

BMJ Open Utilisation willingness for institutional care by the disabled elderly and its influencing factors based on Andersen's model: a cross-sectional survey of Henan, China

Guangmei Yang, Leping Wan, Haiying Dong, Xiaoxiao Liang, Yan He 

To cite: Yang G, Wan L, Dong H, *et al*. Utilisation willingness for institutional care by the disabled elderly and its influencing factors based on Andersen's model: a cross-sectional survey of Henan, China. *BMJ Open* 2022;**12**:e064949. doi:10.1136/bmjopen-2022-064949

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2022-064949>).

Received 19 May 2022

Accepted 26 October 2022



© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

Department of Social Medicine and Health Care Management, School of Public Health, Zhengzhou University, Zhengzhou, China

Correspondence to

Dr Yan He;
h18638787397@163.com

ABSTRACT

Objective To explore the factors that influence institutional care for the disabled elderly in China and the key factors that influence individuals based on the Andersen model.

Design Cross-sectional survey.

Setting The research was conducted in 18 cities in Henan Province, China.

Main outcome measures A multistage, stratified sampling design was employed. The χ^2 test was used to compare the differences in basic information of the disabled elderly. A binary Logit model was used to examine the factors influencing the willingness to institutionalise elderly people with disabilities. The determinants of willingness to care in an institution were also explored in a stratified study by gender, age and region to identify the key differences affecting institutionalisation. The Andersen model was used as the theoretical framework to infer the impact strength of each model.

Results Of the 2810 disabled elderly people in Henan, China, 7.4% of the elderly had a willingness for institutional care. In the binary logistic regression analysis, whether living alone (OR (95% CI)=0.596 (0.388 to 0.916)), medical payment method (basic medical insurance for urban employees: OR (95% CI)=2.185 (1.091 to 4.377)), having mental illness (OR (95% CI)=2.078 (1.044 to 4.137)) had a statistically significant difference ($p<0.05$) on the impact on the willingness of the disabled elderly to receive institutional care. Validation of the fitted coefficients of the model revealed that the needs factor had the most significant effect on the enabling variable, while the predisposing factor had more minerally effect.

Conclusions Several factors influence the willingness of the disabled elderly to institutionalise. Therefore, it is recommended that relevant authorities take targeted measures to focus on the disabled elderly to identify more precise elderly care services to deal with the ageing crisis.

INTRODUCTION

Population ageing has become a global problem, and in China, as the population ageing continues to deepen, the number of disabled elderlies continues to increase. The dependency ratio of China's elderly

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The Andersen model was used to classify the influencing factors and was able to find the key factors as a whole.
- ⇒ The sample was sampled using a multistage sampling method, and the study results have a certain degree of reliability.
- ⇒ This study mainly focuses on the disabled elderly in Henan Province, with some geographical limitations.
- ⇒ This study primarily focuses on the cross-sectional study of the disabled elderly, and further research on the development of their variability is still needed with more data.

population continues to rise. As of 2020, China has more than 42 million disabled people over 60 years old, accounting for about 16.6% of the elderly people in that age group.^{1,2} Disability mainly refers to the partial or complete loss of the ability to care for oneself due to age, disease and other reasons hindering ability and restricting mobility.³ Research findings show that elderly with disabilities are at increased risk for psychological problems and death.⁴⁻⁷ These risks can exacerbate the problem of ageing in place for the disabled elderly and pose significant challenges to the state and society.

Due to the influence of traditional Confucianism, Chinese elderly people generally choose to care for their families.⁸ Still, with urbanization and out-migration, the role of family-centred care is shrinking, the importance of institutional care is becoming more prominent. The Chinese government has issued documents to support the development of nursing homes, and some scholars have conducted relevant studies on institutionalised care.⁹ Institutional care can provide comprehensive services such as food, living and care for the elderly, and the

purpose of their services is to arrange, take care of the elderly.^{10 11} In China, there has been a lot of research on elderly care.^{8 12 13} Other countries had also been conducted on the care of the elderly.^{14 15} These studies show that rural people, people with mental illness and income issues are all important factors influencing people's choice of care. Research has also shown that elderly people's willingness to choose institutional care is associated with marital status,¹⁶ disability¹⁷ and psychological stress.¹⁸ While analysing the willingness of the elderly to institutionalise, one study considers economic issues and compare rural and urban areas.¹²

