Effect of informal care on health care utilisation for the elderly in China: Evidence from China Health and Retirement Longitudinal Study (CHARLS)

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Abstract

Background

Receiving informal care from family members is the mainstream way of care for the elderly in China because of the influence of the culture of filial piety. However, the relationship between informal care and health care use in urban and rural areas needs to be further explored. This study aimed to understand the effect of informal care on health care utilisation for the elderly and explore how this effect differ between urban and rural China.

Method

A total of 5704 residents aged 65 years and above were selected from the wave 3 (2015) and wave 4 (2018) of the China Health and Retirement Longitudinal Study, which is a nationally representative survey. A negative binomial regression model for panel data was used to explore the relationship between informal care and health care utilisation. Besides, a fixed-effect binary choice model for panel data was used for sensitivity test.

Result

The elderly who received informal care had an increase in outpatient and inpatient visits compared with those who did not receive. The inpatient visits of the elderly who received 15–29 days of informal care was higher (incidence rate ratio [IRR] = 2.082, $P < 0.05$). In addition, the elderly who received informal care for more than 30 days had 39.6% more inpatient visits (IRR = 1.396, $P < 0.01$) and 37.4% more outpatient visits than the elderly who did not receive informal care (IRR = 1.374, $P < 0.05$). For urban respondents, receiving informal care can facilitate outpatient use of the elderly, but for rural respondents, receiving informal care can predict an increase in outpatient and inpatient visits.

Conclusion

The impact of informal care on health care utilisation varies between rural and urban residents. Relevant departments should pay attention to the differences in the medical service utilisation amongst different elderly groups and gradually reduce the medical inequality of the elderly.

Background

Along with global ageing, China has stepped into the ageing society since 2000, and China's ageing process is much faster than those of other low- and middle-income countries. According to the results of the seventh census, 13.8% of the population is over 65 years old in 2020 [1]. However, over 17% of the elderly population should be in the hospital but fail to be hospitalised [2]. Unlike developed countries, China, as a developing country, has not effectively met the medical service needs of the elderly (especially the elderly in rural areas) [3, 4]. Informal care provided by relatives, such as children and spouses, is currently the most mainstream way of care in China because of the culture of filial piety. Filial piety is a

core value of Confucianism in Chinese culture and has a strong influence; thus, many Chinese elderly will not choose to move into nursing homes [5]. China's recent documents clearly supported the continuous improvement of home-based, community-based, institutional-based and integrated elderly care service systems promote the health of the elderly and the development of the elderly care industry [6, 7]. However, informal care will still be an important part of China's long-term care system for some time.

Prior studies on informal and formal care do not definitively establish whether the two types of care are substitutes or complements. Some studies found through carefully testing and controlling for endogeneity that informal care by children is a net substitute for long-term care, such as home health care and nursing home care, as well as for hospital care and physician visits [8, 9]. Furthermore, the care provided by children can reduce the expenditure on health services for the elderly; hence, informal care has an alternative effect on health care utilisation [10]. However, the substitution may only be reflected in the elderly with certain diseases, such as diabetes [11]. Prior studies also showed that informal care by adult children can decrease low-skilled home care use (paid domestic help) and is a complement to high-skilled home care (nursing/personal care) in Europe [12]. Accepting the care provided by family members can improve the use of outpatient and hospitalisation by the elderly, especially for those over 75 years old [13]. As China's ageing population continues to increase, policies that encourage informal care can effectively reduce the elderly's demand for housekeeping services, nursing homes and hospital outpatient clinics. This provides a solution for China's pension problems [14].

Rural and urban China represent two distinctive classes. For instance, compared with their urban counterparts, rural residents are more likely to be farmers with lower levels of education and income [15]. Urban and rural areas have great differences in family structure. The children of urban families visit their parents more conveniently and more frequently, whereas the children of rural families only meet with their parents on festivals due to distance issues [16]. Moreover, the accessibility of health services for the elderly in rural areas is worse than that in urban areas [17]. In this case, the scarcity of studies that investigated the patterns of informal care and their association with formal care by considering rural–urban disparity warrants the identification of the relationship in the specific rural and urban contexts to improve the validity of findings.

