

# *Evaluation of the Concentration Index of the Fairness of Health Resources Allocation in China*

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**Abstract—Background:** The study focuses on fairness of China's health resources allocation and provides feasible suggestions for government regional health planning. **Method:** Fairness of China's health resources allocation is evaluated by means of the concentration index (CI) and the indirect standardized concentration index. Contribution of each influencing factor to the unfairness of health resources allocation is decomposed and calculated using the concentration index. **Results:** The concentration indexes of practicing doctors, registered nurses, medical and health institutions, beds and governmental health expenditure are respectively 0.0671, 0.0703, -0.0653, 0.0108 and 0.0327, while the decomposed concentration indexes of per capita GDP are respectively 0.0576, 0.0715, -0.0870, 0.0022 and 0.0244. **Conclusion:** Summarily, China's health resources allocation in 2015 prefers regions with higher economic development, especially in aspect of human resources. Policies on optimizing health resources allocation according to such factors as population density and birth rate have achieved initial success. In the next phase, the Chinese government should give full attention to the impact of the population and aging rate, and focus on need-oriented allocation of health resources, especially of the beds.

**Keywords—Health Resources Allocation, Fairness, Concentration Index**

## I. INTRODUCTION

As social economy in China develops, peoples' anticipation for a happy life also grows. Their need for medical and health services increases rapidly and becomes more varied. Therefore, health supply becomes a critical issue for today's China. Fair and reasonable allocation of health resources is a prerequisite for using limited health resources to satisfy people's daily-increasing and varied need for health services.

Fairness of health resources allocation used to be calculated with the variation coefficient, Gini coefficient and Theil index. But there is flaw in these methods, which is that they cannot tell the correlation between health resources allocation and economic development under market conditions. In this aspect, the concentration index can express the tendency of health resources allocation among regions with different economic development levels.

Several studies have been done to investigate the fairness of health resource allocation. Zhang found that in China health professionals were more likely to be allocated in regions with higher economic development level, while the health institutions and beds are more prone to be built in regions with lower economic development level [1]. Wang found that differences between different areas in Chongqing, China, were the main factors that led to the unfair allocation of health resources [2]. Sun found that there existed distinct difference in the geographical distribution of China's health resources [3].

The study intends to use indirect standardized concentration index and concentration index decomposition to analyze China's health resources allocation in 2015 to prove that economic development or people's need are the main factors driving unfair allocation of health resources, so as to provide scientific support to the government for drawing up regional health planning.

## II. RESULTS

### A. Concentration Index of Health Resources Allocation in Each Province and Municipality of China in 2015

The concentration indexes of certified (assistant) doctors, registered nurses, medical and health institutions, medical beds and governmental health expenditure of 31 Chinese provinces in 2015 are respectively 0.0671, 0.0703, -0.0653, 0.0108, 0.0327, which tells us that with the exception of medical and health institutions all other indicators prefer economically developed regions. After applying indirect standardized procession, we acquired the indirect standardized concentration indexes of above 5 indicators, which are 0.0595, 0.0713, -0.0823, 0.0052, 0.0158. The medical and health institutions are doing worst in fairness of allocation, the registered nurses and certified (assistant) doctors come next to it immediately, while medical beds are the best in fairness.

### B. Decomposition of the Concentration Index

Contribution rates of the decomposed concentration indexes of year-end population, population density, birth rate, aging rate and per capita GDP are more prominent than those of other influencing factors. The decomposed concentration indexes of year-end population, aging rate and per capita GDP are

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basically positive, which tells us these factors make the health resources allocation prefer regions with higher economic development level. While the decomposed concentration indexes of population density and birth rate are basically negative, which shows that these factors render health resources allocation more prone to regions with lower economic development level.

Through concentration index decomposition, we can conclude that the decomposed concentration indexes of certified (assistant) doctors, registered nurses, medical and health institutions, medical beds and governmental health expenditure are respectively 0.0576, 0.0715, -0.0870, 0.0022 and 0.0244, which are in alignment with the indirect standardized concentration indexes. This proves that the concentration index decomposition can truly reflect the influence of economic development on fairness of health resources allocation (please refer to table 2 and 3). Contribution rates of the above 5 decomposed concentration indexes to the control variable (per capita GDP) are respectively 85.90%, 101.68%, 133.29%, 20.12% and 74.51%, while contribution rates of the concentration indexes decomposed from the need variable (year-end population and population density, etc) are 11.28%, 1.37%, -26.07%, 51.98% and 51.57%.

