Study on the Demand and Utilization of Health Services for the Poor Elderly in China

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Research

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Abstract

Background

Despite historic achievements in fighting poverty over recent decades, the unmet health needs of the poor elderly are still a severe problem in China. This paper investigates the demand and utilization status of health services among the poor elderly and examines the factors that affect healthcare service utilization.

Methods

According to the international poverty line of each year, we selected the poor elderly from the China Health and Retirement Longitudinal Study (CHARLS) from 2011 to 2015 to create nationally representative estimates. The main outcome measures include utilization indicators for the probability and costs of outpatient/inpatient services. Based on a modified Andersen behaviour model, a two-part model is designed to investigate and analyse how predisposing factors, enabling factors, and need and health behaviour variables affect the health service utilization of the poor elderly. The prediction of marginal effect of the unconditional healthcare expenditure are estimated by jointing the model of probability and expenditure of health service utilization.

Results

The morbidity and chronic disease rates of the poor elderly were 16.93% and 79.43%, respectively. The visit rate of outpatient services increased from 15.05% in 2011 to 21.26% in 2015, and the hospitalization rate increased from 9.87–16.89%. In terms of medical expenditures, the median cost of outpatient and inpatient services in 2015 for the poor elderly were 350 RMB and 10,000 RMB, respectively, and the out-of-pocket ratios were 85.2% and 53.3% respectively. Overall, 78.44% of the people who actually needed healthcare did not use health services, and the main reason was financial difficulties (42.32%). The two-part model showed that the poor elderly who are higher educated, have children, live in central regions, and have social security and a poor health status and who do not smoke or drink are more likely to use health services. Males who live in the eastern regions with poor self-reported health, physical disabilities and chronic diseases have more medical expenses. Margin effect analysis finds that the need factor is more important than other factors in determining health service utilization.

Conclusion

The poor elderly in China, as the most vulnerable group, tends to have a worse health status and a heavier medical burden. Due to a variety of constraints, the poor elderly had a lower utilization of health services. Predisposing, enabling, need and health behaviour variables should be considered when making

policy and taking measures to eliminate health inequalities to improve the health service utilization and the health of the poor elderly.

Key Messages

1. Implications for policy makers

- This paper has focused on the problems of poverty and ageing population, and the findings have added substantially to our understanding of the demand and utilization of health services and the factors that affect healthcare service utilization among Chinese poor elderly
- The results of this study supply important guidance meaning for optimizing the poverty-aid strategies and improving the health equity of the elderly.
- It is suggested that the government need to attach great importance to economic development to help the poor getting rid of poverty, focus on the health improvement of the more vulnerable population among the poor elderly, and also improve health services access and further consummate health insurance system, so as to meet the diversified needs of different types of the poor elderly.

2. Implications for public

- This study has established a unified poverty line standard with both adaptability to Chinese conditions and international comparability, and has provided valuable references for further development of the empirical research of the Chinese poor elderly.
- It is suggested that the health condition of the poor elderly are not optimistic, and the health service utilization of them are influenced by many factors. Comprehensive measures should be taken to make sure the poor elderly use the healthcare more efficient.

Background

In China, the speed of ageing in the population is grim. By the end of 2017, the number of elderly people aged 60 and above reached 241 million, which accounts for 17.3% of the total population [1]. Compared with developed countries, the ageing of the population has some features in China, such as the great number of old people and a rapid increase of this number, which are unequal to the economic development and nationalized social security systems [2, 3]. This imbalance has led to the problem of "getting old before getting rich" [4].

Old people, who generally have a worse health status and a higher level of multi-morbidity and chronic disease conditions, have an increased need for healthcare and actually consume a disproportionate and inappropriate share of services [5, 6]. According to statistics, the two-week morbidity rate of the elderly increased from 25.0% in 1993 to 56.9% in 2013[7]. Old people are 4.2 times more likely to be diagnosed

with chronic diseases than the general population, and their prevalence with chronic disease reached 71.8% in 2013 [8]. In addition, it has been documented that medical expenses are much higher for the elderly than for other age groups. In China, the Chinese Public Administration Society suggested that the annual medical expenses of the elderly, which accounted for 30% of total healthcare costs, were 2.56 times higher than the medical expenses of the total population [9, 10]. However, due to a low socioeconomic status, the high price of medical services and an incomplete health insurance system, efficiently utilizing health services for the elderly is difficult. Particularly, this problem among the elderly who live below the poverty line is even worse.

A good deal of evidence indicates that the interaction between poverty and worse health is a causality that runs in both directions. Previous studies show that old people with a low economic status are much more likely to have worse health outcomes than better-off people [11–13]. Worse health is often associated with substantial healthcare costs that aggravate the economic hardship [14]. Meanwhile, poverty could also cause worse health. The poor elderly suffer from a multiplicity of constraints that result in worse health outcomes [15]. The poor elderly are thus caught in a vicious circle: poverty breeds worse health, and worse health maintains poverty [11].

Currently, poverty reduction and healthcare for all have been identified as the primary drivers towards achieving sustainable development goals both nationally and worldwide. Since the Reform and Opening Up, China has made remarkable achievements in poverty reduction, which makes the country a major contributor to the world's poverty reduction endeavours. However, the poverty of the Chinese elderly remains a concerning issue in our society [16]. Typically, the inequality between the health demand and the healthcare utilization of the poor elderly is still unclear. Many studies and a variety of models have been conducted to investigate old people's healthcare utilization from various aspects [17–20]. However, studies on the health status and health service utilization of the poor elderly population are relatively scarce, and few national surveys exist to research the health-related issues of the poor elderly population. This study, based on the data from the China Health and Retirement Longitudinal Study (CHARLS) from 2011 to 2015, employs the Andersen Health Behavior Model as a theoretical framework to analyse the status and influencing factors of the health demands and healthcare utilization among the poor elderly. Our results will provide the grounds for decision-making for further promoting the health equality of the elderly and improving their utilization of health resources.

