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Effects of individual， family and community factors on the willingness of institutional elder-care: a cross-sectional survey of the elderly in China.

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Abstract

Objective: The current situation of elder care has become much more problematical in

China, where the One-Child policy was enforced for over 30 years. However, the Chinese economy, social welfare and social security systems are unable to cope with the pressure of the aging population. It is critical to conduct research on problems with elder care. This study analyzed the effects of the willingness to live in elder-care institutions associated with individual factors, family environment and the community environment.

Design: Cross-sectional survey

Setting: Heilongjiang Province, China

Participants: A total of 1003 the elderly were selected through multistage sampling in Heilongjiang Province.

Primary and secondary outcome measures: A cross-sectional survey of 1003 elderly individuals, from nine communities and nine villages in Heilongjiang Province, was conducted from March 1st to August 31st 2016. A multistage, stratified sampling design was employed. Differences in health status, family environment and community environment of the respondents were compared with the t-test and chi-squared test. Logistic regression analysis was performed to assess key determinants of willingness to live in institutions.

Results: This study showed that 45.4% of respondents were willing to live in elder-care institutions in the future. Factors influencing willingness to live in elder-care institutions were age, house ownership, living arrangements, disease caregivers and availability of home health care services.

Conclusions: These results suggest that the willingness to enter elder-care institutions is affected by individual, family environmental and community environmental factors. We should vigorously develop community-centered intensive home-based elder-care services by improving the quality and availability of home health services by expanding investment in the community.

Keywords:Chinese eldercare; institutional eldercare willingness; individual, family and community environment of the elderly; the effects of One-Child policy on the elderly

Strengths and limitations of this study

Made a comprehensive study that selected factors from individual, family environment and community environment as the potential factors which may affect the willingness of institutional eldercare.

Analysed the different factors influenced in the willingness of institutional eldercare among the elderly in Heilongjiang province.

Used cross-sectional design, data were collected at only one point in time.

Our participants were from a single province, and therefore, we cannot generalize the results to assume that they apply to all of the elderly in China.

Introduction

The aging population has become a worldwide phenomenon, and concerns with the issue of elder care have been expanding globally. The situation of elder care has been

very problematical in China, where the One-Child policy was enforced for over 30 years. According to Chinese official data, by the end of 2017, 158,310,000 persons were aged 65 or older, accounting for 11.4% of the total population [1]. Meanwhile, 40.63 million disabled elderly people lived in China, making up 18.3% of the aged population [2].

Chinese society's economy, social welfare and social security systems are unable to cope with the pressure of the aging population. Introduced in the 1980s, the One-Child policy, which meant that a couple can have only one child, was enforced for over 30 years. People who were born at the beginning of the One-Child policy are now the main providers of elder care for their parents. In this so-called 4:2:1 phenomenon, each young parent is usually responsible for two pairs of grandparents, besides having the duty to raise their children [3,4]. Therefore, too much pressure has been put on Chinese families. In addition, the number of elder-care institutions, the quality of elder-care workers and the services provided for the elderly all lag behind the diversified needs of the elderly population [5,6]. Obviously, it is necessary to conduct research on elder-care problems.

The Chinese government has introduced many policies and invested a large amount of money to erase the pressure on elder care, and has proposed two slogans, 'Active aging' and 'Healthy aging' [7]. Topics related to elder care have been paid much attention not only by the government, but also by researchers. The extensive literature about elder care can be divided into four categories.

First, some researchers have focused on the health and quality of life of the elderly [8,9,10]. They have found that the quality of life in the elderly population is affected by many factors, including individual, community and societal variables. Second, some studies of long-term care, which can effectively solve the pressure of social old-age care, found that most countries are ill-prepared in system or law to satisfy the demand for long-term care (LTC) [11,12]. Third, research has shown that the living arrangements of the elderly has an important influence on their mental health [13,14].

Finally, plenty of literature has focused on the factors influencing the willingness to receive elder care. Some studies have assessed the relationship between social support for the elderly and the willingness to receive elder care in China [15-16]. Another study analyzed the different factors influencing willingness to receive elder care from the perspective of inter-generational relations and social economic status [17]. This indicated that the more harmonious the inter-generational relationship, the lower the willingness of the elderly to enter an institution. Meanwhile, the higher the social economic status, the more likely the elderly are to choose institutional elder care. Some researchers have studied the influence of the community environment on the willingness to receive elder care [18-19]. One study showed that the quality of the community environment had a positive effect on the degree of satisfaction with community elder care [20].

We believe that not only the internal characteristics of a person, such as health status, income and age, but also the external factors, such as family members and

community environment, affect the willingness of the elderly to receive elder care. It is worth mentioning that China is currently implementing a policy called the 'community family physician model', which can promote the accessibility of community health management and care services for the elderly. The main duty of the family physician is to carry out health management for community residents, especially chronic disease management and health recovery for the elderly. In this way, the policy has improved the availability of medical treatment for residents, especially for the elderly. Therefore, the implementation of this policy should affect the willingness of elderly people to receive elder care. Our study included the following aspects of the elderly: individual characteristics, family environment and community environment.

Methods

Data and Sample

A cross-sectional survey of elderly individuals was conducted from March 1st to August 31st 2016 in Heilongjiang Province, China. A multistage, stratified sampling design was employed. First, three cities were selected on the basis of their gross domestic product. Second, three communities and three villages were selected in each sampled city according to economic factors. In total, nine communities and nine villages were selected. Those aged 60 years old and above and with the ability to answer the questions were included as our sample.

Data collection

The data were collected through face-to-face interviews using a structured questionnaire conducted by trained undergraduate and graduate students from Harbin Medical University. A total of 1200 questionnaires were distributed; 1003 (83.6%) valid questionnaires were returned.

Assessment tools

The study's instrument was a self-administered questionnaire composed of five sections. Section 1 consisted of the participants' demographic characteristics including residence, gender, age, income, house ownership and education.

Section 2 measured the health status of respondents. Physical health was assessed by self-rated physical health and self-rated capacity. Higher scores indicate better health. The scores for each question ranged from 1 to 5. Psychological health status was assessed by life satisfaction and feeling of isolation.

Section 3 assessed the family environment of the respondents. Family environment included whether he/she had living children, marital status, living arrangements, disease caregiver and parent–child relationships. Living arrangements were investigated using three questions: 'Are you living with your spouse?', 'Are you living with your children?', and 'Are you living with others?'. Based on the answers, we classified living arrangements into four groups: (1) living alone, (2) living with spouse (may have others), (3) living with children (may have others), and (4) living with children and spouse (may have others). Because no participants in our sample were living with others only (not spouse or children), we ruled out this situation. Disease

caregiver was divided into five groups: spouse, child, other relatives, nursing workers and themselves. The parent–child relationship was rated good, normal and bad.

Section 4 assessed the community environment of the respondents. This section included two questions: availability of community recreational facilities and availability of home health-care services. Each question's score ranged from 1 to 5, and high scores indicate high availability.

Section 5 assessed willingness to live in an institution. The variable 'Willingness to live in institution' was indicated by the question 'Which are you willing to accept out of home care and institutional care?'.

Data analysis

The data were analyzed using the Statistical Program for the Social Sciences (SPSS) version 17.0. Descriptive analyses included frequencies and percentages for the categorical variables and means and standard deviations (SDs) for continuous variables. Differences in health status, family environment and community environment for respondents were compared with the t-test and chi-squared test. Logistic regression analysis was performed to assess key determinants of the willingness of elderly people to live in institutions. Statistical significance was set at the 5% level.

Results

Socioeconomic and demographic status of respondents

The socioeconomic and demographic characteristics of the respondents are shown in Table 1. More than half of the respondents were female (52.7%), urban (57.9%) and married (59.4%). A majority of the participants have children (95.0%) and own a house (61.3%). About half of them (52.0%) were educated to a lower level than that of junior high school. Only 31.2% of them had monthly incomes above 2000 CNY. Seventy-two percent of them were able to support themselves financially. In this survey, 51.0% of the respondents were aged between 60 and 69 years, and 27.9% were aged between 70 and 79 years. Table 1 shows that 48.5% of urban older adults and 41.0% of rural older adults preferred elder-care institutions. There were significant differences in the percentage willingness to live in elder-care institutions according to urban area ($p<0.05$), age ($p<0.01$), house ownership ($p<0.01$) and financial independence ($p<0.05$). Older adults who have their own house and have no financial independence had lower willingness to enter eldercare institutions than those who have no house ownership. The respondents aged 80 or above had the highest willingness to enter an elder-care institution, followed by those aged 70–79 and aged 60–69 years.