### III. DISCUSSION

China's health resources allocation in 2015 is valued lower than 0.1 in absolute values of both its concentration index and indirect standardized concentration index, which tells us that China's health resources allocation is relatively fair in 2015. The concentration indexes and indirect standardized concentration indexes of certified (assistant) doctors, registered nurses, medical beds and governmental health expenditure vary between 0 and 0.08, which manifests that health resources allocation prefers regions with higher economic development level. The concentration indexes of medical beds and governmental health expenditure are relatively smaller, which tells us that they are fairer. The concentration index of the medical human resources is higher than the above two indicators, which means that medical human resources are most likely to prefer economically developed regions. This might be resulted from the following factors: (1) the tertiary medical and health institutions constructed under the planning economy system of China were over-concentrated in large and medium cities, when coming to the times of market economy the medical human resources are also more prone to migrate to large and medium cities. This aggravates the human resources shortage in medical and health institutions with weaker competitiveness, which corresponds with the findings of Liu and Li, et al [4]. (2) There is a severe shortage of nursing staff at grassroots units. Researches conducted in many places find that there is a severe shortage of nursing staff [5] and there lacks a clear-defined career orientation of the nursing staff at the grassroots units where most people still think that the nursing staff only functions as medical service providers while other critical functions of the nursing staff like responding to consultancies, educating on health and coordinating medical business are ignored. This makes relevant surveys incomplete and inaccurate on the actual need for grassroots nursing staff.

Therefore, shortage of nursing staff at grassroots units keeps deteriorating.

The concentration index and indirect standardized concentration index of the medical and health institutions are respectively -0.0653 and -0.0823, which tells us allocation of medical and health institutions prefers regions with lower economic development level. The medical and health institutions mentioned in this study include large-scale comprehensive hospitals, specialized hospitals, township health agencies and village health outlets. The Chinese government has adopted the medical health policy of "lower proficiency, higher coverage" at the grassroots level. Therefore, most grassroots medical and health institutions are located at the towns and villages to guarantee accessibility of grassroots medical services. Up to the end of 2015, grassroots medical and health institutions like township health agencies and village health outlets have accounted for 93.6% of China's medical and health institutions. This finding is in line with the survey conducted by Zhang and Zhao, et al [6].

Contribution rates of the decomposed concentration indexes of year-end population, aging rate, per capita GDP of China in 2015 tell us health resources allocation favorable to regions with higher economic development level aggravates the unfairness of allocation. The study finds that regions with higher economic development level in China all have larger populations, higher aging rates and bigger per capita GDP. More health resources are driven by the market to these regions and outnumber the actual need. The decomposed contribution rate of population density shows that every indicator (except for government health expenditure) prefers regions with poor economic development. This help alleviate unfairness of health resources allocation. The reason behind this is that China has implemented the Go-west strategy and given more preferential policies for ethnic minorities in Tibet, Xinjiang, Qinghai and Ningxia to invest more in health business and provide more health resources to regions with a lower population density. The decomposed contribution rate of the birth rate shows that health resources allocation prefers regions with lower economic development level. This attenuates unfairness of health resources allocation because when Chinese government has implemented the family planning policy, most of the less developed regions have adopted the "second child" policy or "second child for only child parents" policy, which increases the local birth rate, and the local government investment in health services. This finding can be verified by China's per capita pediatric health resources and its yearly growth rate.

Using the concentration index decomposition to do calculations about various indicators (exclusive of medical beds), we know that the contribution rate of the non-need variable (per capita GDP) to fair allocation of health resources is higher than 74%, which means per capita GDP is a significant factor that influences fair allocation of health resources (exclusive of medical beds) in China. The contribution rates of the need variables (including year-end population and population density, etc) are significantly lower than the non-need variable, which tells us that Chinese government's policies have achieved tangible results in implementing need-oriented regional health planning and allocating health resources more reasonably. The principles

raised by the China' National Health and Family Planning Commission of "placement of medical institutions must take into full account local population, health conditions, the spectrum of diseases and other factors " shall be enacted on strictly.

Using the concentration index decomposition to calculate on the medical beds, we can know the unfairness of medical beds allocation is mainly resulted from the need variables. Contribution rates of the year-end population and aging rate to unfair allocation of health resources add up to 361.24% while contribution rates of population density, birth rate, death rate, perinatal death rate and incidence of communicable diseases have amounted to 309.26%. Contribution rates of all need variables total 51.98%. It is large public hospitals' irrational expansion which caused over-concentration of medical beds in large public hospitals with strong economic advantages. About this, Xu and Bo, et al has reached similar conclusions in their studies [7].

#### IV. CONCLUSIONS AND SUGGESTIONS

At the end of the 12<sup>th</sup> Five-year Plan, China has achieved relatively fair allocation of health resources. Under conditions of market economy, various health resources (exclusive of medical and health institutions) , especially the health personnel are more prone to be allocated to regions with higher economic development. Chinese government's policies on rational allocation of health resources driven by population density and birth rate have achieved initial success. In the next, China shall focus more on population, aging rate and other factors when planning regional health development and pay attention to realizing need-driven reasonable allocation of health resources, especially of medical beds.

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