Our study extends the literature by examining how informal care affects the frequency of outpatient and inpatient use of the elderly in urban and rural China by using negative binomial regression for panel data and considering the total days of informal care provided by all family members. We need to understand the relationship between informal care and health care utilisation to promote the healthy development of the long-term care system for the elderly and meet the needs of the elderly for the utilisation of health services. This research answers the following three questions: Is informal care positively or negatively associated with health care utilisation? How does different care time affect the frequency of inpatient and outpatient visits for the elderly? Is there a difference in this effect between China's urban and rural areas?

Method And Material

Conceptual model

This study is based on the Andersen and Newman Framework of Health Service Utilisation. The Andersen model is used in analysing the factors that affect health service utilisation (including hospitalisation, doctor visits, dental care, etc.). The initial Andersen model includes predisposing characteristics, enabling resources and needs [18]. Amongst them, predisposing characteristics refer to the demographic characteristics, social structure and health beliefs of the population who tend to use medical services before the occurrence of a disease. Enabling resources refer to the individual's ability to obtain medical services and the accessibility of medical service resources. Need refers to the direct factors of health service utilisation, including perceived illness measures and evaluated illness measures [19,20]. The revised Andersen model believes that individual medical behaviour is the result of the interaction of contextual characteristics, individual characteristics and medical results. Since its creation, the Anderson model has been widely used in researches related to health expenditures and health service utilisation and is therefore an authoritative research model for medical and health services [20,21]. Thus, this study selected variables based on this model. In addition, informal care provided by family members was incorporated into the regression model as an enabling component by referring to the practices of previous literatures [22].

Data and Sample

The data used in this study were derived from the China Longitudinal Study of Health and Retirement (CHARLS). CHARLS is a national survey aimed at providing comprehensive and high-quality data, such as demographic background, family characteristics, health behaviours and conditions and retirement information, of residents aged 45 years and older. A multi-stage stratified proportional probability sampling design was used to randomly select households from 450 villages and residential communities in 150 counties and regions in 28 provinces [23]. The wave 3 study conducted in 2015 and the wave 4 study in 2018 were used for analysis in this paper. A balanced panel data with 5704 participants was formed according to the following criteria: 1) 65 years and older and 2) information about outpatient, hospitalisation and family care were provided in both waves. The details of the sampling process are shown in Fig. 1. The respondents were categorised as urban and rural residents according to the family residential area defined by the National Bureau of Statistics of China.

Dependent variables

This paper analysed two types of health care utilisation: outpatient and inpatient services. The respondents were asked about how many times they had been visited by medical institutions in the last month and how many times they had received inpatient care during the past year. Outpatient and inpatient visits were used to evaluate the utilisation of health services in the elderly in this study. Besides,

the dichotomous variable, namely, whether or not the participants use outpatient or inpatient services, was also used to examine health service utilisation.

Key variables

Interviewees were asked who helped them with their daily life activities in CHARLS. The 10 options for this question are: a) Spouse; b) Father, Mother, Father-in-law or Mother-in-law; c) Children, Children's spouses, Grandson or Granddaughter; d) Sibling, Brother-in-law, Sister-in-law, Sibling of spouse, Children of sibling, Brother-in-law of spouse, Sister-in-law of spouse, Children of brother-in-law or Children of sister-in-law; e) Other relatives; f) Paid helper (such as nanny); g) Volunteer; h) Employee(s) of facility; i) Community; j) Others. The participants who selected one or more of options a–e were considered to have accepted informal care from family members [13,14]. In addition, the interviewees were asked about the number of days in the past month that family members had assisted them.

