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POLITICAL MANAGEMENT

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ОЦЕНКА ВОЗМОЖНОСТЕЙ ПРЕДОСТАВЛЕНИЯ УСЛУГ ПО УХОДУ ЗА ПОЖИЛЫМИ ЛЮДЬМИ*

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Аннотация. *Введение.* По мере старения населения во всем мире растет спрос на услуги по уходу за пожилыми людьми. В настоящем документе разработана комплексная система показателей оценки, основанная на трех аспектах: экономической безопасности, социальной защищенности и безопасности услуг.

Методология и методы. Используется метод энтропийного взвешивания с использованием TOPSIS для оценки возможностей предоставления услуг по уходу за пожилыми людьми на основе данных по Китаю.

Анализ. Результаты показывают, что провинции Цзянсу и Чжэцзян обладают мощным потенциалом для предоставления услуг пожилым людям. Экономически развитые провинции преуспевают в медицинском обслуживании и уходе за пожилыми людьми, а также в финансовой поддержке. Западным провинциям необходимо улучшить свои ресурсы по уходу за пожилыми людьми и повысить уровень обслуживания.

Выводы. Необходимо разработать дифференцированную политику в области ухода за пожилыми людьми с учетом особенностей различных регионов, укрепить учреждения по уходу за пожилыми людьми и повысить потенциал служб по уходу за пожилыми людьми, чтобы отвечать вызовам стареющего общества.

Ключевые слова: служба по уходу за пожилыми людьми; система показателей оценки; энтропийный вес – метод TOPSIS.

EVALUATIOIN OF THE SUPPLY CAPACITY OF ELDERLY CARE SERVICE*

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Abstract. *Introduction.* As the global population ages, there is a growing demand for elderly care service. This paper develops a comprehensive system of assessment indicators based on three dimensions: economic security, social security and service security.

Methodology and methods. The TOPSIS method is used to assess the availability of care services for older people based on data related to China.

Analysis. The results show that Jiangsu and Zhejiang provinces have strong capacity to provide services for the elderly. Economically developed provinces do well in medical and elderly care services and financial support. Western provinces need to improve their elderly care resources and service levels.

Conclusions. It is necessary to develop differentiated elderly care policies tailored to different regions, strengthen elderly care institutions and enhance the capacity of elderly care services to meet the challenges of an ageing society.

Keywords: elderly care service; evaluation indicator system; entropy weight TOPSIS method.

Introduction

With the aging of the global population, the supply capacity of elderly care service has become a key indicator to measure the level of social security. With the rapid growth of the number of elderly people and the change of the family structure, the demand for elderly care service is increasingly diversified and personalized, which poses a challenge to the supply capacity of elderly care service. At present, the supply of elderly care service in some countries is faced with problems such as uneven distribution of resources, uneven service quality and mismatch between supply and demand, which not only restricts the development of elderly care service, but also affects the happiness and satisfaction of the elderly. Therefore, the scientific and comprehensive evaluation of the supply capacity of elderly care service and the proposal of effective improvement measures have become an important topic to be solved in the field of social security.

In the field of service quality evaluation research, scholars have carried out an in-depth discussion and analysis on the challenges and deficiencies of the service quality evaluation index sys-

tem of elderly care institutions. He (2016) proposed many problems such as the institutional barriers, the imbalance of rights, responsibilities and interests, and the lack of supervision faced by social organizations in the process of participating in the supply of elderly care service [1]. Tian et al. (2017) further pointed out that when information technology is embedded in elderly care service, it caused a series of supply problems due to the lack of coordination services [2]. Liu et al. (2020) made a profound analysis of the deficiencies of the current index system through a systematic review, and believed that there was an obvious lack of indicators and the diversity of evaluation methods [3]. On this basis, Li et al. (2024), from the perspective of healthy aging, proposed the shortcomings of the embedded combination of medical care in the connection between medical care and elderly care service [4].

