Decomposing Differences in Health Service Utilization between Older Rurul-to-Urban Migrant Workers and Older Rural Residents：What is Driving the Differences?

Dan Li (danlixjtu@126.com)
Xi'an Jiaotong University
Jian Zhang
Xi'an Jiaotong University

Research Article

Keywords: Difference in Health Service Utilization, Older Rurul-to-Urban Migrant Workers, Fairlie's Decomposition

Posted Date: March 10th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-251780/v1

Abstract

Background: In recent years, the widening gap of health service utilization between different groups in mainland China has become an important issue that cannot be avoided. Yet the related study on the health services utilization for older rural-to-urban migrant workers and comparative study on older rural-to-urban migrants in China is still in its infancy. Our study explored the health service utilization of the older rural-to-urban migrant workers based on a sinicization of the latest Andersen model, by comparison with the older rural dwellers. Further, our study revealed the facets and causes by decomposing the differences in the health service utilization into determinants.

Methods: The data of China Labor-Force Dynamic Survey in 2016, the data of Urban Statistical Yearbook in 2016, and Statistical Bulletin were used. Our study applied the lasted Andersen Model according to China's currency situation. Before we studied the health service utilization, we used Coarsened Exact Matching to control the confounding factors to enhance the comparability of the two groups. The matched data were used to analyze the influencing factors. Fairlie decomposition method was used to analyze the differences and the sources of health service utilization between older rural-to-urban migrant workers and their rural counterparts.

Results: After matching, the probability of two weeks outpatient of older rural-to-urban migrant workers (5.59%) was significantly lower than older rural dwellers (7.57%). The probability of inpatient of older rural migrant workers (5.59%) was significantly lower than older rural dwellers (9.07%). 17.98% of the total difference of two weeks outpatient utilization was due to the observed influence factors. 71.88% of the total difference of inpatient utilization was due to the observed influence factors. Income quantiles (49.57%), self-assessed health (80.91%), and sex ratio in the community (-102.29%) were significant in the differences of inpatient utilization.

Conclusions: The findings have important implications for the difference in the health services utilization between older rural-to-urban migrant workers and older rural residents in China, urging the government to take full account of the heterogeneity. The results provide references for the healthcare policy reform in the process of active ageing in China.

1 Introduction

As far, rural-to-urban migrant workers have made great contributions to the development of urbanization and industrialization in China. Aging and migration have significantly shaped the population composition in China, where older rural-to-urban migrant workers (age 50 and above) make up increasingly large proportions of the population [1–3]. According to the National Bureau of statistics, the proportion of older rural-to-urban migrant workers in total rural-to-urban migrant workers increased from 17.9% to 35.9% during the period of time from 2015 to 2019 [1]. Social Insurance Law in China stipulates that employers should pay the premiums for the social welfare insurance of rural-to-urban migrant workers in full and on time, including old-age, unemployment and medical insurance; however, most of older rural-to-urban migrant workers have not benefited from the statutory social security system, because of the irresponsibility of employers. The obstacle of systems, the lack of social capital and the great intensity of work brought challenges to their health service utilization. However, their health service utilization has not received adequate attention. Notably, the widespread public concern about the vulnerable group is of great significance, and older rural-to-urban migrant workers can’t be ignored in the healthy and sustainable development in mainland China, the country with the largest scale of internal migration.

A growing body of studies have drawn attention to older rural-to-urban migrant workers, and a common finding showed that, compared to older rural residents, older rurul-to-urban migrant workers overall seem to suffer from chronic diseases and mental orders [2-5]. However, there is a shortage of research on the discussion of their health service utilization, not to mention the comparison on health service utilization between older rural-to-urban migrant workers and older rural

residents. To the best of our knowledge, only Zhao explored the determinants of the four-week outpatient rate and the outpatient costs of rural-to-urban migrant workers aged 45 years and older [6].

Access to health service for legal immigrants is highly ranked in the policy agenda in most countries of the world. For example, compared to the Spanish native residents, non-Spaniards seemed to face substantial barriers of entry to specialized health care [7]. African immigrants were 73% less likely to have a regular health care provider than were otherwise similar African American women, because African immigrants face more unique barriers to accessing health care [8]. The importance of separating migrant population and the residents has also been shown in China demonstrating that migrant population have systematically lower use of health care services than the native residents. Yang [9] had explored the difference in health service utilization between the residents and migrant population and its impact factors, and the results showed that, compared to migrant population, the awareness rate of health recording and the completion rate of health record of the native residents were significantly higher. Migrant population in China whose original intention is grand-children's care, housekeeping, better health care services and family care are different from Chinese migrant labors–older rural-to-urban migrant workers. Some prior studies have been able to compare the health service utilization between urban residents and rural-to-urban migrants. For example, Sun [10] compared the health service utilization between urban residents and rural-to-urban migrants in China from 2012 to 2016, and they found that there was no significant difference in their health service utilization. Although prior studies has drawn more attention to the difference of the health service utilization of migrant population relative to the residents from the perspective of the dual structure of urban and rural areas, very few study has drawn more attention on the comparison of health service utilization of older rural-to-urban migrant workers in China relative to the older residents from the perspective of the dual structure of urban and rural areas in China, not to mention the probable determinants of the differences in their health service utilization.

Anderson model provided a good theoretical analysis framework for explaining individual's health service utilization [11]. Various studies have been conducted on the probable determinant at multiple levels of the original version of Andersen model and later versions using three dimensions including predisposing, enabling, and need variances[12~16], but there is few application research on the latest revised Andersen model. According to latest Andersen model, health services utilization is determined by four dynamics: contextual characteristic, individual characteristics, health behavior and health outcome. However, there is few empirical study applying the latest revised Andersen model to grasp the latest development of Andersen model in China [17~19]. Further, considering different culture and social environment between the western countries and China, our study tried to revise the contextual characteristic of lasted Andersen model in Chinese socio-cultural context to provide a reasonable and reliable analysis framework for older rural-to-urban migrant workers in China and their rural counterparts.

To consider these patterns, this paper aimed to show a broader picture in terms of health service utilization between older rural-to-urban migrant workers and rural residents in China by using a nationally representative dataset and further explore causes of the difference at multiple levels of the lasted Andersen model. To enhance the comparability of the two groups and improve estimation of causal effects, we matched older rural-to-urban migrant workers and their rural counterparts by coarsened exact matching (CEM) to reduce the bias of the individuals' self-selection and improve the accuracy of the results. Our findings may be referential for the off-site medical settlement in China for older rural-to-urban migrant workers, and the health policy reform in the process of active ageing in China.

