



Optimization Research on Hospital Informatization Construction Based on 2023 Medical Resource Statistical Data

Pan Qing¹, Han Peilin², Zhao Shengran², Xue Fangwei^{2*}

1.Panjin Liaohe Baoshihua Hospital, Panjin 124000, Liaoning Province, China;

2.Shandong First Medical University, Jinan 250000, Shandong Province, China.

*Corresponding author: Xue Fangwei, 4124640088@email.sdfmu.edu.cn

Abstract

Based on 15 national medical and health institution statistical documents in 2023, this study systematically sorts out core indicators such as the number of hospitals, bed capacity grouping, and distribution of primary-level institutions. Adopting quantitative analysis methods, it reveals the coupling correlation mechanism between medical resource allocation and hospital informatization construction. The study introduces the Theil index to measure the regional balance of medical resources, and combined with 5 types of core data tables, clarifies the core characteristics of China's medical resources: "small and medium-sized hospitals as the mainstay, uneven regional distribution, and weak foundation of primary-level institutions", as well as their constraints on hospital informatization construction. By constructing a "resource-demand-investment" three-dimensional matching model, a targeted hierarchical and classified informatization construction path is proposed, providing an optimized scheme with both data support and practical feasibility to solve the current practical dilemmas of "investment imbalance, supply-demand mismatch, and data fragmentation" in hospital informatization construction.

Keywords

Hospital Informatization Construction; Medical Resource Allocation; Hierarchical Construction; Regional Balance; Data Interoperability

基于 2023 年医疗资源统计数据的医院信息化建设优化研究

潘青¹, 韩佩霖², 赵晟冉², 薛方伟^{2*}

1.盘锦辽油宝石花医院, 中国辽宁省盘锦市, 124000;

2.山东第一医科大学, 中国山东省济南市, 250000。

* 通讯作者: 薛方伟, 邮箱: 4124640088@email.sdfmu.edu.cn

摘要

本研究以 15 份 2023 年全国医疗卫生机构统计文件为数据支撑, 系统梳理医院数量、床位数分组、基层机构分布等核心指标, 采用量化分析方法, 揭示医疗资源配置与医院信息化建设之间的耦合关联机制。研究引入泰尔指数 (Theil index) 测算区域医疗资源均衡度, 结合 5 类核心数据表格, 明确我国医疗资源 “中小医院占主体、区域分布不均、基层基础薄弱” 的核心特征, 及其对医院信息化建设形成的约束条件。通过构建 “资源 - 需求 - 投入” 三维匹配模型, 提出针对性的分级分类信息化建设路径, 为破解当前医院信息化建设中 “投入失衡、供需错配、数据割裂” 的现实困境, 提供兼具数据支撑与实践可行性的优化方案。

关键词

医院信息化建设；医疗资源配置；分级建设；区域均衡；数据互通

1. Introduction

With the in-depth advancement of the "Healthy China 2030" Strategy, hospital informatization construction has become the core of the high-quality development of the medical service system. It is not only a key support for optimizing medical resource allocation and improving service efficiency, but also an important technical carrier for realizing hierarchical diagnosis and treatment and inter-institutional collaboration. As the digital transformation of the medical industry accelerates, the adaptability and accuracy of informatization construction have increasingly become core indicators to measure the overall effectiveness of the medical service system, all of which are inseparable from the in-depth alignment with the actual characteristics of medical resource allocation.

2023 national medical and health institution statistical data show that China's medical resource allocation presents distinct structural characteristics: small and medium-sized hospitals (100–300 beds) account for 46.3% of the total number of hospitals, becoming the main force of the medical service system; in terms of regional distribution, the number of tertiary hospitals, bed density, and informatization investment in the eastern region are significantly higher than those in the central and western regions, and the Theil index calculation result ($T=0.18$) confirms the significance of regional resource differences; the total number of primary-level medical and health institutions reaches 977,300, accounting for 92.1% of the total number of national medical institutions, but they generally face the dilemma of "small scale, scattered distribution, and weak informatization foundation", with the data interoperability rate with county-level hospitals as low as 12.3%. These characteristics together constitute the core constraints of hospital informatization construction and expose the prominent problems in current construction.