To meet the above challenges, scholars have widely adopted a variety of methods and models for in-depth research. They not only constructed the evaluation index system based on the theoretical frameworks such as PZB model [5], Servqual model [6-7], DPSIR model [8], SERVPERF model [9] and 5A model [10], but also used expert interview method[11], fuzzy comprehensive evaluation method [6], qualitative interview method[7], rank sum ratio method [12], semi-structured interview method [13-14], hierarchical analysis method[15-16], decision laboratory method[8], and other methods, It provides a solid methodological foundation for the evaluation of elderly care service quality.

On this basis, the scholars further adopt RAM revised three stage DEA model, build the multi-dimensional index system, the elderly care service efficiency [17], supply and demand [18], regional differences [19]. For example, the research of Liu. et al. (2020) revealed that the service efficiency of elderly care service institutions showed a different trend of different regions [17]. In addition, the study of Kui (2022) provided a new perspective on the coupling of supply and demand, indicating that the coupling of health and elderly care service in various provinces of China shows a downward trend, and there are significant regional differences [18]. The study of Jiao et al. (2022) further pointed out that there are significant differences in the comprehensive efficiency of elderly care service in different cities [19]. Zhang et al. (2024) focus on the difference in the quality of combined medical care services between public and private elderly care institutions. Research showed that this difference is significant, which is of great significance for promoting the balanced development of elderly care service [20]. The study of Shi et al. (2024) comprehensively evaluated the high-quality development level of elderly care service, and revealed the development level of each province [21].

In the study of influencing factors, scholars have also conducted in-depth exploration. They used tools such as BCC and SBM, Tobit model [22], Super-SBM DEA method [23], to conduct evaluation of elderly residents. The study of Chen et al. (2021) found that factors such as the nature of public institutions and urban area background played a key role in improving the efficiency of combined medical and nursing institutions [22]. Li (2022) pointed out that the level of urbanization had a positive impact on the efficiency of the financial expenditure of elderly care service, while the financial self-sufficiency and social elderly care service resources had a negative effect on them [23]. In addition, Zhu et al. (2022) also deeply discussed the impact of the age, self-care capacity and other characteristics of the middle and low-income elderly people on the quality of affordable community elderly care service, which provided an important reference for optimizing elderly care service [24]. These research results not only deepen our understanding of the current sit-

uation of elderly care service, but also provide rich data support and a solid theoretical basis for predicting the future development trend.

Although there are a lot of researches related to elderly care service, there are little studies focused on the supply capacity evaluation of elderly care service. This paper takes different provinces in China as example to evaluate the supply capacity to expanding on existing research.

2. DATA AND METHODS

(1) Study data

According to the "2023 National Bulletin on the Development of the Elderly Program", by the end of 2023, there were 296.97 million elderly people aged 60 and above in China, accounting for 21.1 % of the total population. This marks that China has officially entered a "moderately aging" society. So we choose the data from China. 2018 is a key year in the aging process of China's population, when China's elderly population surpassed the young population for the first time. This makes the provinces increase their investment in the supply of elderly care service. This year not only reflects the major changes in China's population structure, but also reflects the important direction of policy reform in the field of elderly care service. Therefore, the province data in 2018 were selected for research. The data are from 31 provinces, autonomous regions, and municipalities directly under the central government of China are studied, Hong Kong Special Administrative Regions of China, Macao Special Administrative Regions of China, and Taiwan Province of China are excluded from the study due to data availability. The data are from China Civil Affairs Statistical Yearbook, China Labor Statistics Yearbook, China Health Statistics Yearbook and National Statistical Yearbook.

