



Original Article

Quantitative Text Analysis of China's Elderly Care Policy Texts Based on the PMC Model

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ABSTRACT

Against the backdrop of accelerating population aging in China, the scientific optimization of elderly care policies has become a core issue in national governance. Existing studies mostly focus on qualitative interpretation of such policies, lacking systematic quantitative evaluation of their internal structure and overall quality. To fill this gap, this paper constructs an evaluation index system with 9 first level and 40 second-level variables based on the Policy Modeling Consistency (PMC) index model and conducts a quantitative empirical analysis on 15 representative national and local elderly care policies in China through binary scoring, PMC index calculation and three-dimensional surface chart visualization. The results show that the average PMC index of the sample policies is 0.6462, indicating an overall moderate level. The sample policies perform well in policy function, tools and content, while policy guarantee, time validity and administrative level are the key shortcomings. On this basis, this paper puts forward targeted optimization paths for China's elderly care policy system, providing quantitative empirical support for the improvement of elderly care service policies and a methodological reference for quantitative policy text analysis.

Keywords: Elderly Care Policy, PMC Index Model, Policy Evaluation, Population Aging, Quantitative Text Analysis.

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INTRODUCTION

With the continuous acceleration and deepening of population aging in China, the establishment and improvement of a compatible elderly care service system has become one of the core issues in national governance and social development. Data from the 7th National Population Census show that the population aged 60 and above in China has reached 264 million, accounting for 18.7% of the total population, among which the number of disabled elderly has reached 6.18 million (Tan, 2023). Such a severe demographic transition poses a huge challenge to the traditional family-based elderly care model and places higher demands on the responsiveness and systematic design of public policies. In recent years, the central government and relevant ministries have successively issued a series of programmatic documents and concrete policies to promote the development of elderly care services, represented by the 14th Five-Year Plan for the Development of the Cause of Aging and the Elderly Care Service System. A multi-level policy framework for elderly care has been initially formed. Nevertheless, the existing policies still present obvious disparities and considerable room for optimization in content design, coordination and supporting mechanisms, implementation efficiency, and regional adaptability. Current academic studies mostly focus on qualitative interpretation or single-dimensional analysis of policies and lack a comprehensive evaluation tool that can systematically and quantitatively assess the internal structure and consistency of policies. This has, to a certain extent, restricted the scientific understanding and precise optimization of the overall policy quality.

To address the above research gap, this paper introduces the Policy Modeling Consistency (PMC) index model to conduct a multi-dimensional and quantitative empirical evaluation of key national elderly care policies in China. By constructing a multivariate evaluation system covering policy nature, function, scope, incentives and constraints, target groups and other dimensions, the PMC model can transform complex policy texts into measurable and comparable indices and surfaces, thereby directly revealing the internal consistency and the distribution of strengths and weaknesses of policies (Estrada, 2010). This study will systematically screen representative core policy texts of China's elderly care, establish a policy evaluation index system suitable for the Chinese context based on the PMC model, calculate the PMC index of each policy and draw a PMC surface chart, and further conduct an in-depth analysis of their coordination, completeness and internal conflicts at the design level.

LITERATURE REVIEW

Research Status of China's Elderly Care Policies

With the deepening of population aging in China, the rigid demand for care services among the disabled and semi-disabled elderly has been growing continuously. As a core instrument for actively responding to population aging and improving the health and elderly care service system, research on elderly care policies has become a research hotspot in public health management, social security and other related fields. At present, domestic research on elderly care policies has formed a multi-dimensional and multi-method research system, reached a series of research consensus on practical issues in policy implementation, and still leaves considerable room for in-depth exploration.

In terms of research methods, quantitative analysis of policy texts has become a mainstream research paradigm. PMC index model has been widely applied in the scientific evaluation of elderly care policies and integrated medical and elderly care policies (Wang & Han, 2025; Chen & Liu, 2025). By decomposing and scoring policy texts across multiple dimensions such as nature, time validity, administrative level, policy tools and content, researchers have realized systematic and standardized quantitative analysis, which can accurately identify the strengths and shortcomings of policy formulation. Relevant studies have covered several representative policy documents at both central and local levels, providing a scientific quantitative basis for policy optimization.