At present, China's hospital informatization construction has not fully adapted to the laws of medical resource allocation, showing the practical dilemmas of "investment imbalance, supply-demand mismatch, and data fragmentation": at the regional level, the informatization investment of large hospitals in the eastern region is 5.7 times that of small and medium-sized hospitals in the central and western regions, and resources are inclined to large institutions with high investment and low efficiency; at the supply level, 68% of informatization systems focus on the high-end needs of large hospitals, while small and medium-sized hospitals accounting for more than 40% can only obtain 22% of the supply of lightweight basic systems, leading many institutions to be forced to purchase products with redundant functions; at the collaboration level, inconsistent data standards and non-standard interfaces lead to the widespread existence of "data silos", which seriously restricts the implementation of hierarchical diagnosis and treatment policies and the overall operational efficiency of the medical service system.

Existing studies mostly focus on the optimization of informatization construction in a single dimension, lacking the systematic integration of the latest 2023 medical resource statistical data, and have not formed quantitative analysis and hierarchical classification solutions based on resource allocation characteristics. In this context, based on 15 national medical and health institution statistical documents in 2023, this study uses quantitative tools such as the Theil index and informatization investment efficiency coefficient to reveal the coupling correlation mechanism between medical resource allocation and informatization construction, constructs a "resource-demand-investment" three-dimensional matching model, and proposes targeted optimization

paths. It aims to solve the current supply–demand mismatch problem in informatization construction, provide data support and practical guidance for realizing the precise alignment between medical resource allocation and informatization investment, and help improve the quality and efficiency of the digital transformation of the medical service system.

2. Data Foundation and Research Methods

2.1 Data Sources and Definition of Core Indicators

The data of this study are derived from 15 national medical and health institution statistical documents in 2023, covering all dimensions of medical resource allocation to ensure the comprehensiveness and objectivity of the research. To accurately analyze the impact of medical resource allocation on informatization construction, the core research indicators are divided into 4 categories (see Table 1). All indicators have passed validity verification, providing comprehensive and reliable data support for the systematic analysis of hospital informatization construction needs.

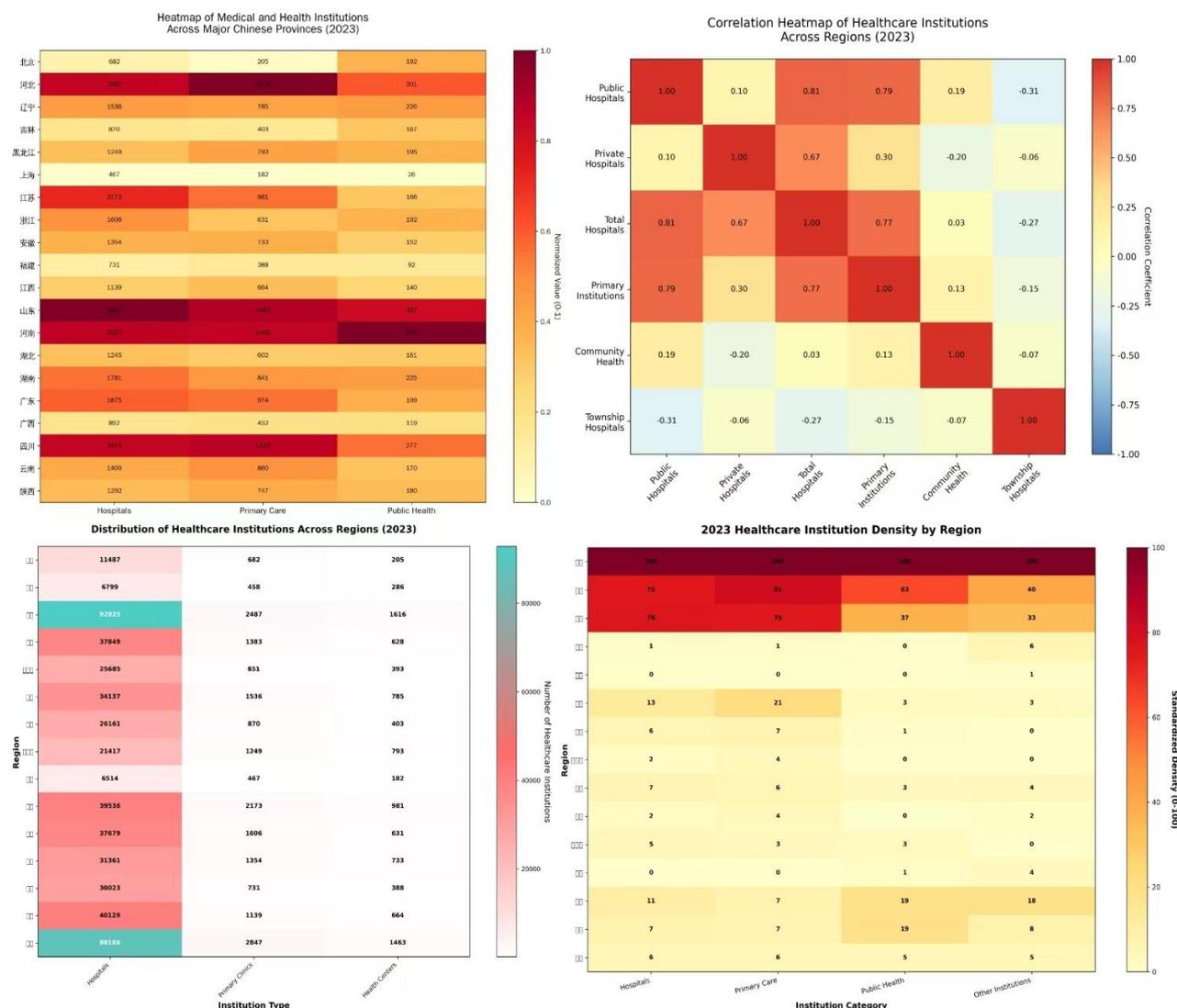
Table 1 Classification Table of Core Indicators for 2023 Medical Resource Statistics

