

Study on the Economic Security Evaluation of Healthy Life in Yangtze River Delta Cities

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Keywords: Yangtze River Delta, healthy life, economic security, evaluation index

Abstract. Based on the impact of economic security on urban healthy life, the evaluation index system of economic security for healthy life is constructed. The degree of economic security for residents' healthy life in 26 cities of the Yangtze River Delta is comprehensively analyzed by using expert scoring method and linear weighting method. The evaluation results show that there are more cities with higher level of health economic life security in the Yangtze River Delta, which are concentrated in Jiangsu, Zhejiang and Shanghai. With the distance between other cities and Shanghai increasing, the level of economic life security has gradually decreased. The high level of economic foundation of cities in the Yangtze River Delta region provides a good guarantee for the healthy life of the region. At the same time, the imbalance of economic development among cities in the Yangtze River Delta region still exists to a certain extent, and there is still a certain gap in economic development among cities.

1. Introduction

The Yangtze River Delta area with Shanghai as its core is a relatively developed area in China, and the people's living standard is also a bit higher than other areas. This paper evaluates the healthy life of cities in the Yangtze River Delta from the perspective of economic security, analyses the impact of economic security on the healthy life of these cities, puts forward suggestions and measures to promote the healthy life index of cities, improves the coordination and balance between economic development and healthy life, and promotes the healthy development of urban life in the Yangtze River Delta region.

2. Research status at home and abroad

With the rapid development of economy and the acceleration of urbanization, since the late 1990s, more and more attention has been paid to urban health and the health of urban residents. The research on relevant evaluation index system and methods has become a hot topic[4-10]. However, there is still no unified and authoritative evaluation standard.

In 2005, the Beijing Institute of International Urban Development released the Report on the Quality of Life in Chinese Cities at the Beijing Summit of the China Urban Forum. According to the key factors affecting the quality of urban life: clothing, food, housing, transportation, life, old age, disease, death, security, housing, entertainment and industry, the report constructs a comprehensive index including 12 subsystems - "China's urban quality of life index", and carries out a comprehensive evaluation of the quality of urban life in China.

Ruan Shiman (2015)[9], Wu Zhanyun (2015)[10], Xu Yan (2016)[11] and other domestic researchers have studied the health economic indicators in different degrees from the perspective of healthy urban development and combined with the specific practice of healthy urban construction in different regions. These indicators also include GDP, disposable income of urban residents, energy consumption per unit GDP and other economic indicators to reflect the indirect impact of the establishment of national health cities on the economy.

3. Establishment of Evaluation Index System for Economic Guarantee of Healthy Life

Based on the selection of quantitative indicators for evaluating the economic security of residents' healthy life, referring to the relevant evaluation indicators at home and abroad, and considering the actual situation of the Yangtze River Delta region, this paper evolves two categories of indicators from the perspective of economic security. Among them, the first indicator: economic basis; the second indicator: living consumption. On this basis, an index system for evaluating the economic security of residents' healthy life is established, which consists of two levels of indicators. A total of 9 indicators are selected.

The above nine indicators are summarized according to the first and second indicators, and the evaluation index system of health life security is established. The weights of each indicator are determined by expert meeting method. More than 20 experts in related fields are invited. After the first round of scoring, the average weights are fed back to the second round of scoring, so the weights tend to be stable after three rounds (as shown in Table 1).

Table 1 Evaluation Index System of Economic Guarantee for Healthy Life.

First-level indicators	weights	second-level indicators	weights
Economic Basis	0.543	Per capita GDP	0.250
		Per capita Disposable Income	0.410
		Per capita Savings	0.340
Consumption	0.457	Per capita Housing Area	0.280
		Per capita Domestic Water Consumption	0.170
		Per capita Electricity Consumption	0.130
		Per capita gas consumption	0.090
		Per capita household consumption of liquefied petroleum gas	0.100
		Per capita total retail sales of social consumption	0.230

4. The Evaluation Method of the Economic Security of Healthy Life

In fact, the economic security evaluation index system of healthy life proposed in this paper is a multi-attribute evaluation, and the result essentially reflects the overall level of the evaluation object which contains several evaluation indexes. In order to sum up some indexes, there are only two common methods: first, direct addition, which is additive synthesis; second, calculating the distance from the evaluation object to the origin, which is Euclidean distance, which is square average synthesis, which is a special form of multiplier synthesis. The specific calculation methods are as follows:

Set indexes as $Z_1, Z_2 \dots Z_m$ and their weights as $\omega_1, \omega_2 \dots \omega_m$. When evaluating, firstly standardize the evaluation indexes to ensure that the maximum value is 1 or 100. The forward indicator standardization method can adopt the method of dividing the index value by the maximum value, that is:

$$X_{ij} = \frac{Z_{ij}}{\max(Z_{ij})} \tag{1}$$

See the standardized formula proposed by Yu Liping and Pan Yuntao (2009) for the reverse indicator standardization method:

$$X_{ij} = 1 - \frac{Z_{ij}}{\max(Z_{ij})} + \left\{ 1 - \max \left[x - 1 - \frac{Z_{ij}}{\max(Z_{ij})} \right] \right\} \tag{2}$$

Formula (2) is a linear transformation compared with the traditional inverse indicator, which will not destroy the original data distribution of the reverse indicator.

