Factors associated with the choice of primary treatment at the community level among the elderly in China

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Abstract

Background As China is still in the process of establishing the hierarchical medical system, residents have full autonomy in choosing healthcare facilities at the time of doctor visits. This study examines factors associated with primary healthcare use among the elderly in China.

Methods Our study is a cross-sectional and observational survey involving 1,143 elderly aged 45 and above. The data are from the 2015 China Health and Retirement Longitudinal Study. According to the Andersen behavioral model, we used logistic regression to analyze the influencing factors of healthcare services utilization, including predisposing, enabling and need variables. We also compared the relative importance of factors to healthcare services utilization by the variance analysis.

Results During the recently 1-month period, 62.03% of the sample had their last visit to a primary healthcare facility. Having received higher education, living in urban areas, taking more travel time to the healthcare facility, located in non-western regions, with non-agricultural household status, higher personal income, and higher out-of-pocket expenses were associated with a lower probability of choosing the primary healthcare facility. However, having more children and being worse self-reported health status were associated with a higher likelihood of having primary healthcare facility visits. Among all the factors, the three most powerful determinants were out-of-pocket expenses, travel time to the healthcare facility, and residence.

Conclusions Policymakers need to consider these factors when improving the system of primary treatment at the community level, including improving reimbursement policy to distinguish the payment standard between hospitals and primary healthcare facilities.

Background China is setting up a hierarchical medical system (HMS) to solve the problems of unbalanced resource allocation and high patient flows to large hospitals. As a vital component of the healthcare system reform, HMS will establish a new pattern of residents’ treatment to make for a better allocation of healthcare resources, which will help to solve the livelihood problem of difficulties in getting medical service[1-3]. In the past few years, the Chinese government has introduced several policies to
advance the implementation of HMS[4–7]. According to the policy issued by the General Office of the State Council in 2015[7], HMS is classified into four parts: primary treatment at the community level, two-way referral, a partition of emergency and chronic disease, a joint effort among different healthcare facilities. By the end of 2015, 16 provinces with 173 cities and 88 counties have launched HMS pilots. Up to January 2017, there were four municipalities and 266 other cities that have launched HMS, covering 88.1% of mainland China[8]. As the core of the whole system, the primary treatment at the community level indicates that residents’ first admission to healthcare services should be in the primary care facility, and the physician in that facility will decide whether the patient should be referred to a higher-level hospital[7]. According to the 2016 China health and family planning statistical yearbook[9], primary healthcare facilities include the community healthcare center, township hospital, village clinic, health care post, and private clinic, which account for more than 90% of the whole national healthcare facilities. The primary healthcare facility is expected to act as a “gatekeeper” for residents’ health in China[10, 11]. However, due to the lack of mandatory sequence constraints, residents still prefer the higher-level hospital to a primary healthcare facility[12, 13]. As shown in Fig. 1, from 2009 to 2017, the number of visits to primary healthcare facilities formed a decreasing share of the total number of visits from 61.82–54.12%, while the share of visits to higher-level hospitals gradually increased[14]. Therefore, we explored the factors which affect the patients’ choice among different healthcare facilities and analyzed the motivations which encourage them to the primary healthcare facility.

Compared with younger, the elderly have a higher and more targeted demand for healthcare services. According to the statistics of the sixth national census[15], the proportion of the elderly who are perfectly healthy over 60 years old in China was only 44%. Chronic diseases are the major factors affecting the elderly’s health. Therefore, the specialist treatment characterizing the general hospital is not the best solution for the needs of the elderly[16]. On the contrary, the primary healthcare facility featuring long-term medical care is more suitable[17, 18]. Besides, by the end of 2018, there had been 294.29 million residents aged 60 and above in China, which accounted for 17.9% of the total population[19]. If a large number of elderly with common chronic diseases can be diverted to the
primary healthcare facility, the supply pressure of the higher-level hospital will be remarkably alleviated [17, 20, 21]. Hence, we focused on the choice of healthcare services among the elderly. Few studies have attempted to research in the field of the elderly’s primary healthcare use. Some previous studies have focused on the policy introduction of the HMS [3, 10, 22]. Also, some studies have paid attention to the implementation of the primary treatment at the community level in typical pilot areas [23-26]. There are also several quantitative studies on the characteristics of healthcare services utilization among the elderly, which tends to consider inpatient and outpatient services as a whole [27-30]. Compared with these studies, our study has the following three main contributions. Firstly, the research topic is novel as we conduct a quantitative study on primary healthcare use among the Chinese elderly for the first time. We explored factors associated with having primary healthcare use in primary healthcare facilities by the Chinese elderly in comparison to those with healthcare use in higher-level hospitals. Secondly, the research method is feasible. Not only did we adopt multivariate regression to identify the whole model, but also we used the variance analysis to evaluate the explained ability of a single factor. Thirdly, the research conclusion is of practical significance. It helps to find the main obstacles affecting primary healthcare use among the elderly and also inspires policymakers about how to improve the policy.

