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Utilization Willingness of Institutional Care by the Elderly: A Comparative Study between Empty-nesters and Non-empty-nesters in Shandong, China

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Abstract

Introduction: Institutional care has been strongly promoted in China to meet the seniors' long-term care needs. Empty-nest elderly, in comparison with their counterparts, have less social support and caring networks. This study aims to compare the utilization willingness of institutional care and its predictors between empty-nest and non-empty-nest seniors.

Methods: A total of 3923 seniors were included in the analysis. Binary logistic regression models were used to understand the association between living arrangements of the elderly households and willingness for institutional care, and also to identify the predictors of the utilization willingness for institutional care among empty-nesters and non-empty-nesters.

Results: Our study found that about 8.5% of the seniors had willingness for institutional care in Shandong, China. Empty-nest singles (OR=6.046; 95CI 3.337-10.917) and empty-nest couples (OR=1.382; 95CI 1.019-1.875) were found to be more willing for institutional care. Our results also showed that residence was a key determinant for institutionalization willingness in empty-nest and non-empty-nest elderly. Among empty-nest singles, psychological stress was a positive determinant for institutional care. Factors including education level, relationship with adult children, household income and per capita living space were determinants for empty-nest couples' willingness for institutionalization. Age, number of children self-reported health status were found to be associated] factors for willingness among non-empty nester.

Conclusions: Government should pay more attention to institutional care in rural areas where elder care is still a gap compared with the urban areas. Targeted policies should be made for different types of seniors to offer appropriate institutional care.

Keywords: Institutional care, Willingness, Elderly, Empty-nest, Determinants

Strengths and limitations of this study

- A large sample of 3,923 participants based on a community survey provided a real profile of willingness for institutional care in Chinese seniors .
- Living arrangements of the households with seniors was found to be associated with the willingness for institutional care in the elderly in China, and the empty-nesters were more willing for institutional care than their counterparts.
- There might be a possible recall bias as for most questionnaire data, which is a limitation of this study.
- The cross-sectional study design precludes any causal interpretation.

Introduction

Since China entered the aging society in 1999, the amount of aging population in China has ranked the first in the world (Aging, 2006). The number of Chinese people aged 60 years and above had reached 212.4 million by 2014, which accounted for 15.5% of the total population (China, 2015). It's estimated that China, with an amount of 98.3 million old people aged 80 or over in 2050, will still be one of those countries which have the greatest numbers of oldest-old (Nations, 2011). With the rapid aging of the Chinese population, the number of empty-nesters is on the rise as well (Liu and Guo, 2008). Empty-nest seniors refer to those seniors who are childless or whose children have already left home (Zhou et al., 2015). With the increasing amount of the elderly empty-nesters, long-term care for the elderly has been emerging as a social problem.

Traditionally, taking care of the elderly by adult children in the family was a basic norm in the Confucian doctrine (Liu and Sun, 2015). In recent years, increased geographic mobility and reduced family size due to one-child policy have made more adult children unavailable for elder care (Zhan et al., 2006b).More women in urban China are gaining higher education and becoming more work-oriented which indicate that gender roles in elder care are changing and the availability of elder care by adult children has become questionable (Zhan and Montgomery, 2003).On the other hand, with Chinese baby boomers approaching retirement age, informal care such as familial care is unlikely to meet the needs of all seniors (Zhan et al., 2006a). One study indicated that nearly half of seniors, who needed some level of assistance in their activities of daily living or instrumental activities of daily living, actually lived alone instead of living with their adult children (Zhan and Montgomery, 2003). Another study found that many seniors expressed preference to live alone or with their spouse, if housing and health status permit (Xu, 1994). Consequently, institutional care has been strongly promoted to meet older adults' long-term care needs (Chou, 2010).

After the welfare reform in 1990s, former government-sponsored nursing homes have become decentralized, and a great amount of private nursing homes is on the rise, mostly emerging in large cities (Zhan et al., 2006b). Previous studies have identified the empty-nest elderly's attitudes towards institutional care and its predictors. One

study found that the seniors' living arrangements prior to elder home placement and their assessment of the cost involved for such care were related to seniors' willingness to stay in elder homes (Guan et al., 2007). Some other studies found that factors including gender, educational attainment, occupation, health insurance, number of children were associated with willing for institutional care among the empty-nest seniors(Chen 2015; Xie et al., 2010; Zhu et al., 2017). However, few of such studies were published in international journals. Moreover, the studies described earlier have some systematic weaknesses. First, almost all of the empirical studies were based on small sample sizes (e.g.,n=523 in the case of Xie et al.; n=570 in the case of Chen et al.; n=1000 in the case of Zhu et al.)(Chen 2015; Xie et al., 2010; Zhu et al., 2017). Second, in many studies it is not clear who is serving as the reference group. In other words, the assciated factors were only explored in the empty-nest seniors(Chen 2015; Xie et al., 2010; Zhu et al., 2017).

To remedy this situation, the present study aims to compare utilization willingness of institutional care between empty-nest and non-empty-nest seniors in China. To do so, we have following specific objectives. First, we will compare the willingness for institutional care between empty-nest and non-empty nest elderly. Second, we will identify the associated factors for institutional care among the empty-nest and non-empty-nest elderly.

Methods

Settings and participants

This study was conducted in Shandong, a province where the elderly aged 65 or over accounted for 11.6% of its total population (Statistics, 2015).In this study, a 3-stage cluster sampling was used to select participants. Firstly, all districts and counties in Shandong province were stratified into three groups on the ground of GDP per capita (2011) separately. Secondly, we chose one district and one county from each group. Thus, three urban districts (Huaiyin, Dongchangfu and Zhangdian) and three rural counties (Qufu, Chiping and Leling) were chosen as the study sites. Similarly, we then chose three sub-districts and three townships in each sampling district or county on the basis of GDP per capita. Lastly, three communities and three villages were selected from each chosen sub-district and township. Therefore, we

selected 27 urban communities and 27 rural villages in total. A total of 3923 older people were included in the analysis.

Data collection

Data were collected from November 2011 to January 2012 by using a house-to-house interview. Face-to-face interviews were conducted among the elderly using a structured questionnaire by trained master students from Shandong University School of Public Health. To ensure quality, completed questionnaires were carefully checked by quality supervisors at the end of each day. The questionnaire included demographic characteristics, living arrangements of the households, relationship with children, marital status, economic status, mental health condition and willingness for institutional care.

Variables and measures

The independent variable was seniors' willingness for institutionalization which was evaluated on the ground of interviewees' answers to 'which endowment way are you willing for?' If the response was 'institutional care', the willingness for institutional care could be coded as 'yes'. On the contrary, if the answer was 'home-based care', 'community endowment' and 'others', willingness for institutional care could be coded as 'no'.

Socio-demographic and psychological characteristics such as gender, age, education, past occupation (pre-retirement occupation),, marital status, number of children, relationship with children, residence, self-reported health status, psychological stress, ADL (activities of daily living), NCDs (non-communicable diseases) and household income were included in this study.

The age of the participants was categorized as follows: 60-, 70- and 80+ years. Other demographic characteristics were classified as follows: gender (male vs. female), education (illiteracy, primary school and junior school or above), past occupation (farmer vs. others), marital status (single vs. couple), number of children (0-3 vs. >3), relationship with children (good vs. bad), residence (urban vs. rural), self-reported health status (good vs. normal or poor), ADL (Ⅰ, Ⅱ and Ⅲ), NCDs in the past six months (yes vs. no), and household income (Q1, Q2, Q3 and Q4). Quartile 1 (Q1) is the poorest and Quartile 4 (Q4) is the richest.

Living arrangement of elderly households could be classified into non-empty nester, empty-nest single and empty-nest couple. Non-empty-nester refers to those seniors who live with their children while empty-nest single and empty-nest couple refers to those seniors who live alone with a spouse and without a spouse respectively more than six months(Zhou et al., 2012). Per-capita living space is a measure that takes total living space (square meter) and divides it by the number of constant people(who live in the house more than half a year) in a house.

Psychological stress was evaluated on the ground of 10-item Kessler Scale (K10). K10 is an effective tool to assess people's psychological status designed by scholars such as Kessler, Mroczek and so on (Kessler et al., 2002). The Chinese-language version of K10 has been verified to be of good reliability and validity (Zhou et al., 2008).

ADL instrument was consisted of Physical Self-maintenance Scale and Instrumental Activities of Daily Living Scale designed by Lawton and Brody (Lawton and Brody, 1969). ADL Scale was used to evaluate people's simple and basic ability to practice one's normal life independently. The reliability and validity of ADL instrument in Chinese-language version was demonstrated to be good (Feng, 2013). Scores of ADL can be divided into 3 levels, the higher level represents more severe dysfunction. Level 1, 2 and 3 means mild dysfunction, moderate dysfunction and severe dysfunction respectively (Mahoney and Barthel, 1965).

Statistical Analysis

The data was double entered and checked using EpiData 6.04. Statistical analyses were performed using SPSS 21.0. For continuous variables, p value was calculated using Student's t test or F-test; for categorical variables, p value was calculated using chi-square test. Two binary logistic regression models were employed to assess the association between living arrangements of elderly households and willingness of institutional care. All reported CIs were calculated at the 95% level. Statistical significance was set at the 5% level.

Patient and Public Involvement statement

Ethical approval was obtained from The Ethical Committee of Shandong University School of Public Health. The investigation was performed after the

acquisition of written informed consents of all participants.

Results

Table 1 showed basic information of the 3923 seniors. About 8.5% seniors had willingness for institutional care. Non-empty-nesters accounted for 40.7% of the participants, empty-nest singles accounted for 10.0%, and empty-nest couples accounted for 49.3%. Generally speaking, the majority of the elderly were female (53.6%), at the ages of 60 and 69 (65.5%), illiterate or semiliterate (44.5%), farmers (64.2%), couple (79.1%), having 0 to 3 children (67.4%), having good or normal relationship with children (92.8%), rural (54.9%), having good self-reported health status (52.1%), having mild dysfunction (72.7%), and having NCDs (65.9%). The elderly's K10 score was 15.8±6.0 and their per-capita living space was 33.9±23.1 square meters.

We presented our results in two models to understand the association between living arrangements of elderly households and willingness for institutional care. Model 1 showed that institutionalization willingness was higher in empty-nest singles (OR=2.759; 95CI 1.974-3.857) and empty-nest couples (OR=1.340; 95CI 1.038-1.729) than in non-empty-nesters. When other variables were controlled, willingness for institutionalization was still higher among empty-nest singles (OR=6.046; 95CI 3.337-10.917) and empty-nest couples (OR=1.382; 95CI 1.019-1.875) than in non-empty-nesters (Table 2). Figure 1 showed that in each of the three subgroups with different household living arrangements, ,urban seniors' willingness to use institutional care was statistically higher than rural seniors'.

Table 3 showed the factors assoicated with willingness for institutional care among empty-nest singles. Univariate analysis indicated that empty-nest singles who were from rural areas (p=0.000) had lower willingness for institutional care. Empty-nest singles who had greater psychological stress (p=0.050) had higher willingness for institutional care. Multi-logistic analysis also showed that the two factors were associated with willingness for institutional care.

As shown in Table 4, univariate analysis showed that those empty-nest couples who had higher education level, who were not farmers (p=0.000), who had normal relationship with children (p=0.013), who had higher household income were more

willing for institutional care. Those empty-nest couples who had more than 3 children (p=0.040), who lived in rural areas (p=0.000), who had severe dysfunction (p=0.003), who had more per-capita living space (p=0.019) were less willing for institutional care. Multi-logistic regression indicated that factors including education level ,relationship with children, household income,residence were assoicated with willingness for institutional care.

Likewise, for those non-empty-nest seniors, multi-logistic regression model found that those with younger age, those who had less children, those who were from urban areas, and those who had normal or poor self-rated health status preferred to use institution (See Table 5).

Discussion

Our study found that 8.5% of the seniors had willingness for institutional care. This was lower than the that found among Korean American elders (45%) with a similar age (Jang et al., 2008). This was lower than the reported rates of 20% in urban area, 17% in rural area in the elderly in China (Chou, 2010), and 16.7% in a study of the seniors aged 65 or above in Taiwan, China (Chung et al., 2008). It was also lower than the 9.69% found in older population in Zhejiang, China (Jiang and Si, 2006), and 44.8% found in a study in the elderly with a similar age in Chengdu, China (Deng et al., 2003). Compared with above mentioned sites, Shandong is rather a conservative province which is deeply affected by Confucianism. The culture of filial piety is profoundly rooted in Shandong residents' mind. This might be primary cause of the variation between our study and the previous studies quoted above.

Our results showed that living arrangement of the households was associated with the elderly's willingness for institutional care. The analysis made it clear that empty-nest singles and empty-nest couples were more willing for institutional care than non-empty-nesters. This finding was consistent with another study which found that older adults who had no spouse or children were more likely to move into nursing homes than their counterparts (Grundy and Jitlal, 2007; Zhan et al., 2006b). Due to lack of care from adult children, empty-nest seniors are facing more endowment risks. Empty-nest elderly had poorer self-rated health, higher prevalence of two-week illness and NCDs, which indicated that they had poorer health status than non-empty-nest

elderly (Zhou et al., 2015). It's also found that empty-nest seniors, in comparison with non-empty nest seniors, had higher level of loneliness (Liu and Guo, 2007). The high physical and mental health service needs might be the reason why empty-nest seniors are more willing for institutional care which can provide professional health care.

Consistent with previous studies, our results also showed that residence was a key predictor for institutionalization willingness in all three types of elderly households (Nie et al., 2015). Urban seniors had statistically higher willingness for institutional care than rural seniors across all three types of elderly household. Compared with rural seniors, urban seniors were less conservative. Rural seniors had lower income, poorer social welfare condition than urban seniors. Further, the supply of institutional care was relatively deficient in rural areas. These differences between rural and urban areas might explain why rural seniors were less willing for institutional care. This finding was helpful for the policy-makers to allocate differentially the institutional care resources in urban and rural China.

Among empty-nest singles, psychological stress was a positive determinant for institutional care which was in accordance with previous studies (Branch and Jette, 1982). To avoid excessive reliance on family members which may result in tensions in family, when seniors had psychological stress, they would rather choose institutional care (Tao and Cong, 2014). This might be associated with empty-nest singles' attitudes of self-reliance.

Similar with previous studies, empty-nest seniors who had normal relationship with children were more willing for institutional care (Chou, 2010). Having good relationship with children represents more financial assistance and spiritual comfort from children. When seniors were in poor relationship with children, they usually relied less on their adult children which may lead to more willingness for institutional care. Empty-nest couples with higher household income were more likely to prefer institutional care which is inconsistent with previous studies in Finland (Einiö, 2010). In Finland, most long-term institutional care is publicly provided in nursing homes and health centers, and user charges are related to disposable income, up to maximum of 80 percent (Nihtilä and Martikainen, 2007). The high-income elderly and their families may therefore have an economic incentive to avoid long-term institutional care if the absolute level of charges would be very high. In China, most institutional

care was provided by private institutions and the charges for different services are fixed so that higher income seniors in China won't have that financial concerns compared with Finland seniors. It was vital to develop pro-poor institutional care policies for those lower-income empty-nest seniors with high willingness for institutional care. We also found that empty-nest couples with more per capita living space were less willing for institutional care. Per capita living space actually could be a representative of wealth. Seniors with higher per capita living space might be richer, given the circumstance of China's rapidly growing housing prices. This might explain why empty-nest couples with more per capita living space were more willing for institutional care. Further, empty-nest couples with education level of junior school or above were more willing for institutional care which was consistent with previous studies (Nie et al., 2015).

It's found that aged 70 and 79, having more than 3 children and normal self-reported health status were risk factors for non-empty nester. Those who aged 70 and 79 had less preference for institutionalization which was inconsistent with one study in Hong Kong (Woo et al., 1994) and other capitalist countries (Wingard et al., 1987) where the likelihood of elderly living in institutional care increased with age. Hong Kong and other capitalist countries are more developed and open than Shandong which makes those seniors more open-minded about institutional care. Different value concepts about institutional care might explain why those seniors were more willing for institutional care compared with Shandong seniors. Those non-empty seniors who had more than 3 children were less willing for institutionalization. More children usually means more financial and physical assistance (Zhan and Montgomery, 2003), so it might reduce elders' needs for institutional care.

This study has a large size of the sample (nearly 4000), which is much larger than that used in most of the similar studies. This give the study a high degree of statistical power. This study has some limitations. Firstly, our study has a cross-sectional design and the result could not be interpreted as cause and effect. Secondly, all data were based on self-reported measures which could lead to recall biases. Thirdly, even those we have included some variables of social support in this study (e.g., living arrangements of the elderly households, number of the children and relationship with children) , we have not yet used a scale to measure social support of the seniors, which would be remedied in the future study.