2 Methods

2.1 Data

The data included two parts. First, the socio-economic data for our study were obtained from China Labor-Force Dynamic Survey in 2016 (CLDS 2016) issued by the Center for Social Survey at Sun Yat-sen University. 21,086 participants aged

15-64 were interviewed. This data set takes account of detailed demographic, health, economic and health service utilization. The CLDS 2016 got the approval for interviewing respondents by the Biomedical Ethics Review Committee of Yat-sen University, and the informed consent was required to sign by the participants (available online: http://css.sysu.edu.cn/Data). In addition, study variables were drawn from the randomly administered, which included questions on health service utilization of randomly selected respondents. Second, we used data released by the Chinese government that are reliable to obtain the indicators of cities and communities. Resource allocation in Chinese cities always has the characteristics of time delay and time accumulation [20,21]. Therefore, the data of cities were obtained from Urban Statistical Yearbook and Statistical Bulletin of municipal government in 2015, and these data were released by the Chinese government that are reliable in 2016.

We grouped cases on the basis of migration status and employment status, distinguishing older rural-to-urban migrant workers and older rural residents. Older rural-to-urban migrant workers who met the criteria were included in our study. The inclusion criteria were: aged 50~65; with rural Hukou (Chinese household registration system); their permanent was cities and towns; employed for more than 6 months. At the same time, older rural residents, who are the same age as older rural-to-urban migrant workers, are also facing the situation of aging. Older rural residents who met the criteria were included in our study. The inclusion criteria were: aged 50~65; with rural Hukou; their permanent was village; not employed, or employed for less than 6 months. In our study, we restricted the age from 50 to 65 [27], to exclude those who have exited the labor market.

2.2 Measurement

In our study, two weeks outpatient utilization and inpatient utilization were used as the indicators to measure health service utilization. In the CLDS 2016 questionnaire, the health service utilization can be represented by the two-week visiting to the clinic (a person visited the clinic at least one time within two weeks) and by admissions to hospital during the past 12 months when the respondent was sick or injury. They were dichotomized to a dummy variable (0-non-use and 1-use).

2.3 Conceptual Framework

As stated above, we drew upon the lasted Andersen model, and we made a minor revision especially relevant to the contextual characteristic in Chinese socio-cultural context. Combined with the purposes of this study and the availability of data, the determinants of health service utilization are shown in Figure 1. The New Rural Cooperative Medical Insurance (NCMS) in China has provided benefits for older rural migrant workers' health service utilization, but the financial coordination and mutual aid of NCMS is mainly based on the county or district as a unit, leading NCMS with the characteristics of strong regional segmentation. The Chinese government divides three regions (East China, Central China, West China) according to geography, economic and social development, and formulates different regional policies. The city level (sub-provincial city and above, below sub-provincial city) in China reflects the political rule and the policy-oriented factors in China.

Combined with the purposes of our study and the availability of data, four dimensions in our study can be constructed from the following aspects:

First, individual characteristics: age group (50~60; 61 and above), gender (male; female), living arrangement (live with spouse; live without spouse), educational level (below primary school; primary school; middle school and above), political affiliation (the party members; the masses), type of industry (manufacturing and construction; wholesale; retail trade and catering; transportation and other non-agricultural sectors), place of work (local; out-of-town), working hours (moderate

labor; excessive labor), NCMS (yes; no), basic endowment scheme (yes; no), income quantiles (poorest; poorer; middle; richer; richest), self-assessed of health status (SAH) (good; fair; poor), number of friends (<= 5; 6~10; >=11).

Second, health behavior: smoking (yes; no), drinking (yes; no), regular exercise every month (yes; no).

Third, health outcome: sense of fairness (unhappy; fair; happy).

Fourth, contextual characteristic: the proportion of ethnic minorities, number of health facilities per capita in the community, sex ratio in the community, the service quality index of the community, the service quality index of the city, health index of the community population, region (east; central; west), city level (sub-provincial city and above; below sub-provincial city). Among them, the service quality index of the community, the service quality index of the city and health index of the community population are constructed by factor analysis.

2.4 Coarsened Exact Matching

Migration for work is not randomly assigned and there is “self-selection based upon personal circumstances”[22], a crude comparison of the health services utilization using only logistic regression may ignore the confounding factors. Our study tackled a methodological issue in assessing the “causal effect” on the change in status by CEM, because older rural-to-urban migrant workers and rural counterparts can become (or very close to) identical in relation to individual characteristics after CEM [2, 23]. In our study, the employment status (be employed outside the country for 6 months or more in the past year) is matched.

In general, the basic operation steps of CEM algorithm can be divided into several steps [24,25]. First, each variable is coarsened by recoding, and thereby indistinguishable values were appointed the same numerical value. Second, the coarsened data were matched by the algorithm of exact matching, and then unmatched units were pruned. As such, the exact matching algorithm is applied to accurately match older rural-to-urban migrant workers (treatment cases) and older rural dwellers (non-treatment controls). Finally, the coarsened data are discarded and the uncoarsened data of the successfully matched data are reserved. Compared to other matching methods, CEM can provide lower variance and bias for any sample size to improve causal inferences [24-27]. Iacus pointed that more variables in matching process would interfere the exact matches, and he also proposed that robustness checks and robustness tests after CEM is not necessary [24, 25]. Therefore, our study did not include all the variables in our conceptual framework and our study does not implement robustness checks after CEM. Age, sex, educational level, economic level, self-rated health and BMI were used for matching in the process of CEM, and matching weights generated by CEM were used to equalize the number of the two groups [24, 25]. For balance checking of two comparison groups, the multivariate imbalance measure L_1 is employed to measure the quality of the matching process, of which size depends on the data set and the selected covariates. L_1 ranges from 0-1, with 0 indicted a perfect global balance between comparison groups, and 1 indicted a maximal imbalance. A larger value represents larger imbalance, and a substantial reduction in L_1 indicted a good matching performance [24, 25]. CEM is an ado command by Blackwell, not an official Stata command, and CEM can be implemented with the “cem” command code in Stata15.0 [28].