Table 1 Analysis of the willingness to live in elder-care institutions according to individual characteristics of the respondents

variables	Total	willingness to live in eldercare institutions

		n	%	n	%
Residence	urban	581	57.9	282	48.5
	rural	422	42.1	173	41.0
χ^2				**5.61***	
Sex	Male	474	47.3	216	45.6
	Female	529	52.7	239	45.2
χ^2				0.02	
Age in years	60-69	512	51.0	189	36.9
	70-79	280	27.9	122	43.6
	≥80	211	21.1	144	68.2
χ^2				**59.69****	
Monthly income (RMB)	<500	314	31.3	124	39.5
	500-999	125	12.5	55	44.0
	1000-1999	251	25	125	49.8
	2000-3000	197	19.6	95	48.2

	>3000	116	11.6	56	48.3
χ^2				7.51	
House property	yes	615	61.3	279	35.9
	no	388	38.7	176	60.3
χ^2				**57.00****	
Financial independence	yes	725	72.3	328	47.8
	no	278	27.7	108	38.8
χ^2				**6.48***	
Education	No education	195	19.4	85	43.6
	primary school	327	32.6	151	46.2
	junior high school	288	28.7	133	46.2
	senior high school	118	11.8	55	46.6
	college degree or above	75	7.5	31	34.0
χ^2				0.98	

*p<0.05; **p<0.01

Willingness to live in elder-care institutions according to family environment

Table 2 shows that participants who have children ($p<0.01$) and/or have a spouse ($p<0.01$) have lower willingness to live in elder-care institutions. It is worth mentioning that our results showed that children were negatively correlated with the willingness to live in an elder-care institution ($\chi^2=18.2$, $p<0.01$) (odds ratio [OR]=7.52, 95% confidence interval [CI]=3.310–17.120, $p<0.05$), which means that the elderly who have children were 7.52 times less willing to live in elder-care institutions than the elderly who have no child. Regarding living arrangements, older adults living alone have the strongest willingness to live in an elder-care institution, followed by those living with a spouse, living with children and living with spouse and children ($p<0.01$). The willingness to enter elder-care institutions among the elderly who were nursed by nursing workers was higher than for those who were nursed by a spouse, children and/or other relatives ($p<0.01$).

Table 2 Analysis of the willingness to live in elder-care institutions according to the family environment of the respondents

variables		Total		willingness to live in institutions	
		n	%	n	%
Children	yes	953	95.0	416	41.5
	no	50	5.0	39	78.0

χ^2				**18.2****	
Marital status	Married	596	59.4	214	36.1
	Others	407	40.6	241	59.2
χ^2				**52.1****	
Living arrangement	Living alone	282	28.12	193	68.4
	Living with spouse	428	42.67	165	38.6
	Living with children	147	14.66	56	38.1
	Living with spouse and children	146	14.55	41	28.1
χ^2				**89.3****	
Disease caregiver	spouse	494	49.25	178	36.0
	Son/daughter	356	35.49	165	46.5
	Other relatives	15	1.50	7	46.7
	nursing workers	90	8.97	69	76.7
	By self	48	4.79	35	72.9

χ^2				**68.8****	
parent-child relationship	Good	885	88.0	398	45.0
	Normal	83	8.3	37	44.6
	Bad	35	3.5	17	48.6
χ^2				0.2	

*p<0.05; **p<0.01

Willingness to live in elder-care institutions according to health status

We used self-rated physical health, life satisfaction, feeling of isolation and self-rated capacity for action to evaluate the health status of the respondents (Table 3). The mean scores for self-rated physical health and self-rated capacity for action were 3.30 and 3.54, respectively, which were slightly higher than the mid-point of 3. The life satisfaction was 5.08, which indicated high well-being among the elderly. The feeling of isolation was at a relatively low level (M=3.54, SD=0.96). Among these four variables, only self-rated capacity for action was significantly different between those preferring home care and those willing to receive institutional care: the participants preferring home care had higher self-rated capacity for action (M=3.61, SD=0.94, p=0.01).

Table 3 Analysis of the willingness to live in elder-care institutions according to the health status of the respondents

variables	Mean ± SD （n=1003）	Range of the score	Home care （n=548）	Institutional care （n=455）	t	P
self-rated physical health	3.30±0.97	1-5	3.28±1.00	3.33±0.94	0.80	0.42
life satisfaction	5.08±1.27	1-7	5.13±1.25	5.03±1.28	1.21	0.23
Feeling of isolation	1.91 ± 0.77	1-5	1.91±0.76	1.91±0.78	0.15	0.88
Self-rated capacity for acti on	3.54±0.96	1-5	3.61±0.94	3.45±0.98	2.59	**0.01**

Willingness to live in elder-care institutions according to community environment

The mean scores for self-assessed availability of community recreational facilities and availability of home health care services were 3.72 and 3.25, respectively (Table 4). Statistically significant differences were noted in the scores on both of these variables between those who preferred home care and those who favored institutional

care; those who preferred home care reported higher scores for the availability of community recreational facilities and the availability of home health care services ($p<0.05$).

Table 4 Analysis of the willingness to live in elder-care institutions according to the community environment of the respondents

variables	Mean ± SD (n=1003)	Range of the score	Home care (n=548)	Institutional care (n=455)	t	P
Availability of community recreation facility	3.72±0.74	1-5	3.76±0.74	3.67±0.74	2.00	**0.046**
Availability of home health care services	3.25±0.69	1-5	3.29 ± 0.71	3.20±0.66	2.15	**0.032**

Factors influencing willingness to live in elder-care institutions

In this study, 45.4% of respondents said they were willing to live in elder-care

institutions at some point in the future. Based on the results of single factor analysis, logistic regression was conducted to analyze the factors influencing the willingness to live in elder-care institutions (Table 5). Regarding the individual factors, only age in years and house ownership were predictors of the willingness to enter institutions. The elders who had no property (OR=2.370, p<0.01), and those aged 80 or above (OR=2.250, p<0.01) were, respectively, 2.370 times and 2.250 times more receptive to living in elder-care institutions than their control groups. With regarding to living arrangements, those living with a spouse (OR=0.468, p<0.01), living with children (OR=0.252, p<0.01) or living with a spouse and children (OR=0.285, p<0.01) were less willing to live in elder-care institutions than those who were living alone. These results meant that the elderly who live with a spouse were 0.468 times more willing to choose institutional elder care than those who were living alone. We also found that elders who were cared for by their children (OR=0.329, p<0.01) or cared for by their spouse (OR=0.403, p<0.01) when they were ill had much lower willingness to live in elder-care institutions than those who cared for themselves. The availability of home health care services (OR=0.780, p<0.05) was negatively associated with the willingness to live in elder-care institutions.

Table 5 Logistic regression analysis of the factors influencing willingness to live in elder-care institutions.

variables	Adjusted OR	95%CI
Residence（reference: urban）		

Rural	0.960	0.700-1.320
Age in years（reference:60-69）		
70-79	1.020	0.730-1.430
≥80	2.250**	1.490-3.400
House property（reference: yes）		
No	2.370**	1.750-3.200
Financial independence（reference: yes）		
No	0.850	0.590-1.210
Children （reference: yes）		
No	7.520**	3.310-17.120
Marital status (reference: married)		
Others	0.730	0.330-1.630
Living arrangement(reference: living alone)		
Living with spouse	0.468**	0.287-0.762
Living with children	0.252**	0.158-0.402
Living with spouse and children	0.285**	0.160-0.509

Disease caregiver (reference: By self)		
spouse	0.403**	0.180-0.903
Son/daughter	0.329**	0.158-0.684
Other relatives	0.481	0.131-1.760
nursing workers	0.802	0.337-1.904
Self-rated capacity for action	1.010	0.860-1.180
Availability of community recreation facility	1.030	0.830-1.280
Availability of home health care services	0.780*	0.626-0.972

*p<0.05; **p<0.01

Discussion

This cross-sectional study was conducted to explore the key factors contributing to the willingness to enter elder-care institutions. This study was a pioneering one because we took the willingness to live in elder-care institutions as the dependent variable and chose independent variables from three dimensions: individual factors, family environment and community environment.

With regard to individual factors, both the single factor analysis (Table 1) and the

logistic regression (Table 5) demonstrated that age and house ownership were significantly associated with the willingness to live in an elder-care institution. People in their 80s and above had 2.250 times more willingness to live in elder-care institutions than the group aged 60–69 years. Another study pointed out that those in advanced old age are much more likely to have elder-care needs, including physical and psychological [21]. Given that most of these needs cannot be met by family, the willingness to accept institutional eldercare rises with age. Second, when analyzing house ownership and the willingness to enter institutional elder care, we found that when the elderly have their own house, they have a significantly lower willingness to accept institutional eldercare than those who have no property. The elderly in China traditionally intend to live the rest of their life in their own house because they regard their own houses as their roots of life. Having their own houses gives the Chinese elderly a great sense of belonging, as a study found that the sense of comfort and freedom when receiving elder care in their own houses is irreplaceable by other methods [22]. A similar conclusion was reached by other studies, which demonstrated that house ownership is highly correlated with current health status and is predictive of future mortality risk in older populations [23-24]. However, statistical significance of the impact of the independent variable residence on the dependent variable (the willingness to live in eldercare institutions) was found only with chi-squared tests (Table 1, $\chi^2=5.61$, $P<0.05$) and not in logistic regression, as shown in many studies [25-26]. However, our result was similar to a previous study [27]. We assume that, as the trend of urban–rural integration advances, the difference between urban and rural

areas is not strong enough to show statistically significant differences when compared with other variables such as age and house ownership.