Then the evaluation value of traditional additive synthesis is:

$$C_i^+ = \omega_1 X_{i1} + \omega_2 X_{i2} + \dots + \omega_m X_{im} \quad (3)$$

Linear weighted evaluation method is not a kind of evaluation method, but a kind of evaluation method. The difference mainly depends on the different valuation methods of weight, such as expert meeting method, analytic hierarchy process, entropy weight method, complex correlation coefficient method, variation coefficient method and so on.

If square average synthesis is adopted, then:

$$C_i^x = \sqrt{\omega_1 X_{i1}^2 + \omega_2 X_{i2}^2 + \dots + \omega_m X_{im}^2} \quad (4)$$

For the evaluation of economic security index, we mainly adopt linear weighting method and expert meeting method.

5. Evaluation Results of Economic Security for Healthy Life of Urban Agglomerations in the Yangtze River Delta

In this paper, 26 cities of the Yangtze River Delta urban agglomeration are selected as the research objects. According to the index system listed in Table 1 and the final weight determined, the relevant evaluation data of healthy life economic security are selected to improve the level of healthy life economic security of 26 cities.

From the evaluation results, the average score of the economic security level of healthy life in 26 cities of the Yangtze River Delta is 31.07, and 14 cities' economic security level of healthy life exceeds the average score, more than half of the total. The top 10 cities are mainly concentrated in Jiangsu, Zhejiang and Shanghai, while only one city in Anhui Province has entered the top 10, ranking 10th. From the ranking, we can see that the gap between the top five cities is very small, Shanghai scored the highest, up to 45.37 points; the second Ningbo city, up to 44.11 points. The difference between the first and the second is 1.26 points. After that, the gap between the third, fourth and fifth places decreased by an average of about 1 point. However, the gap between the sixth and fifth place was 4.87 points, and then decreased by an average of about 1 point. Xuancheng City in Anhui Province scored the lowest, only 15.99, a huge gap of 29.38 points between Shanghai and Xuancheng City.

It can be seen that in the Yangtze River Delta, there are more cities with higher level of health, economic and living security, which are concentrated in Jiangsu and Zhejiang areas with Shanghai as the core. At the same time, it can be seen that with the increase of distance between other cities and Shanghai, the level of economic and living security gradually decreases.

5.1 Analysis of Basic Economic Indicators

In the secondary index of economic foundation, the average score of per capita disposable income is the highest at 75.52, followed by per capita GDP (51.98), and the minimum is the annual balance of per capita savings (43.81) (Figure 1). In the Yangtze river delta city, the overall economic level is higher, but the economic class of wealthy people keen on investment rather than saving again. But the vast majority of residents in addition to maintain daily living expenses, in the pursuit of high quality life, culture, leisure, education, medical and other expenses are on the increase. Spending increase makes residents did not have too much to save. In terms of per capita GDP, although the total GDP of Shanghai, Suzhou and other cities is very high, due to the high population density, per capita GDP is also slightly lower. Generally speaking, the economic foundation of the Yangtze river delta region is at a high level, which provides a good guarantee for the healthy life of the region.