2.5 Fairlie Decomposition

Since the outcome of interest in our study were binary, we utilized the decomposition technique proposed by Fairlie, which can solve the issues of the models such as the logit, probit models [29, 30]. Fairlie decomposition method allows identifying if the observed differences between two groups differ from employment status, and if so, what is the contribution to the difference in health services utilization. Fairlie decomposition method for a nonlinear equation, can be written as follows [29, 30]:

$$\bar{Y}^{w} - \bar{Y}^{B} = \left[\sum_{i=1}^{N^{w}} \frac{F(X_i^{w}\hat{\beta}^{w})}{N^{w}} - \sum_{i=1}^{N^{B}} \frac{F(X_i^{B}\hat{\beta}^{w})}{N^{B}} \right] + \left[\sum_{i=1}^{N^{B}} \frac{F(X_i^{B}\hat{\beta}^{w})}{N^{B}} - \sum_{i=1}^{N^{B}} \frac{F(X_i^{B}\hat{\beta}^{B})}{N^{B}} \right] \quad (1)$$

Where N^{j} is the sample size for group j. In (1), the first bracket represents the differences in distributions of X, and the second represented the differences in the group processes determining levels of Y.

3 Result

Descriptive analyses were performed on each of the variables of contextual characteristic, individual characteristics, health behavior and health outcome. The characteristics of respondents with and without weights were described in Table 1. It was obvious that there were significant differences in many characteristics between older rural-to-urban migrant workers and older rural dwellers before CEM, indicating that differences came from the identity of these groups. 2314 respondents were successfully matched by CEM (859 older rural-to-urban migrant workers and 1455 older rural dwellers). The *p*-Value statistically decreased indicated a good matching performance. The L_1 from 0.6372 to close to zero also revealed the good matching performances. After CEM, the probability of two weeks outpatient of older rural-to-urban migrant workers (5.59%) was significantly lower than older rural dwellers (8.11%). The probability of inpatient of older rural migrant workers (7.57%) was significantly lower than older rural dwellers (9.07%).

Table 1
Descriptive statistics of independent variables before and after CEM

Variabl						
	Older Rural-to-Urban Migrant Workers	Older Rural Dwellers	*p*-Value	Older Rural-to-Urban Migrant Workers	Older Rural Dwellers	*p*-Value *
Two weeks Outpatient	5.99	8.93	<0.01	5.59	8.11	<0.01
Inpatient	7.88	10.61	<0.05	7.57	9.07	<0.05
Gender			<0.001			0.7431
Men†	666 (69.96)	1448(54.11)		617(71.83)	822(56.49)	
Women	286 (30.04)	1228(45.89)		242(28.17)	633(43.51)	
Age			<0.001			0.9923
50–54 †	506 (53.15)	848(31.69)		469(54.6)	551(37.87)	
55–60	198 (20.8)	511(19.1)		164(19.09)	210(14.43)	
61–65	248 (26.05)	1317(49.22)		226(26.31)	694(47.7)	
Living arrangement			0.151			0.8078
Live with spouse †	45(4.73)	160(5.98)		15(1.75)	27(1.86)	
Live without spouse	907(95.27)	2516(94.02)		844(98.25)	1428(98.14)	
Educational attainment			<0.05			0.9012
Below primary school †	420(44.12)	1750(65.4)		391(45.52)	971(66.74)	
Primary school	365(38.34)	731(27.32)		333(38.77)	395(27.15)	
Middle school and above	167(17.54)	195(7.29)		135(15.72)	89(6.12)	
Political affiliation			<0.001			
Party members†	90(9.45)	139(5.19)		81(9.43)	75(5.15)	
The masses	862(90.55)	2537(94.81)		778(90.57)	1380(94.85)	
Type of industry						
Manufacturing and construction†	406(44.76)	——		413(48.08)	48.08	
Wholesale, retail trade and catering	146(16.1)	——		128(14.9)	14.9	
Transportation and other non-agricultural sectors	355(39.14)	——		318(37.02)	37.02	
Farming	——	2676(100)		——	1455(100)	
Place of work						
Local†	458(48.26)	——		650(75.67)	75.67	
Out-of-town	491(51.74)	——		209(24.33)	24.33	
Working hours						

Moderate labor†	724(76.05)	——		408(47.5)	47.5	
Excessive labor	228(23.95)	——		451(52.5)	52.5	
NCMS			<0.01			<0.01
Yes†	869 (91.28)	2501 (93.46)		781(90.92)	1372(94.3)	
None	83 (8.72)	175 (6.54)		78(9.08)	83(5.7)	
Basic endowment scheme			< 0.05			<0.01
Yes†	878 (92.23)	2540 (94.92)		794(92.43)	1390(95.53)	
None	74 (7.77)	136(5.08)		65(7.57)	65(4.47)	
Income quantiles			0.326			0.897
Poorest†	20	2.1		48 (22.33)	226 (20.79)	
Poorer	40	4.2		42 (19.53)	214 (19.69)	
Middle	154	16.18		50 (23.26)	224 (20.61)	
Richer	333	34.98		30 (13.95)	236 (21.71)	
Richest	405	42.54		45 (20.93)	187 (17.20)	
SAH			<0.001			0.8335
Good†	583(61.24)	1159(43.31)		538(62.63)	709(48.73)	
Fair	276(28.99)	821(30.68)		246(28.64)	461(31.68)	
Poor	93(9.77)	696(26.01)		75(8.73)	285(19.59)	
BMI			<0.001			0.9169
Underweight†	42(4.41)	282(10.54)		22(2.56)	57(3.92)	
Ideal	535(56.2)	1575(58.86)		501(58.32)	948(65.15)	
Overweight	375(39.39)	819(30.61)		336(39.12)	450(30.93)	
Number of friends			0.078			0.3989
<= 5†	543(57.04)	1628(60.84)		491(57.16)	858(58.97)	
6~10	226(23.74)	551(20.59)		201(23.4)	312(21.44)	
>=11	183(19.22)	497(18.57)		167(19.44)	285(19.59)	
Smoke			<0.001			<0.05
Yes†	331(34.77)	631(23.58)		396(46.1)	349(23.99)	
No	621(65.23)	2045(76.42)		463(53.9)	1106(76.01)	
Drinking			<0.001			0.099
Yes†	320 (33.61)	697(26.05)		288(33.53)	394(27.08)	
No	632 (66.39)	1979(73.95)		571(66.47)	1061(72.92)	