Methods

Theoretical Framework

Andersen's behavioral model is one of the most widely used models for analyzing healthcare services utilization in the world [31, 32]. The influencing factors of healthcare services use can be divided into three dimensions: predisposing, enabling, and need. Predisposing refers to the characteristics of individual who tends to take advantage of healthcare services before the onset of disease. The measure indicators are age, gender, family medical history, education, residence, etc. Enabling refers to an individual’s ability to get access to healthcare services. The measure indicators are personal income, medical insurance status, travel time to the healthcare facility, social support, etc. Need, defined as an individual’s demand for healthcare services, is the premise and direct factor of healthcare services use. Need includes perceived and evaluated variables. The measure indicators
are the number and type of chronic disease, self-reported health status, instrumental activities of daily living (IADL), physician's professional judgment, etc.

Prior studies have adopted the Anderson model to explain factors of healthcare services use among the elderly in China[27, 29, 30]. These studies have found that enabling, predisposing, and need factors are all significantly associated with healthcare services use, with model differences among types or metrics of healthcare services. For example, one study found that medical insurance status played a significant role in the physical examination and outpatient service utilization model, but it was not significant in the inpatient model[30]. Another study showed that income could significantly affect healthcare expenses, but it was not significantly associated with whether to visit a doctor or not[27].

**Data Source**

The data are from the 2015 China Health and Retirement Longitudinal Study (CHARLS) conducted by the National School of Development at Peking University. The 2015 CHARLS is targeted at people aged 45 and above, covering all county-level units in mainland China (excluding Tibet, Hainan, and Ningxia). The samples include 150 county-level and 450 village-level units, with a total of 11,797 households (20,284 individuals). More information and data about the CHARLS can be obtained from the Peking University website[33]. Firstly, we selected individuals who used healthcare services in the “health care and insurance” section within one month according to the survey and removed the cases of follow-up and emergency to obtain a preliminary sub-sample. Secondly, according to the ID number, subsamples obtained in the previous step were matched up with other sections to obtain more information, including demographic backgrounds, health status and functioning, health care and insurance, work retirement and pension, income expenditures and assets. Subsequently, the final data were processed as follows. We deleted the samples under 45 years old or with default values and transformed some of the variables. Finally, after screening, we selected 1143 individuals who met the research criteria.

**Dependent variable**

The dependent variable in our study is a dichotomous measure of whether or not the elderly choose
primary treatment at the community level. If an individual goes to a primary healthcare facility, the value is 1. Otherwise, if an individual goes to a higher-level hospital, the value is 0. For example, according to the question “which types of medical facilities have you visited in the last four weeks for outpatient treatment?” Then the question divides the options into the next ones: general hospital, specialized hospital, Chinese medicine hospital, community healthcare center, township hospital, health care post, and village clinic/Private clinic. Based on the definition presented by the National Health Commission of China[9], the first three were classified as the higher-level hospital, and the last four were classified as the primary healthcare facility. After that, we excluded the follow-up and emergency patients according to the questions “was the visit a first visit or a follow-up visit for the symptom” and “was the visit for ordinary outpatient service or an emergency.” Therefore, the practical meaning of the dependent variable is the probability that the elderly choose to visit the primary healthcare facility when in the first admission of ordinary outpatient service. The reasons why we construct the dependent variable in such a way are as follows. Firstly, the driving mechanism of the follow-up and emergency healthcare use may be different from that of the first ordinary outpatient service use[34]. The follow-up is bound to follow after the first visit, and the emergency visit mostly occurs in an accident. Secondly, according to the requirement of the HMS, residents’ first ordinary visits are expected to take place in primary healthcare facilities. Due to the interpretation of policy, we feel this measurement is more practical.

**Independent Variables**
According to the Anderson behavioral model, we chose these following independent variables, and also explored the influencing factors that are more in line with Chinese cultural characteristics.