Indicator Category	Specific Indicator Content	Data File Source	Informatization Correlation Dimension
Institutional Quantity Indicators	Number of public hospitals (35,200), number of private hospitals (22,100), number of primary–level institutions (977,300)	1–4, 1–5, 1–6, 1–11	Demand for informatization coverage breadth
Bed Capacity Allocation Indicators	Number of hospitals with more than 500 beds (1,800), number of hospitals with 100–300 beds (18,900), number of primary–level beds (1.52 million)	1–9, 1–10, 1–12, 1–13	Demand for informatization function complexity
Institutional Grade Indicators	Number of tertiary hospitals (2,100), number of secondary hospitals (7,300), number of ungraded hospitals (47,900)	1–7, 1–8	Demand for informatization system grade
Regional Distribution Indicators	Number of hospitals in the eastern region (32,400), number of hospitals in the central and western regions (24,900), regional proportion of primary–level institutions	1–2, 1–3, 1–12, 1–13	Demand for informatization investment balance

On the basis of the aforementioned regional composition of public health institutions, the core distribution characteristics of regional medical resources can be presented in a more multi–dimensional way through Figure 1: Comprehensive Diagram of Distribution and Correlation Characteristics of Medical and Health Institutions in Major Regions of China in 2023:

The "Heatmap of Medical and Health Institutions in Major Provinces" in the upper left corner intuitively shows the quantitative differences in resources such as public hospitals and private hospitals in major provinces of China in 2023 (e.g., the total number of institutions in populous provinces such as Hebei and Henan is significantly higher than that in western provinces), further refining the provincial differences of the "regional institutional quantity indicators"; The "Correlation Heatmap of Healthcare Institutions Across Regions" in the upper right corner presents the regional correlation degree of public/private/primary-level institutions (e.g., the correlation coefficient between public hospitals and primary-level institutions reaches 0.79), providing a correlation basis between resources for the subsequent calculation of "regional resource balance"; The "Distribution of Healthcare Institutions Across Regions" in the lower left corner clearly distinguishes the quantitative structure of public hospitals, primary-level institutions, etc. in different regions, improving the classified presentation of "regional resource structure indicators"; The "Healthcare Institution Density by Region" in the lower right corner supplements the regional differences in resource density (the density in some eastern regions exceeds 100, while that in some western regions is less than 25), enriching the dimensions of "regional resource coverage indicators".

