Analysis on Equity of Health Resources on Primary Medical and Health Service in ChongQing

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ABSTRACT

According to the population distribution and economic indicators, the equity analysis and evaluation of health resources of primary health services in Chongqing in 2014 was carried out. Comparative analysis between the Township and community Primary health care resources in 2014 was made. Its equity was evaluated with Lorenz Curves and Gini Coefficient. The results of analysis by the Lorenz curve and Gini coefficient showed that the per capita possession of community health resources was lower than that of the township in Chongqing. According to population distribution, the Gini coefficient of the township health resources were separately lower than 0.3, the Gini coefficient of the community health resources in addition to organ numbers of the community health service was below 0.3. However, the others were more than 0.4, close to inequity danger status. All kinds of township resources were achieved better fairness according to population distribution. The equity degree was lower on local governments of the community health service and the medical workers of the community except the organ numbers of the community health service.

Keywords: Gini coefficient, Lorenz curve, the health service of township and community, the distribution of resources, equity

1. INTRODUCTION

In this paper, 38 districts and counties (excluding the northern New Area and Wansheng Economic Development Zone) are taken as units to conduct empirical research on the allocation of medical and health resources at all grassroots levels in Chongqing, China. The data are from 2015 Chongqing statistical yearbook and 2014 Chongqing Health and family planning statistical yearbook.

By consulting the literature, combining the characteristics of professional knowledge and statistical yearbook, and based on the representativeness of indicators, this paper selects three types of medical and health resources of township health centers and urban community health service centers, medical and health technicians and the government's investment in medical and health resources as research objects to measure the equalization level of the allocation of medical and health resources at the grass-roots level. The allocation level of rural grass-roots medical and health resources is measured by the number of health institutions per 10,000 non-urban population, the number of health technicians per 10,000 non-urban population and the government's per capita investment in township health services; the allocation level of urban grass-roots medical and health resources is measured by the number of health institutions per 10000 urban population, the number of health technicians per 10000 urban population and the government's community health services It is measured by per capita investment.

2. DATA ANALYSIS METHODS

In this paper, Lorenz curve and Gini coefficient are selected as the evaluation analysis method [1-2] to analyse the fairness of the allocation of medical and health resources at the grassroots level.

2.1. Lorenz Curve

Lorenz curve, proposed by M.O. Lorenz, an American statistician, is a curve used to analyse and compare the fairness of social income distribution or property distribution in economics. Its main idea is to rank resources in a total body (country or region) from small to large, then construct a plane rectangular coordinate system, the abscissa represents the cumulative percentage of population, the ordinate represents the corresponding percentage of resource ownership of each population percentage, and connect the lines composed of each point. Generally speaking, the greater the curvature of Lorenz curve, the more unequal the income distribution. In the field of health economy, the Lorenz curve of health resources distribution by population is drawn according to the order of per capita

health resources in different districts and counties from small to large, with the cumulative population percentage as the abscissa and the cumulative health resources percentage as the ordinate [1].

2.2. Gini Coefficient

Gini coefficient is a statistical index that reflects the fairness of social income distribution calculated by henchman, an Italian economist, according to Lorenz curve. Its value is equal to the ratio of the area enclosed by the 45 ° diagonal and Lorenz curve to the area of the right triangle under the 45 ° diagonal [2]. Gini coefficient is between 0 and 1. The smaller the value is, the fairer the resource distribution is. The larger the value is, the more concentrated the resource distribution is. At present, Gini coefficient has been widely used in the Fairness Evaluation of health resource allocation [3]. The relationship between Gini coefficient and allocation fairness of primary health service resource allocation is based on Gini coefficient standard of income distribution fairness in economics. Gini coefficient below 0.3 is the best fair state, between 0.3 and 0.4 is the normal state, and over 0.4 is the warning state When it reaches 0.6 or above, it is a highly unfair dangerous state [4].

The calculation formula is (1):

$$G = \sum_{i=1}^{n} P_i Y_i + 2 \sum_{i=1}^{n-1} P_i (1 - V_i) - 1 \qquad (1)$$

3. RESULTS

In this paper, Lorenz curve and Gini coefficient are selected as the evaluation analysis method [1-2] to analyze the fairness of the allocation of medical and health resources at the grassroots level.

