Inequity in health care needs, health service use and financial burden of medical expenditures in China: results from a consecutive household monitoring study in Jiangsu Province

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Abstract

Background: Although public medical insurance covers over 95% of the population in China, disparities in health service use and out-of-pocket (OOP) health expenditure across income groups are still widely observed. This study aims to investigate the socio-economic disparities in perceived health care needs, informal care, formal care and payment for health care and explore their equity implication. Methods: We assessed healthcare needs, service use and payment in 400 households in rural and urban areas in Jiangsu, China, and included only the adult sample (N=925). One baseline survey and 10 follow-up surveys were conducted during the 7-month monitoring period, and the Affordability Ladder Program (ALP) framework was adopted for data analysis. Negative binomial/zero-inflated negative binomial and logit regression models were used to explore factors associated with perceived care needs and with the use of three types of health service (self-treatment, outpatient and inpatient care). Two-part model and logit regression were conducted to explore factors associated with OOP health expenditure and the likelihood of incurring catastrophic health expenditure (CHE). Results: Rural residence was significantly associated with more perceived health care needs, more self-treatments, higher probability of using outpatient and inpatient service, more OOP health expenditure and higher likelihood of incurring catastrophic expenditure ($P<0.05$), after adjusting for other variables. Compared to Urban Employee Basic Medical Insurance (UEBMI), enrollment in New Rural Cooperative Medical Scheme (NRCMS) or Urban Resident Basic Medical Insurance (URBMI) was correlated with lower possibility of ever using outpatient service, but more times of outpatient visits when people were at risk of using outpatient service ($P<0.05$). NRCMS/URBMI was also associated with higher likelihood of incurring CHE with reference to UEBM (OR=2.02, $P<0.05$), and this effect was only significant for the rural population in the separate analysis of the rural and urban sample. Conclusions: The rural population perceived more health care needs, had a higher probability of using both informal and formal health care services, and had more OOP health expenditure and a higher likelihood of incurring CHE in Jiangsu. The inequity mainly exists in health care financing, and may be partially addressed through improving the benefit packages of NRCMS/URBMI.

Background

The Chinese health care system has experienced rapid changes along with the socio-economic reform. On the supply side, the government has been investing in health care infrastructure, especially in primary health care institutions in recent years(1). On the demand side, three public health insurance schemes, Urban Employee Basic Medical Insurance (UEBMI), Urban Resident Basic Medical Insurance (URBMI) and New Rural Cooperative Medical Scheme (NRCMS), were gradually established since late 1990s. Currently over 95% of the Chinese population are covered by the three public insurance schemes, and medical services are mostly financed through the co-payment mechanism of the insurance schemes(2). Inpatient medical services are covered with reimbursement rates ranging from 50% to 90% for different schemes at different levels of hospitals, but the reimbursement rates for outpatient service are still rather low for URBMI and NRCMS(3,4).

Many studies have assessed equity in health care utilization and financing in terms of insurance types and income. Recent studies on the three public insurance schemes generally show that they improved people's access to formal care, including both outpatient and inpatient services, and narrowed the gaps in service use across income groups with the expansion of insurance coverage(3,5–8). Nevertheless, one report from the World Bank showed that the separation in the management of the financing and benefit packages of health insurance schemes across insurance types and regions weakened the risk-pooling effect, and caused inequity problems(9). The high proportion of out-of-pocket (OOP) health expenditure also indicated obstacles to accessing health care and high financial burden of health care (10–12). For each type of insurance specifically, research on URBMI reveals that it benefited more the patients from higher income groups, as poorer patients were less likely to use expensive care due to the limited affordability under the current co-payment arrangement, thus receiving less reimbursement than the well-off(13). The UEBMI also favored more the patients from higher income groups or with good health status, and the urban insurance system failed to reduce the OOP health expenditure for the disadvantaged group(6,14). For NRCMS studies show that for rural population the gaps in inpatient service use dramatically narrowed after the expansion of NRCMS in 2003, and NRCMS also encouraged poorer patients to seek informal and preventive care(15). However, the care utilization pattern under NRCMS was still pro-rich and it did not lower health expenditure nor provide sufficient protection for the poor(7,8,15).

