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Study on the Fairness of Basic Medical Insurance Financing and Benefits for Employees in Guangdong Province

Hailan Liu, Shujie Shang, Xusheng Zhang[a,*]

School of Humanities and Management, Guangdong Medical University, Dongguan, 523808, China
[a]zhangxusheng@gdmu.edu.cn
[*]Corresponding author

Abstract: *This study analyzed regional differences in basic medical insurance financing levels and benefits levels for employees in various regions of Guangdong Province. Using the Gini coefficient and Thiel index methods, the fairness of basic medical insurance for employees in Guangdong Province was evaluated using per capita income and per capita expenditure as evaluation indicators. The study found that the Gini coefficient and Thiel index of per capita income and per capita expenditure of employees 'basic medical insurance have high consistency in assessing the degree of difference. 2019-2022 The annual first-order Theil index shows that the trend of intra-regional differences and overall regional differences is basically the same. In terms of contribution rate, the difference in per capita income and per capita expenditure of basic medical insurance for employees in Guangdong Province mainly comes from differences within the Pearl River Delta region and differences between the Pearl River Delta and other regions. The research results show that the fairness of the financing level of basic medical insurance funds for employees in Guangdong Province has been in a relatively ideal state. The gap between the income and expenditure of medical insurance funds in various cities may be affected by factors such as the level of economic development and the degree of population aging. To this end, it is recommended to advance provincial-level coordination of basic medical insurance for employees in Guangdong Province in an orderly manner to make up for regional economic development gaps, promote equitable development of medical insurance, and actively respond to the challenges brought by population aging.*

Keywords: *basic medical insurance for employees; financing; treatment; fairness*

1. Introduction

One of the goals of the medical security industry is to build fair medical insurance. It is necessary to narrow the financing and treatment gap in basic medical insurance between regions to make medical security more equitable and inclusive. Due to various factors such as economic development level, population structure, and distribution of medical resources, various regions in our country have different financing and benefits of basic medical insurance, which has affected the fairness of basic medical insurance to a certain extent. This article analyzes the income and expenditures of basic medical insurance for employees in various regions of Guangdong Province to evaluate the fairness of basic medical insurance for employees in Guangdong Province.

2. Literature review

2.1. Research on the fairness of medical security

The financing and benefits of basic medical insurance will affect its fairness. Xie 'er (2009) conducted an empirical study on the fairness of the utilization of medical and health services in my country. The results showed that high-income groups in my country enjoy more medical services, basic medical insurance shows a "pro-rich" phenomenon, and the health level of high-income groups is also relatively higher [1]. Lagomarsinoetal(2012) An analysis of the progress of medical insurance reform in nine low-income and lower-middle-income countries in Africa and Asia was conducted. The study pointed out that there is a significant gap between rich and poor in underdeveloped countries, and medical insurance reform should pay more attention to fairness [2]. Yu Xiao (2013) pointed out that my country's medical

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security system presents the characteristics of a "multi-track system", and there are large gaps in terms of treatment and financing among various systems, which seriously affects the fairness of the system [3]. Gu Xin (2017) pointed out that China's medical insurance system shows the characteristics of "fragmentation", mainly due to the significant differences in medical insurance systems in different regions, and the significant differences in the operation and management of medical insurance, which ultimately leads to medical insurance across regions and groups. Unfairness [4].

2.2. Research on Equity in Financing

The fairness of basic medical insurance financing has always been an important issue of concern to scholars. A fair financing mechanism is conducive to improving the sustainability of the medical insurance system and reducing social injustice. Financing fairness includes vertical fairness and horizontal fairness. He Wenjiong (2013) pointed out that vertical equity means that families with different incomes and different financial capabilities should enjoy different levels of financing, while horizontal equity means that workers should pay the same medical expenses regardless of their occupation or status as long as their income levels are the same [5]. Fu Hailong and Chen Wenwen (2023) analyzed that the provincial-level coordination model with relative horizontal fairness and vertical fairness is more suitable for provinces with large differences between prefectures and cities [6]. Rostampour and Nosratnejad(2020) examined relevant indicators in low-and middle-income countries and evaluated the medical financing system, and concluded that the insurance system is the most effective financing method to achieve equity in medical services [7]. Shi Tao et al.(2022) used the Thiel Index to measure the fairness of medical insurance financing levels for residents in Shandong Province [8]. Zhao Ying and Wang Zongfan (2023) put forward specific suggestions to improve the fairness of basic medical insurance through research on employee medical insurance financing policies to avoid "reverse" redistribution caused by medical insurance financing [9].