In terms of research content, existing studies mainly focus on three directions. First, research on the sorting and evolution of the policy system (Li, 2025; Schulz & Borsch-Supan, 2024), clarifying the development trajectory of elderly care policies from "basic security" to "diversified supply" and from "separation of medical care and elderly care" to "integration of medical care and elderly care". It also defines the policy orientation of the central government in service system construction, personnel training, payment security and other aspects, as well as the differentiated exploration of local policies in the implementation process. Second, research on policy implementation effects and existing problems (Comas-Herrera et al., 2024; OECD, 2025), pointing out common challenges

such as unbalanced regional development, insufficient support for primary-level service capacity, imperfect long-term care security mechanisms and lagging talent team construction. In addition, some policy provisions are characterized by excessive principled statements and insufficient operational rules, leaving large room for improving the implementation potential and effectiveness of policies. Third, research on policy optimization paths (Wang & Han, 2025). Based on China's national conditions of aging and local practical experience, targeted suggestions are put forward, including improving the coverage and inclusiveness of the policy system, optimizing the mix of policy tools, perfecting the diversified payment security mechanism, and strengthening the supply of primary-level care resources. Meanwhile, practical directions such as integrating traditional Chinese medicine into elderly care and innovating the "Internet Plus nursing services" model are emphasized.

Overall, research on China's elderly care policies has moved beyond single qualitative description and formed a research pattern combining quantitative and qualitative methods as well as integrating theory and practice, providing important support for the improvement of the policy system. However, deficiencies still exist in current studies: First, the differentiated research on local policies is insufficient, and there is a lack of research on policy adaptability in regions with different degrees of aging and economic development levels. Second, long-term follow-up research on policy implementation is inadequate, and continuous investigation into the actual effects after policy implementation and feedback from stakeholders needs to be strengthened. Third, research on policy support for emerging formats such as smart elderly care and community-embedded care is still in the exploratory stage.

In the future, with the changing situation of population aging and the further promotion of the Healthy China strategy, research on elderly care policies will focus more on policy precision, refinement and sustainability, and further strengthen the alignment between policy formulation and practical needs, so as to provide more targeted theoretical references for building a full-cycle and multi-level elderly care service system.

Policy Modeling Consistency Index Model

PMC refers to the systematic measurement and judgment of policy benefits, efficiency, implementation effects, and value based on scientific evaluation criteria and methods, to obtain relevant information and provide a reference and basis for policy improvement and new policy formulation (Howlett & Giest, 2015). At present, commonly used quantitative policy evaluation methods in academia mainly include the Analytic Hierarchy Process, fuzzy comprehensive evaluation, difference-in-differences, computable general equilibrium (CGE) model, grey relational model, and the PMC index model. For example, Pinheiro and Santana (2025) applied the AHP method to analyze the selection decision of energy-saving air conditioning equipment in commercial buildings, verifying the application value of multi-criteria decision-making methods in the optimization of energy-saving technologies. Wang, Qiu, Shen, and Rao (2025) adopted grey relational analysis and fuzzy comprehensive evaluation to conduct an empirical analysis of green competitiveness in 11 provinces and cities in the Yangtze River Economic Zone and put forward targeted countermeasures to improve regional green competitiveness. Ji, Moon, Kwon, and Kim (2025) used difference-in-differences combined with propensity score matching to evaluate the implementation effect of local tobacco control policies for adolescents in South Korea, confirming the intervention effect of tobacco control regulations on adolescent tobacco exposure. Liu, Jiao, Wang, and Ma (2025) employed the PMC index model to quantitatively assess 33 public health emergency response policies in China, analyzing the overall characteristics and key problems of their policy design.

Among these methods, the Policy Modeling Consistency Index (PMC Index Model) was first systematically proposed by the Spanish economist Estrada in 2010 (Estrada, 2010). To date, the model has become a mature and widely recognized quantitative evaluation method in international policy research. As a mainstream analytical tool for quantitative evaluation of policy texts, it also provides mature methodological support for the systematic and standardized evaluation of elderly care policies. Its rich accumulation in theoretical system, operational procedures, and applied practice forms the core methodological foundation for the quantitative analysis of elderly care policies in this study.

