### THE EQUALIZATION OF REGIONAL PUBLIC HEALTH FROM AMULTIDIMENSIONAL STRUCTURE PERSPECTIVE: THE CASE OF JIANGSU, **CHINA**

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### ABSTRACT

Abstract: This paper built a theory of Regional public health services equalization (RPHSE) with a multidimensional structure involving inputs and outputs. On this basis, the paper, by Theil Index(TI), did an empirical analysis on the level of Jiangsu's equalization of public health in the period from 2000 to 2010, and its law of development. The results showed that the development of public health in Jiangsu Province of China was multidimensionalstructurally unequal, which included both the inequality in financial input, and manpower and material resources input in health, and also the inequality in the output like the quality of health services; the volatility of the latter was greater than that of the former. Further comparison showed that the formation of the inequality in the structure of different regional health was distinct. Relatively, in recent years, the inequality in Southern Jiangsu, a developed area, developed while being obviously impacted by the government's financial input in health, and the inequality in Northern Jiangsu, a underdeveloped area, was aggravated mainly by the disparity in the quality of health services which was a result of lacking effective market competition in medical services.

Keywords: Equalization of Health; Theil Index; Multidimensional Structure; Jiangsu China.

### **INTRODUCTION**

Since the launch of National Health Reform Plan in 2009, Chinese government has concentrated on "promoting residents in urban and rural areas to enjoy the equalization of essential public health services", adopted measurements of inputting more in the area of health and deepening the reform in medical and health field and has achieved remarkable results as a whole on driving the developments of RPHSE. But some facts should also be realized that China is a country with a large population, and the historical arrears in field of medical and health have been so high for a long time in addition, consequently, it will be a long and arduous process to fundamentally realize the target of RPHSE which will not happen overnight; what's more, RPHSE contains rich theoretical connotations, therefore, there are system requirements of multidimensional structure levels in objectively promoting the equalization development of public health services.

Numerous Chinese scholars have conducted researches centering on public health services equalization. An(2007) expounds the basic theoretical connotations of China public health services equalization; Xiang(2008) believes that government should play a leading role in the development of public health services equalization; Xie(2009) applies concent ration index method to analyze effects of income factor on inequality of health and unequal utilization of medical services; Chen & Zhou(2011) further divide the public health services into two aspects, which including health material resources and health human resource, and adopts

extended method of TI to study on structural features of public health services inequality evolution.

Although the above researches are of great values, but most of them give connotations of public health services equalization from a single perspective, in fact, development of RPHSE in itself is a complex system, a single perspective is not able to reveal the intrinsic laws of public health services equalization evolution. Objectively, the systematic and multidimensional structure indicator system should be constructed, but the relative researches are lack.

Based on these, this article tries to start with scientific connotation of public health services equalization, build up a systematic and multidimensional evaluation system of RPHSE, take an empirical study on RPHSE level of Jiangsu province of China during 2000-2010 on this basis, and raise conclusions and suggestions in the final part.

## THE CONSTITUTION SYSTEM OF RPHSE

The RPHSE is an part of essential regional public health services equalization system. On its connotation perspective, promoting the development of public health services equalization is objectively a multilevel and full-scale systematic project involving various fields and complicated factors like economy, population and society. On the economics level, RPHSE can be divided into two structural dimensions including health input and output, and there are multistage indexes system under different structural dimensions which will have hierarchical impact on the development of RPHSE(Table 1).

Structural dimension	Impact level	First class index	Second class index		
Input dimension	Low	Expenditure for public health	Government finance health input		
	Medium	Health resources allocation	Bed numbers of medical institutions/1,000 people Medical technical personnel number /1,000 people		
Output dimension	High	Health service quality	Regional human mortality		

Table 1. Structural Index of RPHSE

Firstly, equalization of expenditure for public health is the premise and basis of development of public health services equalization. The medical treatment and public health service cannot develop without relative expenditure for public health, but the essential public health services is involved in the public product, and the government should be the main body of the investment which cannot depend on market investment. Therefore, the index of government finance for health funds is not only the important reflections of government public liability, but also the necessary guarantee to promote the development of public health services equalization.

Secondly, health resources equalization is the important carrier of development of public health services equalization. The medical services of health sectors cannot be carried out without relevant health resources, so the health resources situation is the core factor that influences service capability of medical institutions. The health resources can be classified as two forms including health material resources and health human resource, and the development of regional health resources can be obtained by incremental investment and

allocated by reserve optimization. At a particular time point, The richness and distribution balance of regional medical and health resources have a positive significance on guaranteeing the supply of health service in this region. This article chooses the bed numbers of medical institutions per one thousand people as the health material resources index, and medical technical personnel per one thousand people as the health human resource index which constitute the secondary index for measuring the level of health resources allocation.

