

BMJ Open What factors are associated with utilisation of health services for the poor elderly? Evidence from a nationally representative longitudinal survey in China

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ABSTRACT

Objectives To investigate the status and factors of healthcare service utilisation among the poor elderly in China.

Methods We selected the poor elderly from the China Health and Retirement Longitudinal Study (CHARLS) from 2011 to 2015. The main outcome measures include utilisation indicators for the probability and costs of outpatient/inpatient services. Based on modified Andersen behaviour model, a two-part model is designed to analyse the factors of the health service utilisation of the poor elderly.

Results The visit rate of outpatient services increased from 15.05% in 2011 to 21.26% in 2015, and the hospitalisation rate increased from 7.26% to 14.32%. 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. 78.44% of the people who actually needed healthcare did not use health services, and the main reason was financial difficulties (42.32%). 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. The need factor plays a crucial role in determining health service utilisation.

Conclusions The poor elderly tends to have a worse health status and a heavier medical burden but had a lower utilisation of health services. Predisposing, enabling, need and health behaviour variables should be considered to improve the health service utilisation and the health of the poor elderly.

INTRODUCTION

In China, the speed of ageing in the population is grim. By the end of 2017, the number of elderly people aged 60 years 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

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ A modified Andersen behavioural model of health services was applied as a theoretical framework to comprehensively and rationally analyse the factors influencing health service utilisation among poor older adults.
- ⇒ The spatial price deflators were constructed to adjust the poverty line standards in urban and rural areas, so that the poverty line standards can be applied to the urban and rural elderly in China.
- ⇒ This study used a two-part model for multifactor analysis of health service utilisation through logit regression and generalised linear regression, which better overcomes the problems caused by the discontinuity, heterogeneity and non-normality of health service data in data analysis.
- ⇒ The health service utilisation in this study used self-reported measures, which were more prone to potential errors than administrative records.

to the economic development and nationalised social security systems.² This imbalance has led to the problem of ‘getting old before getting rich’.³

Old people, who generally have a worse health status and a higher level of multimorbidity and chronic disease conditions, have an increased need for healthcare and actually consume a disproportionate and inappropriate share of services.^{4,5} According to statistics, the 2-week morbidity rate of the elderly increased from 25.0% in 1993 to 56.9% in 2013.⁶ In addition, it has been documented that medical expenses are much higher for the elderly than for other age groups. In China, on the one hand, some scholars have analysed the health service utilisation of the elderly in a poverty-stricken area in China. The results show that the 2-week prevalence rate is 62.7%, and the 2-week visit rate is 37.3%, which is significantly different from

the national average at that time.⁷ A further decline in health level leads to an increase in the burden of medical expenses, forming a vicious circle. Chinese and foreign scholars have confirmed through research on different regions of the world that economic difficulties are the primary reason why the poor population does not seek medical care.^{8,9} In addition, studies have shown that older adults' perceptions of their own health status can also affect medical treatment behaviour. Through analysis, 21.6% of the elderly self-assessed that their health status was poor, but the measurement results showed that the proportion of elderly people with functional disabilities was as high as 71.7%.¹⁰ On the other hand, 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.¹¹ However, due to a low socioeconomic status, the high price of medical services and an incomplete health insurance system, efficiently using 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.¹²⁻¹⁴ Worse health is often associated with substantial healthcare costs that aggravate the economic hardship.¹⁵ Meanwhile, poverty could also cause worse health. The poor elderly suffer from a multiplicity of constraints that result in worse health outcomes.¹⁶ The poor elderly are thus caught in a vicious circle: poverty breeds worse health, and worse health maintains poverty.¹²

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.¹⁷ Typically, the inequality between the health demand and the healthcare utilisation of the poor elderly is still unclear. Many studies and a variety of models have been conducted to investigate old people's healthcare utilisation from various aspects.¹⁸⁻²¹ However, studies on the health status and health service utilisation 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 behaviour model as a theoretical framework to analyse the status and influencing factors of the health demands and healthcare utilisation 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 utilisation of health resources.

METHODS

Data

The data used here come from the national baseline survey of the CHARLS collected from 2011 to 2015.²² 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 harmonised with leading international research studies in the Health and Retirement Study (HRS) and intended to provide a high-quality public microdatabase with a wide range of information that serves the needs of scientific and policy research on ageing-related issues.²⁴

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.