Henan Province, the most populous province in central China, has relatively less developed economic and is still in the exploratory stage of an elderly care system for the disabled elderly. The Andersen model was developed by Andersen *et al*,¹⁹ applied to health service utilisation and integrated with the maintenance and improvement of vital health.²⁰ The Andersen model is now flexibly used in various studies,^{21–25} and research on the use of services by the elderly is more mature.^{26 27} In recent years, Andersen's model has been applied more to the factors influencing the way elderly people combine healthcare or their willingness to age. Specific studies have been conducted on the service utilisation of elderly people at home and abroad.^{28–30} The modelling approach categorises the influencing factors into predisposing factors, enabling variables and needs factors, thus classifying the influencing factors and making the research results more holistic and easier to compare the influence of each category. Therefore, this study explores the factors influencing institutional care for the disabled elderly on the basis of the Andersen model, using Henan Province, China, as an example. This can identify key influencing factors as a whole and provide targeted suggestions for establishing a comprehensive elderly care service for the disabled elderly in China to meet the needs of the disabled elderly better.

METHODS

Data and sample

A cross-sectional survey of the elderly was conducted in Henan Province, China, from January to September 2019. First, those 60 years and older who were able and willing to answer the questions were included in our sample. Second, in order to make our samples as representative as possible, we used a multistage stratified sampling design. The 18 cities in Henan Province were used as primary sampling units, and each city drew its urban and rural elderly population according to the ratio of urban:rural as 4:6, respectively. The sampled population was then divided into two strata for random sampling according to the proportion of two age groups, 60–69 and >70 years old. In addition, a face-to-face interview format was used during the survey to ensure that the elderly understood the questionnaire correctly. A total of 6094 questionnaires were finally distributed.

Assessment tools

The study's instrument was a self-administered questionnaire composed of three sections. The first section was the demographic characteristics of the participants, including age, gender, occupation, education, marital status, region, monthly income status, living alone or not (yes, no), medical payment methods, dementia, number of chronic diseases and mental illness (yes, no).

The second section assessed the ability status of the interviewees. The Elderly Ability Assessment (MZ/7039-2013)³¹ questionnaire developed by the Chinese civil affairs industry was used to assess the abilities of the elderly. There are four main one-level indicators: activity of daily living, mental status, sensory and communication, social involvement. Twenty-two two-level indicators: activity of daily living (eating, bathing, grooming, dressing, bowel control, urine control, toileting, bed and chair transfer, walking on level ground, walking up and down stairs), mental status (cognitive functioning, aggressive behaviour, depressive symptoms), sensory and communication (level of awareness, vision, hearing, communication), social involvement (life skills, work skills, time/space orientation, person orientation, social interaction skills). The questionnaire allows you to score each indicator on a total scale of 0–100. A score of 100 is intact, 65–95 is mildly impaired, 45–60 is moderately impaired and ≤ 40 is severely impaired. Elderly people with mild, moderate and severe impairment is defined as disabled.

The third section assessed the elderly's willingness to age. Namely, which way would you prefer to care? The answer options are as follows.

1. Care by children (relatives).
2. At home, with doctors, nurses, caregivers and so on.
3. Staying in the community/health centres with elderly care services.
4. Staying in nursing homes with doctors and nurses.
5. Staying in a hospital with nursing care functions.
6. Staying in a nursing home when not sick, going to the hospital when sick.
7. Others.

The exact reason for (7) can be classified as 'family care', so (1) and (7) are 'family care'. (2) and (3) are combined with 'community care'. (4), (5) and (6) are combined with 'institutional care'. Therefore, (4), (5) and (6) are 'institutional care' and (1), (2), (3) and (7) are 'non-institutional care'.

Andersen model

The Andersen model, which is widely used in health service research and health-related influence factor analysis, is the mainstream model for research and analysis of health service utilisation.¹⁹ Some studies have applied the model to the study of elderly care needs and elderly services, with positive results.^{27 28}

The effects of predisposing factors (eg, age, gender, occupation, education, marital status), enabling variables (eg, region, monthly income status, living alone or not, medical payment method) and needs factors (eg,

dementia, number of chronic diseases, mental illness) on the behaviour of different ageing options for the disabled elderly in Henan are investigated in this paper using Andersen's model as a framework.

Analytical methods

Statistical analyses were performed using SPSS V.21.0. For categorical variables, p value was calculated using χ^2 test. Binary logistic regression with an enter method was used to assess the influences on willingness to accept institutional care. A stratified model with separate logistic regressions stratified by age, gender and region was used to further investigate the differences in campaign factors between groups. All reported CIs were calculated at the 95% level. Statistical significance was set at the 5% level.