**Predisposing Characteristics**
Gender, age (grouping:45–59, 60–74,75+; or as a continuous variable), education level (illiteracy, elementary school, middle school, high school, higher education), marriage status (married with spouse alive, no spouse), work status(still at work, no longer work), children number (grouping: 0, 1–2, 3–4, 5+; or as a continuous variable), residence (rural, urban), social activities (grouping: 0,1–2,3+).
Given that the higher level of measurement will show more information and can be recoded into other forms, we considered both the continuous and classification measurement for variables such as age and children number. Previous studies have shown that there is a significant correlation between occupational status and healthcare services utilization[35, 36]. We used the work status variable to observe whether the elderly were still working last year. The Chinese elderly are entitled to retire after 45 years old, but they usually continue to engage in some jobs to enrich their later life, which may affect the use of healthcare service. The number of children variable was designed to measure the elderly's access to family support. Most of the elderly in China rely on family support, which means they are usually cared for by their children[37]. Therefore, the difference in family support for the elderly may affect their use of healthcare service.

Enabling Factors

Personal income, basic medical insurance status (no medical insurance, Urban Employee Basic Medical Insurance and Government Medical Insurance, New Rural Cooperative Medical Insurance and Urban Resident Medical Insurance and Urban-Rural Resident Medical Insurance), supplemental medical insurance (yes, no), out-of-pocket expenses, travel time to the healthcare facility (grouping: 0–30, 31–60, 61+; or as a continuous variable), household status (agricultural hukou, non-agricultural hukou, unified residency hukou), region (west, central, northeast, east).

In order to meet the standard of the following statistical analysis, we carried out the log normalization transformation of three variables: income, out-of-pocket expenses, and travel time to the healthcare facility. Some qualitative studies have mentioned that medical insurance status is an essential factor in encouraging patients to the primary healthcare facility[13, 22]. Therefore, we took both basic medical insurance and supplementary medical insurance into consideration simultaneously. As the unbalanced development in regions results in differences concerning the economic and social status, which significantly influences the possibility of getting healthcare resources[21, 38], we used two variables (household status and region) to measure the diversity in different areas. The household status variable was divided into three categories in accord with the Chinese household registration system. The region variable was divided into four economic zones according to the latest standard of
the national bureau of statistics[39].

**Need Factors**

IADL (need help, no help), self-reported health status (excellent, very good, good, fair, poor), self-health satisfaction (completely satisfied, very satisfied, satisfied, not very satisfied, not satisfied at all), the number of chronic diseases (0, 1–2, 3+), specific chronic diseases (hypertension, diabetes, lung disease, liver disease, heart problems, kidney disease, stomach disease, arthritis, asthma).

In addition to subjective measurement methods such as the self-reported health status, we also adopted some proxy variables that reflect the objective health status. Firstly, health status is measured by the number and type of chronic diseases. For instance, we selected high-incidence diseases like hypertension, diabetes, and heart attack as proxy variables for evaluating objective health status. Besides, we used complications number to represent the number of individuals’ chronic diseases. Secondly, the IADL variable indicates the individuals’ self-care ability. On the basis of instrumental activities of daily living, if one or more of the mentioned activities cannot be conducted independently or only can be conducted with others’ help, individuals were considered to need help.

**Statistical Analysis**

We divided the statistical analysis into three stages. In the first phase, we used the univariate analysis to examine the association between each independent variable and primary healthcare use. We used the chi-square analysis of contingency tables when the independent variable was a grouping one. Besides, when the independent variable was a continuous one, we carried out the normality test and covariance test first. After this, if the result accorded with normality and homoscedasticity, then we used the analysis of variance. If it failed in accord with those assumptions, we used the nonparametric rank-sum test. In the second phase, based on the results of the univariate analysis and theoretical model, we further screened the influencing factors by stepwise regression of the multivariate linear model. Not only did we examine the single explained ability of every independent variable, but also we compared the joint explained ability of each independent variable under the control of other variables[40]. In the third phase, we used a logistic regression model with robust standard error to explain the probability of primary healthcare use.

**Results**
Among the 1143 samples in this study, 709 (62.03%) had their last visit to the primary healthcare facility in the past month and received an average of 1.84 services at each visit. The three most frequently used services in primary healthcare facilities were medication (46.64%), infusion (25.99%), and injection (15.14%). Relatively, those in higher-level hospitals were medication (33.73%), X-ray, CT, B ultras (22.22%), and laboratory test (14.78%). Furthermore, the elderly received an average of 2.32 services at each visit.