The CHARLS collected information on the income, consumption, private and public transfer payments of the elderly. Crucially, in 2011, 2013 and 2015, the economic information modules in the questionnaire were similar. Since the elderly are highly dependent on the family, their income and consumption are usually based on the family. So we use the household income to measure their economic status. The household income of the elderly includes the family's wage income (the sum of wages, bonuses and cash benefits), agricultural income (the family's income from agricultural and forestry products minus input costs), income from animal husbandry and aquatic products (the family's total income from animal husbandry and aquatic products minus their own consumption and input costs), self-employed income, public transfer payment and other income. 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 under-reporting might be a problem. 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.²⁵

Furthermore, in order to ensure the international comparability of the research, this paper selected the standard of the international poverty line published by the World Bank (US\$1.9 per person per day). 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 in 2011, 2013 and 2015.²⁶ Then, we used the spatial price deflators to adjust the poverty line standards in urban and rural areas, so that the poverty line standards can be applied to the urban and rural elderly in China. After excluding the respondents with key variables missing or for not reaching the standards, 3760 respondents over 60 years old who live on or below the poverty line were ultimately selected for this paper from 2011 to 2015.

Measurements

Dependent variables

To account for the observable differences in health needs, this study considers the 1 month morbidity, chronic disease prevalence and self-reported health status of the poor elderly population.^{4,5} The dependent variables in our analysis reflect the intensity and expenditure of different healthcare utilisations. We consider the following measures of health service utilisation: (A) the probability of outpatient visits during the 1 month that precedes the survey date; (B) the individual expenditure for the outpatient visits during the past month; (C) the probability of being hospitalised 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 Behaviour 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 equalise access to healthcare.²⁷ The original model considered that health service utilisation 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. With the further development of the model, the Andersen model developed to the third stage, which formed three components with linear relationship: (1) the main determinants; (2) health behaviours; and (3) health outcomes.²⁸ The modified Andersen behavioural model has shown that health behaviours can serve as an indicator of positive health beliefs and health literacy and have an impact on healthcare underutilisation. Healthy behaviours, including diet, exercise and self-care, are associated with health service utilisation, which in turn affect health outcomes.²⁹ Up to now, increasingly more studies have employed this model and its variations to assess the utilisation and outcomes of healthcare services for both general and vulnerable populations.²¹ 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 utilisation among the poor elderly. Our model

includes four types of variables, namely, predisposing, enabling, need and health behaviour variables.³⁰

Predisposing variables

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 variables

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 variables

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 (ADLs). 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 ADLs: bathing/showering; eating; dressing; getting into

or out of bed; using the toilet; or controlling urination and defecation.

Health behaviour variables

Health behaviour 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).

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 χ^2 test. Subsequently, a two-part model is employed to further investigate the factors that affect the utilisation 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, V.15.0.

Since people cannot decide whether or not to use health services and the medical expenditure at the same time, they must initially decide whether or not to utilise health services and then decide the cost of healthcare once they have accepted the services. Hence, a two-part negative binomial distribution model (two-part Negbin) was applied in this study, since the decision to use health services and the medical expenditure were not jointly determined.^{31–33} Moreover, previous studies have suggested that many individuals did not use any healthcare services during the study period; therefore, the medical cost data are usually characterised by having a substantial proportion of zero values and a right-skewed distribution, and they may exhibit heteroscedasticity.³⁴ 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 utilisation in the present paper.³⁵ Specifically, the first part of the model is a logistic that predicts the probability of any use of health services: in equation (1), the dependent variable Z_i^* is the probability of health service utilisation, and $\varepsilon_i \sim N(0, 1)$. If $X_i\alpha_i + \varepsilon_i > 0$, then $Z_i = 1$; otherwise, $Z_i = 0$. Health expenditure is analysed by a generalised linear model with a gamma distribution and a log link that can estimate the medical costs of only the observations with positive spending.^{36–38} In equation 3, $E(Y>0|X)$ is the probability of inpatient service utilisation multiplied by the expected cost, which is conditional on being a user, and the sample average of $E(Y_i)$ becomes the expected hospitalisation spending of the elderly. Since equation 3 is specified as gamma GLIMMIX, the link function directly characterises 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:

$$Z_i^* = X_i\alpha_i + \varepsilon_i \quad (1)$$

$$\log Y_i = X_i\beta_i + \mu_i \quad (2)$$

$$E(Y_i|Z_i = 1, X_i) = \Phi(X_i\alpha_i) \exp(X_i\beta_i + \delta_i^2/2) \quad (3)$$

Patient and public involvement

The data used in this study were derived from the CHARLS database and involved no patients in the design or development of the research question and outcome measures. No patients were involved in developing the hypothesis and plans for design of this study either. The results would not be disseminated to study participants or any other individuals or communities.