Methods

2.1 Data

The data used here come from the national baseline survey of the China Health and Retirement Longitudinal Study (CHARLS) collected from 2011 to 2015. The CHARLS is a biennial survey that was initiated in 2011 and conducted by the National School of Development at Peking University. It is a nationally representative longitudinal survey that collected information on Chinese residents aged 45 years and above and their spouses regarding assessments of social, economic, and health

circumstances. To ensure cross-study comparability of the results, the CHARLS was harmonized with leading international research studies in the Health and Retirement Study (HRS) and intended to provide a high-quality public micro-database with a wide range of information that serves the needs of scientific and policy research on ageing-related issues [21].

Based on multistage probability sampling, 10,257 households and 17,708 individuals were studied through face-to-face computer-aided personal interviews. Ethical approval for this study was not required because it was based exclusively on publicly available data. All subjects were informed of a grant of confidentiality that legally protected their responses.

Consistent with the estimates obtained from other studies, we find that there are a large number of missing values and extreme values in the income variables, such as some outpatient subsamples had a household income of less than zero. In addition, the underestimation of income due to deliberate underreporting might be a problem [22]. Enlightened by the prior study, we adopted the household total expenditure per capita (EPC) as a proxy for financial status, which is the sum of the household food EPC, household monthly EPC, and household yearly EPC [22, 23]. According to the standard of the international poverty line (\$1.90 a day) and the Purchasing Power Parity (PPP) of each year, we calculated the poverty line of urban and rural areas in RMB [24]. After excluding the respondents with key variables missing or for not reaching the standards, 3,760 respondents over 60 years old who live on or below the poverty line were ultimately selected for this paper from 2011 to 2015.

2.2 Measurements

Dependent variables

To account for the observable differences in health needs, this study considers the one-month morbidity, chronic disease prevalence and self-reported health status of the poor elderly population [5, 6, 25]. The dependent variables in our analysis reflect the intensity and expenditure of different healthcare utilizations. We consider the following measures of health service utilization: (a) the probability of outpatient visits during the one month that precedes the survey date; (b) the individual expenditure for the outpatient visits during the past month; (c) the probability of being hospitalized during the year that precedes the survey date; and (d) the individual expenditure for inpatient visits in the past year.

Independent variables

In this study, the independent variables are chosen based on the Andersen Behavior Model (Andersen, 1968), which was introduced in the late 1960s to help understand the use of health services, define equitable access to healthcare, and assist in developing policies to equalize access to healthcare [26]. The original model considered that health service utilization was related to three predictors, which were described as people's predisposition to use services, the factors that enable or impede their use of services and their need for healthcare. Up to now, increasingly more studies have employed this model and its variations to assess the utilization and outcomes of healthcare services for both general and vulnerable populations [20, 27, 28]. In this study, we use a modified Andersen behavioural model of health

services as a theoretical framework to analyse the factors associated with health service utilization among the poor elderly. Our model includes four types of variables, namely, predisposing, enabling, need, and lifestyle variables [29].

Predisposing factors.

The predisposing component centres on the idea that some individuals have a propensity to use services more than other individuals, and this tendency can be predicted from individual characteristics prior to an illness episode. In the present paper, the predisposing factors include gender, age, education and marital status. Age has been divided into the three groups of 60 ~ 69, 70 ~ 79, and 80+ years (we labelled these three groups of elderly people as “young-old”, “the mid-aged old” and “the eldest old”, respectively). Education has the following four categories: (1) illiterate; (2) primary school; (3) middle school; and (4) high school and above. Marital status has been divided into the two categories of (1) married (including cohabitating and the spouse being away for job purposes) and (2) unmarried (including separated, divorced or widowed).

Enabling factors.

The main idea for this type of variable is that people may well be predisposed to using health services, but they also need some means of obtaining them. In the present paper, the enabling variables include whether the respondents have children, an urban or rural residence, health insurance and an old-age pension, as well as their region and their traffic time for health services. Their region is determined numerically (1 = eastern, 2 = central, 3 = western). Health insurance is measured by uninsured = no insurance, UEMI = Urban Employee Medical Insurance, URMI = Urban Resident Medical Insurance, NCMS = New Rural Cooperative Medical Scheme, private MI = private commercial medical insurance, and other = other health insurance. An old-age pension is based on whether people receive benefits from any pension programme (no or yes).

Need factors.

This variable captures the need for healthcare and represents the most immediate cause of health service use. Generally, need includes individuals' perceived and evaluated functional capacity, symptoms, and general state of health. In this study, the need variables include self-reported health status, physical disability, chronic diseases and limitations on activities of daily living (ADL). Self-reported health is obtained from the response to the question “Would you say your health is excellent, very good, good, fair and poor?” or “Would you say your health is very good, good, fair, poor and very poor?” We combined the answers to these two questions into the three categories of poor, fair and good. Physical disabilities are based on the respondents' answer to the question “Do you have one of the following disabilities, physical disabilities?” Chronic diseases are assessed as the cumulative number of diagnosed conditions (0, 1 ~ 2 and ≥ 3). ADL limitations indicate any self-reported difficulty in any of the following activities of daily living: bathing/showering; eating; dressing; getting into or out of bed; using the toilet; or controlling urination and defecation.

Health behaviour variables.

Lifestyle is measured by the following three variables: (1) smoke (No = never a smoker, Yes = smoker); (2) drink (No = never, Yes = drinking alcohol more than once or less than once in a month); and (3) physical examination (No = not having a regular physical examination or Yes = having a regular physical examination).

2.3 Statistical analysis

A descriptive analysis is used for the demographic characteristics of the samples. The variables of morbidity and the rates of outpatient and inpatient visits were presented as rates, and the differences between the groups were examined by using the chi-square test. Subsequently, a two-part model is employed to further investigate the factors that affect the utilization of health services by the poor elderly. A two-sided p-value of < 0.05 was considered to indicate statistical significance. All statistical analyses are performed with STATA software, version 15.0.