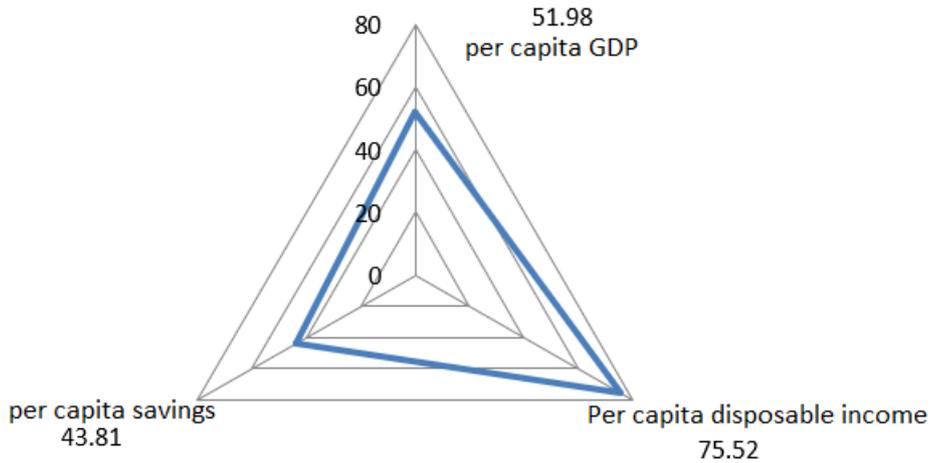


Fig. 1 The mean value of the second-level index

5.2 Analysis of Indicators of Life Consumption

As shown in Figure 2, the average of the secondary indicators of living consumption is 55.05 per capita, 54.69 per capita living water consumption, 54.08 per capita living electricity consumption and 53.129 per capita social consumption and retail sales. These indicators scored higher than other indicators, because the urban residents in the Yangtze River Delta had a higher disposable income, so they had the most basic guarantee of life, and spent more on housing, domestic electricity and consumption. The average scores of gas consumption per capita and LPG household consumption per capita were 41.619 and 20.58 respectively. On the one hand, because of the good economic foundation of the Yangtze River Delta region and the high popularity of gas for residents, the per capita consumption of liquefied petroleum is relatively low. At the same time, the per capita consumption of gas and liquefied petroleum gas for households decreases because of the increasing types of household appliances and the prolonged time of household appliances.

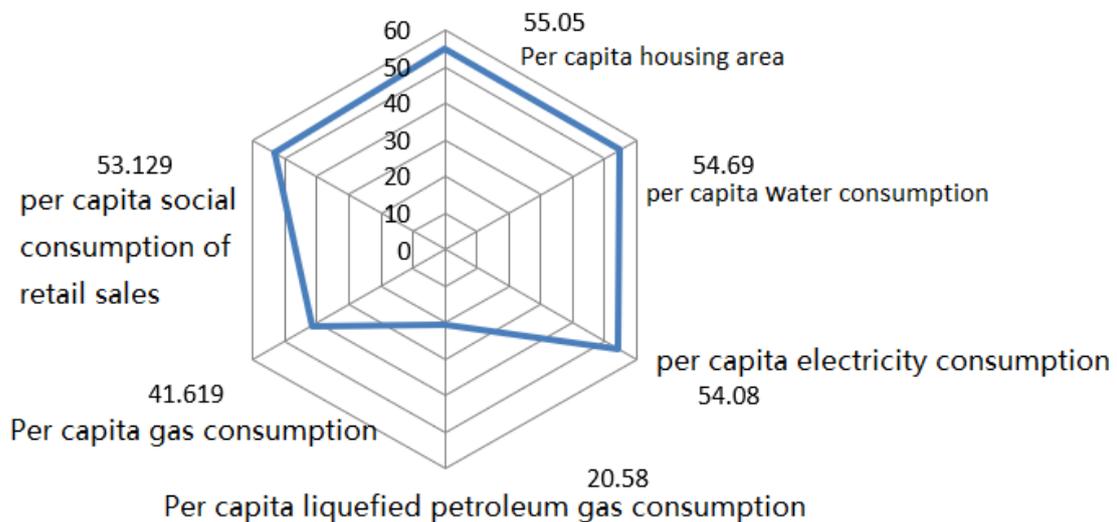


Fig. 2 The average of the secondary indicators of living consumption.

5.3 Analysis of the Gap between Cities

In order to analyze the disparity among different cities, the first step is to rank the indicators from low to high, and then calculate the percentage of the total value of the first 20% cities in the total value of all indicators, and get the disparity coefficient of the indicators. The bigger the index is, the smaller the gap between cities is. On the contrary, the smaller the index is, the bigger the gap between cities is.

Table 3 Coefficient of disparity between cities of the first and second indicators in the evaluation of economic security of healthy life.

First-level indicator	gap coefficient %	second-level indicator	gap coefficient%
Economic base	9.99	Per capita GDP	8.11
		Per capita disposable income	13.43
		Per capita end-of-year savings balance	8.44
Life expenditure	8.87	per capita housing area	11.47
		Water consumption per capita	9.13
		Per capita household electricity consumption	10.55
		Per capita gas consumption	4.97
		Per capita household consumption of LPG	8.39
		per capita social consumption of retail sales	8.73

From Table 3, we can see that the disparity coefficient of per capita disposable income is the largest among the three indicators of economic base, which is 13.43%. This shows that the disparity of per capita disposable income between cities in the Yangtze River Delta is relatively small, the income disparity between different cities has narrowed year after year, and the income distribution pattern has been further improved. The gap coefficients of GDP per capita and savings balance per capita at the end of the year are 8.11% and 8.44%, respectively. This shows that the imbalance of economic development among cities in the Yangtze River Delta region still exists, and there is still a certain gap in economic development among cities.