The application of the classic PMC index model follows a fixed and standardized analytical process, which consists of four key steps to ensure objectivity, reproducibility, and comparability of evaluation results. First, constructing a multi-dimensional evaluation index system. Based on the core attributes of policies and research objectives, first-level evaluation variables and corresponding second-level sub-variables are established. The first-level variables cover core elements of the entire policymaking and implementation process, while the second-level variables are required to be mutually exclusive, observable, and operable, so that the evaluation system can comprehensively capture the core information of policy texts. The classic PMC model initially included 10 first-level variables and 50 second-level variables (Estrada, 2010). Subsequently, scholars at home and abroad have adjusted and optimized the index system according to the characteristics of policies in different fields, forming flexible evaluation frameworks adapted to various policy types (Zhang, Geng, and Wang, 2015; Fang & Liu, 2023); Dang et al., 2024). Second, the second-level variables are standardized using a 0–1 binary scoring method: 1 if the content is mentioned in the policy text, and 0 otherwise. This method avoids the subjective bias of weight assignment in methods such as AHP and the Delphi method, which is the core support for the objectivity of the PMC index model (Estrada, 2010). Third, the PMC index is calculated as follows: the score of each first-level variable is the arithmetic mean of its subordinate second-level variables, and the total index is the sum of all first-level variable scores. With 10 first-level variables, the value range of a single variable is [0, 1], and the total index ranges from [0, 10]. Fourth, policy grades are classified based on the total index for policy diagnosis: ≥ 8.0 as excellent, 7.0–8.0 as good, 6.0–7.0 as acceptable, and < 6.0 as poor. Meanwhile, by decomposing the scores of first- and second-level variables, the strengths and weaknesses of policies can be accurately identified to achieve targeted optimization and diagnosis.

Since its introduction, the PMC index model has been widely used in public policy evaluation worldwide due to its core advantages of objectivity, comprehensiveness, and comparability. Its application scenarios have gradually expanded from initial macroeconomic and industrial development policies to technological innovation, ecological environment, public health, social security, education, health care, and other fields (Wang & Liu, 2020). In view of this, this study adopts the PMC index model to systematically conduct quantitative evaluation and optimization research on China's elderly care policy texts. The overall research framework is as follows: First, systematically sort out and collect national-level elderly care policy texts in China, complete preprocessing such as text cleaning and coding, and combine high-frequency word mining and existing PMC application research to build a special PMC index evaluation system suitable for the characteristics of China's elderly care policies. Second, select representative policy samples to complete index scoring and PMC index calculation, and draw PMC surface charts for visual policy presentation. Third, based on the index results, comprehensively analyze the overall effectiveness, core strengths, and existing shortcomings of China's elderly care policies, and propose targeted policy optimization paths to provide empirical support and decision-making references for improving the policy and institutional system of elderly care services in China.

CONSTRUCTION OF THE PMC INDEX MODEL

Policy Text Collection

Policy texts were retrieved by full-text matching in authoritative policy databases using core keywords: elderly care, aged care, elderly nursing, long-term care services, and elderly care security. The databases covered policy documents issued at the national level (e.g., by the National Health Commission and other central ministries), provincial-level governments, and autonomous regional governments, as well as their health and other competent departments. To guarantee that the research sample is representative, authoritative, and valid, three core principles—openness, authority, and systematicness—were adopted as the basis for sampling in this study. Corresponding screening criteria were formulated to refine and purify the initially retrieved policy texts, with specific requirements as follows:

Relevance of Content: Policy texts were required to have a direct connection with the field of elderly care, with their core focus placed on key aspects such as the construction of the elderly care service system, supply guarantee, standardized management, and industrial development.

Validity of documents: Only normative documents with formal legal or administrative binding force were incorporated into the research sample, including laws, regulations, opinions, notices, plans, and implementation plans. In contrast, non-normative documents that lack formal effectiveness, such as leadership speeches, work approvals, negotiation letters, industry standards, and

news updates, were excluded from the sample. All initially retrieved texts were carefully read, reviewed, and screened manually on an individual basis. Eventually, 63 valid policy texts that fully met the research requirements were confirmed as the final research sample.

Variable Selection and Parameter Identification

With reference to the setting logic of policy evaluation indicators proposed by Estrada et al., this study selected four basic variables with strong universality, namely X1 Policy Nature, X2 Policy Time Validity, X3 Policy Subject, and X6 Policy Evaluation. These variables are used to cover the basic attribute characteristics of policies from issuance to implementation and correspond to basic information dimensions such as "Policy No.", "Issuance Date", and "Policy Level".

Based on this, combined with the results of text mining and existing research achievements in the field of elderly care, and fully considering the core characteristics of China's elderly care policies in aspects such as "service supply, guarantee support, and standardized management", five additional first-level variables and their corresponding secondary variables were further constructed, including X4 Policy Target Groups (such as the elderly, care institutions, primary medical units, etc.), X5 Policy Objectives (such as improving the coverage of care services, standardizing care quality, improving long-term care security, etc.), X7 Policy Tools (such as financial subsidies, standards and norms, talent training, supervision and assessment, etc.), X8 Policy Content (such as care needs assessment, service project standardization, cross-departmental coordination mechanisms, etc.), and X9 Policy Guarantee (such as fund guarantee, talent guarantee, supervision guarantee, etc.). Finally, an elderly care policy evaluation index system consisting of 9 first-level variables and 40 secondary variables was formed (Table 1). All secondary variables were set around core policy issues such as the construction of the elderly care service system, the improvement of the guaranteed mechanism, and the improvement of service quality. Based on it, equal weights were assigned to all variables, and the secondary variables were set to follow a [0,1] binary distribution. That is, if the content of the policy text meets the description standards of the corresponding secondary variables (such as involving specific contents like "elderly care needs assessment" and "nursing talent training subsidies"), a value of 1 is assigned; otherwise, a value of 0 is assigned.