3.1. Basic Situation of Medical and Health Resources Allocation in Chongqing

By the end of 2014, Chongqing had a total resident population of 29.914 million, including 17.8301 million urban residents. There are 17885 primary medical and health institutions, accounting for 95.31% of the total number of medical and health institutions in the city, including 181 community health service centers and 921 township health centers.

There are 50,571 primary medical and health technical personnel, accounting for 32.82% of the city's health technical personnel, including 25888 health technical personnel, 0.89 licensed (Assistant) doctors per thousand population, 0.57 registered nurses per thousand population, and a medical care ratio of 1:0.64 in township hospitals; 7238 health technical personnel, 0.16 licensed (Assistant) doctors per thousand population in community health service centers There were 0.14 registered nurses and the ratio of medical care to nursing care was 1:0.88.

In 2014, Chongqing municipal government invested a total of 3,376,284,000 yuan in basic medical and health services, including 24978600 yuan in township hospitals and 822,023,000 yuan [5] in community health service centers. In terms of per capita investment, the per capita investment of township is 206.71 yuan, and the highest is 1095.41 yuan in Nan'an District, followed by Shapingba District (814.72 yuan per capita) and Dadukou District (663.84 yuan per capita), while the lowest is Pengshui County (97.8 yuan per capita). Yuzhong District has no rural population and no township hospital, so it has no government investment in township; the community is With a per capita of 46.1 yuan, Nan'an District still has the highest per capita of 118.99 yuan, followed by Rongchang district (111.97 yuan per capita) and Jiangbei District (106.69 yuan per capita), while Bishan District, Chengkou County, Dianjiang County, Zhongxian County, Fengjie County, Wulong County, Shizhu County and Youyang County have a certain number of urban population, but no community, so there is no government investment in the community. See Table 1 and Table 2.

Table 1 Allocation of medical and health resources in Chongqing in 2014

Health Resources	City	Basic Level		
		Total	Township	Community
Health institutions	18766	17885	921	181
Health technician (person)	154091	50571	25888	7238
Registered practicing (Assistant) physician	58007	25437	10759	2788
Including: Registered nurse	62662	13391	6934	2542
Government funding：(10,000 RMB=1,454 USD)	742686.1	337628.4	249786	82202.3

Table 2 Allocation of basic medical and health resources in Chongqing in 2014

Zone	Township		Community	
	Service population (10,000)	Government's per capita investment	Service population (10,000)	Government's per capita investment
Yuzhong	-	-	65.04	71.19
Dadukou	0.99	663.84	32.05	27.74
Jiangbei	4.06	264.78	79.81	106.69
Shapingba	6.57	814.72	104.63	65.62
Jiulongpo	10.41	610.85	106.60	43.93
Nan'an	4.75	1095.41↑	79.26	118.99↑
Beibei	16.12	360.19	60.97	10.19
Yubei	31.96	231.25	118.39	42.32
Banan	21.82	317.68	75.55	43.16
Fulin	42.97	197.39	70.64	64.84
Qijiang	49.21	145.97	60.08	6.60
Dazu	37.40	135.36	37.63	2.41
Changshou	32.41	212.06	48.50	32.03
Jiangjin	49.13	327.42	80.12	9.21
Hechuan	50.72	167.51	83.27	60.54
Yongchuan	39.83	182.82	68.59	74.94
Nanchuan	25.71	198.91	30.20	22.86
Bishan	36.88	181.51	35.15	-
Tongliang	34.63	231.18	31.75	60.66
Tongnan	36.19	187.61	29.61	43.90
Rongchang	35.96	137.98	32.61	111.97
Wanzhou	62.40	213.82	98.06	8.50
Liangping	39.54	126.71	26.69	27.00
Chengkou	12.94	254.31	5.89	-
Fengdu	36.31	180.34	24.88	33.71
Dianjiang	40.56	191.63	27.38	-
Zhongxian	44.09	224.60	28.06	-
Kaixian	67.58	225.16	49.20	98.08
Yunyang	55.56	228.66	34.31	18.19
Fengjie	47.83	141.05	29.56	-
Wushan	29.90	167.27	16.70	31.99
Wuxi	26.95	237.37	12.28	15.64
Qianjiang	25.06	166.48	20.60	106.06
Wulong	21.34	179.22	13.47	-
Shizhu	24.17	180.26	15.04	-
Xiushan	31.40	186.97	17.67	75.76
Youyang	39.56	160.59	16.68	-
Pengshui	35.50	97.80	16.09	68.06
Total	31.80	206.71	46.92	46.10

