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High lights

1. This paper combine theory of the EOp (Roemer,1998) and analytical framework of the reward *principle* and the *compensation principle*(Fleurbaey and Schokkaert ,2009).
2. This paper analyzes inequality health care problems between urban and rural in China
3. Based on EOp, This paper discusses the urban-rural integrated medical insurance system.

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Abstract: This paper investigates the urban-rural inequality of opportunity in health care in China based on the theory of the EOp of Roemer (1998). Following th*e compensation principle* proposed by Fleurbaey and S*chokkaert* (2011), this paper decomposes the *fairness gap* in the urban-rural health care utilization. The results shows that the ratios of the *fairness gap* to are 1.167 during 1997-2000 and 1.744 during 2004-2006. It implies that the degree of the essential inequity is underestimated. Meanwhile, upgrading the urban-rural reimbursement ratios is probably not sufficient to eliminate the inequality of opportunity in health care utilization between urban and rural residents. Under background of urban-rural dualistic social structure and the widening of urban-rural income gap, the pro-disadvantage policies will be more effective to promote the equality of opportunity in health care.

Key words: Equality of opportunity; Health care; Fairness gap; urban-rural integrated medical insurance system

JEL Classification: D12, D63, I18

1. Introduction

Chinese medical insurance systems is urban-rural dualistic. The Medical Insurance for Urban Residents (MIUR) which is only for urban residents, and the National Cooperative Medical System (NCMS) which is only for rural residents. Owing to deficiency of urban-rural dualistic medical insurance systems, there are lager health and health care inequalities between urban and rural in China. In order to reducing inequalities of health care system, China initiates the Urban-Rural Integrated Medical Insurance System (URIMIS) recently. The URIMIS is still in the stage of exploration. The URIMIS aims to realize equality by unifying the two separate medical insurance systems.

The equality divides to two classes in health care, *outcome equality* and *equality of opportunity* (EOp). The outcome equality means the same reimbursement policy or the same health care utilization between urban and rural residents. Most health care research rely on outcome equality (Lei and Lin, 2009; Wagstaff et al., 2009; Yip and Hsiao, 2009). However, due to large gap in individual and circumstance characteristics between urban and rural residents, it may lead to inefficiency[①]. EOp means the public opportunities should be equally open to all individuals regardless of their races, religions or other factors, which represent the identities (Rawls ,1971). Roemer(1993,1998, 2002) refine EOp for empirical studies. EOp is of vital importance for both academic researches and policy making (World Bank, 2005).

Refers to equality of opportunity, Daniels (1985, 1996) analyzes health inequality. Zheng (2006) introduces the income-health matrix to measure health opportunity and inequality in health security circumstances and socioeconomic structure. Using data from the UK National Child Development Study, Rosa Dias (2009) finds a significant inequality of opportunity in health. C*ircumstances* can affect the self-assessed health level in adulthood directly and indirectly (*e.g.* through *effort* such as education), such as parental socioeconomic status (SES) and childhood health. Rosa Dias (2010) further improves measurement of inequality of opportunity by combining Roemer's framework with the Grossman model of human capital and health demand, and discusses the *partial-circumstance problem*. Based on *circumstances* of childhood condition, Jusot *et al*. (2010) and Trannoy *et al*. (2010) research on the inequality of opportunity in adulthood health. Balia and Jones (2011) investigate the inequality of opportunity in mortality risk among individuals who and whose parents smoke or ever smoked. Jones *et al*. (2012) analyze primarily the role of education in the inequality of

① we've given several examples in Appendix as a simple explanation.

opportunity in health, and note that there are significant and economically sizable linkages between the quality of education and health in some dimensions.

As mentioned before, there are no relevant topics about China. Based on the theory of the EOp(Roemer,1993;1998;2002)and the *compensation principle* for the EOp(Fleurbaey and Schokkaert,2009;2011), this paper calculates and decomposes the urban-rural health care *fairness gaps* in China. Using data from the China Health and Nutrition Survey (CHNS), the results show that: (1) during the two periods of 1997-2000 and 2004-2006, the *fairness gaps*(when we take urban circumstances as the "ideal" reference circumstances)are 1.167 and 1.744 respectively, it indicates that the results is underestimated from the original statistical data ; (2) the significance of reimbursement ratio decreases in the *fairness gap* in the later period, which probably implies that it is less effective to narrow urban-rural gap only by upgrading the reimbursement ratios.