Family environment also comprised some typical factors influencing willingness to live in elder-care institutions. This study showed that the elderly who have children were 7.52 times less willing to live in elder-care institutions than those who have no children. This meant that children were negatively correlated with the willingness to live in elder-care institution. In addition, we found that the elderly who lived alone and those who cared for themselves when they had diseases both had the highest willingness to live in elder-care institutions. Undeniably, Chinese grown children nowadays are facing great pressure because of the so-called '4-2-1' family structure and the interpersonal tensions and work–family conflict created by the advent of globalization and fierce market competition [28-29]. However, a published review indicated that adult children still endorse filial piety in contemporary Chinese society [30]. This result was consistent with many studies in which the elderly showed less willingness to live in elder-care institutions when they have children [31-32]. As the well-known proverb 'raising children to ensure elder care' indicates, in Chinese traditional culture, filial piety demands that, apart from economic and living care, psychological care should also be provided for elderly parents [33]. Some studies have even pointed out that adult children who have placed their parents in elder-care homes may be negatively regarded by society [34-35]. This study showed that the elderly who lived alone had the highest willingness to live in elder-care institutions. We assume that the elderly living alone typically lack physical and psychological assistance and care from their family, and are

therefore more willing to live in elder-care institutions. Similar results were found in a study that showed that elderly people who lived alone were more willing to live in elder-care institutions, for both single males and females, when compared with those who lived with children or others [36]. First, as another study concluded, older people are more likely than any other section of the population to be living in single-person households [37]. Second, the elderly who live alone have higher scores for loneliness and worse mental health and functioning compared with those who do not live alone [38-39]. Third, a Korean study found that physical health status, self-esteem, family support and health-promoting behavior, specifically exercise and nutrition, of the elderly living with family were higher than those of the elderly living alone [40].

With an increase in age, physical health tends to deteriorate, so we included disease-caregiver in our research. Our analysis showed significant differences among five disease caregivers: spouse, son or daughter, other relatives, nursing workers and the elderly person themselves; 86.24% of respondents were provided with disease care by their immediate family members or other relatives. This means that informal care is the main form of care for the elderly in China. A study in Europe showed that informal care is an effective substitute for long-term care as long as the needs of the elderly are met [41]. In support, in our study the lowest willingness to accept elder-care institutions was shown by the elderly cared for by their spouse. A study demonstrated that a spouse can give the elder physical and, especially, mental care, thus their willingness to live in elder-care institutions was lower than that of those that have no spouse [42]. In the multiple logistic regression analysis, we found that when the elderly were provided with

disease care by their spouse or children, their willingness to live in elder-care institutions decreased. When the elderly have no children or live alone, they cannot obtain informal or formal care from family as desired, so they have to seek care from elder-care institutions. Therefore, the primary culture of filial piety, the conditions of living and the presence of disease all affect the willingness of the elderly to live in elder-care institutions.

Last, but not least, we paid attention to the community environment. We found that that availability of home health-care services negatively affected the willingness to live in elder-care institutions, in agreement with previous studies [43-44]. In China, home health-care services are mostly provided by institutions called elder-care community centers, such as Community Health Service centers. One study showed that these centers could increase willingness to accept home elder care [45]. The research pointed out that high availability of home health services in the community provided the elderly with basic nursing services to meet their fundamental needs for care, and therefore lowered the willingness to accept institutional elder care [46]. In our study, the mean availability of home health care services was 3.25, which is much higher than the average level because of adoption of the model of community family physician. This new Chinese policy, the 'community family physician model', has aroused heated discussion among all types of people. Some researchers have found that this policy is associated with problems such as unclear responsibilities, high medical risk and lack of a security system [47-48]. However, some found that this policy did improve the convenience and success rate of medical treatment, thus improving the level of health

of the signatories [49-50]. It is no doubt that home health-care services have become more conveniently available for elderly residents.

Conclusion

At present, in China, the enormous pressure of elder care has shifted increasingly from family to society, and it is difficult for institutions to take on the heavy burden of care. However, the tradition of filial piety in Chinese culture is restricting the willingness of the elderly to receive institutional elder care. Therefore, we should vigorously develop community-centered intensive home-based elder-care services by improving the quality and availability of home health services by expanding investment in the community. Only in this way can we meet the need for both formal and informal elder care and the need to cater to the Chinese traditional morality.

Ethics approval and consent to participate

Ethics approval for this study was granted by the Institutional Research Board of Harbin Medical University.The data were collected anonymously. Respondents were assured that participation in this survey was voluntary, with the return of completed questionnaires being taken as consent to participate.

Consent for publication

All presentations of case reports have consent for publication.

Availability of data and materials

Data will not be shared. Because we promise not disclose their information when we

signed the informed consent with the respondents.

Patient and public involvement

This study did not involve patients and the public.

Competing interests

The authors declare that they have no competing interests.

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Contributors

LL conceived and designed the experiments; ZW WY performed the experiments;XS XZ analyzed the data; SH YX LL contributed reagents/materials/analysis tools; ZW wrote the paper. ZW WY XS provided technical support. LL critically revised the paper. All authors checked and proof-read the final version of manuscript.

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Effects of individual，family and community factors on the willingness of institutional elder-care: a cross-sectional survey of the elderly in China.

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Abstract

Objective: To investigate the effects of the willingness to live in elder-care institutions associated with individual factors, family environment and the community environment in the elderly in China.

Design: Cross-sectional survey

Setting: Heilongjiang Province, China

Participants: A total of 1003 the elderly were selected through multistage sampling in Heilongjiang Province.

Primary and secondary outcome measures: A multistage, stratified sampling design was employed. Differences in health status, family environment and community environment of the respondents were compared with the t-test and chi-squared test. Logistic regression analysis was performed to assess key determinants of willingness to live in institutions.

Results: This study showed that 45.4% of respondents were willing to live in elder-care institutions in the future. Factors influencing willingness to live in elder-care institutions were age, house ownership, living with spouse and children, disease caregivers and availability of home health care services. The elders who had no property (OR=2.370, $p<0.01$), and those aged 80 or above (OR=2.250, $p<0.01$) were, respectively, 2.370 times and 2.250 times more receptive to living in elder-care institutions than their control groups. However, those living with a spouse (OR=0.468, $p<0.01$), living with children (OR=0.252, $p<0.01$) or living with a spouse and children (OR=0.285, $p<0.01$) were less willing to live in elder-care institutions.

Conclusions: These results suggest that the willingness to enter elder-care institutions is affected by individual, family environmental and community environmental factors. We should vigorously develop community-centered intensive home-based elder-care services by improving the quality and availability of home health services by expanding investment in the community.

Keywords: Chinese eldercare; institutional eldercare willingness; individual, family and community environment of the elderly; the effects of One-Child policy on the elderly

Strengths and limitations of this study

Made a comprehensive study that selected factors from individual, family environment and community environment as the potential factors which may affect the willingness of institutional eldercare.

Analyzed the different factors influenced in the willingness of institutional eldercare among the elderly in Heilongjiang province.

Used cross-sectional design, data were collected at only one point in time.

Our participants were from a single province, and therefore, we cannot generalize the results to assume that they apply to all of the elderly in China.

Introduction

The aging population has become a worldwide phenomenon, and concerns with the issue of elder care have been expanding globally. The situation of elder care has been very problematical in China, where the One-Child policy was enforced for over 30 years[1]. According to Chinese official data, by the end of 2017,158,310,000 persons were aged 65 or older, accounting for 11.4% of the total population[2]. Meanwhile, 40.63 million disabled elderly people lived in China, making up 18.3% of the aged population[3].

Chinese society's economy, social welfare and social security systems are unable to cope with the pressure of the aging population. Introduced in the 1980s, the One-Child policy, which meant that a couple can have only one child, was enforced for over 30 years. People who were born at the beginning of the One-Child policy are now the main providers of elder care for their parents. In this so-called 4:2:1 phenomenon, each young parent is usually responsible for two pairs of grandparents, besides having the duty to raise their children [4,5]. Therefore, too much pressure has been put on Chinese families. In addition, the number of elder-care institutions, the quality of elder-care workers and the services

provided for the elderly all lag behind the diversified needs of the elderly population[6,7]. Obviously, it is necessary to conduct research on elder-care problems.

The Chinese government has introduced many policies and invested a large amount of money to erase the pressure on elder care, and has proposed two slogans, 'Active aging' and 'Healthy aging'[8]. Topics related to elder care have been paid much attention not only by the government, but also by researchers. The extensive literature about elder care can be divided into four categories.

First, some researchers have focused on the health and quality of life of the elderly[9,10,11]. They have found that the quality of life in the elderly population is affected by many factors, including individual, community and societal variables. Second, some studies of long-term care, which can effectively solve the pressure of social old-age care, found that most countries are ill-prepared in system or law to satisfy the demand for long-term care (LTC)[12,13]. Third, research has shown that the living arrangements of the elderly has an important influence on their mental health [14,15].

Finally, plenty of literature has focused on the factors influencing the willingness to receive elder care. Some studies have assessed the relationship between social support for the elderly and the willingness to receive elder care in China[16,17]. Another study analyzed the different factors influencing willingness to receive elder care from the perspective of inter-generational relations and social economic status[18]. This indicated that the more harmonious the inter-generational relationship, the lower the willingness of the elderly to enter an institution. Meanwhile, the higher the social economic status, the more likely the elderly are to choose institutional elder care. Some researchers have studied the influence of the community environment on the willingness to receive elder care[19,20]. One study

showed that the quality of the community environment had a positive effect on the degree of satisfaction with community elder care[21].

We believe that not only the internal characteristics of a person, such as health status, income and age, but also the external factors, such as family members and community environment, affect the willingness of the elderly to receive elder care. It is worth mentioning that China is currently implementing a policy called the 'community family physician model', which can promote the accessibility of community health management and care services for the elderly. The main duty of the family physician is to carry out health management for community residents, especially chronic disease management and health recovery for the elderly. Whether to choose institutional eldercare indicates whether old people are willing to leave the familiar environment, which can give them various kinds of support such as disease care, physical and mental accompany. Considering the influences of personal factors and external factors on the elderly's willingness of eldercare are not isolated. Our study included the following aspects of the elderly: individual characteristics, family environment and community environment. In view of the newly launched policy 'family physician model', which have been studied rarely, we have taken the 'Availability of home health care' as an aspect. Our research was a pioneer in the study of the willingness to care for the elderly in three aspects of the individual, family and community.