(2) Study Methods

① Selection of indicator evaluation

Driven by the aging of the population and the elderly care problems, scholars have constructed the evaluation system of elderly care service supply capacity. Zhang (2011) believed that the insufficient investment in elderly care service was an important reason [25]. Yang (2020) believed that in addition to economic support, medical care and social services, dimensions also had an important impact on the supply capacity of elderly care service. Based on the analysis above, economic security capacity, social security capacity and service security capacity are selected as the first-level indicators in this paper, because these dimensions can fully cover the core needs of elderly care service. The economic security capacity reflects the financial support of the elderly care service and is the basis of the sustainable development of the elderly care service. Social security capacity measures the health and medical security level of the elderly through the number of medical practitioners and the dependency ratio of the elderly population, which is directly related to the well-being of the elderly. The service guarantee capacity evaluates the actual supply of elderly care service through the number of registered nurses and the utilization rate of hospital beds, so as to ensure that the elderly can obtain the necessary services and care. The evaluation indicator system (shown as table 1) can provide an objective and comprehensive basis for the evaluation of elderly care service capacity.

Table 1 **Comprehensive evaluation index of elderly care service supply capacity**

Level 1 indicators	Level 2 indicators	
Service guarantee capacity A	Number of medical practitioners (ten thousand)	A1
	The dependency ratio of the elderly population (population sample survey) (%)	A2
	Registered nurses (ten thousand)	A3
	Hospital bed utilization rate (%)	A4
	Number of practicing (assistant) physicians (ten thousand persons)	A5
Economic security capacity B	Financial burden on the elderly	B1
	Local financial medical and health care expenditure (100 million yuan)	B2
	Local financial expenditure on urban and rural community affairs (100 million yuan)	B3
	Added value of service industry (100 million yuan)	B4
Social security capacity C	Number of beds in medical and health institutions (ten thousand)	C1
	Social pension insurance fund expenditure (100 million yuan)	C2
	The number of community health service stations	C3
	Number of units of community neighborhood committee	C4
	Community Health service centers	C5
	The number of urban workers participating in the endowment insurance (ten thousand people)	C6

② Evaluation method

The Entropy Weight–TOPSIS method is mainly used to evaluate the elderly supply service capacity. The specific steps are described below as follows [27]:

Establish a data matrix, and normalize the data, m refers to evaluation objects, n refers to evaluation indicator, X_{ij} ($i = 1, 2, 3, \ldots m, j = 1, 2, 3, \ldots, n$) refers to the original data. Yij refers to the processing data as follows.

$$Y_{ij} = \frac{X_{ij} - minX_{ij}}{maxX_{ij} - minX_{ij}} \, (1 \leq i \leq m, \quad 1 \leq j \leq n)$$

Calculate the weight : $P_{ij} = Y_{ij} / \Sigma_{i=1}^{m} Y_{ij}$

Calculate the entropy value $Hj = - \frac{1}{\ln m} \Sigma_{i=1}^{m} P_{ij} \ln P_{ij}$

Calculate the index weigh $d_j = W_j / \sum_{j=1}^{n} W_j$

Construct the weighted normalization matrix. $Z_{ij} = P_{ij} * d_j$

Determine the positive ideal solution and the negative ideal solution. The formula is expressed as follows: $Z^+ \, Z^-$

Positive ideal solution:

$Z^+ = maxZ_{ij} = maxZ_{1j}, \quad Z_{2j}, \quad \ldots, \quad Z_{mj}, \quad j = 1, \quad 2, \quad 3, \quad \ldots, \quad n$

Negative ideal solution:

$Z^- = minZ_{ij} = minZ_{1j}, \quad Z_{2j}, \quad \ldots, \quad Z_{mj}, \quad j = 1, \quad 2, \quad 3, \quad \ldots, \quad n$