Regular exercise every month			<0.001			<0.05
Yes†	232 (24.37)	510 (19.06)		202(23.52)	292(20.07)	
No	720 (75.63)	2166(80.94)		657(76.48)	1163(79.93)	
Sense of fairness			0.246			0.1524
Unhappy†	58(6.09)	204(7.62)		49(5.7)	87(5.98)	
Fair	283(29.73)	809(30.23)		248(28.87)	430(29.55)	
Happy	611(64.18)	1663(62.14)		562(65.42)	938(64.47)	
Proportion of ethnic minorities%%	3.99(15.35)	10.61(25.37)	<0.01	4.17(15.95)	8.34(19.15)	<0.05
Sex ratio in the community%%	1.04(1.78)	1.62(6.08)	<0.001	1.01(1.54)	1.91(8.03)	<0.05
Number of health facilities per capita in the community	0.01(0.01)	0.01(0.01)	<0.001	0.01(0.01)	0.01(0.02)	<0.05
Service quality index of the community	0.66(1.31)	0.49(1.31)	<0.001	-0.01(0.09)	0.6651	<0.01
Service quality index of the city	0.80(1.67)	0.57(1.12)	<0.001	0.09(0.81)	0.8073	<0.01
Health index of the community population	0.69(0.64)	1.02(0.61)	<0.01	0.01(0.21)		<0.01
Region			<0.001			< 0.05
East†	55 (21.24)	1071(40.02)		612(71.25)	594(40.82)	
Middle	60 (23.17)	851(31.8)		147(17.11)	488(33.54)	
West	144 (55.6)	754(28.18)		100(11.64)	373(25.64)	
City level			<0.01			0.085
Sub-provincial city and above†	71 (16.82)	497(18.57)		123(14.32)	307(21.1)	
Below sub-provincial city	108 (25.59)	2179(81.43)		736(85.68)	1148(78.9)	
L_1	0.6372			0.0001		

Note: † Reference levels in the regressions; virtual variables for Chi-square test; *p**-value indicated the actual *p*-values after matching; *p*#-value indicated the weight to be considered; *N* (%) were reported.

Binary logistic regressions were conducted to test which factors are predictive of health service utilization among older rural migrant workers and older rural dwellers. The adjusted associations between health service utilization and its determinants were identified in Table 2. The factors influencing two weeks outpatient utilization of older rural-to-urban migrant workers were age, self-assessed health and city level of residence. The factors influencing the inpatient service utilization of older rural dwellers were income quantiles, self-assessed health, BMI and sense of fairness. The factors influencing the inpatient service utilization of older rural-to-urban migrant workers were place of work, self-assessed health, regular exercise in every month and sense of fairness. The factors influencing the inpatient service utilization of

older rural dwellers were educational attainment, self-assessed health, number of friends and service quality index of the community.

Table 2
Association of independent variables and health service utilization in multivariate regression analysis

Variabl								
	Older Rural-to-Urban Migrant Workers		Older Rural Dwellers		Older Rural-to-Urban Migrant Workers		Older Rural Dwellers	
Gender								
Men†	Ref		Ref		Ref		Ref	
Women	-0.2605	0.4764	0.1698	0.2641	0.4459	0.4378	-0.1142	0.2441
Age								
50–54 †	Ref		Ref		Ref		Ref	
55–60	-1.3506*	0.6790	-0.4980	0.3790	0.2396	0.4238	0.0254	0.3387
61–65	-0.3351	0.4718	-0.2933	0.2662	0.4382	0.3961	0.2193	0.2463
Living arrangement								
Live with spouse †	Ref		Ref		Ref		Ref	
Live without spouse	0.3737	1.3539	0.1723	0.7797	-0.8918	0.8200	0.4313	0.7730
Educational attainment								
Below primary school †	Ref		Ref		Ref		Ref	
Primary school	0.3199	0.4144	0.1719	0.2829	0.3042	0.3642	-0.5742*	0.2851
Middle school and above	0.2252	0.6897	-0.2361	0.7659	-0.0760	0.5290	-1.3347*	0.7577
Political affiliation								
Party members†	Ref		Ref		Ref		Ref	
The masses	0.3737	1.3539	1.4445	1.0397	0.3147	0.5688	0.2126	0.5518
Type of industry								
Manufacturing and construction†	Ref		——	——	Ref		——	——
Wholesale, retail trade and catering	0.2284	0.4881	——	——	0.0088	0.4325	——	——
Transportation and other non-agricultural sectors	-0.4293	0.4437	——	——	0.0903	0.3556	——	——
Farming	——		——	——	——		——	——

Place of work								
Local†	Ref		——	——	Ref		——	——
Out-of-town	-0.4509	0.4723	——	——	-0.9231**	0.4394	——	——
Working hours								
Moderate labor†	Ref		——	——	Ref		——	——
Excessive labor	0.0580	0.3842	——	——	0.5263	0.3224	——	——
Medical scheme								
Yes†	Ref		Ref		Ref		Ref	
None	0.9745	0.9632	-0.4634	0.7430	0.0567	0.8505	-0.3626	0.6252
NCMS								
Yes†	Ref		Ref		Ref		Ref	
None	-0.2336	1.0771	-0.8543	0.9036	-0.6618	0.9760	0.0340	0.6824
Income quantiles								
Poorest†	Ref		Ref		Ref		Ref	
Poorer	-0.1935	0.5214	-0.2197*	0.3057	0.0848	0.4711	-0.1497	0.2972
Middle	-0.5663	0.5753	-0.0829*	0.3082	-0.0343	0.5107	-0.1875	0.3074
Richer	0.1037	0.5903	-0.4252	0.3538	0.7230	0.5117	0.1213	0.3148
Richest	-1.3272	0.7641	-0.5246	0.4252	1.0054	0.5033	0.1817	0.3524
SAH								
Good†	Ref		Ref		Ref		Ref	
Fair	0.5303	0.4561	0.9238***	0.3037	0.7800**	0.3511	0.8786***	0.2685
Poor	2.5872***	0.4770	2.0299***	0.2974	2.3718***	0.4031	1.7987***	0.2707
BMI								
Underweight†	Ref		Ref		Ref		Ref	
Ideal	0.3076	0.3769	-0.7318**	0.4083	-0.8318	0.6449	0.5406	0.5051
Overweight	0.3994	1.2811	-0.7271	0.4433	-1.5398	0.6774	0.2122	0.5372
Number of friends								
<= 5†	Ref		Ref		Ref		Ref	
6~10	-0.5572	0.5049	0.3300	0.2504	0.1084	0.3899	0.7072**	0.2305
>=11	0.2666	0.5337	-0.2957	0.3089	0.4095	0.3968	0.2182	0.2659
Smoke				<0.001				<0.05
Yes†	Ref		Ref		Ref		Ref	