The rest of this paper is organized as follows: Section 2 presents theories and methods. Section 3 outlines data sources and variables. Section 4 calculates and explains the urban-rural *fairness gaps* in health care by using the CHNS data. Section 5 offers conclusion.

2. Theories and Methods

2.1. Equality of Opportunity

In second principle[②] of justice, Rawls (1971) points out that the public opportunities should open to all individuals equally, regardless of races, religions or other identity. *Difference principle* (or *Rawls maximin principle*) means the most disadvantage group should be granted the maximal opportunity. Based on Rawls (1971), Sen (1980, 1999) emphasizes that people have the *capabilities* to choose the most value lifestyle. Dworkin (1981a, 1981b) introduces the concept of *equality of resources.* It suggesting that some disadvantages should be compensated, even if they are caused by external. Arneson (1989) and Cohen (1989) modify Dworkin's theory, and bring two conceptions: *equality of opportunity for welfare* and *equality of access to advantage* the. Based on these theories, Roemer (1993, 1998, 2002) proposes an axiomatic approach for EOp empirical studies

According to EOp, one's *advantage* (y) is determined by two categories, *i.e. circumstances* (c) and *effort* (e); the former is beyond one's control, the latter is not. *Circumstances* classify into J *types*. The function is as follows:

② The first principle is about the priority of freedom, namely, it should be prior considered, on the premise that all people have equal freedom, to maximize the freedom that each one can enjoy.

$$y_i = y(c_i, e_i). \tag{1}$$

It will maximize the *advantage* of those who possess the least *advantage*[③] In a fair society(Roemer,1998):

$$\max \min_c y(c, \tilde{e}). \tag{2}$$

where $\tilde{e}$ is one's *effort*.

Totaling the *advantage* of all individuals at each level of *effort*, we obtain:

$$\max \int_e \min_c y(c,e) f(e) de, \tag{3}$$

where *f(e)* is the density function of the *effort*.

Roemer (1998, pp. 5－32) emphasizes repeatedly that part of the *effort* can be affected by *circumstances*, which will affect the distribution characteristics of the *advantage* indirectly. It means that the *advantage* is with the (absolute) *level of effort* rather than (relative) *degree of effort* in one's own *type*. However, the individual only take responsibility for *degree of effort* in his *type*, not responsible for the distribution characteristics of the *effort*. Thus, Roemer defines one's *degree of effort* using the quantile π in the conditional distribution of his *type*. Function (3) can be rewritten as (4), which can also be regarded as an explanation of the *maximin principle* of Roemer:

$$\max \int_\pi \min_c y(c, \pi) d\pi. \tag{4}$$

2.2. Empirical Strategy

2.2.1. *Reward Principle & Compensation Principle*

For the EOp analysis, Fleurbaey and Schokkaert (2009, 2011) propose two principles－the *reward principle* and the *compensation principle* under selective egalitarianism.

Reward principle encourages inequalities caused by *effort.* For this reason, when measuring the EOp, influences from *effort* should be wiped off firstly. The typical method is to calculate the "corrected" advantage $\tilde{y}_i$ of individual *i* by fixing the value of *effort* ẽ, i.e. $\tilde{y}_i = y(c_i, \tilde{e})$. In this way, we can obtain the *direct unfairness* by calculating the inequality in $\tilde{y}$ using traditional methods such as Gini index.

Compensation principle suggests that the inequalities caused by *circumstances* should be compensated. Whatever the *circumstances*, each individual should attain the same *advantage* in the same *effort*. Meanwhile, compensation should be given to those who attain less *advantage*. This principle has a close relationship with the *horizontal equity*, which indicates that the same health care need should receive the

[③] It is worth noting that Roemer puts forward a somewhat different proposal from that of Rawls, who cares about how to maximize the minimum level of advantage, however, across all individuals regardless of their types.

same health care regardless of one's income level, region or race, *etc*. All of these factors belonging to *circumstances*. Base on *compensation principle*, It sets an "ideal" distribution of c_i (c^*), and then we obtain the fair distribution of y_i (y_i^*) via $y_i^*=y(c^*, e_i)$. The unfair inequality of opportunity (the *fairness gap*) is $(y_i - y_i^*)$.