Thirdly, health service quality equalization constitutes the high-level object of development of public health services equalization. Measurement of the development level of public health service can not only depend on the quantity but also take quality into consideration. When the health service reserves are set, the deflection of the service quality and efficiency of the medical institutions between regions will have an internal and deep impact on the difference of the medical and health service level enjoyed by residents in different regions. Consequently, the health service quality equalization is the ultimate goal of development of public health services equalization. Based on the availability of the data, this paper applies regional human mortality index to approximately measure public health service quality equalization level.

## METHODOLOGY

As the public health services equalization issues belong to the inequality subject category, this paper selects the common methods used to study the unequalization-- TI as the basic method form. The advantages of TI is that it can divide the whole inequality into within inequality Iw and residual inequality Ib, and the formula is:

I=Iw+Ib=
$$\Sigma$$
 a Na I0a+ $\Sigma$  a ln( $\overline{\mathbf{Y}}/\overline{\mathbf{Ya}}$ )

Including: Na is population rate of a group, and IOa is TI of a group,  $\overline{\mathbf{Ya}}$  is the income mean value of a group, and  $\overline{\mathbf{Y}}$  is the total income mean value. The higher value of I calculated by this formula shows the severer inequality. Based on the above theoretical framework, the TI model of multidimensional structure of RPHSE level in Jiangsu is constituted, and see the relevant variable types and connotations in Table 1.

(1)

The data sources of the index variables are mainly from the statistical data of 13 cities in Statistical yearbook of Jiangsu of 2000-2010, but there is no fiscal health input index in the yearbook of 2000-2005, but having fiscal input of science, education, culture and health care. Here, the method of Zhang & Hu(2006) is used for reference and set the health care expenditure to account for 1/4 of the fiscal expenditure of science, education, culture and health care. In this way, the required index data can be obtained indirectly.

In addition, to reflect the different factors among different regions, we divide Jiangsu into three regions of South Jiangsu, Central Jiangsu and North Jiangsu according to the standard division in Statistical yearbook of Jiangsu. South Jiangsu is the developed region in Jiangsu including Suzhou, Wuxi, Changzhou, Nanjing and Zhenjiang; The Central Suzhou includes Yangzhou, Taizhou and Nantong; And North Suzhou is undeveloped region in Jiangsu including Xuzhou, Lianyungang, Yancheng, Huaian and Suqian.

# RESULTS

Constitute the TI model of multidimensional structure of RPHSE level of Jiangsu province and three regions of South Jiangsu, Central Jiangsu and North Jiangsu during 2000-2010. See the relevant calculate results in Table 2.

Based on the data of table 2, draw the relevant trend chart of 1-3 to reveal the evolvement rule of the development of RPHSE on different level in different regions in Jiangsu.

	Gov. finance health input TI (GFHI TI)				Health Material Resources TI (HMR TI)			
	Whole	S. of	C. of	N. of	Whole	S. of	C. of	N of Pro
	Pro.	Pro.	Pro.	Pro.	Pro.	Pro.	Pro.	N. 01 F10.
2000	0.0461	0.0024	0.0076	0.0065	0.0591	0.0060	0.0010	0.0164
2001	0.0541	0.0028	0.0067	0.0053	0.0597	0.0063	0.0011	0.0125
2002	0.0616	0.0035	0.0079	0.0089	0.0831	0.0151	0.0030	0.0149
2003	0.1130	0.0113	0.0027	0.0093	0.0655	0.0077	0.0033	0.0116
2004	0.1100	0.0111	0.0027	0.0119	0.0643	0.0076	0.0036	0.0099
2005	0.1004	0.0147	0.0056	0.0041	0.0608	0.0072	0.0026	0.0069
2006	0.1449	0.0275	0.0053	0.0042	0.0582	0.0081	0.0052	0.0027
2007	0.1707	0.0325	0.0029	0.0020	0.0572	0.0084	0.0029	0.0031
2008	0.0930	0.0358	0.0015	0.0022	0.0565	0.0116	0.0033	0.0048
2009	0.0808	0.0192	0.0006	0.0046	0.0561	0.0144	0.0026	0.0044
2010	0.0738	0.0165	0.0003	0.0076	0.0499	0.0148	0.0029	0.0084
AVG	0.0953	0.0161	0.0040	0.0061	0.0610	0.0098	0.0029	0.0154
	Health Human Resource TI (HHR TI)				Health Service Quality TI (HSQ TI)			
	Whole	S. of	C. of	N. of	Whole	S. of	C. of	N of Pro
	Pro.	Pro.	Pro.	Pro.	Pro.	Pro.	Pro.	N. 01 1 10.
2000	0.0514	0.0127	0.0006	0.0187	0.0473	0.0013	0.0004	0.0671
2001	0.0540	0.0133	0.0008	0.0195	0.0275	0.0045	0.0010	0.0151
2002	0.0821	0.0154	0.0022	0.0161	0.0269	0.0061	0.0021	0.0107
2003	0.0676	0.0083	0.0011	0.0276	0.0219	0.0035	0.0022	0.0131
2004	0.0640	0.0028	0.0030	0.0297	0.0156	0.0090	0.0010	0.0102
2005	0.0588	0.0025	0.0007	0.0186	0.0502	0.0049	0.0042	0.0498
2006	0.0648	0.0021	0.0008	0.0114	0.0262	0.0059	0.0059	0.0125
2007	0.0600	0.0056	0.0061	0.0007	0.0461	0.0049	0.0111	0.0411
2008	0.0660	0.0096	0.0011	0.0088	0.0232	0.0074	0.0069	0.0352
2009	0.0660	0.0108	0.0020	0.0059	0.0129	0.0048	0.0154	0.0096
2010	0.0659	0.0109	0.0020	0.0063	0.0125	0.0065	0.0105	0.0051
AVG	0.0637	0.0086	0.0019	0.0154	0.0282	0.0054	0.0056	0.0245

