

**Association Between Major Non-Communicable Diseases, Healthcare Use,
Financial Burden and Socioeconomic Factors in China: A Cross-Sectional
Study**

by

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Duke Global Health Institute
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Date: 4/8/2021

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Joseph Egger



Lijing Yan

Thesis submitted in partial fulfillment of
the requirements for the degree of
Master of Science in the Duke Global Health Institute
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ABSTRACT

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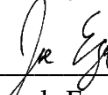
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Abstract

Background Four major noncommunicable diseases (NCDs)—cardiovascular diseases (CVD), diabetes, chronic respiratory diseases, and cancer—have become the leading causes of disability-adjusted life-years in China. Curbing these diseases is critical in the Healthy China 2030 plan, a national health promotion strategy. A key question is whether the plan will expand service capacity for people with NCDs, and also reduce the financial burden that people in China suffer in paying for those services. In order to inform this question, this study examined (i) the current use of healthcare services in China by people with different types of NCDs; (ii) the financial burden they experience in seeking such care; and (iii) whether socioeconomic status (SES) factors influence both their use of healthcare services and the financial burden of service use.

Method We used data from the 2018 wave of a nationally representative survey, called China Health and Retirement Longitudinal Study (CHARLS). We included all participants who were interviewed in the 2018 survey. We examined three types of outcomes: perceived healthcare needs (measured by self-reported health), the use of healthcare services, and the financial burden of such use (as assessed by out-of-pocket expenses [OOP] and catastrophic health expenditure [CHE]). The indicators we used were four major NCDs, and SES factors (including education status, employment status, income level, residence status, and different health insurance schemes: Urban Employee

Basic Medical Insurance [UEBMI], and Urban-Rural Resident Medical Insurance [URRMI]). Logistic regression models were used to assess effects of having four NCDs and SES factors on people's perceived needs, healthcare service use, and CHE. Negative binomial models were performed to assess the effects of four major NCDs and SES factors on the number of times that healthcare services were used. Multiple linear regression models were adopted to examine the associations between four major NCDs, SES factors, the financial burden of service use, and the distance from the healthcare facility to home.

Results A total of 20,813 respondents were included in our analyses. Compared with having one or more of the four major NCDs, there is some evidence that having no NCDs was associated with lower odds of having an outpatient visit in the last month (odds ratio [OR]=0.86), a hospitalization in the last year (OR=0.87) or taking purchased medicine in the last month (OR=0.82). People without NCDs may also have lower OOP for purchasing medicines in the last month compared with those with one or more of the four major NCDs (exponentiated $\beta = 0.87$). However, no evidence of differences was found in healthcare service use and the financial burden of the service use between people with four major NCDs and people with other types of NCDs. In relation to SES factors, (i) residency status: people living in rural areas may have higher baseline odds (OR = 1.11) of taking self-purchased medicine, more hospital admissions during the past year (IRR = 1.25), longer distance traveled from home to their last outpatient visit

(exponentiated $\beta = 1.28$), and longer distance traveled from home to their last inpatient visit facility (exponentiated $\beta = 1.25$) than those who were in urban areas. (ii) health insurance type: some evidence showed that people without health insurance may have worse self-perceived health (OR = 1.53), lower odds of going to an outpatient visit in the last month (OR=0.71), and lower odds of an inpatient visit in the last year (OR=0.32) compared with people covered by UEBMI. People without health insurance also may travel further from home to an inpatient facility (exponentiated $\beta = 3.39$) and have higher odds of experiencing CHE (OR = 1.37) compared with people with UEBMI. People covered with URRMI may have poorer self-perceived health (OR = 1.21), lower odds of having an inpatient visit in the last year (OR=0.73), lower number of hospital admissions in the last year (IRR = 0.77) and lower OOP expenses for the last outpatient visit (exponentiated $\beta = 0.77$) than people with UEBMI. They also may travel longer distances from their home to an inpatient facility (exponentiated $\beta = 2.06$) than people with UEBMI.

Conclusion There was no evidence showed that there were differences between having one or more of these four major NCDs versus having other types of NCDs in people's self-perceived health, their use of healthcare services, and the financial burden of such service use, thus we should not overlook the prevention and management of other types of NCDs. In addition, continuous attention should be paid to the prevention and management of four major NCDs in China. Despite the Chinese government's efforts to

improve the health system to ensure universal health coverage in China, efforts should be further taken in providing financial protection to people in less-resourced settings (i.e., people living in rural areas and those without a health insurance plan) and to avoid inequality in healthcare service use that favors richer people.

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1. Introduction

1.1 *Burden of noncommunicable diseases*

The noncommunicable diseases (NCDs) with the largest global burden of disease—cardiovascular diseases (CVD), diabetes, cancer and chronic respiratory diseases—have become prominent on the global health agenda since the 2011 United Nations High-Level Meeting on the Prevention and Control of Non-communicable Diseases^{1,2}. These four NCDs now account for 80% of deaths and 90% of early preventable deaths worldwide, and the burden falls disproportionately on low-income and middle-income countries¹. NCDs not only threaten public health, but also have social and economic impacts. Given the chronic nature of NCDs, people with NCDs tend to seek healthcare more frequently than those with acute health conditions, and thus are more likely to be exposed to costs associated with such healthcare.

In China, a systematic analysis for the Global Burden of Disease Study in 2017³ found that CVD, chronic obstructive pulmonary disease (COPD), and cancer have become the leading causes of disability-adjusted life-years (DALYs). The Healthy China 2030 plan⁴ is a national health promotion strategy. To obtain “healthy life” for the general population, the plan sets a goal of a 30% relative reduction in premature mortality resulting from major NCDs from 2015 to 2030. However, given the major burden of NCDs in China and the variation in access to healthcare services and

providers among different provinces and cities⁵, it will be challenging for China to achieve these goals.

1.2 Barriers in access to healthcare services

In 2009, in order to provide all citizens with equal access to health care services and to reduce the large costs of seeking health care (i.e., to provide financial protection), China launched an ambitious, national-level health care system reform⁶. Over 97% of people now have health insurance coverage through three main social health insurance schemes—the Urban Employee Basic Medical Insurance plan (UEBMI), the Urban Resident Basic Medical Insurance (URBMI) plan, and the new rural cooperative medical schemes (NRCMS) plan. These schemes have improved accessibility to healthcare services. To further ensure equity in health insurance coverage, at the end of 2015, the central government decided to integrate URBMI and NRCMS into one health insurance plan, known as the Urban-Rural Resident Medical Insurance (URRMI) scheme⁷. Almost all inpatient and outpatient care was included in the coverage benefits of the URRMI scheme, and the insurance reimbursement rate increased from about 50% in 2008 to 75% in 2016^{8,9}. However, although the 2009 health care system reform had some positive impacts, such as improving the quality of services of public hospitals^{6,10}, expanding health insurance coverage⁸, and strengthening primary care delivery^{8,11}, gaps and challenges remain.

One potential barrier to accessing health services is long distances to a health facility. Many health delivery models in developed countries have taken into account the distance traveled to medical facilities, since long distance to a facility is known to be a barrier to accessing healthcare services ¹¹. However, in China, there have been few studies exploring the association between distance traveled to health facilities, access to services, and health outcomes ¹². In addition to distance, a number of questions still remain about the health insurance scheme, including (i) whether people covered with health insurance are truly being given adequate financial protection, (ii) whether there are variations in coverage among people of different socioeconomic status (SES), and (iii) what proportion of healthcare services are being covered in the benefits package. A major challenge that may hinder the progress towards the achievement of “healthy life” in China is the uneven distribution of health resources and the inequity in seeking healthcare services. Several studies have found either inequity in the access to healthcare services among different income groups (see below) ¹³, or a continuous heavy financial burden for service users, especially for the poor in rural areas¹⁴.

1.3 Impact of socioeconomic status on healthcare access

SES, whether assessed by educational level, occupation, income, or environmental quality, has been shown to influence disparities in access to healthcare services ¹⁵. Such disparities in access to services in turn can further worsen health outcomes, especially in older adults ¹⁶⁻¹⁸.

In some countries ^{14,19,20}, studies have found that inequity in the use of healthcare services is associated with SES factors. SES factors are more than just financial well-being, they also encompass the access to any societal resources ²¹. In China, Zhang et al showed that rural-urban differences are one SES factor that influences access to healthcare services ¹². And the type of health insurance will definitely influence the health resources that people can get access to, especially for older adults who would not have work in their later lives. In addition to influencing access to healthcare services, SES also influences health outcomes more directly. In Western countries, SES factors have been found to have impacts on physical health, mental health or functionality ²²⁻²⁶. Many studies in China conducted since 2009 have confirmed that differences in SES factors significantly influence the morbidity or even multimorbidity of chronic disease ²⁷⁻²⁹.

1.4 Expanding access and reducing financial burden

The initial goal set for the 2009 China health reform is to ensure all citizens have equal and affordable basic health care with reasonable quality by 2020 ⁶. Although the goal has yet to be achieved, the government has taken broad efforts towards promoting a healthier population. The Healthy China 2030 strategy, announced in 2016, set two specific targets: (i) to increase health service capacity, and (ii) to further ease people's financial burden when it comes to paying for health services ⁴. The Fourteenth Five-year Plan (FYP) in China (2021-2025), which guides the direction of policy for the future

development, is likely to see a continuation of the Healthy China 2030 Vision⁹. The 14th FYP placed a heightened emphasis on “rebalance of medical resources and acceleration of construction of hierarchical diagnosis and tiered treatment system”⁹ to ensure equity in seeking health care. A key question is whether the plan will expand service capacity for people with NCDs, and also reduce the financial burden that people in China suffer in paying for those services.