Though the two principles and their corresponding methods have something in common, they are in effect only compatible under one situation that *c* and *e* are completely independent, *i.e.* they are additively separable (Fleurbaey and Schokkaert, 2009). Therefore we need to choose between the two for empirical work where in most cases we cannot ignore the correlation of *c* and *e*.

This paper will base on the *compensation principle* in view of the following two reasons. First, what we care about is how to reimburse rural residents for their disadvantage of *circumstances*. This is much closer to the logic of the *compensation principle*. Second, *reward principle* is usually used to explain inequalities within a certain group, while *compensation principle*, between groups. We concern in this paper whether the same health care needs attain the same health care between urban and rural residents. This is more in line with the *compensation principle*.

2.2.2. When Roemer Meets Oaxaca

We define *c* as the indicator of household register (*hukou*). If *c* equal to 1 means individual is an urban resident, 0 means rural resident. During the analysis, we define all other factors to the vector *e*, which is classified into two components, e^1 and e^2. The vector e^1 is on behalf of factors whose correlation with *c* will bring about illegitimate urban-rural differences, *e.g.* income level and medical insurance types, *etc.* Contrarily, the vector e^2 is on behalf of factors which will not bring about illegitimate differences, *e.g.* health care needs (Fleurbaey and Schokkaert, 2011). In this way, the *advantage* can be expressed as a function of *c*, e^1 and e^2:

$$hc_i = \alpha + \beta\varphi(c_i) + \gamma\psi(e_i^1) + \delta\chi(e_i^2) + \varepsilon_i, \tag{5}$$

where *hc* is the health care use, β, γ and δ are parameters, α is the constant, and ε_i is an error item. In accordance with the definition of e^1, it is appropriate to regard e^1 as a function of *c* and π (the *degree of effort*), *i.e.*

$$e_i^1 = \eta(c_i, \pi_i^1). \tag{6}$$

Thus (5) can be rewritten as

$$hc_i = \alpha + \beta\varphi(c_i) + \gamma\psi \circ \eta(c_i, \pi_i^1) + \delta\chi(e_i^2) + \varepsilon_i. \tag{7}$$

A more general form can be written as

$$hc_i = \alpha + \beta\varphi(c_i) + (\gamma + \mu c_i)\psi \circ \eta(c_i, \pi_i^1) + (\delta + \rho c_i)\chi(e_i^2) + \varepsilon_i, \tag{8}$$

where we add μ and ρ to separately express the coefficient differences of $\psi \circ \eta(c_i, \pi_i^1)$

and $\chi(e_i^2)$ between urban and rural groups.

Defining φ(1)=1, φ(0)=0, and taking urban circumstances (U) as the "ideal" reference background (c=1), then we obtain the *fairness gap* between urban and rural residents[④], as the following:

$$f.g. = \hat{\beta} + \hat{\rho}\chi(e_i^2 \mid R) + \hat{\gamma}[\psi \circ \eta(U, \pi_i^1 \mid R) - \psi \circ \eta(R, \pi_i^1 \mid R)] + \hat{\mu}\psi \circ \eta(U, \pi_i^1 \mid R). \quad (9)$$

According to function (9), we can obtain a decomposition form (the right hand of this equation) similar to what proposed by Oaxaca (1973). The constant term can be regarded as a coefficient of the variable I, whose value is 1 invariably. Here we consider I as one of the elements of e^2. The *fairness gap* between urban and rural residents divides to three parts.

$\hat{\beta} + \hat{\rho}\chi(e_i^2 \mid R)$ equals to the coefficient effect of e^2. It indicates that the first part of health care gap, which is from the insufficient health care expenditure of rural residents under urban-rural dualistic.

$\hat{\gamma}[\psi \circ \eta(U, \pi_i^1 \mid R) - \psi \circ \eta(R, \pi_i^1 \mid R)]$ equals to the e^1 *environmental characteristic effect*. It indicates that the second part of health care gap, which is from the difference circumstances. It equals to difference between the counterfactual characteristics of e^1 and actual characteristics.

$\hat{\mu}\psi \circ \eta(U, \pi_i^1 \mid R)$ equals to the e^1 *environmental coefficient effect*. It indicates that the third part of health care gap, which is from the implacable urban-rural coefficient differences of e^1. It means there will be a gap even rural residents in the urban characteristics.