RESULTS

Sample characteristics

Table 1 provides the sample characteristics in this study. Among the 3760 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. A percentage of 31.91 had no old-age pension and 13.62% had no medical insurance. A percentage of 81.38 were enrolled in universal medical insurance schemes, 72.47% covered by NCMI (New Cooperative Medical Insurance), 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 min, and one-third of the respondents reported that their inpatient traffic time was more than 1 hour.

In regard to the health status, 77.26% reported that their health was either fair or poor (52.78% and 24.48%, respectively). In terms of disease status, the percentage of interviewees with chronic diseases was 78.56%. A percentage of 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).

The health service utilisation of the poor elderly

The utilisation rate of health services

The outpatient and inpatient rates of impoverished old people rose by 5% and 7% from 2011 to 2015, respectively.

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

Variables	N	Per cent
Predisposing variables		
Gender		
Male	1804	47.98
Female	1956	52.02
Age group (years)		
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
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)		

Continued

Table 1 Continued

Variables	N	Per cent
<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
Lifestyle 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
ADLs, activities of daily living; private MI, private commercial medical insurance ; UEMI, urban employee medical insurance; URMI, urban resident medical insurance .		

The rate of outpatient visits increased from 15.05% in 2011 to 20.06% in 2015, and the hospitalisation rate increased from 10.56% in 2011 to 17.74% in 2015. The growth rate of health services is slower from 2013 to 2015 than from 2011 to 2013 (online supplemental figure S1) .

Outpatient services

In 2015, 20.06% of the poor elderly used outpatient services in the previous month. The median of the outpatient expense was 353 RMB, and the out-of-pocket ratio was 84.41%. [Table 2](#) contains the utilisation 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,

Table 2 Outpatient service utilisation by predisposing, enabling, need and health behaviour variables among the poor elderly

	Outpatient rate (%)	P value	Expenses (RMB)	Out-of-pocket (OOP) expenses (RMB)	OOP ratio (%)
Gender					
Male	18.45	0.010	333	220	82.23*
Female	21.91		243	200	86.21
Age group (years)					
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
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	0.000	200	160	82.85
1~2	18.76		360	270	85.01

Continued

Table 2 Continued

	Outpatient rate (%)	P value	Expenses (RMB)	Out-of-pocket (OOP) expenses (RMB)	OOP ratio (%)
≥3	30.70		450	300	84.09
Self-reported health status					
Poor	31.42	0.000	600	430	85.03
Fair	18.72		345	260	84.12
Good	11.79		300	215	83.00
Physical disability					
No	17.93	0.000	250	200	85.17
Yes	22.81		300	205	83.88
ADL					
No difficulty	16.38	0.000	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
*Significant at 10%.					
†Significant at 5%.					
‡Significant at 1%.					
ADLs, activities of daily living; NCMI, New Rural Cooperative Medical Insurance; private MI, private commercial medical insurance ; UEMI, urban employee medical insurance; URMI, urban resident medical insurance.					

discovered by UEMI, private medical insurance and other insurance and live in urban areas tend to use 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.

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 1 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 900 RMB, almost four 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 health-care 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%) (online supplemental figure S2).

Inpatient services

In 2015, 15.92% of the participants were hospitalised 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 years, who were unmarried, non-smokers and non-drinkers, with more than 15 min 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

hospitalisation 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 hospitalisation expenses, we find the median and out-of-pocket ratio of hospitalisation expenses for the poor elderly are 10 000 RMB 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 hospitalisation.

The main reasons for not seeking inpatient care are lack of money (58.68%) and not being willing to go to the hospital (22.19%) (table 3).

Predictors of health service utilisation

Outpatient service

The results from TPM analysis in table 4 show that predisposing factors, enabling factors, need factors and health behaviour variables were significantly associated with outpatient visits. Compared with 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 with 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 with 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 198 RMB. Conditional on having any outpatient visits, female reduces the outpatient expenditures by 100 RMB, the older age reduces the expense by 86 RMB, high school and above education reduces the 73 RMB, alcohol consumption reduces 145 RMB, chronic disease reduces 149 RMB and fair or good health status reduces 238 RMB and 319 RMB, respectively. While the followed predictors will increase the cost of outpatient: with kids (116 RMB), UEMI (197 RMB), private MI (311 RMB), old-age pension (95 RMB) and more than 1 hour traffic time (95 RMB) (table 4).

Inpatient service

Table 5 reports two-part results of hospitalisation utilisation. The results of hospitalisation were somewhat different from outpatient visits. The need variables are the common and significant factors that exert a greater impact on hospitalisation utilisation. 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 hospitalisation rate of the elderly with chronic diseases is 5.31 times that of those without chronic diseases ($p<0.01$). Moreover, compared with the poor elderly with ADL impairments, people without ADL impairments are more likely to use inpatient service. In addition, we find that the females have higher probabilities and medical costs of hospitalisation (OR=0.69, $p<0.05$). Compared with 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 hospitalisation. 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 hospitalisation expense across health insurance status and health insurance schemes. With regard to the health behaviour variables, smoking and drinking behaviours decrease the probability of hospitalisation, and the regular physical examination increase hospitalisation rate ($p<0.01$).