2.3. Research on fairness of treatment

Existing research shows that the fairness of medical insurance financing and treatment has attracted widespread attention from scholars. Zhou Qin and Liu Guoen (2016) pointed out that the medical insurance reimbursement level of floating population is significantly lower than that of local registered residents [10]. Wang Zhen (2022) found that there are significant regional differences in the raising, benefits and balances of basic medical insurance funds for employees, and proposed the need to build a national fund adjustment system to promote balanced development [11]. He and Sato (2013) conducted a study on the use of basic medical insurance in China. The results showed that higher-income groups in urban areas have obvious advantages in terms of medical insurance benefits, while basic medical insurance failed to significantly reduce the difference in hospitalization burden between urban and rural areas [12]. Alvarez and El-Sayed (2017) analyzed the per capita GDP of 35 low-and middle-income countries, and used the Gini coefficient and multiple regression model to evaluate the implementation effect of universal medical insurance. They found that the fairness of medical insurance benefits is affected by the country's economic level and the gap between rich and poor. Among them, middle-income countries generally perform poorly in terms of fairness and efficiency of medical care [13]. Jin Shuanghua (2020) found that there are significant benefit differences in the medical insurance system. Low-income groups not only have poor health conditions, but also have significantly lower medical insurance compensation levels than high-income groups [14].

To sum up, regarding the research on the fairness of medical insurance financing and treatment, scholars mainly focus on the fairness of medical insurance financing, treatment and medical service utilization among different groups of people, but the fairness of the single medical insurance system among different regions Research is still insufficient. Based on existing research, this paper takes 21 prefecture-level cities in Guangdong Province as research objects, and systematically analyzes the fairness of basic medical insurance financing and treatment for employees in each prefecture-level city, which has important research value and practical significance.

3. Research objects and methods

One of the goals of the medical security industry is to build fair medical insurance. It is necessary to narrow the financing and treatment gap in basic medical insurance between regions to make medical security more equitable and inclusive. Due to various factors such as economic development level, population structure, and distribution of medical resources, various regions in our country have different

ISSN 2616-5902 Vol. 7, Issue 4: 57-65, DOI: 10.25236/AJBM.2025.070407

financing and benefits of basic medical insurance, which has affected the fairness of basic medical insurance to a certain extent. This article analyzes the income and expenditures of basic medical insurance for employees in various regions of Guangdong Province to evaluate the fairness of basic medical insurance for employees in Guangdong Province.

3.1. Definition of research objects

Taking the basic medical insurance system for employees as the research object, 21 prefecture-level cities in Guangdong Province are divided into four major regions: the Pearl River Delta region, northern Guangdong, western Guangdong, and eastern Guangdong based on geographical location and economic development level. Among them, the Pearl River Delta region includes Huizhou, Guangzhou, Dongguan, Shenzhen, Zhaoqing, Foshan, Zhongshan, Zhuhai, and Jiangmen; the northern Guangdong region includes Qingyuan, Shaoguan, Heyuan, Meizhou, and Yunfu; the western Guangdong region includes Maoming, Zhanjiang, and Yangjiang; and the eastern Guangdong region includes Chaozhou, Jieyang, Shantou, and Shanwei.

3.2. Determination of Evaluation Indicators and Data Sources

This paper aims to evaluate the fairness of basic medical insurance for employees in Guangdong Province, and analyzes it from two aspects: financing and treatment. Two key indicators were selected: per capita medical insurance fund income and per capita medical insurance fund expenditure.