Table 1

Quantitative Evaluation Variable Settings for Elderly Care Policies

Level One Variable	Specific Secondary Variable	Core Supporting Documents (Author + Year)	Support the Core Logic with Documents
X1 Policy Nature	X1-1Description, X1-2Regulation, X1-3Recommendation, X1-4Support, X1-5 Trial	Ruiz Estrada (2011), Wang Jing (2020)	Policy nature is categorized into "regulatory/supportive/guidance-type", aligning with the classification of elderly care policies
X2 policy validity	X2-1short-term X2-2 medium-term X2-3 long-term	Ruiz Estrada (2011), Xie Xiansheng (2025)	Time-boundness by implementation cycle and matching characteristics of long-term planning in elderly care
X3 Policy Level	X3-1Central regulations, X3-2 Local normative documents, X3-3 Local working documents	Zhang Yongan (2015), Xie Xiansheng (2025)	Distinguish between central/local policies and adapt the hierarchical management logic of elderly care policies
X4 Policy Tools	X4-1 Supply, X4-2 Environment, X4-3 Demand	Zhang Yong'an (2015), Zhang Yixin (2025)	Tools are categorized into "supply/environment/demand types", covering elderly care resource supply and financial support
X5 Policy Object	X5-1 Subordinate Health Commission,	Zhang Yongan (2015), Wang Jing (2020), Chen	The object contains "government/institution/elderly", clearly

Level One Variable	Specific Secondary Variable	Core Supporting Documents (Author + Year)	Support the Core Logic with Documents
X6 Policy Content	X5-2 Medical Institution, X5-3 Subordinate Market Regulatory Department, X5-4 Subordinate Medical Security Department, X5-5 Others	Haoyang (2024)	identifying the target of policy implementation
	X6-1 Service Content and Types, X6-2 Service Provision and Specifications, X6-3 Resource and Capacity Building, X6-4 Incentive and Support Policies, X6-5 Payment and Guarantee Mechanisms, X6-6 Implementation and Supervision	Wang Jing (2020), Zhang Yixin (2025), Zhai Yunkai (2022)	The content should cover "Service Standards / Payment Mechanisms / Regulation" to meet the core needs of elderly care
X7 Policy Evaluation	X7-1: Clear objectives; X7-2: Well-founded basis; X7-3: Comprehensive planning. X7-4: Scientific approach; X7-5: Country-specific adaptation. X7-6: Current situation integration	Ruiz Estrada (2010), Zhang Yixin (2025), Chen Haoyang (2024)	The evaluation dimensions include "target clarity / scientific validity / adaptability to national conditions"
X8 Policy Protection	X8-1 Materials, X8-2 Funds, X8-3 Communications and Transportation, X8-4 Legal Protection, X8-5 Contingency Management	Ruiz Estrada (2010), Zhang Yongan (2015), Xie Xiansheng (2025)	The guarantee must cover "funding/materials/law/preparedness" to support the implementation of elderly care
X9 Policy Features	X9-1 Standard Guidance, X9-2 Layout Planning, X9-3 Accelerated Construction, X9-4 Supervision and Assessment	Wang Jing (2020), Chen Haoyang (2024), Zhai Yunkai (2022)	The function includes "Guidance/Layout Planning/Supervision and Assessment", clarifying the policy value

CALCULATION OF THE PMC INDEX

The PMC index serves as a core metric to quantify the overall quality and formulation effectiveness of policy texts, with its standardized calculation process strictly following the classic framework optimized by Hong, Liu, and Qi (2026). The calculation is completed through three sequential and standardized steps: first, we conduct quantitative assignment for each secondary variable in accordance with Formula (1) and Formula (2); second, we calculate the score of each first-level variable using Formula (3); finally, we substitute the scores of all first-level variables into Formula (4) to generate the final PMC index. Given that a total of 10 first-level variables is included in the evaluation system constructed by this study, the PMC index theoretically ranges from 0 to 10. Drawing on the classic policy grading evaluation standards proposed by Estrada (2010), we classify the evaluated policies into different grades according to their final PMC index values, with the detailed classification criteria presented in Table 3.