In this research, informal care was examined by two aspects:

- a) Whether the respondents have received informal care from family members. The answers were coded as 'Yes' and 'No.'
- b) The number of days of informal care that respondents received in a month. The answers were coded as 'none,' 'less than 15 days,' 'between 15 and 29 days' and '30 days or more.'

The Control variables

Control variables were selected in accordance with predisposing characteristic, enabling resources and needs according to the Andersen model [24–27]. The following individual-level characteristics were considered as control variables (Table 1).

Table 1: Definition/codes of the control variables.

	Variables	Codes/definition
Predisposing Characteristics	Gender	0=Male; 1=Female
	Age	Continuous variable
	Marital statuses	0=Single; 1=Partnered
	Education	1 = Illiterate; 2 = Primary school and lower; 3 = Junior middle school; 4 = Senior middle school and higher
Enabling Resources	Medical insurance	0=None; 2=Yes
	Pension	Whether received any pension or not: 1=No; 2=Yes
	Financial support from children	Financial support received from children: 0=None; 1=0-2000yuan; 2=2000-5000yuan; 3=5000-10000yuan; 4=10000yuan or more
	Smoke	0=No; 2=Yes
	Drink	0=No; 2=Yes
Need	Chronic diseases	0=None; 1=Yes
	Number of ADL limitations	Range from 0 to 6
	Number of IADL limitations	Range from 0 to 6
	Self-rated health	1=very good; 2=good; 3=fair; 4=poor; 5=very poor
	Year	2015; 2018

Note: ADL: activities of daily living; IADL: instrument activities of daily living.

Statistical analysis

The dependent variables of this study are outpatient visits and inpatient visits, which are count variables; therefore, the analysis methods considered were Poisson regression and negative binomial regression [28]. However, for a good-fitting model, Poisson regression requires the mean and variance of the dependent variable to be equal. Substantial departures from this measure may indicate a problem with model specification and also suggest that the estimated standard errors may be downwardly biased. In comparison, negative binomial regression is more suitable when overdispersion occurs [29]. This study examined whether the two dependent variables have overdispersal through the likelihood-ratio test of

alpha value. The results show that the alpha value is significantly not 0 (95% confidence interval [CI]: 4.75–6.03; 95% CI: 1.41–2.09), which means negative binomial regression should be used in this study instead of Poisson regression [30,31]. Subsequently, this study conducted Hausman test (both $P < 0.001$) and LR test (both $P < 0.001$) using inpatient and outpatient visits as the outcome variables, respectively. The results showed that the fixed effect is more applicable. Therefore, fixed-effect negative binomial regression for panel data was conducted to estimate the impact of informal care on the health service utilisation of the elderly. [32]. Cluster-robust standard errors were used to control heteroscedasticity [33]. The specification of the model was as follows:

$$\ln(\lambda_{it}) = \beta_1 \text{care}_{it} + \beta_2 P_{it} + \beta_3 E_{it} + \beta_4 N_{it} + \mu_{it} + \varepsilon,$$

where λ_{it} represents the outpatient or inpatient visits of individual i in period t , care_{it} represents the time of informal care obtained by individual i in period t , and P_{it} , E_{it} and N_{it} represent the control variables related to predisposing characteristics, enabling resources and needs in the Anderson Model, respectively. μ_{it} is the individual fixed effect, and ε is the error term. Incidence rate ratio (IRR) was calculated to facilitate the interpretation of the results. [34].

Model uncertainty is ubiquitous in social science. Thus, substitution dependent variables and substitution regression model were used to test the robustness [35]. The dichotomous variable, namely, whether outpatient and inpatient services were used, was regarded as the outcome variable. A fixed-effect binary choice model for panel data was used for sensitivity test.

Results

Basic characteristics of the respondents

The basic characteristics of the whole sample are shown in Table 2. In general, the elderly living in the city have slightly more outpatient visits and lesser inpatient visits than those of the rural elderly.

Table 2: Sample characteristics of the selected respondents at baseline.