Patient and public involvement

This study did not involve patients and the public in the design or planning of the study.

RESULTS

Sociodemographic characteristics

A total of 6094 questionnaires were distributed in this study, and excluding the missing data (participants who did not take the complete survey or did not answer the question about willingness to receive eldercare), 5570 valid questionnaires were returned, with a response rate of 91.40% and then 2810 elderly with disabilities were screened as the subjects of this study. Of the 2810 disabled elderly, 207 (7.4%) opted for institutional care. Generally, the majority of the elderly were women (53.2%), age over 70 years (61.5%), with occupation (73.2%), primary (34.4%), married (71.6%), rural (73.3%), not living alone (93.3%), new rural cooperative medical insurance (67.0%), have a chronic disease (48.7%). The χ^2 tests, showed that the differences were statistically significant ($p < 0.05$) when comparing marital status, living alone or not, medical payment method, dementia and mental illness. See [table 1](#).

A multifactorial analysis of factors affecting the institutionalisation of the disabled elderly

Whether the elderly chose institutional care as the dependent variable, and factors with $p < 0.05$ in the χ^2 tests were included in the independent variables. A statistical analysis of the five variables that may affect the institutional care of the elderly was conducted using the dichotomous logistic regression analysis method, and a logistic regression model was obtained using the step-in method, according to the criteria of $\alpha_{in} = 0.05$ and $\alpha_{out} = 0.10$. Whether living alone (OR (95% CI)=0.596 (0.388 to 0.916)), medical payment method (basic medical insurance for urban employees: OR (95% CI)=2.185 (1.091 to 4.377)), having mental illness (OR (95% CI)=2.078 (1.044 to 4.137)) had a statistically significant difference ($p < 0.05$) on the impact on the willingness of the disabled elderly to receive institutional care, see [table 2](#).

Validation of the fitted coefficients of the model

Model IV is used as a standard to compare the effect size of other models. The study results show that the $-2LL$, Cox & Snell R^2 and Nagelkerke R^2 of the model I have the most significant change in value. The slightest change in the value of each change in model III indicates that the needs factors have the most significant impact, followed by enabling variables. The predisposing factors have the most negligible impact. See [table 3](#).

Analysis of gender, age and regional differences in factors influencing the institutional care for the disabled elderly

To determine the differences in the willingness of institutional care, a stratified study of age, gender and region was conducted. The results of the study show that there are some differences in the independent variables between the genders. Of these, living alone or not was an important factor influencing the choice of institutional care for male elderly people with disabilities. Mental illness was an important factor influencing the choice of institutional care for female disabled elderly people.

In a comparison of elderly people aged 60–69 (younger group) and >70 (older group), the medical payment method was an important factor influencing the choice of institutional care for the disabled elderly in the younger group. Whether or not lived alone, and mental illness were important factors influencing the choice of institutional care for the older group of disabled elderly.

In a comparison of elderly people in different regions, medical payment method was an important factor influencing the choice of institutional care for urban disabled elderly people. Whether or not live alone was an important factor influencing the choice of institutional care for the disabled elderly in rural areas. See [table 4](#).

DISCUSSION

Using Andersen's model, this study explores the willingness and factors influencing the institutional care of disabled elderly people in China. This study revealed that 7.4% of the disabled elderly chose institutional care, This result is lower than in Jiangsu Province (14.2%),¹⁷ Shandong Province (8.5%)¹¹ and Taiwan Province (16.7%).³² This may be partly due to the level of local economic development, and partly due to the fact that this study focused more on the community setting. The population of this study is the elderly living in the community or at home, which is a good way to highlight the factors that influence the institutionalisation of the disabled elderly, although there will be some bias in the sample for studying the choice of institutional care for the disabled elderly. However, consistent with all of these results, the majority of people preferred home or community-based care.^{33 34} It may be deduced from this that most disabled elderly people are still impacted by conventional thinking, and family care is still the most common method of ageing.³⁵ When the findings are compared with those of previous research, it is clear that the proportion of elderly who