In order to inform this question, it is important to understand (i) the current use of healthcare services in China by people with different types of NCDs and without NCDs; (ii) the financial burden they experience in seeking such care; and (iii) whether SES factors influence both their use of healthcare services and the financial burden of service use. Previous studies have examined NCD risk factors in China, the influence of SES on multimorbidity, and other factors influencing the use of healthcare services. However, there have been few studies specifically examining disparity in access to health services among patients with different NCDs in China. To the best of our knowledge, there has been no dedicated study that explored the association of SES factors with the use of healthcare services among patients with NCDs and the financial burden of such service use in China. This study aims to close this information gap.

The overall study objective is to assess the effect of having four major NCDs on use of healthcare services in China, the effect of SES factors in their use of healthcare services, and the financial burden caused by such health service use.

The **three specific aims** are:

1. To assess whether having any one or more of the four major NCDs is associated with greater healthcare service use and greater out-of-pocket expenditures (OOP) than having no NCD or having any other NCD.
2. To assess how SES factors affect use of healthcare services and the financial burden of healthcare service use—measured as OOP and catastrophic health expenditures (CHEs)—among the general population.
3. To assess whether SES factors affects use of healthcare services and the financial burden of that use among people with the four major NCDs.

2. Methods

2.1 *Data source and samples*

Data from a nationwide household survey, called the China Health and Retirement Longitudinal Study (CHARLS), were used. The detailed methodology and rationale of the survey has been reported elsewhere³⁰. Briefly, CHARLS is a national biennial survey of persons 45 years age or older in China since 2011. The survey uses a probability-proportionate-to-size (PPS) sampling strategy to get a national representative survey sample. By using this strategy, the sample size of each sampling unit was proportional to the population size of this sampling unit, and the data were from the census. Based on the PPS strategy, the survey covers 450 communities from 150 counties that fall within 28 provinces. The survey includes health, social and economic circumstances of these residents³¹. Of the baseline survey in 2011, there were a total number of 17,708 respondents from 10,253 households, who were followed up every two years. For each wave of the survey, participants in the previous wave would be followed up, while new additional participants would also be recruited.

For this study, we used the up-to-date 2018 (wave 4) data, from which a total of 20,813 respondents were successfully enrolled. For our analysis, we included all participants who were interviewed in the 2018 survey. A total of 3,146 (15.1%) respondents reported that they had one or more of the four major types of NCDs.

2.2 Analytic approach

This study collected and analyzed existing data using quantitative methods through two key steps.

Step 1: In order to give a “big picture” summary of the key demographic findings, we examined the demographic characteristics of all people interviewed in the 2018 survey.

We summarized:

- their use of healthcare services
- the financial burden of their healthcare service use
- their access to healthcare facilities
- the proportion of people who have the four major NCDs (CVD, cancer, chronic respiratory diseases, and diabetes), and
- the perceived needs of all people interviewed in the 2018 national survey

Step 2: We performed several regression analyses to assess:

- whether having one or more of the four major NCDs would impact people’s use of healthcare services and the financial burden of such healthcare service use
- the effects of SES factors on the use of healthcare services and on the financial burden of such healthcare service use among the general population who were interviewed,
- specifically among people with the four major NCDs, the effects of SES factors on the use of healthcare services and on the financial burden of this service use.

2.3 Study variables

2.3.1 Dependent variables

In this study, we chose the following as dependent variables: perceived need, an outpatient visit in the last month, an inpatient visit in the last year, taking purchased medicine in the last month, number of outpatient visits in the previous month, number of hospitalization nights during the last inpatient visit, and distance from home to the last outpatient visit and last inpatient visit. These variables are key indicators for the use of healthcare services. To measure the financial burden of the healthcare service use, we used OOP for the last outpatient visit, last hospitalization, or self-medication during the last month along with the CHE status of a participant's household. We describe these variables in more detail below.

Perceived need. Perceived need refers to the perception of an individual about the necessity or benefits of seeking healthcare services³². The assessment of perceived needs reflects the effectiveness of healthcare services to some extent, because a need is usually met when the health care is efficacious³³. Thus, perceived need can be considered as a predictor of the use of healthcare services³⁴. Perceived need is usually measured by self-reported health. In this study, the question that assessed self-reported health, as a proxy for perceived need, was: "Would you say your health is very good, good, fair, poor or very poor?"³¹. The answers to this question were combined into one scale "Good, fair, or poor".

Service use. In CHARLS, participants were asked whether they had any outpatient visits in the previous month or a hospital admission in the previous year. They were then asked about the number of outpatient visits using the following question: “In the last month have you visited a public hospital, private hospital, public health center, clinic, or health worker’s or doctor’s practice, or been visited by a health worker or doctor for outpatient care? (Not including physical examination)”. The number of hospital admissions in the past year were based on the question: “How many times have you received inpatient care during the past year?” Answers on the number of outpatient visits and hospital admissions were coded as counts. We also created a dichotomous variable for responses to questions about whether or not they had outpatient visits in the past month, and whether or not they had inpatient visits in the past year.

Distance traveled. Following the questions about the frequency of outpatient/inpatient visits, the distance from the respective outpatient/inpatient facility last visited was asked: “How many kilometers is it from this medical facility to your residence?” The value of the distance from healthcare facility to home was log-transformed in order to normalize the distribution of these outcome variables in the regression model.

Financial burden. In this study, the financial burden was measured by OOP as well as the CHE of the respondents. The OOP expenditures for the last outpatient visit

and hospitalization were based on the question “How much did you pay out of pocket, after reimbursement from insurance for that outpatient visit/hospitalization?”. For self-medication, respondents were asked, “How much did you pay out-of-pocket for purchased medicine during the last month (not including prescription medicines)?” The value of OOP payment was log-transformed in order to normalize the distribution of these outcome variables in the regression model. We measured the CHE at the household level. A binary variable was created to indicate whether the participant’s household had catastrophic health expenditures (CHE) or not. When the annual OOP spending on healthcare equaled or exceeded 40% of a household’s capacity to pay³⁵, we coded the variable as 1, and if it was below 40% we coded it as 0. Our definition of CHE, widely used by the international health community, was originally proposed by the WHO: “We defined expenditure as being catastrophic if a household’s financial contributions to the health system exceed 40% of income remaining after subsistence needs have been met.”³⁶ To derive annual OOP on healthcare, we calculated the OOP for outpatient visits, inpatient visits and self-medication over the past year by multiplying the times people went to outpatient/inpatient care or purchased medicine in a year by the OOP of these healthcare seeking behaviors each time. We measured the household’s capacity to pay as the total consumption expenditure of the household minus the food-based household spending.

2.3.2 Independent variables

The CHARLS collected information on both self-reported health problems which were diagnosed by health professional before, as well as health problems diagnosed from blood taken during physical examinations conducted when being interviewed. We used self-reported, doctor-diagnosed NCDs as classification criteria for the variable of the status of having any of the four major NCDs. This variable was divided into three categories: (1) not having any type of NCD; (2) having one or more of the four major NCDs (CVD, cancer, chronic respiratory diseases, diabetes); (3) having other type(s) of NCDs except for the four major ones (i.e., dyslipidemia; emotional, nervous, or psychiatric problems; memory-related diseases and so on). We combined responses for hypertension, heart disease and stroke to create the CVD indicator variable.

It is unlikely that there is a single best marker of a SES factor that is adequate in exploring the association between SES factors and the use of healthcare services. There are interactions between changes in SES factors throughout a person's life course and there are regional variations in SES associations with the use of healthcare services. Therefore, we first used total annual household expenditure as a proxy measure of economic status. We chose to use this indicator rather than annual household income since previous studies have indicated that income might not reflect the true CHE level when the health expenditure of a household could come from its savings³⁷, which is usually the case in China. Next, we chose educational level and employment status as

measures of societal status. Health insurance type would be another indicator to represent people's societal status. Since rural-urban differences are known to influence SES in China¹², residency status was included as another proxy for SES factor.

Household consumption was constructed from a series of questions that asked about different kinds of living expenses, such as rent, food, clothing, and electricity. Annual consumption was categorized into three tertiles: tertile 1, < 14,200CNY (\$2057); tertile 2, 14,218 (\$2060) to < 36,960CNY (\$5355); tertile 3, < 484,6532CNY (\$702,172)¹. Based on the self-reported highest level of education attainment from a respondent, educational level was categorized into four groups: below primary school, primary school, high school (including junior high, senior high and vocational school), and college and above. We categorized occupation into agricultural work, employed nonfarm work, self-employed nonfarm work, and unemployed/retired/receded². The residency status in CHARLS was categorized into four types: urban, rural-to-urban, urban and special areas, so a categorical variable was constructed to represent four different types of residency. Finally, there were four categories for the health insurance type, which were UEBMI, URRMI, other health insurance, and without health insurance.

¹ We used the average exchange rate in 2020, which was 1 USD = 6.9022 CNY.

² Receded refers to a worker who loses the ability to work due to illness and disability, but does not meet the requirements for retirement in terms of age, working experience or personal payment years. After being certified by the hospital, and approved by the organization, the worker stops working.; aid and compensation is given to recuperate

2.3.3 Control variables

The control variables included in the regression analysis were chosen based on Andersen's model³⁸. The model categorizes the factors that influence the use of healthcare service into predisposing, enabling, and need variables. The predisposing variables include age, gender, nationality, and marital status. Types of health insurance are counted as enabling variables. The need variable includes satisfaction with local medical service and disability.