$$X:N[0,1] \quad (1)$$

$$X=\{PR:[0,1]\} \quad (2)$$

$$X_i \left[\sum_{j=1}^n \frac{X_{ij}}{T(X_{ij})} \right], i=1,2,3,\dots,\infty \quad i \text{ is the primary variable and } j \text{ is the secondary variable} \quad (3)$$

$$\begin{aligned} \text{PMC} = & X_1 \left(\sum_{a=1}^6 \frac{X_{1a}}{4} \right) + X_2 \left(\sum_{b=1}^3 \frac{X_{2b}}{4} \right) + X_3 \left(\sum_{c=1}^4 \frac{X_{3c}}{2} \right) + X_4 \left(\sum_{d=1}^6 \frac{X_{4d}}{3} \right) + \\ & X_5 \left(\sum_{e=1}^4 \frac{X_{5e}}{3} \right) + X_6 \left(\sum_{f=1}^4 \frac{X_{6f}}{4} \right) + X_7 \left(\sum_{g=1}^5 \frac{X_{7g}}{4} \right) + X_8 \left(\sum_{h=1}^7 \frac{X_{8h}}{3} \right) + X_9 \left(\sum_{i=1}^6 \frac{X_{9i}}{4} \right) \quad (4) \end{aligned}$$

Table 3*Classification of policy rating levels*

PMC index number	8~10	6.00~7.99	4.00~5.99	0.00~3.99
Grade Evaluation	outstanding	good	admissibility	bad

Drawing of PMC Surface Charts

To intuitively present the comprehensive evaluation results of a single policy on various indicators, a PMC surface chart is used to display the scores of each dimension of the PMC index in a three-dimensional form. The drawing of this surface chart is based on the PMC matrix: first-level variables X1 to X9 are selected, a third-order matrix is constructed according to Formula (5), and the surface chart is generated based on this matrix.

$$\text{PMC Surface} = \begin{pmatrix} X_1 & X_2 & X_3 \\ X_4 & X_5 & X_6 \\ X_7 & X_8 & X_9 \end{pmatrix} \quad (5)$$

EMPIRICAL STUDY ON QUANTITATIVE EVALUATION OF ELDERLY CARE POLICIES**Selection of Evaluation Samples**

The PMC index model is primarily used for the quantitative evaluation of special policies on a specific theme and typically demonstrates high applicability in small-sample policy evaluation (Zhang, Li, & Wang, 2022). As previous studies generally selected representative policies for analysis in the sampling process (Gao, 2025), this study adopted a purposive sampling method to ensure comprehensiveness and comparability of the content coverage of policy samples. Through careful screening and combined with expert opinions, we finally determined 15 typical policies as the research samples, which feature high thematic relevance, strong representativeness, relatively similar text structures and a relatively uniform release time distribution, and the full details of the selected samples are listed in Table 4.

Table 4*Analysis text of evaluation policies for Elderly Care Policies*

Order Number	Policy Name	Issuing authority
P1	Heilongjiang Province Healthy Aging Action Plan (2018-2020)	Heilongjiang Provincial Health Commission and other departments
P2	Notice on Issuing the Action Plan for Further Improving Nursing Services (2023-2025)	National Health Commission
P3	Notice on Issuing the Guidelines for Promoting the Reform and Development of the Nursing Service Industry	National Health Commission
P4	Implementation Plan for Establishing and Improving the Elderly Health Service System in Beijing	Beijing Municipal Health Commission

P5	Implementation Plan for Liaoning Province to Implement the 14th Five-Year Plan for Healthy Aging	Liaoning Provincial Health Commission
P6	General Office of Anhui Provincial People's Government Transmits the Implementation Opinions of the Provincial Health and Family Planning Commission on Promoting the Integration of Medical and Health Services with Elderly Care Services	People's Government of Anhui Province
P7	National Nursing Development Plan (2021-2025)	National Health Commission
P8	Shanghai's 14th Five-Year Plan for the Development of Aging Affairs	Shanghai Municipal Health Commission Guangdong Provincial Health Commission, Guangdong
P9	Work Plan of Guangdong Province on Accelerating the Development of Elderly Care Services	Provincial Administration of Traditional Chinese Medicine
P10	Implementation Plan for the Autonomous Region's Further Improvement of Nursing Services Action Plan (2023-2025)	Health Commission of Xinjiang Uygur Autonomous Region
P11	Implementation Plan for Establishing and Improving the Elderly Health Service System	Liaoning Provincial Health Commission
P12	Notice of the General Office of the National Health Commission on Carrying Out Pilot Work for Geriatric Medical and Nursing Services (Guo Wei Ban Yi Han [2021] No.560)	National Health Commission
P13	Notice of the Beijing Municipal Health Commission on the Construction of Elderly Care Centers in Beijing	Beijing Municipal Health Commission
P14	Implementation Measures for Elderly Care Subsidy System for Special Family Planning Families in Anhui Province, issued by Anhui Provincial Health and Family Planning Commission and Anhui Provincial Department of Civil Affairs	Anhui Provincial Health and Family Planning Commission
P15	Implementation Opinions on Further Promoting the High-Quality Development of Nursing (2022-2025)	Zhejiang Provincial Health Commission