The linear form is:

$$hc_i = \alpha + \beta c_i + (\gamma + \mu c_i)e_i^1 + (\delta + \rho c_i)e_i^2 + \varepsilon_i \quad (10)$$

for (8), and

$$e_i^1 = a + bc_i + (d + lc_i)\pi_i^1 + \tau_i \quad (11)$$

for (6), where in (11) a is the constant, b, d and l are parameters, and τ_i is an error item.

The *fairness gap* is :

$$f.g. = \hat{\beta} + \hat{\rho}E(e_i^2 \mid R) + \hat{\gamma}[E(U, \pi_i^1 \mid R) - E(R, \pi_i^1 \mid R)] + \hat{\mu}E(U, \pi_i^1 \mid R), \quad (12)$$

We use the propensity score to get the individual π(*degree of effort*) in his own group. Meanwhile, allowing the error terms of (10) and (11) correlated, we use the

[④] According to Fleurbaey and Schokkaert (2009), the *fairness gap* should be $y(c_i,e_i)$- $y(c^*,e_i)$. However, in order to obtain positive values of the *fairness gap* and its components, we use the reverse value here. Since $y(c^*,e_i)$and $y(c_i,e_i)$ are the same for urban residents due to the construction of equation, this *fairness gap* in effect is the difference between the counterfactual estimate of the rural residents' health care expenditure in the urban circumstances and the actual health care expenditure of the rural residents.

Geweke-Hajivassiliou-Keane (GHK) simulation (Gates, 2007) [5] to estimate the system.

3. Data

3.1. Data Sources

The sample is from the China Health and Nutrition Survey, which is collected by the Carolina Population Center of the University of North Carolina at Chapel Hill and the National Institute of Nutrition and Food Safety at the Chinese Center for Disease Control and Prevention. It includes nine waves. The URIMIS pilot actions initiate since 2009, the NCMS was established in 2003.Therefore, this paper uses data waves from 1997 to 2006. We set wave 1997 and 2000 as the *period 1* group and waves 2004 and 2006 as the group of *period 2*.

3.2. Variables

As most empirical research, we employ the health care expenditure during the past four weeks as health care utilization. By reference of relative studies on racial/ethical disparities of health and health care (e.g. IOM, 2003; McGuire *et al.*, 2006; Cook *et al.*, 2010; Fleurbaey and Schokkaert, 2011), we define that e1—vector of illegitimate factors—includes variables describing medical insurance policy, region and socioeconomic status (SES), etc., and that e2—vector of legitimate factors—includes variables describing health care needs and individual preferences. variables in e1 can be classified into three parts: (1) SES variables including family per capita income and education, (2) policy variable, i.e. reimbursement ratio, (3) health care environmental variables, including region, medicines availability and travel time for doctor visits. Variables in e2 are classified into four parts: (1) demographic variables, including age, sex and marital status, (2) general health variables, including self-reported health status and chronic disease history, (3) health variables reflecting situations of illness, i.e. types of illness one had suffered from and the severity of the illness, during the past four weeks, (4) preference variables, including treatment preferences and lifestyle preferences such as whether smoke or drink.

The actual reimbursement ratio(the proportion of health care expenditure paid for by the medical insurance[6]) may be the best indicator to measure the insuring degree

[5] As Gates (2007) explains, the GHK simulation has excellent features, and it is widely used in the health economics domain, e.g. Deb and Trivedi (2006), Balia and Jones(2008) and Rosa-Dias(2010), *etc*. STATA has already developed the corresponding command *cmp*, which is detailedly introduced by Roodman (2009).

[6] In the CHNS questionnaires there are relevant questions which we can use directly for the measurement.

and the health care economic burden. if respondents who did participate in medical insurances but spent zero on health care, we take their self-reported policy reimbursement ratios[⑦] as replacements. If one's self-reported policy reimbursement ratio is missing, we replace the missing value with the average value of same characteristic respondents. Meanwhile, the treatment preferences are usually ignored in the health care researches. In this paper we control the treatment preferences to some extent via the answer of "what did you do when you felt ill". In addition, price level adjusts to the 2009 year.

The final sample includes 4168 individuals. The *period 1* includes 1076 sample number, and the *period 2* includes 3092. In *period 1*, 412 respondents are from urban areas. And, there are 1283 urban respondents and 1809 rural respondents in *period 2*. The description of variables is shown in Table 1, where we see obvious urban-rural differences in the past-four-week health care expenditure. The directly observed differences are 225.096 and 268.149 respectively in *period 1* and *period 2*, with the urban residents expending more in both periods. Urban-rural differences of SES variables, income and education, as well as policy variable, actual reimbursement ratio, are evident, too. Meanwhile, the urban-rural differences expressed by medical environmental variables in e^1 seem small, which are somewhat counter-intuitive. Maybe these available variables are not able to reflect the qualities of health care properly or completely, although they do show differences. However, they are still reserved for the *fairness gap* analysis out of consideration for comprehensiveness and completion.