The age of the respondents was categorized into three groups: 45-59 years, 60-74 years, and 75 years and older. Marital status also had three categories: married and partnered, separated/divorced/widowed, and never married. There were two categories of nationality: Han nationality and others. Since there are two major types of health insurance in the Chinese health insurance system, the health insurance variable was categorized into four groups: UEBMI (urban employee basic medical insurance), URRMI (urban-rural resident medical insurance), others, and none. The satisfaction with local medical services in the CHARLS survey was assessed by the question "Are you satisfied with the quality, cost and convenience of local medical services?". We combined the answers to this question, which were very satisfied, somewhat satisfied, neutral, somewhat dissatisfied, and very dissatisfied, into three simpler categories: satisfied, neutral, or dissatisfied. Another need variable—disability—was categorized into a dichotomous variable, for which 0 represents having no disability, and 1 indicates

having one or more of the following disabilities: physical disability, brain injury/intellectual disability, vision problem, hearing problem, speech impediment.

2.4 Statistical analysis

We examined three types of outcomes: perceived need, the use of healthcare services, and the financial burden of such use (OOP, CHE). For each of these outcomes of interest, we first summarized the general descriptive statistics, and second explored the associations between the independent variables and these three key outcomes with regression analyses. We also report the prevalence of CVD, diabetes, cancer, and chronic respiratory diseases. In the descriptive analyses, we reported the number of people within each category of the outcome variable and its percentage for the category; for number of outpatient and inpatient visits, we reported the mean and standard deviation (SD); while for other continuous outcome variables, median and the first and third quartile were reported.

We performed logistic regression analyses, negative binomial regression analyses, and multilevel linear regression analyses to assess the effects of four major NCDs, as well as different levels of SES factors, on the use of healthcare services and the financial burden of such healthcare service use. We used a logistic regression model to examine the association between the odds of healthcare service use and SES factors, and between the odds of encountering CHE and SES factors. The logistic regression model was also used to assess the effects of four major NCDs on the odds of perceived need

and the odds of CHE. The negative binomial regression model was adopted to examine the effects of four major NCDs and SES factors on the number of times that healthcare services were used. We used negative binomial regression because we observed overdispersion in the number of times that healthcare services were used (likelihood ratio (LR) chi-square test of $\alpha=0$, $p<0.001$), which means the variances were greater than the means in outcome variables. Logistic and linear regression models were chosen based on whether the outcome variable was binary or numerical (and the assumption of performing these regression analyses were not violated).

To examine the associations of four major NCDs and SES factors with the financial burden and the distance from the healthcare facility to home, we performed multivariable linear regression modeling. In addition, for each linear regression model, we performed the White test to examine the homogeneity of the variance of residuals; we used the Skewness Kurtosis test to examine the normality of residuals; and we tested multicollinearity by using Variance Inflation Factors (VIF). If the assumptions of the normal distribution and the homogeneity of variance of the residuals were violated, we used Weighted Least Squares to adjust for the regression model.

For the logistic regression analyses, we report associations as odds ratios (ORs) adjusted for age, gender, marital status, nationality, health insurance type, and disability status, as well as the satisfaction with local medical services, with 95% confidence intervals (CIs). For the binomial negative regression analyses, incidence rate ratios

(IRRs) and 95% CIs adjusted for the above control variables were reported to assess the relationship between the independent variables and the dependent variables. For the multivariable regression analyses, we reported the log-transformed coefficient and 95% CIs adjusted for the above control variables. All data analyses were conducted using STATA 16.0.

2.5 Ethical approval

The original CHARLS was approved by the Ethical Review Committee at Peking University (IRB00001052_11015). Written informed consent was obtained from each participant before the household survey. The information of all participants was de-identified, thus there were limited risks for participants' confidentiality. The wave 4 dataset in 2018 is publicly available at <http://charls.pku.edu.cn/en/page/data/2018-charls-wave4>.

3. Results

3.1 *Demographic and socioeconomic characteristics of the general population, and the prevalence of four major NCDs*

Summary of demographic characteristics Table 1 summarizes the demographic and socioeconomic characteristics of the general population in the national survey. Most participants (81.5%) were under 75 years old, and more than half (52.9%) were female. About 85% of survey participants were married and living with their partners at the time of the interview. Han was the major ethnic group (88%), with minorities accounting for just 12% of the sample population.

Socioeconomic factors In terms of socioeconomic factors, about 34% of people did agricultural work, 29% of them had a nonfarm occupation, and more than 37% of people did not work (they were unemployed, retired or receded). A large proportion of people (43.5%) did not finish primary school; this proportion was higher than the proportion of people who had a high school degree and above (34.5%). Furthermore, of the general population, there were more than three times more rural residents than urban residents. Most of the population was covered by URRMI (80.8%), compared with only 14.2% coverage by UEBMI.

NCD prevalence The prevalence of four major NCDs is also shown in Table 1.

Cardiovascular diseases had the highest prevalence (190.4 cases per thousand) among the four NCDs in the sample population, followed by chronic respiratory diseases (58.7

cases per thousand), diabetes (57.7 cases per thousand), and cancer (13.2 cases per thousand).

Table 1 Demographic and socioeconomic characteristics of the study population

Characteristics	The study population	
	N	% of total sample
All participants	20813	-
Age		
45-59	8495	40.8
60-74	8228	39.5
75+	3798	18.3
*missing	292	1.4
Marital status		
Married and partnered	16864	81.0
Separated/divorced/widowed	2834	13.6
Never married	118	0.6
*missing	997	4.8
Sex		
Male	9340	44.9
Female	10476	50.3
*missing	997	4.8
Nationality		
Han	18235	87.6
Others	2578	12.4
*missing	0	0.0
Occupation		
Agricultural work	6728	32.3
Employed nonfarm work	4047	19.4
Self-employed nonfarm work	1533	7.4
Unemployed/ retired/receded	7410	35.6
*missing	1095	5.3
Education		
Below primary school	8623	41.4
Primary school	4357	20.9
High school (junior, senior and vocational school)	6406	30.8
College and above	430	2.1
*missing	997	4.8
Residency status		
Urban	4016	19.3
Urban-rural integration zone	1616	7.8
Rural	14078	67.6

Special areas	106	0.5
*missing	997	4.8
Health insurance		
UEBMI	2802	13.5
URRMI	15978	76.8
Others	384	1.8
None	599	2.9
*missing	1041	5.0
4 NCDs		
No NCDs	5063	24.3
Have 4 NCD(s)	3146	15.1
Have other NCD(s)	5639	27.1
*missing	6965	33.5
NCDs	Prevalence in the study population (no. of cases per 1,000 sample respondents)	
Four types of NCDs		
Cardiovascular diseases	190.4	
Diabetes	57.7	
Chronic respiratory diseases	58.7	
Cancer	13.2	

*: the number of missing values for each variable

3.2 Use of healthcare services

Tables 2-5 show basic characteristics of the healthcare service use (Table 2), the use of outpatient healthcare services in the last month (Table 3), the use of inpatient healthcare services in the past year (Table 4), and the proportion of people who had self-medication in the last month (Table 5) by different population sub-groups.

For the general population, 3255 (16.5%) people reported that they had visited outpatient services 2.21 times on average during the last month prior to the interview. The average number of hospital admissions during the last year were 1.67 times for 3327 (16.8%) people who made an inpatient visit. The median distance from the last

outpatient facility to home was 4 km, while the median distance from the last inpatient facility to home was much longer (10 km). Just over 40% of the population (42.4%) purchased medicine over the past month.

People who had a college degree and above had the least number of outpatient visits among all educational groups. The distance from the last hospitalization facility to home was shortest for people with the highest annual household living expenditure.

Table 2 Basic characteristic of the healthcare service use

Characteristics	The sample participants	
	N	% of total sample
Perceived needs		
Good	4577	22.0
Fair	8939	42.9
Poor	4736	22.9
*missing	2535	12.2
Outpatient visit last month		
No	16509	79.3
Yes	3255	15.6
*missing	1049	5.0
Inpatient visit last year		
No	16437	79.0
Yes	3327	16.0
*missing	1049	5.0
Self-medication last month		
No	8378	40.2
Yes	11382	54.7
*missing	1053	5.1
Incidence of CHE		
No	12420	59.7
Yes	8393	40.3
*missing	0	0.0

*: the number of missing values for each variable

Table 3 The use of outpatient services by different population sub-groups

Sub-groups	Number of visits in the last month		Distance of last visit	
	N	Mean(SD)	N	Median(Q1, Q3)
Total	3255	2.21(2.75)	2974	4(1,14.2)
Predisposing variables				
Age				
45-59	1390	2.29(2.83)	1268	4(1,15)
60-74	1349	2.23(2.89)	1238	3.15(1,13)
75+	478	1.90(1.82)	432	3(1,14)
Marital status				
Married and partnered	2774	2.21(2.79)	2537	4(1,15)
Separated/ Divorced/Widowed	458	2.21(2.53)	415	3(1,12)
Never married	23	2.04(1.15)	22	3.5(2,10)
Sex				
Male	1525	2.25(2.92)	1403	4(1,15)
Female	1730	2.18(2.58)	1571	4(1,14)
Nationality				
Han	2975	2.23(2.77)	2723	3.5(1,12.6)
Others	280	2.00(2.43)	251	5(1,25)
Enabling variables				
Occupation				
Agricultural work	1098	2.27(2.96)	997	5(1.5,15)
Employed nonfarm work	652	2.05(1.72)	603	3(1,12)
Self-employed nonfarm work	267	2.33(3.38)	247	4(1,15)
Unemployed/ retired/receded	1232	2.19(2.72)	1122	3(1,10)
Education				
Below primary school	1476	2.22(2.68)	1337	4(1,15)
Primary school	703	2.37(3.25)	647	4(1,14)
High school (junior, senior and vocational school)	1002	2.10(2.53)	921	3.5(1,11)
College and above	74	1.91(1.31)	69	2(1,5)
Residence status				
Urban	641	2.07(2.64)	603	3(1,8)
Urban-rural integration zone	290	2.51(3.69)	266	3(1,15)
Rural	2311	2.21(2.64)	2095	4(1.5,15)
Special areas	13	2.08(1.55)	10	7.5(2.5,29.7)
Health insurance				
UEBMI	479	2.28(3.47)	456	3(1,6)