The median amount of the inpatient expenditure is 1420 RMB. Conditional on using at least one hospitalisation, female spends 497RMB higher than the male, married respondent spends 457 RMB than the single counterpart. The low income elderly covered by UEMI have 1069 RMB and 844 RMB higher inpatient costs compared with respondents covered by URMI or NCMI and 620 RMB higher for the participants covered by other insurance. The urban residents have 1137 RMB higher inpatient costs than the rural one. Furthermore, more than 1 hour traffic time increases the expense by 568 RMB, chronic disease increases 930 RMB, regular physical examination increases 624 RMB, smoking and drinking behaviours increase 624 RMB and 500 RMB, respectively. The followed predictors will reduce hospitalisation expenditure: fair or good health status (1119 RMB, 1475 RMB) and ADL impairments (208 RMB) (table 5).

DISCUSSION

This study indicated that the poor elderly have more health needs but use healthcare services at a relatively low level, and economic difficulty is the largest obstacle to using health services. The results showed that in the past month, the incidence rate of low-income elderly people, the prevalence of chronic diseases and the proportion of elderly people with three or more kinds of diseases were higher. In sharp contrast, indicators related to

Table 3 Inpatient service utilisation by predisposing, enabling, need and health behaviour variables among the poor elderly

	Inpatient rate (%)	P value	Expenses (RMB)	Out-of-pocket (OOP) expenses (RMB)	OOP ratio (%)
Gender					
Male	16.71	0.206	10 000	3964	49.38*
Female	15.17		5284	2750	62.28
Age group (years)					
60~69	13.98	0.001	10 000	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		10 000	3000	45.4
High school and above	17.42		13 000	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		10 000	4000	50.78
≥3	16.70		8000	3750	57.74
Health insurance					
Uninsured	14.64	0.464	7000	7000	100.00
UEMI	18.98		20 000	4000	31.78‡
URMI	13.56		10 000	4850	79.73
NCMI	15.93		7000	3000	77.43
Private MI	10.00		30 000	30 000	100.00
Other	19.87		10 000	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		10 750	4000	47.05
Region					
Western area	16.09	0.095	10 000	6000	62.35
Central area	13.62		12 400	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	0.000	6000	6000	51.64
1~2	13.47		8000	3000	56.44

Continued

Table 3 Continued

	Inpatient rate (%)	P value	Expenses (RMB)	Out-of-pocket (OOP) expenses (RMB)	OOP ratio (%)
≥3	27.32		8750	3000	65.98‡
Self-reported health status					
Poor	28.01	0.000	8750	3964	57.77*
Fair	13.63		8000	3000	55.11
Good	8.56		5000	2225	40.10
Physical disability					
No	12.61	0.000	7900	3000	54.85
Yes	19.71		10 000	5423	57.19
ADL					
No difficulty	10.18	0.000	10 000	5000	57.7
Difficulties	23.53		8000	3300	50.49
Smoke					
No	17.46	0.000	8000	3000	57.16*
Yes	12.30		10 000	3800	50.94
Drink					
No	16.89	0.006	8000	3000	55.68
Yes	12.82		10 500	4000	56.01
Physical examination					
No	13.00	0.000	10 000	3645	61.24‡
Yes	19.81		8000	3000	51.76
*Significant at 5%. †Significant at 10%. ‡Significant at 1%. ADLs, activities of daily living; private MI, private commercial medical insurance ; UEMI, urban employee medical insurance; URMI, urban resident medical insurance.					

health service utilisation such as outpatient rate, hospitalisation rate and non-visit rate for 2 weeks in recent months were relatively low. Although the utilisation rate of inpatient and outpatient services increased gradually over time, the health service utilisation 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.³⁹ 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 underutilisation.⁴⁰ In terms of medical burden, the median cost of outpatient and inpatient services for the poor elderly were 353 RMB 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,⁴¹ 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.