A rich literature also explored the rural-urban difference in healthcare service use and financing. Several recent studies revealed that with the expansion of insurance coverage, the disparities in health service utilization and reimbursement rate between rural and urban population substantially narrowed in recent years, but still exist till now(16–18). Rural patients enjoyed lower reimbursements and bear a high burden of medical expenditure with reference to their income level(17,19). Studies also showed how demographic and socio-economic factors such as related to ethnic minority, income, education, insurance coverage etc., may have a differential impact on the service use pattern of rural and urban populations(20,21). Nevertheless, there is a lack of systematic analysis on how demographic and socio-economic factors would have an impact on the whole health seeking process under the current health care system, starting from health care needs to payment for services for both rural and urban population. In this study we referred to the Affordability Ladder Program (ALP) which provides a holistic approach to examine equity in health care system from the demand-side perspective through step-by-step analysis(22). This framework has been used to explore access to and payment for certain type of health service as well as general health care in other countries(22–25). In this study we used the ALP framework to explore the whole health care seeking path in Jiangsu, China, taking into account the perceived health care needs, informal care, formal care and payment for health care. Jiangsu is a relatively well-developed province in eastern China with a per capita GDP of $14,000 in 2015, and over 95% of the population were covered by one of the three public health insurance schemes(26).We focused on the equity implication of non-need factors for health care such as residence, income, and insurance coverage(27), and explored how these factors may influence each ladder step of health care for the rural and urban population respectively.

Methods

Sampling Design

One urban district (Gusu) and one rural county (Jinhu) in Jiangsu were selected as study sites. Gusu and Jinhu are located in southern and northern Jiangsu respectively, and the GDP per capita (RMB 136,556) in Gusu is twice as in Jinhu (RMB 65,535). Disproportionate stratified sampling was applied with a sample size of 200 households in each site. A list of households with non-communicable disease (NCD) patients was obtained from the local health bureau, and 100 households were randomly selected from the list in each site. The other 100 sample households were randomly selected from the rest of the households in the study sites. As the sample size is relatively small, the households with NCD patients were over-sampled in order to increase the total events of service use, and the project also aims to look at NCD management and the results are not published yet.

Data Collection

This study consisted of a baseline survey and 10 follow-up surveys over 7 consecutive months during 2015–2016, with the first 6 surveys conducted bi-weekly and the last 4 monthly(the first 6 surveys are in phase 1, the rest 4 are in phase 2 when survey frequency was reduced with regard to respondents' feedback that the survey in phase 1 was too frequent). One knowledgeable person from each household, usually the household head, signed informed consent before the interview, and answered on behalf of all members in the household. The baseline survey gathered participants' basic demographic, socio-economic and health information, as well as inpatient service use and expenditure in the past year. Each follow-up survey contained 6 questionnaires concerning chronic disease management for different NCDs, emergent illness (including emergent conditions of NCDs), patients' utilization of self-treatment, outpatient and inpatient services as well as medical costs and out-of-pocket payments.

The baseline survey and the last follow-up survey of phase 1 (6th) and phase 2 (10th) were conducted through face-to-face interviews by trained interviewers in participants' home. For other follow-up surveys participants were asked to choose between: 1) filling survey questionnaires themselves; 2) call interviewers when disease/health service use occurs; 3) face-to-face interview at home; or 4) telephone interview for the follow-up survey. More than 90% of households chose face-to-face interview, a few opted for telephone interview and almost no households filled the survey questionnaires themselves or called interviewers.

All questionnaires were checked by supervisors of the interviewers before transferring to the investigators. A small sample (5%) of the questionnaires were randomly selected and double-checked by investigators through telephone re-interview for quality assurance, and the concordance rate of double-checking exceeded 95%. Double data entry procedure was performed, and the inconsistencies, outliers and missing values were also double-checked in order to ensure data quality. Datasets were encrypted in storage and de-identified during data analysis to protect participants' confidentiality.