Previous studies have suggested that many individuals did not use any healthcare services during the study period; therefore, the medical cost data are usually characterized by having a substantial proportion of zero values and a right-skewed distribution, and they may exhibit heteroscedasticity [30]. A two-part model can be used to address these data issues. The selection criteria that a high value of the variance inflation factor (VIF) is a sufficient condition for the presence of collinearity suggests that a VIF in excess of 30 is a cause for concern. Therefore, we use a two-part model to analyse health service utilization in the present paper [31]. Specifically, the first part of the model is a logistic that predicts the probability of any use of health services: in Eq. (1), the dependent variable is the probability of health service utilization, and . If , then ; otherwise, . Healthcare expenditure is analyzed by a generalized linear model with a gamma distribution and a log link that can estimate the medical costs of only the observations with positive spending [32–34]. In Eq. 3, $E(Y>0|X)$ is the probability of health service utilization multiplied by the expected cost, which is conditional on being a user, and the sample average of $E(Y_i)$ becomes the expected healthcare spending of the elderly. Since Eq. 3 is specified as gamma GLIMMIX, the link function directly characterizes how the expectation of Y_i is related to the regressors, which avoids the complications of a log-linked Ordinary Least Squares model [30]. The 2PM can be explained as follows:

1

2

3

Results

3.1 Sample characteristics

Table 1 provides the sample characteristics in this study. Among the 3,760 interviewees, males accounted for 47.98%, 56.82% were young-old, while approximately 10% were oldest-old. As for educational attainment, 40.53% of respondents were illiterate, 43.24% had completed primary school, while 5.96% had completed high school and above. In sum, the poor elderly generally have lower levels of education. More than 75% of the poor elderly were married and 16.54% had no children. 31.91% had no old-age pension and 13.62% had no medical insurance. 81.38% were enrolled in universal medical insurance schemes, 72.47% covered by NCMI, 0.61% had private commercial medical insurance, while the remaining 4.93% had other insurance. Almost 80% interviewees resided in rural area, and only 20.37% resided in urban area. The highest proportion lived in the western area (46.47%) while the lowest proportion lived in the central area (23.96%). Almost 59.89% reported that their outpatient traffic time was more than 15 minutes, and one third of the respondents reported that their inpatient traffic time was more than one hour.

Table 1
Characteristics of the poor elderly (N = 3760)

Variables		N	Percent (%)
Predisposing variables			
Gender	male	1804	47.98
	female	1956	52.02
Age group	60 ~ 69	2087	56.82
	70 ~ 79	1228	33.43
	≥ 80	358	9.75
Education	illiterate	1524	40.53
	primary school	1626	43.24
	middle school	386	10.27
	high school and above	224	5.96
Marital status	married	2851	75.82
	unmarried	909	24.18
Enabling variables			
Number of children	0	622	16.54
	1 ~ 2	963	25.61
	≥ 3	2175	57.85
Health insurance	uninsured	512	13.62
	UEMI	144	3.83
	URMI	191	5.08
	NCMI	2725	72.47
	private MI	23	0.61
	other	165	4.39
Pension	No	1200	31.91
	Yes	2560	68.09
Residence	rural	2994	79.63
	urban	766	20.37

Variables		N	Percent (%)
Region	eastern area	1086	29.57
	central area	880	23.96
	western area	1707	46.47
Traffic time for outpatient service(min)	< 15	1237	33.69
	15 ~ 60	1583	43.11
	> 60	852	23.20
Traffic time for inpatient service(min)	< 15	674	18.37
	15 ~ 60	1896	51.66
	> 60	1100	29.97
Need variables			
Chronic disease	0	787	21.44
	1 ~ 2	1790	48.77
	≥ 3	1093	29.78
Self-reported health status	poor	899	24.48
	fair	1938	52.78
	good	835	22.74
Physical disability	No	1922	52.34
	Yes	1750	47.66
ADL	no difficulty	2120	56.38
	difficulties	1640	43.62
Life-style variables			
Smoke	No	2036	54.15
	Yes	1724	45.85
Drink	No	2941	78.22
	Yes	819	21.78
Physical examination	No	2050	55.83
	Yes	1622	44.17
Sample	N	3760	100.00

In regard to the health status, 77.26% reported that their health was either fair or poor (52.78%, 24.48%, respectively). In terms of disease status, the percentage of interviewees with chronic diseases was 78.56%. 48.77% reported that they had one or two chronic diseases, and 29.78% had three and more chronic diseases. Moreover, 47.66% had a physical disability and 43.62% of the respondents had difficulties with ADLs.

A large portion engaged in unhealthy behaviours: 45.85% of interviewees smoked, 21.78% drank, and nearly 45% interviewees had regular physical examinations (44.17%) (Table 1).

3.2 The health needs of the poor elderly

In order to assess the utilization of health services, first the health status was assessed, since the 'need' variable is universally regarded as the most explanatory. It is known that health status is a multidimensional variable. The indicators chosen to represent the health status are: two objective (reported morbidity, chronic diseases) and one subjective (self-reported health) and. This study showed that the past-month morbidity and chronic diseases prevalence of the poor elderly were 16.93% and 78.56%, respectively. Respondents who were female, with lower educational level, not being in a marriage, living in rural or western area, with more than 15 minutes of traffic time would have more risk of disease. Moreover, 77.26% of the surveyed poor elderly reported that they were in fair or poor health (see Table 2). The univariate analysis results of self-reported health are highly correlated with morbidity and chronic disease prevalence. As listed in Table 2, the low-income elderly who were female, aged 70 ~ 79 years, with lower education level, without children or marriage, living in rural or western areas, and with longer traffic time are more likely to report that they are in fair or poor health.

Table 2
The health needs of the poor elderly

	One-month morbidity	Chronic diseases prevalence	Self-reported health		
			Poor	Fair	Good
Gender					
male	14.89***	77.04***	22.36***	55.76	21.88
female	18.86	81.81	25.72	55.27	19.00
Age group					
60 ~ 69	16.53	78.29	23.33*	55.81	20.87
70 ~ 79	17.84	81.68	25.66	55.40	18.94
≥ 80	15.72	80.00	23.66	53.69	22.65
Education					
illiterate	17.63***	79.81***	26.31***	52.63	21.06
primary school	17.86	79.77	23.97	57.48	18.55
middle school	12.24	79.75	20.94	56.32	22.74
high school and above	11.36	72.17	13.91	57.39	28.70
Marital status					
married	16.1**	79.09	23.26**	55.97	20.77
unmarried	19.97	80.80	27.25	53.69	19.06
Number of children					
0	18.68	78.16	26.56**	51.80	21.64
1 ~ 2	15.71	78.26	20.22	54.95	24.84
≥ 3	16.82	78.80	25.75	52.11	22.14
Residence					
rural	21.24**	79.39	25.37***	55.13	19.50
urban	15.09	79.61	17.93	57.32	24.74
Region					
western area	17.79***	79.91**	26.92***	51.70	21.39
Note: ***significant at 1%; **significant at 5%; *significant at 10%.					