The present study aimed (1) to describe the status quo of and compare the willingness to use institutional eldercare from individual characteristics, family environment and community environment. and (2) to analyze effects of individual, family and community factors on the willingness of institutional elder-care.

Methods

Data and Sample

A cross-sectional survey of elderly individuals was conducted from March 1st to August 31st 2016 in Heilongjiang Province, China. Firstly, those aged 60 years old and above, having the ability and willing to answer the questions were included as our sample. Secondly, to make our samples representative as much as possible, we have employed multistage stratified sampling design. Meanwhile, we chose urban and rural samples each accounting for about 50 percent. Thirdly, three cities, Harbin, Qiqihar, and Jiamusi, were selected on the basis of their Gross Domestic Product. And three communities and three villages were selected in each sampled city according to economic factors. In total, nine communities and nine villages were selected. Besides, in order to ensure that the elderly understand the questionnaire correctly, we used the face-to-face interview form during investigation.

Data collection

The data were collected through face-to-face interviews using a structured questionnaire conducted by trained undergraduate and graduate students from Harbin Medical University. A total of 1200 questionnaires were distributed; 1003 (83.6%) valid questionnaires were returned.

Assessment tools

The study's instrument was a self-administered questionnaire composed of five sections. Section 1 consisted of the participants' demographic characteristics including residence, gender, age, income, house ownership and culture. Among these variables, residence was composed of *rural* and *urban, income was* represented by five levels: *<500, 500-999, 1000-1999, 2000-3000* and *>3000* monthly and culture has divided into 5 dimensions by *no education*, *primary school*, *junior high school, senior high school* and *college degree or*

above.

Section 2 measured the health status of respondents. Physical health was assessed by self-rated physical health and self-rated capacity. Higher scores indicate better health. The scores for each question ranged from 1 to 5. Psychological health status was assessed by life satisfaction and feeling of isolation.

Section 3 assessed the family environment of the respondents. Family environment included whether he/she had living children, marital status, living arrangements, disease caregiver and parent–child relationships. Living arrangements were investigated using three questions: 'Are you living with your spouse?', 'Are you living with your children?', and 'Are you living with others?'. Based on the answers, we classified living arrangements into four groups: (1) living alone, (2) living with spouse (may have others), (3) living with children (may have others), and (4) living with children and spouse (may have others). Because no participants in our sample were living with others only (not spouse or children), we ruled out this situation. Disease caregiver was divided into five groups: spouse, child, other relatives, nursing workers and themselves. The parent–child relationship was rated good, normal and bad.

Section 4 assessed the community environment of the respondents. This section included two questions: availability of community recreational facilities and availability of home health-care services. Each question's score ranged from 1 to 5, and high scores indicate high availability.

Section 5 assessed willingness to live in an institution. The variable 'Willingness to live in institution' was indicated by the question 'Which are you willing to accept out of home care and institutional care?'. Let the respondents consider whether they want to go to an

institution or stay home for the eldercare when they need.

Data analysis

The data were analyzed using the Statistical Program for the Social Sciences (SPSS) version 17.0.Descriptive analyses included frequencies and percentages for the categorical variables and means and standard deviations (SDs) for continuous variables. Differences in health status, family environment and community environment for respondents were compared with the t-test and chi-squared test. Logistic regression analysis was performed to assess key determinants of the willingness of elderly people to live in institutions. 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

Socioeconomic and demographic status of respondents

The socioeconomic and demographic characteristics of the respondents are shown in Table 1. More than half of the respondents were female (52.7%), urban (57.9%) and married (59.4%). A majority of the participants have children (95.0%) and own a house (61.3%). About half of them (52.0%) were educated to a lower level than that of junior high school. Only 31.2% of them had monthly incomes above 2000 CNY. Seventy-two percent of them were able to support themselves financially. In this survey, 51.0% of the respondents were aged between 60 and 69 years, and 27.9% were aged between 70 and 79 years. Table 1 shows that 48.5% of urban older adults and 41.0% of rural older adults preferred elder-care institutions. There were significant differences in the percentage willingness to live in elder-care institutions according to urban area ($p<0.05$), age ($p<0.01$), house ownership

(p<0.01) and financial independence (p<0.05). Older adults who have their own house and have no financial independence had lower willingness to enter eldercare institutions than those who have no house ownership. The respondents aged 80 or above had the highest willingness to enter an elder-care institution, followed by those aged 70–79 and aged 60–69 years.

Table 1 Analysis of the willingness to live in elder-care institutions according to individual characteristics of the respondents

variables		Total		willingness to live in eldercare institutions	
		n	%	n	%
Residence	urban	581	57.9	281	48.4
	rural	422	42.1	173	41.0
$\chi 2$				**5.36**	
P				**0.02**	
Sex	Male	474	47.3	215	45.4
	Female	529	52.7	239	45.2
$\chi 2$				0.00	
P				1.00	
Age in years	60-69	508	51.0	188	37.0
	70-79	280	27.9	122	43.6
	≥80	215	21.1	144	67.0

χ^2				**55.21**	
P				**0.00**	
Monthly income (RMB)	<500	314	31.3	124	39.5
	500-999	125	12.5	55	44.0
	1000-1999	251	25.0	124	49.4
	2000-3000	197	19.6	95	48.2
	>3000	116	11.6	56	48.3
χ^2				7.16	
P				0.12	
House property	yes	615	61.3	221	35.9
	no	388	38.7	233	60.1
χ^2				**55.85**	
P				**0.00**	
Financial independence	yes	725	72.3	346	47.7
	no	278	27.7	108	38.8
χ^2				**6.39**	
P				**0.01**	
Education	No education	195	19.4	85	43.6
	Primary school	327	32.6	151	46.2
	Junior high school	288	28.7	132	45.8

	Senior high school	118	11.8	55	46.6
	College degree or above	75	7.5	31	41.3
$\chi 2$				0.92	
P				0.92	

Willingness to live in elder-care institutions according to family environment

Table 2 shows that participants who have children ($p<0.01$) and/or have a spouse ($p<0.01$) have lower willingness to live in elder-care institutions. It is worth mentioning that our results showed that children were negatively correlated with the willingness to live in an elder-care institution($\chi^2=18.2$, $p<0.01$) (odds ratio [OR]=7.52,95%confidence interval [CI]=3.310–17.120, $p<0.05$), which means that the elderly who have children were 7.52 times less willing to live in elder-care institutions than the elderly who have no child. Regarding living arrangements, older adults living alone have the strongest willingness to live in an elder-care institution, followed by those living with a spouse, living with children and living with spouse and children ($p<0.01$). The willingness to enter elder-care institutions among the elderly who were nursed by nursing workers was higher than for those who were nursed by a spouse, children and/or other relatives ($p<0.01$).

Table 2 Analysis of the willingness to live in elder-care institutions according to the family environment of the respondents

variables	Total	willingness to live in institutions

		n	%	n	%
Children	yes	950	94.7	415	43.7
	no	53	5.3	39	73.6
$\chi 2$				**18.1**	
P				**0.00**	
Marital status	Married	593	59.4	213	35.9
	Others	410	40.6	241	58.8
$\chi 2$				**51.1**	
P				**0.00**	
Living arrangement	Living alone	282	28.1	193	68.4
	Living with spouse	428	42.7	165	38.6
	Living with children	147	14.7	56	38.1
	Living with spouse and children	146	14.6	40	28.1
$\chi 2$				**90.7**	
P				**0.00**	
Disease caregiver	spouse	494	49.3	177	35.8
	Son/daughter	356	35.5	166	46.6
	Other relatives	15	1.5	7	46.7
	nursing workers	90	9.0	69	76.7
	By self	48	4.8	35	72.9

$\chi 2$				**68.7**	
P				**0.00**	
parent-child relationship	Good	883	87.9	399	45.2
	Normal	84	8.4	37	44.0
	Bad	36	3.6	18	50.0
$\chi 2$				0.38	
p				0.83	

Willingness to live in elder-care institutions according to health status

We used self-rated physical health, life satisfaction, feeling of isolation and self-rated capacity for action to evaluate the health status of the respondents (Table 3). The mean scores for self-rated physical health and self-rated capacity for action were 3.30 and 3.54, respectively, which were slightly higher than the mid-point of 3. The life satisfaction was 5.08, which indicated high well-being among the elderly. The feeling of isolation was at a relatively low level (M=3.54, SD=0.96). Among these four variables, only self-rated capacity for action was significantly different between those preferring home care and those willing to receive institutional care: the participants preferring home care had higher self-rated capacity for action (M=3.61, SD=0.94, p=0.01).

Table 3 Analysis of the willingness to live in elder-care institutions according to the health status of the respondents

variables	Mean ± SD （n=1003）	Range of the score	Home care （n=548）	Institutional care	t	P

				（n=455）		
self-rated physical health	3.30±0.97	1-5	3.28±1.00	3.33±0.94	0.80	0.42
life satisfaction	5.08±1.27	1-7	5.13±1.25	5.03±1.28	1.21	0.23
Feeling of isolation	1.91 ± 0.77	1-5	1.91±0.76	1.91±0.78	0.15	0.88
Self-rated capacity for action	3.54±0.96	1-5	3.61±0.94	3.45±0.98	2.59	**0.01**

Willingness to live in elder-care institutions according to community environment

The mean scores for self-assessed availability of community recreational facilities and availability of home health care services were 3.72 and 3.25, respectively (Table 4). Statistically significant differences were noted in the scores on both of these variables between those who preferred home care and those who favored institutional care; those who preferred home care reported higher scores for the availability of community recreational facilities and the availability of home health care services ($p<0.05$).

