerational support. In the early stages, the analysis primarily focuses on the mediating effect of health literacy on health status [36]. The analysis of the mediating effect utilizes a practical mediation test program proposed by Baron and Kenny, Judd and Kenny, and the Sobel test, which involves sequential tests and the Sobel test [37]. To verify the prerequisites for the mediation test, Pearson correlation analysis is conducted among variables such as health status, health literacy, and self-rated health, confirming the mediating effect. In contrast, the Bootstrap method in mediating effect analysis offers advantages such as non-parametric nature, wide applicability, accurate confidence interval calculation, and robustness against interference. This study elaborates on the complex but commonly encountered mediating variables in research, thus opting for a more suitable analytical approach, the Bootstrap method, to analyze the mediating effect of intergenerational support. In the study, the main effect is whether the individual is



**Fig. 4** Roadmap of the mediating effects of widowhood and child intergenerational support on the quality-of-life relationship



widowed, and it was found that widowhood is negatively correlated with the quality of life of elderly individuals. Regardless of gender, widowhood reduces their quality of life index, and it is also negatively correlated with the quality of life of rural elderly individuals. The mediating effect is represented by intergenerational support variables, including intergenerational economic support and intergenerational emotional support. Intergenerational economic support partially mediates the relationship between widowhood and the quality of life of elderly individuals. The stress variable in the study pertains to lifestyle factors, including smoking and drinking habits. Regardless of whether smoking and drinking stem from lifestyle stress or personal circumstances, they may have positive or negative effects on the quality of life of elderly individuals. However, since these factors lack universality, they are not the focus of our study.

Widowhood significantly impacts the quality of life among older adults, as widowed individuals tend to experience a lower quality of life compared to those who are married. Marriage fosters a shared economy, allowing couples to divide the burdens and enjoy the benefits of life together [28]. However, the loss of a spouse diminishes an individual's resilience, resulting in an inevitable decline in the quality of life for the elderly. In later stages of life, spouses fulfill vital roles as caregivers and companions, relying on each other for support and fostering interdependence [38]. The absence of spousal support in later life leads to feelings of loneliness, ultimately diminishing the quality of life. Widowhood, being a stressful event, triggers physiological stress responses in the body [39], which contribute to health issues among older adults and impede their ability to adapt to later life. Consequently, this invariably leads to a decline in the quality of life among older adults.

There exist notable gender and rural-urban disparities in the impact of widowhood on the quality of life among older adults. The study findings reveal that the adverse effects of widowhood on quality of life are more pronounced among elderly men compared to elderly women. This discrepancy can be attributed to the traditional gender roles and division of labor prevailing in China, where men primarily shoulder the financial responsibilities of the household, while women often assume the caregiving duties of daily life [40]. The gender-based division of labor likely contributes to the differential impact of widowhood on the quality of life of older adults, as women tend to possess greater self-sufficiency in managing their well-being. Widowhood significantly diminishes the quality of life among rural older adults, whereas its effect on the quality of life of urban older adults appears to be statistically insignificant. The disparity in economic development between urban and rural areas in China has led to stark contrasts in living conditions. Rural areas, in

particular, face distinct challenges in terms of economic status, healthcare accessibility, and social support. The economic backwardness prevalent in rural regions exacerbates the hardships faced by older adults, profoundly influencing their quality of life. For widowed older adults residing in rural areas, the loss of a male spouse often entails a substantial reduction, or even complete cessation, of economic resources. Conversely, the loss of a female spouse translates to depletion of caregiving resources and emotional support, further compromising the quality of life for rural widowed older adults.