No	0.1269	0.4569	0.5024	0.3139	-0.0830	0.3715	0.2018	0.2750
Drinking								
Yes†	Ref		Ref		Ref		Ref	
No	0.9937	0.5225	0.2418	0.2987	-0.4316	0.3670	0.1285	0.2569
Regular exercise every month								
Yes†	Ref		Ref		Ref		Ref	
No	-0.6749	0.3976	-0.0720	0.2891	-0.8280**	0.3260	0.0099	0.2668
Sense of fairness								
Unhappy†	Ref		Ref		Ref		Ref	
Fair	0.2501	0.6492	-0.9945*	0.3519	-1.2225**	0.5714	-0.6119	0.3633
Happy	-0.8565	0.6635	-0.7262**	0.3299	-0.7139	0.5209	-0.3945	0.3457
Proportion of ethnic minorities	-0.0113	0.0134	0.0016	0.0041	0.0100	0.0089	0.0032	0.0037
Sex ratio in the community	-1.0148	0.7023	-0.0088	0.0269	-0.0876	0.2968	0.0192	0.0099
Number of health facilities per capita in the community	-158.2989	235.3570	11.2460	74.8736	-20.7497	178.8096	16.2103	66.6137
Service quality index of the community	0.3742	0.3038	-0.3039	0.2366	0.1196	0.2612	-0.0969*	0.2069
Service quality index of the city	0.3298	0.2225	-0.0079	0.1764	0.1004	0.1946	-0.0895	0.1746
Health index of the community population	-0.3254	0.4373	-0.2828	0.1864	0.0713	0.2406	-0.1125	0.1328
Region			Ref					
East†	Ref		-0.2886	0.2875	Ref		Ref	
Middle	0.3376	0.5570	0.0615	0.2638	0.4398	0.4448	-0.4139	0.2719
West	0.6087	0.5788			0.2092	0.5073	0.1955	0.2379
City level			Ref					
Sub-provincial city and above†	Ref		0.0275	0.2803	Ref		Ref	
Below sub-provincial city	2.2806*	1.1650	Ref		0.0476	0.4482	0.0572	0.2565
N								

L_1	0.6372	0.0001

Note* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; all predictors entered the multivariate regression simultaneously. Note: The Symbol of "*" is defined by a *P* value < 0.05; the Symbol of "**" is defined by a *P* value < 0.01; the Symbol of "***" is defined by a *P* value < 0.001.

Table 3 illustrated the weighted decomposition of the differences of the two groups. 17.98% of the total difference of two weeks outpatient utilization between older rural-to-urban migrant workers and older rural dwellers was enlightened by the observed influence factors. 71.88% of the total difference of inpatient utilization between older rural-to-urban migrant workers and older rural dwellers was due to the observed influence factors. Our findings demonstrated that income quantiles (49.57%), SAH (80.91%), and sex ratio in the community (−102.29%) were highly significant in explanation of differences in inpatient utilization.

Table 3
Fairlie's decomposition of the difference of health service utilization between matched older rural-to-urban migrant workers and older rural dwellers

Terms of Decomposition						
Total gap (%)	-0.0082			-0.0106		
Explained (%)	17.98%			71.88%		
Explained						
Variable	Contribution (%)	95%CI		Contribution (%)	95%CI	
Age	-4.44	-0.0028	0.0035	-0.30	-0.0014	0.0015
Gender	5.27	-0.0032	0.0023	27.91	-0.0081	0.0021
Living arrangement	-0.95	-0.0009	0.0010	0.57	-0.0007	0.0006
Educational level	0.16	-0.0014	0.0014	39.20	-0.0084	0.0000
Income quantiles	-25.26	-0.0019	0.0060	49.57*	-0.0103	-0.0003
NCMS	14.61	-0.0071	0.0047	8.29	-0.0076	0.0059
Basic endowment scheme	-5.31	-0.0035	0.0044	2.84	-0.0045	0.0039
Political affiliation	-9.86	-0.0006	0.0023	7.14	-0.0029	0.0014
Number of friends	7.77	-0.0025	0.0012	7.80	-0.0028	0.0012
SAH	0.92	-0.0045	0.0043	80.91***	-0.0139	-0.0033
BMI	-5.35	-0.0015	0.0023	-16.12	-0.0007	0.0042
Smoke	1.76	-0.0024	0.0021	-17.59	-0.0016	0.0054
Drinking	-2.41	-0.0016	0.0020	0.27	-0.0013	0.0012
Regular exercise every month	7.47	-0.0030	0.0018	-3.15	-0.0013	0.0020
Sense of fairness	-0.63	-0.0017	0.0018	6.31	-0.0038	0.0024
Region	-50.68	-0.0045	0.0128	-9.46	-0.0083	0.0103
City level	-4.88	-0.0018	0.0026	2.93	-0.0016	0.0010
Proportion of ethnic minorities	-0.49	-0.0016	0.0017	2.36	-0.0014	0.0009
Sex ratio in the community	2.99	-0.0016	0.0011	-102.29***	0.0065	0.0152
Number of health facilities per capita in the community	3.62	-0.0028	0.0022	4.45	-0.0027	0.0018
Service quality index of the community	30.10	-0.0093	0.0043	-6.05	-0.0043	0.0056
Service quality index of the city	18.20	-0.0074	0.0044	-1.80	-0.0074	0.0078
Health index of the community population	30.56	-0.0070	0.0020	-7.78	-0.0034	0.0051

4 Discussion

Our study focused on the older rural-to-urban migrant workers (age 50 and above) in China, a group at the bottom of the heap in China. To the best of our knowledge, our study was the first large-scale comparative study on the health services utilization between older rural-to-urban migrants and older rural dwellers in China. In addition, a minor revision of the lasted Andersen model in Chinese socio-cultural context can provide theoretical support for the systematic explanation of the health service utilization for the older rural-to-urban migrant workers and their rural counterparts in China. As far as we know, this study is the first empirical research using a national data to apply the lasted Andersen model in China.

Our results showed that the probability of two weeks outpatient and the probability of inpatient of older rural-to-urban migrant workers were 5.59% and 7.57% respectively, which were lower than 8.11% and 9.07% of older rural dwellers. By calculating the total labor force population of CLDS 2016, the probability of two weeks outpatient and the probability of inpatient were 6.37% and 7.52% respectively. By calculating the labor force population of 50 years and over of CLDS 2016, the probability of two weeks outpatient and the probability of inpatient were 8.24% and 10.83%, respectively. By comparison, the probability of two weeks outpatient and the probability of inpatient of older rural-to-urban migrant workers is lower than that of the older rural dwellers. Several reasons could partially explain it as follows. First, it may be related to the insufficient knowledge of their health status of older rural-to-urban migrant workers. Second, limited medical insurance and the reimbursement policy of off-site medical treatment made health service utilization a luxury rather than a necessity. What' worse, older rural-to-urban migrant workers are often laid off in the event of an accident, and medical costs are not covered. As such, many older rural-to-urban migrant workers may seek out to self-healing or give up medical treatment or hospitalization. Third, it may be related to their cultural values and norms concerning their health care service use. Finally, being employed was associated with less likelihood of health service utilization for older rural-to-urban migrant workers. Older rural migrant workers are a group of "healthy selection", in line with most prior studies demonstrated that rural-to-urban migrant workers had better physical health status than their non-migrating peers at home [31, 32]. As older rural-to-urban migrant workers were in special stratum who have fall into the dilemma of "poverty caused by old age", the recognition of the plight of their health service utilization is a crucial topic that we cannot skirt it.