Conclusion

Our study suggested that living arrangements of the households with seniors was associated with the willingness for institutional care of the elderly in China, and the empty-nesters were more willing for institutional care than their counterparts. Our results also showed that residence was a key associated factor for institutionalization willingness in all three types of elderly households. Government should pay more attention to institutional care in rural areas where elder care is still a gap compared with urban areas. Furthermore, we also identified some other associated factors for institutional care willingness among each type of the elderly households. Targeting policies should be developed to offer appropriate institutional care for different types of the seniors.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Chengchao Zhou, Yangyang Qian, and Wen Qin conceived the idea, Chengchao Zhou implemented the field study. Chengchao Zhou, Yangyang Qian, Dandan Ge, Li Zhang participated in the statistical analysis and interpretation of the results. Yangyang Qian drafted the manuscript. Chengchao Zhou, Wen Qin, and Long Sun gave many valuable comments on the draft and also polished it. All authors read and approved the final manuscript.

Data sharing

No additional data available.

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References:

Aging, C.N.C.o., 2006. China stepped into aging society in 1999, and the number of the elderly ranks in the first in the world.

Branch, L.G., Jette, A.M., 1982. A Prospective Study of Long-Term Care Institutionalization among the Aged. American Journal of Public Health 72, 1373-1379.

Chen J,2015. Willingness for institutional care and its influencing factors in the empty-nest seniors: An empirical study in Suzhou city, China.Modern Preventive Medicine 142(9):1660-2 (in Chinese)
China, N.B.o.S.o., 2015. Population map of China's economy, and a rapidly aging population in society.

Chou, R.J.-A., 2010. Willingness to live in eldercare institutions among older adults in urban and rural China: a nationwide study. Ageing and Society 30, 583-608.

Chung, M.-H., Hsu, N., Wang, Y.-C., Lin, H.-C., Huang, Y.-L., Amidon, R.L., Kao, S., 2008. Factors Affecting the Long-Term Care Preferences of the Elderly in Taiwan. Geriatric Nursing 29, 293-301.

Deng, Y., Li, N., Liu, C., Yang, W., Wu, X., Wang, Y., 2003. Laonianren yanglao moushi xienzhe de yinxiang yinshu yianjiu [Factors affecting older adults' choices in types of eldercare] (in Chinese). China Journal of Public Health 19, 731-732.

Einiö, E.K., 2010. Determinants of Instituional Care at Older Ages in Finland. The Population Reseach Institute.

Feng, J., 2013. Daily Activities of Living Scale's Application Value in Patients In Respiratory Medicine (in Chinese). Hebei Medical Journal 35, 3346-3348.

Grundy, E., Jitlal, M., 2007. Socio-demographic variations in moves to institutional care 1991-2001: a record linkage study from England and Wales. Age and Ageing 36, 424-430.

Guan, X., Zhan, H.J., Liu, G., 2007. Institutional and Individual Autonomy: Investigating Predictors of Attitudes Toward Institutional Care in China. The International Journal of Aging and Human Development 64, 83-107.

Jang, Y., Kim, G., Chiriboga, D.A., Cho, S., 2008. Willingness to Use a Nursing Home: A Study of Korean American Elders. Journal of Applied Gerontology the Official Journal of the Southern Gerontological Society 27, 110-117.

Jiang, Y.-x., Si, W., 2006. Analysis of the factors influencing on elders' preferences for social care : empirical evidence from Zhejiang Province (in Chinese). Population & Economics, 8-12.

Kessler, R.C., Andrews, G., Colpe, L.J., Hiripi, E., Mroczek, D.K., T.Normand, S.-L., Walters, E.E., Zaslavsky, A.M., 2002. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. Psychological Medicine 32, 959-976.

Lawton, M.P., Brody, E.M., 1969. Assessment of Older People: Self-Maintaining and Instrumental Activities of Daily Living. Gerontologist 9, 179-186.

Liu, L., Guo, Q., 2007. Loneliness and Health-Related Quality of Life for the Empty Nest Elderly in the Rural Area of a Mountainous County in China. Quality of Life Research 16, 1275-1280.

Liu, L., Guo, Q., 2008. Life Satisfaction in a Sample of Empty-Nest Elderly: A Survey in the Rural Area of

a Mountainous County in China. Quality of Life Research 17, 823-830.

Liu, T., Sun, L., 2015. An apocalyptic vision of ageing in China: Old age care for the largest elderly population in the world. Zeitschrift für Gerontologie und Geriatrie 48, 354-364.

Nations, U., 2011. World Population Prospects The 2010 Revision, p. 9.

Mahoney FI, Barthel DW, 1965. Functional evaluation: the Barthel Index. Md State Med J. Feb;14:61-5.

Nie, A., Cao, F., Shao, D., 2015. Endowment and Living Willingness and Its Influence Factors of the Elderly: Based on CSS 2011. Chinese Public Administration.

Nihtilä, E., Martikainen, P., 2007. Household Income and Other Socio-Economic Determinants of Long-Term Institutional Care among Older Adults in Finland. Population Studies 61, 299-314.

Statistics, S.P.B.o., 2015. Shandong Statistic Year Book.

Tao, T., Cong, C., 2014. An Analysis of Influencing Factors on Elder's Preference for Patterns of Old-age Support: Some Empirical Evidence from Beijing Xicheng District (in Chinese). Population & Economics, 15-22.

Wingard, D.L., Jones, D.W., Kaplan, R.M., 1987. Instituional Care Utilization by the Elderly: A Critical Review. The Geontologicla Society of American 27, 156-163.

Woo, J., Ho, S.C., Lau, J., Yuen, Y.K., 1994. Age and marital status are major factors associated with institutionalisation in elderly Hong Kong Chinese. Journal of Epidemiology and Community Health 48, 306-309.

Xie X, Chen L, Peng Y, Zhao S, Fan S, 2010. Population and Development 16 (2):67-75 (in Chinese)
Xu, Q., 1994. Status quo and problems of old age support by youth and adult within the family (in Chinese). Sociological Research, 80-84.

Zhan, H.J., Liu, G., Guan, X., 2006a. Willingness and availability: Explaining new attitudes toward institutional elder care among Chinese elderly parents and their adult children. Journal of Aging Studies 20, 279-290.

Zhan, H.J., Liu, G., Guan, X., Bai, H.-g., 2006b. Recent Developments in Institutional Elder Care in China: Changing Concepts and Attitudes. Journal of Aging & Social Policy 18, 85-108.

Zhan, H.J., Montgomery, R.J.V., 2003. Gender And Elder Care In ChinaThe Influence of Filial Piety and Structural Constraints. Gender & Society 17, 209-229.

Zhou, C., Chu, J., Wang, T., Peng, Q., He, J., Zheng, W., Liu, D., Wang, X., Ma, H., Xu, L., 2008. Reliability and Validity of 10-item Kessler Scale (K10) Chinese Version in Evaluation of Mental Health Status of Chinese Population (in Chinese). Chinese Journal of Clinical Psychology 16, 627-629.

Zhou C, Chu J, Liu D, Zheng W, Guo X, Xu L, 2012. Comparison of health need and utilization between empty-nest and non-empty-nest aging population in urban communities: A sample survey based on Jinan city. Chinese Journal of Health Policy,05 (2) :24-29(in Chinese)

Zhou, C., Ji, C., Chu, J., Medina, A., Li, C., Jiang, S., Zheng, W., Liu, J., Rozelle, S., 2015. Non-use of health care service among empty-nest elderly in Shandong, China: a cross-sectional study. BMC Health Services Research 15, 1-10.

Zhu A, Liu Q, Cao C, Zhu J, Li J, Qiu X, et al., 2017. Willingness for institutional care and its influencing factors among the empty-nest seniors in Hangzhou, China. Preventive Medicine, 29(7):665-9 (in Chinese)

Table 1 Socio-demographic characteristics of the elderly in Shandong, China (n=3923)

Characteristics	Total n (%)	Empty-nest single n (%)	Empty-nest couple n (%)	Non-empty-nest n (%)	χ^2/F	p
N	3923(100.0)	391(10.0)	1934(49.3)	1598(40.7)		
Gender					43.525	**0.000**
Male	1821(46.4)	132(33.8)	983(50.8)	706(44.2)		
Female	2102(53.6)	259(66.2)	951(49.2)	892(55.8)		
Age					145.042	**0.000**
60-	2568(65.5)	162(41.4)	1257(65.0)	1149(71.9)		
70-	1122(28.6)	183(46.8)	588(30.4)	351(22.0)		
80-	233(5.9)	46(11.8)	89(4.6)	98(6.1)		
Education					84.222	**0.000**
Illiteracy or semiliterate	1744(44.5)	240(61.4)	744(38.5)	760(47.6)		
Primary school	1171(29.8)	96(24.6)	633(32.7)	442(27.7)		
Junior school or above	1008(25.7)	55(14.1)	557(28.8)	396(24.8)		
Past occupation					34.103	**0.000**

Farmer	2519(64.2)	278(71.1)	1156(59.8)	1085(67.9)		
Others	1404(35.8)	113(28.9)	778(40.2)	513(32.1)		
Marital Status					2024.826	**0.000**
Single [a]	820(20.9)	391(100.0)	0(0.0)	429(26.8)		
Couple	3103(79.1)	0(0.0)	1934(100.0)	1169(73.2)		
Number of children					42.968	**0.000**
0-3	2643(67.4)	212(54.2)	1290(66.7)	1141(71.4)		
>3	1280(32.6)	179(45.8)	644(33.3)	457(28.6)		
Relationship with children					44.656	**0.000**
Good or normal	3639(92.8)	332(84.9)	1794(92.8)	1513(94.7)		
Poor	284(7.2)	59(15.1)	140(7.2)	85(5.3)		
Residence					150.403	**0.000**
Urban	1768(45.1)	155(39.6)	912(47.2)	701(43.9)		
Rural	2155(54.9)	236(60.4)	1022(52.8)	897(56.1)		
Self-reported health status					28.629	**0.000**
Good	2044(52.1)	173(44.2)	962(49.7)	909(56.9)		

Normal or poor	1879(47.9)	218(55.8)	972(50.3)	689(43.1)		
Psychological stress	15.8±6.0	17.3±7.2	15.6±5.7	15.6±5.9	1.743	**0.004**
ADL					75.403	**0.000**
I	2853(72.7)	217(55.5)	1403(72.5)	1233(77.2)		
II	631(16.1)	98(25.1)	313(16.2)	220(13.8)		
III	439(11.2)	76(19.4)	218(11.3)	145(9.1)		
NCD					26.274	**0.000**
Yes	2586(65.9)	296(75.7)	1293(66.9)	997(62.4)		
No	1337(34.1)	95(24.3)	641(33.1)	601(37.6)		
Household income					371.563	**0.000**
Q1 [b]	996(25.4)	221(56.5)	537(27.8)	238(14.9)		
Q2	1001(25.5)	81(20.7)	551(28.5)	369(23.1)		
Q3	965(24.6)	69(17.6)	414(21.4)	482(30.2)		
Q4	961(24.5)	20(5.1)	432(22.3)	509(31.9)		
Per-capita living space	33.9±23.1	53.0±42.6	36.9±20.0	25.4±14.6	7.255	**0.000**

[a] Single includes those who are unmarried(1.7%), divorced(0.3%), widowed(18.6%), separated(0.3%).

[b] Quartile 1 (Q1) is the poorest and Quartile 4 (Q4) is the richest.

Table 2 Association of institutionalization and household composition in Shandong, China

Characteristics	Model 1 (No covariates)		Model 2 (Covariates)	
	OR (95%CI)	p	OR (95%CI)	p
Household composition				
Non-empty-nest	1.0	**0.000**	1.0	**0.000**
Empty-nest single	2.759(1.974-3.857)	**0.000**	6.036(3.337-10.917)	**0.000**
Empty-nest couple	1.340(1.038-1.729)	**0.024**	1.382(1.019-1.875)	**0.038**
Gender				
Male			1.0	
Female			1.014(0.783-1.312)	0.919
Age				
60-			1.0	0.663
70-			0.881(0.657-1.183)	0.400
80-			1.022(0.561-1.864)	0.942
Education				
Illiteracy or semiliterate			1.0	0.047

Primary school	1.065(0.771-1.470)	0.702
Junior school or above	1.481(1.045-2.097)	0.027
Past occupation		
Farmer	1.0	
Others	0.915(0.659-1.269)	0.594
Marital Status		
Single [a]	1.0	
Couple	1.336(0.773-2.308)	0.300
Number of children		
0-3	1.0	
>3	0.679(0.503-0.916)	0.011
Relationship with children		
Good or normal	1.0	
Poor	2.418(1.649-3.546)	0.000
Residence		
Urban	1.0	

Rural	0.236(0.170-0.329)	0.000
Self-reported health status		
Good	1.0	
Normal or poor	1.115(0.857-1.452)	0.418
Psychological stress	1.005(0.984-1.027)	0.635
ADL		
Ⅰ	1.0	0.349
Ⅱ	1.028(0.731-1.447)	0.872
Ⅲ	0.707(0.431-1.162)	0.172
NCD		
Yes	1.0	
No	1.002(0.755-1.330)	0.991
Household income		
Q1 [b]	1.0	0.327
Q2	1.136(0.760-1.699)	0.534
Q3	1.197(0.791-1.810)	0.396

Q4			1.475(0.949-2.292)	0.084
Per-capita living space			0.992(0.986-0.999)	0.024
Constant	0.070	0.000	0.078	0.000
R squared		0.019		0.141
Observations	3923			

[a] Single includes those who are unmarried(1.7%), divorced(0.3%), widowed(18.6%), separated(0.3%).

[b] Quartile 1 (Q1) is the poorest and Quartile 4 (Q4) is the richest.

Table 3 Factors associated with willingness of institutional care among old empty-nest single in Shandong, China (n=391)

Characteristics	Willingness for institutionalization		OR_c (95%CI)	p	OR_a (95%CI)	p
	Yes (%)	No (%)				
n=391	63(16.1)	328(83.9)				
Gender						NA
Male	21(15.9)	111(84.1)	1.0			
Female	42(16.2)	217(83.8)	1.023(0.578-1.812)	0.938		
Age						NA
60-	27(16.7)	135(83.3)	1.0	0.708		
70-	27(14.8)	156(85.2)	0.865(0.484-1.547)	0.626		
80-	9(19.6)	37(80.4)	1.216(0.526-2.810)	0.647		
Education						NA
Illiteracy or semiliterate	38(15.8)	202(84.2)	1.0			
Primary school	17(17.7)	79(82.3)	1.144(0.610-2.144)	0.675		
Junior school or above	8(14.5)	47(85.5)	0.905(0.396-2.066)	0.812		
Past occupation						NA

Farmer	40(14.4)	238(85.6)	1.0			
Others	23(20.4)	90(79.6)	1.521(0.862-2.682)	0.148		
Number of children						NA
0-3	38(17.9)	174(82.1)	1.0			
>3	25(14.0)	154(86.0)	0.743(0.429-1.288)	0.290		
Relationship with children						NA
Good or normal	49(14.8)	283(85.2)	1.0			
Poor	14(23.7)	45(76.3)	1.797(0.918-3.519)	0.087		
Residence						
Urban	38(24.5)	117(75.5)	1.0		1.0	
Rural	25(10.6)	211(89.4)	0.365(0.210-0.634)	**0.000**	0.304(0.161-0.572)	**0.000**
Self-reported health status						NA
Good	24(13.9)	149(86.1)	1.0			
Normal or poor	39(17.9)	179(82.1)	1.353(0.778-2.352)	0.284		
Psychological stress	63(16.1)	328(83.9)	1.036(1.000-1.073)	**0.050**	1.045(1.007-1.085)	**0.019**
ADL						NA

Ⅰ	32(14.7)	185(85.3)	1.0			
Ⅱ	18(18.4)	80(81.6)	1.301(0.690-2.453)	0.416		
Ⅲ	13(17.1)	63(82.9)	1.193(0.589-2.415)	0.624		
NCD						NA
Yes	50(16.9)	246(83.1)	1.0			
No	13(13.7)	82(86.3)	0.780(0.403-1.508)	0.460		
Household income						
Q1	29(13.1)	192(86.9)	1.0		1.0	
Q2	19(23.5)	62(76.5)	2.209(1.064-3.869)	**0.032**	1.434(0.721-2.851)	0.304
Q3	13(18.8)	56(81.2)	1.537(0.749-3.154)	0.241	0.832(0.373-1.858)	0.654
Q4	2(10.0)	18(90.0)	0.736(0.162-3.337)	0.691	0.401(0.084-1.917)	0.252
Per-capita living space	63(16.1)	328(83.9)	0.997(0.990-1.005)	0.504		NA

[a] Quartile 1 (Q1) is the poorest and Quartile 4 (Q4) is the richest.