Table 1 Sociodemographic characteristics of the disabled elderly

Variables	Participants (n=2810)	Institutional care (n=207) N (%)	Non-Institutional care (n=2603) N (%)	χ^2	P value
<i>Predisposing factors</i>					
Age (years)				2.075	0.150
60–69	1082 (38.5)	70 (33.8)	1012 (38.9)		
>70	1728 (61.5)	137 (66.2)	1591 (61.1)		
Gender				1.774	0.193
Male	1314 (46.8)	106 (51.2)	1208 (46.4)		
Female	1496 (53.2)	101 (48.8)	1395 (53.6)		
Occupation				1.515	0.254
With occupation	2056 (73.2)	159 (76.8)	1897 (72.9)		
Without occupation	754 (26.8)	48 (23.2)	706 (27.1)		
Education				3.563	0.468
Illiterate	950 (33.8)	74 (35.7)	876 (33.7)		
Primary	966 (34.4)	72 (34.8)	894 (34.3)		
Junior high school	513 (18.3)	33 (15.9)	480 (18.4)		
High school	257 (9.1)	15 (7.3)	242 (9.3)		
University college or above	124 (4.4)	13 (6.3)	111 (4.3)		
Marital status				18.517	<0.001
Unmarried	69 (2.5)	13 (6.3)	56 (2.2)		
Married	2011 (71.6)	129 (62.3)	1882 (72.3)		
Widowed	695 (24.7)	62 (30.0)	633 (24.3)		
Divorced	35 (1.2)	3 (1.4)	32 (1.2)		
<i>Enabling variables</i>					
Region				0.047	0.829
Urban	751 (26.7)	54 (26.1)	697 (26.8)		
Rural	2059 (73.3)	153 (73.9)	1906 (73.2)		
Monthly income status				0.155	0.925
<¥2000	2280 (81.1)	167 (80.7)	2113 (81.2)		
¥2001–4000	460 (16.4)	34 (16.4)	426 (16.4)		
>¥4001	70 (2.5)	6 (2.9)	64 (2.4)		
Living alone or not				13.355	0.001
Yes	272 (16.9)	35 (16.9)	237 (9.1)		
No	2538 (83.1)	172 (83.1)	2366 (90.9)		
Medical payment method				12.179	0.016
Basic medical insurance for urban employees	379 (13.5)	22 (10.6)	357 (13.7)		
Basic medical insurance for urban residents	421 (15.0)	26 (12.6)	395 (15.2)		
New rural cooperative medical insurance	1882 (67.0)	141 (68.1)	1741 (66.9)		
Commercial medical insurance	8 (0.3)	2 (1.0)	6 (0.2)		
Non	120 (4.2)	16 (7.7)	104 (4.0)		
<i>Needs factors</i>					
Dementia				5.246	0.022
No	2587 (92.1)	182 (87.9)	2405 (92.4)		

Continued

Table 1 Continued

Variables	Participants (n=2810)	Institutional care (n=207) N (%)	Non-Institutional care (n=2603) N (%)	χ^2	P value
Yes	223 (7.9)	25 (12.1)	198 (7.6)		
Number of chronic diseases				0.342	0.952
0	683 (24.3)	47 (22.7)	636 (24.4)		
1	1369 (48.7)	104 (50.2)	1265 (48.6)		
2	514 (18.3)	38 (18.4)	476 (18.3)		
≥3	244 (8.7)	18 (8.7)	226 (8.7)		
Mental illness				13.166	< 0.001
Yes	78 (2.8)	14 (6.8)	64 (2.5)		
No	2732 (97.2)	193 (93.2)	2539 (97.5)		

choose institutional care has risen significantly. Using the 2011 China Health and Retirement Longitudinal Study (CHARLS) data, Xie *et al*³⁶ investigated the problem of institutionalised ageing, finding that 3.34% of the urban elderly chose institutional care. The explanation for this gap analysis could be due to the varied topics of the study. While Xie focused on the urban elderly, this study focuses not only on the urban elderly, but also on the rural elderly. Another reason may be that this study was conducted on disabled elderly people, who generally cannot live independently and would prefer professional care. As result, the government must create better policies to optimise institutionalised care, improve service quality, increase the trust of the elderly in institutionalised care and

provide a more comprehensive aged care service system for more disabled elderly.

This study found that among the factors affecting the institutionalisation of the disabled elderly, enabling variables (living alone or not, medical payment method) and needs factors (mental illness) had a greater impact on the disabled elderly. Among them, this study found that the disabled elderly living alone were more inclined to institutional care, which is similar to the findings of past studies.^{10 37} This may be due to the fact that elderly people who live alone often lack the companionship and psychological care of their family members and thus escape their loneliness through institutional care, hence the higher willingness to institutionalise. In the stratified study, it was

Table 2 Logistic regression analysis of factors affecting the institutionalisation of the disabled elderly.