Table 4 Analysis of the willingness to live in elder-care institutions according to the community environment of the respondents

variables	Mean ± SD （n=1003）	Range of the score	Home care （n=548）	Institutional care （n=455）	t	P
Availability	3.72±0.74	1-5	3.76±0.74	3.67±0.74	2.00	**0.046**

of community recreation facility						
Availability of home health care services	3.25±0.69	1-5	3.29 ± 0.71	3.20±0.66	2.15	**0.032**

Factors influencing willingness to live in elder-care institutions

In this study, 45.4% of respondents said they were willing to live in elder-care institutions at some point in the future. Based on the results of single factor analysis, logistic regression was conducted to analyze the factors influencing the willingness to live in elder-care institutions (Table 5). Regarding the individual factors, only age in years and house ownership were predictors of the willingness to enter institutions. The elders who had no property (OR=2.370, p<0.01), and those aged 80 or above (OR=2.250, p<0.01) were, respectively, 2.370 times and 2.250 times more receptive to living in elder-care institutions than their control groups. With regarding to living arrangements, those living with a spouse (OR=0.468, p<0.01), living with children (OR=0.252, p<0.01) or living with a spouse and children (OR=0.285, p<0.01) were less willing to live in elder-care institutions than those who were living alone. These results meant that the elderly who live with a spouse were 0.468 times more willing to choose institutional elder care than those who were living alone. We also found that elders who were cared for by their children (OR=0.329, p<0.01) or cared for by their spouse (OR=0.403, p<0.01) when they were ill had much lower willingness to live in elder-care institutions than those who cared for themselves. The availability of home

health care services (OR=0.780, p<0.05) was negatively associated with the willingness to live in elder-care institutions.

Table 5 Logistic regression analysis of the factors influencing willingness to live in elder-care institutions

variables	Adjusted OR	95%CI
Residence（reference: urban）		
Rural	0.960	0.700-1.320
Age in years（reference:60-69）		
70-79	1.020	0.730-1.430
≥80	2.250**	1.490-3.400
House property（reference: yes）		
No	2.370**	1.750-3.200
Financial independence（reference: yes）		
No	0.850	0.590-1.210
Children （reference: yes）		
No	7.520**	3.310-17.120
Marital status (reference: married)		
Others	0.730	0.330-1.630
Living arrangement(reference: living alone)		
Living with spouse	0.468**	0.287-0.762
Living with children	0.252**	0.158-0.402
Living with spouse and children	0.285**	0.160-0.509
Disease caregiver (reference: By self)		

spouse	0.403**	0.180-0.903
Son/daughter	0.329**	0.158-0.684
Other relatives	0.481	0.131-1.760
nursing workers	0.802	0.337-1.904
Self-rated capacity for action	1.010	0.860-1.180
Availability of community recreation facility	1.030	0.830-1.280
Availability of home health care services	0.780*	0.626-0.972

*p<0.05; **p<0.01

Discussion

This cross-sectional study was conducted to explore the key factors contributing to the willingness to enter elder-care institutions. This study was a pioneering one because we took the willingness to live in elder-care institutions as the dependent variable and chose independent variables from three dimensions: individual factors, family environment and community environment.

With regard to individual factors, both the single factor analysis(Table 1) and the logistic regression(Table 5) demonstrated that age and house ownership were significantly associated with the willingness to live in an elder-care institution. People in their 80s and above had 2.250 times more willingness to live in elder-care institutions than the group aged 60–69years. We found the same conclusion from another study[22]. Another study pointed out that those in advanced old age are much more likely to have elder-care needs, including physical and psychological[23]. Given that most of these needs cannot be met by family, the willingness to accept institutional eldercare rises with age. Second, when analyzing house

ownership and the willingness to enter institutional elder care, we found that when the elderly have their own house, they have a significantly lower willingness to accept institutional eldercare than those who have no property. The elderly in China traditionally intend to live the rest of their life in their own house because they regard their own houses as their roots of life. Having their own houses gives the Chinese elderly a great sense of belonging, as a study found that the sense of comfort and freedom when receiving elder care in their own houses is irreplaceable by other methods[24]. A similar conclusion was reached by other studies, which demonstrated that house ownership is highly correlated with current health status and is predictive of future mortality risk in older populations[25-26]. However, statistical significance of the impact of the independent variable residence on the dependent variable (the willingness to live in eldercare institutions) was found only with chi-squared tests(Table 1,χ^2=5.61,P $<$ 0.05) and not in logistic regression, as shown in many studies[27-28]. However, our result was similar to a previous study[29]. We assume that, as the trend of urban–rural integration advances, the difference between urban and rural areas is not strong enough to show statistically significant differences when compared with other variables such as age and house ownership.

Family environment also comprised some typical factors influencing willingness to live in elder-care institutions. This study showed that the elderly who have children were 7.52 times less willing to live in elder-care institutions than those who have no children. This meant that children were negatively correlated with the willingness to live in elder-care institution. In addition, we found that the elderly who lived alone and those who cared for themselves when they had diseases both had the highest willingness to live in elder-care institutions. Undeniably, Chinese grown children nowadays are facing great pressure because

of the so-called '4-2-1' family structure and the interpersonal tensions and work–family conflict created by the advent of globalization and fierce market competition[30-31]. However, a published review indicated that adult children still endorse filial piety in contemporary Chinese society[32]. This result was consistent with many studies in which the elderly showed less willingness to live in elder-care institutions when they have children[33-34].As the well-known proverb 'raising children to ensure elder care' indicates, in Chinese traditional culture, filial piety demands that, apart from economic and living care, psychological care should also be provided for elderly parents[35]. Some studies have already pointed out that adult children who have placed their parents in elder-care homes may be negatively regarded by society[36-37]. This study showed that the elderly who lived alone had the highest willingness to live in elder-care institutions. We assume that the elderly living alone typically lack physical and psychological assistance and care from their family, and are therefore more willing to live in elder-care institutions. Similar results were found in a study that showed that elderly people who lived alone were more willing to live in elder-care institutions, for both single males and females, when compared with those who lived with children or others[38]. First, as another study concluded, older people are more likely than any other section of the population to be living in single-person households[39]. Second, the elderly who live alone have higher scores for loneliness and worse mental health and functioning compared with those who do not live alone[40-41]. Third, a Korean study found that physical health status, self-esteem, family support and health-promoting behavior, specifically exercise and nutrition, of the elderly living with family were higher than those of the elderly living alone[42].

With an increase in age, physical health tends to deteriorate, so we included

disease-caregiver in our research. Our analysis showed significant differences among five disease caregivers: spouse, son or daughter, other relatives, nursing workers and the elderly person themselves; 86.24% of respondents were provided with disease care by their immediate family members or other relatives. This means that informal care is the main form of care for the elderly in China. A study in Europe showed that informal care is an effective substitute for long-term care as long as the needs of the elderly are met [43]. In support, in our study the lowest willingness to accept elder-care institutions was shown by the elderly cared for by their spouse. A study demonstrated that a spouse can give the elder physical and, especially, mental care, thus their willingness to live in elder-care institutions was lower than that of those that have no spouse[44]. In the multiple logistic regression analysis, we found that when the elderly were provided with disease care by their spouse or children, their willingness to live in elder-care institutions decreased. When the elderly have no children or live alone, they cannot obtain informal or formal care from family as desired, so they have to seek care from elder-care institutions. Therefore, the primary culture of filial piety, the conditions of living and the presence of disease all affect the willingness of the elderly to live in elder-care institutions.

Last, but not least, we paid attention to the community environment. We found that that availability of home health-care services negatively affected the willingness to live in elder-care institutions, in agreement with previous studies [45-46]. In China, home health-care services are mostly provided by institutions called elder-care community centers, such as Community Health Service centers. One study showed that these centers could increase willingness to accept home elder care[47]. The research pointed out that high availability of home health services in the community provided the elderly with basic

nursing services to meet their fundamental needs for care, and therefore lowered the willingness to accept institutional elder care[48]. In our study, the mean availability of home health care services was 3.25, which is much higher than the average level because of adoption of the model of community family physician. This new Chinese policy, the 'community family physician model', has aroused heated discussion among all types of people. Some researchers have found that this policy is associated with problems such as unclear responsibilities, high medical risk and lack of a security system[49-50]. However, some found that this policy did improve the convenience and success rate of medical treatment, thus improving the level of health of the signatories[51-52]. It is no doubt that home health-care services have become more conveniently available for elderly residents.

However, several limitations in our study should be discussed. First of all, we have used cross-sectional design, in which data were collected at only one point in time. It might cause information bias, mainly including recall bias and measurement bias. In order to reduce measurement bias, investigators have undergone rigorous training and increased investigator survey skills and our respondents were given enough time to recall. Then, our participants were from a single province, and therefore, we cannot generalize the results to assume that they apply to all of the elderly in China. In order to make our study much more convincing, we will introduce some more widely-used measuring tools like ADL into our research and conduct the same research nationwide later.

Conclusion

At present, in China, the enormous pressure of elder care has shifted increasingly from family to society, and it is difficult for institutions to take on the heavy burden of care.