URRMI	2627	2.19(2.59)	2384	4(1,15)
Others	71	2.56(3.66)	67	3.3(1,10)
None	78	2.23(1.69)	67	4(2,15)
Annual household living expenditure				
Lowest 33.3%	1053	2.23(2.78)	952	4(1,15)
Middle 33.3%	1082	2.21(2.79)	983	4(1.5,15)
Highest 33.3%	1120	2.20(2.67)	1039	3(1,10)
Need variable				
4 NCDs				
No NCDs	753	2.24(2.89)	699	3.5(1,10)
Have 4 NCD(s)	535	2.15(2.51)	503	4(1,15)
Have other NCD(s)	940	2.24(2.80)	853	4(1,15)
*missing	1027	2.20(2.72)	919	3.5(1,14)
Disability				
No disabilities	2043	2.23(2.73)	1872	3(1,12)
Either disability	1208	2.15(2.66)	1099	4(1,15)
Satisfaction of local medical services				
Satisfied	1126	2.19(2.78)	1014	4(1,15)
Neutral	1488	2.27(2.94)	1370	3.5(1,12)
Dissatisfied	587	2.06(1.73)	543	4(1,12.6)

*: the number of missing values for 4 NCDs (although the number of missing values for 4 NCD was large, they were random)

Table 4 The use of inpatient services by different population sub-groups

Sub-groups	Hospital admissions in the past year		Distance of last visit	
	N	Mean(SD)	N	Median(Q1,Q3)
Total	3327	1.67(2.96)	2799	10(3,30)
Predisposing variables				
Age				
45-59	1445	1.71(4.19)	1215	10(3.7,301)
60-74	1352	1.65(1.50)	1134	10(3,30)
75+	481	1.56(1.13)	408	10(3.2,35)
Marital status				
Married and partnered	2824	1.68(3.18)	2379	10(3.5,32)
Separated/ Divorced/Widowed	479	1.62(1.09)	400	10(3,30)

Never married	24	1.54(0.72)	20	4.5(2.5,30)
Sex				
Male	1545	1.60(1.40)	1302	10(3.5,30.5)
Female	1782	1.72(3.83)	1497	10(3,30)
Nationality				
Han	3067	1.66(3.04)	2585	10(3.2,30)
Others	260	1.72(1.80)	214	10(3,50)
Enabling variables				
Occupation				
Agricultural work	1162	1.78(4.65)	987	15(4,36)
Employed nonfarm work	610	1.68(1.52)	516	10(4,30)
Self-employed nonfarm work	259	1.68(1.84)	221	12(3,30)
Unemployed/ retired/receded	1289	1.56(1.17)	1068	10(3,30)
Education				
Below primary school	1424	1.65(1.45)	1189	15(4,35)
Primary school	731	1.61(1.40)	620	12(4,34.0)
High school (junior, senior and vocational school)	1090	1.74(4.75)	924	10(3,30)
College and above	82	1.37(0.91)	66	4.5(2,15)
Residence status				
Urban	720	1.57(1.16)	610	5.5(2,20)
Urban-rural integration zone	284	1.58(1.18)	250	7.4(3,30)
Rural	2306	1.70(3.47)	1926	15(5,35)
Special areas	17	1.88(1.41)	13	9(5,60)
Health insurance				
UEBMI	561	1.87(6.39)	452	4.5(2,17)
URRMI	2644	1.62(1.50)	2247	15(4,35)
Others	71	1.89(1.94)	56	5(2,17.5)
None	51	1.59(1.04)	44	16.5(4.6,43.7)
Annual household living expenditure				
Lowest 33.3%	1082	1.66(1.63)	913	12(4,35)
Middle 33.3%	1140	1.65(1.451)	964	15(4,35.5)
Highest 33.3%	1105	1.69(4.65)	922	8(3,30)
Need variable				
4 NCD				
No NCDs	759	1.70(5.54)	630	10(4,30)
Have 4 NCD(s)	556	1.67(1.40)	466	10(3.5,34)
Have other NCD(s)	1034	1.61(1.27)	902	10(3,30)

*missing	978	1.70(1.77)	801	12(4.32)
Disability				
No disabilities	2023	1.69(3.65)	1698	10(3,30)
Either disability	1299	1.63(1.30)	1096	14(4,35)
Satisfaction of local medical services				
Satisfied	1237	1.76(4.43)	1057	10(4,30)
Neutral	1425	1.55(1.38)	1193	10(3,30)
Dissatisfied	587	1.70(1.50)	482	12(4,40)

*: the number of missing values for 4 NCDs (although the number of missing values for 4 NCD was large, they were random)

Table 5 Proportion of people in different population sub-groups who took purchased medicine in the last month

Sub-groups	Taking purchased medicine in the last month	
	Yes(N/(%))	No(N/(%))
Total	8378(42.4)	11382(57.2)
Predisposing variables		
Age		
45-59	4901(58.0)	3559(42.1)
60-74	4764(58.0)	3445(42.0)
75+	1569(56.1)	1230(43.9)
Marital status		
Married and partnered	9718(57.8)	7095(42.2)
Separated/ Divorced/Widowed	1601(56.6)	1229(43.4)
Never married	63(53.9)	54(46.2)
Sex		
Male	5360(57.6)	3953(42.5)
Female	6022(57.6)	4425(42.4)
Nationality		
Han	10410(57.3)	7771(42.7)
Others	972(61.6)	607(38.4)
Enabling variables		
Occupation		
Agricultural work	3944(58.7)	2776(41.3)
Employed nonfarm work	2250(55.6)	1794(44.4)
Self-employed nonfarm work	876(57.2)	655(42.8)
Unemployed/ retired/receded	4275(57.7)	3132(42.3)
Education		

Below primary school	4888(56.8)	3720(43.2)
Primary school	2521(58.1)	1821(41.9)
High school (junior, senior and vocational school)	3744(58.7)	2637(41.3)
College and above	229(53.6)	200(46.6)
Residence status		
Urban	2278(56.8)	1732(43.2)
Urban-rural integration zone	930(57.8)	679(42.2)
Rural	8119(57.86)	5916(42.2)
Special areas	55(51.9)	51(48.1)
Health insurance		
UEBMI	1589(56.8)	1211(43.3)
URRMI	9264(58.0)	6714(42.0)
Others	218(56.8)	166(43.2)
None	311(52.0)	287(48.0)
Annual household living expenditure		
Lowest 33.3%	3732(57.5)	2768(42.5)
Middle 33.3%	3853(58.4)	2743(41.6)
Highest 33.3%	3787(56.9)	2867(43.1)
<hr/>		
Need variable		
<hr/>		
4 NCD		
No NCDs	2711(53.6)	2350(46.4)
Have 4 NCD(s)	1850(58.9)	1292(41.1)
Have other NCD(s)	3371(59.8)	2264(40.2)
*missing	3450(58.3)	2472(41.7)
Disability		
No disabilities	7063(56.4)	5472(43.7)
Either disability	4300(59.7)	2898(40.3)
Satisfaction of local medical services		
Satisfied	3930(55.0)	3217(45.0)
Neutral	5079(58.0)	3678(42.0)
Dissatisfied	2055(66.4)	1040(33.6)

*: the number of missing values for 4 NCDs (although the number of missing values for 4 NCD was large, they were random)

Table 6 shows the association between (a) SES factors and outpatient visits in the last month, hospitalization in the last year, and medicine purchased, and (b) the four

major NCDs and outpatient visits in the last month, hospitalization in the last year, and medicine purchased, explored in a logistic regression analysis.

Compared with having no NCDs, having one or more of the four major NCDs was found to have potential associations with higher odds of having an outpatient visit in the last month (OR=0.86, 95%CI 0.76 to 0.98), a hospitalization in the last year (OR=0.87, 95%CI 0.77 to 0.99) or taking purchased medicine in the last month (OR=0.82, 96%CI 0.74 to 0.90). The odds of going to an outpatient visit in the last month may be lower in people with a high school degree and above compared with illiterate people (OR=0.85 95%CI 0.75 to 0.96), and lower in people without a health insurance plan compared with people with UEBMI (OR=0.71, 95%CI 0.51 to 0.99). For people who live in the urban-rural integration zone, the odds of going to an outpatient visit in the last month may be 1.23 times higher than those who live in the urban area (95%CI 1.02 to 1.49). The odds of an inpatient visit in the last year may be lower in people without a health insurance plan (OR=0.32, 95%CI 0.22 to 0.48), and with URRMI (OR=0.73, 95% CI 0.64 to 0.83). People living in rural areas were possible to have 11% higher odds (OR = 1.11, 95%CI 1.00 to 1.22) of taking self-purchased medicine than those who live in urban areas.