This study finds that gender, age and education level significantly impacted the health service utilisation of the poor elderly. Older women living in poverty actually have poorer health and are at greater risk of disease.⁴² However, our findings suggest that they are less likely to receive healthcare and spend less on healthcare. One possibility is that their relatively low family status would hinder them from using health services to allow more important family members to use health services.⁴³ In our study, the results showed that the young-old would

Table 4 Results of the multiple regression on the predictors of outpatient service utilisation 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 above	1.57*	0.33	-0.54*	0.45	-73*
Marital status ref (married)					
Unmarried	1.07	0.15	0.11	0.21	44
Enabling variables					
Number of children ref (none)					
>0	1.11	0.08	0.21	0.11	116*
Health insurance ref (NCMI)					
Uninsured	0.95	0.22	0.28	0.32	25
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 ref (poor)					
Fair	0.50*†	0.14	-0.46‡	0.19	-238‡
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)					

Continued

Table 4 Continued

	Logit		GLM		Expense
	OR	SE	Coef.	SE	dy/dx
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 χ^2	255.20				
Prob > χ^2	<0.001				
Pseudo R-squared	0.10				

*Significant at 5%.

†Significant at 10%.

‡Significant at 1%.

ADLs, activities of daily living; private MI, private commercial medical insurance; UEMI, urban employee medical insurance; URMI, urban resident medical insurance.

be more likely to use outpatient services and less likely to be hospitalised. This may be explained by the young-old who care more about their own health and prohibitively high hospitalisation expenses, and they thus might use more outpatient services to protect themselves from catastrophic expenses. The older old are more likely to be hospitalised but spend less money on health services. A possible explanation is that worse health and severe symptoms force them to be hospitalised.⁴⁴ 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 health expenditure.⁴⁵ 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.³⁰

Our analysis reveals that health insurance and old-age pensions significantly increased the probability of health service utilisation 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 utilisation 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.⁴⁶ 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 US\$61, just approximately 15% of the per capita fund of the UEMI scheme.⁴⁷ 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.³⁵ In addition, we find that 13.62% participants had no medical insurance that 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 optimise the health insurance system.

The impact of the regional distribution can be explained by medical service accessibility.⁴⁸ Compared with the eastern area of China, living in the central and western regions was found to have a significantly negative effect on health services utilisation, 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.⁴⁹ 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 utilisation of the local low-income population. In this study, there are no significant differences in the healthcare utilisation 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.¹⁷

Prior studies concluded that the need variables were strong determinants of healthcare utilisation of greater predictive value compared with the predisposing and enabling variables in Andersen’s model.^{50 51} Our finding

Table 5 Results of the multiple regression on the predictors of inpatient service utilisation 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 ref (none)					
>0	1.34	0.11	0.40	0.10	548
Health insurance ref (UEMI)					
Uninsured	0.38†	0.55	0.05	0.47	223
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					
Self-reported health status ref (poor)					
Fair	0.31*	0.18	-0.14	0.15	-1119*
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)					

Continued

Table 5 Continued

	Logit		GLM		Expense
	OR	SE	Coef.	SE	dy/dx
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 χ^2	399.86				
Prob $>\chi^2$	<0.001				
Pseudo R-squared	0.16				

*Significant at 1%.

†Significant at 5%.

‡Significant at 10%.

ADLs, activities of daily living; GLM, generalised linear regression; NCMI, New Rural Cooperative Medical Insurance; UEMI, urban employee medical insurance; URMI, urban resident medical insurance.

is consistent with previous literatures that need factors are the primary determinants of healthcare utilisation.^{21 52 53}

We find that poor self-reported health and more chronic disease multiplied healthcare utilisation 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.⁵⁴ This paper agrees with the former indication that advances in health service utilisation 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.⁵⁵

Most studies have shown that unhealthy behaviour such as smoking and drinking are health risk factors.^{56 57} This study finds that the utilisation 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.^{58 59} 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 hospitalisation 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.⁶⁰ 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.

The current study is subject to several limitations. First, using cross-sectional data, we could not interpret the associations as causal associations of poor elderly. Longitudinal research is required to identify casualty. Second, CHARLS uses self-reported measures on health service utilisation, which are more prone to potential errors than objective measures. Future studies could use hospital registration information and clinical assessments to obtain more reliable results. Third, this study selected the poor elderly from the CHARLS from 2011 to 2015. Since the latest CHARLS data were released in 2020, it was better to use the newly released data in the future study for the status of healthcare service utilisation among the poor elderly. Finally, we did not explore whether the healthcare service utilisation among Chinese poor elderly is reasonable, and the rationale of healthcare service utilisation among the Chinese poor elderly group should be explored in subsequent studies.

Even with these limitations, there are still some new findings in this study. Our investigations add substantially to the understanding of the utilisation status of health services and the factors that affect healthcare service utilisation 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 utilisation. Second, in recognising 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 popularise health knowledge and improve health literacy. Finally, the government should optimise 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 the 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 utilisation 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 utilisation 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.

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