Data analysis

We included only the adult population in the analysis as children usually do not make care seeking decisions themselves(28). Descriptive analyses were conducted to examine the demographic and socio-economic characteristics of the overall sample as well as of the urban and rural sample respectively. The chi-squared test and t-test were conducted to see if there were significant differences between the rural and the urban sample. Based on the ALP framework(22) we identified 6 key outcome variables of interests throughout the care-seeking path as shown in Table 1. The total of reporting emergent illness episodes, conducting self-treatment, outpatient service use, inpatient service use, and the total amount of OOP health expenditure were aggregated over the 7-month survey period. Catastrophic health expenditure was defined as total OOP health expenditure exceeding 10% of household income(29).

Table 1: Key outcome variables identified based on the ALP framework

Healthcare seeking path	Outcome variables
Perceived health care needs Health service use	1) number of self-reported emergent illness episodes
Informal care	2) self-treatment
Formal care	3) outpatient service use
	4) inpatient service use
Payment for health care	5) total OOP health expenditure
Financial burden of health care	6) catastrophic health expenditure (CHE) during the survey period

Multivariate regression models were used to explore factors associated with each of these outcome variables of interests. As preliminary analyses showed that there were many "zeros" in the data (no emergent illness, no service use and no health expenditure), we considered standard Possion/Negative Binomial (NB) models versus zero-inflated Poisson (ZIP) /negative binomial (ZINB) models for the first three outcomes which were count variables, and a generalized linear model (GLM) versus a two part model combining logit model and GLM for the OOP health expenditure(30). The zero-inflated models have two processes that separately model the likelihood of not being at risk of having the event (process 1, note that a positive coefficient or relative risk >1 implies a lower probability of being at risk) and the total times of having event given that one is at risk (process 2), and the two-part model estimates the likelihood of incurring any OOP medical expenditure and the amount of expenditure if incurred in two steps(30). As for model selection, we considered the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC) of each model first, and Vuong's closeness test for ZINB vs. the standard negative binomial model if AIC and BIC preferred different models(31). Based on these criteria we selected ZINB model for total times of self-reported emergent illness, NB model for self-treatment, ZINB model for outpatient service use and two part models combining logit model and GLM for the OOP health expenditure (see supplemental materials for details). As only 9 patients in our sample were admitted more than once, we coded inpatient service use as a binary variable of use/non-use. Logit regression was conducted to analyze factors associated with the likelihood of ever using inpatient service and incurring CHE.

As for the independent variables, we focused on the effects of factors indicating socio-economic status (SES), including rural/urban residence, education level, income, employment and the status of health insurance, and adjusted for factors that may affect both these SES factors and the outcomes, including age,

gender, marital status and presence of NCD. Age, income and education level are treated as categorical variables in regression. As for insurance, we grouped people with the new cooperative medical scheme (NRCMS) together with those enrolled in urban resident basic medical insurance (URBMI), as they provided similar benefit packages and only 6% of the sample were enrolled in URBMI. The average income per capita was divided into 3 groups: the richest 33.3%, middle 33.3% and poorest 33.3% for the whole sample. Standard errors were adjusted for household clustering considering the intra-household correlation.