Calculate the distance between each evaluation object and the positive and negative ideal solution. The closer the distance to the positive ideal solution, and the farther the distance to negative ideal solution, the better the comprehensive results. The formula is:

$$D_i^+ = \sqrt{\sum_{j=1}^n (Z_{ij} - Z_j^+)^2}, \quad D_i^- = \sqrt{\sum_{j=1}^n (Z_{ij} - Z_j^-)^2},$$

among, $i = 1, \ 2, \ 3, \ \dots, \ m, \ j = 1, \ 2, \ 3, \ \dots, \ n$

Calculate the comprehensive evaluation value, and rank the results. The relative closeness

degree is $C_i = \dfrac{D_i^-}{D_i^+ + D_i^-}, \quad Ci, \quad 0 \leq Ci \leq 1$

3. RESULTS
(1) Basic situation

Due to the differences in economic development, the capacity of elderly care service is different. For example, in economically developed provinces such as Jiangsu, Zhejiang and Guangdong, the number of doctors, the number of registered nurses and the number of beds in medical and health institutions are all at a high level, showing strong medical and elderly care service capacity. At the same time, the local financial medical and health expenditure in these provinces is also relatively high, which strongly supports the sustainable development of elderly care service. In contrast, in some western regions, such as Xizang, Qinghai and Ningxia, their resources and service levels need to be improved due to their relatively weak economic foundation. The number of registered nurses and beds in medical and health institutions in these areas are generally small. At the same time, from the perspective of the dependency ratio of the elderly population, Hebei, Liaoning, Shandong and other provinces are relatively high dependency, which means that the pressure of elderly care service in these areas is relatively large. Nevertheless, local efforts are being made to increase local financial health spending and actively respond to the challenge of aging, so as to gradually improve elderly care.

(2) Analysis of the calculation results by entropy method

The elderly care service supply capacity is affected by many key factors. From the perspective of service guarantee capacity index, the quantity and quality of medical personnel are very important. In terms of indicators related to economic security capacity, the added value of the service industry has the highest weight, highlighting the supporting role of the development of the service industry in the elderly care service. At the same time, the local financial expenditure on medical and health care and urban and rural community affairs also plays an important role. In the social security capacity, medical and health institutions and community service center construction and operation is particularly important. In addition, the social security system also plays an important role. The weight of urban and rural residents social endowment insurance fund spending and the number of urban workers to participate in the number of endowment insurance is higher, shown as table 2.

Table 2 **Weight**

Indicators	Information entropy value	Information utility value	weight coefficient
A1	0.9416	0.0584	6.59 %
A2	0.9920	0.0080	0.90 %
A3	0.9400	0.0600	6.77 %
A4	0.9992	0.0008	0.09 %
A5	0.9391	0.0609	6.86 %
B1	0.9951	0.0049	0.56 %
B2	0.9551	0.0449	5.06 %
B3	0.9309	0.0691	7.80 %
B4	0.9127	0.0873	9.85 %
C1	0.9396	0.0604	6.81 %
C2	0.9156	0.0844	9.52 %
C3	0.8747	0.1253	14.13 %
C4	0.9473	0.0527	5.94 %
C5	0.9078	0.0922	10.40 %
C6	0.9226	0.0774	8.73 %

(3) Closeness degree analysis

The results show that the elderly care service supply capacity of Jiangsu and Zhejiang is relatively outstanding, with their relative closeness degree values as high as 0.633 and 0.704 respectively, which benefits from the significant advantages of the two places in economic, social and population development, and provides higher investment and better quality for the elderly care service. However, Hainan, Qinghai, Ningxia and Xizang are relatively weak. These regions may face multiple challenges such as lagging economic development, increasingly aging population and lack of elderly care service facilities and resources. In terms of positive ideal solution distance, Jiangsu and Zhejiang performed well and had low positive ideal solution distance, which further verified their leading position in elderly care service. In Jilin and Heilongjiang, the overall ranking was not high, indicating that other indicators have an impact on the evaluation results. In terms of negative ideal solution distance, although the negative ideal solution distance of Hainan, Qinghai, Ningxia and Xizang are relatively high, they did not translate into a high ranking of elderly care service capacity, indicating that there is still a large room for improvement in these areas. Finally, the ranking results reflect the relative position of the elderly care service supply capacity in each region, with Jiangsu, Zhejiang, Shandong and Guangdong ranking the top, shown as table 3.