4. Results

How large are the urban-rural inequalities of opportunity in health care utilization? The results are shown in Table 2.

When the urban circumstances are regarded as the "ideal" reference circumstances of *c*, the total *fairness gap* is 262.670 *yuan* in *period 1*, the urban-rural difference is 225.096 *yuan*. The ratio of the *fairness gap* is 1.167 in *period 1*. The statistics shows that urban residents spend more 100 *yuan* than rural residents. However, rural residents should spend more 16.7 *yuan* per capita than urban residents through the equity view. The *fairness gap* will reach 116.7 *yuan*. Similarly, the urban-rural difference is 268.149 *yuan* in *period 2*. the calculated *fairness gap* is 467.521 *yuan*. The ratio of the *fairness gap* to the average urban-rural difference is

[⑦] In the CHNS questionnaires the corresponding questions are "What percentage of the fees for outpatient care does your insurance pay (not including registration fee)"and "What percentage of the fees for inpatient care does your insurance pay (not including food expenses)".

1.744. The statistics shows that rural residents spend less 100 *yuan* per capita than urban residents. Based on the EOp, rural residents should spend 74.4 *yuan* more per capita. Compared with the outcome inequality, situation of rural residents is much worse. Moreover, the value of the *fairness gap* in *period 2* is bigger than *period 1*. it shows the inequality of opportunity is increasing with time going.

Table 2 also shows that the three parts of the *fairness gap*. The effect of first part is more significant than other two parts. The ratios of e^2 *coefficient effects* are 0.674 in *period 1*, and 1.173 in *period 2*. It indicates that the urban-rural *gaps* accounts for 57.75% of the whole *fairness gap* in *period 1*, and 67.25% in *period 2*. We think that health consciousness and service qualities play a key effect. There is ingrained difference between urban and rural residents in the consciousness of health and health care utilization and health service qualities. Urban residents prefer to more health investment. and usually receive better medicine and techniques first.

The e^1 *environmental coefficient effect* are 8.5% in *period 1*, and 4.8% in *period 2.* In addition, the ratios of e^1 *environmental characteristic effect* are 0.408 and 0.522 respectively. It makes up 34.96% of the whole *fairness gap* in *period 1* and 29.93% in *period 2*.

The effect of reimbursement ratio is 0.236 in *period 1*, 0.003 in *period 2*. The effect is much less in *period 2* . The reason is the NCMS initiate after *period 1*. the NCMS reduce reimbursement benefit inequality between urban and rural in medical accessibility.

There is index number problem in the Oaxaca decomposition. Based on De Murger et al. (2007), we re-conduct the fairness gap decomposition, with rural circumstances (R) as the “ideal” reference circumstances. The robustness test supports above result. The details shows in Table 3.

5. Conclusion

Based on EOp and *compensation principle*, This paper analyzes inequality health care utilization between urban and rural in China. We define three components of the *fairness gap*, the e^2 *coefficient effect*, the e^1 *environmental characteristic effect*, and the e^1 *environmental coefficient effect*. The results indicate that statistical data may underestimate the degree of the essential inequalities. These inequalities are from environmental characteristic. Inequality of opportunity is due to the expansion of income inequality, which is from "hukou" restrictions. Due to the establishment of the NCMS, the effect of reimbursement ratio makes a dramatic change during the two periods. It reduces the inequalities of opportunity between urban and rural.

Due to widening of urban-rural income gap, it is insufficient to narrow the fairness-gap only by unifying the medical insurance policies for both urban and rural residents. Accordance with the *maximin principle* of Roemer, our suggestion is improve the affordability of the rural poor.