	All (N=5704)		Urban(N=1427)		Rural(N=4277)	
	mean	Sd.	mean	Sd.	mean	Sd.
Inpatient	0.36	0.93	0.37	0.81	0.36	0.97
Outpatient	0.46	1.49	0.41	1.36	0.48	1.54
Informal care	1.68	1.20	1.56	1.14	1.73	1.22
Gender	0.49	0.50	0.51	0.50	0.49	0.50
Age	74.35	6.54	74.13	6.36	74.42	6.59
Marital status	0.49	0.50	0.53	0.50	0.48	0.50
Education	1.86	0.87	2.33	1.08	1.70	0.72
Chronic diseases	0.46	0.50	0.47	0.50	0.45	0.50
Smoke	0.26	0.44	0.20	0.40	0.27	0.45
Drink	0.29	0.46	0.30	0.46	0.29	0.45
Medical insurance	0.92	0.26	0.94	0.24	0.92	0.27
Number of ADL limitations	0.62	1.19	0.44	1.02	0.68	1.24
Number of IADL limitations	1.23	1.56	0.74	1.38	1.12	1.61
Financial support	1.37	1.25	1.27	1.37	1.41	1.20
Pension	0.16	0.37	0.47	0.50	0.06	0.23
Self-rated health	3.09	0.94	2.90	0.91	3.15	0.95

Note: Sd. = standard error

Informal care of the elderly in urban and rural areas

This study found by comparing informal care in urban and rural areas of China that the proportion of elderly people who received informal care increased from 19.08% and 28.99% in 2015 to 24.80% and 33.29% in 2018, respectively. The elderly who had been in care for 30 days or more accounted for the highest proportion. In addition, a higher proportion of rural elderly people received informal care than urban ones in both years (Fig. 2).

Main Results

The results of the negative binomial regression in Table 3 show that informal care provided by family members remarkably improved the utilisation of outpatient and inpatient services for the elderly.

Specifically, compared with the elderly who did not receive family care, the inpatient visits of the elderly who received 15–29 days of informal care was higher (IRR=2.082, $P<0.05$). In addition, the elderly who received informal care for more than 30 days had 39.6% more inpatient visits than (IRR=1.396, $P<0.01$) and 37.4% more outpatient visits than those who did not receive informal care (IRR=1.374, $P<0.05$).

Table 3: Impact of informal care on health service utilisation: fixed-effect negative binomial model for panel data.

	Inpatient (N=5704)		Outpatient (N=5704)	
	IRR	Bootstrap standard error	IRR	Bootstrap standard error
Informal care (reference: None)				
1-14d	1.022	0.164	1.219	0.255
15-29d	2.082**	0.664	1.262	0.415
30d or more	1.396***	0.175	1.374**	0.189
Gender (reference: male)	0.583	0.202	1.044	0.263
Age	1.042**	0.020	0.944***	0.016
Marital status (reference: single)	0.632**	0.125	1.290	0.234
Education (reference: illiterate)	1.105	0.113	1.038	0.088
Chronic diseases (reference: None)	1.399***	0.109	1.111	0.085
Smoke (reference: No)	0.470***	0.081	0.869	0.158
Drink (reference: No)	0.720**	0.116	1.028	0.132
Medical insurance (reference: None)	1.275	0.291	1.263	0.215
Number of ADL limitations	1.056	0.041	1.037	0.042
Number of IADL limitations	1.044	0.042	0.993	0.039
Financial support (reference: None)	1.107**	0.044	0.939	0.039
Pension (reference: None)	0.911	0.147	1.331*	0.228
Self-rated health	1.238***	0.071	1.267***	0.070
Intercept	0.026***	0.036	7.624	10.204

Note: IRR = incidence rate ratio. (*), (**), (***) mean significant level at 10%, 5%, 1%, respectively. ADL: activities of daily living; IADL: instrument activities of daily living.