The data in this article comes from the "Guangdong Statistical Yearbook" and statistical bulletins published by the official websites of medical security bureaus in Guangdong Province, and selects the number of employees participating in basic medical insurance and fund income data from 2019 to 2022.

3.3. Research Methods

This paper uses the Gini coefficient and the Thiel index to respectively calculate the fairness of per capita financing and per capita expenditure of basic medical insurance funds for employees across Guangdong Province from 2019 to 2022. The Theil index is an important indicator for assessing the degree of inequality in income distribution. It can decompose differences between different sample groups. However, the Thiel index also has certain limitations. It cannot provide the distribution of income gaps within specific groups. The advantage of the Gini coefficient is that it can clearly identify income gaps at different levels and reflect the degree of unfairness of different groups. Therefore, this paper uses these two methods for comprehensive calculation.

3.3.1. Gini Coefficient and Its Decomposition

The Gini coefficient and its decomposition are commonly used methods to measure regional differences. In this paper, the overall Gini coefficient G, intra-regional Gini coefficient G_{jj} and inter-regional Gini coefficient G_{jh} are calculated based on the four major regions of the Pearl River Delta, eastern Guangdong, western Guangdong, and northern Guangdong. The calculation formula is as follows;

$$G = \frac{\sum_{j=1}^{k}\sum_{h=1}^{k}\sum_{i=1}^{nj}\sum_{r=1}^{nk}|y_{ji}-y_{hr}|}{2n^2\bar{y}} \tag{1}$$

$$G_{jj} = \frac{\frac{1}{2\bar{y}}\sum_{i=1}^{nj}\sum_{r=1}^{nj}|y_{ji}-y_{ir}|}{n_j^2} \tag{2}$$

$$G_{jh} = \frac{\sum_{i=1}^{nj}\sum_{r=1}^{nj}|y_{ji}-y_{hr}|}{n_j n_h(\overline{y_j}+\overline{y_h})} \tag{3}$$

Where, k represents the number of regions; n represents the number of prefecture-level cities; $\bar{y}$ represents the average income or expenditure of medical insurance funds in each prefecture-level city, $\overline{y_j}(\overline{y_h})$ represents the average income or expenditure of medical insurance funds in j(h) area; $\overline{y_{ji}}(\overline{y_{hr}})$ represents the income or expenditure level of i(r) cities in j(j) area. See Table 1 for the Gini coefficient and regional equilibrium (fairness) evaluation grade criteria.

Table 1: Gini coefficient and regional equilibrium (fairness) evaluation level classification criteria

Gini coefficient	(0≤G<0.2)	(0.2≤G<0.3)	(0.3≤G<0.4)	(0.4≤G<0.5)	(0.5≤G<0.1)
Evaluation grade	Fair	Slightly fair	Threshold	Slightly unfair	Unfair

ISSN 2616-5902 Vol. 7, Issue 4: 57-65, DOI: 10.25236/AJBM.2025.070407

3.3.2. Theil's Index and Its Decomposition

The Theil Index is an important tool for measuring income gaps between individuals or regions, and is also a common analytical method for assessing regional differences. The larger the index value, the higher the degree of regional differences and the weaker the fairness; conversely, if the index is smaller, it means that the regional differences are smaller and the fairness is better [11]. This study uses the Theil Index to analyze the differences in basic medical insurance financing and benefits for employees within and between regions in Guangdong Province, and calculates the overall differences, intraregional differences, interregional differences and their related contribution rates in Guangdong Province.