Results

Sample Characteristics

Four-hundred households participated and completed the surveys, totaling 1057 people. We included the 925 adult participants in the analyses. Table 1 shows the demographic, socio-economic, health status and the descriptive analysis of the six outcome variables for the overall sample as well as in Gusu (urban) and Jinhu (rural) respectively. The sample included 463 adult participants in the urban area and 462 in the rural area. The gender distribution was almost balanced, and 44.1% were over 60 years old. Participants in the urban area had higher socio-economic status in terms of education, employment and income (P<0.001). In the rural sample 27.9% of participants had never completed primary school education, while the percentage is only 2.6% in the urban sample. The average income per capita of the households in the urban sample was almost twice that in the rural sample. Over 95% of the sample were covered by public health insurance, and therefore we could not explore the effects of having no public health insurance on health care utilization. Over 70% of urban sample were covered by UEBMI while in the rural sample 87.5% were enrolled in the NRCMS. As for NCD status, 45.7% of the sampled population had at least one type of NCD, and this rate was slightly higher in the rural area. Descriptive analysis on the six outcome variables showed that the rural sample had more self-reported emergent illness episodes, used both more informal and formal health care services, had higher OOP health expenditure and higher likelihood of incurring CHE (P<0.01).

Table 2: Basic characteristics of study participants (%)

	Total sample	Gusu (urban)	Jinhu (rural)	P value
	n=925	n=463	n=462	
Gender				
male	51.2	47.08	49.6	0.308
Age				
average (sd)	54.5 (17.0)	53.5(18.8)	55.5(15.0)	0.077
18-29	10.7	12.3	9.1	
30-59	45.2	41.3	49.1	
>=60	44.1	46.4	41.8	
Marriage				
married	85.4	85.3	85.5	0.937
Education				
Below primary	15.2	2.6	27.9	<0.001
primary and junior high	48.7	41	56.3	
senior high school and above	36.1	56.4	15.8	
Employment				
employed	55.0	37.8	72.3	<0.001
retired	27.1	50.8	3.3	
unemployed	21.4	17	26.2	
Health insurance				
UEBMI	40.5	73.4	7.6	<0.001
URBMI	6.2	7.6	4.8	
NRCMS	49	10.6	87.5	
other and no insurance	4.3	8.4	0.2	
Mean household income per capita (RMB)				
average (sd)	2135(1395)	2807(1462)	1462(920)	<0.001
With NCD				
yes	45.7	43.8	47.6	0.249
Self-reported emergent illness episodes				
mean (sd)	0.98(1.66)	0.40(1.12)	1.56(1.90)	<0.001
Total times of self-treatment				
mean(sd)	0.39(0.94)	0.06(0.37)	0.71(1.19)	<0.001
Total times of outpatient service				
mean (sd)	0.66(1.34)	0.35(0.96)	0.97(1.57)	<0.001
% inpatient service use	6.0	3.9	8.0	0.008
Total OOP health expenditure				
mean(sd)	594(4266)	201(1940)	991(5697)	<0.001
% CHE	16.8	6.5	27.1	<0.001

Factors associated with health care needs

Table 3 shows the association between perceived health care needs and a series of demographic, health status and socio-economic factors, using the ZINB model. Process 1 of the model showed that people with rural residence were much more likely to be at risk of reporting emergent illness as compared to the

urban counterparts (OR = 0.02, P = 0.003). Having NCD also increased the probability of such risk (OR = 0.326, P = 0.032). Process 2 of the model shows that NCD is also associated with reporting emergent illness more often. People enrolled in NRCMS/URBMI also tend to report more times of emergent illness compared to those enrolled in UEBM, after adjusting for other factors (IRR = 1.67, p = 0.039). Education level seemed to be negatively associated with the times of self-reported emergent illness, and the association is almost significant for those with highest education level (senior high school and above).

Table 3: Regression analysis of factors associated with self-reported emergent illness episodes using ZINB model

	Process 1		Process 2	
	OR	P>z	IRR	P>z
Age				
<30	ref.		ref.	
30-59	0.24	0.165	0.76	0.551
>=60	0.41	0.367	0.73	0.493
Male	0.88	0.805	0.91	0.561
Rural residence	0.02	0.003	0.73	0.280
Married	0.76	0.584	0.93	0.668
Education Level				
no education	ref.		ref.	
primary and junior high	1.36	0.761	0.86	0.317
senior high school and above	0.76	0.808	0.60	0.052
Employed	1.17	0.795	1.07	0.671
Insurance				
UEBMI	ref.		ref.	
NRCMS/URBMI	1.75	0.260	1.67	0.039
Income level				
poorest 33.3%	ref.		ref.	
middle 33.3%	0.92	0.913	0.94	0.739
richest 33.3%	0.75	0.669	0.85	0.390
With NCD	0.33	0.032	1.39	0.035

(OR: odds ratio. IRR: incident rate ratio. Process 1 modeled the likelihood of not being at risk of reporting self-reported illness, process 2 modeled the total number of self-reported emergent illness episodes given that one is at risk. The sample size is the same as described in table 2).