Table 4 Factors associated with willingness of institutional care among old empty-nest couple in Shandong, China (n=1934)

Characteristics	Willingness for institutionalization		OR_c (95%CI)	p	OR_a (95%CI)	p
	Yes (%)	No (%)				
n=1934	165(8.5)	1769(91.5)				
Gender						NA
Male	83(8.4)	900(91.6)	1.0			
Female	82(8.6)	869(91.4)	1.023(0.744-1.408)	0.888		
Age						NA
60-	100(8.0)	1157(92.0)	1.0	0.384		
70-	58(9.9)	530(90.1)	1.266(0.902-1.778)	0.173		
80-	7(7.9)	82(92.1)	0.988(0.445-2.195)	0.976		
Education						
Illiteracy or semiliterate	34(4.6)	710(95.4)	1.0		1.0	
Primary school	45(7.1)	588(92.9)	1.598(1.010-2.528)	**0.045**	1.115(0.686-1.814)	0.660
Junior school or above	86(15.4)	471(84.6)	3.813(2.521-5.767)	**0.000**	1.927(1.177-3.157)	**0.009**
Past occupation						

Farmer	54(4.7)	1102(95.3)	1.0		1.0	
Others	111(14.3)	667(85.7)	3.396(2.419-4.767)	**0.000**	0.735(0.439-1.233)	0.244
Number of children						
0-3	122(9.5)	1168(90.5)	1.0		1.0	
>3	43(6.7)	601(93.3)	0.685(0.477-0.983)	**0.040**	0.872(0.592-1.286)	0.490
Relationship with children						
Good or normal	145(8.1)	1649(91.9)	1.0		1.0	
Poor	20(14.3)	120(85.7)	1.895(1.146-3.134)	**0.013**	2.921(1.680-5.077)	**0.000**
Residence						
Urban	136(14.9)	776(85.1)	1.0		1.0	
Rural	29(2.8)	993(97.2)	0.167(0.110-0.252)	**0.000**	0.258(0.152-0.438)	**0.000**
Self-reported health status						NA
Good	85(8.8)	877(91.2)	1.0			
Normal or poor	80(8.2)	892(91.8)	0.925(0.672-1.273)	0.634		
Psychological stress	165(8.5)	1769(91.5)	0.984(0.955-1.014)	0.289		
ADL						

I	134(9.6)	1269(90.4)	1.0		1.0	
II	24(7.7)	289(92.3)	0.786(0.500-1.237)	0.298	0.926(0.575-1.492)	0.753
III	7(3.2)	211(96.8_	0.314(0.145-0.681)	**0.003**	0.456(0.204-1.020)	0.056
NCD						NA
Yes	118(9.1)	1175(90.9)	1.0			
No	47(7.3)	594(92.7)	0.788(0.554-1.121)	0.185		
Household income						
Q1	11(2.0)	526(98.0)	1.0		1.0	
Q2	34(6.2)	517(93.8)	3.145(1.576-6.273)	**0.001**	2.300(1.127-4.691)	**0.022**
Q3	44(10.6)	370(89.4)	5.686(2.898-11.157)	**0.000**	2.503(1.164-5.380)	**0.019**
Q4	76(17.6)	356(82.4)	10.208(5.348-19.485)	**0.000**	3.758(1.695-8.335)	**0.001**
Per-capita living space	165(8.5)	1769(91.5)	0.989(0.980-0.998)	**0.019**	0.985(0.974-0.995)	**0.005**

[a] Quartile 1 (Q1) is the poorest and Quartile 4 (Q4) is the richest.

Table 5 Factors associated with willingness of institutional care among old non-empty-nesters in Shandong, China (n=1598)

Characteristics	Willingness for institutionalization		OR_c (95%CI)	p	OR_a (95%CI)	p
	Yes (%)	No (%)				
n=1598	104(6.5)	1494(93.5)				
Gender						NA
Male	48(6.8)	658(93.2)	1.0		1.0	
Female	56(6.3)	836(93.7)	0.918(0.616-1.368)	0.675		
Age						
60-	93(8.1)	1056(91.9)	1.0	**0.001**	1.0	
70-	10(2.8)	341(97.2)	0.333(0.171-0.647)	**0.001**	0.405(0.210-0.814)	**0.011**
80-	1(1.0)	97(99.0)	0.117(0.016-0.849)	**0.034**	0.209(0.027-1.591)	0.131
Education						
Illiteracy or semiliterate	34(4.5)	726(95.5)	1.0		1.0	
Primary school	30(6.8)	412(93.2)	1.555(0.938-2.578)	0.087	0.962(0.561-1.649)	0.887
Junior school or above	40(10.1)	356(89.9)	2.399(1.493-3.856)	**0.000**	1.099(0.630-1.916)	0.739
Past occupation						

Farmer	48(4.4)	1037(95.6)	1.0		1.0	
Others	56(10.9)	457(89.1)	2.647(1.773-.953)	**0.000**	1.103(0.669-1.818)	0.702
Marital Status						
Single	18(4.2)	411(95.8)	1.0		1.0	
Couple	86(7..4)	1083(92.6)	1.813(1.077-3.051)	**0.025**	1.216(0.697-2.122)	0.492
Number of children						
0-3	91(8.0)	1050(92.0)	1.0		1.0	
>3	13(2.8)	444(97.2)	0.338(0.187-0.610)	**0.000**	0.506(0.271-0.948)	**0.033**
Relationship with children						NA
Good or normal	95(6.3)	1418(93.7)	1.0			
Poor	9(10.6)	76(89.4)	1.768(0.859-3.637)	0.122		
Residence						
Urban	82(11.7)	619(88.3)	1.0		1.0	
Rural	22(2.5)	875(97.5)	0.19(0.117-0.307)	**0.000**	0.210(0.122-0.363)	**0.000**
Self-reported health status						
Good	48(5.3)	861(94.7)	1.0		1.0	

Normal or poor	56(8.1)	633(91.9)	1.587(1.065-2.365)	**0.023**	1.854(1.225-2.805)	**0.003**
Psychological stress	104(6.5)	1494(93.5)	0.990(0.956-1.026)	0.595		NA
ADL						NA
I	89(7.2)	1144(92.8)	1.0			
II	11(5.0)	209(95.0)	0.677(0.355-1.288)	0.234		
III	4(2.8)	141(97.2)	0.365(0.132-1.008)	0.052		
NCD						
Yes	65(6.5)	932(93.5)	1.0			NA
No	39(6.5)	562(93.5)	0.995(0.660-1.500)	0.981		
Household income						
Q1	15(6.3)	223(93.7)	1.0			NA
Q2	12(3.3)	357(96.7)	0.500(0.230-1.087)	0.080		
Q3	30(6.2)	452(93.8)	0.987(0.520-1.872)	0.967		
Q4	47(9.2)	462(90.8)	1.512(0.828-2.764)	0.179		
Per-capita living space	104(6.5)	1494(93.5)	0.985(0.969-1.001)	0.073		NA

OR_c: crude odds ratio; OR_a: adjusted odds ratio

[a] Single includes those who are unmarried(0.9%), divorced(0.3%), widowed(25.3%), separated(0.3%).

[b] Quartile 1 (Q1) is the poorest and Quartile 4 (Q4) is the richest.

Legend of Figure 1

Figure 1 Prevalence of seniors' willingness for institutionalization among empty-nest single, empty-nest couple and non-empty-nest in Shandong, China (n=3923)

p<0.001***, p<0.01**, p<0.05*

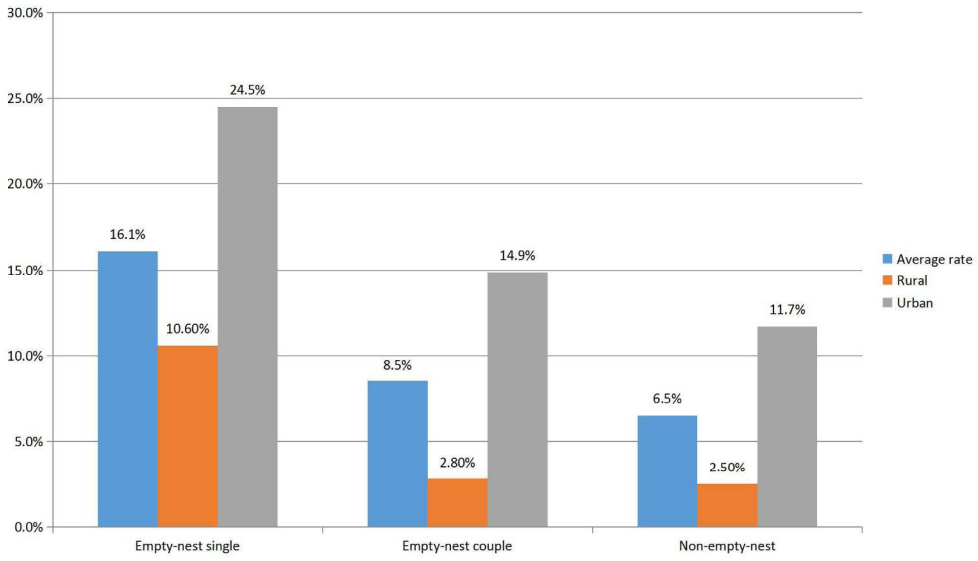

Figure 1

244x141mm (300 x 300 DPI)

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

	Item No	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	1，
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2,3
Objectives	3	State specific objectives, including any prespecified hypotheses	3
Methods			
Study design	4	Present key elements of study design early in the paper	3,4,5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3,4,5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	3,4,5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	3,4,5
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	3,4,5
Bias	9	Describe any efforts to address potential sources of bias	9
Study size	10	Explain how the study size was arrived at	3,4,5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	3,4,5
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	3,4,5
		(*b*) Describe any methods used to examine subgroups and interactions	3,4,5
		(*c*) Explain how missing data were addressed	
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	
		(*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	5,6
		(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	5,6
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	5,6

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	5,6
		(*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	7,8
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	7,8
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	7,8
Generalisability	21	Discuss the generalisability (external validity) of the study results	
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	9

*Give information separately for exposed and unexposed groups.

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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Difference in Utilization Willingness of Institutional Care between Empty-nest and Non-empty-nest Elderly: A Cross-sectional Study in Shandong, China

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Difference in Utilization Willingness of Institutional Care between Empty-nest and Non-empty-nest Elderly: A Cross-sectional Study in Shandong, China

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Abstract

Introduction: Institutional care has been strongly promoted in China to meet the seniors' long-term care needs. Empty-nest elderly, in comparison with their counterparts, have less social support and caring networks. This study aims to compare the utilization willingness of institutional care and its predictors between empty-nest and non-empty-nest seniors.

Methods: A total of 3923 seniors (60+) were included in the analysis. Face-to-face interviews were conducted among the elderly using a structured questionnaire to collect data. Two binary logistic regression models were employed to assess the association between living arrangements of elderly households and willingness of institutional care. Multivariate logistic regression models were used to identify the predictors of the utilization willingness for institutional care among empty-nesters and non-empty-nesters.

Results: Our study found that about 8.5% of the seniors had willingness for institutional care in Shandong, China. Empty-nest singles (OR=5.301; 95CI 2.838-9.904) and empty-nest couples (OR=1.547; 95CI 1.135-2.107) were found to be more willing for institutional care. Our results also showed that residence was a key determinant for institutionalization willingness in empty-nest and non-empty-nest elderly. Among empty-nest singles, psychological stress was a positive determinant for institutional care. Factors including education attainment, relationship with adult children, household income and per capita living space were determinants for empty-nest couples' willingness for institutionalization. Age, number of children, self-reported health status were found to be associated factors for willingness among non-empty nesters.

Conclusions: Government should pay more attention to institutional care in rural areas where elder care is still a gap compared with the urban areas. Targeted policies should be made for different types of seniors to offer appropriate institutional care.

Keywords: Willingness for insitutional care, Elderly, Empty-nest, Determinants

Strengths and limitations of this study

- A large sample of 3,923 participants based on a community survey provided a real profile of willingness for institutional care in Chinese seniors .
- This study focuses on the association between living arrangements of the households with seniors and the willingness for institutional care in the elderly in China.
- There might be a possible recall bias as for most questionnaire data, which is a limitation of this study.
- The cross-sectional study design precludes any causal interpretation.

Introduction

Since 1999, the proportion of the seniors aged 60 and above among the general population in China has reached more than 10%, the number of aging population in China has ranked the first in the world.[1] The number of Chinese people aged 60 years and above had reached 212.4 million by 2014, which accounted for 15.5% of the total population.[2] It's estimated that China, with an amount of 98.3 million old people aged 80 or over in 2050, will still be one of those countries which have the greatest numbers of oldest-old.[3] With the rapid aging of the Chinese population, the number of empty-nesters is on the rise as well.[4] Empty-nest seniors refer to those seniors who are childless or whose children have already left home.[5] With the increasing number of the elderly empty-nesters, long-term care for the elderly has been emerging as a social problem.

Traditionally, taking care of the elderly by adult children in the family was a basic norm in the Confucian doctrine.[6] In recent years, increased geographic mobility and reduced family size due to one-child policy have made more adult children unavailable for elder care.[7] Actually, inter-generational relations are also changing, thus elderly support is no longer considered to be an absolute obligation by adult children.[8-9] More women in urban China are gaining higher education and becoming more work-oriented which indicates that gender roles in elder care are changing and the availability of elder care by adult children has become questionable.[10]On the other hand, with Chinese baby boomers approaching retirement age, informal care such as familial care is unlikely to meet the needs of all seniors.[11] One study indicated that nearly half of seniors, who needed some level of assistance in their activities of daily living or instrumental activities of daily living, actually lived alone instead of living with their adult children.[10] Another study found that many seniors expressed preference to live alone or with their spouse, if housing and health status permit.[12] Consequently, institutional care has been strongly promoted to meet older adults' long-term care needs (Chou, 2010).[13]

After the welfare reform in 1990s, former government-sponsored nursing homes have become decentralized, and a great amount of private nursing homes is on the rise, mostly emerging in large cities.[7]Previous studies have identified the empty-nest elderly's attitudes towards institutional care and its predictors. Some studies found that the rate of institutional care of Chinese elderly was on the rise rapidly, which

might be due to elderly's increasing need for that.[14-15] A study found that the seniors' living arrangements prior to elder home placement and their assessment of the cost involved for such care were related to seniors' willingness to stay in elder homes.[16] Some other studies found that factors including gender, educational attainment, occupation, health insurance, number of children were associated with willing for institutional care among the empty-nest seniors.[17-19] However, few of such studies were published in international journals. Moreover, the studies described earlier have some systematic weaknesses. First, almost all of the empirical studies were based on small sample sizes (e.g.,n=523 in the case of Xie et al.; n=570 in the case of Chen et al.; n=1000 in the case of Zhu et al.).[17-19] Second, in many studies it is not clear who is serving as the reference group. In other words, the associated factors were only explored in the empty-nest seniors. [17-19]

To remedy this situation, the present study aims to compare utilization willingness of institutional care between empty-nest and non-empty-nest seniors in China. To do so, we have following specific objectives. First, we will compare the willingness for institutional care between empty-nest and non-empty nest elderly. Second, we will identify the associated factors for institutional care among the empty-nest and non-empty-nest elderly. Our study is an empirical study and it's not guided by theory.

Methods

Settings and participants

This study was conducted in Shandong, a province where the elderly aged 65 or over accounted for 11.6% of its total population.[20] In this study, a 3-stage cluster sampling was used to select participants. Firstly, all districts and counties in Shandong province were stratified into three groups (high, middle and low GDP per capita) on the ground of GDP per capita (2011) separately. Secondly, we chose one district and one county from each group. Thus, three urban districts (Huaiyin, Dongchangfu and Zhangdian) and three rural counties (Qufu, Chiping and Leling) were chosen as the study sites. Similarly, we then chose three sub-districts and three townships in each sampling district or county on the basis of GDP per capita. Lastly, three communities and three villages were selected from each chosen sub-district and township. Therefore, we selected 27 urban communities and 27 rural villages in total. A total of 3923 older people were included in the analysis.

Data collection

Data were collected from November 2011 to January 2012 by using a house-to-house interview. Face-to-face interviews were conducted among the elderly using a structured questionnaire by trained master students from Shandong University School of Public Health. To ensure quality, completed questionnaires were carefully checked by quality supervisors at the end of each day. The questionnaire included demographic characteristics, living arrangements of the households, relationship with children, marital status, economic status, mental health condition and willingness for institutional care.

Variables and measures

The dependent variable was seniors' willingness for institutional care which was evaluated on the ground of interviewees' answers to 'which endowment way are you willing for?' If the response was 'institutional care', the willingness for institutional care would be coded as 'yes'. On the contrary, if the answer was 'home-based care', 'community endowment' or 'others', willingness for institutional care would be coded as 'no'.

Socio-demographic and psychological characteristics such as gender, age, education, past occupation (pre-retirement occupation), marital status, number of children, relationship with children, residence, self-reported health status, psychological stress, ADL (activities of daily living), NCDs (non-communicable diseases), and household income were included in this study.

The age of the participants was categorized as follows: 60-, 70- and 80+ years. Other demographic characteristics were classified as follows: gender (male vs. female), education (illiteracy or semiliterate, primary school and junior school or above), past occupation (farmer vs. others), marital status (single vs. couple), number of children (0-3 vs. >3), relationship with children (good vs. bad), residence (urban vs. rural), self-reported health status (good vs. normal or poor), ADL (Ⅰ, Ⅱ and Ⅲ), NCDs in the past six months (yes vs. no), and household income (Q1, Q2, Q3 and Q4). Quartile 1 (Q1) is the poorest and Quartile 4 (Q4) is the richest.

Living arrangement of elderly households could be classified into non-empty nester, empty-nest single and empty-nest couple. Non-empty-nester refers to those seniors who live with their children while empty-nest single and empty-nest couple refers to those seniors who live alone with a spouse and without a spouse respectively

more than six months.[21] Per-capita living space is a measure that takes total living space (square meter) and divides it by the number of permanent people(who live in the house more than half a year) in a house.