Table 6 Association between (a) SES factors and outpatient visits in last month, hospitalization in last year, and medicine purchased, and (b) the four major NCDs and outpatient visits in last month, hospitalization in last year, and medicine purchased (logistic regression analysis)

Covariates	Outpatient visit in last month	Hospital admission in last year	Self-medication in last month
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	OR	95%CI	P value	OR	95%CI	P value	OR	95%CI	P value
Enabling variables									
Occupation (reference group: agricultural work)									
Employed nonfarm work	1.09	0.96,1.24	0.200	0.83	0.72,0.94	0.005*	0.94	0.86,1.04	0.250
Self-employed nonfarm work	1.11	0.93,1.33	0.257	0.96	0.80,1.15	0.628	1.01	0.88,1.17	0.840
Unemployed/retired/receded	1.05	0.94,1.18	0.379	0.99	0.89,1.10	0.836	0.98	0.90,1.06	0.574
Education (reference group: below primary school)									
Primary school	0.91	0.81,1.04	0.161	0.98	0.86,1.11	0.722	1.04	0.94,1.14	0.458
High school (junior, senior and vocational school)	0.85	0.75,0.96	0.010*	1.02	0.90,1.15	0.802	1.10	0.99,1.20	0.056
College and above	0.85	0.60,1.19	0.342	0.96	0.69,1.33	0.806	0.98	0.76,1.26	0.856
Residence status (reference group: urban)									
Urban-rural integration zone	1.23	1.02,1.49	0.034*	1.02	0.84,1.23	0.854	1.10	0.95,1.28	0.197
Rural	1.11	0.97,1.27	0.124	0.97	0.86,1.11	0.699	1.11	1.00,1.22	0.046*
Special areas	0.42	0.17,1.07	0.068	0.72	0.35,1.47	0.372	0.69	0.42,1.12	0.132
Health insurance (ref: UEBMI)									
URRMI	0.94	0.81,1.08	0.349	0.73	0.64,0.83	<0.001*	1.01	0.91,1.13	0.797
Others	1.14	0.81,1.61	0.449	0.74	0.52,1.05	0.092	1.01	0.77,1.32	0.954
None	0.71	0.51,0.99	0.042*	0.32	0.22,0.48	<0.001*	0.81	0.65,1.02	0.072
Annual household living expenditure (reference group: middle tertile)									
Lowest 33.3%	0.95	0.84,1.06	0.355	1.02	0.91,1.14	0.753	0.96	0.88,1.05	0.349
Highest 33.3%	1.09	0.98,1.23	0.124	0.99	0.88,1.11	0.802	0.96	0.88,1.05	0.329
Need variable									
4 NCDs (reference group: have ≥1 of the 4 NCDs)									
No NCDs	0.86	0.76,0.98	0.023*	0.87	0.77,0.99	0.029*	0.82	0.74,0.90	<0.001*
Have other NCDs	0.99	0.88,1.11	0.811	1.05	0.93,1.18	0.426	1.03	0.94,1.13	0.561

*p<0.05

**Adjusted for age, sex, marital status, nationality, disability status, and satisfaction with local medical services

Table 7 shows the association between (a) SES factors and number of outpatient visits and hospital admissions, and (b) the four major NCDs and number of outpatient

visits and hospital admissions, explored in a negative binomial regression analysis.

According to table 7, it was possible that the number of outpatient visits during the past month was lower in people with employed nonfarm work than those with agricultural work (IRR = 0.89, 95% CI 0.80 to 0.99); it was also possible that the number of outpatient visits was lower in people with a high school degree than in people with lower than primary school degree (IRR = 0.88, 95%CI 0.79 to 0.97). For those who did employed nonfarm work (IRR=0.90, 95%CI 0.81 to 0.99) and did not have work (IRR=0.88, 95%CI 0.81 to 0.96), the IRR for the number of hospital admissions during the past year may be lower than those who did agricultural work. It is likely that people who had high school degree were admitted to hospitals more frequently than those who had below primary school degree (IRR=1.13, 95%CI 1.03 to 1.25). For those living in rural areas, the IRR for the number of hospital admissions may be 1.25 times greater than those who were in urban areas (IRR = 1.25, 95%CI 1.13 to 1.39). Compared with people with UEBMI, people with URRMI may have less hospital admissions during the past year (IRR=0.77, 95%CI 0.70 to 0.85). The number of hospital admissions during the past year may be higher in people with the highest tertile of annual household living expenditure than the middle tertile (IRR=1.11, 95%CI 1.02 to 1.22).

Table 7 Association between (a) SES factors and number of outpatient visits and hospital admissions, and (b) the four major NCDs and number of outpatient visits and hospital admissions (negative binomial regression analysis)

Covariates	Number of outpatient visits			Number of hospital admissions		
	IRR	95%CI	p	IRR	95%CI	p value

value						
Enabling variables						
Occupation (reference group: agricultural work)						
Employed nonfarm work	0.89	0.80,0.99	0.030*	0.90	0.81,0.99	0.041*
Self-employed nonfarm work	1.04	0.90,1.20	0.571	0.95	0.83,1.10	0.515
Unemployed/retired/receded	1.00	0.92,1.10	0.981	0.88	0.81,0.96	0.003*
Education (reference group: below primary school)						
Primary school	0.92	0.83,1.02	0.110	0.99	0.89,1.09	0.780
High school (junior, senior and vocational school)	0.88	0.79,0.97	0.010*	1.13	1.03,1.25	0.010*
College and above	0.80	0.60,1.06	0.127	0.84	0.63,1.12	0.230
Residence status (reference group: urban zone)						
Urban-rural integration zone	1.15	0.99,1.33	0.065	1.07	0.92,1.25	0.362
Rural	1.01	0.90,1.12	0.907	1.25	1.13,1.39	<0.001*
Special areas	0.89	0.39,2.05	0.787	1.50	0.87,2.59	0.141
Health insurance (reference group: UEBMI)						
URRMI	0.98	0.87,1.10	0.718	0.77	0.70,0.85	<0.001*
Others	1.08	0.82,1.40	0.588	0.93	0.70,1.22	0.581
None	0.92	0.70,1.21	0.548	0.72	0.51,1.01	0.055
Annual household living expenditure (reference group: middle tertile)						
Lowest 33.3%	1.01	0.92,1.11	0.831	1.01	0.92,1.11	0.823
Highest 33.3%	1.03	0.94,1.13	0.579	1.11	1.02,1.22	0.022*
Need variable						
4 NCDs (reference group: have ≥1 of the 4 NCDs)						
No NCDs(ref)	1.07	0.96,1.18	0.209	1.00	0.91,1.11	0.968
Have other NCDs	1.08	0.98,1.19	0.130	0.98	0.89,1.07	0.597

*p<0.05

**Adjusted for age, sex, marital status, nationality, disability status, and satisfaction with local medical services

Table 8 shows the association between (a) SES factors and distance from home to last outpatient and last inpatient visit, and (b) the four major NCDs and distance from home to last outpatient and last inpatient visit, explored in a multivariable linear

regression analysis. The only factor that may be positively associated with distance from home to the last outpatient visit was living in a rural area (exponentiated $\beta = 1.28$, 95%CI 1.03 to 1.59). In contrast, it was likely that the distance from home to the last inpatient visit facility was negatively correlated with unemployment/retired/receded status (exponentiated $\beta = 0.79$, 95%CI 0.67 to 0.94) and with the highest tertile of annual household living expenditure (exponentiated $\beta = 0.82$, 95% CI 0.68 to 0.99), and it may be positively correlated with living in a rural area (exponentiated $\beta = 1.25$, 95% CI 1.01 to 1.54), having the URRMI plan (exponentiated $\beta = 2.06$, 95% CI 1.68 to 2.54), and having no health insurance plan (exponentiated $\beta = 3.39$, 95% CI 1.60 to 7.20).

Table 8 Association between (a) SES factors and distance from home to last outpatient and last inpatient visit, and (b) the four major NCDs and distance from home to last outpatient and last inpatient visit (multivariable linear regression analysis)

Covariates	Distance from last outpatient visit facility to home			Distance from last inpatient visit facility to home		
	Exponentiated β	95%CI	p value	Exponentiated β	95%CI	p value
Enabling variables						
Occupation (reference group: agricultural work)						
Employed nonfarm work	0.81	0.65,1.00	0.051	0.83	0.67,1.04	0.100
Self-employed nonfarm work	0.90	0.67,1.19	0.447	0.79	0.58,1.08	0.139
Unemployed/retired/receded	0.93	0.77,1.11	0.411	0.79	0.67,0.94	0.007*
Education (reference group: below primary school)						
Primary school	1.00	0.82,1.22	0.987	1.02	0.83,1.24	0.860
High school (junior, senior and vocational school)	1.07	0.87,1.31	0.551	0.83	0.68,1.01	0.064
College and above	0.70	0.32,1.55	0.376	0.74	0.46,1.19	0.211
Residence status (reference group: urban)						
Urban-rural integration	1.18	0.88,1.59	0.264	0.96	0.71,1.30	0.795

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zone						
Rural	1.28	1.03,1.59	0.027*	1.25	1.01,1.54	0.040*
Special areas	2.86	0.05,152.	0.604	1.45	0.57,3.69	0.437
		44				
Health insurance (reference group: URBMI)						
URRMI	1.17	0.91,1.52	0.222	2.06	1.68,2.54	<0.001*
Others	1.31	0.70,2.45	0.403	1.29	0.67,2.49	0.451
None	1.12	0.61,2.05	0.711	3.39	1.60,7.20	0.001*
Annual household living expenditure (reference group: middle tertile)						
Lower 33.3%	1.02	0.84,1.24	0.810	0.91	0.76,1.09	0.320
Higher 33.3%	0.93	0.77,1.12	0.438	0.82	0.68,0.99	0.037*
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Need variable						
4 NCDs (reference group: have ≥1 of the 4 NCDs)						
No NCDs	1.04	0.85,1.29	0.686	0.98	0.80,1.20	0.858
Have other NCDs	1.04	0.86,1.26	0.701	0.99	0.83,1.19	0.947
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*p<0.05

**Adjusted for age, sex, marital status, nationality, disability status, and satisfaction with local medical services

3.3 The financial burden of the healthcare service use and perceived needs

Table 9 shows median number of OOP payments for the most recent outpatient visit in the last month, the most recent hospitalization in the past year, and the medicines purchased in the last month by different sub-groups. The median annual household living expenditure was 23,668 Yuan (\$3429). The median OOP for the most recent outpatient visit in the last month was 200 Yuan (\$29), the median OOP for the most recent hospitalization during the past year was 2100 Yuan (\$304), and the median OOP for medicines purchased in the last month was 100 Yuan (\$14).