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Table 1

Description of Variables

	Period 1				*Period 2*			
	Urban		Rural		Urban		Rural	
Variables	Mean	Sd.	Mean	Sd.	Mean	Sd.	Mean	Sd.
y								
Health care expenditure during the past 4 weeks	779.758	2201.553	554.663	2189.791	709.827	5039.766	441.677	2351.327
e^1								
Family per capita income (yuan/year)	6943.783	7030.383	4569.000	5328.661	10729.150	10548.700	5796.847	8870.297
Formal education years	7.124	4.730	5.066	4.031	7.836	4.819	5.516	4.181
Reimbursement ratio (%)	26.036	37.793	6.143	23.223	25.116	34.834	9.360	24.019
Region (1= the east region, 0= others)	0.383	0.487	0.325	0.469	0.486	0.500	0.411	0.492
Travel time (min.) by Bike to health facility	17.197	20.373	16.089	18.706	14.499	14.464	13.439	17.789
Medicines availability(1=yes, 0=no)	0.951	0.215	0.967	0.179	0.988	0.111	0.985	0.121
e^2								
Basic Demographic Information								
Age (years)	53.008	16.252	52.322	15.692	54.145	15.897	55.435	14.686
Sex (1=male，0=female)	0.422	0.495	0.438	0.497	0.434	0.496	0.423	0.494
Marital status (1= married, 0= others)	0.801	0.400	0.797	0.403	0.796	0.403	0.811	0.392
General Health Information								
Self-reported health status (4=excellent, 3=good, 2=fair, 1=poor)	2.138	0.750	2.056	0.819	2.228	0.797	2.061	0.785
Ever diagnosed High blood pressure (1=yes, 0=no)	0.182	0.386	0.148	0.355	0.246	0.431	0.170	0.376
Diabetes (1=yes, 0=no)	0.158	0.365	0.123	0.329	0.194	0.396	0.132	0.339

Myocardial infarction (1=yes, 0=no)	0.015	0.120	0.014	0.116	0.014	0.118	0.009	0.094
Apoplexy (1=yes, 0=no)	0.039	0.193	0.027	0.163	0.034	0.180	0.025	0.156
Illness During the Past 4 Weeks								
Suffered from chronic or acute diseases (1=yes, 0=no)	0.874	0.332	0.883	0.322	0.634	0.482	0.669	0.471
Got fever, sore throat or cough (1=yes, 0=no)	0.359	0.480	0.357	0.479	0.373	0.484	0.362	0.481
Got diarrhea or stomachache (1=yes, 0=no)	0.126	0.332	0.131	0.338	0.156	0.363	0.153	0.360
Got headache or dizziness (1=yes, 0=no)	0.306	0.461	0.283	0.451	0.253	0.435	0.265	0.441
Got joint pain or muscle pain (1=yes, 0=no)	0.165	0.372	0.181	0.385	0.260	0.439	0.281	0.450
Got rash or dermatitis (1=yes, 0=no)	0.032	0.175	0.024	0.153	0.036	0.186	0.024	0.152
Got eye/ear disease (1=yes, 0=no)	0.034	0.181	0.026	0.158	0.062	0.240	0.050	0.217
Got heart disease/chest pain (1=yes, 0=no)	0.102	0.303	0.069	0.254	0.112	0.316	0.082	0.274
Got other infectious disease (1=yes, 0=no)	0.032	0.175	0.032	0.175	0.047	0.211	0.050	0.217
Got noncommunicable disease (1=yes, 0=no)	0.158	0.365	0.149	0.356	0.244	0.430	0.187	0.390
Severity of the illness (3=quite severe, 2=somewhat severe, 1=not severe)	1.740	0.689	1.640	0.674	1.687	0.657	1.702	0.665
Inpatient visits (1=yes, 0=no)	0.092	0.290	0.074	0.262	0.031	0.174	0.030	0.170
Preferences								
What to do when felt ill (4=none, 3=saw a doctor, 2=saw the local health worker, 1=self care)	2.522	0.908	2.706	0.751	2.074	1.168	2.472	1.048
Ever smoked (1=yes, 0=no)	0.250	0.434	0.304	0.460	0.313	0.464	0.307	0.462
Drink alcohol last year (1=yes, 0=no)	0.316	0.465	0.280	0.449	0.341	0.474	0.280	0.449
Number of sub-sample	412		664		1283		1809	

Note: “Sd.” denotes standard deviation.