Data from: 2014 health and family planning statistical yearbook; 2015 Chongqing statistical yearbook

3.2. Evaluation on the Fairness of the Allocation of Medical and Health Resources at the Basic Level

Based on the data of population and health resources of each district and county, this study draws Lorenz curve and calculates Gini coefficient for three categories of health resources indicators, namely, basic medical and health institutions, health technicians and government funding, so as to evaluate the fairness of the allocation of basic medical and health resources in Chongqing.

First of all, distinguish the medical and health resources of towns and communities, and then rank the per capita expenditure of the government on the medical and health services of towns (or communities) in order from small to large. Take the cumulative percentage of non town (or town) population of each administrative region as the abscissa, and the cumulative percentage of per capita expenditure of the governments of each administrative region on the medical and health services of towns (or communities) as the ordinate, draw 2 In 2014, the Lorenz curve of the per capita investment resources of Chongqing municipal government to the township (or community) medical and health services according to the population distribution. According to the basic data in Table 2, the Gini coefficient of the fairness of the government's per capita investment resources for health services in towns (or communities) according to the population distribution is calculated, and the result is consistent with the Lorenz curve. As above, the Lorenz curve of population distribution of township (or community) health technicians and township (or community) health institution resources are drawn respectively, and Gini coefficient is calculated. See Figure 1 and Figure 2.
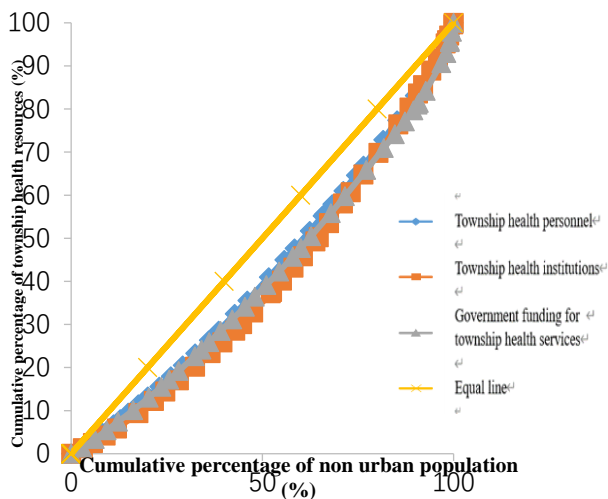

Figure 1 Lorenz Curve of health resources of towns and villages in Chongqing by population distribution in 2014
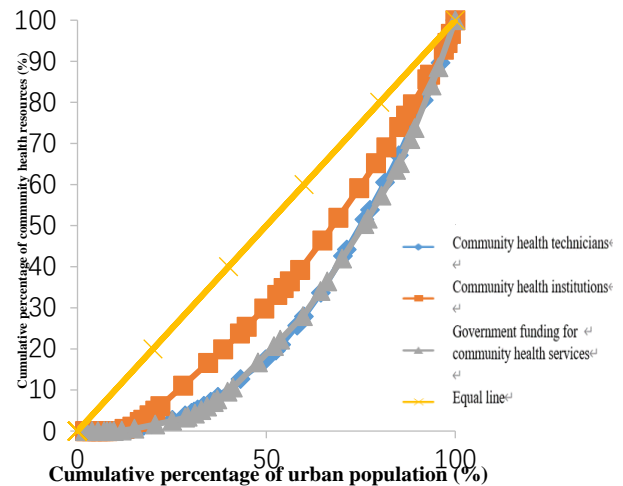

Figure 2 Lorentz curve of community health resources by population distribution in districts and counties of Chongqing

3.3. Gini Coefficient and Fairness Judgment

The results show that:

(1) Among the basic medical and health resources in Chongqing, the Gini coefficients of township health technicians, township health institutions and government's investment in township health services are 0.1573, 0.2042 and 0.1813, respectively, which are less than 0.3, indicating that the township medical and health resources have achieved good fairness in population allocation.