Psychological stress was evaluated on the ground of 10-item Kessler Scale (K10). K10 is an effective tool to assess people's psychological status designed by scholars such as Kessler, Mroczek and so on (Kessler et al., 2002).[22] The Chinese-language version of K10 has been verified to be of good reliability and validity.[23]

ADL instrument was consisted of Physical Self-maintenance Scale and Instrumental Activities of Daily Living Scale designed by Lawton and Brody.[24] ADL Scale was used to evaluate people's simple and basic ability to practice one's normal life independently. The reliability and validity of ADL instrument in Chinese-language version was demonstrated to be good.[25] Scores of ADL can be divided into three levels, the higher level represents more severe dysfunction. Level 1, 2 and 3 means mild dysfunction, moderate dysfunction, and severe dysfunction respectively.[26]

We also presented the variables and assignments in the Appendix Table1.

Statistical Analysis

The data was double entered and checked using EpiData 6.04. Statistical analyses were performed using SPSS 21.0. For continuous variables, p value was calculated using Student's t test or F-test; for categorical variables, p value was calculated using chi-square test. Two binary logistic regression models were employed to assess the association between living arrangements of elderly households and willingness of institutional care. We used univariate logistic regression model and mutli-variate logistic regression model to explore the factors associated with willingness of institutional care. All reported CIs were calculated at the 95% level. Statistical significance was set at the 5% level.

Patient and Public Involvement statement

Ethical approval was obtained from The Ethical Committee of Shandong University School of Public Health. The investigation was performed after the acquisition of written informed consents of all participants.

Results

Table 1 showed basic information of the 3923 seniors. About 8.5% seniors had willingness for institutional care. Non-empty-nesters accounted for 40.7% of the

participants, empty-nest singles accounted for 10.0%, and empty-nest couples accounted for 49.3%. Generally speaking, the majority of the elderly were female (53.6%), between the ages of 60 and 69 (65.5%), illiterate or semiliterate (44.5%), farmers (64.2%), couple (79.1%), having 0 to 3 children (67.4%), having good or normal relationship with children (91.3%), rural (54.9%), having good self-reported health status (52.1%), having mild dysfunction (72.7%), and having NCDs (65.9%). The elderly's K10 score was 15.8±6.0 (M±SD) and their per-capita living space was 33.9±23.1 (M±SD) square meters.

We presented our results in two models to understand the association between living arrangements of elderly households and willingness for institutional care. Model 1 showed that willingness for institutional care was higher in empty-nest singles (OR=2.759; 95CI 1.974-3.857) and empty-nest couples (OR=1.340; 95CI 1.038-1.729) than in non-empty-nesters. When other variables were controlled, willingness for institutional care was still higher among empty-nest singles (OR=5.301; 95CI 2.838-9.904) and empty-nest couples (OR=1.547; 95CI 1.135-2.107) than in non-empty-nesters (Table 2). Figure 1 showed that in each of the three subgroups with different household living arrangements, urban seniors' willingness to use institutional care was statistically higher than rural seniors'.

Table 3 showed the factors assoicated with willingness for institutional care among empty-nest singles. Univariate analysis indicated that empty-nest singles who were from rural areas (p=0.000) had lower willingness for institutional care. Empty-nest singles who had greater psychological stress (p=0.050) had higher willingness for institutional care. Multivariate logistic analysis also showed that the two factors were associated with willingness for institutional care.

As shown in Table 4, univariate analysis showed that those empty-nest couples who had higher education level, who were non-farmers (p=0.000), who had poor relationship with children (p=0.014), who had higher household income were more willing for institutional care. Those empty-nest couples who had more than 3 children (p=0.040), who lived in rural areas (p=0.000), who had severe dysfunction (p=0.003), who had more per-capita living space (p=0.019) were less willing for institutional care. Multi-logistic regression indicated that factors including education level, relationship with children, household income, residence were assoicated with willingness for institutional care.

Likewise, for those non-empty-nest seniors, multi-logistic regression model

found that those with younger age, those who had less children, those who were from urban areas, and those who had normal or poor self-rated health status preferred to use institutional care (See Table 5).

Discussion

Our study found that 8.5% of the seniors had willingness for institutional care. This was lower than the that found among Korean American elders (45%) with a similar age. [27]This was lower than the reported rates of 20% in urban area, 17% in rural area in the elderly in China, and 16.7% in a study of the seniors aged 65 or above in Taiwan, China. It was also lower than the 9.69% found in older population in Zhejiang, China, and 44.8% found in a study in the elderly with a similar age in Chengdu, China.[13,28-30]Compared with above mentioned sites, Shandong is rather a conservative province which is deeply affected by Confucianism. The culture of filial piety is profoundly rooted in Shandong residents' mind. This might be primary cause of the variation between our study and the previous studies mentioned above.

Our results showed that living arrangement of the households was associated with the elderly's willingness for institutional care. The analysis made it clear that empty-nest singles and empty-nest couples were more willing for institutional care than non-empty-nesters. This finding was consistent with another study which found that older adults who had no spouse or children were more likely to move into nursing homes than their counterparts.[7,31] Due to lack of care from adult children, empty-nest seniors are facing more endowment risks. Empty-nest elderly had poorer self-rated health, higher prevalence of two-week illness and NCDs, which indicated that they had poorer health status than non-empty-nest elderly.[5]It's also found that empty-nest seniors, in comparison with non-empty nest seniors, had higher level of loneliness.[32] The high physical and mental health service needs might be the reason why empty-nest seniors are more willing for institutional care which can provide professional health care.

Consistent with previous studies, our results also showed that residence was a key predictor of willingness for institutional care in all three types of elderly households.[33] Urban seniors had statistically higher willingness for institutional care than rural seniors across all three types of elderly household. Compared with rural seniors, urban seniors were less conservative. Rural seniors had lower income, poorer social welfare condition than urban seniors. Further, the supply of institutional

care was relatively deficient in rural areas. These differences between rural and urban areas might explain why rural seniors were less willing for institutional care. This finding was helpful for the policy-makers to allocate differentially the institutional care resources in urban and rural China.

Among empty-nest singles, psychological stress was a positive determinant for institutional care which was in accordance with previous studies.[34] To avoid excessive reliance on family members which may result in tensions in family, when seniors had psychological stress, they would rather choose institutional care.[35] This might be associated with empty-nest singles' attitudes of self-reliance.

Similar with previous studies, empty-nest seniors who had normal relationship with children were more willing for institutional care.[13] Having good relationship with children represents more financial assistance and spiritual comfort from children. When seniors were in poor relationship with children, they usually relied less on their adult children which may lead to more willingness for institutional care. Empty-nest couples with higher household income were more likely to prefer institutional care which is inconsistent with previous studies in Finland.[36] In Finland, most long-term institutional care is publicly provided in nursing homes and health centers, and user charges are related to disposable income, up to maximum of 80 percent.[37] The high-income elderly and their families may therefore have an economic incentive to avoid long-term institutional care if the absolute level of charges would be very high. In China, most institutional care was provided by private institutions and the charges for different services are fixed so that higher income seniors in China will not have that financial concerns compared with Finland seniors. It was vital to develop pro-poor institutio3nal care policies for those lower-income empty-nest seniors with high willingness for institutional care. We also found that empty-nest couples with more per capita living space were less willing for institutional care. Per capita living space actually could be a representative of wealth. Seniors with higher per capita living space might be richer, given the circumstance of China's rapidly growing housing prices. This might explain why empty-nest couples with more per capita living space were more willing for institutional care. Further, empty-nest couples with education level of junior school or above were more willing for institutional care, which was consistent with previous studies.[33]

It's found that aged 70 and 79, having more than 3 children and normal self-reported health status were risk factors for non-empty nesters. Those who aged 70

and 79 had less preference for institutional care which was inconsistent with one study in Hong Kong (Woo et al., 1994) and other developed countries (Wingard et al., 1987) where the likelihood of elderly living in institutional care increased with age.[38-39] Hong 33Kong and other developed countries are more developed and open than Shandong, which makes those seniors more open-minded about institutional care. Different value concepts about institutional care might explain why those seniors were more willing for institutional care compared with Shandong seniors. Those non-empty seniors who had more than 3 children were less willing for institutional care. More children usually means more financial and physical assistance, so it might reduce elders' needs for institutional care.[10]

This study has a large size of the sample (nearly 4000), which is much larger than that used in most of the similar studies. This gives the study a high degree of statistical power. This study has some limitations. Firstly, our study has a cross-sectional design and the result could not be interpreted as cause and effect. Secondly, all data were based on self-reported measures which could lead to recall biases. Thirdly, even though we have included some variables of social support in this study (e.g., living arrangements of the elderly households, number of the children and relationship with children), we have not yet used a scale to measure social support of the seniors, which would be remedied in the future study. Finally, our investigation is conducted in Shandong province,which is rather a conservative region, thus the results of our study may not be generalized to other parts of China.

Conclusion

Our study suggested that living arrangements of the households with seniors was associated with the willingness for institutional care of the elderly in China, and the empty-nesters were more willing for institutional care than their counterparts. Our results also showed that residence was a key associated factor for willingness for institutional care in all three types of elderly households. Government should pay more attention to institutional care in rural areas where elder care is still a gap compared with urban areas. Furthermore, we also identified some other associated factors for institutional care willingness among each type of the elderly households. Targeting policies should be developed to offer appropriate institutional care for different types of the seniors.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Chengchao Zhou, Yangyang Qian, and Wen Qin conceived the idea, Chengchao Zhou implemented the field study. Chengchao Zhou, Yangyang Qian, Dandan Ge, Li Zhang participated in the statistical analysis and interpretation of the results. Yangyang Qian drafted the manuscript. Chengchao Zhou, Wen Qin, and Long Sun gave many valuable comments on the draft and also polished it. All authors read and approved the final manuscript.

Data sharing

No additional data available.

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References:

1. Chinese National Commission of Aging. China stepped into aging society in 1999, and the number of the elderly ranks in the first in the world. 2006
2. National Bureau of Statistics of the People's Republic of China. Population map of China's economy, and a rapidly aging population in society. 2015
3. United Nations. World Population Prospects The 2010 Revision, p. 9. .2011
4. Liu, L., Guo, Q. Life Satisfaction in a Sample of Empty-Nest Elderly: A Survey in the Rural Area of a Mountainous County in China. Quality of Life Research, 2008;17, 823-830.
5. Zhou, C., Ji, C., Chu, J., Medina, A., Li, C., Jiang, S., Zheng, W., Liu, J., Rozelle, S. Non-use of health care service among empty-nest elderly in Shandong, China: a cross-sectional study. BMC Health Services Research. 2015; 15, 1-10.
6. Liu, T., Sun, L. An apocalyptic vision of ageing in China: Old age care for the largest elderly population in the world. Zeitschrift für Gerontologie und Geriatrie. 2015; 48, 354-364.
7. Zhan, H.J., Liu, G., Guan, X., Bai, H.-g. Recent Developments in Institutional Elder Care in China: Changing Concepts and Attitudes. Journal of Aging & Social Policy, 2006; 18, 85-108.
8. Croll E. The Intergenerational Contract in the Changing Asian Family. Oxford Development Studies. 2006; 34(4):473-91.
9. Lin Z, Pei X. Intergenerational exchange of resources and elderly support in rural China. International Journal of Aging and Human Development. 2016;83(2):108-27
10. Zhan, H.J., Montgomery, R.J.V. Gender and elder care In China： The influence of filial piety and structural constraints. Gender & Society,2003; 17, 209-229.
11. Zhan, H.J., Liu, G., Guan, X. Willingness and availability: Explaining new attitudes toward institutional elder care among Chinese elderly parents and their adult children. Journal of Aging Studies, 2006; 20, 279-290.
12. Xu, Q. Status quo and problems of old age support by youth and adult within the family (in Chinese). Sociological Research, 1994; 80-84.
13. Chou, R.J.-A. Willingness to live in eldercare institutions among older adults in urban and rural China: a nationwide study. Ageing and Society, 2010; 30, 583-608.
14. Cheng Y, Rosenberg M, Wang W, Yang L, Hairong L. Access to residential care in Beijing, China: making the decision to relocate to a residential care facility. . Ageing & Society. 2012;32(8):1277-99.
15. Peng R, Wu B. Changes of Health Status and Institutionalization Among Older Adults in China. Journal of Aging and Health. 2015;27(7):1223-46.
16. Guan, X., Zhan, H.J., Liu, G. Institutional and Individual Autonomy: Investigating Predictors of Attitudes Toward Institutional Care in China. The International Journal of Aging and Human Development. 2007; 64, 83-107.
17. Chen J, Willingness for institutional care and its influencing factors in the empty-nest seniors: An empirical study in Suzhou city, China.Modern Preventive Medicine,2015; 142(9):1660-2 (in Chinese)
18. Xie X, Chen L, Peng Y, Zhao S, Fan S. Population and Development,2010; 16 (2):67-75 (in Chinese)
19. Zhu A, Liu Q, Cao C, Zhu J, Li J, Qiu X, et al. Willingness for institutional care and its influencing factors among the empty-nest seniors in Hangzhou, China. Preventive Medicine,2017; 29(7):665-9 (in Chinese)
20. Shandong Provincial Statistics Bureau. Shandong Statistic Year Book. 2015
21. Zhou C, Chu J, Liu D, Zheng W, Guo X, Xu L. Comparison of health need and utilization between empty-nest and non-empty-nest aging population in urban communities: A sample survey based on Jinan city. Chinese Journal of Health Policy,2012; 05(2):24-29(in Chinese)
22. Kessler, R.C., Andrews, G., Colpe, L.J., Hiripi, E., Mroczek, D.K., T.Normand, S.-L., Walters, E.E., Zaslavsky, A.M. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. Psychological Medicine, 2002; 32, 959-976.
23. Zhou, C., Chu, J., Wang, T., Peng, Q., He, J., Zheng, W., Liu, D., Wang, X., Ma, H., Xu, L. Reliability and Validity of 10-item Kessler Scale (K10) Chinese Version in Evaluation of Mental Health Status of Chinese Population (in Chinese). Chinese Journal of Clinical Psychology, 2008; 16, 627-629.
24. Lawton, M.P., Brody, E.M. Assessment of Older People: Self-Maintaining and Instrumental Activities of Daily Living. Gerontologist, 1969; 9, 179-186.
25. Feng, J. Daily Activities of Living Scale's Application Value in Patients In Respiratory Medicine (in Chinese). Hebei Medical Journal, 2013; 35, 3346-3348.
26. Mahoney FI, Barthel DW. Functional evaluation: the Barthel Index. Md State Med J.1965;

Feb;14:61-5.
27. Jang, Y., Kim, G., Chiriboga, D.A., Cho, S. Willingness to Use a Nursing Home: A Study of Korean American Elders. Journal of Applied Gerontology the Official Journal of the Southern Gerontological Society, 2008; 27, 110-117.
28. Chung, M.-H., Hsu, N., Wang, Y.-C., Lin, H.-C., Huang, Y.-L., Amidon, R.L., Kao, S. Factors Affecting the Long-Term Care Preferences of the Elderly in Taiwan. Geriatric Nursing, 2008; 29, 293-301.
29. Jiang, Y.-x., Si, W., Analysis of the factors influencing on elders' preferences for social care : empirical evidence from Zhejiang Province (in Chinese). Population & Economics, 2006; 8-12.
30. Deng, Y., Li, N., Liu, C., Yang, W., Wu, X., Wang, Y. Laonianren yanglao moushi xienzhe de yinxiang yinshu yianjiu [Factors affecting older adults' choices in types of eldercare] (in Chinese). China Journal of Public Health, 2008; 19, 731-732.
31. Grundy, E., Jitlal, M. Socio-demographic variations in moves to institutional care 1991-2001: a record linkage study from England and Wales. Age and Ageing, 2007; 36, 424-430.
32. Liu, L., Guo, Q. Loneliness and Health-Related Quality of Life for the Empty Nest Elderly in the Rural Area of a Mountainous County in China. Quality of Life Research, 2007; 16, 1275-1280.
33. Nie, A., Cao, F., Shao, D. Endowment and Living Willingness and Its Influence Factors of the Elderly: Based on CSS 2011. Chinese Public Administration.2015
34. Branch, L.G., Jette, A.M. A Prospective Study of Long-Term Care Institutionalization among the Aged. American Journal of Public Health, 1982; 72, 1373-1379.
35. Tao, T., Cong, C. An Analysis of Influencing Factors on Elder's Preference for Patterns of Old-age Support: Some Empirical Evidence from Beijing Xicheng District (in Chinese). Population & Economics, 2014; 15-22.
36. Einiö, E.K. Determinants of Instituional Care at Older Ages in Finland. The Population Reseach Institute. 2010
37. Nihtilä, E., Martikainen, P. Household Income and Other Socio-Economic Determinants of Long-Term Institutional Care among Older Adults in Finland. Population Studies, 2007; 61, 299-314.
38. Woo, J., Ho, S.C., Lau, J., Yuen, Y.K. Age and marital status are major factors associated with institutionalisation in elderly Hong Kong Chinese. Journal of Epidemiology and Community Health, 1994; 48, 306-309.
39. Wingard, D.L., Jones, D.W., Kaplan, R.M. Instituional Care Utilization by the Elderly: A Critical Review. The Geontologicla Society of American, 1987; 27, 156-163.