Table 10 shows the incidence of CHE for the use of healthcare services. In 2018, 40.3% of all interviewed households encountered CHE, and there were variations across different sub-groups. Table 9 also shows the perceived needs of the general population in

the survey. One quarter of those in the survey (25.0%) felt they were in good health, and 26.0% felt their health was poor. About one third (34.1%) of people with one or more of the four major NCDs felt their health was poor. In contrast, only 7.2% of people without NCDs felt their health was poor.

Table 9 Financial burden of healthcare service use by sub-groups

	OOP for the last outpatient visit		OOP for the last hospitalization		OOP for the self-medication in the last month	
	N	Median(Q1,Q3)	N	Median(Q1,Q3)	N	Median(O1,Q3)
Total	2998	200(70,600)	3011	2100(1000,5000)	10636	100(45,300)
Predisposing variables						
Age						
45-59	1289	200(80,600)	1319	2200(1000,5000)	4598	100(45,300)
60-74	1228	200(60,600)	1212	2000(1000,5000)	4429	100(40,300)
75+	445	200(70,600)	439	2400(1000,6000)	1468	100(46,300)
Marital status						
Married and partnered	2557	200(70,600)	2379	10(3.5,32)	9089	100(45,300)
Separated/ Divorced/Widowed	420	200(60.5,600)	400	10(3,30)	1488	100(40,300)
Never married	21	300(100,584)	20	4.5(2.5,30)	59	200(50,300)
Sex						
Male	1406	200(70,600)	1393	2300(1000,5400)	5025	100(40,300)
Female	1592	200(70,600)	1618	2000(1000,5000)	5611	100(45,300)
Nationality						
Han	2752	200(70,600)	2776	2135.5(1000,5000)	9721	100(40,300)
Others	246	255(100,630)	235	2000(850,5000)	915	150(50,300)
Enabling variables						
Occupation						
Agricultural work	1026	200(60,600)	1062	2000(900,5000)	3757	100(45,300)
Employed nonfarm work	602	200(75,600)	553	2000(1000,4500)	2079	100(50,250)
Self-employed nonfarm work	243	170(50,500)	224	2150(925,5200)	814	100(35,250)
Unemployed/ retired/receded	1122	230(80,600)	1165	2400(1000,5000)	3951	100(45,300)

Education						
Below primary school	1355	200(65,600)	1293	2000(900,5000)	4577	100(40,300)
Primary school	648	200(80,600)	652	2000(960,5000)	2373	100(50,300)
High school (junior, senior and vocational school)	927	200(75,600)	996	2400(1000,5000)	3487	100(45,300)
College and above	68	215(100,600)	70	3000(1750,5460)	199	100(45,300)
Residence status						
Urban	582	200(80,600)	658	2451.5(1100,5000)	2069	110(50,300)
Urban-rural integration zone	270	287.5(84,760)	254	2200(1000,5000)	878	100(45,300)
Rural	2136	200(69.5,580)	2084	2000(900,5000)	7639	100(40,270)
Special areas	10	275(150,700)	15	700(250,4500)	50	125(53,400)
Health insurance						
UEBMI	425	300(100,800)	515	2500(1300,5500)	1311	150(50,400)
URRMI	2444	200(70,600)	2390	2000(850,5000)	8860	100(40,276.5)
Others	58	200(58,680)	63	2900(1100,4800)	174	100(50,300)
None	71	200(50,600)	43	3500(700,8400)	291	100(30,300)
Annual household living expenditure						
Lowest 33.3%	962	200(60,584)	977	2000(825,5000)	3524	100(41,300)
Middle 33.3%	1004	200(80,600)	1023	2000(1000,5000)	3615	100(45,300)
Highest 33.3%	1032	200(80,600)	1011	2400(1000,5500)	3497	100(45,300)
Need variable						
4 NCD						
No NCDs	688	200(68,600)	692	2500(1012.5,6000)	2516	100(30,200)
Have 4 NCD(s)	501	200(80,600)	496	2000(800,5000)	1742	100(46,300)
Have other NCD(s)	862	204(80,600)	940	2000(925,5000)	3153	100(50,300)
*missing	947	200(65,600)	883	2000(1000,5000)	3225	100(45,300)
Disability						
No disabilities	1888	200(70,600)	1852	2100(1000,5000)	6589	100(40,300)
Either disability	1107	200(70,600)	1154	2000(828,5000)	4028	100(45,300)
Satisfaction of local medical services						
Satisfied	1007	200(60,600)	1102	2000(780,4500)	3625	100(40,250)
Neutral	1381	200(70,600)	1300	2300(1000,5000)	4764	100(45,300)
Dissatisfied	565	260(100,700)	552	3000(1150,6000)	1973	130(50,300)

*: the number of missing values for 4 NCDs (although the number of missing values for 4 NCD was large, they were random)

Table 10 Perceived needs and CHE by sub-groups

Sub-groups	Perceived needs (self-reported health)			CHE
	Good(N/(%))	Fair(N/(%))	Poor(N/(%))	Yes(N/(%))
Total	4577(25.0)	8938(48.9)	4763(26.1)	8393(40.3)
Predisposing variables				
Age				
45-59	2018(25.7)	3850(49.0)	1985(25.3)	3127(36.8)
60-74	1865(24.6)	3723(49.1)	1993(26.3)	3043(37.0)
75+	612(23.9)	1253(48.9)	699(27.3)	2098(55.2)
Marital status				
Married and partnered	3916(25.1)	7622(48.9)	4051(26.0)	6259(37.0)
Separated/ Divorced/Widowed	629(24.4)	1270(49.2)	682(26.42)	1082(38.2)
Never married	32(29.6)	46(42.6)	30(17.8)	55(46.6)
Sex				
Male	2166(25.1)	4181(48.5)	2277(26.4)	3495(37.4)
Female	2411(25.0)	4757(49.3)	2486(25.8)	3901(37.2)
Nationality				
Han	4237(25.2)	8241(49.0)	4347(25.8)	6833(37.5)
Others	340(23.4)	697(48.0)	416(28.6)	1560(60.5)
Enabling variables				
Occupation				
Agricultural work	1395(22.3)	3046(48.7)	1811(29.0)	2448(36.4)
Employed nonfarm work	1011(26.9)	1846(49.1)	902(24.0)	1563(38.6)
Self-employed nonfarm work	382(26.8)	684(48.1)	357(25.1)	585(38.2)
Unemployed/ retired/receded	1780(26.1)	3353(49.2)	1680(24.7)	2742(37.0)
Education				
Below primary school	1934(24.3)	3853(4.4)	2169(27.3)	3283(38.1)
Primary school	1017(25.2)	1938(48.1)	1075(26.7)	1638(27.6)
High school (junior, senior and vocational school)	1510(25.6)	2957(50.1)	1433(24.3)	2324(36.3)
College and above	116(29.6)	190(48.5)	86(21.9)	151(35.1)
Residence status				
Urban	951(25.9)	1815(49.4)	911(24.8)	1479(36.8)
Urban-rural integration zone	402(26.5)	751(49.6)	362(23.9)	604(37.4)
Rural	3186(24.5)	6325(48.7)	3476(26.8)	5266(37.4)
Special areas	38(38.4)	47(47.5)	14(14.1)	47(44.3)
Health insurance				

UEBMI	759(29.8)	1290(50.6)	499(19.6)	1037(37.0)
URRMI	3599(24.3)	7169(48.4)	4051(27.3)	5919(37.0)
Others	95(26.6)	194(54.3)	68(19.1)	131(34.1)
None	121(22.0)	284(51.6)	145(26.4)	265(44.2)
Annual household living expenditure				
Lowest 33.3%	1432(23.8)	2895(48.1)	1695(28.2)	3001(43.3)
Middle 33.3%	1534(25.1)	3004(49.1)	1580(25.8)	2742(39.5)
Highest 33.3%	1611(26.3)	3039(49.5)	1488(24.2)	2650(38.2)
Need variable				
4 NCD				
No NCDs	2136(45.6)	2210(47.2)	336(7.2)	2013(39.8)
Have 4 NCD(s)	528(18.2)	1383(47.7)	990(34.1)	1159(36.8)
Have other NCD(s)	741(14.3)	2433(47.1)	1992(38.6)	1988(35.3)
*missing	1172(21.2)	2912(52.7)	1445(26.1)	3233(46.4)
Disability				
No disabilities	3590(30.1)	6138(51.5)	2198(18.4)	4785(38.1)
Either disability	987(15.5)	2800(44.1)	2565(40.4)	2566(35.6)
Satisfaction of local medical services				
Satisfied	1671(25.2)	3205(48.3)	1767(26.6)	2781(38.9)
Neutral	2064(25.5)	3986(49.3)	2035(25.2)	3178(36.3)
Dissatisfied	675(23.7)	1396(49.0)	780(27.4)	970(31.3)

Table 11 shows the association between OOP expenses from healthcare use and SES factors, and between OOP expenses from healthcare use and the four major NCDs (multilevel linear regression analysis). Table 12 shows the association between (a) perceived needs and SES factors, (b) perceived needs and four major NCDs, (c) CHE and SES factors, and (d) CHE and four major NCDs (logistic regression analysis).