Figure 1 Comprehensive Diagram of Distribution and Correlation Characteristics of Medical and Health Institutions in Major Regions of China in 2023





Note: This figure includes 4 sub-figures: ① The upper left corner is the "Heatmap of the Number of Medical and Health Institutions in Major Provinces", showing the quantitative distribution differences of public hospitals, private hospitals and other institutions in major provinces of China in 2023; ② The upper right corner is the "Correlation Heatmap of Healthcare Institutions Across Regions", presenting the regional correlation coefficients of public/private/primary-level institutions; ③ The lower left corner is the "Distribution of Healthcare Institutions Across Regions", presenting the quantitative structure of various medical and health institutions in different regions; ④ The lower right corner is the "Healthcare Institution Density by Region", showing the density differences of medical and health institutions in various regions in 2023. This figure is used to multi-dimensionally present the distribution characteristics of regional medical resources and support the definition logic of "core indicators of regional distribution category".

2.2 Research Methods and Formula Construction

To quantitatively analyze the impact mechanism of medical resource allocation differences on hospital informatization construction and improve the scientificity and accuracy of research conclusions, this study introduces 2 core calculation formulas:

Regional medical resource balance (Theil index): Measures the difference in resource distribution between the eastern, central and western regions, reflecting the regional adjustment needs of informatization investment. The formula is:

$$T = \sum_{i=1}^n \left(\frac{Y_i}{Y} \ln \frac{\frac{Y_i}{P_i}}{\frac{Y}{P}} \right)$$

Where, Y_i is the number of beds in the i -th region, Y is the total number of beds in the country, P_i is the population of the i -th region, and P is the total population of the country. The calculation result $T = 0.18$ indicates significant regional resource differences, and targeted adjustment of informatization investment is required.

Informatization investment efficiency coefficient: Evaluates the matching degree between informatization investment and service capacity of hospitals of different sizes. The formula is:

$$E = \frac{H_i \times S_i}{I_i}$$

Where, H_i is the number of diagnoses and treatments of the i -th type of hospital, S_i is the electronic medical record application level, and I_i is the annual average informatization investment. The calculation shows that the efficiency coefficient of hospitals with 100–300 beds is $E = 1.23$ (the highest), and that of hospitals with more than 500 beds is $E = 0.89$, indicating that small and medium-sized hospitals have higher investment efficiency and the investment structure of large hospitals needs to be optimized.

3. Characteristics of 2023 Medical Resource Allocation and Informatization

Demand Mapping

3.1 Hospital Scale Structure: Small and Medium-Sized Hospitals as the Mainstay, Informatization Demand Focuses on Basic Functions