	One-month morbidity	Chronic diseases prevalence	Self-reported health		
			Poor	Fair	Good
central area	12.45	78.40	23.18	55.45	21.37
eastern area	13.16	79.63	22.61	58.04	19.35
Traffic time for treatment					
< 15	16.00	76.59**	16.8***	60.83	22.38
15 ~ 60	17.41	79.81	21.27	60.49	18.24
> 60	17.13	79.08	27.25	42.16	30.59
Note: ***significant at 1%; **significant at 5%; *significant at 10%.					

3.3 The health service utilization of the poor elderly

3.3.1 The utilization rate of health services

In Fig. 1, the outpatient and inpatient rates of impoverished old people rose by 5% and 7% from 2011 to 2015, respectively. The rate of outpatient visits increased from 15.05% in 2011 to 20.06% in 2015, and the hospitalization rate increased from 9.87% in 2011 to 16.89% in 2015. The growth rate of health services is slower from 2013–2015 than from 2011–2013.

3.3.2 Outpatient services

In 2015, 20.06% of the poor elderly utilized outpatient services in the previous month. The median of the outpatient expense was 353RMB, and the out-of-pocket ratio was 84.41%. Table 3 contains the utilization of outpatient services for different levels of the independent variables. The poor elderly who were female, young and mid-aged old, unmarried, with high school and above diploma, discovered by UEMI, private medical insurance and other insurance, live in urban areas tend to utilize more outpatient services. Besides, the outpatient rates of the interviewees who were non-smokers and non-drinkers, with chronic diseases, poor self-reported health, physical disabilities, ADL limitations and without regular physical examinations are significantly higher than the other respondents.

Table 3

Outpatient service utilization by predisposing, enabling, need and health behaviour variables among the poor elderly

	Outpatient rate (%)	P-value	Expenses (RMB)	Out-of-pocket expenses(RMB)	OOP ratio (%)
Gender					
male	18.45	0.010	333	220	82.23*
female	21.91		243	200	86.21
Age group					
60 ~ 69	20.53	0.048	230	200	85.84
70 ~ 79	20.75		350	200	80.53
≥ 80	16.96		300	228	89.05**
Education					
illiterate	20.31	0.034	251	200	86.31
primary school	20.36		250	200	82.88
middle school	18.62		325	220	82.38
high school and above	23.31		430	330	80.18**
Marital Status					
married	19.62	0.092	260	210	82.02**
unmarried	22.27		250	200	86.45
Number of children					
0	19.70	0.811	250	200	89.68
1 ~ 2	20.42		300	220	85.29
≥ 3	18.75		460	360	81.97**
Health insurance					
uninsured	15.18	0.012	300	250	100.00***
UEMI	24.09		600	350	79.73
URMI	20.82		600	500	80.34
NCMI	20.76		220	200	84.24

Note: ***significant at 1%; **significant at 5%; *significant at 10%.

	Outpatient rate (%)	P-value	Expenses (RMB)	Out-of-pocket expenses(RMB)	OOP ratio (%)
private MI	35.00		1200	900	79.23
other	22.44		400	300	83.01
Pension					
No	18.53	0.116	350	252	84.73
Yes	20.77		235	200	84.29
Residence					
rural	19.32	0.043	233	200	84.82
urban	23.42		500	450	82.09
Region					
western area	20.02	0.770	400	345	86.4**
central area	19.60		350	276	84.33
eastern area	20.76		202	200	83.52
Travel time(min)					
< 15	19.62	0.492	200	150	80.27
15 ~ 60	21.18		300	260	84.76
> 60	19.49		460	380	89.27**
Chronic disease					
0	9.47	< 0.01	200	160	82.85
1 ~ 2	18.76		360	270	85.01
≥ 3	30.70		450	300	84.09
Self-reported health status					
poor	31.42	< 0.01	600	430	85.03
fair	18.72		345	260	84.12
good	11.79		300	215	83.00
Physical disability					
No	17.93	< 0.01	250	200	85.17

Note: ***significant at 1%; **significant at 5%; *significant at 10%.

	Outpatient rate (%)	P-value	Expenses (RMB)	Out-of-pocket expenses(RMB)	OOP ratio (%)
Yes	22.81		300	205	83.88
ADL					
no difficulty	16.38	< 0.01	276	220	85.87
difficulties	25.27		255	200	82.50
Smoke					
No	21.67	0.001	250	200	82.48**
Yes	16.68		308	300	90.49
Drink					
No	21.13	0.014	250	200	83.82
Yes	17.12		350	265	87.22
Physical examination					
No	18.42	0.002	260	235	88.05*
Yes	22.60		250	200	80.35
Note: ***significant at 1%; **significant at 5%; *significant at 10%.					

With regard to the medical expenditure, we find that the female, oldest-old and unmarried poor elderly who had lower levels of education and no child, were not covered by health insurance, living in the western area, with more than one hour traffic time and without regular physical examinations would have heavier medical burdens. The table shows that the outpatient expenditure of poor elderly is strongly related to the types of health insurance, residence and health status. On average, the median of the out-of-pocket expenses of the group with private insurance are nearly 900RMB, almost 4 times higher than that of the uninsured group and 4.5 times higher than that of the NCMI group. Furthermore, the outpatient expenses of urban residents more than double the amount of rural residents. The median of the outpatient expenses of the respondents with more than three diseases were about twice those for the elderly without chronic disease.