Independent variable	Comparison group	Reference group	β	SE	Wald χ^2	P value	OR (95% CI)
Marital status	Unmarried	Divorced	-0.722	0.694	1.083	0.298	0.486 (0.125 to 1.893)
	Married		0.239	0.622	0.148	0.701	1.270 (0.375 to 4.302)
	Widowed		0.071	0.632	0.013	0.910	1.074 (0.311 to 3.705)
Living alone or not	Yes	No	-0.517	0.219	5.569	0.018	0.596 (0.388 to 0.916)
Medical payment method	Basic medical insurance for urban employees	Non	0.782	0.354	4.867	0.027	2.185 (1.091 to 4.377)
	Basic medical insurance for urban residents		0.652	0.343	3.613	0.057	1.920 (0.980 to 3.763)
	New rural cooperative medical insurance		0.457	0.290	2.482	0.115	1.579 (0.894 to 2.786)
	Commercial medical insurance		-0.747	0.880	0.721	0.396	0.474 (0.084 to 2.657)
Dementia	Yes	No	0.187	0.260	0.515	0.474	1.205 (0.724 to 2.006)
Mental illness	Yes	No	0.732	0.351	4.338	0.037	2.078 (1.044 to 4.137)
Constants			0.282	0.744	2118	0.146	-

Table 3 Prediction probability and goodness-of-fit of each model

	-2LL	-2LL change value*	Ccx & Snell R ²	Ccx & Snell R ² change value*	Nagelkerke R ²	Nagelkerke R ² change value*
Model IV	1419.864	–	0.021	–	0.051	–
Model I	1442.788	22.924	0.013	–0.008	0.031	–0.02
Model II	1429.395	9.531	0.017	–0.004	0.042	–0.009
Model III	1428.136	8.272	0.018	–0.003	0.043	–0.008

Note: * indicates that the change value is an increase or decrease compared with model IV.

Model I: Logit(Yi)=predisposing factors+enabling variables.

Model II: Logit(Yi)=predisposing factors+needs factors.

Model III: Logit(Yi)=enabling variables+needs factors.

Model IV: Logit(Yi)=predisposing factors+enabling variables+needs factors.

found that older and rural elderly people who live alone have a greater preference for institutional care. This may be because as one's age, one's health tends to deteriorate and one's ability to care for oneself gradually declines.³⁸ It is also difficult to meet the care needs of elderly people with disabilities due to a lack of resources in rural areas, which in turn can influence the choice of care options for the elderly with disabilities.³⁹

In terms of medical payment methods, elderly people with basic medical insurance for urban employees tend to be more inclined to institutionalised care than those who do not have medical insurance. This may be because the medical insurance is the most basic medical coverage, which can ease the pressure of medical expenses. Furthermore, people who are willing to pay for medical insurance tend to place a higher value on their lives and have a certain income and are therefore more willing to accept institutional care. This is in contrast to the findings of Zhao *et al.*⁴⁰ The difference may be due to the difference in the population studied. Zhao *et al* focused on the general elderly population, while the present study focused on the disabled elderly. In the stratified study, paying for medical insurance had a greater impact on the choice of institutional care for the disabled elderly in urban areas, but not for those in rural areas. This may be due to geographical differences in the social security and service delivery systems, with urban elderly having better access to social security and benefits than their rural counterparts, and therefore being more likely to choose institutional care.⁴¹ In terms of needs factors, elderly people with mental illnesses are more inclined to choose institutional care, which may be related in part to the health status of the elderly. Some studies have shown that the elderly in poorer health prefer institutional care.^{40 42} On the other hand, it may be that institutions can provide more professional care for this type of the elderly and at the same time reduce the burden of their children.^{11 43} In the stratified study, women and older age group with mental illnesses were more likely to choose institutional care. This is similar to the findings of past studies where elderly females were more likely to enter institutional care than elderly males.⁴⁴ It has also been shown that

gender is not only a determinant of poorer physical health-related quality of life among the elderly, but also a determinant of poorer mental health-related quality of life.^{45 46}