Applying the lasted Andersen model to the empirical research using a national data in China can assist to identify the particular challenges in obtaining health services among older rural-to-urban migrant workers, and it can also yield important insight into the health service utilization of such groups. In terms of contextual characteristics, service quality index of the community was the significant influencing factor. As highlighted by other researchers [33, 34], the health services of community are becoming increasingly important, and our study suggested that attention should be paid to the relationship between the community and health services utilization, considering the heterogeneity of different dimensions. In terms of individual characteristics, significant influencing factors included educational attainment, income quantiles, self-assessed health, BMI, place of work, self-assessed health and the number of friends. In terms of health behavior, significant influencing factors included regular exercise every month. In terms of outcome, significant influencing factors included sense of fairness. Our results may be useful to shed light on relevant health policy and public health interventions targeted to the vulnerable in China. Our study can also expand the rational thinking on the health service utilization of the older rural-to-urban migrant workers.

It is worth noting that NCMS has no significant association on the utilization and the difference of the two groups. Although older rural-to-urban migrant workers are employed in permanent residences, the permanent residences don't fully integrated them into their urban residents' medical insurance system or employees medical insurance system, which is more effective for older rural-to-urban migrant workers. The result of CLDS 2016 showed a very high percentage (90.92%) of older rural-to-urban migrant workers participate in NCMS in their Hukou city. Older rural-to-urban migrant workers with NCMS across the county/district utilized the health service outside the unified county/district, so the "regional segmentation" of the NCMS had an impact on the older rural migrant workers across the county/district. Our study identified that what really works are not whether they participate in the NCMS or not, but the policies of

participating places and reimbursement in different places. Although the progress of off-site medical treatment in China is encouraging, much work remains to be done in the health service utilization for older rural-to-urban migrant workers.

Fairlie decomposition method helped examine this by "decomposing" the difference of health services utilization into how much can be explained by the employment status, and how much remained unexplained. Our results showed that 17.98% of the difference in two weeks outpatient services utilization was caused by the observed influencing factors, however, the unobserved differences still accounted for a large proportion. Our results showed that there was no significant difference in two weeks outpatient utilization. 71.88% of the difference in inpatient services utilization was due to the observed influencing factors. Among them, income quantiles has statistical significance to the difference. When combined with high costs of physical examination and cure diseases due to ill-health, there can be catastrophic consequences for older rural-to-urban migrant workers, which may include falling into poverty or being pushed into deeper poverty. In general, the income problems faced by older rural-to-urban migrant workers cannot be blamed on their "not working hard", but is a social problem that governments should value. As public policy plays a very significant role in shaping the income distribution and protecting their legitimate rights and interests, including protesting unpaid wages, raising the minimum wage. The positive and obvious function of such social policy is to give the poor people opportunities to change their life [35-37]. Echoing with previous published studies [38, 39], SAH contributed the difference because SAH is largely a reflection of the integrated perception of their health, including the biological, psychological and social dimensions, that is strongly correlated with their health services utilization. The contribution of sex ratio in the community to the difference in the inpatient services utilization between older rural-to-urban migrant workers and older rural dwellers was 102.29%, that is, the higher the proportion of males in community, the lower the difference in inpatient services utilization. Our result can provide theoretical support for the targeted health promotion policies or health care measures. Improving the health services utilization of the older labor-force in China can improve the national governance system and social governance capacity, as well as the realization of the strategic goal of "Healthy China".

Although our study has extended previous work in addressing some important challenges, it is not without limitations. First, CLDS 2016 data is limited by its cross-sectional design that does not allow the determination of time precedence or causal inferences between health service utilization and related factors. The aging of older rural-to-urban migrant workers is a dynamic process, and a longitudinal comparative analysis that follows patterns and can establish causal relationships between study variables and health service use in our future research will be conducted. Second, considering the availability of data, many variables were not included in the conceptual framework, which did not allow for complete testing of the proposed theoretical model. More determinants in the Chinese Construction for lasted Andersen model will be presented to illustrate more relationships in our further study. Third, the decomposition results are more obviously influenced by the explanatory variables. Many factors not included in the decomposition model, such as medical costs and awareness of medical examination. We will add more variables in future studies to further explore the optimal scheme to improve the nature of the utilization variable itself. Finally, the data we used can’t allow distinguishing return rural-to-urban migrant workers are those who migrated for at least 6 months in their life but now returned, therefore any hidden bias may remain.

5 Conclusion

Our study showed that the health service utilization of older rural migrant workers in China is insufficient, and our study shed some light on the substantial differences in the health service utilization between older rural-to-urban migrant workers and older rural dwellers. Applying the minor revision of the lasted Andersen model in Chinese socio-cultural context, our results provided new empirical evidences on the influencing factors of the health service utilization and the differences among the two groups were diversified, especially contextual characteristic and individual characteristics. Our study informed that the heterogeneity of older rural-to-urban migrant workers in China should be embedded in the formulation of health policies. Establishing the social security system suitable for the characteristics of older rural-to-

urban migrant workers and perfecting off-site medical treatment in China should be of interest to the Chinese government.

Abbreviations

CLDS: China Labor-Force Dynamic Survey

CEM: coarsened exact matching method

Hukou: Chinese household registration system

NCMS: New cooperative medical scheme

SAH: self-assessed of health status

95%CI: 95% Coefficient Interval

Declarations

Ethics approval and consent to participate

The CLDS 2016 has got the approval for interviewing respondents by the Biomedical Ethics Review Committee of Yat-sen University, and the informed consent was required to sign by the participants (available online: http://css.sysu.edu.cn/Data). The study methodology was carried out in accordance with approved guidelines.

Consent for publication

Not applicable.

Availability of data and materials

The datasets analysed during the current study are available in the CLDS (available online:http://css.sysu.edu.cn/Data). The data of cities were obtained from Urban Statistical Yearbook and Statistical Bulletin of municipal government (available online:https://data.cnki.net/trade/Yearbook/Single/N2017060038?z=Z007).

Competing interests

The authors declare that they have no competing interests.

Funding

No.