Table 2

Decomposition of the Fairness Gaps Using CHNS Data

	Period 1		*Period 2*	
Directly observed average differences	225.096		268.149	
	Fairness Gap	Ratio	Fairness Gap	Ratio
***e^2 coefficient effect*:**				
Age	387.248	1.720	-801.470	-2.989
Male	76.158	0.338	251.163	0.937
Married	-123.302	-0.548	-105.519	-0.394
Self-reported health: fair	166.831	0.741	-593.614	-2.214
Self-reported health: good	56.920	0.253	-305.803	-1.140
Self-reported health: excellent	18.001	0.080	-29.494	-0.110
High blood pressure	54.396	0.242	0.897	0.003
Diabetes	-79.090	-0.351	51.664	0.193
Myocardial infarction	6.067	0.027	-4.507	-0.017
Apoplexy	7.781	0.035	-3.898	-0.015
Suffered from chronic or acute diseases	667.391	2.965	-165.665	-0.618
Got fever, sore throat or cough	-136.195	-0.605	90.036	0.336
Got diarrhea or stomachache	-28.023	-0.124	-44.276	-0.165
Got headache or dizziness	78.907	0.351	-48.257	-0.180
Got joint pain or muscle pain	-1.126	-0.005	41.766	0.156
Got rash or dermatitis	4.013	0.018	40.411	0.151
Got eye/ear disease	-42.756	-0.190	24.671	0.092
Got heart disease/chest pain	34.711	0.154	63.017	0.235
Got other infectious disease	39.230	0.174	17.924	0.067
Got noncommunicable disease	-64.060	-0.285	46.340	0.173
Severity of the illness: somewhat severe	111.614	0.496	-4.149	-0.015
Severity of the illness: quite severe	82.171	0.365	133.673	0.499
Inpatient	-8.388	-0.037	43.000	0.160
To see local health worker when felt ill	0.692	0.003	-20.647	-0.077
To see a doctor when felt ill	163.488	0.726	189.518	0.707
To do nothing when felt ill	31.194	0.139	55.693	0.208
Smoke	-3.613	-0.016	-54.234	-0.202
Drink	-165.846	-0.737	-103.918	-0.388
Wave	-27.906	-0.124	-99.114	-0.370
Intercept	-1154.844	-5.130	1649.307	6.151
	151.663	**0.674**	**314.513**	**1.173**
e^1 environmental characteristic effect:				
Family per capita income	-15.542	-0.069	147.014	0.548
Education	70.475	0.313	13.324	0.050
Reimbursement ratio	53.126	0.236	0.793	0.003
East China	-8.402	-0.037	-20.763	-0.077
Travel time to health facility	-9.245	-0.041	-0.729	-0.003
Medicines available	1.352	0.006	0.373	0.001

	91.763	**0.408**	**140.011**	**0.522**
e^I environmental coefficient effect:				
Family per capita income	-28.221	-0.125	87.714	0.327
Education	129.135	0.574	16.578	0.062
Reimbursement ratio	16.633	0.074	10.050	0.037
East China	-34.839	-0.155	-64.626	-0.241
Travel time to health facility	-68.028	-0.302	21.779	0.081
Medicines available	4.564	0.020	-58.499	-0.218
	19.244	**0.085**	**12.997**	**0.048**
Total	**262.670**	**1.167**	**467.521**	**1.744**
Number of sub-sample	1076		3092	

Note: "Ratio" in the 3rd and 5th column denotes the ratio of the decomposed *fairness gap* as well as the total *fairness gap*, *i.e.* each cell in the 2nd and 4th column, to the directly observed average difference in the corresponding period.