Past research has focused mostly on studies of the general elderly population's willingness to care for the elderly, with less attention paid to disabled elderly people. Applying findings from studies of the general elderly to the disabled elderly can limit the explanatory power of factors affecting the willingness of the disabled elderly to age. This is an obstacle for policy-makers and health service planners to take targeted measures. However, this study focuses on the disabled elderly, while this study explores the basis of Andersen's model, in order to compare the goodness of fit of each model to more easily determine the factors that have the greatest impact on institutional care, and its results are more convincing in tackling the elderly disabled problem. Therefore, this study on the willingness of the disabled elderly to age will help to provide a more rational theoretical basis for health professionals to help the disabled elderly to live a better life in their later years. However, there are some limitations in our study that need to be discussed. First, this study used a cross-sectional study, which prevents causal inferences from being drawn from the findings. Second, only the elderly in Henan Province were recruited for this study, making the sample less generalisable. Finally, as the responses were self-reported, there would be some subjective bias.

CONCLUSIONS

In the study based on Andersen's model, needs factors were found to have the greatest impact on the disabled elderly, suggesting that the subjective and objective needs of individuals for health services are the main factors influencing the choice of institutional care for the disabled elderly. Based on this study, in developing institutional elderly care services, it is essential to focus on the disabled elderly as the service target, diversify service contents and forms, and provide long-term care for the disabled elderly with professional medical

Table 4 Analysis of differences stratified by gender, age and region

Independent variable	Comparison group	Reference group	Male		Female		60–69		>70		Urban		Rural	
			P value	OR	P value	OR	P value	OR	P value	OR	P value	OR	P value	OR
Marital status	Unmarried	Divorced	0.505	0.558	0.707	0.618	0.152	0.246	0.635	0.581	0.635	2.139	0.314	0.438
	Married		0.522	1.679	0.862	0.839	0.556	1.665	0.790	0.835	0.835	0.795	0.493	1.681
	Widowed		0.857	1.161	0.775	0.741	0.681	1.456	0.706	0.675	0.636	0.588	0.583	1.525
Living alone or not	Yes	No	0.046	0.536	0.237	0.689	0.307	0.612	0.023	0.569	0.368	0.671	0.011	0.522
Medical payment method	Basic medical insurance for urban employees	Non	0.162	1.964	0.115	2.323	0.084	3.128	0.138	1.882	0.004	4.608	0.919	0.946
			0.177	2.024	0.151	1.954	0.014	5.601	0.452	1.353	0.014	3.464	0.376	1.581
			0.754	1.137	0.062	2.157	0.108	2.406	0.432	1.314	0.078	2.601	0.732	1.137
Dementia	Yes	No	0.506	0.425	0.654	0.574	0.176	0.203	0.646	0.542	0.608	0.586	0.175	0.176
			0.270	1.464	0.845	0.924	0.969	0.976	0.391	1.277	0.231	1.731	0.779	1.092
Mental illness	Yes	No	0.296	1.702	0.042	2.270	0.662	1.395	0.037	2.317	0.128	2.796	0.054	2.237

staff institution. Government policy support and quality monitoring are also needed to comprehensively improve the quality of services for the disabled elderly, increase the willingness of the elderly to be socialised and promote the sustainable development of the elderly care industry to identify more accurate elderly care services and address the growing ageing crisis.

Acknowledgements The authors thank all participants in this study for helping them complete this study.

Contributors YH received the grant. GY and YH designed the study. GY wrote the main manuscript text. LW, HD and XL collected the data. GY analysed the data. YH participated in the interpretation of the results and critical revision of important intellectual content of the manuscript, and approved the final version of the manuscript. All authors reviewed the manuscript. YH is responsible for the overall content as a guarantor.

Funding This research was funded by Henan Province key research and development and promotion of special projects (scientific and technological research), grant number 212102310814. National Key R&D Program for Active Health and Aging Science and Technology Response Key Special Project, grant number 2020YFC2006100. Annual Project of Henan Provincial Philosophy and Social Science Planning, grant number 2020BSH017. Henan Province Federation of Social Science Research Project, grant number SKL-2021-406.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not applicable.