Policy preferences in specific regions can significantly impact widowed elderly individuals. Since the introduction of the "Healthy China" strategy, China has been dedicated to promoting equitable public health services, reducing regional and demographic health disparities, fostering social equity, and achieving comprehensive, high-level health security [41]. Research indicates that social participation can improve the physical and psychological health of widowed elderly individuals, enhancing their quality of life [42]. Thus, more comprehensive policies should be developed to encourage social participation among widowed elderly individuals, providing tailored support based on their specific needs to ensure their health rights and leverage the benefits of social engagement. This approach helps build a fair and inclusive health security system, enabling all elderly individuals to enjoy a healthy, engaged, and secure old age, thus achieving the goal of healthy aging. We believe the focus should first be on the health security of widowed elderly individuals, ensuring the effective provision of their health needs [43]. Medical institutions should offer diversified and specialized health services. Additionally, establishing a community-based health security service system for the elderly is fundamental to building a new health security framework [44, 45]. A community-based approach that integrates medical care, health services, health insurance, and medical assistance is crucial for ensuring the accessibility and rational allocation of health resources for the elderly. Health security services should also be tailored to the income levels of the elderly, providing necessary support to meet the diverse health security needs of different segments of the elderly population. Therefore, reforming the health security system must be integrated with current administrative policies to effectively improve the quality of life for widowed elderly individuals.

This study reveals that intergenerational financial support plays a partially mediating role in the association between widowhood and quality of life among older adults. It is observed that higher levels of financial support from children correspond to a higher quality of life index for widowed older adults. This finding holds particular significance in the context of China, where older

adults predominantly rely on support from their children as the primary source of financial assistance [46]. Consequently, when widowed older adults lose not only their spouses but also a substantial portion of their family and social support networks, financial support from their children becomes crucial. Such support ensures and strengthens the financial capacity of widowed individuals, mitigating concerns regarding financial stress, illness, and other risks. This, in turn, directly or indirectly contributes to the positive psychological well-being of older adults. The dual impact of widowhood on the mental and physical well-being of older adults profoundly affects their overall quality of life, aligning with previous research findings. The “main effect model” proposes that well-established social support promotes health, irrespective of the individual’s stress levels. In cases where older adults lack sufficient security in later life, the financial support provided by their children can compensate for such deficiencies. This not only enhances their standard of living and physical functioning but also fosters a sense of happiness, thereby elevating their overall quality of life.

Some limitations in this paper should be acknowledged. Firstly, the intergenerational support indicators for children included in this study encompass intergenerational emotional support and intergenerational financial support. However, due to data limitations, important dimensions of social support such as caregiving support and other instrumental support were not incorporated into the model, which could potentially fully inform policy development. Additionally, our analysis of caregiving support from children could be further extended by examining their involvement in parents’ daily activities, as well as care provided during special circumstances such as hospital stays or vacation periods. This broader approach would provide a more comprehensive understanding of the support dynamics and inform more effective policy development. Secondly, due to data limitations, we lack information on the impact of the duration of widowhood on the quality of life of the elderly. A study published in the journal *Epidemiology* indicates that 40% of women and 26% of men die within three years of their partner’s death, a phenomenon known as the “widowhood effect [47].” The shortest durations observed are on the same day, one month, six months, and one year, with the longest being 10 years or more. This indirectly demonstrates that elderly individuals experience psychological or physiological effects over time following their spouse’s death, which can subsequently impact their own lifespan. Future research could address this limitation by examining the effects of varying periods of widowhood on the quality of life of older adults through longitudinal data analysis.

Future research will initially focus on studying the impact of different widowhood periods on the quality of life of elderly individuals through long-term tracking data. Additionally, the research will explore the relationship between social participation levels and life satisfaction among widowed elderly individuals. This includes investigating the effects of social activities, such as social gatherings and participation in group organizational activities, on the quality of life of widowed elderly individuals, as well as the impact of factors such as social exclusion and feelings of loneliness on their quality of life. Due to current limitations in data acquisition channels, time span, factors influencing data, and limited samples of elderly individuals, it is essential to consider researching other factors such as social security.

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#### Author contributions

All authors contributed to the study conception and design. Writing - original draft preparation: Xiaoting Zhu; Writing - review and editing: Xiaoting Zhu; Conceptualization: Xiaoting Zhu, Baicheng Ning; Methodology: Xiaoting Zhu, Fang Xia, Bingmei Wang; Formal analysis and investigation: Xiaoting Zhu, Baicheng Ning, Yunqiang Li, Pengqi Zhang, Xinyue Zhang; Resources: Guangcheng Ji; Supervision: Mingquan Li, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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#### Data availability

All data generated or analyzed during this study are included in this published article.

#### Declarations

##### Ethics approval and consent to participate

Not applicable.

##### Consent for publication

Not applicable.

##### Competing interests

The authors declare no competing interests.

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