Table 1 Socio-demographic characteristics of the elderly in Shandong, China (n=3923)

Characteristics	Total n (%)	Empty-nest single n (%)	Empty-nest couple n (%)	Non-empty-nest n (%)	χ^2/F	p
N	3923(100.0)	391(10.0)	1934(49.3)	1598(40.7)		
Gender					43.525	**0.000**
Male	1821(46.4)	132(33.8)	983(50.8)	706(44.2)		
Female	2102(53.6)	259(66.2)	951(49.2)	892(55.8)		
Age					145.042	**0.000**
60-	2568(65.5)	162(41.4)	1257(65.0)	1149(71.9)		
70-	1122(28.6)	183(46.8)	588(30.4)	351(22.0)		
80-	233(5.9)	46(11.8)	89(4.6)	98(6.1)		
Education					84.222	**0.000**
Illiteracy or semiliterate	1744(44.5)	240(61.4)	744(38.5)	760(47.6)		
Primary school	1171(29.8)	96(24.6)	633(32.7)	442(27.7)		
Junior school or above	1008(25.7)	55(14.1)	557(28.8)	396(24.8)		
Past occupation					34.103	**0.000**
Farmer	2519(64.2)	278(71.1)	1156(59.8)	1085(67.9)		
Others	1404(35.8)	113(28.9)	778(40.2)	513(32.1)		
Marital Status					2024.826	**0.000**
Single [a]	820(20.9)	391(100.0)	0(0.0)	429(26.8)		
Couple	3103(79.1)	0(0.0)	1934(100.0)	1169(73.2)		
Number of children					42.968	**0.000**
0-3	2643(67.4)	212(54.2)	1290(66.7)	1141(71.4)		
>3	1280(32.6)	179(45.8)	644(33.3)	457(28.6)		
Relationship with children[b]					35.101	**0.000**
Good or normal	3581(92.9)	298(85.6)	1782(92.7)	1501(94.6)		
Poor	275(7.1)	50(14.4)	140(7.3)	85(5.4)		
Residence					150.403	**0.000**
Urban	1768(45.1)	155(39.6)	912(47.2)	701(43.9)		
Rural	2155(54.9)	236(60.4)	1022(52.8)	897(56.1)		

Self-reported health status					28.629	**0.000**
Good	2044(52.1)	173(44.2)	962(49.7)	909(56.9)		
Normal or poor	1879(47.9)	218(55.8)	972(50.3)	689(43.1)		
Psychological stress	15.8±6.0	17.3±7.2	15.6±5.7	15.6±5.9	1.743	**0.004**
ADL					75.403	**0.000**
I	2853(72.7)	217(55.5)	1403(72.5)	1233(77.2)		
II	631(16.1)	98(25.1)	313(16.2)	220(13.8)		
III	439(11.2)	76(19.4)	218(11.3)	145(9.1)		
NCD					26.274	**0.000**
Yes	2586(65.9)	296(75.7)	1293(66.9)	997(62.4)		
No	1337(34.1)	95(24.3)	641(33.1)	601(37.6)		
Household income[c]					371.563	**0.000**
Q1	996(25.4)	221(56.5)	537(27.8)	238(14.9)		
Q2	1001(25.5)	81(20.7)	551(28.5)	369(23.1)		
Q3	965(24.6)	69(17.6)	414(21.4)	482(30.2)		
Q4	961(24.5)	20(5.1)	432(22.3)	509(31.9)		
Per-capita living space	33.9±23.1	53.0±42.6	36.9±20.0	25.4±14.6	7.255	**0.000**

[a] Single includes those who are unmarried(1.7%), divorced(0.3%), widowed(18.6%), separated(0.3%).
[b] 67 of the participants are childless elders, and were regared as missing data here.
[c]Quartile 1 (Q1) is the poorest and Quartile 4 (Q4) is the richest.

Table 2 Association of willingness for institutional care and household composition in Shandong, China

Characteristics	Model 1 (No covariates)		Model 2 (Covariates)	
	OR (95%CI)	p	OR (95%CI)	p
Household composition				
Non-empty-nest	1.0		1.0	
Empty-nest single	2.759(1.974-3.857)	**0.000**	5.301(2.838-9.904)	**0.000**
Empty-nest couple	1.340(1.038-1.729)	**0.024**	1.547(1.135-2.107)	**0.006**
Gender				
Male			1.0	
Female			1.223(0.938-1.595)	0.137
Age				
60-			1.0	
70-			1.017(0.754-1.371)	0.912
80-			1.144(0.612-2.139)	0.674
Education				
Illiteracy or semiliterate			1.0	
Primary school			1.166(0.835-1.627)	0.368
Junior school or above			1.617(1.128-2.136)	0.009
Past occupation				
Farmer			1.0	
Others			1.283(0.899-1.830)	0.169
Marital Status				
Single [a]			1.0	
Couple			1.190(0.680-2.085)	0.542
Number of children				
0-3			1.0	
>3			0.755(0.559-1.021)	0.068

Relationship with children				
Good or normal			1.0	
Poor			2.504(1.685-3.720)	0.000
Residence				
Urban			1.0	
Rural			0.546(0.383-0.778)	0.000
Self-reported health status				
Good			1.0	
Normal or poor			1.019(0.778-1.334)	0.891
Psychological stress			0.998(0.975-1.020)	0.833
ADL				
I			1.0	
II			0.910(0.637-1.299)	0.603
III			0.577(0.334-0.997)	0.049
NCD				
Yes			1.0	
No			0.957(0.717-1.277)	0.764
Household income [b]				
Q1			1.0	
Q2			1.514(0.995-2.304)	0.053
Q3			1.612(1.017-2.554)	0.042
Q4			2.065(1.271-3.354)	0.003
Per-capita living space			0.989(0.983-0.996)	0.003
Constant	0.070	0.000	0.044	0.000

R squared		0.019	0.112
Observations	3923		

[a] Single includes those who are unmarried(1.7%), divorced(0.3%), widowed(18.6%), separated(0.3%).
[b] Quartile 1 (Q1) is the poorest and Quartile 4 (Q4) is the richest.

Table 3 Factors associated with willingness of institutional care among old empty-nest single in Shandong, China (n=391)

Characteristics	Willingness for institutionalization		OR_c (95%CI)	p	OR_a (95%CI)	p
	Yes (%)	No (%)				
n=391	63(16.1)	328(83.9)				
Gender						NA
Male	21(15.9)	111(84.1)	1.0			
Female	42(16.2)	217(83.8)	1.023(0.578-1.812)	0.938		
Age						NA
60-	27(16.7)	135(83.3)	1.0	0.708		
70-	27(14.8)	156(85.2)	0.865(0.484-1.547)	0.626		
80-	9(19.6)	37(80.4)	1.216(0.526-2.810)	0.647		
Education						NA
Illiteracy or semiliterate	38(15.8)	202(84.2)	1.0			
Primary school	17(17.7)	79(82.3)	1.144(0.610-2.144)	0.675		
Junior school or above	8(14.5)	47(85.5)	0.905(0.396-2.066)	0.812		
Past occupation						NA
Farmer	40(14.4)	238(85.6)	1.0			
Others	23(20.4)	90(79.6)	1.521(0.862-2.682)	0.148		
Number of children						NA
0-3	38(17.9)	174(82.1)	1.0			
>3	25(14.0)	154(86.0)	0.743(0.429-1.288)	0.290		
Relationship with children[a]						NA
Good or normal	39(13.1)	259(86.9)	1.0			
Poor	11(22.0)	39(78.0)	1.873(0.886-3.962)	0.101		
Residence						
Urban	38(24.5)	117(75.5)	1.0		1.0	
Rural	25(10.6)	211(89.4)	0.365(0.210-0.634)	**0.000**	0.304(0.161-0.572)	**0.000**

Self-reported health status						NA
Good	24(13.9)	149(86.1)	1.0			
Normal or poor	39(17.9)	179(82.1)	1.353(0.778-2.352)	0.284		
Psychological stress[b]	63(16.1)	328(83.9)	1.036(1.000-1.073)	**0.050**	1.045(1.007-1.085)	**0.019**
ADL						NA
Ⅰ	32(14.7)	185(85.3)	1.0			
Ⅱ	18(18.4)	80(81.6)	1.301(0.690-2.453)	0.416		
Ⅲ	13(17.1)	63(82.9)	1.193(0.589-2.415)	0.624		
NCD						NA
Yes	50(16.9)	246(83.1)	1.0			
No	13(13.7)	82(86.3)	0.780(0.403-1.508)	0.460		
Household income[c]						
Q1	29(13.1)	192(86.9)	1.0		1.0	
Q2	19(23.5)	62(76.5)	2.209(1.064-3.869)	**0.032**	1.434(0.721-2.851)	0.304
Q3	13(18.8)	56(81.2)	1.537(0.749-3.154)	0.241	0.832(0.373-1.858)	0.654
Q4	2(10.0)	18(90.0)	0.736(0.162-3.337)	0.691	0.401(0.084-1.917)	0.252
Per-capita living space	63(16.1)	328(83.9)	0.997(0.990-1.005)	0.504		NA

OR $_c$: crude odds ratio; OR $_a$: adjusted odds ratio

[a] 43 of the participants are childless elders, and were regared as missing data here.

[b] We also included "Psychological stress" into multi-variate logistice regression model.

[c] Quartile 1 (Q1) is the poorest and Quartile 4 (Q4) is the richest.

Table 4 Factors associated with willingness of institutional care among old empty-nest couple in Shandong, China (n=1934)

Characteristics	Willingness for institutionalization		OR_c (95%CI)	p	OR_a (95%CI)	p
	Yes (%)	No (%)				
n=1934	165(8.5)	1769(91.5)				
Gender						NA
Male	83(8.4)	900(91.6)	1.0			
Female	82(8.6)	869(91.4)	1.023(0.744-1.408)	0.888		
Age						NA
60-	100(8.0)	1157(92.0)	1.0	0.384		
70-	58(9.9)	530(90.1)	1.266(0.902-1.778)	0.173		
80-	7(7.9)	82(92.1)	0.988(0.445-2.195)	0.976		
Education						
Illiteracy or semiliterate	34(4.6)	710(95.4)	1.0		1.0	
Primary school	45(7.1)	588(92.9)	1.598(1.010-2.528)	**0.045**	1.139(0.703-1.845)	0.660
Junior school or above	86(15.4)	471(84.6)	3.813(2.521-5.767)	**0.000**	1.918(1.173-3.135)	**0.009**
Past occupation						
Farmer	54(4.7)	1102(95.3)	1.0		1.0	
Others	111(14.3)	667(85.7)	3.396(2.419-4.767)	**0.000**	0.909(0.535-1.544)	0.724
Number of children						
0-3	122(9.5)	1168(90.5)	1.0		1.0	
>3	43(6.7)	601(93.3)	0.685(0.477-0.983)	**0.040**	0.878(0.598-1.288)	0.506
Relationship with children[a]						
Good or normal	145(8.1)	1637(91.9)	1.0		1.0	
Poor	20(14.3)	120(85.7)	1.882(1.138-3.111)	**0.014**	2.677(1.553-4.615)	**0.000**
Residence						
Urban	136(14.9)	776(85.1)	1.0		1.0	
Rural	29(2.8)	993(97.2)	0.167(0.110-0.252)	**0.000**	0.167(0.110-0.252)	**0.000**

Self-reported health status						NA
Good	85(8.8)	877(91.2)	1.0			
Normal or poor	80(8.2)	892(91.8)	0.925(0.672-1.273)	0.634		
Psychological stress	165(8.5)	1769(91.5)	0.984(0.955-1.014)	0.289		
ADL						
I	134(9.6)	1269(90.4)	1.0		1.0	
II	24(7.7)	289(92.3)	0.786(0.500-1.237)	0.298	0.905(0.563-1.453)	0.678
III	7(3.2)	211(96.8_	0.314(0.145-0.681)	**0.003**	0.436(0.196-1.018)	0.052
NCD						NA
Yes	118(9.1)	1175(90.9)	1.0			
No	47(7.3)	594(92.7)	0.788(0.554-1.121)	0.185		
Household income[b]						
Q1	11(2.0)	526(98.0)	1.0		1.0	
Q2	34(6.2)	517(93.8)	3.145(1.576-6.273)	**0.001**	2.676(1.326-5.400)	**0.006**
Q3	44(10.6)	370(89.4)	5.686(2.898-11.157)	**0.000**	3.117(1.430-6.798)	**0.004**
Q4	76(17.6)	356(82.4)	10.208(5.348-19.485)	**0.000**	4.674(2.057-10.621)	**0.000**
Per-capita living space	165(8.5)	1769(91.5)	0.989(0.980-0.998)	**0.019**	0.984(0.974-0.995)	**0.003**

OR_c: crude odds ratio; OR_a: adjusted odds ratio

[a] 12 of the participants are childless elders, and were regared as missing data here.

[B] Quartile 1 (Q1) is the poorest and Quartile 4 (Q4) is the richest.

Table 5 Factors associated with willingness of institutional care among old non-empty-nesters in Shandong, China (n=1598)

Characteristics	Willingness for institutionalization		OR $_c$ (95%CI)	p	OR $_a$ (95%CI)	p
	Yes (%)	No (%)				
n=1598	104(6.5)	1494(93.5)				
Gender						NA
Male	48(6.8)	658(93.2)	1.0		1.0	
Female	56(6.3)	836(93.7)	0.918(0.616-1.368)	0.675		
Age						
60-	93(8.1)	1056(91.9)	1.0	**0.001**	1.0	
70-	10(2.8)	341(97.2)	0.333(0.171-0.647)	**0.001**	0.405(0.210-0.814)	**0.011**
80-	1(1.0)	97(99.0)	0.117(0.016-0.849)	**0.034**	0.209(0.027-1.591)	0.131
Education						
Illiteracy or semiliterate	34(4.5)	726(95.5)	1.0		1.0	
Primary school	30(6.8)	412(93.2)	1.555(0.938-2.578)	0.087	0.962(0.561-1.649)	0.887
Junior school or above	40(10.1)	356(89.9)	2.399(1.493-3.856)	**0.000**	1.099(0.630-1.916)	0.739
Past occupation						
Farmer	48(4.4)	1037(95.6)	1.0		1.0	
Others	56(10.9)	457(89.1)	2.647(1.773-.953)	**0.000**	1.103(0.669-1.818)	0.702
Marital Status[a]						
Single	18(4.2)	411(95.8)	1.0		1.0	
Couple	86(7..4)	1083(92.6)	1.813(1.077-3.051)	**0.025**	1.216(0.697-2.122)	0.492
Number of children						
0-3	91(8.0)	1050(92.0)	1.0		1.0	
>3	13(2.8)	444(97.2)	0.338(0.187-0.610)	**0.000**	0.506(0.271-0.948)	**0.033**
Relationship with children[b]						NA
Good or normal	92(6.1)	1409(93.9)	1.0			
Poor	9(10.6)	76(89.4)	1.814(0.881-3.735)	0.106		

Residence						
Urban	82(11.7)	619(88.3)	1.0		1.0	
Rural	22(2.5)	875(97.5)	0.19(0.117-0.307)	**0.000**	0.210(0.122-0.363)	**0.000**
Self-reported health status						
Good	48(5.3)	861(94.7)	1.0		1.0	
Normal or poor	56(8.1)	633(91.9)	1.587(1.065-2.365)	**0.023**	1.854(1.225-2.805)	**0.003**
Psychological stress	104(6.5)	1494(93.5)	0.990(0.956-1.026)	0.595		NA
ADL						NA
Ⅰ	89(7.2)	1144(92.8)	1.0			
Ⅱ	11(5.0)	209(95.0)	0.677(0.355-1.288)	0.234		
Ⅲ	4(2.8)	141(97.2)	0.365(0.132-1.008)	0.052		
NCD						
Yes	65(6.5)	932(93.5)	1.0			NA
No	39(6.5)	562(93.5)	0.995(0.660-1.500)	0.981		
Household income[c]						
Q1	15(6.3)	223(93.7)	1.0			NA
Q2	12(3.3)	357(96.7)	0.500(0.230-1.087)	0.080		
Q3	30(6.2)	452(93.8)	0.987(0.520-1.872)	0.967		
Q4	47(9.2)	462(90.8)	1.512(0.828-2.764)	0.179		
Per-capita living space	104(6.5)	1494(93.5)	0.985(0.969-1.001)	0.073		NA

OR_c: crude odds ratio; OR_a: adjusted odds ratio

[a] Single includes those who are unmarried(0.9%), divorced(0.3%), widowed(25.3%), separated(0.3%).

[b] 12 of the participants are childless elders, and were regared as missing data here.

[c]Quartile 1 (Q1) is the poorest and Quartile 4 (Q4) is the richest.