$$T = \frac{1}{P}\sum_{q=1}^{p}\frac{S_q}{\bar{y}}\ln(\frac{S_q}{\bar{y}}) \tag{4}$$

$$T_p = \frac{1}{P}\sum_{q=1}^{p}\frac{S_{pq}}{\bar{y}}\ln(\frac{S_{pq}}{\bar{y}}) \tag{5}$$

$$T = T_w + T_b = \sum_{p=1}^{4}(\frac{k_p}{k}\times\frac{\bar{S}_p}{\bar{S}}\times T_p) + \sum_{p=1}^{4}(\frac{k_p}{k}\times\frac{\bar{S}_p}{\bar{S}}\times\ln\frac{\bar{S}_p}{\bar{S}}) \tag{6}$$

$$\text{Contribution rate of intra-regional differences} = T_w / T \tag{7}$$

$$\text{Contribution rate of regional differences} = T_b / T \tag{8}$$

In formula (4), T represents the overall difference in the income and benefits expenditures of basic medical insurance funds for employees in Guangdong Province, and the value is in [0,1], reflecting the size of regional differences. The lower the value, the smaller the difference, and vice versa, the larger the difference. q represents prefecture-level cities, p represents the number of prefecture-level cities, S_q represents the level of medical insurance financing benefits of prefecture-level cities q, and $\bar{S}$ represents the average level of basic medical insurance financing benefits of employees in Guangdong Province. In formula (5), T_p represents the overall difference Theil index of region p, k_p represents the number of prefecture-level cities in region p, S_{pq} represents the financing treatment level of prefecture-level cities q in region p, and $\bar{S}_p$ represents the average financing treatment level of region p. In formula (6), the overall difference in the level of financing benefits is further decomposed into the intra-regional difference Theil index Tw and the inter-regional difference Theil index Tb. In addition, in equations (7) and (8), T_w/T and T_b/T are defined as the contribution rates of intra-regional differences and inter-regional differences to the overall difference respectively. The source factors of the differences in employee financing benefits in various prefecture-level cities in Guangdong Province can be explained through the contribution rates. $(S_p/S) \times (T_p/T)$ is the contribution rate of each region to the overall difference within the region, S_p represents the sum of the financing or treatment levels of various prefecture-level cities within region p, and S represents the sum of the financing or treatment levels of Guangdong Province.

4. Results and Analysis

4.1. Overview of per capita financing and per capita expenditure of basic medical insurance for employees in Guangdong Province

4.1.1. Per capita financing of employee basic medical insurance funds in various prefecture-level cities from 2019 to 2022

Table 2: Per capita financing of basic medical insurance for employees in the four major regions of Guangdong Province from 2019 to 2022 (unit: yuan)

Regional	2019	2020	2021	2022
Pearl River Delta	3024.57	3244.16	2196.21	2419.98
Eastern Guangdong	2506.75	2820.18	2048.94	2473.98
Western Guangdong	3770.77	3873.59	2957.58	2568.61
Northern Guangdong	3208.87	3710.15	2396.24	2582.97

Note: Per capita fundraising amount = total income from basic medical insurance fund for employees/number of employees participating in basic medical insurance. Data source: Calculated based on data from the 2019-2022 Guangdong Statistical Yearbook.

Judging from the per capita financing of each region in Table 2, the per capita financing of the economically underdeveloped eastern, western and northern Guangdong regions is higher than that of the economically developed Pearl River Delta region. From the perspective of time development, per capita financing in various regions is generally on an upward trend, but negative growth occurred in 2020. This may be due to the impact of the epidemic, the government's implementation of short-term

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exemptions and phased premium reduction policies, and the growth rate of per capita contributions after 2021 shows a slowdown trend.

It can be seen from Table 3 that during the period from 2019 to 2022, the ratio of per capita financing of employee basic medical insurance funds to per capita GDP in the four major regions of Guangdong Province generally fluctuated, indicating that the burden of basic medical insurance payment for employees has generally decreased. When comparing regions, this proportion in the Pearl River Delta region is always lower than that in non-Pearl River Delta regions, indicating that in the Pearl River Delta region, the burden of basic medical insurance payment for employees is relatively light.