Ethics approval This study involves human participants and was approved by Zhengzhou University (No. ZZUIRB2020-51). Participants gave informed consent to participate in the study before taking part.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplementary information.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iD

Yan He <http://orcid.org/0000-0001-8636-1947>

REFERENCES

- Wang P, Li MH, Liu GG, *et al*. Do Chinese have similar health-state preferences? A comparison of mainland Chinese and Singaporean Chinese. *Eur J Health Econ* 2015;16:857–63.
- Bai L, Gu S, Gu H, *et al*. The impact of disability on intergenerational care needs of the elderly in China. *Inquiry* 2021;58:469580211018283.
- Shaar K, McCarthy M. Definitions and determinants of handicap in people with disabilities. *Epidemiol Rev* 1994;16:228–42.
- Wei L, Yi H, Hai-Lu Z. Elderly people with disabilities in China. *J Am Geriatr Soc* 2019;67:858–9.
- Zamudio-Rodríguez A, Letenneur L, Féart C, *et al*. The disability process: is there a place for frailty? *Age Ageing* 2020;49:764–70.
- Harkin T, Buckingham-Schutt L. Thirty years after passage of the Americans with disabilities act: has the medical community done enough? *Ann Intern Med* 2020;173:756–7.
- Chen S, Zheng J, Chen C, *et al*. Unmet needs of activities of daily living among a community-based sample of disabled elderly people in eastern China: a cross-sectional study. *BMC Geriatr* 2018;18:160.
- Xia Y, Xu L, Sun L, *et al*. Rural-Urban differences in home-based care willingness among older adults: a cross-sectional study in Shandong, China. *Int J Qual Health Care* 2020;32:126–34.
- Dong X, Wong BO, Yang C, *et al*. Factors associated with willingness to enter care homes for the elderly and pre-elderly in West of China. *Medicine* 2020;99:e23140.
- Wang Z, Xing Y, Yan W, *et al*. Effects of individual, family and community factors on the willingness of institutional elder care: a cross-sectional survey of the elderly in China. *BMJ Open* 2020;10:e032478.
- Qian Y, Qin W, Zhou C, *et al*. Utilisation willingness for institutional care by the elderly: a comparative study of empty nesters and non-empty nesters in Shandong, China. *BMJ Open* 2018;8:e022324.
- Dong X, Wong BO, Yang C, *et al*. Factors associated with willingness to enter care homes for the elderly and pre-elderly in West of China. *Medicine* 2020;99:e23140.
- Zeng L, Xu X, Zhang C, *et al*. Factors influencing long-term care service needs among the elderly based on the latest anderson model: a case study from the middle and upper reaches of the Yangtze River. *Healthcare* 2019;7. doi:10.3390/healthcare7040157. [Epub ahead of print: 03 12 2019].
- Amare AT, Caughey GE, Whitehead C, *et al*. The prevalence, trends and determinants of mental health disorders in older Australians living in permanent residential aged care: implications for policy and quality of aged care services. *Aust N Z J Psychiatry* 2020;54:1200–11.
- Beck RA, Arizmendi A, Purnell C, *et al*. House calls for seniors: building and sustaining a model of care for homebound seniors. *J Am Geriatr Soc* 2009;57:1103–9.
- Grundy E, Jitlal M. Socio-Demographic variations in moves to institutional care 1991–2001: a record linkage study from England and Wales. *Age Ageing* 2007;36:424–30.
- Chen N, Li X, Yuan N, *et al*. Utilization willingness of institutional care between disabled and non-disabled seniors: evidence from Jiangsu, China. *BMC Health Serv Res* 2019;19:410.
- Branch LG, Jette AM. A prospective study of long-term care institutionalization among the aged. *Am J Public Health* 1982;72:1373–9.
- Andersen RM. National health surveys and the behavioral model of health services use. *Med Care* 2008;46:647–53.
- Gelberg L, Andersen RM, Leake BD. The behavioral model for vulnerable populations: application to medical care use and outcomes for homeless people. *Health Serv Res* 2000;34:1273–302.
- Johri S, Bhatt RN. Singular behavior of eigenstates in anderson's model of localization. *Phys Rev Lett* 2012;109:076402.
- Fortin M, Bamvita J-M, Fleury M-J. Patient satisfaction with mental health services based on Andersen's Behavioral Model. *Can J Psychiatry* 2018;63:103–14.
- Hajek A, Kretzler B, König H-H. Determinants of dental service use based on the Andersen model: a study protocol for a systematic review. *Healthcare* 2020;8. doi:10.3390/healthcare8030333. [Epub ahead of print: 10 09 2020].
- Herkraht FJ, Vettore MV, Werneck GL. Utilisation of dental services by Brazilian adults in rural and urban areas: a multi-group structural equation analysis using the Andersen behavioural model. *BMC Public Health* 2020;20:953.
- Yang H, Hagedorn A, Zhu H, *et al*. Mental health and well-being in older women in China: implications from the Andersen model. *BMC Geriatr* 2020;20:254.
- de Klerk MM, Huijsman R, McDonnell J. The use of technical AIDS by elderly persons in the Netherlands: an application of the Andersen and Newman model. *Gerontologist* 1997;37:365–73.
- Kempen GI, Suurmeijer TP. Professional home care for the elderly: an application of the Andersen-Newman model in the Netherlands. *Soc Sci Med* 1991;33:1081–9.
- Wei Y, Zhang L. Analysis of the influencing factors on the preferences of the elderly for the combination of medical care and pension in long-term care facilities based on the Andersen model. *Int J Environ Res Public Health* 2020;17. doi:10.3390/ijerph17155436. [Epub ahead of print: 28 07 2020].
- Fu YY, Guo Y, Bai X, *et al*. Factors associated with older people's long-term care needs: a case study adopting the expanded version of the anderson model in China. *BMC Geriatr* 2017;17:38.
- Travers JL, Hirschman KB, Naylor MD. Adapting Andersen's expanded behavioral model of health services use to include older adults receiving long-term services and supports. *BMC Geriatr* 2020;20:58.
- Ministry of Civil Affairs P. *Competence assessment for the elderly MZ/T039-2013 [S]*. Beijing: China Standard Publishing House. In., 2014.
- Chung M-H, Hsu N, Wang Y-C, *et al*. Factors affecting the long-term care preferences of the elderly in Taiwan. *Geriatr Nurs* 2008;29:293–301.
- Huang Z, Liu Q, Meng H, *et al*. Factors associated with willingness to enter long-term care facilities among older adults in Chengdu, China. *PLoS One* 2018;13:e0202225.