Legend of Figure 1

Figure 1 Prevalence of seniors' willingness for institutionalization among empty-nest single, empty-nest couple and non-empty-nest in Shandong, China (n=3923)
p<0.001***, p<0.01**, p<0.05*

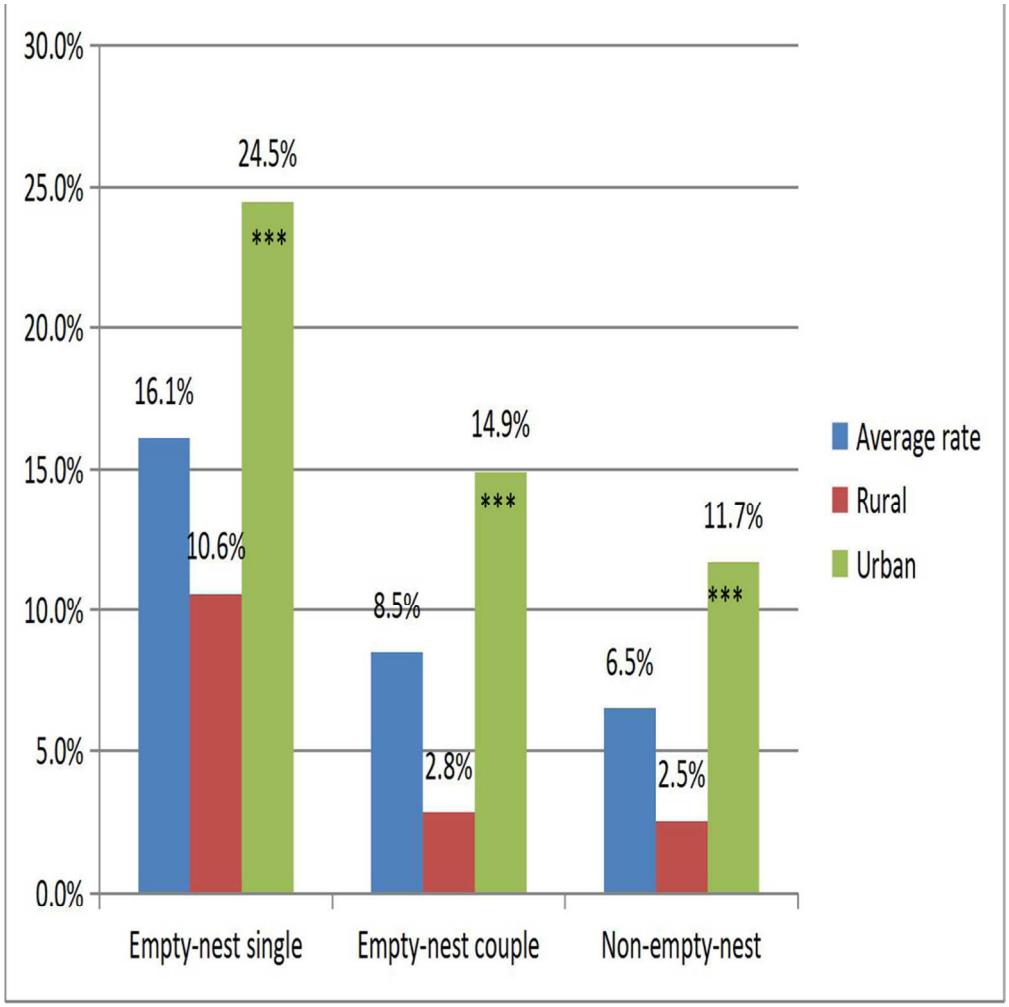

Figure 1 Prevalence of seniors' willingness for institutionalization among empty-nest single, empty-nest couple and non-empty-nest in Shandong, China (n=3923)

90x90mm (300 x 300 DPI)

Appendix Table 1: Variables and assignments

Variables	Code
Gender	
Male	0
Female	1
Age	
60-	1
70-	2
80-	3
Education	
Illiteracy or semiliterate	1
Primary school	2
Junior school or above	3
Past occupation	
Farmer	1
Others	2
Marital Status	
Single [a]	1
Couple	2
Number of children	
0-3	1
>3	2
Relationship with children	
Good or normal	1
Poor	2
Residence	
Urban	1
Rural	2
Self-reported health status	
Good	1
Normal	2
Psychological stress	-
ADL	
Ⅰ	1
Ⅱ	2
Ⅲ	3
NCD	
Yes	1
No	2
Household income	
Q1 [b]	1
Q2	2
Q3	3
Q4	4

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

	Item No	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	1，
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2,3
Objectives	3	State specific objectives, including any prespecified hypotheses	3
Methods			
Study design	4	Present key elements of study design early in the paper	3,4,5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3,4,5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	3,4,5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	3,4,5
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	3,4,5
Bias	9	Describe any efforts to address potential sources of bias	9
Study size	10	Explain how the study size was arrived at	3,4,5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	3,4,5
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	3,4,5
		(*b*) Describe any methods used to examine subgroups and interactions	3,4,5
		(*c*) Explain how missing data were addressed	
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	
		(*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	5,6
		(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	5,6
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	5,6

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	5,6
		(*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	7,8
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	7,8
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	7,8
Generalisability	21	Discuss the generalisability (external validity) of the study results	
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	9

*Give information separately for exposed and unexposed groups.

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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Utilization Willingness for Institutional Care by the Elderly: A Comparative Study of Empty Nesters and Non-empty Nesters in Shandong, China

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Utilization Willingness for Institutional Care by the Elderly: A Comparative Study of Empty Nesters and Non-empty Nesters in Shandong, China

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Abstract

Introduction: Institutional care has been strongly promoted in China to meet seniors' long-term care needs. Empty-nest elderly, in comparison with their counterparts, have less social support and fewer caring networks. This study aimed to compare the utilization willingness for institutional care and its predictors between empty-nest and non-empty-nest seniors.

Methods: A total of 3923 seniors were included in the analysis. Binary logistic regression models were used to understand the association between the living arrangements of the elderly households and willingness for institutional care and to identify the predictors of the utilization willingness for institutional care among empty nesters and non-empty nesters.

Results: Our study found that approximately 8.5% of the seniors had a willingness for institutional care in Shandong, China. Empty-nest singles (OR=5.301; 95CI 2.838-9.904) and empty-nest couples (OR=1.547; 95CI 1.135-2.107) were found to be more willing to receive institutional care. Our results also showed that residence was a key determinant for institutionalization willingness in empty-nest and non-empty-nest elderly. Among empty-nest singles, psychological stress was a positive determinant for institutional care. Factors including education attainment, relationship with adult children, household income and per capita living space were determinants for empty-nest couple willingness for institutionalization. Age, number of children, and self-reported health status were found to be associated factors for willingness among non-empty nesters.

Conclusions: The government should pay more attention to institutional care in rural areas where there is still a gap in elder care compared with that in urban areas. Targeted policies should be made for different types of seniors to offer appropriate institutional care.

Keywords: Willingness for institutional care, Elderly, Empty nest, Determinants

Strengths and limitations of this study

- A large sample of 3,923 participants based on a community survey provided a real profile of willingness for institutional care in Chinese seniors.
- There might be a possible recall bias for most questionnaire data, which is a limitation of this study.
- The cross-sectional study design precludes any causal interpretation.

Introduction

Since 1999, the proportion of seniors aged 60 and above among the general population in China has reached more than 10%, and the number of people in the ageing population in China has ranked the first in the world.[1] The number of Chinese people aged 60 years and above reached 212.4 million by 2014, which accounted for 15.5% of the total population.[2] It has been estimated that China, with 98.3 million old people aged 80 or over in 2050, will still be one of the countries that has the greatest numbers of oldest-to-old people.[3] With the rapid ageing of the Chinese population, the number of empty nesters is on the rise as well.[4] Empty-nest seniors are those seniors who are childless or whose children have already left home.[5] With the increasing number of elderly empty nesters, long-term care for the elderly has been emerging as a social problem.

Traditionally, taking care of the elderly by adult children in the family was a basic norm within Confucian doctrine.[6]In recent years, increased geographic mobility and reduced family size due to the one-child policy have made more adult children unavailable for elder care.[7] Inter-generational relations are also changing; thus, elderly support is no longer considered an absolute obligation by adult children.[8-9] More women in urban China are obtaining a higher education and becoming more work oriented, which indicates that gender roles in elder care are changing, and the availability of elder care by adult children has become questionable.[10] On the other hand, with Chinese “baby boomers” approaching retirement age, informal care, such as familial care, is unlikely to meet the needs of all seniors.[11] One study indicated that nearly half of the seniors who needed some level of assistance in their activities of daily living or instrumental activities of daily living actually lived alone instead of living with their adult children.[10] Another study found that many seniors expressed preference to live alone or with their spouse, if housing and health status permitted.[12] Consequently, institutional care has been strongly promoted to meet older adults’ long-term care needs.[13]

After the welfare reform in 1990s, former government-sponsored nursing homes have become decentralized, and the amount of private nursing homes is on the rise, mostly emerging in large cities.[7] Previous studies have identified the attitudes of empty-nest elderly towards institutional care and its predictors. Some studies found

that the rate of institutional care of the Chinese elderly was rapidly on the rise, which might be due to the elderly's increasing need.[14-15] A study found that seniors' living arrangements prior to elder home placement and their assessment of the cost involved for such care were related to seniors' willingness to stay in elder homes.[16] Some other studies found that factors including gender, educational attainment, occupation, health insurance, and number of children were associated with willingness for institutional care among the empty-nest seniors.[17-19] However, only a few of these studies were published in international journals. Moreover, the studies described earlier had some systematic weaknesses. First, almost all of the empirical studies were based on small sample sizes (e.g., n=523 in the case of Xie et al.; n=570 in the case of Chen et al.; n=1000 in the case of Zhu et al.).[17-19] Second, in many studies, it was not clear who served as the reference group. In other words, the associated factors were only explored in empty-nest seniors.[17-19]

To remedy this situation, the present study aimed to compare the willingness to utilize institutional care between empty-nest and non-empty-nest seniors in China. To do so, we had the following specific objectives. First, we compared the willingness for institutional care between empty-nest and non-empty-nest elderly. Second, we identified the associated factors for institutional care among the empty-nest and non-empty-nest elderly. Our study was an empirical study and was not guided by theory.

Methods

Data

This study was conducted in Shandong, a province where the elderly aged 65 or over accounted for 11.6% of the total population.[20] In this study, a 3-stage cluster sampling was used to select participants, as described in detail previously.[21] A total of 3923 older people was included in the analysis.We used a face-to-face interviews to collect data from November 2011 to January 2012. The interviews were conducted by trained master students from Shandong University School of Public Health. To ensure quality, completed questionnaires were carefully checked by quality supervisors at the end of each day. The questionnaire included demographic characteristics, living arrangements of the households, relationship with children, marital status, economic status, mental health condition and willingness for

institutional care.

Variables and measures

The dependent variable was seniors' willingness for institutional care, which was evaluated on the grounds of participant answers to 'which endowment way are you willing for?' If the response was 'institutional care', the willingness for institutional care was coded as 'yes'. In contrast, if the answer was 'home-based care', 'community endowment' or 'others', willingness for institutional care was coded as 'no'.

Socio-demographic and psychological characteristics such as gender, age, education, past occupation (pre-retirement occupation), marital status, number of children, relationship with children, residence, self-reported health status, psychological stress, activities of daily living (ADL), non-communicable diseases (NCDs), and household income were included in this study.

The age of the participants was categorized as follows: 60-, 70- and 80+ years. Other demographic characteristics were classified as follows: gender (male vs. female), education (illiteracy or semiliterate, primary school and junior school or above), past occupation (farmer vs. others), marital status (single vs. couple), number of children (0-3 vs. >3), relationship with children (good vs. bad), residence (urban vs. rural), self-reported health status (good vs. normal or poor), ADL (□, □ and □), NCDs in the past six months (yes vs. no), and household income (Q1, Q2, Q3 and Q4). Quartile 1 (Q1) is the poorest and Quartile 4 (Q4) is the richest.

The living arrangements of elderly households were classified into non-empty nester, empty-nest single and empty-nest couple. Non-empty nester refers to those seniors who live with their children, while empty-nest single and empty-nest couple refers to those seniors who live alone without a spouse and with a spouse, respectively, for more than six months.[22] Per-capita living space is a measure that takes total living space (square metre) and divides it by the number of permanent people (who live in the house more than half a year) in a house.

Psychological stress was evaluated on the grounds of the 10-item Kessler Scale (K10). K10 is an effective tool to assess people's psychological status and was designed by scholars such as Kessler and Mroczek.[23] The Chinese-language version

of the K10 has been verified to have good reliability and validity.[24]

The ADL instrument consisted of the Physical Self-maintenance Scale and Instrumental Activities of Daily Living Scale designed by Lawton and Brody.[25] The ADL Scale was used to evaluate people's simple and basic ability to practise one's normal life independently. The reliability and validity of the ADL instrument in the Chinese-language version was demonstrated to be good.[26] Scores for ADL can be divided into three levels, with the higher level representing more severe dysfunction. Levels 1, 2 and 3 means mild dysfunction, moderate dysfunction, and severe dysfunction, respectively.[27]

We also present the variables and assignments in Appendix Table 1.

Statistical Analysis

The data were double entered and checked using EpiData 6.04. Statistical analyses were performed using SPSS 21.0. For continuous variables, p values were calculated using a Student's t test or F-test; for categorical variables, p values were calculated using a chi-square test. Two binary logistic regression models were employed to assess the association between living arrangements of elderly households and willingness for institutional care. We used a univariate logistic regression model and multi-variate logistic regression model to explore the factors associated with willingness for institutional care. All reported CIs were calculated at the 95% level. Statistical significance was set at the 5% level.

Patient and Public Involvement statement

Neither patients nor the public were involved in the development of the research question, in the analysis and in drawing conclusions from the results. The results in this study will provide evidence for policy-makers and will not be disseminated to the study participants.

Results

Table 1 shows basic information on the 3923 seniors. Approximately 8.5% seniors indicated willingness for institutional care. Non-empty nesters accounted for 40.7% of the participants, empty-nest singles accounted for 10.0%, and empty-nest couples accounted for 49.3%. Generally, the majority of the elderly were female (53.6%), between the ages of 60 and 69 (65.5%), illiterate or semiliterate (44.5%),

farmers (64.2%), couples (79.1%), having 0 to 3 children (67.4%), having a good or normal relationship with their children (91.3%), rural (54.9%), having good self-reported health status (52.1%), having mild dysfunction (72.7%), and having NCDs (65.9%). The elderly's K10 score was 15.8±6.0 (M±SD), and their per-capita living space was 33.9±23.1 (M±SD) square metres.

We presented our results in two models to understand the association between living arrangements of elderly households and willingness for institutional care. Model 1 showed that willingness for institutional care was higher in empty-nest singles (OR=2.759; 95CI 1.974-3.857) and empty-nest couples (OR=1.340; 95CI 1.038-1.729) than that in non-empty nesters. When other variables were controlled, willingness for institutional care was still higher among empty-nest singles (OR=5.301; 95CI 2.838-9.904) and empty-nest couples (OR=1.547; 95CI 1.135-2.107) than that in non-empty nesters (Table 2). Figure 1 shows that in each of the three subgroups with different household living arrangements, urban seniors' willingness to use institutional care was statistically higher than that of rural seniors.

Table 3 shows the factors associated with willingness for institutional care among empty-nest singles. Univariate analysis indicated that empty-nest singles who were from rural areas ($p<0.001$) had lower willingness for institutional care. Empty-nest singles who had greater psychological stress ($p=0.050$) had higher willingness for institutional care. Multivariate logistic analysis also showed that the two factors were associated with willingness for institutional care.

As shown in Table 4, univariate analysis showed that those empty-nest couples who had a higher education level, who were non-farmers ($p<0.001$), who had a poor relationship with their children ($p=0.014$), and who had higher household incomes were more willing for institutional care. Those empty-nest couples who had more than 3 children ($p=0.040$), who lived in rural areas ($p<0.001$), who had severe dysfunction ($p=0.003$), and who had more per-capita living space ($p=0.019$) were less willing for institutional care. Multi-logistic regression indicated that factors including education level, relationship with children, household income, and residence were associated with willingness for institutional care.

Likewise, for those non-empty-nest seniors, the multi-logistic regression model found that those with younger age, those who had fewer children, those who were

from urban areas, and those who had a normal or poor self-rated health status preferred to use institutional care (See Table 5).

Discussion

Our study found that 8.5% of the seniors had willingness for institutional care. This rate was lower than the that found among Korean American elders (45%) with a similar age.[28] This rate was lower than the reported rates of 20% in an urban area and 17% in a rural area in the elderly in China and 16.7% in a study of the seniors aged 65 or above in Taiwan, China. This rate was also lower than the 9.69% found in an older population in Zhejiang, China, and 44.8% found in a study in the elderly with a similar age in Chengdu, China.[13,29-31] Compared with the abovementioned sites, Shandong is a rather conservative province that is deeply affected by Confucianism. The culture of filial piety is profoundly rooted in Shandong residents' minds. This might be a primary cause of the variation between our study and the previous studies mentioned above.

Our results showed that living arrangements of the households were associated with the elderly's willingness for institutional care. The analysis made it clear that empty-nest singles and empty-nest couples were more willing for institutional care than non-empty nesters. This finding was consistent with another study that found that older adults who had no spouse or children were more likely to move into nursing homes than their counterparts.[7,32] Due to lack of care from adult children, empty-nest seniors are facing more endowment risks. Empty-nest elderly had poorer self-rated health, higher prevalence of two-week illness and NCDs, which indicated that they had poorer health status than non-empty-nest elderly.[5] In addition, empty-nest seniors, in comparison with non-empty-nest seniors, had higher levels of loneliness.[33] The high physical and mental health service needs might be the reason why empty-nest seniors are more willing for institutional care, which can provide professional health care.