Table 3: Per capita financing of basic medical insurance for employees in the four major regions of Guangdong Province from 2019 to 2022 (unit: yuan)

Regional	2019	2020	2021	2022
Pearl River Delta	2.66%	2.82%	1.71%	1.81%
Eastern Guangdong	5.92%	6.57%	4.33%	5.14%
Western Guangdong	7.79%	7.89%	5.35%	4.46%
Northern Guangdong	8.22%	9.01%	5.26%	5.59%

Note: Per capita GDP= GDP/permanent population; GDP and permanent population data are from Guangdong Statistical Yearbook

4.1.2. Per capita expenditure of basic medical insurance funds for employees in each prefecture level city in 2022

Due to the lack of data in Huizhou City, this article only collects the expenditures of medical insurance funds in 20 other cities in Guangdong Province in 2022. It can be seen from Table 4 that the city with the highest per capita expenditure of basic medical insurance funds for employees is Guangzhou City, and the lowest is Zhongshan City. From a regional perspective, per capita expenditure in the Pearl River Delta region varies greatly. There is little difference in per capita expenditure in eastern Guangdong, western Guangdong and northern Guangdong.

Table 4: Per capita expenditure of basic medical insurance funds for employees in some cities in Guangdong Province in 2022

Regional	Prefecture-level cities	Number of insured persons (ten thousand)	Total expenditure (ten thousand yuan)	Per capita expenditure (yuan)
Pearl River Delta	Guangzhou	908.67	5726600	6302.18
	Shenzhen	1337.62	3751600	2804.68
	Zhuhai	175.87	630750	3586.46
	Dongguan	587.59	1199097	2040.7
	Fushan	449.07	1259324	2804.29
	Zhongshan	217.98	297424.29	1364.46
	Jiangmen	178.81	338000	1890.27
	Zhaoqing	90.6	285100	3146.8
Eastern Guangdong	Shantou	91.68	334883	3652.74
	Chaozhou	32.53	104400	3209.35
	Jieyang	27.01	77571	2871.94
	Shanwei	25.54	91653.12	3588.61
Western Guangdong	Yangjiang	37.02	108300	2925.45
	Zhanjiang	96.69	407242.06	4211.83
	Maoming	61.4	265700	4327.36
Northern Guangdong	Qingyuan	85.95	293413.63	3413.77
	Yunfu	31.23	104673	3351.68
	Meizhou	58.22	215400	3699.76
	Shaoguan	68.71	297424.29	4328.69
	Heyuan	52.55	178400	3394.86

Note: Per capita expenditure = employee basic medical insurance fund expenditure/employee basic medical insurance participants. Data source: Data compiled from the official websites of medical security bureaus of various cities in Guangdong Province.

ISSN 2616-5902 Vol. 7, Issue 4: 57-65, DOI: 10.25236/AJBM.2025.070407

4.2. Fairness analysis based on Dagum Gini coefficient

4.2.1. Gini coefficient of per capita financing of basic medical insurance for employees in Guangdong Province

The data in Table 5 are calculated according to equations (1), (2), (3). The results show that the overall difference in the per capita funding level of basic medical insurance for employees in Guangdong Province is shrinking, from 0.176 in 2019 to 0.128 in 2022. In terms of regions, the Gini coefficient of the Pearl River Delta region is slightly higher than the overall Gini coefficient of the province, and the internal differences are large. Regional differences show a trend of narrowing first and then expanding. The Gini coefficients in eastern Guangdong, western Guangdong and northern Guangdong are lower than the overall Gini coefficient of the province. The internal differences in eastern Guangdong and western Guangdong show a trend of expanding first and then shrinking, and the internal differences in northern Guangdong show a trend of continuing to expand. Among the four major regions, western Guangdong has the smallest internal differences. In terms of inter-regional differences, there are small differences in per capita financing levels among regions. Judging from the average Gini coefficient among various regions, there is a large difference between the Pearl River Delta and the eastern Guangdong region, with the Gini coefficient between groups being 0.182. The difference between northern Guangdong and western Guangdong regions is the smallest, with the Gini coefficient being 0.089.