(2) The Gini coefficients of community health technical personnel, community health institutions and government's investment in community health services in population allocation are 0.4262, 0.2828 and 0.4318, respectively, which shows that the resources of community health institutions have achieved good fairness in population allocation, and the investment of community health technical personnel and government in community health services exceeds 0.4 alert state, namely The present distribution of resources is not fair.

(3) Comparing the three kinds of health resource indicators of towns and communities, the Gini coefficient of all kinds of health resources in towns is lower than that in communities, which shows that the fairness of the allocation of health resources in Chongqing is slightly better than that in communities. See Table 3 for details.

Table 3 Gini coefficient of basic medical and health resources allocation by population distribution in Chongqing in 2014

Region	Health technicians	Institution	Government funding
Township	0.1573	0.2042	0.1813
Community	0.4262	0.2828	0.4318

4. DISCUSSION

4.1. Unfair Distribution of Community Medical and Health Resources

Due to the scarcity of health resources and the unlimited demand for health services, more and more attention has been paid to how to scientifically and reasonably optimize the allocation of health resources, improve the fairness and utilization efficiency of their distribution, so as to better serve the people and promote human physical and mental health [6]. The Gini coefficient calculated by the cumulative percentage of population in this paper is 0.4262 for community health technicians, and 0.4318 for the government's investment in community health services, all of which are over 0.4 alert state, which is regarded as unfair resource distribution. For example, Bishan, Chengkou, Dianjiang, Zhongxian, Fengjie, Wulong, Shizhu and Youyang have a certain urban population, but there is no corresponding community health resources investment. The reason is that the government has not paid enough attention to the fairness of health resources allocation and kept up with the progress while accelerating the development of health undertakings.

4.2. The Fairness of Basic Medical and Health Resources Allocation in Urban and Rural Areas Is Quite Different

Comparing the fairness of the allocation of various medical and health resources between township and community, township is superior to community. At the same time, township has 76 health institutions per 10000 people, 21.42 health technicians per 10000 people, and the government's per capita investment is 206.71 yuan; community has 1 health institutions per 10000 people, 4.06 health technicians per 10000 people, and the government's per capita The investment is 46.1 yuan. The amount of health resources per capita in towns was higher than that in communities. However, with the growth of population and the gradual increase of urbanization rate in recent years, in 2014, the urbanization rate of Chongqing has reached 59.6%, the urban population is far more than the rural population, and the demand for basic medical and health resources in urban communities will also increase dramatically. The scarce health resources in the community are obviously in short supply, and the crowd will rush to large hospitals, which will inevitably increase the "difficulty and cost of seeing a doctor" Problem.

4.3. Pay Attention to the Demand of Local Residents for Basic Health Services and Improve the Supply Decision-Making Mechanism

The lack of government investment in health is an important factor in the rational allocation of health resources. Primary medical and health resources are quasi-public goods, which have the nature of quasi-public goods. The allocation of resources mainly depends on the financial input of local government and the consumption demand of residents for primary medical and health services [7]. However, when the government allocates the basic medical and health service resources, it often ignores the effective demand of local residents for basic medical and health services due to the pursuit of unity, which makes it lack of pertinence.

5. CONCLUSION

In the allocation of basic medical and health service resources in Chongqing, the township medical and health resources have achieved good fairness in population allocation, while the community medical and health resources have appeared inequity, mainly reflected in two types of resources: community health technical personnel (g = 0.4262) and government investment in community funds (g = 0.4318). In addition, the fairness of all kinds of medical and health resources allocation in the community is lower than that in the township.

Based on the data sources of Chongqing Health Statistical Yearbook and Chongqing Medical and health system, this paper calculates Gini coefficient of basic level medical and health technicians, basic level medical and health institutions and government's investment in basic level medical and health care according to the population distribution, analyzes the current situation and problems of the distribution of basic level medical and health resources, and points out that in order to ensure the focus of medical and health resources to agriculture At the same time, it is necessary to ensure the construction of urban grass-roots medical and health care, deal with the relationship between urban communities and hospitals, so as to determine the work direction of improving the fairness of Chongqing's grass-roots medical and health resources allocation.

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