Factors associated with use of self-treatment, outpatient and inpatient service

Table 4 shows the analyses of the total times of conducting self-treatments, outpatient service use and inpatient service use for a series of demographic, health status and socio-economic factors, using different regression models. NB regression of self-treatment on these factors showed that older age, rural residence and having NCD were significantly associated with increased use of self-treatment (P<0.05), and the effect was particularly strong for rural residence (IRR = 6.072), after adjusting for other factors. As for outpatient service use, regression analysis using the ZINB model showed that rural residence was associated with much higher probability of being at risk of using outpatient services (i.e. using any of these services) compared to urban residence (OR = 0.015, P<0.001). On the contrary, enrollment in NRCMS/RBMI significantly decreased the probability of using any outpatient service compared to UEBMI (OR = 13.3, P<0.05), which means NRCMS/RBMI may discourage outpatient service use. Nevertheless, for those who were at risk of using outpatient service, NRCMS/RBMI was significantly associated with more use (IRR = 2.754, P<0.05). Logit regression of inpatient service use showed that rural residence and having NCD were associated with higher probability of using inpatient service (P<0.056), while men were less likely to use inpatient service than female (P<0.05), after adjusting for other covariates.

Table 4: Regression analysis of factors associated with self-treatment, outpatient service and inpatient service use

	Self-treatment NB		Outpatient service use ZINB-proc1		ZINB-proc2		Inpatient service use logit	
	IRR	P>z	OR	P>z	IRR	P>z	OR	P>z
Age								
<30	ref.		ref.				ref.	
30-59	2.41	0.010	0.64	0.574	0.75	0.499	0.34	0.083
>=60	2.27	0.026	0.76	0.790	0.59	0.232	1.11	0.879
Male	0.94	0.692	1.66	0.423	0.98	0.919	0.37	0.008
Rural residence	6.07	0.000	0.02	0.000	0.56	0.341	3.56	0.002
Married	0.87	0.498	0.59	0.595	0.86	0.520	1.85	0.180
Education Level								
no education	ref.		ref.				ref.	
primary and junior high	1.09	0.627	0.50	0.557	0.71	0.112	1.27	0.577
senior high school and above	0.87	0.630	1.30	0.879	0.71	0.381	1.70	0.378
Employed	0.91	0.623	1.45	0.659	1.07	0.745	0.61	0.197
Insurance								
UEBMI	ref.		ref.				ref.	
NRCMS/URBMI	1.48	0.255	13.29	0.027	2.75	0.026	1.10	0.832
Income level								
poorest 33.3%	ref.		ref.				ref.	
middle 33.3%	0.89	0.540	0.26	0.271	0.79	0.186	1.52	0.301
richest 33.3%	0.61	0.092	0.21	0.460	0.71	0.200	1.07	0.869
With NCD	1.49	0.007	0.06	0.208	1.21	0.365	2.65	0.002

(OR: odds ratio. IRR: incident rate ratio. Proc: Process. Process 1 of ZINB modeled the likelihood of not being at the risk of using outpatient service, and process 2 modeled the total times of outpatient service use given that one is at that risk. The sample size is the same as described in table 2).