Authors' contributions

DL participated in the design of the study, performed the statistical analysis, and drafted the manuscript. JZ conceived of the study and participated in its design. Both authors contributed to and have approved the final manuscript.

Acknowledgements

We are grateful to Yat-sen University for providing us with the data, and we thank the CLDS 2016 team to make the data publicly available.

References

1. The National Bureau of Statistics. Survey Report on Rural-to-Urban Migrants. 2020. http://www.stats.gov.cn/tjsj/zxfb/202004/t20200430_1742724.html (accessed on 27 January 2020).
2. Li D, Zhou Z, Shen C, Zhang J, Yang W, Nawaz R. Health Disparity between the Older Rural-to-Urban Migrant Workers and Their Rural Counterparts in China. Int J Environ Res Public Health. 2020 Feb 4;17(3):955.10.3390/ijerph17030955
3. Yang, W., Li, D., Gao, J. et al. Decomposing differences in depressive symptoms between older rural-to-urban migrant workers and their counterparts in mainland China. BMC Public Health 20, 1442 (2020). https://doi.org/10.1186/s12889-020-09374-1
4. Zhu, H. Elderly migrant workers health, work and social security status of silting. South. Popul. 2017, 32,25–33. CNKI:SUN:LFRK.0.2017-06-003
5. Wu, M, Duan, C, Zhu, X. Effect of Social Support on Psychological Well-being in Elder Rural-urban Migrants. Popul. J. 2016, 4, 93–102. 10.16405/j.cnki.1004-129X.2016.04.011
6. Zhao X, Min D, Ma W. Utilization of outpatient service and influential factors of expenditure of middle-aged and elderly migrant workers in China. Journal of Peking University, 2015,47(03) : 464-468. 10.3969/j.issn.1671-167X.2015.03.018
7. Jiménez-Rubio, D., Hernández-Quevedo, C. Inequalities in the use of health services between immigrants and the native population in Spain: what is driving the differences? Eur J Health Econ 12, 17–28 (2011). https://doi.org/10.1007/s10198-010-0220-z
8. Ahad F B , Zick C D , Simonsen S E , et al. Assessing the Likelihood of Having a Regular Health Care Provider among African American and African Immigrant Women. Ethnicity & disease, 2019, 29(2):253-260.10.18865/ed.29.2.253
9. Xin Y . Difference in utilization of basic public health service between registered and migrant population and its related factors in China. Chinese Journal of Public Health. 2018,34(06). D631.42;R197.1
10. Zheng, L., Hu, R., Dong, Z. et al. Comparing the needs and utilization of health services between urban residents and rural-to-urban migrants in China from 2012 to 2016. BMC Health Serv Res 18, 717 (2018). https://doi.org/10.1186/s12913-018-3522-y
11. Andersen R M . Revisiting the Behavioral Model and Access to Medical Care: Does It Matter. Journal of Health and Social Behavior, 1995, 36(1):1-10.2307/2137284
12. Andersen, R. M., & Davidson, P. L. (2007). Improving Access to Care in America: Individual and Contextual Indicators. In R. M. Andersen, T. H. Rice, & G. F. Kominski (Eds.), Changing the U.S. health care system: Key issues in health services policy and management (p. 3–31). Jossey-Bass.
13. Aday, L. A. 1994. "Health Status of Vulnerable Populations." Annual Review of Public Health 15: 487-509. 1993. At Risk in America: The Health and Health Care Needs of Vulnerable Populations in the United States. San Francisco:Jossey-Bass, Inc. 10.1146/annurev.pu.15.050194.002415
14. Aday, L., and W. Awe. 1997. "Health Services Utilization Model." In Handbook of Health Behavior Research, Vol. . Determinants of Health Behavior:Personal and Social, edited by D. Gochman. New York: Plenum Publishing Co. https://doi.org/10.1002/0470011815.b2a4a010

15. Hajek A, Bock J O, König H H. Which factors affect health care use among older Germans? Results of the German ageing survey. Bmc Health Services Research, 2017,17(1):30. 10.1186/s12913-017-1982-0
16. Kareholt K L M T. Are public care and services for older people targeted according to need? Applying the Behavioural Model on longitudinal data of a Swedish urban older population. European Journal of Ageing, 2006(3):22-33. 10.1007/s10433-006-0017-1
17. Lu S, Le Y. Anderson Health Service Utilization Behavior Model: interpretation and operationalization of Indicator System. Chinese Health Economics, 2018(9) : 5-10. CNKI:SUN:WEIJ.0.2018-09-003
18. Chen M. Andson's behavioral model of Health Service Utilization and its application. Journal of the Nanjing Medical University. 2018, 18 (1) : 11-14. CNKI:SUN:YKNS.0.2018-01-002
19. Li D. Equity Analysis on Health Service Utilization of Chinese Rural Migrant Workers with New Cooperative Medical Scheme: An Empirical Study from the Perspective of Equal Opportunity.2020. Xi'an: of Xi'an Jiatong University. http://www.lib.xjtu.edu.cn/ (accessed on 27 January 2020).
20. Yu Junli, Xu Huifeng & Wang Liangliang. (2020). Local Government Finance expends, official appointment and investment synchronism. Management Review (09) , 3-17. Doi: 10.14120 J. No, no, no. CN11-5057/f. 2020.09.001.
21. Li, D., Zhou, Z., Si, Y. et al. Unequal distribution of health human resource in mainland China: what are the determinants from a comprehensive perspective?. Int J Equity Health 17, 29 (2018). https://doi.org/10.1186/s12939-018-0742-z
22. Mark, G.; Subramanian, S.V.; Daniel, V.; Danny, D. Internal migration, area effects and health: Does where you move to impact upon your health? Soc. Sci. Med. 2015, 136–137, 27–34.10.1016/j.socscimed.2015.05.011
23. Sidney, J.A., Coberley, C., Pope, J.E. et al. Extending coarsened exact matching to multiple cohorts: an application to longitudinal well-being program evaluation within an employer population. Health Serv Outcomes Res Method 15, 136–156 (2015). https://doi.org/10.1007/s10742-014-0136-7
24. Iacus, S.M.; King, G.; Porro, G. Causal inference without balance checking: Coarsened exact matching.Polit. Anal. 2012, 20, 1–24.doi:10.1093/pan/mpr013
25. Iacus SM, King G, Porro G. Multivariate Matching Methods That Are Monotonic Imbalance Bounding. Journal of the American Statistical Association. 2011, 106(493):345-61.10.1198/jasa.2011.tm09599
26. Gotsadze, G.; Murphy, A.; Shengelia, N.; Zoidze, A. Healthcare utilization and expenditures for chronic and acute conditions in Georgia: Does benefit package design matter? BMC Health Serv. Res. 2015, 15, 88.10.1186/s12913-015-0755-x
27. Hametner C, Kellert L, Ringleb PA. Impact of sex in stroke thrombolysis: a coarsened exact matching study. BMC Neurology. 2015; 15(1):10.10.1186/s12883-015-0262-z
28. Matthew Blackwell, Stefano Iacus, Gary King. cem: Coarsened exact matching in Stata. The Stata Journal.2009, 9, Number 4, pp. 524–546. 10.1177/1536867X0900900402
29. Fairlie, R. W. The absence of the african-american owned business: an analysis of the dynamics of self-employment. Journal of Labor Economics. 1999, 17(1), 80-108.https://doi.org/10.1086/209914
30. Fairlie, R.W.; Moore, A.G.; Bauskin, A.R.; Russell, P.K.; Zhang, H.P.; Breit, S.N. MIC-1 is a novel TGF-β superfamily cytokine associated with macrophage activation. J. Leukoc. Biol. 1999, 65, 2–5.10.1002/jlb.65.1.2
31. Lu, Y. Test of the 'healthy migrant hypothesis': A longitudinal analysis of health selectivity of internal migration in Indonesia. Soc. Sci. Med. 2008, 67, 1331–1339. 10.1016/j.socscimed.2008.06.017
32. Chen, J. Internal migration and health: Re-examining the healthy migrant phenomenon in china. Soc. Sci. Med. 2011, 72, 1294–1301.10.1016/j.socscimed.2011.02.016
33. Mohammadi Bidhandi H , Patrick J , Noghani P , et al. Capacity planning for a network of community health services[J]. European Journal of Operational Research, 2019, 275.10.1016/j.ejor.2018.11.008