Consistent with previous studies, our results also showed that residence was a key predictor of willingness for institutional care in all three types of elderly households.[34] Urban seniors had statistically higher willingness for institutional care than rural seniors across all three types of elderly households. Compared with rural seniors, urban seniors were less conservative. Rural seniors had lower incomes

and poorer social welfare conditions than urban seniors. Further, the supply of institutional care was relatively deficient in rural areas. These differences between rural and urban areas might explain why rural seniors were less willing for institutional care. This finding was helpful for policy-makers to differentially allocate the institutional care resources in urban and rural China.

Among empty-nest singles, psychological stress was a positive determinant for institutional care, which was in accordance with previous studies.[35] To avoid excessive reliance on family members, which may result in tensions in the family, when seniors had psychological stress, they would rather choose institutional care.[36] This might be associated with empty-nest singles' attitudes of self-reliance.

Similar to previous studies, empty-nest seniors who had a normal relationship with children were more willing for institutional care.[13] Having a good relationship with children represents more financial assistance and spiritual comfort from children. When seniors were in a poor relationship with children, they usually relied less on their adult children, which may lead to more willingness for institutional care. Empty-nest couples with higher household income were more likely to prefer institutional care which is inconsistent with previous studies in Finland.[37] Finland health system partially funds most long-term care provided at institutional facilities including health centers and nursing homes, with the maximum user fees not exceeding 80% of patients' disposable income.[38] Given this, extremely high expenditures in absolute value that would be imposed on affluent patients could economically discourage them from seeking long-term institutional care. In China, most institutional care was provided by private institutions, and the charges for different services were fixed so that, compared with Finland seniors, higher-income seniors in China will not have financial concerns. It was vital to develop pro-poor institutional care policies for those lower-income empty-nest seniors with high willingness for institutional care. We also found that empty-nest couples with more per capita living space were less willing for institutional care. Per capita living space actually could be a representative of wealth. Seniors with higher per capita living space might be richer, given the circumstance of China's rapidly growing housing prices. This might explain why empty-nest couples with more per capita living space were more willing for institutional care. Further, empty-nest couples with an education level of junior school or above were more willing for institutional care,

which was consistent with previous studies.[34]

It was found that age 70 and 79 years, having more than 3 children and normal self-reported health status were risk factors for non-empty nesters. Those who were age 70 and 79 had less preference for institutional care, which was inconsistent with one study in Hong Kong and other developed countries where the likelihood of elderly living in institutional care increased with age.[39-40] Hong Kong and other developed countries are more developed and open than Shandong, which makes those seniors more open-minded about institutional care. Different value concepts about institutional care might explain why those seniors were more willing for institutional care when compared with Shandong seniors. Non-empty-nest seniors who had more than 3 children were less willing for institutional care. More children usually means more financial and physical assistance, so it might reduce elderly needs for institutional care.[10]

This study had a large size sample (nearly 4000), which is much larger than that used in most of the similar studies. This gave the study a high degree of statistical power. This study had some limitations. First, our study had a cross-sectional design, and the results could not be interpreted as cause and effect. Second, all data were based on self-reported measures, which could lead to recall biases. Third, even though we have included some variables of social support in this study (e.g., living arrangements of the elderly households, number of the children and relationship with children), we did not use a scale to measure social support of the seniors, which will be remedied in a future study. Finally, our investigation was conducted in Shandong province, which is rather a conservative region, thus the results of our study may not be generalized to other parts of China.

Conclusion

Our study suggested that the living arrangements of households with seniors were associated with the willingness for institutional care of the elderly in China, and empty nesters were more willing for institutional care than their counterparts. Our results also showed that residence was a key associated factor for willingness for institutional care in all three types of elderly households. The government should pay

more attention to institutional care in rural areas where there is still a gap in elder care when compared with that in urban areas. Furthermore, we also identified some other associated factors for institutional care willingness among each type of elderly household. Targeting policies should be developed to offer appropriate institutional care for different types of seniors.

Competing interests

The authors declare that they have no competing interests.

Ethics approval

Ethical approval was obtained from The Ethical Committee of Shandong University School of Public Health.

Authors' contributions

Chengchao Zhou, Yangyang Qian, and Wen Qin conceived the idea, Chengchao Zhou implemented the field study. Chengchao Zhou, Yangyang Qian, Dandan Ge, Li Zhang participated in the statistical analysis and interpretation of the results. Yangyang Qian drafted the manuscript. Chengchao Zhou, Wen Qin, and Long Sun gave many valuable comments on the draft and polished it. All authors read and approved the final manuscript.

Data sharing

No additional data available.

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References:

1. Chinese National Commission of Aging. China stepped into aging society in 1999, and the number of the elderly ranks in the first in the world. 2006

2. National Bureau of Statistics of the People's Republic of China. Population map of China's economy, and a rapidly aging population in society. 2015

3. United Nations. World Population Prospects The 2010 Revision, p. 9. .2011

4. Liu, L., Guo, Q. Life Satisfaction in a Sample of Empty-Nest Elderly: A Survey in the Rural Area of a Mountainous County in China. Quality of Life Research, 2008;17, 823-830.

5. Zhou, C., Ji, C., Chu, J., Medina, A., Li, C., Jiang, S., Zheng, W., Liu, J., Rozelle, S. Non-use of health care service among empty-nest elderly in Shandong, China: a cross-sectional study. BMC Health Services Research. 2015; 15, 1-10.

6. Liu, T., Sun, L. An apocalyptic vision of ageing in China: Old age care for the largest elderly population in the world. Zeitschrift für Gerontologie und Geriatrie. 2015; 48, 354-364.

7. Zhan, H.J., Liu, G., Guan, X., Bai, H.-g. Recent Developments in Institutional Elder Care in China: Changing Concepts and Attitudes. Journal of Aging & Social Policy, 2006; 18, 85-108.

8. Croll E. The Intergenerational Contract in the Changing Asian Family. Oxford Development Studies. 2006; 34(4):473-91.

9. Lin Z, Pei X. Intergenerational exchange of resources and elderly support in rural China. International Journal of Aging and Human Development. 2016;83(2):108-27

10. Zhan, H.J., Montgomery, R.J.V. Gender and elder care In China：The influence of filial piety and structural constraints. Gender & Society,2003; 17, 209-229.

11. Zhan, H.J., Liu, G., Guan, X. Willingness and availability: Explaining new attitudes toward institutional elder care among Chinese elderly parents and their adult children. Journal of Aging Studies, 2006; 20, 279-290.

12. Xu, Q. Status quo and problems of old age support by youth and adult within the family (in Chinese). Sociological Research, 1994; 80-84.

13. Chou, R.J.-A. Willingness to live in eldercare institutions among older adults in urban and rural China: a nationwide study. Ageing and Society, 2010; 30, 583-608.

14. Cheng Y, Rosenberg M, Wang W, Yang L, Hairong L. Access to residential care in Beijing, China: making the decision to relocate to a residential care facility. . Ageing & Society. 2012;32(8):1277-99.

15. Peng R, Wu B. Changes of Health Status and Institutionalization Among Older Adults in China. Journal of Aging and Health. 2015;27(7):1223-46.

16. Guan, X., Zhan, H.J., Liu, G. Institutional and Individual Autonomy: Investigating Predictors of Attitudes Toward Institutional Care in China. The International Journal of Aging and Human Development. 2007; 64, 83-107.

17. Chen J, Willingness for institutional care and its influencing factors in the empty-nest seniors: An empirical study in Suzhou city, China.Modern Preventive Medicine,2015; 142(9):1660-2 (in Chinese)

18. Xie X, Chen L, Peng Y, Zhao S, Fan S. Population and Development,2010; 16 (2):67-75 (in Chinese)

19. Zhu A, Liu Q, Cao C, Zhu J, Li J, Qiu X, et al. Willingness for institutional care and its influencing factors among the empty-nest seniors in Hangzhou, China. Preventive Medicine,2017; 29(7):665-9 (in

Chinese)

20. Shandong Provincial Statistics Bureau. Shandong Statistic Year Book. 2015

21.QianY, Chu J, Ge D, Zhang L, Sun L, Zhou C. Gender difference inutilization willingness of institutional care among the single seniors:evidence from rural Shandong, China. Int J Equity Health (2017) 16: 77.

22. Zhou C, Chu J, Liu D, Zheng W, Guo X, Xu L. Comparison of health need and utilization between empty-nest and non-empty-nest aging population in urban communities: A sample survey based on Jinan city. Chinese Journal of Health Policy,2012; 05(2):24-29(in Chinese)

23. Kessler, R.C., Andrews, G., Colpe, L.J., Hiripi, E., Mroczek, D.K., T.Normand, S.-L., Walters, E.E., Zaslavsky, A.M. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. Psychological Medicine, 2002; 32, 959-976.

24. Zhou, C., Chu, J., Wang, T., Peng, Q., He, J., Zheng, W., Liu, D., Wang, X., Ma, H., Xu, L. Reliability and Validity of 10-item Kessler Scale (K10) Chinese Version in Evaluation of Mental Health Status of Chinese Population (in Chinese). Chinese Journal of Clinical Psychology, 2008; 16, 627-629.

25. Lawton, M.P., Brody, E.M. Assessment of Older People: Self-Maintaining and Instrumental Activities of Daily Living. Gerontologist, 1969; 9, 179-186.

26. Feng, J. Daily Activities of Living Scale's Application Value in Patients In Respiratory Medicine (in Chinese). Hebei Medical Journal, 2013; 35, 3346-3348.

27. Mahoney FI, Barthel DW. Functional evaluation: the Barthel Index. Md State Med J.1965; Feb;14:61-5.

28. Jang, Y., Kim, G., Chiriboga, D.A., Cho, S. Willingness to Use a Nursing Home: A Study of Korean American Elders. Journal of Applied Gerontology the Official Journal of the Southern Gerontological Society, 2008; 27, 110-117.

29. Chung, M.-H., Hsu, N., Wang, Y.-C., Lin, H.-C., Huang, Y.-L., Amidon, R.L., Kao, S. Factors Affecting the Long-Term Care Preferences of the Elderly in Taiwan. Geriatric Nursing, 2008; 29, 293-301.

30. Jiang, Y.-x., Si, W., Analysis of the factors influencing on elders' preferences for social care : empirical evidence from Zhejiang Province (in Chinese). Population & Economics, 2006; 8-12.

31. Deng, Y., Li, N., Liu, C., Yang, W., Wu, X., Wang, Y. Laonianren yanglao moushi xienzhe de yinxiang yinshu yianjiu [Factors affecting older adults' choices in types of eldercare] (in Chinese). China Journal of Public Health, 2008; 19, 731-732.

32. Grundy, E., Jitlal, M. Socio-demographic variations in moves to institutional care 1991-2001: a record linkage study from England and Wales. Age and Ageing, 2007; 36, 424-430.

33. Liu, L., Guo, Q. Loneliness and Health-Related Quality of Life for the Empty Nest Elderly in the Rural Area of a Mountainous County in China. Quality of Life Research, 2007; 16, 1275-1280.

34. Nie, A., Cao, F., Shao, D. Endowment and Living Willingness and Its Influence Factors of the Elderly: Based on CSS 2011. Chinese Public Administration.2015

35. Branch, L.G., Jette, A.M. A Prospective Study of Long-Term Care Institutionalization among the Aged. American Journal of Public Health, 1982; 72, 1373-1379.

36. Tao, T., Cong, C. An Analysis of Influencing Factors on Elder's Preference for Patterns of Old-age Support: Some Empirical Evidence from Beijing Xicheng District (in Chinese). Population & Economics, 2014; 15-22.

37. Einiö, E.K. Determinants of Instituional Care at Older Ages in Finland. The Population Reseach

Institute. 2010

38. Nihtilä, E., Martikainen, P. Household Income and Other Socio-Economic Determinants of Long-Term Institutional Care among Older Adults in Finland. Population Studies, 2007; 61, 299-314.

39. Woo, J., Ho, S.C., Lau, J., Yuen, Y.K. Age and marital status are major factors associated with institutionalisation in elderly Hong Kong Chinese. Journal of Epidemiology and Community Health, 1994; 48, 306-309.

40. Wingard, D.L., Jones, D.W., Kaplan, R.M. Instituional Care Utilization by the Elderly: A Critical Review. The Geontologicla Society of American, 1987; 27, 156-163.

Table 1 Socio-demographic characteristics of the elderly in Shandong, China (n=3923)

Characteristics	Total n (%)	Empty-nest single n (%)	Empty-nest couple n (%)	Non-empty nester n (%)	χ^2/F	p
N	3923(100.0)	391(10.0)	1934(49.3)	1598(40.7)		
Gender					43.525	**<0.001**
Male	1821(46.4)	132(33.8)	983(50.8)	706(44.2)		
Female	2102(53.6)	259(66.2)	951(49.2)	892(55.8)		
Age					145.042	**<0.001**
60-	2568(65.5)	162(41.4)	1257(65.0)	1149(71.9)		
70-	1122(28.6)	183(46.8)	588(30.4)	351(22.0)		
80-	233(5.9)	46(11.8)	89(4.6)	98(6.1)		
Education					84.222	**<0.001**
Illiteracy or semiliterate	1744(44.5)	240(61.4)	744(38.5)	760(47.6)		
Primary school	1171(29.8)	96(24.6)	633(32.7)	442(27.7)		
Junior school or above	1008(25.7)	55(14.1)	557(28.8)	396(24.8)		
Past occupation					34.103	**<0.001**
Farmer	2519(64.2)	278(71.1)	1156(59.8)	1085(67.9)		
Others	1404(35.8)	113(28.9)	778(40.2)	513(32.1)		

Marital Status					2024.826	**<0.001**
Single [a]	820(20.9)	391(100.0)	0(0.0)	429(26.8)		
Couple	3103(79.1)	0(0.0)	1934(100.0)	1169(73.2)		
Number of children					42.968	**<0.001**
0-3	2643(67.4)	212(54.2)	1290(66.7)	1141(71.4)		
>3	1280(32.6)	179(45.8)	644(33.3)	457(28.6)		
Relationship with children[b]					35.101	**<0.001**
Good or normal	3581(92.9)	298(85.6)	1782(92.7)	1501(94.6)		
Poor	275(7.1)	50(14.4)	140(7.3)	85(5.4)		
Residence					150.403	**<0.001**
Urban	1768(45.1)	155(39.6)	912(47.2)	701(43.9)		
Rural	2155(54.9)	236(60.4)	1022(52.8)	897(56.1)		
Self-reported health status					28.629	**<0.001**
Good	2044(52.1)	173(44.2)	962(49.7)	909(56.9)		
Normal or poor	1879(47.9)	218(55.8)	972(50.3)	689(43.1)		
Psychological stress	15.8±6.0	17.3±7.2	15.6±5.7	15.6±5.9	1.743	**0.004**
ADL					75.403	**<0.001**
I	2853(72.7)	217(55.5)	1403(72.5)	1233(77.2)		
II	631(16.1)	98(25.1)	313(16.2)	220(13.8)		

III	439(11.2)	76(19.4)	218(11.3)	145(9.1)		
NCD					26.274	**<0.001**
Yes	2586(65.9)	296(75.7)	1293(66.9)	997(62.4)		
No	1337(34.1)	95(24.3)	641(33.1)	601(37.6)		
Household income[c]					371.563	**<0.001**
Q1	996(25.4)	221(56.5)	537(27.8)	238(14.9)		
Q2	1001(25.5)	81(20.7)	551(28.5)	369(23.1)		
Q3	965(24.6)	69(17.6)	414(21.4)	482(30.2)		
Q4	961(24.5)	20(5.1)	432(22.3)	509(31.9)		
Per-capita living space	33.9±23.1	53.0±42.6	36.9±20.0	25.4±14.6	7.255	**<0.001**

[a] Single includes those who were unmarried (1.7%), divorced (0.3%), widowed (18.6%), or separated (0.3%).

[b] 67 of the participants were childless elders and were regarded as missing data here.

[c] Quartile 1 (Q1) is the poorest, and Quartile 4 (Q4) is the richest.

Table 2 Association of willingness for institutional care and household composition in Shandong, China

Characteristics	Model 1 (No covariates)		Model 2 (Covariates)	
	OR (95%CI)	p	OR (95%CI)	p
Household composition				
Non-empty nester	1.0		1.0	
Empty-nest single	2.759(1.974-3.857)	**<0.001**	5.301(2.838-9.904)	**<0.001**
Empty-nest couple	1.340(1.038-1.729)	**0.024**	1.547(1.135-2.107)	**0.006**
Gender				
Male			1.0	
Female			1.223(0.938-1.595)	0.137
Age				
60-			1.0	
70-			1.017(0.754-1.371)	0.912
80-			1.144(0.612-2.139)	0.674
Education				
Illiteracy or semiliterate			1.0	
Primary school			1.166(0.835-1.627)	0.368
Junior school or above			1.617(1.128-2.136)	0.009
Past occupation				

Farmer	1.0	
Others	1.283(0.899-1.830)	0.169
Marital Status		
Single [a]	1.0	
Couple	1.190(0.680-2.085)	0.542
Number of children		
0-3	1.0	
>3	0.755(0.559-1.021)	0.068
Relationship with children		
Good or normal	1.0	
Poor	2.504(1.685-3.720)	**<0.001**
Residence		
Urban	1.0	
Rural	0.546(0.383-0.778)	**<0.001**
Self-reported health status		
Good	1.0	
Normal or poor	1.019(0.778-1.334)	0.891
Psychological stress	0.998(0.975-1.020)	0.833
ADL		

I			1.0	
II			0.910(0.637-1.299)	0.603
III			0.577(0.334-0.997)	**0.049**
NCD				
Yes			1.0	
No			0.957(0.717-1.277)	0.764
Household income [b]				
Q1			1.0	
Q2			1.514(0.995-2.304)	0.053
Q3			1.612(1.017-2.554)	**0.042**
Q4			2.065(1.271-3.354)	**0.003**
Per-capita living space			0.989(0.983-0.996)	**0.003**
Constant	0.070	**<0.001**	0.044	**<0.001**
R squared		0.019		0.112
Observations	3923			

[a] Single includes those who were unmarried (1.7%), divorced (0.3%), widowed (18.6%), or separated (0.3%).