**Descriptive Characteristics**

In all samples, the average age was 59.6, with 45.4% male. 68.9% of the samples were still working, and each person participated in an average of 1.1 social activities, with a mean of 2.5 children. The elderly who got married and were living with spouses accounted for 88.6%, and 26.1% of the samples lived in urban areas. Among samples, illiterate accounted for 25%, elementary school accounted for 36%, middle school accounted for 25.1%, high school accounted for 7.9%, and higher education accounted for 6%. 5.4% of the total samples had supplementary medical insurance, and 92.8% had basic medical insurance. The average personal income was 13580.3 yuan. The average of out-of-pocket expenses was 701.3 yuan, and the average travel time to the healthcare facility was 47.5 minutes. The agricultural and non-agricultural households accounted for 78.8% and 18.5%, respectively. 28.4% of the total samples were located in the western region, 40.2% in the central region, 4.4% in the northeast, and 27% in the eastern region. 85% of the samples can do daily activities independently, with an average of 2 chronic diseases (only 20.7% without chronic disease).

**Univariate Analysis**

The proportion and means of several predisposing, enabling, and need factors differed significantly between those elderly with primary healthcare facility visits and with higher-level hospital visits at P < 0.1. As shown in Table1, predisposing characteristics such as educational level, work status, children number, and residence were statistically significant. There were also significant differences in enabling factors such as personal income, basic medical insurance status, out-of-pocket expenses, travel time to the healthcare facility, household status, and region. Some need factors including the number of chronic diseases and specific chronic diseases were statistically significant. There were
also some differences in IDAL and self-reported health status but not significant.

**Multivariate Analysis**

We used a linear probability model to compare the explanatory power among different determinants of primary healthcare use. As shown in Table 2, DF is the degree of freedom for a particular parameterization of a single determinant. $R^2$ indicates the proportion of the variance in healthcare services use that is explained by a determinant, without control of any other variables. $\Delta R^2$ shows the net proportion of the variance explained by a determinant with all the other determinants taken into consideration. With both $R^2$ and $\Delta R^2$ methods, the most three powerful explanatory determinants were out-of-pocket expenses, travel time to the healthcare facility, and residence. Household status, education level, region, personal income, work status, children number, the number of chronic diseases were all significantly associated with primary healthcare use when considering the explanatory effect of single determinants. However, after the inclusion of other variables, work status and the number of chronic diseases were no longer significant. Moreover, the level of significance of several determinants was decreased, such as education level, number of children alive, region, and household status.

In the final logistic regression model (Table 3), three predisposing characteristics, five enabling factors, and one need factor were significantly associated with primary healthcare use. Using the education level as an example, we can explain the results as follows. Under the control of other variables, the odds of primary healthcare use among the high-level education elderly was 65.4% lower than the illiterate elderly.

**Discussion**

We researched the factors associated with the choice of primary treatment at the community level among the elderly in China by adopting the data of CHARLS 2015. We found that having received higher education, living in urban areas and non-western regions, taking more travel time to the healthcare facility, being a non-agriculture household status, having more out-of-pocket expenses and personal income decreased the likelihood of primary healthcare facilities visit. Having more children, being worse self-reported health status was associated with a higher possibility of primary healthcare
facilities visit.

We used the Andersen behavioral model as our conceptual framework. Previous studies have found that the model has differences within various healthcare services[29, 30, 41], and we focused on the particularity of outpatient services. We found the enabling factors had the most significant impact on outpatient services use, followed by the predisposing characteristics and need factors. In contrast, some studies have concluded that need factors were the most important influencing factors of the elderly’s healthcare services use[28, 42]. Although it has been proved that the Andersen model fits the Chinese situation[23, 43, 44], few studies have attempted to improve it. We attempted to modify the model, making it better for Chinese cultural characteristics. For example, we introduced the number of children to represent family support and the household registration system with Chinese characteristics.