However, the tradition of filial piety in Chinese culture is restricting the willingness of the elderly to receive institutional elder care. Therefore, we should vigorously develop community-centered intensive home-based elder-care services by improving the quality and availability of home health services by expanding investment in the community. Only in this way can we meet the need for both formal and informal elder care and the need to cater to the Chinese traditional morality.

Ethics approval and consent to participate

Ethics approval for this study was granted by the Institutional Research Board of Harbin Medical University. The data were collected anonymously. Respondents were assured that participation in this survey was voluntary, with the return of completed questionnaires being taken as consent to participate.

Availability of data and materials

Data will not be shared. Because we promise not disclose their information when we signed the informed consent with the respondents.

Competing interests

The authors declare that they have no competing interests.

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Contributors

LL conceived and designed the experiments; ZW WY performed the experiments; XS XZ analyzed the data; SH YX LL contributed reagents/materials/analysis tools; ZW wrote the paper. ZW WY XS provided technical support. LL critically revised the paper. All authors

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Line1-2, P1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	Line21-57, P1-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Line58-97, P3-5
Objectives	3	State specific objectives, including any prespecified hypotheses	Line98-117, P5
Methods			
Study design	4	Present key elements of study design early in the paper	
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	Line119-129,P6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Line135-165, P6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Line130-134, P6
Bias	9	Describe any efforts to address potential sources of bias	*Line350-354, P21*

Study size	10	Explain how the study size was arrived at	
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	Line167-173, P7-8
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Line121-128, P6
		(*e*) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Line176-195, P8-9
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Line178-192,P8-9
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	Line197-232, P11-15
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	
		(*b*) Report category boundaries when continuous variables were categorized	

		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	Line235-252, P15-16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Line350-358, P21
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Line257-349, P17-21
Generalisability	21	Discuss the generalisability (external validity) of the study results	Line360-368, P21-22
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Line379-381, P22

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Effects of individual, family and community factors on the willingness of institutional elder-care: a cross-sectional survey of the elderly in China.

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Effects of individual， family and community factors on the willingness of institutional elder-care: a cross-sectional survey of the elderly in China.

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Abstract

Objective: To investigate the effects of the willingness to live in elder-care institutions associated with individual factors, family environment and the community environment in the elderly in China.

Design: Cross-sectional survey

Setting: Heilongjiang Province, China

Participants: A total of 1003 elderly people were selected through multistage sampling in Heilongjiang Province.

Primary and secondary outcome measures: A multistage, stratified sampling design was employed. Differences in health status, family environment and community environment of the respondents were compared with the t-test and chi-squared test. Logistic regression analysis was performed to assess key determinants of willingness to live in institutions.

Results: This study showed that 45.4% of respondents were willing to live in elder-care institutions in the future. Factors influencing willingness to live in elder-care institutions were age, house ownership, living with spouse and children, disease caregivers and availability of home health care services. The elders who had no property (OR=2.37, 95% CI = 1.750–3.200, p<0.01), and those aged 80 or above (OR=2.25, 95% CI = 1.490–3.400, p<0.01) were, respectively, 2.370 times and 2.250 times more receptive to living in elder-care institutions than their control groups. However, those living with a spouse (OR=0.49, 95% CI = 0.287–0.762 ,p<0.01), living with children (OR=0.25, 95% CI = 0.158–0.402, p<0.01) or living with a spouse and children (OR=0.29, 95% CI = 0.160–0.509, p<0.01) were less willing to live in elder-care institutions.

Conclusions: These results suggest that the willingness to enter elder-care institutions is affected by individual, family environmental and community environmental factors. We should vigorously develop community-centered intensive home-based elder-care services by improving the quality and availability of home health services by expanding investment in the community.

Keywords: Chinese eldercare; institutional eldercare willingness; individual, family and community environment of the elderly; effects of the One-Child policy on the elderly

Strengths and limitations of this study

Strengths: We carried out a comprehensive study that selected factors related to individuals, family environment and community environment as potential factors which may affect the willingness to accept institutional eldercare.

The samples were selected through multistage sampling.

Limitations: We selected participants from a single province.

The small sample size in our study limits the generalizability of the findings.

We used a cross-sectional design; therefore, no causal relationships can be identified.

Introduction

The aging population has become a worldwide phenomenon, and concerns with the issue of elder care have been expanding globally. The situation of elder care has been very problematical in China, where the One-Child policy was enforced for over 30 years[1]. According to Chinese official data, by the end of 2017,158,310,000 persons were aged 65 or older, accounting for 11.4% of the total population[2]. Meanwhile, 40.63 million disabled elderly people lived in China, making up 18.3% of the aged population[3].

Chinese society's economy, social welfare and social security systems are unable to cope with the pressure of the aging population. Introduced in the 1980s, the One-Child policy, which meant that a couple can have only one child, was enforced for over 30 years. People who were born at the beginning of the One-Child policy are now the main providers of elder care for their parents. In this so-called 4:2:1 phenomenon, each young parent is usually responsible for two pairs of grandparents, besides having the duty to raise their children [4,5]. Therefore, too much pressure has been put on Chinese families. In addition, the number of elder-care institutions, the quality of elder-care workers and the services provided for the elderly all lag behind the diversified needs of the elderly population[6,7].

Obviously, it is necessary to conduct research on elder-care problems.

The Chinese government has introduced many policies and invested a large amount of money to erase the pressure on elder care, and has proposed two slogans, 'Active aging' and 'Healthy aging'[8]. Topics related to elder care have been paid much attention not only by the government, but also by researchers. The extensive literature about elder care can be divided into four categories.

First, some researchers have focused on the health and quality of life of the elderly[9,10,11]. They have found that the quality of life in the elderly population is affected by many factors, including individual, community and societal variables. Second, some studies of long-term care, which can effectively solve the pressure of social old-age care, found that most countries are ill-prepared in system or law to satisfy the demand for long-term care (LTC)[12,13]. Third, research has shown that the living arrangements of the elderly has an important influence on their mental health[14,15].

Finally, plenty of literature has focused on the factors influencing the willingness to receive elder care. Some studies have assessed the relationship between social support for the elderly and the willingness to receive elder care in China[16,17]. Another study analyzed the different factors influencing willingness to receive elder care from the perspective of inter-generational relations and social economic status[18]. This indicated that the more harmonious the inter-generational relationship, the lower the willingness of the elderly to enter an institution. Meanwhile, the higher the social economic status, the more likely the elderly are to choose institutional elder care. Some researchers have studied the influence of the community environment on the willingness to receive elder care[19,20]. One study showed that the quality of the community environment had a positive effect on the degree of

satisfaction with community elder care[21].

We believe that not only the internal characteristics of a person, such as health status, income and age, but also the external factors, such as family members and community environment, affect the willingness of the elderly to receive elder care. It is worth mentioning that China is currently implementing a policy called the 'community family physician model', which can promote the accessibility of community health management and care services for the elderly. The main duty of the family physician is to carry out health management for community residents, especially chronic disease management and health recovery for the elderly. Whether to choose institutional eldercare indicates whether old people are willing to leave their familiar environment, which can give them various kinds of support such as disease care, and physical and mental company. The influences of personal factors and external factors on the willingness to accept eldercare are not isolated. Our study included the following aspects of the elderly: individual characteristics, family environment and community environment. In view of the newly launched policy 'family physician model', which has been studied only rarely, we have taken the 'Availability of home health care' as an aspect of the study. Our research is pioneering in the study of the willingness to accept care for the elderly with regard to three aspects: the individual, family and community.

The present study aimed: (1) to describe the status quo and compare the willingness to use institutional eldercare according to individual characteristics, family environment and community environment; (2) to analyze effects of individual, family and community factors on the willingness to accept institutional elder-care.

Methods

Data and Sample

A cross-sectional survey of elderly individuals was conducted from March 1st to August 31st 2016 in Heilongjiang Province, China. First, those aged 60 years and above having the ability and being willing to answer the questions were included as our sample. Second, to make our sample as representative as possible, we employed a multistage stratified sampling design. We chose urban and rural samples, each accounting for about 50 percent. Third, three cities, Harbin, Qiqihar, and Jiamusi, were selected on the basis of their gross domestic product. Three communities and three villages were selected in each sampled city according to economic factors. In total, nine communities and nine villages were selected. In addition, in order to ensure that the elderly understood the questionnaire correctly, we used the face-to-face interview format during the investigation.

Data collection

The data were collected through face-to-face interviews using a structured questionnaire conducted by trained undergraduate and graduate students from Harbin Medical University. A total of 1200 questionnaires were distributed; 1003 (83.6%) valid questionnaires were returned.

Assessment tools

The study's instrument was a self-administered questionnaire composed of five sections. Section 1 consisted of the participants' demographic characteristics including residence, gender, age, income, house ownership and culture. Among these variables, residence was composed of *rural* and *urban*, *income was* represented by five levels: *<500, 500–999, 1000–1999, 2000–3000* and *>3000* monthly, and culture was divided into five dimensions: *no education*, *primary school*, *junior high school, senior high school* and *college degree or above.*

Section 2 measured the health status of respondents. Physical health was assessed by self-rated physical health and self-rated capacity. Higher scores indicate better health. The scores for each question ranged from 1 to 5. Psychological health status was assessed by life satisfaction and feeling of isolation.