Health insurance type and annual household living expenditure may have association with OOP for the last outpatient visit (Table 11). According to table 11, the OOP expenses for the last outpatient visit may be 23% lower in people with URRMI than

in those with UEBMI (exponentiated $\beta = 0.77$, 95% CI 0.62 to 0.98). Meanwhile, people from the poorest households (the lowest tertile of annual household living expenditure) had a lower OOP for the last outpatient visit (Coefficient = 0.83, 95%CI 0.70 to 0.99) than households in the middle tertile of annual living expenditure. People who lived in special areas may have a much lower OOP for the last in-patient visit than those who lived in urban areas (exponentiated $\beta = 0.32$, 95% CI 0.16 to 0.64). People who did not have NCDs may have 1.25 times greater OOP expenses for the last inpatient visit than those with four major NCDs (exponentiated $\beta = 1.25$, 95%CI 1.05 to 1.48).

Several SES factors were found to be possibly correlated with OOP due to buying medicines (not including prescription medicines) in the last month: occupation, residence status, health insurance type and having four major NCDs. People who did self-employed nonfarm work may have 13% lower OOP for purchasing medicines than those who did agricultural work (exponentiated $\beta = 0.87$, 95%CI 0.77 to 0.98). The money spent on purchasing medicines for people living in rural areas may be 10% lower than for those who live in urban area (exponentiated $\beta = 0.90$, 95%CI 0.82 to 0.98). The OOP for buying medicines may be lower for people with URRMI (exponentiated $\beta = 0.68$, 95%CI 0.62 to 0.75), and for those without health insurance plans (exponentiated $\beta = 0.67$, 95%CI 0.55 to 0.81) relative to those with UEBMI. The OOP for purchasing medicines in the last month in people with no NCDs may be lower than that among those with one or more of the four major NCDs (exponentiated $\beta = 0.87$, 95%CI 0.79 to 0.94).

Residence status, health insurance type, annual household living expenditure, and having four major NCDs were all likely to have impacts on the odds of encountering CHE (Table 12). Among these factors, having no health insurance plan (OR = 1.37, 95%CI 1.09 to 1.72), having no NCDs (OR = 1.11, 95%CI 1.01 to 1.23), and being among the poorest households (OR = 1.15, 95%CI 1.05 to 1.25) may increase the odds of experiencing CHE compared with having the UEBMI plan, having four major NCDs, and being among more wealthy households, respectively. Additionally, living in rural areas (OR = 0.90, 95%CI 0.82 to 0.98) may be associated with lower odds of experiencing CHE than living in urban areas.

Compared with people doing agricultural work, people who did employed nonfarm work (OR = 0.88, 95% CI 0.78 to 0.99), self-employed nonfarm work (OR = 0.77, 95% CI 0.65 to 0.92), or who were unemployed/retired/receded (OR = 0.89, 95%CI 0.80 to 0.98) were more likely to feel that their health status was good (Table 11). People with the URRMI plan (OR = 1.21, 95%CI 1.07 to 1.38) or without a health insurance plan (OR = 1.53, 95%CI 1.15 to 2.05) were more likely to feel that their health was poor than those with the UEBMI plan. People who had other types of NCDs were more likely to feel that their health was poor than people with the four major NCDs (OR = 1.35, 95%CI 1.19 to 1.53). People without any NCD had 71% higher odds of feeling that their health was good than those with the four major NCDs (OR = 0.29, 95%CI 0.26 to 0.33).

Table 11 Association between OOP from healthcare use and SES factors, and between OOPs

from healthcare use and four major NCDs (multivariable linear regression analysis)

Covariates	OOP for last outpatient visit			OOP for last inpatient visit			OOP for self-medication in the last month		
	Exponentiated β	95%CI	p value	Exponentiated β	95%CI	p value	Exponentiated β	95%CI	p value
Total									
Enabling variables									
Occupation (ref: agricultural work)									
Employed nonfarm work	0.91	0.75,1.09	0.307	0.94	0.78,1.12	0.471	0.97	0.88,1.06	0.511
Self-employed nonfarm work	0.76	0.57,1.01	0.056	1.14	0.89,1.45	0.291	0.87	0.77,0.98	0.021*
Unemployed/retired/receded	0.96	0.81,1.15	0.656	0.99	0.86,1.15	0.918	0.97	0.90,1.04	0.390
Education (ref: below primary school)									
Primary school	1.00	0.83,1.21	0.975	0.94	0.80,1.12	0.493	1.01	0.93,1.10	0.813
High school (junior, senior and vocational school)	1.02	0.85,1.24	0.805	0.89	0.76,1.05	0.173	1.00	0.92,1.08	0.951
College and above	0.83	0.40,1.72	0.618	1.02	0.58,1.78	0.940	1.02	0.77,1.33	0.912
Residence status (ref: urban)									
Urban-rural integration zone	1.21	0.91,1.61	0.188	1.06	0.82,1.37	0.650	1.01	0.89,1.15	0.890
Rural	1.02	0.82,1.25	0.874	0.92	0.76,1.11	0.397	0.90	0.82,0.98	0.021*
Special areas	1.27	0.27,6.03	0.759	0.32	0.16,0.64	0.001*	1.11	0.73,1.67	0.634
Health insurance (ref: UEBMI)									
URRMI	0.77	0.62,0.98	0.030*	0.85	0.70,1.03	0.087	0.68	0.62,0.75	<0.001*
Others	1.24	0.74,2.07	0.410	0.90	0.48,1.68	0.743	0.85	0.67,1.09	0.193
None	0.72	0.48,1.09	0.121	1.40	0.77,2.58	0.272	0.67	0.55,0.81	<0.001*
Annual household living expenditure (ref: middle tertile)									
Lowest 33.3%	0.83	0.70,0.99	0.041*	1.00	0.85,1.16	0.974	0.98	0.91,1.06	0.685
Highest 33.3%	1.04	0.87,1.24	0.699	1.15	0.98,1.35	0.078	0.94	0.87,1.01	0.109
Need variable									
4 NCDs (ref: have ≥ 1 of the 4 NCDs)									
No NCDs(ref)	0.92	0.76,1.12	0.419	1.25	1.05,1.48	0.011*	0.87	0.79,0.94	0.001*
Have other NCDs	0.95	0.80,1.14	0.609	1.04	0.89,1.21	0.654	1.08	0.99,1.17	0.085

*p<0.05

**Adjusted for age, sex, marital status, nationality, disability status, and satisfaction with local medical services

Table 12 Association between (a) perceived needs and SES factors, (b) perceived needs and four

major NCDs, (c) CHE and SES factors, and (d) CHE and four major NCDs (logistic regression analysis)

Covariates	Perceived needs			CHE		
	OR	95%CI	p value	OR	95%CI	p value
Enabling variables						
Occupation (ref: agricultural work)						
Employed nonfarm work	0.88	0.78,0.99	0.044*	1.05	0.95,1.16	0.336
Self-employed nonfarm work	0.77	0.65,0.92	0.003*	1.02	0.89,1.18	0.757
Unemployed/retired/receded	0.89	0.80,0.98	0.024*	0.99	0.91,1.08	0.782
Education (ref: below primary school)						
Primary school	0.95	0.85,1.07	0.440	0.99	0.90,1.09	0.789
High school (junior, senior and vocational school)	1.00	0.89,1.12	0.983	0.93	0.84,1.02	0.119
College and above	0.85	0.63,1.16	0.312	0.90	0.69,1.17	0.440
Residence status (ref:urban)						
Urban-rural integration zone	0.99	0.82,1.18	0.882	0.96	0.83,1.12	0.614
Rural	1.02	0.90,1.16	0.741	0.90	0.81,0.99	0.046*
Special areas	0.60	0.34,1.06	0.078	1.60	0.98,2.61	0.058
Health insurance (ref: UEBMI)						
URRMI	1.21	1.07,1.38	0.003*	1.03	0.92,1.15	0.623
Others	1.19	0.85,1.65	0.305	0.95	0.71,1.25	0.696
None	1.53	1.15,2.05	0.004*	1.37	1.09,1.72	0.008*
Annual household living expenditure (ref: middle tertile)						
Lowest 33.3%	1.01	0.90,1.12	0.889	1.15	1.05,1.25	0.003*
Highest 33.3%	0.98	0.88,1.10	0.775	0.94	0.86,1.03	0.169
Need variable						
4 NCDs (ref: have ≥1 of the 4 NCDs)						
No NCDs	0.29	0.26,0.33	<0.001*	1.11	1.01,1.23	0.028*
Have other NCDs	1.35	1.19,1.53	<0.001*	0.94	0.86,1.04	0.230

*p<0.05

**Adjusted for age, sex, marital status, nationality, disability status, and satisfaction with local medical services

4. Discussion

This study used a nationally representative Chinese dataset (CHARLS dataset) to examine how the use of healthcare services (outpatient visits, inpatient visits, and taking purchased medicine) and the financial burden of such use may be possibly associated with (a) SES factors, and (b) four major NCDs (CVD, diabetes, chronic respiratory diseases, and cancer). A key finding was that people with one or more of the four major NCDs were more likely to use healthcare services than those who did not have any NCD. However, people without NCDs may pay more OOP for last hospitalization, and were more likely to incur CHE. The reason may be that the inpatient could be accident and other major diseases for people without NCDs, so people without NCDs not necessarily have lower inpatient expense. OOP is also determined by level of hospitals, if NCD patients utilized primary/secondary hospitals more, they are likely to have lower OOP due to the lower fee for health care. Because inpatient services usually incur higher OOP for healthcare expenses¹³ relative to outpatient services, the higher OOP for hospitalization among people without NCDs may suggest higher odds of experiencing CHE than those with one or more of the four major NCDs. On the other hand, compared with people having other types of NCDs, there were no differences in healthcare service use and the financial burden of such use among people with one or more of the four major NCDs.