The samples were divided into urban and rural residents to test the difference in the impact of informal care on the formal care of the elderly in urban and rural areas. The results in Table 4 show the remarkable differences between urban and rural areas. In terms of inpatient visits, the number of hospitalisation of the elderly in rural areas who received care for 15–29 days and more than 30 days increased by 111.4% (IRR=2.114, P<0.05) and 53.2% (IRR=1.532, P<0.01), respectively. In terms of outpatient visits, urban elders who received informal care within 15 days had increased outpatient visits (IRR=3.164, P<0.01), whereas the elderly in rural areas need 30 days or longer period of care to increase outpatient visits significantly (IRR=1.500, P<0.05).

Table 4: Association between informal care and health service utilisation in urban and rural China.

	Urban (N=1427)		Rural (N=4277)	
	Inpatient	Outpatient	Inpatient	Outpatient
Informal care—reference: None—				
1-14d	0.488	3.164*	1.210	1.330
15-29d	2.038	2.015	2.114**	1.227
30d or more	1.208	1.804	1.532***	1.500**

Note: IRR = incidence rate ratio. All models have controlled variables, including gender, age, marital status, education, chronic diseases, smoke, drink, medical insurance, number of ADL limitations, number of IADL limitations, financial support, pension and self-rated health. (*), (**), (***) mean significant level at 10%, 5%, 1%, respectively.

Sensitivity tests

This study regarded whether the respondents used outpatient and inpatient services or not as outcome variables to test the robustness of the results. A fixed-effect binary choice model for panel data was selected after Hausman test (both P<0.001). The result showed that informal care can remarkably increase the utilisation of outpatient and inpatient services for the elderly. The result is consistent with the outcome of the negative binomial regression model.

Table 5: Impact of informal care on health care utilisation: fixed-effect binary choice model for panel data.

	Inpatient (N=5704)		Outpatient (N=5704)	
	β	Sd.	β	Sd.
Informal care (reference: None)				
1-14d	0.024	0.244	0.397*	0.237
15-29d	1.117**	0.441	0.298	0.406
30d or more	0.449**	0.192	0.403**	0.184
Gender (reference: male)	1.038	1.418	-0.001	0.843
Age	0.037	0.026	-0.107***	0.027
Marital status (reference: single)	-1.239***	0.358	0.358	0.314
Education (reference: illiterate)	0.054	0.124	-0.089	0.149
Chronic diseases (reference: None)	0.407***	0.113	0.146	0.112
Smoke (reference: No)	-0.871***	0.268	-0.546**	0.270
Drink (reference: No)	-0.370**	0.186	0.030	0.192
Medical insurance (reference: None)	0.364	0.232	0.227	0.235
Number of ADL limitations	0.112*	0.063	0.018	0.055
Number of IADL limitations	0.079	0.058	0.002	0.057
Financial support (reference: None)	0.136**	0.057	-0.021	0.060
Pension (reference: None)	-0.180	0.250	0.144	0.262
Self-rated health (reference: very good)	0.236***	0.080	0.274***	0.081

Note: Sd.= standard error. (*), (**), (***) mean significant level at 10%, 5%, 1%, respectively.

Discussion

Status of informal care and health care utilization

The proportion of informal care in China is increasing, and the proportion of informal care in rural areas is higher than that in urban areas. The reason may be that Chinese families follow The Pecking Order Theory in their choice of care mode for the elderly, which means that they will use all internal care resources first before social care [36].

The elderly living in the city have slightly more outpatient visits and lesser inpatient visits than those of the rural elderly. This finding may be due to the fact that the urban elderly have more convenience to seek medical treatment and more channels to receive outpatient services than the rural elderly [37]. The rural elderly's priority health needs are inhibited by personal economic conditions, especially for diseases with mild symptoms, which reduce their outpatient visits [38]. In addition, mild symptoms may become severe because of the poor economic conditions and poor health literacy of rural elderly. Therefore, the hospitalisation rate is high in rural areas [39].