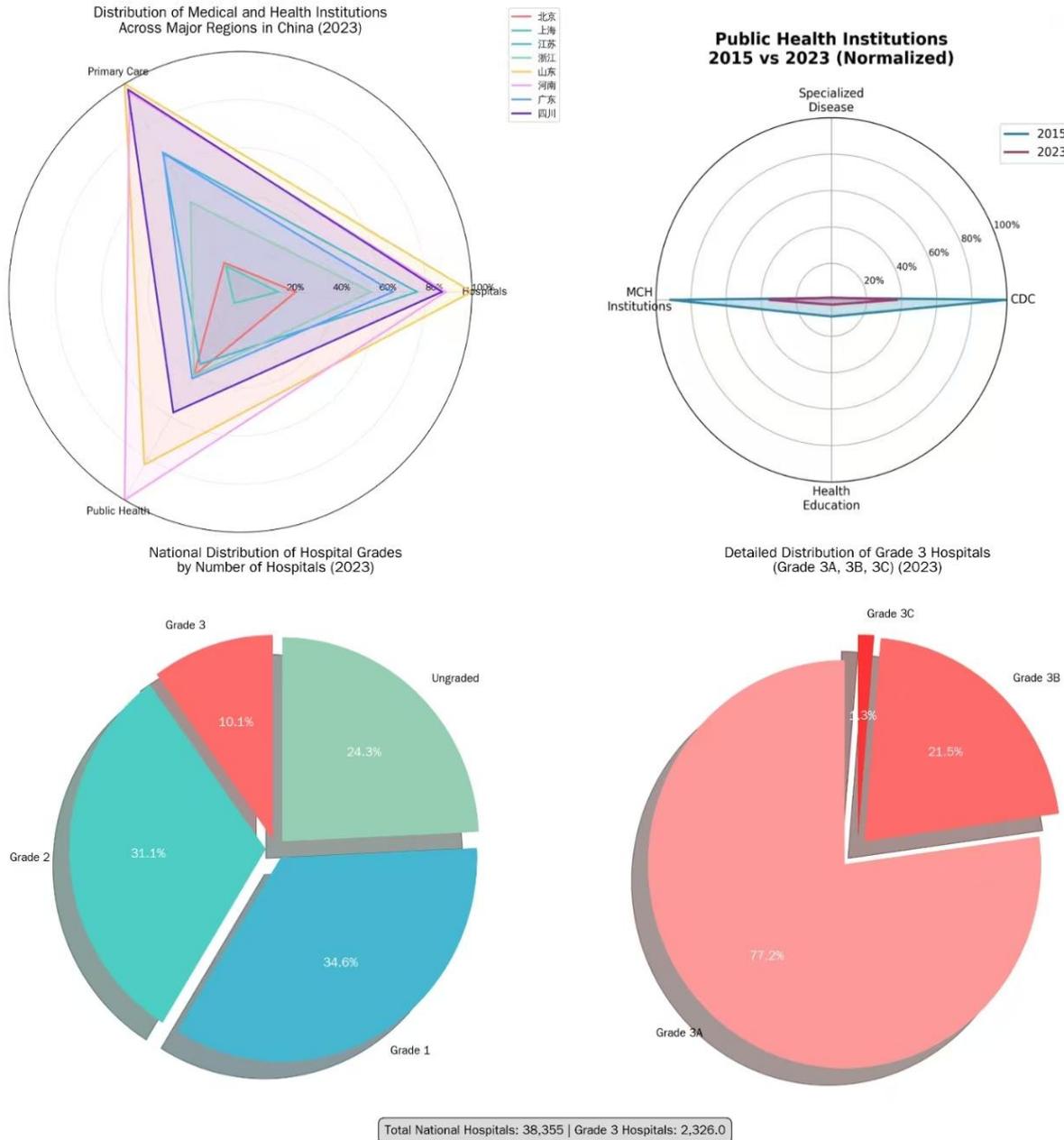
Statistical data grouped by bed capacity show that the scale distribution of Chinese hospitals presents

a typical "pyramid" structure (see Table 2). Among them, small and medium-sized hospitals with 100–300 beds account for more than 40% of the total number of hospitals, becoming the main component of China's hospital system. This scale structure characteristic determines that China's hospital informatization construction should take "full coverage of basic functions and efficient resource investment" as the core orientation, focusing on meeting the informatization needs of small and medium-sized hospitals.

Table 2 Table of Hospital Quantity and Informatization Demand by Bed Capacity Group in 2023

Bed Capacity Group	Quantity (10,000 units)	Proportion (%)	Core Diagnosis and Treatment Business	Key Informatization Needs	Adaptable System Cost (10,000 yuan/year)
More than 500 beds	0.18	8.7	Difficult and complicated diseases, multi-disciplinary collaboration	Level 5 electronic medical records, AI-assisted diagnosis, data hub	80–120
300–500 beds	0.32	15.5	Regional common disease diagnosis and treatment	Level 4 electronic medical records, integration of outpatient and inpatient services	40–60
100–300 beds	1.89	46.3	Basic common disease diagnosis and treatment	Level 3 electronic medical records, direct medical insurance connection	15–25
Less than 100 beds	1.71	33.5	Community-based basic medical care	Electronic health records, teleconsultation	5–10