PMC INDEX CALCULATION AND SURFACE PLOTTING

Based on the policy evaluation index system constructed in Table 2, a 0/1 binarization process was performed on each secondary variable. In the process of policy text analysis, to control the interference of subjective factors on assignment, the following judgment principles were set: a value of 1 was assigned only when the evaluation content corresponding to the secondary indicator was clearly stated in the policy text and had a substantial length.

For ambiguous expressions with divergent understandings, collective evaluation was conducted by consulting experts in the field to reach a consistent judgment, to ensure the reliability of the evaluation results. After completing the assignment, the scores of each variable were entered into the multi-dimensional input-output matrix, and the PMC index values of the 15 policies were calculated in turn according to Formula (3) and Formula (4). Finally, each policy was evaluated with reference to the grade classification standards in Table 5.

Table 5

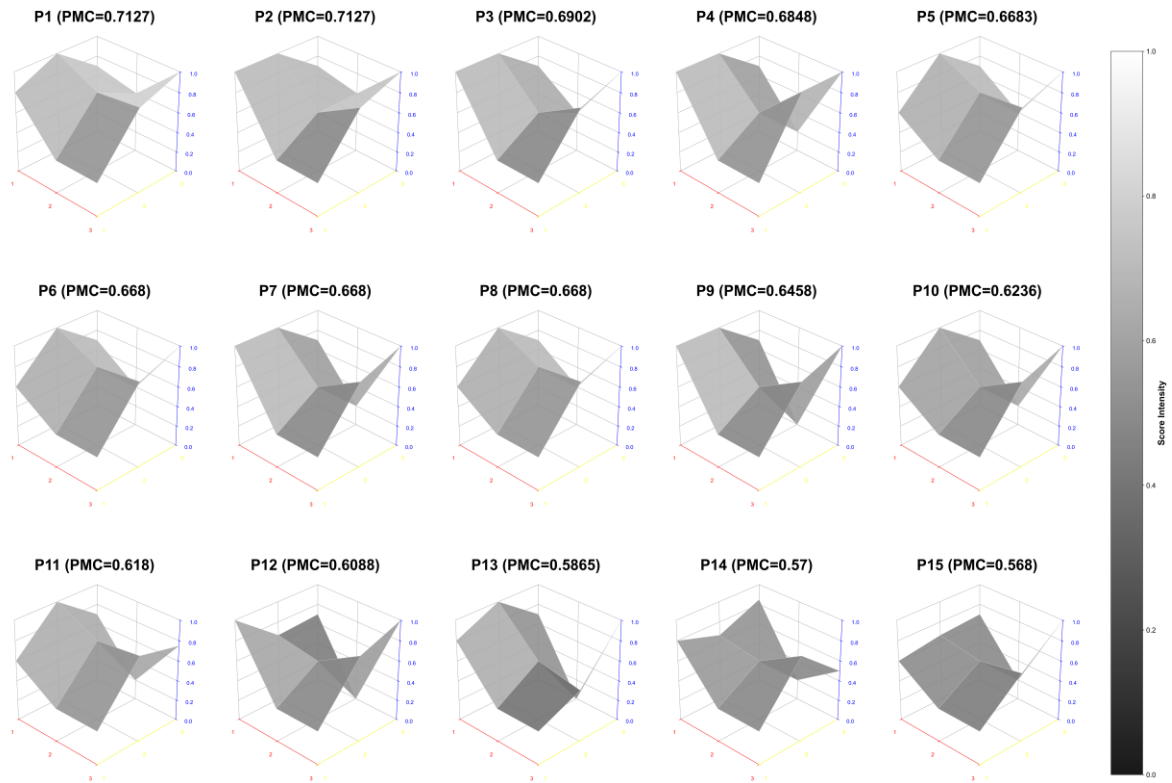
PMC Index and Level of Sample Policies

Number	PMC Index Number	PMC Grade	X1	X2	X3	X4	X5	X6	X7	X8	X9
P1	0.7127	Good	0.8	0.3333	0.3333	1	0.8022	0.8485	0.697	0.6	1
P2	0.7127	Good	1	0.3333	0.3333	1	0.6022	0.8485	0.697	0.6	1
P3	0.6902	Secondary	1	0.3333	0.3333	1	0.6	0.8485	0.697	0.4	1
P4	0.6848	Secondary	1	0.3333	0.3333	1	0.6	1	0.697	0.2	1
P5	0.6683	Secondary	0.6	0.3333	0.3333	1	0.8022	0.8485	0.697	0.4	1
P6	0.668	Secondary	0.6	0.3333	0.3333	1	0.8	0.8485	0.697	0.4	1
P7	0.668	Secondary	1	0.3333	0.3333	1	0.6	0.8485	0.697	0.2	1
P8	0.668	Secondary	0.6	0.3333	0.3333	1	0.8	0.8485	0.697	0.4	1
P9	0.6458	Secondary	1	0.3333	0.3333	1	0.6	0.8485	0.697	0	1
P10	0.6236	Secondary	0.6	0.3333	0.3333	1	0.6	0.8485	0.697	0.2	1
P11	0.618	Secondary	0.6	0.3333	0.3333	1	0.8	0.8485	0.697	0.2	0.75
P12	0.6088	Secondary	1	0.3333	0.3333	0.6667	0.6	0.8485	0.697	0	1
P13	0.5865	Qualified	0.8	0.3333	0.3333	1	0.6	0.5152	0.697	0	1
P14	0.57	Qualified	0.8	0.3333	0.3333	0.6667	0.6	0.8485	0.8485	0.2	0.5
P15	0.568	Qualified	0.6	0.3333	0.3333	0.6667	0.6	0.6818	0.697	0.2	1
mean	0.6462	/	0.8	0.3333	0.3333	0.9333	0.6671	0.82526667	0.7071	0.2667	0.95

According to Formula (5), after constructing the PMC matrix by combining the PMC index of each policy indicator, the Python language is used to draw the three-dimensional surface chart. The specific implementation process is as follows: First, the Pandas library is used to complete the reading, cleaning and structured organization of the PMC index data of 15 elderly care policies and the data of 9 first-level indicators (X1-X9), so as to ensure that the data format meets the drawing requirements; second, based on Formula (5), the scores of the 9 first-level indicators of each policy are reshaped into a 3×3 PMC matrix to provide a data basis for three-dimensional visualization; then, the NumPy library is imported to generate the grid coordinate data (X and Y axis grids) required for