Table 3

Robustness Test of Table 2: Rural as the Reference Circumstances

	Period 1		*Period 2*	
Directly observed average differences	225.096		268.149	
	Fairness Gap	Ratio	Fairness Gap	Ratio
***e^2 coefficient effect*:**				
Age	392.324	1.743	-782.817	-2.919
Male	73.391	0.326	257.510	0.960
Married	-123.965	-0.551	-103.547	-0.386
Self-reported health: fair	192.867	0.857	-556.721	-2.076
Self-reported health: good	61.505	0.273	-410.789	-1.532
Self-reported health: excellent	13.187	0.059	-39.637	-0.148
High blood pressure	67.092	0.298	1.297	0.005
Diabetes	-101.040	-0.449	75.892	0.283
Myocardial infarction	6.518	0.029	-7.149	-0.027
Apoplexy	11.146	0.050	-5.252	-0.020
Suffered from chronic or acute diseases	660.779	2.936	-156.815	-0.585
Got fever, sore throat or cough	-137.071	-0.609	92.643	0.345
Got diarrhea or stomachache	-26.994	-0.120	-45.075	-0.168
Got headache or dizziness	85.231	0.379	-46.166	-0.172
Got joint pain or muscle pain	-1.028	-0.005	38.642	0.144
Got rash or dermatitis	5.254	0.023	60.954	0.227
Got eye/ear disease	-56.747	-0.252	30.534	0.114
Got heart disease/chest pain	51.078	0.227	86.451	0.322
Got other infectious disease	39.139	0.174	16.848	0.063
Got noncommunicable disease	-67.785	-0.301	60.327	0.225
Severity of the illness: somewhat severe	122.736	0.545	-4.157	-0.016
Severity of the illness: quite severe	103.797	0.461	124.753	0.465
Inpatient	-10.483	-0.047	44.911	0.167
To see local health worker when felt ill	0.367	0.002	-8.647	-0.032
To see a doctor when felt ill	151.617	0.674	124.701	0.465
To do nothing when felt ill	26.976	0.120	53.760	0.200
Smoke	-2.969	-0.013	-55.150	-0.206
Drink	-186.812	-0.830	-126.831	-0.473
Wave	-24.483	-0.109	-97.180	-0.362
Intercept	-1154.844	-5.130	1649.307	6.151
	170.783	**0.759**	**272.597**	**1.017**
e^1 environmental characteristic effect:				
Family per capita income	-0.874	-0.004	72.381	0.270
Education	18.030	0.080	6.352	0.024
Reimbursement ratio	16.448	0.073	-16.123	-0.060
East China	-2.170	-0.010	-9.087	-0.034
Travel time to health facility	-4.561	-0.020	-2.447	-0.009
Medicines available	2.793	0.012	0.519	0.002

	29.667	**0.132**	**51.594**	**0.192**
e^I environmental coefficient effect:				
Family per capita income	-42.889	-0.191	162.347	0.605
Education	181.580	0.807	23.550	0.088
Reimbursement ratio	53.310	0.237	26.966	0.101
East China	-41.072	-0.182	-76.301	-0.285
Travel time to health facility	2.187	0.010	-58.644	-0.219
Medicines available	-72.712	-0.323	23.497	0.088
	80.404	0.357	101.414	0.378
Total	**280.854**	**1.248**	**425.605**	**1.587**
Number of sub-sample	1076		3092	

Note: "Ratio" in the 3rd and 5th column denotes the ratio of the decomposed *fairness gap* as well as the total *fairness gap*, *i.e.* each cell in the 2nd and 4th column, to the directly observed average difference in the corresponding period.

Appendix

Examples of the Misleading Aspects of the *Outcome Equality* in the Health Care Analysis

In the introduction of this paper, we endorse the idea that we should focus on the essential equity, *i.e.* the *equality of opportunity* (EOp), rather than the *outcome equality* or the *reimbursement equality* of health care. Here we give three examples as a simple explanation. Example A and B explain the misleading use of the *outcome equality*, and Example C, the *reimbursement equality*.

Example A: Suppose the aging proportion is higher among urban residents, who involuntarily have more health need, and thus more health care expenditure, than the rural residents. Such urban-rural differences due to demographic characteristics are indeed reasonable and desirable, reflecting the effective allocation of health resources. Under such situation, policies need no interfere, while purchasing the *outcome equality* may result in inefficiency.

Example B: Suppose there are two residents belonging respectively to the urban and rural areas. The health care expenditure of the rural resident should have been 1000 *yuan* because of his serious illness. However, as lack of money or effective medical security, his actual expenditure is only 500 *yuan*. Meanwhile, the urban resident, who enjoys a more generous medical insurance, spends the same 500 *yuan* for a health problem, such as flu, which could have been cured with the expense of only 100 *yuan*. There seems no inequality from straightforward the aspect of actual expenditure on health care. However, the essential inequality was concealed.

Example C: Suppose there are two residents belonging respectively to the urban and rural areas and enjoying the same reimbursement of 50%. One day, they both are attacked by a same disease, such as flu. However, the rural resident decides not to see a doctor because of lack of money, but the urban resident does. Then, the premium paid by the rural resident in effect is used to reimburse the urban resident, resulting in the phenomenon of *the rural help the urban* or *the poor help the rich*, although we are reluctant to face it. Thus when we judge basing on the *reimbursement equality*, such as unifying the reimbursement policies for both urban and rural residents, there may also be essential inequities.