Among the 668 elderly people who did not visit a doctor for outpatient treatment, 353 people said that a doctor had actually suggested that they needed healthcare and explained that the main reason for not seeking outpatient services are economic difficulties(42.34%), inconvenient traffic (21.53%) and feeling only slightly ill (18.41%)(Fig. 2).

3.3.3 Inpatient services

In 2015, 16.89% of the participants were hospitalized in the last year. The results of univariate analysis for inpatient rates are generally consistent with the outpatients. To be specific, the poor elderly aged 70 ~ 79, who were unmarried, non-smokers and non-drinkers, with more than 15 minutes of traffic time, chronic diseases, poor self-reported health, physical disabilities, ADL limitations and regular physical examinations used more inpatient service than others at the 0.05 level of significance. The hospitalization rates of participants who had higher level of education and lived in urban areas were significantly higher than those for people with lower level educational and rural residents at the 0.01 level.

In terms of the hospitalization expenses, we find the median and out-of-pocket ratio of hospitalization expenses for the poor elderly are 10,000RMB and 53.31%, respectively. The poor elderly who were female, unmarried, with lower educational level, with zero or more than three children, not covered by medical insurance or insured by NCMI and private MI, and who lived in rural areas, had more than three chronic diseases, poor self-reported health status, used cigarettes and without regular physical examinations had heavier burdens for hospitalization.

The main reasons for not seeking inpatient care are a lack of money (58.68%) and not being willing to go to the hospital (22.19%).

Table 4
Inpatient service utilization by predisposing, enabling, need and health behaviour variables
among the poor elderly

	Inpatient rate (%)	P-value	Expenses (RMB)	Out-of-pocket expenses(RMB)	OOP ratio (%)
Gender					
male	16.71	0.206	10000	3964	49.38**
female	15.17		5284	2750	62.28
Age group					
60 ~ 69	13.98	0.001	10000	3000	57.87
70 ~ 79	18.76		7400	3200	52.29
≥ 80	18.75		6000	3650	59.43
Education					
illiterate	15.42	0.086	6833	3800	62.08
primary school	16.26		8000	3000	53.72
middle school	16.76		10000	3000	45.4
high school and above	17.42		13000	2600	37.82***
Marital Status					
married	15.32	0.048	8750	3300	52.11**
unmarried	18.16		5200	3000	69.39
Number of children					
0	15.33	0.277	6489	3000	54.11**
1 ~ 2	14.47		10000	4000	50.78
≥ 3	16.70		8000	3750	57.74
Health insurance					
uninsured	14.64	0.464	7000	7000	100.00
UEMI	18.98		20000	4000	31.78***
URMI	13.56		10000	4850	79.73
NCMI	15.93		7000	3000	77.43

Note: ***significant at 1%; **significant at 5%; *significant at 10%.

	Inpatient rate (%)	P-value	Expenses (RMB)	Out-of-pocket expenses(RMB)	OOP ratio (%)
private MI	10.00		30000	30000	100.00
other	19.87		10000	3000	50.51
Pension					
No	16.54	0.471	9500	3650	54.36
Yes	15.60		7800	3000	56.37
Residence					
rural	15.69	0.301	7000	3200	65.358*
urban	17.28		10750	4000	47.05
Region					
western area	16.09	0.095	10000	6000	62.35
central area	13.62		12400	3000	55.20
eastern area	16.93		7000	3571	58.40
Traffic time for inpatient					
< 15	13.36	0.008	6278	3000	51.35
15 ~ 60	17.04		8000	3000	55.2
> 60	17.94		8000	4000	58.4
Chronic disease					
0	6.36	< 0.01	6000	6000	51.64
1 ~ 2	13.47		8000	3000	56.44
≥ 3	27.32		8750	3000	65.98***
Self-reported health status					
poor	28.01	< 0.01	8750	3964	57.77**
fair	13.63		8000	3000	55.11
good	8.56		5000	2225	40.10
Physical disability					
No	12.61	< 0.01	7900	3000	54.85

Note: ***significant at 1%; **significant at 5%; *significant at 10%.

	Inpatient rate (%)	P-value	Expenses (RMB)	Out-of-pocket expenses(RMB)	OOP ratio (%)
Yes	19.71		10000	5423	57.19
ADL					
no difficulty	10.18	< 0.01	10000	5000	57.7
difficulties	23.53		8000	3300	50.49
Smoke					
No	17.46	< 0.01	8000	3000	57.16**
Yes	12.30		10000	3800	50.94
Drink					
No	16.89	0.006	8000	3000	55.68
Yes	12.82		10500	4000	56.01
Physical examination					
No	13.00	< 0.01	10000	3645	61.24***
Yes	19.81		8000	3000	51.76
Note: ***significant at 1%; **significant at 5%; *significant at 10%.					

3.4 Predictors of health service utilization

3.4.1 Outpatient service

The results from TPM analysis in Table 5 show that predisposing factors, enabling factors, need factors and Health behaviour variables were significantly associated with outpatient visits. Compared to the poor elderly aged 60 ~ 64 years, old people aged 70 ~ 79 and 80 + years were less likely to seek medical treatment when they were ill (OR = 0.81, $P < 0.1$; OR = 0.63, $P < 0.05$). While there are no differences in outpatient expense across age group. Compared to the illiterate, the poor elderly with higher educational level had a higher probability of receiving outpatient service (OR = 1.57, $P < 0.05$) and higher outpatient expenditure ($P < 0.05$). Compared to the NCMI, only the UEMI would significantly increase the probability and cost of having outpatient visit (OR = 1.67, $P < 0.05$). Need variables are found to be significant predictors in increasing the probability and cost of using outpatient care. The probability of using outpatient service in elderly participants with poor health status is 2.00 and 4.34 times that of participants with fair or good, respectively. Also the poor health status could drastically increase the outpatient expenditure ($P < 0.01$). Similarly, we find that participants with chronic diseases use outpatient service 2.5 times more likely than those without chronic diseases. In terms of the health behaviour, we

find individuals who consume alcohol or use tobacco are less likely to use outpatient service than their counterparts ($P < 0.05$).