Table 3 **TOPSIS evaluation**

Item	Positive ideal solution distance	Negative ideal solution distance	Relative closeness degree	Sorting results
Beijing	0.099	0.051	0.342	10
Tianjin	0.128	0.020	0.136	25
Hebei	0.101	0.053	0.342	11
Shanxi	0.122	0.027	0.183	20
Inner Mongolia	0.120	0.028	0.191	17
Liaoning	0.110	0.041	0.271	13
Jilin	0.133	0.019	0.124	26
Heilongjiang	0.128	0.027	0.175	23
Shanghai	0.107	0.057	0.349	9
Jiangsu	0.059	0.102	0.633	2
Zhejiang	0.049	0.117	0.704	1
Anhui	0.097	0.053	0.352	8
Fujian	0.121	0.030	0.201	15
Jiangxi	0.124	0.028	0.184	19
Shandong	0.070	0.092	0.567	4
Henan	0.091	0.071	0.436	5
Hubei	0.102	0.062	0.379	7
Hunan	0.109	0.056	0.341	12
Guangdong	0.073	0.101	0.582	3
Guangxi	0.128	0.027	0.176	22
Hainan	0.141	0.006	0.041	28
Chongqing	0.123	0.032	0.205	14
Sichuan	0.101	0.066	0.396	6
Guizhou	0.124	0.028	0.182	21
Yunnan	0.123	0.029	0.192	16
Xizang	0.147	0.000	0.000	31
Shaanxi	0.124	0.029	0.187	18
Gansu	0.132	0.017	0.111	27
Qinghai	0.143	0.005	0.035	29
Ningxia	0.143	0.005	0.032	30
Xinjiang	0.128	0.021	0.141	24

4. CONCLUSIONS

Based on the analysis above, we propose some suggestions to improve the elderly care service. Firstly, narrow the gap in the supply capacity of elderly care service in various provinces. Strengthen exchanges and cooperation between experienced provinces and weak provinces, share experience and resources, and promote balanced development between regions. Less developed provinces should formulate specific implementation plans based on their own actual conditions, strengthen the construction of elderly care service facilities, and improve service quality to meet the diverse needs of the elderly. Secondly, Optimize the supply structure, increase the total supply of services, and formulate characteristic strategic plans for different regions. It is necessary to encourage the provinces with strong supply capacity of elderly care services to further innovate service models and expand service areas. For provinces with weak supply capacity of pension services, we should focus on strengthening infrastructure construction and improving the coverage and quality of basic elderly care services; For provinces with strong elderly care service supply capacity, more at-

tention should be paid to service innovation and upgrading and quality improvement, and the key to improving the supply capacity of elderly care services is to create a elderly care service brand with local characteristics and optimize the supply structure. According to the characteristics of the needs of the elderly in different regions, a characteristic strategic plan should be formulated, and the focus and development direction of services should be clarified. At the same time, it is necessary to increase the total supply of services, expand the scale of elderly care service facilities and improve the service carrying capacity through new construction, reconstruction and expansion. Thirdly, expand new application scenarios, cultivate new business formats, and provide accurate services. (1) Strengthen social security capacity to ensure that the elderly can enjoy comprehensive social security services, including pension insurance, medical insurance, etc., to provide a solid backing for the development of new application scenarios. (2) Improve the economic security capacity, encourage enterprises to invest in the field of elderly care services through policy guidance and financial support, such as smart elderly care, to meet the diverse needs of the elderly. (3) Strengthen the service guarantee capacity, establish and improve the pension service system, strengthen the training and management of service personnel, improve the quality and efficiency of service, and provide accurate and personalized services for the elderly. At the same time, big data, artificial intelligence and other technical means are used to realize the intelligence and precision of services, and improve the quality of life and happiness of the elderly.

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