Section 3 assessed the family environment of the respondents. Family environment included whether he/she had living children, marital status, living arrangements, disease caregiver and parent–child relationships. Living arrangements were investigated using three questions: 'Are you living with your spouse?', 'Are you living with your children?', and 'Are you living with others?'. Based on the answers, we classified living arrangements into four groups: (1) living alone, (2) living with spouse (may have others), (3) living with children (may have others), and (4) living with children and spouse (may have others). Because no participants in our sample were living with others only (not spouse or children), we ruled out this situation. Disease caregiver was divided into five groups: spouse, child, other relatives, nursing workers and themselves. The parent–child relationship was rated good, normal and bad.

Section 4 assessed the community environment of the respondents. This section included two questions: availability of community recreational facilities and availability of home health-care services. Each question's score ranged from 1 to 5, and high scores indicate high availability.

Section 5 assessed willingness to live in an institution. The variable 'Willingness to live in institution' was indicated by the question 'Which are you willing to accept out of home care and institutional care?'. The respondents were allowed to consider whether they wanted to go to an institution or stay at home for eldercare when needed.

Data analysis

The data were analyzed using the Statistical Program for the Social Sciences (SPSS) version 17.0.Descriptive analyses included frequencies and percentages for the categorical variables and means and standard deviations (SDs) for continuous variables. Differences in health status, family environment and community environment for respondents were compared with the t-test and chi-squared test. Logistic regression analysis was performed to assess key determinants of the willingness of elderly people to live in institutions. 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

Socioeconomic and demographic status of respondents

The socioeconomic and demographic characteristics of the respondents are shown in Table 1. More than half of the respondents were female (52.7%), urban (57.9%) and married (59.4%). A majority of the participants have children (95.0%) and own a house (61.3%). About half of them (52.0%) were educated to a lower level than that of junior high school. Only 31.2% of them had monthly incomes above 2000 CNY. Seventy-two percent of them were able to support themselves financially. In this survey, 51.0% of the respondents were aged between 60 and 69 years, and 27.9% were aged between 70 and 79 years. Table 1 shows that 48.5% of urban older adults and 41.0% of rural older adults preferred elder-care institutions. There were significant differences in the percentage willingness to live in elder-care institutions according to urban area ($p<0.05$), age ($p<0.01$), house ownership ($p<0.01$) and financial independence ($p<0.05$). Older adults who have their own house and

have no financial independence had lower willingness to enter eldercare institutions than those who have no house ownership. The respondents aged 80 or above had the highest willingness to enter an elder-care institution, followed by those aged 70–79 and aged 60–69 years.

Table 1 Analysis of the willingness to live in elder-care institutions according to individual characteristics of the respondents

variables		Total		willingness to live in eldercare institutions	
		n	%	n	%
Residence	urban	581	57.9	281	48.4
	rural	422	42.1	173	41.0
$\chi 2$				**5.36**	
P				**0.02**	
Sex	Male	474	47.3	215	45.4
	Female	529	52.7	239	45.2
$\chi 2$				0.00	
P				1.00	
Age in years	60-69	508	51.0	188	37.0
	70-79	280	27.9	122	43.6
	≥80	215	21.1	144	67.0
$\chi 2$				**55.21**	

P				**<0.001**	
Monthly income (RMB)	<500	314	31.3	124	39.5
	500-999	125	12.5	55	44.0
	1000-1999	251	25.0	124	49.4
	2000-3000	197	19.6	95	48.2
	>3000	116	11.6	56	48.3
χ^2				7.16	
P				0.12	
House property	yes	615	61.3	221	35.9
	no	388	38.7	233	60.1
χ^2				**55.85**	
P				**<0.001**	
Financial independence	yes	725	72.3	346	47.7
	no	278	27.7	108	38.8
χ^2				**6.39**	
P				**0.01**	
Education	No education	195	19.4	85	43.6
	Primary school	327	32.6	151	46.2
	Junior high school	288	28.7	132	45.8
	Senior high school	118	11.8	55	46.6

	College degree or above	75	7.5	31	41.3
$\chi 2$				0.92	
P				0.92	

Willingness to live in elder-care institutions according to family environment

Table 2 shows that participants who have children ($p<0.01$) and/or have a spouse ($p<0.01$) have lower willingness to live in elder-care institutions. It is worth mentioning that our results showed that children were negatively correlated with the willingness to live in an elder-care institution($\chi^2=18.2$, $p<0.01$) (odds ratio [OR]=7.52,95%confidence interval [CI]=3.310–17.120, $p<0.05$), which means that the elderly who have children were 7.52 times less willing to live in elder-care institutions than the elderly who have no child. Regarding living arrangements, older adults living alone have the strongest willingness to live in an elder-care institution, followed by those living with a spouse, living with children and living with spouse and children ($p<0.01$). The willingness to enter elder-care institutions among the elderly who were nursed by nursing workers was higher than for those who were nursed by a spouse, children and/or other relatives ($p<0.01$).

Table 2 Analysis of the willingness to live in elder-care institutions according to the family environment of the respondents

variables		Total		willingness to live in institutions	
		n	%	n	%

Children	yes	950	94.7	415	43.7
	no	53	5.3	39	73.6
χ2				**18.1**	
P				**<0.001**	
Marital status	Married	593	59.4	213	35.9
	Others	410	40.6	241	58.8
χ2				**51.1**	
P				**<0.001**	
Living arrangement	Living alone	282	28.1	193	68.4
	Living with spouse	428	42.7	165	38.6
	Living with children	147	14.7	56	38.1
	Living with spouse and children	146	14.6	40	28.1
χ2				**90.7**	
P				**<0.001**	
Disease caregiver	spouse	494	49.3	177	35.8
	Son/daughter	356	35.5	166	46.6
	Other relatives	15	1.5	7	46.7
	nursing workers	90	9.0	69	76.7
	By self	48	4.8	35	72.9
χ2				**68.7**	

P				**<0.001**	
parent-child relationship	Good	883	87.9	399	45.2
	Normal	84	8.4	37	44.0
	Bad	36	3.6	18	50.0
$\chi 2$				0.38	
p				0.83	

Willingness to live in elder-care institutions according to health status

We used self-rated physical health, life satisfaction, feeling of isolation and self-rated capacity for action to evaluate the health status of the respondents (Table 3). The mean scores for self-rated physical health and self-rated capacity for action were 3.30 and 3.54, respectively, which were slightly higher than the mid-point of 3. The life satisfaction was 5.08, which indicated high well-being among the elderly. The feeling of isolation was at a relatively low level (M=3.54, SD=0.96). Among these four variables, only self-rated capacity for action was significantly different between those preferring home care and those willing to receive institutional care: the participants preferring home care had higher self-rated capacity for action (M=3.61, SD=0.94, p=0.01).

Table 3 Analysis of the willingness to live in elder-care institutions according to the health status of the respondents

variables	Mean ± SD （n=1003）	Range of the score	Home care （n=548）	Institutional care （n=455）	t	P

self-rated physical health	3.30±0.97	1-5	3.28±1.00	3.33±0.94	0.80	0.42
life satisfaction	5.08±1.27	1-7	5.13±1.25	5.03±1.28	1.21	0.23
Feeling of isolation	1.91 ± 0.77	1-5	1.91±0.76	1.91±0.78	0.15	0.88
Self-rated capacity for action	3.54±0.96	1-5	3.61±0.94	3.45±0.98	2.59	**0.01**

Willingness to live in elder-care institutions according to community environment

The mean scores for self-assessed availability of community recreational facilities and availability of home health care services were 3.72 and 3.25, respectively (Table 4). Statistically significant differences were noted in the scores on both of these variables between those who preferred home care and those who favored institutional care; those who preferred home care reported higher scores for the availability of community recreational facilities and the availability of home health care services ($p<0.05$).

Table 4 Analysis of the willingness to live in elder-care institutions according to the community environment of the respondents

variables	Mean ± SD (n=1003)	Range of the score	Home care (n=548)	Institutional care (n=455)	t	P
Availability of community	3.72±0.74	1-5	3.76±0.74	3.67±0.74	2.00	**0.046**

recreation facility						
Availability of home health care services	3.25±0.69	1-5	3.29 ± 0.71	3.20±0.66	2.15	**0.032**

Factors influencing willingness to live in elder-care institutions

In this study, 45.4% of respondents said they were willing to live in elder-care institutions at some point in the future. Based on the results of single factor analysis, logistic regression was conducted to analyze the factors influencing the willingness to live in elder-care institutions (Table 5). Regarding the individual factors, only age in years and house ownership were predictors of the willingness to enter institutions. The elders who had no property (OR=2.37, p<0.01), and those aged 80 or above (OR=2.25, p<0.01) were, respectively, 2.370 times and 2.250 times more receptive to living in elder-care institutions than their control groups. With regarding to living arrangements, those living with a spouse (OR=0.47, p<0.01), living with children (OR=0.25, p<0.01) or living with a spouse and children (OR=0.29, p<0.01) were less willing to live in elder-care institutions than those who were living alone. These results meant that the elderly who live with a spouse were 0.468 times more willing to choose institutional elder care than those who were living alone. We also found that elders who were cared for by their children (OR=0.33, p<0.01) or cared for by their spouse (OR=0.40, p<0.01) when they were ill had much lower willingness to live in elder-care institutions than those who cared for themselves. The availability of home health care services (OR=0.78, p<0.05) was negatively associated with the willingness to live in

elder-care institutions.