Table 2 TI Value of	<b>DDUCE</b> I aval of Jiangen	Province and Three Pagions
Table 2. 11 value of	KPHSE Level of Jlangsu	Province and Three Regions

# DISCUSSION THE LEVEL OF FINANCIAL HEALTH INPUT EQUALIZATION

Overall, as Figure 1 shows, the TI of the financial health input of Jiangsu Province, China during 2000 to 2010 firstly increased and then decreased, the evolution trend in general shows an inverted U sharp, and around the year of 2007 is an important turning point. This indicates that since the "Eleventh Five-Year" with the increasing emphasis of Jiangsu Province on livelihood security like health care and the raising financial input, the degree of health services equalization based on government's public investment in Jiangsu has been maintained a good momentum of continuous improvement

From the regional comparison, the degree of equalization on China's Jiangsu regional financial health input does not constitute a logical positive relationship with the level of economic development, but it presents a reverse effect, which diametrically opposites to what we expected. By calculating the average health input TI within the different regions during 2000-2010, we find out that southern region is up to 0.0161, while the central region and northern region is only 0.004 and 0.0061 respectively. The average level of the health input in the economically developed southern region exceeds the economically underdeveloped northern region. I believe that one of the reasons may be related to differences of input body and input mode, in the financial system at this stage, the public health input in the economically developed southern regions of Jiangsu is mainly carried out by local primary governments, so the input level is affected, cannot fully meet the local population's growing demand for health services; By contrast, to the central and northern regions in Jiangsu whose economy is relatively backward, in addition to the input of local government, it'll also have the superior financial transfer payments and special support, which allows them to gain a series of tendentious policy support to have a priority development, but the economically developed regions is somewhat stagnated.

Therefore, we should strengthen the basis of the development of RPHSE by gradually improving the main level and the level of co-ordination of the main body and input mode of the inter-regional public health input.



Figure 1. TI of Government Finance Health Input in Jiangsu

# THE LEVEL OF HEALTH RESOURCES ALLOCATION EQUALIZATION

Figure 2 shows the TI of health material resources and health human resource in Jiangsu during the period of 2000-2010, it also experienced a sharp rise in first, then slowly lowering to the evolution of approximately inverted U, which in 2002, it was the highest inequality of health resources, then starting from 2003, China has launched several rounds of health care reform, and increased the investment in the development of medical and health resources, so it gradually improved the inequalities of the health resources and health workforce. By further comparing the corresponding mean size of TI, we find that the inequality of health human resource is greater than the inequality of health material resources in Jiangsu. Therefore, the emphasis on building and strengthening human resource for the health should be the key point of promoting the development of equalization depth for the new allocation of health resources in Jiangsu.

In addition, it is worth to note that there is an evolution trend of significant differentiation in the inequality of health resources in each region of Jiangsu. On the one hand, The magnitude

and the regional disparities of the inequalities of health resources in southern, central and northern Jiangsu tended to become narrow and converge, especially for the economically underdeveloped northern part, because of the provincial financial benefits from special support policies in Jiangsu, the development of medical and health hardware have made a great progress in recent years; However, in the allocation of health workforce, there are significant regional differences, especially in northern part, for some time, affected by the economic environment, failed to build up an effective mechanism to attract and retain scarce health care professionals, leading to form a big gap in the development of health workforce with the southern part and other developed regions, which has seriously hampered the development of local medical and health undertakings. The good news is, with the increasing of the talent support efforts to the economic and social development in northern part from Jiangsu provincial government, which promote the implementation of high-end talent (including in the health sector) flowing to the northern part, to form the "Talent Project" of entrepreneurship development in northern part, the situation of public health recourses unequalization in underdeveloped areas has been gradually improved.