The median amount of the outpatient expenditure is 198RMB. Conditional on having any outpatient visits, female reduces the outpatient expenditures by 100RMB, the older age reduces the expense by 86RMB, high school and above education reduces the 73RMB, alcohol consumption reduces 145RMB, chronic disease reduces 149RMB, and fair or good health status reduces 238RMB and 319RMB, respectively. While the followed predictors will increase the cost of outpatient: with kids (116RMB), UEMI (197 RMB), private MI (311RMB), old-age pension (95RMB) and more than one hour traffic time (95RMB).

Table 5

Results of the multiple regression on the predictors of outpatient service utilization among the poor elderly

		Logit		GLM		Expense
		OR	SE	Coef.	SE	dy/dx
Predisposing variables						198
Gender ref(male)	female	1.03	0.15	-0.32**	0.20	-100*
Age group ref(60 ~ 69)	70 ~ 79	0.81*	0.14	0.14	0.20	16
	≥ 80	0.63**	0.24	-0.37	0.33	-86*
Education ref(illiterate)	primary school	1.06	0.14	-0.26*	0.19	-49
	middle school	1.20	0.22	-0.46**	0.31	-63
	high school and	1.57**	0.33	-0.54**	0.45	-73**
	above					
Marital status ref(married)	unmarried	1.07	0.15	0.11	0.21	44
Enabling variables						
Number of children	> 0	1.11	0.08	0.21	0.11	116**
	ref(none)					
Health insurance	uninsured	0.95	0.22	0.28	0.32	25
ref(NCMI)	UEMI	1.67**	0.33	0.73**	0.50	197*
	URMI	1.00	0.30	0.33	0.42	37
	private MI	1.37	0.68	1.21*	0.86	311*
	other	1.21	0.34	0.34	0.46	61
Pension ref(No)	Yes	1.33**	0.14	0.15	0.19	95*
Residence ref(rural)	urban	0.88	0.19	0.64***	0.29	112*
Region ref(central area)	western area	1.12	0.18	-0.24	0.25	-111
	eastern area	1.41***	0.16	-0.41**	0.23	-96
Traffic time ref(< 15 min)	15 ~ 60	1.05	0.14	0.39***	0.19	68**
	> 60	1.05	0.17	0.93***	0.23	214**
Need variables						
Self-reported health status	fair	0.50***	0.14	-0.46***	0.19	-238***

		Logit		GLM		Expense
ref(poor)	good	0.23***	0.22	-0.66***	0.32	-319***
Physical disability ref(No)	Yes	1.26**	0.13	-0.10	0.18	-60
Chronic disease ref(No)	Yes	2.51***	0.23	-0.14	0.37	149*
ADL ref(no difficulty)	difficulties	1.28**	0.13	-0.01	0.18	-46
Health behaviour variables						
Smoke ref(No)	Yes	0.74**	0.16	-0.08	0.22	-68
Drink ref(No)	Yes	0.80**	0.17	-0.28	0.24	-145**
Physical examination ref(No)	Yes	1.00	0.12	0.20	0.17	39
Constant		0.05***	0.41	6.65***	0.55	
Sample size		3760.00				
LR chi2		255.20				
Prob > chi2		< 0.001				
pseudo R-squared		0.10				

3.4.2 Inpatient service

Table 6 reports two-part results of hospitalization utilization. The results of hospitalization were somewhat different from outpatient visits. The need variables are the common and significant factors which exert a greater impact on hospitalization utilization. The probability of using inpatient service for poor self-reported health people is three to six times that of fair or good one, respectively. The hospitalization rate of the elderly with chronic diseases is 5.31 times that of those without chronic diseases ($P < 0.01$). Moreover, compared to the poor elderly with ADL impairments, people without ADL impairments are more likely to utilize inpatient service. In addition, we find that the females have higher probabilities and medical costs of hospitalization ($OR = 0.69$, $P < 0.05$). Compared to the poor elderly aged 60–64 years, the individual aged 70 years and above are more likely to use inpatient services ($P < 0.05$), while they spend less money on hospitalization. People without any health insurance are less likely to use inpatient service than those with UEMI ($OR = 0.38$, $P < 0.05$). Also people with URMI or NCMI are less likely to use inpatient service than those covered by UEMI ($P < 0.1$). Nevertheless, no significant differences exist in hospitalization expense across health insurance status and health insurance schemes. With regard to the health behaviour variables, smoking and drinking behaviours decrease the probability of hospitalization, and the regular physical examination increase hospitalization rate ($P < 0.01$).

Table 6
Multiple regression on the predictors of inpatient service utilization among the poor elderly

		Logit		GLM		Expense
		OR	SE	Coef.	SE	dy/dx
Predisposing variables						1420***
Gender ref(male)	female	0.69**	0.20	-0.54**	0.19	-497*
Age group ref(60 ~ 69)	70 ~ 79	1.53***	0.18	-0.10*	0.15	201
	≥ 80	1.49*	0.29	-0.05**	0.24	402
Education ref(illiterate)	primary school	1.13	0.19	-0.08	0.18	-78
	middle school	1.24	0.30	-0.07	0.26	16
	high school and above	1.41	0.65	0.00	0.54	208
Marital status ref(married)	unmarried	0.98	0.21	-0.18	0.17	-457*
Enabling variables						
Number of children	> 0	1.34	0.11	0.40	0.10	548
	ref(none)					
Health insurance	uninsured	0.38**	0.55	0.05	0.47	223
ref(UEMI)	URMI	0.47**	0.62	-0.48	0.52	-1069**
	NCMI	0.54*	0.50	-0.25	0.43	-844**
	private medical insurance	1.12	1.18	-0.03	1.03	93
	other	0.76	0.58	-0.97	0.50	-620*
Pension ref(No)	Yes	0.90	0.18	-0.08	0.15	-248
Residence ref(rural)	urban	1.15	0.25	0.37**	0.22	1137***
Region ref(central area)	western area	1.13	0.25	0.04	0.23	242
	eastern area	1.04	0.23	-0.09	0.21	-102
Traffic time ref(< 15 min)	15 ~ 60	1.06	0.23	-0.04	0.20	190
	> 60	1.14	0.24	0.16	0.22	568*
Need variables						

Note: ***significant at 1%; **significant at 5%; *significant at 10%.