A second major finding was that people of lower SES were likely to have poorer self-perceived health, and lived further to these facilities than people of higher SES groups. For certain types of healthcare service use, different SES indicators had different associations. People without health insurance or those with URRMI were less likely to make either an outpatient or inpatient visit, and may have less hospital admissions than people with UEBMI. However, our study found possibly more health service use among people whose education was below primary school, who did agricultural work, or who lived in rural areas than those with high school education, who did non-agricultural work, or who lived in urban areas. For example, the former group were more likely to (a) visit outpatient facilities in the last month, (b) receive inpatient care in the last year, and (c) purchase non-prescribed medicines.

When it comes to the financial burden of healthcare service use, people without health insurance plans may have less OOP for service use, which was consistent with the result that they may use healthcare services less frequently, yet they were more likely to encounter CHE. These results are expected because people without health insurance plans are exposed to more health risk factors and are more likely to face financial hardship. Therefore, when they are ill, they may be less willing to seek healthcare services, and have a higher probability of facing hardship in paying for their health care. The same results of possibly less OOP for medical service use and yet higher odds of

encountering CHE were found in people with lower SES in household consumption level—i.e., those with the lowest household living expenditure.

While previous studies explored the factors that may impact healthcare service use ^{12,39}, as mentioned before they seldom examined the distance traveled from outpatient and inpatient facilities to home as a factor that affects use. The distance to health facilities can reflect the accessibility of healthcare services for people of different SES. One major finding in our study was that people with lower SES—people who did agricultural work, lived in rural areas, did not have health insurance, and had lower annual household living expenditure—they may travel a further distance from home to health facilities for their last visit, compared with people with higher SES. These findings on distance traveled to a facility may indicate the lack of healthcare facilities in rural areas, and the lack of access to health care for people in less advantaged SES (restricted economic condition and social security condition).

We also found that there may exist a rural-urban difference in the use of healthcare services as well as in the financial burden of this use. Consistent with the findings of Jiang et al ⁴⁰, who found that the rural population had a higher probability of self-treatment, our study found that people in rural areas may be more likely to (a) purchase non-prescribed medicine and (b) have more frequent hospital admissions during the past year. Our study results may imply: (1) overuse of self-administered medication in rural areas, which may reflect a desire to avoid seeing doctors when

people feel ill, or low health insurance coverage rate for prescribed medicine; (2) increased utilization of inpatient services. Although rural residents were more likely to purchase non-prescribed medicine, they were found to possibly pay less OOP on self-medication relative to those who lived in urban areas. Also, although they may have more hospital admissions during the past year, they may be less likely to encounter CHE than urban residents. These seemingly contradictory results may be a reflection of lower incomes, lower medical fees and less access to expensive patent drugs in rural areas. Additionally, the tendering policy in China makes drug prices vary across different regions⁴¹. These factors could explain why they spent less OOP on self-medication whereas they had higher odds of purchasing such medicine, to some extent. Future studies should examine OOP for healthcare service use as the proportion of annual income in order to learn more about the financial burden on rural residents.

In terms of the effects of health insurance, our findings are consistent with a previous study which found that individuals with health insurance used more healthcare services than those without any type of health insurance plan¹³. In our study, those without any type of health insurance plan may be less likely to go to either an outpatient or inpatient visit than those with UEBMI, despite that they may have poorer self-perceived health. They also might spend less on OOP expenses on self-medication than those with UEBMI, though they may have higher odds of experiencing CHE. This phenomenon underscores the importance of having a health insurance plan, and it

suggests that having a health insurance plan may influence people's health-seeking behavior.

The lower OOP expenses that uninsured people paid may indicate that they spent less on seeking health care due to the lack of financial protection. It may be that those without a health insurance plan forego seeking care out of their concerns about the costs. These findings further highlight the attention that needs to be paid to accelerate the promotion of universal health coverage since people without a health insurance plan are less likely to seek health care when they are aware of their disease⁴².

Among people who did have health insurance plans, the *type* of plan (URRMI versus UEBMI) may influence their healthcare seeking behaviors and may be associated with differences in the financial burden of healthcare use. People with URRMI may be less likely to go for an inpatient visit, have lower number of hospital admissions in the last year, and they would travel further in distance when seeking inpatient care relative to those with UEBMI despite that they may have poorer self-perceived health than those with UEBMI. Compared with outpatient services, inpatient services usually incur higher out-of-pocket healthcare expenses and are the major cause for people to encounter financial hardship¹³. Therefore, people tend to forgo inpatient care when hospitalization expenses surpass their ability to pay, which can explain the lower frequency of inpatient visits among people with URRMI. Unlike other studies, our study did not explore the features of forgone hospital admissions (defined as "an admission indicated by a doctor

but which was declined or not followed through by the patient”¹³. However, our findings still point to the need to improve the benefit package for inpatient care for patients covered by URRMI to guarantee equity in seeking inpatient care.

We found that people with URRMI may pay less OOP for outpatient visits, as well as less OOP for self-medication, compared with those with UEBMI. Given that people with URRMI may have worse self-perceived health (indicating that they need more health care), and the reimbursement rate of URRMI is lower than that of UEBMI^{14,43}, the lower OOP for medical services among people with URRMI suggests that they may use services less than people with URRMI. Thus, efforts are required to improve the URRMI scheme in order to guarantee that all healthcare services are affordable and equitable to people with whatever health insurance type.

We also found there may not be any difference in incurring CHE between people who covered by UEBMI and those covered by URRMI. This finding suggests that with the continuous integration of NRCMS and URBMI into URRMI in many regions of China, the financial gap in seeking health care has been narrowed among different benefit packages of different health insurance schemes. Different health insurance schemes seem to be providing equal rates of financial protection.

Our study found there may be no association between SES factors and healthcare service use, and the financial burden of the service use among people specifically with one or more of the four major NCDs. The lack of an association may because of the

random error and the unmeasured confoundings in the study. The large missing values for four NCD morbidity may also lead to low power for the result of this analysis.

4.1 *Implications for policy and practice*

We believe our findings provide new evidence which helps to inform policy—for example, if our study finding is true that other NCDs, not just the major four NCDs, can cause much healthcare service use and financial burden, the expansion of access to healthcare services for other NCDs is needed. It may also suggest that funding and resources should be equally invested in the prevention and control of all types of NCDs. An exclusive focus on the four major NCDs could lead to neglect of other types of NCDs that also have negative health outcomes.

On the other hand, compared with people who do not have any kind of NCDs, those who have one or more of the four NCDs may indeed be more likely to go to an outpatient visit, to have an inpatient visit, and to purchase non-prescribed medicine. They also were found to possibly have more OOP expenses for self-medication than those without any type of NCDs, which may imply that a large proportion of the OOP expenses for people with one or more of the four major NCDs comes from purchasing medicines. These findings are consistent with previous research³⁹, and they show that China needs to strengthen the development of healthcare facilities or services to help people with major NCDs to address their needs for seeking health care, and to provide them with financial protection. The urban-rural differences in the access to health care

facilities and in the use of health care, as well as differences based on type of health insurance, underline the importance of ensuring equity in access to health care across insurance schemes and regions. Reducing the differences in the benefit packages between various health insurance plans or integrating them into one standardized scheme and further expanding the health coverage rate may be of great help to achieve that goal.

4.2 Study strengths and limitations

Our study had a number of limitations. First, the CHARLS questionnaire did not ask about the healthcare service use that is directly related to the specific NCDs, or the healthcare expenditure directly related to NCDs. The possible misclassification of these variables resulted from the measurement errors may lead to the biased results of the pattern of healthcare service use and financial burden incurred by NCDs. Moreover, my study did not use weighted data to perform analyses which may bias the results, since CHARLS used a PPS sampling strategy, meaning the sample was not a random sample. In addition, because of the risk of recall bias, data for healthcare expenditure was only chosen for the most recent use of healthcare services. As a result, the long-term impact of the financial burden of the four major NCDs may not have been captured in this study. Furthermore, since the NCD morbidity and all cost variables were self-reported in CHARLS, it may be better to conduct physical examinations on site to get more precise diagnoses, and to use official health databases if future studies are going to explore

health expenditures by people with major NCDs. Finally, this study did not measure the possible confoundings which may bias the results.

Although some studies have already explored the effects of SES factors on NCDs, to our knowledge, this is the first study to examine the effects of the four major NCDs on healthcare service use as well as on the financial burden of the service use. Additionally, our study used the distance traveled from healthcare facilities to home as an indicator to examine accessibility to health care, an indicator seldom used in previous studies. Our study also used the most up-to-date data from a nationally representative survey to gain an understanding of the progress in, and effects of, the current health policy reforms in China, and to understand whether people's health needs were met by using medical services.

One thing to add is since this study is a cross-sectional study and is exploratory, and I did not have strong hypotheses for all analyses, it is possible that these seemingly "significant" associations are due to chance. Therefore, results should be interpreted with caution.

5. Conclusion

In conclusion, this study uses a national representative dataset from CHARLS to conduct a cross-sectional study. Our study explored whether having one or more of the four major NCDs and different SES levels affect the use of healthcare services and the financial burden of such service use among senior adults in China. We found there may be no difference between having one or more of these four major NCDs versus having other types of NCDs in self-perceived health, use of healthcare services, and the financial burden of such service use. Thus, we should not overlook the prevention and management of other types of NCDs. Additionally, it is likely that people of lower SES tend to have worse self-perceived health, and visit healthcare facilities more frequently. People of lower SES also may travel a further distance to medical facilities than people of higher SES groups. Furthermore, people with lower SES may have less OOP for outpatient visits and self-medication, but may have higher odds of encountering CHE due to healthcare service use relative to those with higher SES. The potential differences in the use of healthcare services by people of different SES indicate that future health reforms should do more to ensure equal access to health care for people with different SES. Despite the continuous implementation of the health reform and the development of the health framework to ensure universal health coverage in China, efforts should be further taken to protecting people in less-resourced settings financially, and to avoid pro-rich inequality of healthcare service use.

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