Table 5: Gini coefficient of per capita financing of basic medical insurance for employees in Guangdong Province from 2019 to 2022 and its decomposition results

		2019	2020	2021	2022	mean
Overall Gini coefficient		0.176	0.175	0.145	0.128	0.156
Intra-group Gini coefficient	PRD	0.238	0.225	0.146	0.158	0.192
	EG	0.119	0.126	0.131	0.055	0.108
	WG	0.046	0.055	0.093	0.022	0.054
	NG	0.053	0.072	0.092	0.109	0.082
Gini coefficient between groups	PRD& EG	0.232	0.205	0.15	0.14	0.182
	PRD &NG	0.167	0.194	0.152	0.159	0.168
	PRD& WG	0.19	0.192	0.192	0.14	0.179
	EG & NG	0.174	0.184	0.124	0.099	0.145
	EG & WG	0.218	0.182	0.163	0.052	0.154
	NG & WG	0.072	0.069	0.116	0.099	0.089

Note: PRD: Pearl River Delta; EG: Eastern Guangdong; WG: Western Guangdong;NG: Northern Guangdong.

4.2.2. Gini coefficient of per capita expenditure on basic medical insurance for employees in Guangdong Province

Table 6: Gini coefficient of per capita expenditure on basic medical insurance for employees in Guangdong Province in 2022 and its decomposition results

Overall	intra-group Gini coefficient				Gini coefficient between groups					
	PRD	EG	NG	WG	PRD& EG	PRD& NG	PRD& WG	EG& NG	EG& NG	NG& WG
0.159	0.242	0.051	0.050	0.082	0.184	0.202	0.223	0.064	0.108	0.090

Note: PRD: Pearl River Delta; EG: Eastern Guangdong; WG: Western Guangdong; NG: Northern Guangdong.

The data in Table 6 are calculated according to formulas (1), (2), (3). Overall, the Gini coefficient of the per capita expenditure of the basic medical insurance fund for employees in Guangdong Province is less than 0.2, and fairness is in an ideal state. In terms of regions, the Pearl River Delta region has the largest internal differences, but it is still in a relatively fair state, with a Gini coefficient of 0.242. Northern Guangdong has the smallest internal difference, only 0.050. Judging from the Gini coefficient among regions, there are large differences between the Pearl River Delta region and the other three regions, with the largest difference between the Pearl River Delta and Western Guangdong, with the Gini coefficient reaching 0.223.

4.3. Fairness analysis based on Theil index

4.3.1. Thiel Index of Per Capita Financing of Basic Medical Insurance for Employees in Guangdong Province

Table 7 reports the Thiel index and contribution rate of the financing level of basic medical insurance for employees in the four major regions. In terms of overall differences, the Thiel index dropped from

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0.11 in 2019 to 0.0311, indicating that the overall difference in the financing level of basic medical insurance for employees in Guangdong Province is narrowing. By comparing the Theil index and contribution rate between regions and within regions, it is found that the contribution rate of intraregional differences is greater than the contribution rate of interregional differences, indicating that the overall difference in per capita financing of basic medical insurance for employees in Guangdong Province mainly comes from intraregional differences. Judging from the further decomposition results of intra-regional differences, the Pearl River Delta region has the largest difference and contribution rate from 2019 to 2022, exceeding 90%. The intra-regional differences in the northwest and eastern Guangdong are much smaller than those in the Pearl River Delta region. Therefore, the issue of simultaneous development in the Pearl River Delta region needs urgent attention.