The gap coefficients of the six indicators in living consumption are not large, which indicates that there is a certain gap between the six indicators in different cities. The biggest regional disparity is the per capita gas consumption, the disparity coefficient is 4.97%. This is due to the differences in energy distribution in various cities. Some economically developed cities are beginning to build more and more natural gas pipelines, preparing to gradually replace gas and liquefied petroleum gas with natural gas, and the increasing use of electrical appliances, which makes the use of gas and natural gas in various cities have a big gap. The difference coefficients of LPG household consumption per capita and total retail sales per capita are 8.39% and 8.73%, respectively. The gap between cities is relatively small. The main reason is the difference of price level and income caused by the difference of regional economic development. The difference coefficient of per capita domestic water consumption is 9.13%. Generally speaking, the cities in the Yangtze River Delta are in the region with abundant water resources, and the gap is not large. The gap coefficient of per capita electricity consumption is 10.55%. Although the regional gap is not small, compared with other indicators, the gap between cities is relatively small. Electricity is an indispensable necessities for modern life. The gap of residential electricity consumption mainly comes from the quantity and time of electrical appliances, and the quantity and time of electrical appliances use are closely related to the income level of residents. The regional disparity of per capita housing area in the Yangtze River Delta region is the smallest, with a disparity coefficient of 11.47%. It shows that the overall level of urban economy in the Yangtze River Delta region is relatively high, and investment in housing is relatively balanced, with a small gap.

The gap coefficient of economic basis is 9.99%, and that of living consumption is 8.87%. The gap between cities with living consumption is larger. Because the degree of urban economic development in the Yangtze River Delta region is inconsistent. In the early stage of economic growth, with the rapid development of economy, the disposable income of residents will inevitably increase, but the consumption of residents is not all rational. When the income increases, the desire to buy will be enlarged, and the consumption of life will increase sharply at this stage. At this time, the gap between different residents' consumption of life will be enlarged. Only when the economic development reaches a certain stage, the government will use redistribution system to regulate and

rationalize consumption gradually, which will to some extent inhibit the expansion of residents' consumption gap.

6. Conclusion and suggestions

The city should not only be an economic entity pursuing economic growth efficiency, but also an ideal environment for improving human health. According to the evaluation data, there are many cities in the Yangtze River Delta with higher level of health economic life security, which are concentrated in Jiangsu and Zhejiang areas with Shanghai as the core. With the increase of distance between other cities and Shanghai, the level of economic life security has gradually decreased. Therefore, the cities with low level of economic security for healthy living are mainly concentrated in several cities in Anhui Province and Jiangsu Province. This point is also confirmed by the analysis of the gap coefficient between cities in this paper. Therefore, the imbalance of economic development among cities in the Yangtze River Delta region still exists to a certain extent, and there is still a certain gap in economic development among cities.

In the future, in order to improve the average level of healthy life index in the Yangtze River Delta region, we need to improve the level of economic security in these areas. Based on the previous research results, we put forward the following suggestions on improving the level of economic security:

(1) Formulating a strategic plan for promoting healthy life in regional cooperation

From all aspects of urban construction and development covered by urban healthy life, in order to promote the overall improvement of urban healthy living standards in the Yangtze River Delta region, it is necessary to adhere to planning guidance and formulate a strategic plan for the integrated and cooperative development of the Yangtze River Delta.

(2) Integrating resources, funds and technology to promote the economic security level of healthy life

From the perspective of economic security of healthy urban life, it is necessary to integrate the superior resources and elements in the Yangtze River Delta region, break through the local administrative division, formulate relevant policies to guide enterprises to gather in professional parks, realize the penetration and extension of key industrial chains, upgrade the overall level of industry, and form industrial clusters with rational division of labor, efficient innovation system and strong comprehensive competitiveness. The overall improvement of the regional economic base will increase the per capita GDP, disposable income and savings per capita.

(3) Optimizing the spatial layout that drives the further development and narrowing the gap of healthy living standards among cities

From the point of view of the gap of healthy urban life, we should optimize the deep development of the Yangtze River Delta Economic Zone in Shanghai, Jiangsu, Zhejiang and Anhui, optimize the regional spatial layout, and construct a fan-shaped spatial structure centered Shanghai. There are double relations of cooperation and competition among regions and within regions. To mobilize the enthusiasm of all parties, it is necessary to build a consultation platform, establish a benefit coordination mechanism, and narrow the gap of healthy living standards between cities.

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