drawing, and the pyplot module of the Matplotlib library and the Axes3D class in the mpl_toolkits.mplot3d sub-library are called to create a 3D drawing environment; finally, by looping through the data of 15 policies, the plot surface function is used to draw a 3D grayscale surface chart for each policy, the tick_params function is called to set the axis color, and the view_init function is used to unify the 3D perspective, and the global title and shared color bar are added through functions such as subtitle and colorbar, and finally saved as Figure 1.

Figure 1

PMC Index Surface Plots of 15 Policies



*The red X-axis, yellow Y-axis, and blue Z-axis represent the row dimension, column dimension, and indicator score of the PMC matrix, respectively; the grayscale color bar on the right quantifies the score intensity, with a gradient from black (0.0, the lowest score) to white (1.0, the highest score).

DISCUSSION AND CONCLUSION

Based on the quantitative analysis of 15 elderly care policies via the PMC index model, China's current elderly care policies are overall at a moderate level. They have a sound foundation in policy functions, tool selection and content framework, but have notable shortcomings in policy guarantee, time-effectiveness and administrative level, targeted adaptation, and evaluation iteration. To build a more scientific, sound and efficient elderly care policy system adapting to the deepening population aging, countermeasures are proposed as follows:

Improve the Diversified Policy Guarantee System to Consolidate Policy Implementation Foundation

Policy guarantee is the core shortcoming with the lowest score in this evaluation, as the deficiency of supporting measures, including funding, talent, supervision and materials directly constrain policy implementation (Goggin et al., 1990). First, establish a multi-channel funding guarantee mechanism: clarify the investment ratio and growth mechanism of central and local fiscal expenditure in elderly care, guide social capital participation, and improve the long-term care insurance system to expand coverage and alleviate funding pressure. Second, strengthen talent support for elderly care: introduce targeted training, recruitment and incentive policies, improve the curriculum system for elderly nursing in colleges, carry out special training for grassroots nursing staff, and build a reasonable salary and career development system to enhance post attractiveness. Third, improve supervision and emergency support: formulate unified national elderly care service quality standards, build a cross-departmental supervision platform for whole-process management, and develop emergency plans to improve risk response capacity. Fourth, supplement material and facility support: make overall plans for the layout of elderly care facilities, promote

standardized construction of community, home-based and institutional nursing facilities, and ensure the supply and allocation of nursing equipment and consumables.