Out-of-pocket (OOP) payment and financial burden across income groups

Table 5 shows the results of regression analyses of factors associated with OOP health expenditure using a two-part model combining logit regression and GLM, as well as factors associated with CHE using a logit model. Similar to the results of the analysis on inpatient service use, NCD and rural residence were significantly associated with higher probability of incurring medical expenditure and CHE (P<0.001). For those who had out-of-pocket health expenditure, men tended to spend less than women, and men were also less likely to incur catastrophic expenditure (P<0.05). People in NRCMS/RBMI were also twice likely to incur CHE as those enrolled in UEBMI (P<0.05), after adjusting for other variables.

Table 5: regression analysis of factors associated out-of-pocket health expenditure and CHE

	OOP health expenditure part1-logit		part2-GLM		Catastrophic health expenditure logit	
	OR	P>z	Coef.	P>z	OR.	P>z
Age						
<30	ref.					
30-59	1.46	0.286	57.7	0.952	1.01	0.979
>=60	1.07	0.863	1898.1	0.156	1.13	0.796
Male	0.80	0.183	-2207.4	0.042	0.58	0.013
Rural residence	6.60	0.000	1094.2	0.258	2.92	0.000
Married	1.16	0.534	595	0.337	0.94	0.830
Education Level						
no education	ref.				ref.	
primary and junior high	0.68	0.124	1788.4	0.148	0.97	0.904
senior high school and above	0.62	0.144	2199.7	0.145	0.73	0.406
Employed	0.90	0.629	712.9	0.519	0.61	0.057
Insurance						
UEBMI	ref.				ref.	
NRCMS/URBMI	1.33	0.273	238.5	0.595	2.02	0.024
Income level						
poorest 33.3%	ref.				ref.	
middle 33.3%	1.06	0.803	-237.4	0.744	0.72	0.209
richest 33.3%	1.09	0.703	877.2	0.572	0.57	0.069
With NCD	1.99	0.000	212.8	0.775	2.97	0.000

(Part 1 of the two-part model used logit regression to estimate the likelihood of incurring OOP health expenditure, and part 2 used GLM to model the amount of OOP health expenditure if occurred)

Separate analysis on the rural and urban sample

We further explored the effects of demographic and SES factors on these outcomes of interests for urban and rural population separately. Gender played a role in the rural but not in the urban area. Compared to women, men in the rural area tended to report fewer emergent illnesses, use less inpatient and outpatient services, and thus less often incurred catastrophic expenditure. It is also noticeable that for the rural sample, people enrolled in NRCMS/URBMI were more likely to incur CHE compared to those enrolled in UEBMI, and being in the richest tertile also decreased the likelihood of incurring CHE. Nevertheless, insurance category and income were not significantly associated with the possibility of incurring CHE in the urban sample, and only NCD status seemed to have an effect on CHE ($P<0.05$) (see supplemental materials for all result tables).

Discussion

Findings from this study revealed a clear rural-urban distinction: the rural population tended to have more perceived health care needs, had a higher probability to use both informal (self-treatment) and formal (outpatient and inpatient) healthcare services, and had more OOP health expenditure and a higher likelihood of incurring catastrophic expenditure after controlling for other factors. The rural-urban difference in perceived health care needs may be due to unobserved disparities in health status, for example, healthier people are more likely to move to urban areas to seek job opportunities. In our study situated in a developed region, the rural population have access to care upon need, and non-need factors such as income seemed to have no effect on health care utilization, and insurance type only had an impact on outpatient service use. Nevertheless, while the expansion of insurance coverage, mainly NRCMS/URBMI, and the investment in health care infrastructure has been narrowing the gaps in service use, people in rural areas are still facing higher financial burden of treatment.

Besides the rural-urban difference, people enrolled in UEBMI were less likely to incur catastrophic expenditures, and our separate analysis of the rural and urban sample showed that this protective effect is significant for the rural population, but no for the urban population. While previous studies have revealed that current benefit packages of NRCMS are not sufficient to protect people from catastrophic spending(4,32), our study also suggests that we may need to improve the coverage range and reimbursement rate of NRCMS/URBMI to reduce the possibility of catastrophic expenditure, and this is particularly urgent when more poor people start to seek care. We also noticed that while enrollment in NRCMS/RBMI indicates lower probability of using any outpatient care, it was associated with increased times of visits for those who were at risk of using outpatient service. This finding suggests that as NRCMS/URBMI provides little coverage for outpatient service, people may delay care seeking until the disease is serious, which may in turn lead to higher expenditure for treatment.