[b] Quartile 1 (Q1) is the poorest, and Quartile 4 (Q4) is the richest.

Table 3 Factors associated with willingness for institutional care among older empty-nest singles in Shandong, China (n=391)

Characteristics	Willingness for institutionalization		OR_c (95%CI)	p	OR_a (95%CI)	p
	Yes (%)	No (%)				
n=391	63(16.1)	328(83.9)				
Gender						NA
Male	21(15.9)	111(84.1)	1.0			
Female	42(16.2)	217(83.8)	1.023(0.578-1.812)	0.938		
Age						NA
60-	27(16.7)	135(83.3)	1.0	0.708		
70-	27(14.8)	156(85.2)	0.865(0.484-1.547)	0.626		
80-	9(19.6)	37(80.4)	1.216(0.526-2.810)	0.647		
Education						NA
Illiteracy or semiliterate	38(15.8)	202(84.2)	1.0			
Primary school	17(17.7)	79(82.3)	1.144(0.610-2.144)	0.675		
Junior school or above	8(14.5)	47(85.5)	0.905(0.396-2.066)	0.812		
Past occupation						NA
Farmer	40(14.4)	238(85.6)	1.0			
Others	23(20.4)	90(79.6)	1.521(0.862-2.682)	0.148		
Number of children						NA

0-3	38(17.9)	174(82.1)	1.0			
>3	25(14.0)	154(86.0)	0.743(0.429-1.288)	0.290		
Relationship with children[a]						NA
Good or normal	39(13.1)	259(86.9)	1.0			
Poor	11(22.0)	39(78.0)	1.873(0.886-3.962)	0.101		
Residence						
Urban	38(24.5)	117(75.5)	1.0		1.0	
Rural	25(10.6)	211(89.4)	0.365(0.210-0.634)	**<0.001**	0.304(0.161-0.572)	**<0.001**
Self-reported health status						NA
Good	24(13.9)	149(86.1)	1.0			
Normal or poor	39(17.9)	179(82.1)	1.353(0.778-2.352)	0.284		
Psychological stress[b]	63(16.1)	328(83.9)	1.036(1.000-1.073)	**0.050**	1.045(1.007-1.085)	**0.019**
ADL						NA
I	32(14.7)	185(85.3)	1.0			
II	18(18.4)	80(81.6)	1.301(0.690-2.453)	0.416		
III	13(17.1)	63(82.9)	1.193(0.589-2.415)	0.624		
NCD						NA
Yes	50(16.9)	246(83.1)	1.0			

No	13(13.7)	82(86.3)	0.780(0.403-1.508)	0.460		
Household income[c]						
Q1	29(13.1)	192(86.9)	1.0		1.0	
Q2	19(23.5)	62(76.5)	2.209(1.064-3.869)	**0.032**	1.434(0.721-2.851)	0.304
Q3	13(18.8)	56(81.2)	1.537(0.749-3.154)	0.241	0.832(0.373-1.858)	0.654
Q4	2(10.0)	18(90.0)	0.736(0.162-3.337)	0.691	0.401(0.084-1.917)	0.252
Per-capita living space	63(16.1)	328(83.9)	0.997(0.990-1.005)	0.504		NA

OR_c: crude odds ratio; OR_a: adjusted odds ratio

[a] 43 of the participants are childless elders and were regarded as missing data here.

[b] We also included "Psychological stress" in a multi-variate logistic regression model.

[c] Quartile 1 (Q1) is the poorest, and Quartile 4 (Q4) is the richest.

Table 4 Factors associated with willingness for institutional care among old empty-nest couples in Shandong, China (n=1934)

Characteristics	Willingness for institutionalization		OR_c (95%CI)	p	OR_a (95%CI)	p
	Yes (%)	No (%)				
n=1934	165(8.5)	1769(91.5)				
Gender						NA
Male	83(8.4)	900(91.6)	1.0			
Female	82(8.6)	869(91.4)	1.023(0.744-1.408)	0.888		
Age						NA
60-	100(8.0)	1157(92.0)	1.0	0.384		
70-	58(9.9)	530(90.1)	1.266(0.902-1.778)	0.173		
80-	7(7.9)	82(92.1)	0.988(0.445-2.195)	0.976		
Education						
Illiteracy or semiliterate	34(4.6)	710(95.4)	1.0		1.0	
Primary school	45(7.1)	588(92.9)	1.598(1.010-2.528)	**0.045**	1.139(0.703-1.845)	0.660
Junior school or above	86(15.4)	471(84.6)	3.813(2.521-5.767)	**<0.001**	1.918(1.173-3.135)	**0.009**
Past occupation						
Farmer	54(4.7)	1102(95.3)	1.0		1.0	
Others	111(14.3)	667(85.7)	3.396(2.419-4.767)	**<0.001**	0.909(0.535-1.544)	0.724
Number of children						

0-3	122(9.5)	1168(90.5)	1.0		1.0	
>3	43(6.7)	601(93.3)	0.685(0.477-0.983)	**0.040**	0.878(0.598-1.288)	0.506
Relationship with children[a]						
Good or normal	145(8.1)	1637(91.9)	1.0		1.0	
Poor	20(14.3)	120(85.7)	1.882(1.138-3.111)	**0.014**	2.677(1.553-4.615)	**<0.001**
Residence						
Urban	136(14.9)	776(85.1)	1.0		1.0	
Rural	29(2.8)	993(97.2)	0.167(0.110-0.252)	**<0.001**	0.167(0.110-0.252)	**<0.001**
Self-reported health status						NA
Good	85(8.8)	877(91.2)	1.0			
Normal or poor	80(8.2)	892(91.8)	0.925(0.672-1.273)	0.634		
Psychological stress	165(8.5)	1769(91.5)	0.984(0.955-1.014)	0.289		
ADL						
I	134(9.6)	1269(90.4)	1.0		1.0	
II	24(7.7)	289(92.3)	0.786(0.500-1.237)	0.298	0.905(0.563-1.453)	0.678
III	7(3.2)	211(96.8_	0.314(0.145-0.681)	**0.003**	0.436(0.196-1.018)	0.052
NCD						NA
Yes	118(9.1)	1175(90.9)	1.0			

No	47(7.3)	594(92.7)	0.788(0.554-1.121)	0.185		
Household income[b]						
Q1	11(2.0)	526(98.0)	1.0		1.0	
Q2	34(6.2)	517(93.8)	3.145(1.576-6.273)	**0.001**	2.676(1.326-5.400)	**0.006**
Q3	44(10.6)	370(89.4)	5.686(2.898-11.157)	**<0.001**	3.117(1.430-6.798)	**0.004**
Q4	76(17.6)	356(82.4)	10.208(5.348-19.485)	**<0.001**	4.674(2.057-10.621)	**<0.001**
Per-capita living space	165(8.5)	1769(91.5)	0.989(0.980-0.998)	**0.019**	0.984(0.974-0.995)	**0.003**

OR_c: crude odds ratio; OR_a: adjusted odds ratio

[a] 12 of the participants are childless elders and were regarded as missing data here.

[B] Quartile 1 (Q1) is the poorest, and Quartile 4 (Q4) is the richest.

Table 5 Factors associated with willingness for institutional care among older non-empty nesters in Shandong, China (n=1598)

Characteristics	Willingness for institutionalization		OR_c (95%CI)	p	OR_a (95%CI)	p
	Yes (%)	No (%)				
n=1598	104(6.5)	1494(93.5)				
Gender						NA
Male	48(6.8)	658(93.2)	1.0		1.0	
Female	56(6.3)	836(93.7)	0.918(0.616-1.368)	0.675		
Age						
60-	93(8.1)	1056(91.9)	1.0	**0.001**	1.0	
70-	10(2.8)	341(97.2)	0.333(0.171-0.647)	**0.001**	0.405(0.210-0.814)	**0.011**
80-	1(1.0)	97(99.0)	0.117(0.016-0.849)	**0.034**	0.209(0.027-1.591)	0.131
Education						
Illiteracy or semiliterate	34(4.5)	726(95.5)	1.0		1.0	
Primary school	30(6.8)	412(93.2)	1.555(0.938-2.578)	0.087	0.962(0.561-1.649)	0.887
Junior school or above	40(10.1)	356(89.9)	2.399(1.493-3.856)	**<0.001**	1.099(0.630-1.916)	0.739
Past occupation						
Farmer	48(4.4)	1037(95.6)	1.0		1.0	
Others	56(10.9)	457(89.1)	2.647(1.773-.953)	**<0.001**	1.103(0.669-1.818)	0.702
Marital status[a]						

Single	18(4.2)	411(95.8)	1.0		1.0	
Couple	86(7.4)	1083(92.6)	1.813(1.077-3.051)	**0.025**	1.216(0.697-2.122)	0.492
Number of children						
0-3	91(8.0)	1050(92.0)	1.0		1.0	
>3	13(2.8)	444(97.2)	0.338(0.187-0.610)	**<0.001**	0.506(0.271-0.948)	**0.033**
Relationship with children[b]						NA
Good or normal	92(6.1)	1409(93.9)	1.0			
Poor	9(10.6)	76(89.4)	1.814(0.881-3.735)	0.106		
Residence						
Urban	82(11.7)	619(88.3)	1.0		1.0	
Rural	22(2.5)	875(97.5)	0.19(0.117-0.307)	**<0.001**	0.210(0.122-0.363)	**<0.001**
Self-reported health status						
Good	48(5.3)	861(94.7)	1.0		1.0	
Normal or poor	56(8.1)	633(91.9)	1.587(1.065-2.365)	**0.023**	1.854(1.225-2.805)	**0.003**
Psychological stress	104(6.5)	1494(93.5)	0.990(0.956-1.026)	0.595		NA
ADL						NA
Ⅰ	89(7.2)	1144(92.8)	1.0			
Ⅱ	11(5.0)	209(95.0)	0.677(0.355-1.288)	0.234		

III	4(2.8)	141(97.2)	0.365(0.132-1.008)	0.052	
NCD					
Yes	65(6.5)	932(93.5)	1.0		NA
No	39(6.5)	562(93.5)	0.995(0.660-1.500)	0.981	
Household income[c]					
Q1	15(6.3)	223(93.7)	1.0		NA
Q2	12(3.3)	357(96.7)	0.500(0.230-1.087)	0.080	
Q3	30(6.2)	452(93.8)	0.987(0.520-1.872)	0.967	
Q4	47(9.2)	462(90.8)	1.512(0.828-2.764)	0.179	
Per-capita living space	104(6.5)	1494(93.5)	0.985(0.969-1.001)	0.073	NA

OR_c: crude odds ratio; OR_a: adjusted odds ratio

[a] Single includes those who are unmarried (0.9%), divorced (0.3%), widowed (25.3%), or separated (0.3%).

[b] 12 of the participants are childless elders and were regarded as missing data here.

[c] Quartile 1 (Q1) is the poorest, and Quartile 4 (Q4) is the richest.

Legend for Figure 1

Figure 1 Prevalence of seniors' willingness for institutionalization among empty-nest singles, empty-nest couples and non-empty nesters in Shandong, China (n=3923)

p<0.001***, p<0.01**, p<0.05*

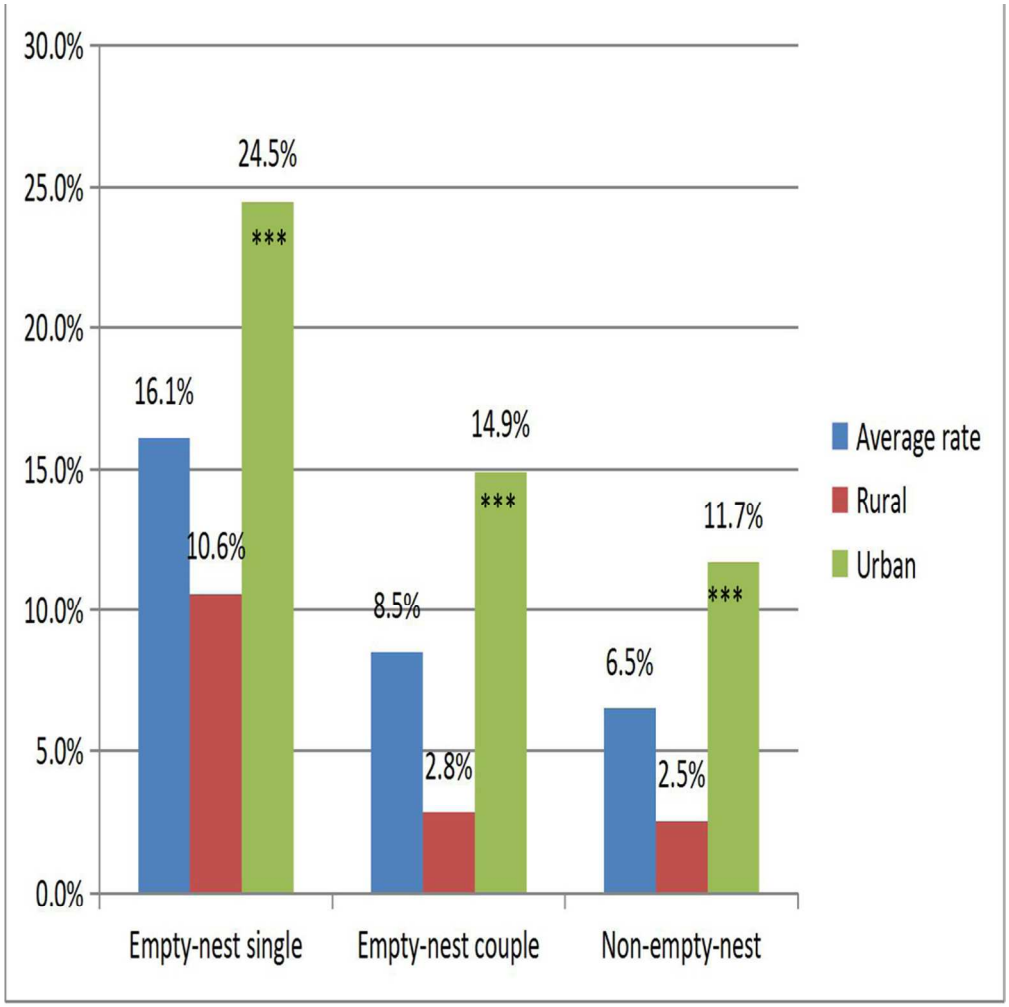

Figure 1 Prevalence of seniors' willingness for institutionalization among empty-nest single, empty-nest couple and non-empty-nest in Shandong, China (n=3923)

90x90mm (300 x 300 DPI)

Appendix Table 1: Variables and assignments

Variables	Code
Gender	
Male	0
Female	1
Age	
60-	1
70-	2
80-	3
Education	
Illiteracy or semiliterate	1
Primary school	2
Junior school or above	3
Past occupation	
Farmer	1
Others	2
Marital Status	
Single [a]	1
Couple	2
Number of children	
0-3	1
>3	2
Relationship with children	
Good or normal	1
Poor	2
Residence	
Urban	1
Rural	2
Self-reported health status	
Good	1
Normal	2
Psychological stress	-
ADL	
Ⅰ	1
Ⅱ	2
Ⅲ	3
NCD	
Yes	1
No	2
Household income	
Q1 [b]	1
Q2	2
Q3	3
Q4	4

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

	Item No	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	1，
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	1
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	2,3
Objectives	3	State specific objectives, including any prespecified hypotheses	3
Methods			
Study design	4	Present key elements of study design early in the paper	3,4,5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	3,4,5
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	3,4,5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	3,4,5
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	3,4,5
Bias	9	Describe any efforts to address potential sources of bias	9
Study size	10	Explain how the study size was arrived at	3,4,5
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	3,4,5
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	3,4,5
		(*b*) Describe any methods used to examine subgroups and interactions	3,4,5
		(*c*) Explain how missing data were addressed	
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	
		(*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	5,6
		(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	5,6
		(b) Indicate number of participants with missing data for each variable of interest	
Outcome data	15*	Report numbers of outcome events or summary measures	5,6

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	5,6
		(*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	7,8
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	7,8
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	7,8
Generalisability	21	Discuss the generalisability (external validity) of the study results	
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	9

*Give information separately for exposed and unexposed groups.

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.