Optimize Policy Time-Effectiveness and Level Design to Improve Systematisms and Long-Term Effectiveness

Both Policy Time Effectiveness and Policy Level have a mean score of 0.33, reflecting the problems of short-term orientation, single issuing entity, and insufficient cross-level and cross-departmental coordination in current policies. First, strengthen medium and long-term overall planning: break the dominance of short-term tasks (less than 3 years) in current policies, formulate a 5-10 year medium and long-term development plan for elderly care in line with China's population aging trend, and realize the effective connection between short-term policies and long-term planning. Second, build a cross-departmental and cross-level coordination mechanism: break policy barriers between health, civil affairs, medical security, finance and other departments, establish a joint meeting system for policy formulation and implementation, and strengthen the connection between central guiding policies and local differentiated implementation rules to improve regional adaptability. Third, enhance the level and authority of policy issuance: formulate high-level comprehensive policies for core issues of elderly care service system construction, clarify the responsibilities of each department, and strengthen policy binding force and execution to address the insufficient coordination caused by single-department policy issuance.

Strengthening Precise and Refined Policy Design to Adapt to Diversified Elderly Care Needs

Current policies have deficiencies in the precise coverage of policy objects and detailed content design, with insufficient attention to special groups such as disabled and demented elderly, and excessive principled expressions with limited operability in some clauses. First, promote targeted policy implementation: further subdivide elderly care service recipients, formulate special policies and supporting measures for differentiated needs of disabled, demented, advanced-age and empty-nest elderly, and consider the needs of relevant entities including nursing institutions and grassroots medical units to improve policy coverage. Second, refine operable policy clauses: clarify detailed rules on service content, standards, processes, evaluation cycles and result application for core links of elderly care services, and improve policy specifications for emerging models such as integrated medical and elderly care, community embedded nursing and home-based care. Third, promote the integration of policies and regional realities: encourage local governments to refine policy measures based on local elderly population structure, nursing resource distribution and economic development level, avoid a one-size-fits-all approach, and improve policy implementation effects.

Improve Policy Tool Portfolio and Dynamic Evaluation Mechanism to Enhance System Adaptability and Iteration Capacity

Policy Tools and Policy Function have high scores in this evaluation, laying a foundation for policy optimization. However, there is still room for improvement in the adaptive application of policy tool combinations, and the dynamic adjustment mechanism for policy evaluation is not yet complete. First, optimize the diversified combination and adaptive application of policy tools: give full play to the synergy of supply-oriented, environment-oriented and demand-oriented policy tools. While strengthening supply-oriented tools such as financial subsidies, standard setting and talent training, improving environment-oriented tools including tax incentives and land security, and stimulating market vitality via demand-oriented tools such as service procurement and consumption subsidies. Second, establish a whole-life-cycle dynamic policy evaluation system: improve the quantitative evaluation method centered on the PMC index model, build a closed-loop mechanism combining field research and stakeholder feedback, and take evaluation results as the core basis for policy adjustment, improvement and abolition to realize targeted optimization. Third, strengthen the adaptability of policies to emerging formats: keep up with the development trends of smart elderly care, Internet Plus Nursing Services and traditional Chinese medicine elderly care, timely introduce supporting policies, and include R&D of smart nursing equipment, promotion of TCM nursing services and integration of online and offline services into policy support scope.

LIMITATIONS

This study has several limitations that should be noted. First, the purposive sampling of 15 representative elderly care policies, with a focus on national-level policies and those from economically developed provinces, results in insufficient coverage of policies in underdeveloped central and western regions of China, making it difficult to fully reflect the regional heterogeneity of the country's multi-level elderly care policy system. Second, the 0–1 binary scoring method applied to secondary variables can only identify the presence or absence of relevant content in policy texts, but cannot distinguish the refinement degree, operability and implementation strength of policy provisions, which limits the granularity and accuracy of the PMC index evaluation results. Finally, this study focuses on the static quantitative evaluation of policy text structure and content based on the PMC index model and lacks an empirical analysis of the actual implementation effects of the policies, as well as the key constraints in the grassroots implementation process of the policies.

DECLARATION

Ethical Consideration: This study strictly adhered to the Declaration of Helsinki and relevant national and institutional ethical guidelines. Informed consent was obtained. All procedures performed in this study were consistent with the ethical standards of the Declaration of Helsinki. Before data collection, ethical approval was obtained from the Institutional Review Board. Written informed consent was obtained.

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