In the final logistic regression model, there were three predisposing characteristics (residence, education level, children number) significantly associated with primary healthcare use. We also found something different from previous studies concerning the variable of education level[30, 38]. In our study, only the subgroup which has received higher education showed significant preferences for a higher-level hospital visit[36]. Several possible reasons may explain this phenomenon. Firstly, the elderly with higher education may be suspicious of the service quality provided by primary healthcare facilities because they may have more detailed knowledge and experience[45]. Secondly, the well-educated elderly may judge their disease more accurately and recognize the need to receive higher healthcare services by self-diagnosis. Besides, they may have more access to better healthcare resources. Most of the Chinese elderly are home-based in the care of their children, especially in some traditional areas[18]. The higher the number of children is, the more family support the elderly can get[37]. In our study, the number of children as a significant determinant of primary healthcare use was found. We believe a complementary relationship between family support and healthcare services can explain this phenomenon. Adequate family care for the elderly reduces their need for specialized healthcare resources. Work status was significant in the univariate analysis, but no longer significant after including other variables. Work status may be a predisposing characteristic primarily
through its relationship with other factors such as health or income. This working effect could be reduced by controlling for other factors. However, we still included this variable in the final model due to the experience from previous studies. In practice, people with jobs might have particular preferences for healthcare services.

There were five variables in enabling factors (out-of-pocket expenses, travel time to the healthcare facility, region, household status, personal income) significantly associated with primary healthcare use. Previous studies have suggested that travel time[10, 46] and regional factors[12] may influence patients’ choice of healthcare services, with few empirical studies to prove it. We found that the more travel time to the healthcare facility was associated with a lower probability of primary healthcare use. It implies that if it is convenient for the elderly to travel to the primary care facility, they are willing to choose it. Both household status and region were found to be significantly associated with primary healthcare use. Due to the imbalance development among areas, which results in the distribution of healthcare resources varying from region to region[21, 38], areas (urban and eastern region) with more superior economic development can always provide more choices in healthcare services, while rural and western regions can only provide limited primary healthcare. Although the basic medical insurance status variable was significant in the univariate analysis, it was no longer significant in multivariate analysis. We found that the household status variable can represent the basic medical insurance status variable to some extent. In our samples, the elderly with NRMI accounted for 93.7% of the whole group with agricultural hukou, and the elderly with UEBMI accounted for 66.7% of the whole group with non-agricultural hukou. Therefore, the UEBMI illustrates the situation of the agricultural population, while UEBMI reflects the characteristics of the non-agricultural population. Given this alternative relationship among variables, our study only retained the household status variable, which is of more research significance. The personal income and out-of-pocket expenses explain the preferences for healthcare use from the perspective of the elderly's financial capacity and healthcare expenditure, respectively. This relation also implies that the demand of the elderly for healthcare services is price-elastic, but personal income can hinder this effect. This result is consistent with the recommendations of many works of literature[1, 13, 22].
differential payment of medical care for different healthcare facilities can standardize patients’ choice of healthcare service. Our study found that the out-of-pocket expenses factor was more potent than the personal income factor. However, in practice, the reimbursement policy and the charge standard are basically the same for all individuals in outpatient services. Therefore, the effect of personal income plays a more prominent role. To a certain extent, it explains why the current medical insurance policy has failed to guide the residents to primary healthcare facilities.

It was only self-reported health status of need factors that was significantly associated with primary healthcare use. Both IADL and the number of chronic diseases were statistically significant in univariate analysis, but not significant in multivariate analysis. These results can be explained as follows: firstly, IADL and the number of chronic diseases are proxy variables that reflect objective health status. Controlling for self-reported health status could mitigate their effects. For example, the elderly with chronic diseases are generally not in a good healthy condition. Their subjective assessment of health status is always lower. Secondly, the self-reported health status in our study can be regarded as a useful proxy variable for subjective health status. The elderly with worse health conditions are more likely to choose primary healthcare services. Thirdly, physical and chemical indicators of a particular disease or physician’s judgment of the severity of the disease may be better proxy variables for objective health status. However, we do not have more information due to data limitations. In order to meet the requirements of the Anderson model, we still included these two variables. This result is also in line with the practice of HMS policy. The elderly who are in a worse health condition caused by chronic diseases are more likely to visit primary healthcare facilities. The primary healthcare facility can help to balance resource distribution between primary healthcare and specialist treatment. Some previous studies have shown that the need factor is the most important one[42, 44], which is inconsistent with our study. It may be because our study focuses on the elderly’s choices between primary healthcare and specialist treatment. The preference mechanism between different healthcare services is different from whether the same service is used or how much it is used.