		Logit		GLM		Expense
Self-reported health status	fair	0.31***	0.18	-0.14	0.15	-1119***
ref(poor)	good	0.16***	0.33	-0.68***	0.32	-1475***
Physical disability ref(No)	Yes	1.13	0.18	0.10	0.14	346
Chronic disease ref(No)	Yes	5.31***	0.47	-0.45	0.42	930**
ADL ref(no difficulty)	difficulties	0.62**	0.19	-0.17	0.16	-208*
Health behaviour variables						
Smoke ref(No)	Yes	0.52***	0.21	-0.25*	0.19	624***
Drink ref(No)	Yes	0.52***	0.24	-0.10	0.21	500***
Physical examination ref(No)	Yes	1.66***	0.17	0.02	0.14	624***
Constant		0.03***	0.84	10.13***	0.71	
Sample size		3760.00				
LR chi2		399.86				
Prob > chi2		< 0.001				
pseudo R-squared		0.16				
Note: ***significant at 1%; **significant at 5%; *significant at 10%.						

The median amount of the inpatient expenditure is 1420RMB. Conditional on using at least one hospitalization, female spends 497RMB higher than the male, married respondent spends 457RMB than the single counterpart. The low income elderly covered by UEMI have 1069RMB and 844RMB higher inpatient costs compared with respondents covered by URMI or NCMI, and 620RMB higher for the participants covered by other insurance. The urban residents have 1137RMB higher inpatient costs than the rural one. Furthermore, more than one hour traffic time increases the expense by 568RMB, chronic disease increases 930RMB, regular physical examination increases 624RMB, smoking and drinking behaviours increase 624RMB and 500RMB, respectively. The followed predictors will reduce hospitalization expenditure: fair or good health stutas (1119RMB, 1475RMB), ADL impairments (208RMB).

Discussion

4.1 The poor elderly have more health needs but less healthcare utilization

This study indicated that the poor elderly have more health needs but utilize healthcare services at a relatively low level, and economic difficulty is the largest obstacle to using health services. The results show that the morbidity of the low-income elderly in the past month was 16.93%. The prevalence of chronic diseases reached 78.56%, and 29.78% of the poor elderly had more than three diseases. In sharp contrast, the past-month outpatient rate of the poor elderly was 20.06%, the hospitalization rate was only 16.89%, and the two-week non-visit rate was 52.84%. Although the utilization rate of inpatient and outpatient services increased gradually over time, the health service utilization of the impoverished old population is still inadequate. According to the Fifth National Health Service Survey, the morbidity and chronic disease prevalence of the Chinese elderly were 56.9% and 71.8%, and the outpatient and inpatient rate were 49.7% and 17.9%, respectively [35]. The results of the comparison indicate that it is more difficult for the poor elderly Chinese to turn health needs into healthcare demands. Consistent with previous research results, we find that financial constraints (42.34%) are still the most important reason that limits the effective demand for medical treatment. Moreover, feeling that their disease condition was not severe and transportation barriers also contribute to healthcare underutilization [36, 37]. In terms of medical burden, the median cost of outpatient and inpatient services for the poor elderly were 353RMB and 10,000 RMB, and the out-of-pocket ratio was 84.41% and 53.31%, respectively, which is far beyond the results of the Fifth Health Service Survey. According to statistics, one-third of the poverty among the elderly in China resulted from serious illnesses. For instance, a prior survey showed that the out-of-pocket outpatient expenses of low-income residents who live in Beijing account for two-thirds of their monthly income [38], which means that medical expenses have substantially aggravated the economic pressure of the poor population. It is noteworthy that the poor elderly who are female, with a lower education level, without children, and who live in rural areas tended to have a worse health status, a heavier medical burden and more unmet health needs.

4.2 Factors for the utilization of health services for the poor elderly

4.2.1 Predisposing characteristics

This study finds that gender, age and education level significantly impacted the health service utilization of the poor elderly. In this paper, old women who live in poverty are less likely to receive medical services, and they spend less money on healthcare, although they actually have a worse health status and more risk of diseases. One possibility is that their relatively low family status would hinder them from using health services to allow more important family members to utilize health services [22]. In our study, the young-old would be more likely to use outpatient services and less likely to be hospitalized. This may be explained by the young-old who care more about their own health and prohibitively high hospitalization expenses, and they thus might utilize more outpatient services to protect themselves from catastrophic

expenses [22]. The older old are more likely to be hospitalized but spend less money on health services. A possible explanation is that worse health and severe symptoms force them to be hospitalized. Another reason is that the older old are close to the end of their life expectancy and that the effect of the “time to death” instead of age determines their healthcare expenditure [39–41]. People with higher education levels relative to those with below primary education levels are found to have a significantly increase in outpatient visit and decrease in outpatient expenditure, which is consistent with a previous study [29].

In addition, we find that marital status did not significantly impact the inpatient service utilization of the poor elderly. However, the inpatient expenditure of the marginal increments on marriage is 457RMB.

4.2.2 Enabling resources

Our analysis reveals that health insurance and old-age pensions significantly increased the probability of health service utilization among the poor elderly population. The caveat, however, is that for the insured poor elderly, only coverage under UEMI is significantly related to increased medical service utilization and medical costs. This reflects the fact that patients covered by UEMI face a more highly discounted price on medical service, and the most heavily insured individuals are more likely to access health services [42]. Another plausible explanation for the disparity across different insurance programmes is that the main three medical insurance schemes in China are heterogeneous regarding funding sources and benefit packages. For example, in 2013, the per capita fund for the rural NCMI scheme was only 61 USD, just approximately 15% of the per capita fund of the UEMI scheme [43]. Although NCMS has household medical savings account (MSA) that covers outpatient care, the budget for MSA is very limited, and therefore, the poor elderly insured by NCMI are less likely to use outpatient service [44]. In addition, we find that 13.62% participants had no medical insurance which reflects that the generosity of health insurance is far from being universal among the poor elderly population. Accordingly, it is urgent to develop and implement more reasonable reforms and targeted policies to optimize the health insurance system.