Table 7: Thiel Index and Contribution Rate of Financing Level of Basic Medical Insurance for Employees in Guangdong Province from 2019 to 2022

year	Overall Thiel index	Regional differences and contribution rates	Intra-regional differences and contribution rates				
			Overall	PRD	EG	NG	WG
2019	0.11(1.55)	0.0017(98.45)	0.1083(86.61)	0.1234(86.61)	0.031(2.99)	0.005(5.84)	0.0035(4.56)
2020	0.0962(1.56)	0.0015(98.44)	0.0947(86.22)	0.1077(86.22)	0.031(3.08)	0.0102(6.29)	0.0049(4.41)
2021	0.0491(4.48)	0.0022(95.52)	0.0469(84.8)	0.0517(84.8)	0.0241(3.4)	0.0199(6.83)	0.017(4.97)
2022	0.0311(0.64)	0.0002(99.36)	0.0309(85.6)	0.0343(85.6)	0.0057(3.69)	0.0192(6.47)	0.001(4.23)

Note: The values in brackets are contribution rates, in %. PRD: Pearl River Delta; EG: Eastern Guangdong; WG: Western Guangdong; NG: Northern Guangdong.

4.3.2. Thiel Index of Per capita Expenditure of Basic Medical Insurance Fund for Employees in Guangdong Province

Table 8: Thiel Index and Decomposition of Per Capita Expenditure of Basic Medical Insurance Fund for Employees in Guangdong Province in 2022

Overall Thiel index	Regional differences and contribution rates	Intra-regional differences and contribution rates				
		Overall	PRD	EG	NG	WG
0.0911	0.0007(0.77)	0.0904(99.23)	0.1059(84.47)	0.0037(3.81)	0.0052(6.82)	0.0093(4.89)

Note: The values in brackets are contribution rates, in %. PRD: Pearl River Delta; EG: Eastern Guangdong; WG: Western Guangdong; NG: Northern Guangdong.

It can be seen from Table 8 that the gap in per capita expenditure of basic medical insurance funds for employees in Guangdong Province mainly comes from intra-regional differences, and intra-regional differences mainly come from differences in the Pearl River Delta region. The gap between prefecture-level cities in the Pearl River Delta region is the largest among the four regions. The fairness among prefecture-level cities in eastern Guangdong is the best. The Thiel index in northern and western Guangdong is in the middle, which is consistent with the above Gini coefficient. The analysis results are consistent.

5. Discussion and suggestions

5.1. Discussion on the fairness of financing for basic medical insurance for employees in Guangdong Province

From the perspective of the whole province, the Gini coefficient and Thiel index of the per capita income collected from basic medical insurance for urban employees in Guangdong Province from 2019 to 2022 are both below 0.2, and the fairness of fund financing in various prefecture-level cities has been in a relatively ideal state. In terms of sub-regions, the gap in financing levels within and between regions in eastern Guangdong, western Guangdong and northern Guangdong from 2019 to 2022 is small, but the differences within the Pearl River Delta region are large, indicating that the Pearl River Delta region is more equitable than that in other regions. Poor. Moreover, the Gini coefficients between the Pearl River Delta region and the other three regions are all large, indicating that there is a large gap in financing levels between the Pearl River Delta region and other regions. The fairness of medical insurance in the Pearl River Delta region is relatively poor, largely because the economic development level of various cities in the Pearl River Delta is uneven. The economic development level of leading cities such as Guangzhou and Shenzhen is much higher than that of other cities.

ISSN 2616-5902 Vol. 7, Issue 4: 57-65, DOI: 10.25236/AJBM.2025.070407

5.2. Discussion on the fairness of basic medical insurance benefits for employees in Guangdong Province

Both the Theil Index and the Gini Coefficient indicate that the fairness of per capita expenditure on basic medical insurance for employees in Guangdong Province is in an ideal state. The differences in per capita expenditure within and among regions of eastern Guangdong, western Guangdong, and northern Guangdong are relatively small. This may be because these regions have relatively close economic levels and relatively consistent medical service levels and population structures. The intra-regional differences in the Pearl River Delta region are greater than those in the other three regions, and the intra-regional differences in the Pearl River Delta region are the main reason for the overall differences. Analysis of raw data shows that the per capita expenditure level of basic medical insurance for employees in the Pearl River Delta region is relatively high. The per capita expenditure level of basic medical insurance for employees in Guangzhou City is much higher than that of other cities. This difference may be due to the high level of economic development in Guangzhou City, with medical facilities, medical technology, and staffing ranking among the top in the province, so medical expenses are relatively high. In addition, it can also be seen from the raw data that the per capita expenditure on basic medical insurance for employees in economically developed Shenzhen is much lower than that of some cities in eastern and western Guangdong. This may be because Shenzhen is a very young city and the majority of employees are young people, which also indirectly reflects the impact of population aging on medical insurance fund expenditures.