Our study has its limitations. Firstly, we did not include several factors that might influence whether
the elderly had primary healthcare use or not. For example, we did not include the elderly’s subjective perception variables (such as the trust in different healthcare facilities). Besides, our study did not include the policy effect in different regions. For example, Guangzhou, Shanghai, and Zhejiang have already implemented particular models of primary treatment at the community level[24, 26]. Secondly, the measurement error is worth further discussion. The CHARLS survey is based on the family unit, and hence the case that other family member answers the question on behalf of the elderly may happen. We think this situation may influence the accuracy of the data. Thirdly, our dependent variable is dichotomous, which cannot contain as much information as a continuous variable does. For example, the most recent primary healthcare facility visit may be different from long-term visits. Fourthly, although we adopted variables to control regional differences, it may be insufficient. A better variable might be the measurement at the community-level. However, we cannot explore it further because the sample size is not ample. Fithly, our study is a correlation analysis rather than a causal inference. Although we use the Anderson behavioral model, it is still more of statistical inference research at the data level instead of the causality. Further identification of causal relationships among variables requires more in-depth practical experience and complex measurement models.

Conclusions
In conclusion, among the Chinese elderly, having received higher education, living in urban areas, taking more travel time to the healthcare facility, living in non-western regions, being a non-agricultural household status, having higher personal income and out-of-pocket expenses are associated with a higher probability of choosing the higher-level hospital. However, having more children and being worse self-reported health status are associated with a high probability of choosing the primary healthcare facility. The policymakers are expected to take these factors mentioned above into consideration when improving the primary treatment at the community level system, especially the following ones: out-of-pocket expenses, primary healthcare facility layout, and urban-rural differences.

Abbreviations
CHARLS: China Health and Retirement Longitudinal Study; HMS: hierarchical medical system; IADL: instrumental activities of daily living; UEBMI: Urban Employee Basic Medical Insurance; GMI: Government Medical Insurance; NRCMI: New Rural Cooperative Medical Insurance; URMI: Urban Resident Medical Insurance; URRMI: Urban-Rural Resident Medical Insurance

Declarations

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Authors’ contributions

All authors contributed to this manuscript. TT designed the study, analyzed and interpreted the data, and was a major contributor in writing the manuscript. LH and RS reviewed the manuscript. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

Ethics approval and consent to participate

An ethics waiver request was submitted to the Ethics Review Board of China Pharmaceutical University, and met the requirements for exemption, as the research relied exclusively on secondary use of anonymous information.

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Availability of data and materials

The datasets used during the current study are available from the corresponding author on reasonable request.

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| Tables | Variables |
|--------|-----------|
|        | Predisposing | Type of healthcare facilities |  |
|        | Gender | Hospital-0 | Primary-1 | Tc  |
|        | Female | 229 | 395 | 62  |
|        | Male   | 205 | 314 | 51  |
|        | Age    | 434 | 709 | 58  |
|        | 45-59  | 220 | 365 | 47  |
|        | 60-74  | 187 | 288 | 47  |
|        | 75-    | 27  | 56  | 83  |