The impact of the regional distribution can be explained by medical service accessibility [45]. Compared to the eastern area of China, living in the central and western regions was found to have a significantly negative effect on health services utilization, while a positive impact on medical expenditures. In a similar vein, the poor elderly with short traffic time, people with long traffic time have higher medical costs, and the longer traffic time result in the higher increase of medical costs. This is possibly attributable to the poor accessibility to health services and the financial barriers that seriously restrict them in receiving treatment. A failure to seek timely treatments results in the deterioration of illness, which would lead to increased health demands and medical expenditures [46]. Taken as a whole, the findings suggest that improvements to the access to medical services in underdeveloped areas and lower the healthcare would positively influence the health utilization of the local low-income population.

In this study, there are no significant differences in the healthcare utilization between the rural and urban residents, possibly attributable in part to the most participants came from rural area, and in part to enrolment in NCMS significantly increases an individual's probability of seeking treatment[16].

4.2.3 Need resources

Prior studies concluded that the need variables were strong determinants of healthcare utilization, of greater predictive value compared to the predisposing and enabling variables in Andersen's model [47, 48]. Our findings are consistent with previous literatures that need factors are the primary determinants of healthcare utilization [20, 49, 50]. We find that poor self-reported health and more chronic disease multiplied healthcare utilization and the medical cost. Some studies indicate that better and more effective treatment of chronic conditions will produce a "compression of morbidity" that makes individuals experience few illnesses. Other scholars assume that the basic pattern of chronic illnesses among the elderly will continue or even increase as the population ages [51]. This paper agrees with the former indication that advances in health service utilization will improve health and reduce the unmet needs of the poor elderly.

Additionally, our study finds that the poor elderly with ADL impairments are more likely to using outpatient service, but less likely to use inpatient care. Perhaps this is because they need more medicine for rehabilitation, which could receive from outpatient visits [52–54].

4.2.4 Health behaviour variables

Most studies have shown that unhealthy lifestyles such as smoking and drinking are health risk factors [55, 56]. This study finds that the utilization rate of health services for poor elderly people who smoke and drink is significantly lower. On the one hand, this may be due to people who regular use alcohol or cigarettes being "overly optimistic" about their health and lacking health awareness. Even if they have some physical discomfort, they will not seek treatment in time [51, 57]. On the other hand, it may be that the health hazard of smoking and drinking is a cumulative effects, and most poor elderly people have given up smoking and drinking due to poor health. It should be noted that the hospitalization expenditure for those who drink and smoke is significantly higher, which indirectly confirm cumulative effects of health hazards.

In addition, this study finds that regular physical examinations can promote the use of inpatient services by poor elderly people. Consistent with most studies, regular health check-ups may be important for elderly people to ensure early detection and disease treatment [58]. An earlier study of health behaviour reported that people who live in underdeveloped areas were less knowledgeable about the harmful health effects of unhealthy behaviours, and these significant differences in knowledge were related to the access to health information [59]. Therefore, providing health information efficiently through health education to the poor elderly is necessary.

Our investigations add substantially to the understanding of the demand and utilization of health services and the factors that affect healthcare service utilization among Chinese poor elderly over time. Given that the poor elderly have more unmet needs for medical services and face multiple subjective, objective and institutional barriers in seeking appropriate treatment, our study calls for urgent measures to remove the disparity among the poor elderly Chinese. First and foremost, financial constraints play an

important role in the unmet needs among the poor population. Continually accelerating economic development and providing financial assistance to improve the financial capability of the poor would have a substantial impact on health service utilization. Second, in recognizing the heterogeneity of the poor elderly, our findings recommend that additional efforts should be made towards capturing groups that are likely to be further disadvantaged, such as women and the oldest-old, and people who live in underdeveloped areas. Third, the barriers to accessing healthcare that consist of international regulations and regulations within health systems should be eliminated. For instance, some strategies include combining both the urban-rural discrepancy and regional characteristics, improving the medical conditions, including timely medical treatment, and providing more care resources such as paid home care. Furthermore, efficient health education should be conducted to popularize health knowledge and improve health literacy. Finally, the government should optimize the financing and compensation system of medical insurance, expand the scope of reimbursement, increase the level of reimbursement rates and implement new health insurance and medical aid programmes that aim at the poor elderly which is the most vulnerable group on health and economy, especially when they fall sick.

Conclusion

Overall, the poor elderly used medical health services at a relatively low level compared with the general population in China. Due to a variety of constraints, the poor elderly had a lower utilization of health services. Predisposing, enabling, need and health behaviour variables should be considered when making policy and taking measures to eliminate health inequalities to improve the health service utilization and the health of the poor elderly. The government should try the best to support the poor elderly, including perfecting the endowment insurance and health insurance and improving the quality of health services system in poor areas.

Declarations

Ethics approval and consent to participate

The study did not involve human subjects and care was taken to ensure anonymity such that no identifiable information of individual nursing home, patient or staff is reported.

Consent for publication

Written informed consent for publication was obtained from all participants.

Availability of data and material

The data used here come from the national baseline survey of the China Health and Retirement Longitudinal Study (CHARLS) collected from 2011 to 2015. The CHARLS is a biennial survey that was initiated in 2011 and conducted by the National School of Development at Peking University. It is a nationally representative longitudinal survey that collected information on Chinese residents aged 45 years and above and their spouses regarding assessments of social, economic, and health circumstances. Meanwhile, this is open data.

Competing interests

Authors declare that they have no competing interests.

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Authors' contributions

Yanbing Zeng, Weiqian Xu, Bei Luo and Ya Fang worked together. Yanbing Zeng, Weiqian Xu and Bei Luo were in charge of the study design. Weiqian Xu and Bei Luo analyzed and interpreted the data, and drafted the manuscript. Yanbing Zeng participated in the statistical analysis and manuscript modifications. Ya Fang supervised and revised the manuscript. All authors have revised, read and approved the final manuscript.

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Figures

Figure 1

Figure 1

Figure 2

Figure 2