5.3. Suggestions on improving the fairness of basic medical insurance for employees in various regions of Guangdong Province

5.3.1. Promote provincial-level coordination of basic medical insurance for employees in Guangdong Province in an orderly manner

The basic medical insurance for employees in Guangdong Province is generally fair and has a certain provincial-level coordination foundation. Provincial coordination should aim to improve the efficiency of fund use and reduce systemic risks. The contribution base should be scientifically determined, the level of financing should be compatible with the level of economic development, and the setting of financing standards should comprehensively consider the proportion of individual contributions in the regional GDP, the income level of employees, and the level of economic development of the region. It is necessary to formulate reasonable provincial-level coordination policies, formulate regionally differentiated payment standards, and take into account efficiency while fairness. At the same time, it is necessary to strengthen the management and supervision of provincial-level pooled funds to ensure the safe operation of the funds.

5.3.2. Bridging regional economic development gaps and promoting equitable development of medical insurance

Focus on the coordinated development of regional economies. First, narrow the economic development gap between cities in the Pearl River Delta region and promote balanced economic development within the region, thereby promoting the fairness of medical insurance in the Pearl River Delta region. The government should optimize the top-level design of regional development, strengthen the coordinated development mechanism of cities in the Pearl River Delta region, guide and optimize resource allocation through policies, improve urban transportation infrastructure construction, enhance exchanges and cooperation between different cities, and provide for the free flow of economic factors Create good conditions and promote industrial complementarity and resource sharing between cities. Secondly, it is necessary to improve the economic development level of eastern, western and northern Guangdong, narrow the medical insurance gap between these regions and the Pearl River Delta region, thereby promoting the fairness of basic medical insurance for employees in the province. The governments of eastern, western and northern Guangdong should transform the mode of economic development and improve the level of regional economic development according to local conditions. In addition, it is necessary to promote inter-regional strategic cooperation, so that regions rich first drive regions rich later, narrow economic development gaps, and promote common prosperity. By narrowing the differences in economic development levels between cities within the region and between regions, we will improve the fairness of basic medical insurance for employees in the province.

5.3.3. Actively respond to the challenges brought by population aging

As my country's population aging intensifies, the medical needs of the elderly population continue to

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rise, putting dual pressure on the financing and expenditure of basic medical insurance for employees. In order to deal with this pressure, the following three measures can be taken. The first is to broaden the channels for fund raising, such as increasing government financial subsidies and increasing charitable donations. The second is to strengthen the supervision of medical insurance funds and improve the efficiency of fund use. The third is to appropriately delay the retirement age and establish a lifelong payment system for basic medical insurance for employees, thereby increasing the income of the fund.

6. Conclusions

The Thiel Index and Gini Coefficient are used to calculate the financing and expenditures of basic medical insurance funds for employees in various regions of Guangdong Province. It is found that the fairness of the financing and benefits of basic medical insurance for employees in Guangdong Province has been in a relatively ideal state among various regions. Second, the fairness of medical insurance financing and treatment in the Pearl River Delta region is worse than that in eastern Guangdong, western Guangdong and northern Guangdong. The main reason is that the economic development level of cities in the Pearl River Delta region is more uneven. Therefore, it is necessary to narrow the economic development gap among cities in the Pearl River Delta region and promote balanced economic development in the region. Third, medical insurance fund expenditures in some economically underdeveloped cities such as eastern Guangdong and western Guangdong are higher than those in economically developed cities, mainly due to population aging. Therefore, corresponding measures must be introduced to actively respond to the aging of the population.

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