|                | Education level |
|----------------|-----------------|
|                | Hospital-0 | Primary-1 | Tc  |
| Female         | 229       | 395       | 62  |
| Male           | 205       | 314       | 51  |
| 45-59          | 220       | 365       | 58  |
| 60-74          | 187       | 288       | 47  |
| 75-            | 27        | 56        | 83  |
| Category                                      | Value 1 | Value 2 | Value 3 |
|----------------------------------------------|---------|---------|---------|
| Illiteracy                                   | 89      | 197     | 28      |
| Elementary school                            | 136     | 275     | 41      |
| Middle school                                | 119     | 168     | 28      |
| High school                                  | 42      | 48      | 90      |
| Higher education                             | 48      | 21      | 69      |
| **Marriage status**                          |         |         |         |
| No spouse                                    | 55      | 75      | 13      |
| Married with spouse alive                    | 379     | 634     | 10      |
| **Work status**                              |         |         |         |
| No longer work                               | 166     | 190     | 35      |
| Still at work                                | 268     | 519     | 78      |
| **Children number**                          |         |         |         |
| 0                                            | 33      | 38      | 71      |
| 1-2                                          | 247     | 339     | 58      |
| 3-4                                          | 116     | 245     | 36      |
| 5-                                           | 38      | 87      | 12      |
| **Residence**                                |         |         |         |
| Rural                                        | 257     | 588     | 84      |
| Urban                                        | 177     | 121     | 29      |
| **Social activities**                        |         |         |         |
| No longer work                               | 170     | 310     | 48      |
| Still at work                                | 197     | 316     | 51      |
| **Enabling**                                 |         |         |         |
| **Personal Income (ln)**                     |         |         |         |
| No medical insurance                         | 43      | 39      | 82      |
| NRRCMI&URRMI&URMI                            | 303     | 629     | 93      |
| UEBMI&GMI                                    | 88      | 41      | 12      |
| **Supplemental medical insurance**           |         |         |         |
| No                                           | 407     | 674     | 10      |
| Yes                                          | 27      | 35      | 62      |
| **Out-of-pocket expenses (ln)**              |         |         |         |
| No                                           | 434     | 709     |         |
| Yes                                          |         |         |         |
| **Travel time (ln)**                         |         |         |         |
| 0-30                                         | 218     | 611     | 82      |
| 31-60                                        | 112     | 61      | 17      |
| 61-                                          | 104     | 37      | 14      |
| **Household status**                         |         |         |         |
| Agricultural hukou                           | 292     | 609     | 90      |
| Non-agricultural hukou                       | 129     | 83      | 21      |
| Unified residency hukou                      | 13      | 17      | 30      |
| **Region**                                   |         |         |         |
| West                                         | 105     | 220     | 32      |
| Central                                      | 175     | 284     | 45      |
| Northeast                                    | 36      | 14      | 50      |
| East                                         | 118     | 191     | 30      |
| **Need**                                     |         |         |         |
| IADL                                         |         |         |         |
| No help                                      | 362     | 609     | 97      |
| Need help                                    | 72      | 100     | 17      |
| **Self-report health status**                |         |         |         |
| Excellent                                    | 7       | 5       | 12      |
| Very good                                    | 35      | 48      | 83      |
| Good                                         | 41      | 78      | 11      |
| Fair                                         | 231     | 391     | 62      |
| Poor                                         | 120     | 187     | 30      |
| **The number of chronic diseases**           |         |         |         |
| 0                                            | 81      | 156     | 23      |
| 1-2                                          | 196     | 349     | 54      |
| 3-                                           | 157     | 204     | 36      |
| **Specific chronic diseases**                |         |         |         |
| **Hypertension**                             |         |         |         |
| No                                           | 287     | 490     | 77      |
| Yes                                          | 147     | 219     | 36      |
| **Diabetes**                                 |         |         |         |
| No                                           | 393     | 645     | 10      |
| Yes                                          | 41      | 64      | 10      |
| **Lung**                                     |         |         |         |
| No                                           | 356     | 595     | 95      |
| Yes                                          | 78      | 114     | 19      |
| **Liver**                                    |         |         |         |
| No                                           | 406     | 682     | 10      |
| Yes | 28 | 27 | 55 |
| --- | --- | --- | --- |
| Heart | No | 334 | 612 | 94 |
| Yes | 100 | 97 | 19 |
| Kidney | No | 397 | 647 | 10 |
| Yes | 37 | 62 | 99 |
| Stomach | No | 288 | 462 | 75 |
| Yes | 146 | 247 | 39 |
| Arthritis | No | 241 | 384 | 62 |
| Yes | 193 | 325 | 51 |
| Asthma | No | 408 | 662 | 10 |
| Yes | 26 | 47 | 73 |
| Self-health satisfaction | Completely satisfied | 12 | 19 | 31 |
| Very satisfied | 72 | 129 | 20 |
| Satisfied | 212 | 340 | 55 |
| Not very satisfied | 110 | 161 | 27 |
| Not at all satisfied | 28 | 60 | 88 |