Association between informal care and formal care

This study found that informal care provided by family members is positively associated with outpatient and inpatient services in urban and rural residents. Similar findings were found in prior studies [12, 13, 40]. Accepting informal care for 15 days or more can remarkably increase the utilisation of health services for the elderly.

In terms of inpatient care, the elderly who receive informal care for 15–29 days per month have more than twice as many inpatient services as those who do not receive care. The hospitalisation rate of the elderly who received informal care for 30 days or more is higher by 39.6% compared with those who did not receive care. On the one hand, hospitalisation involves highly professional and highly skilled personnel, who cannot be replaced by informal care [12]; on the other hand, family members can detect the diseases of the care recipients in time and help them to seek medical attention promptly.

In terms of outpatient care, the elderly who receive informal care for 30 days or more have higher frequency of outpatient use. The reason may be that informal care provided by family members is more related to daily life care than medical services. Accordingly, caregivers can consult doctors about health status and medical treatment of the elderly to reduce medical barriers. Moreover, the elderly can be sent to medical institutions in time because of the preventive psychology of informal caregivers [41].

Heterogeneity between urban and rural areas

The impact of informal care on health care utilisation differs greatly between urban and rural areas in China. This finding is in line with prior studies [42, 43]. The elderly living in cities receive informal care without affecting their inpatient visits. However, in rural areas, receiving care from family members can increase the hospitalisation rate of the elderly. In terms of outpatient use, informal care within 15 days can increase the number of outpatient visits of the urban elderly, and informal care of 30 days or more can increase the outpatient visits of the rural elderly. This difference may be due to the dual socioeconomic structure of urban–rural divide and rule; urban and rural elderly people have differences in income, concepts and service provision [44]. The elderly in rural areas have poor medical awareness and poor economic conditions; therefore, family members have a greater role in urging the elderly to seek medical treatment [37]. Another reason may be the better accessibility of health resources for the urban elderly than that of the rural elderly [17]. The elderly in rural areas, especially the disabled, need help from other family members to obtain outpatient and inpatient services because of the long distance to health care facilities.

Limitation

There are three limitations in this study. First, the study period covers only 2 waves. The short study period may not reflect the long-term effects of informal care on health care utilisation. Second, the endogeneity in this study was not controlled which may lead to biased estimates. Third, this study focuses on informal care provided by all the caregivers instead of different caregivers. Further research should be conducted to examine the impact of informal care provided by different caregivers on health care utilisation.

Conclusion

This study has two main findings. Firstly, informal care provided by family members can remarkably increase the outpatient and inpatient visits of the elderly. Moreover, this effect still exists after replacing the outcome variables and model. Secondly, the association between informal and health care utilisation varies between rural and urban residents. The impact of informal care on the health care use amongst urban elderly is weaker than that in rural areas. These findings imply the role of informal care and remind that relevant departments should pay attention to the differences in medical service utilisation levels amongst different elderly groups and gradually reduce medical inequality amongst the elderly.

Abbreviations

CHARLS: China Longitudinal Study of Health and Retirement

IRR: incidence rate ratio

Sd.: standard error

ADL: activities of daily living;

IADL: instrument activities of daily living

Declarations

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Authors' contributions

Xinlan Chen and DS designed this study and performed the statistical analysis. XC drafted the manuscript. DS, YC and Xinlin Chen participated in data analysis and helped to revise the draft. All

authors read and approved the final manuscript.

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Ethics approval and consent to participate

The data used in this study were retrieved from the CHARLS. This survey was endorsed by the Biomedical Ethics Committee of Peking University (NO.IRB 00001052–11015). All participants in the survey signed or marked (if illiterate) the informed consent forms.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and analysed during the current study are available in the CHARLS repository, [<http://charls.pku.edu.cn/en>].

Competing interests

The authors declare that they have no competing interests.

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Figures

Figure 1

Flowchart of participant selection.

Figure 2

Comparison of informal care in urban and rural areas from 2015 to 2018