34. Hill J D , Cuthel A M , Grudzen C R . Access to Home and Community Health Services for Older Adults With Serious, Life-Limiting Illness: A Study Protocol[J]. American Journal of Hospice and Palliative Medicine, 2020, 38(2):104990912092023.10.1177/1049909120920230
35. Akresh, I.R. Health Service Utilization Among Immigrants to the United States. Popul Res Policy Rev.2009, 28, 795.10.1007/s11113-009-9129-6
36. Crettaz, E. Alleviating working poverty in postindustrial economies. 2010. Lausanne: Université de Lausanne. https://serval.unil.ch/resource/serval:BIB_E6B51B41D085.P001/REF.pdf (accessed on 27 January 2020).
37. Liu, J. Working Poor in Mainland China: Concept and Life Trajectory of Its Main Working Groups. Journal of US-China Public Administration. 2017, 14(2), 91-99.10.17265/1548-6591/2017.02.004
38. Borrell C, Espelt A, Rodriguez-Sanz M, et al. Analyzing differences in the magnitude of socioeconomic inequalities in self-perceived health by countries of different political tradition in Europe. Int J Health Serv. 2009;39(2):321–41.10.2190/HS.39.2.f
39. Lu, L., Zeng, J. & Zeng, Z. What limits the utilization of health services among china labor force? analysis of inequalities in demographic, socio-economic and health status. Int J Equity Health 16, 30 (2017).10.1186/s12939-017-0523-0

Figures

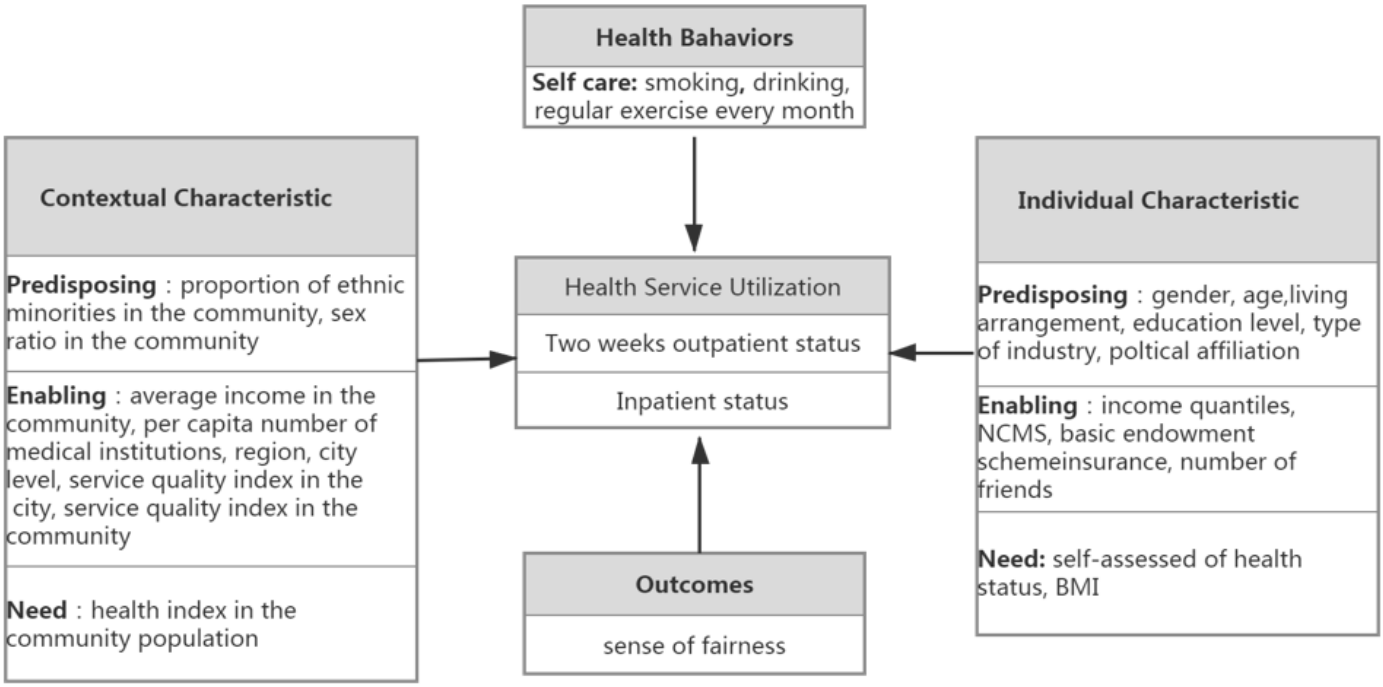

Figure 1

Minor revision of the lasted Andersen model in Chinese socio-cultural context. It showed the determinants of health service utilization by a minor revision especially relevant to the contextual characteristic in Chinese socio-cultural context.