As the health care reform in China continues, NRCMS is being, or has been, integrated with URBMI in many regions. Several studies on this integration show that it narrowed the rural-urban gaps in inpatient benefit, improved the quality of health care and reduced the health care expenditure of the rural population(33,34). The integration of all the three public insurances has just started to be piloted in some cities(35). Although some studies have revealed that such integration would encounter administrative and technical challenges(36,37), it is still regarded by many researchers as a critical way to reduce inequity across insurance schemes and regions(9,37,38). In our study we emphasize that there is a need to reduce the gaps in benefit packages for UEBMI and NRCMS/URBMI, in view of the increasing health care demands from the rural population.

In this study we investigated and identified the inequity in health care needs, service use and financing between rural and urban population, as well as across different types of public insurance. Nevertheless, this study also has several limitations. As mentioned above, it was conducted in the most developed eastern area of China where in 2017 less than 0.8% of the rural population still lived in absolute poverty(39). Findings from this study may underestimate the level of inequity in health care with regards to the overall situation in China, as poorer people in this area were still able to access inpatient care despite of the high OOP medical expenditure. The short monitoring period and changes in the frequency of follow-up surveys also restricted us in observing seasonal changes in health care needs or service use. Besides, CHE is a household-level variable and we realize that when we use individual regressors as proxy for their household-level equivalents, we introduced measurement error ‘on the right-hand side’, leading to attenuation bias. On the other hand, the fact that we included all adults from a household in our ample tends to neutralize this bias. In light of these findings and limitations, future research may increase the number of study sites and extend the length of monitoring to get a more complete understanding of the equity issues in health care across regions in China at different developmental stages. Besides, the reason why men in rural area made less use of inpatient services remains unclear, and deserves further investigation.

Conclusion

The rural population in Jiangsu perceived more health care needs and had a higher probability of using both informal and formal health care services than the urban population. Rural population also had higher OOP health expenditure, and NRCMS /URBMI provided less sufficient protection from catastrophic expenditure as compared to UEBMI. While the expansion of the coverage in NRCMS/URBMI has narrowed the gaps in health care utilization, the inequities in health care financing may be further addressed through improving the benefit packages of NRCMS/URBMI.

List Of Abbreviations

OOP: out-of-pocket

ALP: Affordability Ladder Program

CHE: Catastrophic Health Expenditure

UEBMI: Urban Employee Basic Medical Insurance

NRCMS: New Rural Cooperative Medical Scheme

URBMI: Urban Resident Basic Medical Insurance

NCD: Non-communicable disease

NB: Negative Binomial

ZIP: Zero-inflated Poisson

ZINB: Zero-inflated Negative Binomial

GLM: Generalized Linear Model

AIC: Akaike Information Criterion

BIC: Bayesian Information Criterion

SES: Socio-economic Status

Declarations

Ethics approval and consent to participate

This study was approved by the Institutional Review Board of Duke University. Written informed consent was sought from and signed by all interviewed respondents.

Consent for publication

Anonymized information was used in this manuscript to ensure confidentiality

Availability of data and materials

The datasets generated and/or analyzed during the current study are not publicly available due to the fact that the data are owned by the National Health Commission China. The data could be available after obtaining consent from the National Health Commission China.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

The study was designed by LY, XX, WJ, LX and YZ. LY, XX, LX and YZ organized and coordinated the data collection process, and WJ participated in the data collection. XX and WJ cleared the dataset. WJ conducted literature search and wrote the manuscript as the first author. ST, FC, CE and LY provided suggestions on data analysis framework and data interpretation, and helped revise the draft. All authors reviewed the draft manuscript and provided comments on the finalization of the manuscript.

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