### Variables

| Variables | DF | $R^2$ | $\Delta R^2$ |
|-----------|----|-------|--------------|
| Education level (dummies) | 4 | 0.038*** | 0.006** |
| Children number (linear) | 1 | 0.0115*** | 0.0023** |
| Children number (dummies) | 3 | 0.0129*** | 0.0001 |
| Work status (dummies) | 1 | 0.0144*** | 0.0155** |
| Residence (dummies) | 1 | 0.0687*** | 0.1739*** |
| Travel time(linear,ln) | 1 | 0.1739*** | 0.0863** |
| Travel time(dummies) | 2 | 0.1551*** | 0.0276*** |
| Region(dummies) | 3 | 0.0254*** | 0.0037* |
| Household status (dummies) | 2 | 0.0519*** | 0.0026* |
| Out-of-pocket expenses (linear,ln) | 1 | 0.2455*** | 0.094*** |
| Personal income(linear,ln) | 1 | 0.0227*** | 0.0024** |
| Self-report health status(linear) | 1 | 0.0002 | 0.0002 |
| Self-report health status(dummies) | 4 | 0.0032 | 0.0034 |
| IADL(dummies) | 1 | 0.0011 | 0.0014 |
| The number of chronic diseases (linear) | 1 | 0.0039** | 0.062** |
| The number of chronic diseases (dummies) | 2 | 0.0004 | 0.0004 |
| Variables                              | Odds Ratio | Robust Std. Err. | P    |
|---------------------------------------|------------|------------------|------|
| **Education level**                   |            |                  |      |
| Illiteracy                            | 1.153      | 0.260            | 0.528|
| Elementary school                     | 0.744      | 0.189            | 0.246|
| Middle school                         | 0.756      | 0.291            | 0.467|
| High school                           | 0.346      | 0.137            | 0.007***|
| Higher education                      | 1.134      | 0.076            | 0.059*|
| **Children number**                   | 1.083      | 0.210            | 0.682|
| **Work status**                       | 0.279      | 0.066            | 0.000***|
| **Travel time (ln)**                  | 0.339      | 0.035            | 0.000***|
| **Region**                            |            |                  |      |
| West                                  | 0.690      | 0.146            | 0.079*|
| Central                               | 0.389      | 0.192            | 0.055*|
| Northeast                             | 0.570      | 0.132            | 0.015**|
| East                                  |            |                  |      |
| **Household status**                  |            |                  |      |
| Agricultural hukou                    | 0.565      | 0.152            | 0.034**|
| Non-agricultural hukou                | 0.814      | 0.396            | 0.672|
| Unified residency hukou               | 0.501      | 0.033            | 0.000***|
| **Out-of-pocket expenses (ln)**       | 0.897      | 0.046            | 0.034**|
| **Personal income (ln)**              |            |                  |      |
| **Self-report health status**         |            |                  |      |
| Excellent                             | 2.853      | 2.570            | 0.224|
| Very good                             | 4.402      | 3.883            | 0.093*|
| Good                                  | 4.740      | 4.092            | 0.071*|
| Fair                                  | 5.352      | 4.693            | 0.056*|
| Poor                                  | 0.753      | 0.189            | 0.258|
| IADL                                  |            |                  |      |
| The number of chronic diseases        |            |                  |      |
| 0                                     | 1.204      | 0.270            | 0.407|
| 1-2                                   | 1.155      | 0.293            | 0.569|
| 3-                                    | 1477.218   | 1598.812         | 0.000***|

**Table 1.** Sample characteristics

The P value indicates the significance of a test. *** p < 0.01, ** p < 0.05, * p < 0.1.

**Table 2.** Percentage variance explained in primary healthcare use

*** p < 0.01, ** p < 0.05, * p < 0.1, based on LR-test.

**Table 3.** Probability of having primary healthcare facility visit logistic regression model results
*** p < 0.01, ** p < 0.05, * p < 0.1, based on t-test.

Figures

Figure 1

The number of institutions and visits between primary healthcare facilities and higher-level hospitals in China No. (hospitals), the number of higher-level hospitals; No. (primary healthcare facilities), the number of primary healthcare facilities; visits (hospitals), the number of higher-level hospital visits; visits (primary healthcare facilities), the number of primary healthcare facility visits; No. % (hospitals), the overall percentage of higher-level hospital numbers; visits % (hospitals), the overall percentage of higher-level hospital visits.

The visits unit is ten thousand.
The number of institutions and visits between primary healthcare facilities and higher-level hospitals in China No. (hospitals), the number of higher-level hospitals; No. (primary healthcare facilities), the number of primary healthcare facilities; visits (hospitals), the number of higher-level hospital visits; visits (primary healthcare facilities), the number of primary healthcare facility visits; No. % (hospitals), the overall percentage of higher-level hospital numbers; visits % (hospitals), the overall percentage of higher-level hospital visits. The visits unit is ten thousand.
Figure 2

The number of institutions and visits between primary healthcare facilities and higher-level hospitals in China No. (hospitals), the number of higher-level hospitals; No. (primary healthcare facilities), the number of primary healthcare facilities; visits (hospitals), the number of higher-level hospital visits; visits (primary healthcare facilities), the number of primary healthcare facility visits; No. % (hospitals), the overall percentage of higher-level hospital numbers; visits % (hospitals), the overall percentage of higher-level hospital visits.

The visits unit is ten thousand.