- 34 Gu T, Yuan J, Li L, *et al.* Demand for community-based care services and its influencing factors among the elderly in affordable housing communities: a case study in Nanjing City. *BMC Health Serv Res* 2020;20:241.
- 35 Zhang L, Zeng Y, Wang L, *et al.* Urban-Rural differences in long-term care service status and needs among home-based elderly people in China. *Int J Environ Res Public Health* 2020;17. doi:10.3390/ijerph17051701. [Epub ahead of print: 05 03 2020].
- 36 Xie J, You J. An empirical analysis of urban elderly people's behavior and willingness to choose institutional care. *Statistics and Decision Making* 2017;23:103–6.
- 37 Su S-W, Wang D. Health-Related quality of life and related factors among elderly persons under different aged care models in Guangzhou, China: a cross-sectional study. *Qual Life Res* 2019;28:1293–303.
- 38 Bateman H, Wu S, Thorp S, *et al.* Flexible insurance for informal long-term care: a study of stated preferences. *SSRN Electronic Journal*.
- 39 Li M, Zhang Y, Zhang Z, *et al.* Rural-Urban differences in the long-term care of the disabled elderly in China. *PLoS One* 2013;8:e79955.
- 40 Zhao R, Zhou H, Zhu J. Factors associated with willingness to choose the way for old-age care: a population-based cross-sectional study in Chongqing, China. *Inquiry* 2021;58:469580211020196.
- 41 Hongwei HU, Zhang Y, Guo M. Mental Health, Urban and Rural Difference and the Demand of Home Care Security. *Journal of North University of China(Social Science Edition)* 2012.
- 42 Feng Z, Zhan HJ, Feng X, *et al.* An industry in the making: the emergence of institutional elder care in urban China. *J Am Geriatr Soc* 2011;59:738–44.
- 43 Liu Z-W, Yu Y, Fang L, *et al.* Willingness to receive institutional and community-based eldercare among the rural elderly in China. *PLoS One* 2019;14:e0225314.
- 44 Qian Y, Chu J, Ge D, *et al.* Gender difference in utilization willingness of institutional care among the single seniors: evidence from rural Shandong, China. *Int J Equity Health* 2017;16:77.
- 45 Orfila F, Ferrer M, Lamarca R, *et al.* Gender differences in health-related quality of life among the elderly: the role of objective functional capacity and chronic conditions. *Soc Sci Med* 2006;63:2367–80.
- 46 Tajvar M, Arab M, Montazeri A. Determinants of health-related quality of life in elderly in Tehran, Iran. *BMC Public Health* 2008;8:323–323..