Table 5 Logistic regression analysis of the factors influencing willingness to live in elder-care institutions

variables	Adjusted OR	95%CI
Residence（reference: urban）		
Rural	0.96	0.700-1.320
Age in years（reference:60-69）		
70-79	1.02	0.730-1.430
≥80	2.25**	1.490-3.400
House property（reference: yes）		
No	2.37**	1.750-3.200
Financial independence（reference: yes）		
No	0.85	0.590-1.210
Children （reference: yes）		
No	7.52**	3.310-17.120
Marital status (reference: married)		
Others	0.73	0.330-1.630
Living arrangement(reference: living alone)		
Living with spouse	0.47**	0.287-0.762
Living with children	0.25**	0.158-0.402
Living with spouse and children	0.29**	0.160-0.509
Disease caregiver (reference: By self)		
spouse	0.40**	0.180-0.903

Son/daughter	0.33**	0.158-0.684	*p
Other relatives	0.48	0.131-1.760	<0.
nursing workers	0.80	0.337-1.904	05;
Self-rated capacity for action	1.01	0.860-1.180	**p
Availability of community recreation facility	1.03	0.830-1.280	<0. 01
Availability of home health care services	0.78*	0.626-0.972	

Discussion

This cross-sectional study was conducted to explore the key factors contributing to the willingness to enter elder-care institutions. This study was a pioneering one because we took the willingness to live in elder-care institutions as the dependent variable and chose independent variables from three dimensions: individual factors, family environment and community environment.

With regard to individual factors, both the single factor analysis (Table 1) and the logistic regression (Table 5) demonstrated that age and house ownership were significantly associated with the willingness to live in an elder-care institution. People in their 80s and above had 2.250 times more willingness to live in elder-care institutions than the group aged 60–69 years. The same conclusion was drawn from another study[22]. Another study pointed out that those in advanced old age are much more likely to have elder-care needs, including physical and psychological[23]. Given that most of these needs cannot be met by family, the willingness to accept institutional eldercare rises with age. Second, when analyzing house ownership and the willingness to enter institutional elder care, we found that when the

elderly have their own house, they have a significantly lower willingness to accept institutional eldercare than those who have no property. The elderly in China traditionally intend to live the rest of their life in their own house because they regard their own houses as their roots of life. Having their own houses gives the Chinese elderly a great sense of belonging, as a study found that the sense of comfort and freedom when receiving elder care in their own houses is irreplaceable by other methods[24]. A similar conclusion was reached by other studies, which demonstrated that house ownership is highly correlated with current health status and is predictive of future mortality risk in older populations[25-26]. However, statistical significance of the impact of the independent variable residence on the dependent variable (the willingness to live in eldercare institutions) was found only with chi-squared tests (Table 1,χ^2=5.61,P $<$ 0.05) and not in logistic regression, as shown in many studies[27-28]. However, our result was similar to a previous study [29]. We assume that, as the trend of urban–rural integration advances, the difference between urban and rural areas is not strong enough to show statistically significant differences when compared with other variables such as age and house ownership.

Family environment also comprised some typical factors influencing willingness to live in elder-care institutions. This study showed that the elderly who have children were 7.52 times less willing to live in elder-care institutions than those who have no children. This meant that children were negatively correlated with the willingness to live in elder-care institution. In addition, we found that the elderly who lived alone and those who cared for themselves when they had diseases both had the highest willingness to live in elder-care institutions. Undeniably, Chinese grown children nowadays are facing great pressure because of the so-called ‘4-2-1’ family structure and the interpersonal tensions and work–family

conflict created by the advent of globalization and fierce market competition[30-31]. However, a published review indicated that adult children still endorse filial piety in contemporary Chinese society[32]. This result was consistent with many studies in which the elderly showed less willingness to live in elder-care institutions when they have children[33-34].As the well-known proverb 'raising children to ensure elder care' indicates, in Chinese traditional culture, filial piety demands that, apart from economic and living care, psychological care should also be provided for elderly parents[35]. Some previous studies have pointed out that adult children who have placed their parents in elder-care homes may be negatively regarded by society[36-37]. This study showed that the elderly who lived alone had the highest willingness to live in elder-care institutions. We assume that the elderly living alone typically lack physical and psychological assistance and care from their family, and are therefore more willing to live in elder-care institutions. Similar results were found in a study that showed that elderly people who lived alone were more willing to live in elder-care institutions, for both single males and females, when compared with those who lived with children or others[38]. First, as another study concluded, older people are more likely than any other section of the population to be living in single-person households[39]. Second, the elderly who live alone have higher scores for loneliness and worse mental health and functioning compared with those who do not live alone[40-41]. Third, a Korean study found that physical health status, self-esteem, family support and health-promoting behavior, specifically exercise and nutrition, of the elderly living with family were higher than those of the elderly living alone[42].

With an increase in age, physical health tends to deteriorate, so we included disease-caregiver in our research. Our analysis showed significant differences among five

disease caregivers: spouse, son or daughter, other relatives, nursing workers and the elderly person themselves; 86.24% of respondents were provided with disease care by their immediate family members or other relatives. This means that informal care is the main form of care for the elderly in China. A study in Europe showed that informal care is an effective substitute for long-term care as long as the needs of the elderly are met [43]. In support, in our study the lowest willingness to accept elder-care institutions was shown by the elderly cared for by their spouse. A study demonstrated that a spouse can give the elder physical and, especially, mental care, thus their willingness to live in elder-care institutions was lower than that of those that have no spouse[44]. In the multiple logistic regression analysis, we found that when the elderly were provided with disease care by their spouse or children, their willingness to live in elder-care institutions decreased. When the elderly have no children or live alone, they cannot obtain informal or formal care from family as desired, so they have to seek care from elder-care institutions. Therefore, the primary culture of filial piety, the conditions of living and the presence of disease all affect the willingness of the elderly to live in elder-care institutions.

Last, but not least, we paid attention to the community environment. We found that that availability of home health-care services negatively affected the willingness to live in elder-care institutions, in agreement with previous studies [45-46]. In China, home health-care services are mostly provided by institutions called elder-care community centers, such as Community Health Service centers. One study showed that these centers could increase willingness to accept home elder care[47]. The research pointed out that high availability of home health services in the community provided the elderly with basic nursing services to meet their fundamental needs for care, and therefore lowered the

willingness to accept institutional elder care[48]. In our study, the mean availability of home health care services was 3.25, which is much higher than the average level because of adoption of the model of community family physician. This new Chinese policy, the 'community family physician model', has aroused heated discussion among all types of people. Some researchers have found that this policy is associated with problems such as unclear responsibilities, high medical risk and lack of a security system[49-50]. However, some found that this policy did improve the convenience and success rate of medical treatment, thus improving the level of health of the signatories[51-52]. It is no doubt that home health-care services have become more conveniently available for elderly residents.

However, several limitations in our study should be discussed. First, we used a cross-sectional design, in which data were collected at only one point in time. This may have caused information bias, including mainly recall bias and measurement bias. In order to reduce measurement bias, the investigators underwent rigorous training to improve their survey skills and our respondents were given enough time to recall. Second, our participants were from a single province and, therefore, we cannot generalize the results to assume that they apply to all of the elderly in China. In order to make our study more convincing, we will introduce more widely-used measuring tools including ADL into our research and conduct the same research nationwide in future.

Conclusion

At present, in China, the enormous pressure of elder care has shifted increasingly from family to society, and it is difficult for institutions to take on the heavy burden of care. However, the tradition of filial piety in Chinese culture is restricting the willingness of the

elderly to receive institutional elder care. Therefore, we should vigorously develop community-centered intensive home-based elder-care services by improving the quality and availability of home health services by expanding investment in the community. Only in this way can we meet the need for both formal and informal elder care and the need to cater to the Chinese traditional morality.

Ethics approval and consent to participate

Ethics approval for this study was granted by the Institutional Research Board of Harbin Medical University. The data were collected anonymously. Respondents were assured that participation in this survey was voluntary, with the completion of the questionnaire being taken as consent to participate.

Availability of data and materials

Data will not be shared because we promised not to disclose their information when respondents signed the informed consent form.

Competing interests

The authors declare that they have no competing interests.

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Contributors

LL conceived and designed the experiments; ZW WY performed the experiments; XS, XZ analyzed the data; SH, YX, LL contributed reagents/materials/analysis tools; ZW wrote the paper. ZW, WY, XS provided technical support. LL critically revised the paper. All authors checked and proof-read the final version of manuscript.

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STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Line1-2, P1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	Line21-57, P1-3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Line58-97, P3-5
Objectives	3	State specific objectives, including any prespecified hypotheses	Line98-117, P5
Methods			
Study design	4	Present key elements of study design early in the paper	
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	Line119-129,P6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Line135-165, P6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	Line130-134, P6
Bias	9	Describe any efforts to address potential sources of bias	*Line350-354, P21*

Study size	10	Explain how the study size was arrived at	
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	Line167-173, P7-8
		(*b*) Describe any methods used to examine subgroups and interactions	
		(*c*) Explain how missing data were addressed	
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	Line121-128, P6
		(*e*) Describe any sensitivity analyses	
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Line176-195, P8-9
		(b) Give reasons for non-participation at each stage	
		(c) Consider use of a flow diagram	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Line178-192,P8-9
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	Line197-232, P11-15
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	
		(*b*) Report category boundaries when continuous variables were categorized	

		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	
Discussion			
Key results	18	Summarise key results with reference to study objectives	Line235-252, P15-16
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	Line350-358, P21
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Line257-349, P17-21
Generalisability	21	Discuss the generalisability (external validity) of the study results	Line360-368, P21-22
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Line379-381, P22

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.