Figure 2-2. TI of Health Human Resource in Jiangsu

# THE LEVEL OF HEALTH SERVICE QUALITY EQUALIZATION

The ultimate target of promoting public health service equalization development is to realize the equal access to basic health care and health maintenance for different people, while it's finally decided by regional medical health service quality and the efficiency of production endogenously. So we use population mortality rate as alternative proxies for the measured regional medical and health service quality level to calculate health service quality equalization levels in different regions of Jiangsu (see Figure 3). As the figure shows, clearly compared with the steadily improved health input equalization in the province in recent years, reflected the TI of output level of Jiangsu health service quality is in a sharp oscillation condition, especially the larger amplitude of 2004-2008, in the form of some M type change. At the same time, there was a significant difference among different regions. The mean value of the sample period of health service quality of the TI in South Jiangsu and Central Jiangsu were only 0.0054 and 0.0056, and the fluctuation is relatively smooth, and in less developed economy region in North Jiangsu, mean value of the health service quality of TI is as high as 0.0245, far more than South Jiangsu and North Jiangsu, but the Is has a very similar evolution with Jiangsu province's, also presents the M type shock, which indicates that there is a huge gap between the equalization of health service quality in North Jiangsu region, and poses a serious drag on the development of Jiangsu province. The possible explanation is that the enhancement of the regional health service quality on theory should increase health tangible inputs, and improve the "hardware" in medical institutions, but what is more important is that it should pay more attention to the "software" factors, among which the incentive and constraint mechanism to build medical institutions and to improve the quality of service is so essential, which requires the government to guide, deep the reform of the public hospital system mechanism, more importantly, it should pay attention to effectively cultivate the regional medical service market, make full use of market competition mechanism of survival of the fittest, form the inner power of medical institutions to promote health service quality and external pressure mechanisms; and from the actual situation, although in recent years the northern Jiangsu area under all levels of government support, has made great progress in terms of equalization on health input, but compared with South and the Central of Jiangsu, the northern Jiangsu area due to its less developed economy, the overall level of the market is so low, and the medical and health fields lack of service consciousness and concept of market competition, and even have the wrong understanding of "government investment = government arrangement", the phenomenon of excessive depending on government is so serious, resulting in medical institutions do not pay enough attention to their operation and management mechanism and service quality, and then form unreasonable situation of high input but low output.



Figure 3. TI of Health Service Quality in Jiangsu

# CONCLUSIONS

The article based on health input and output and other different structural dimension analyzes the systematic theoretical connotation system of the RPHSE. On this basis, it uses TI way to carry on empirical analysis on the RPHSE level in the period of 2000-2010 at Jiangsu, China, the result indicates that, there is multidimensional structure inequality of the Jiangsu public

health development totality, and it has health financial input as well as health manpower, material resources input inequality, as well as health service quality and other output inequality, the volatility of the latter is more serious than the former; furthermore, the form structure is different in different regional health inequalities, in contrast, health inequality evolution of economical developed southern Jiangsu area is influenced very serious by the health input fluctuations of the existing financial system under the government, but the intensity of the less developed northern Jiangsu area health inequality is mainly driving by the health service quality gap result in lacking of effective medical service market competition.

Based on the new period of Jiangsu and the whole of China deeply promote region public health services development strategy requirement, the article proposes the following four basic recommendations:

- 1. Establish theoretical connotation system of the RPHSE. Based on the view of this article, public health service equalization should compose both health funds and health resources and other investment level equality, and it more relates to health service quality output level, the latter is the inherent requirements of deep development for public health service equalization.
- 2. Further clarify the main role of government in regional public health input equalization, to reform the existing financial policy; establish financial authority and powers adapt mechanism; straighten out the government public input responsibility to promote the ordination and equalization development of public health input in different regions.
- 3. To promote the equalization of health resources allocation mechanism and optimize present distribution of medical resources, special attention should be paid to the health human resource training and talent introduction policy support in areas of weak economy, to narrow development gap between health human resource in different regions.
- 4. Let the equalization development of regional health service output quality as the core content for the next stage of deepening medical reform. On one hand, we should deepen the reform of the public hospital internal system mechanism, establish medical staff performance appraisal and distribution system which focus on patient oriented service efficiency and service quality, to form an internal effective incentive and restraint mechanism; on the other hand, attention should be paid to construct of regional medical service market competition system, steadily implement diversified medical thinking, moderate and orderly liberalize regional medical market, encourage to meet the requirements of social capital and foreign capital entering, form of the effective competition for existing region public hospital, and thus construct the external promotion mechanism for improving the quality of the regional health services.

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