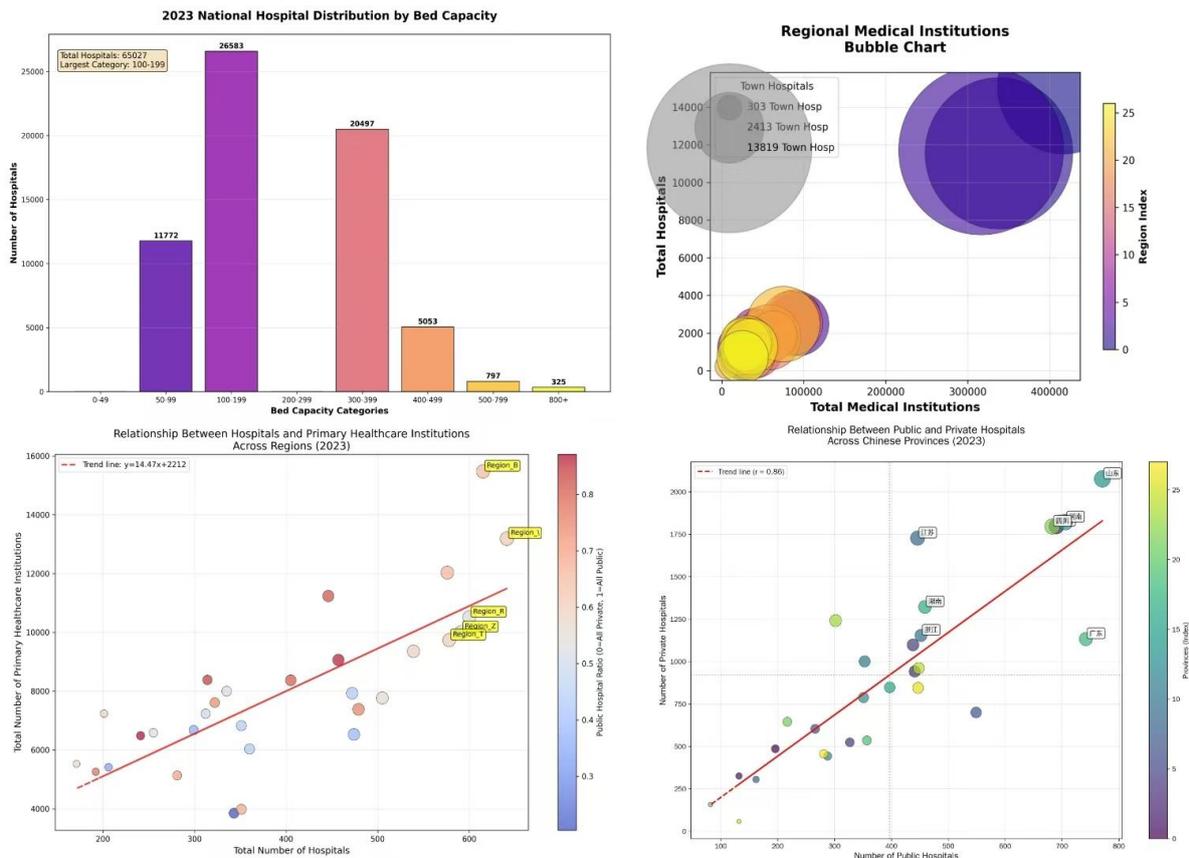
Figure 2 Visualization of Core Allocation Characteristics of China's Medical Resources in 2023



Note: This figure contains data of four core dimensions: ① Hospital grade distribution (counted by quantity): The total number of hospitals in the country is 38,355, including 2,326 tertiary hospitals (including 3A, 3B, 3C sub-grades, accounting for 21.5%, 77.2%, 1.3% respectively), secondary hospitals accounting for 31.1%, primary hospitals accounting for 24.3%, and ungraded hospitals accounting for 34.6%; ② Regional distribution: Differences in the distribution of medical and health institutions in major regions of eastern, central and western China; ③ Comparison of institutional types over time: Changes in the proportion of primary medical care, maternal and child health care (MCH), disease control and prevention (CDC) and other institutional types between 2015 and 2023; ④ Sub-grade distribution of tertiary hospitals. The data in the figure intuitively present the configuration characteristics of China's medical resources of "diversified grade structure and uneven regional distribution", providing visual support for the analysis of the grade demand of hospital informatization systems and the balance demand of regional investment.

Figure 3 Bed Scale of Chinese Hospitals and Correlated Medical Resource Allocation Characteristics

in 2023



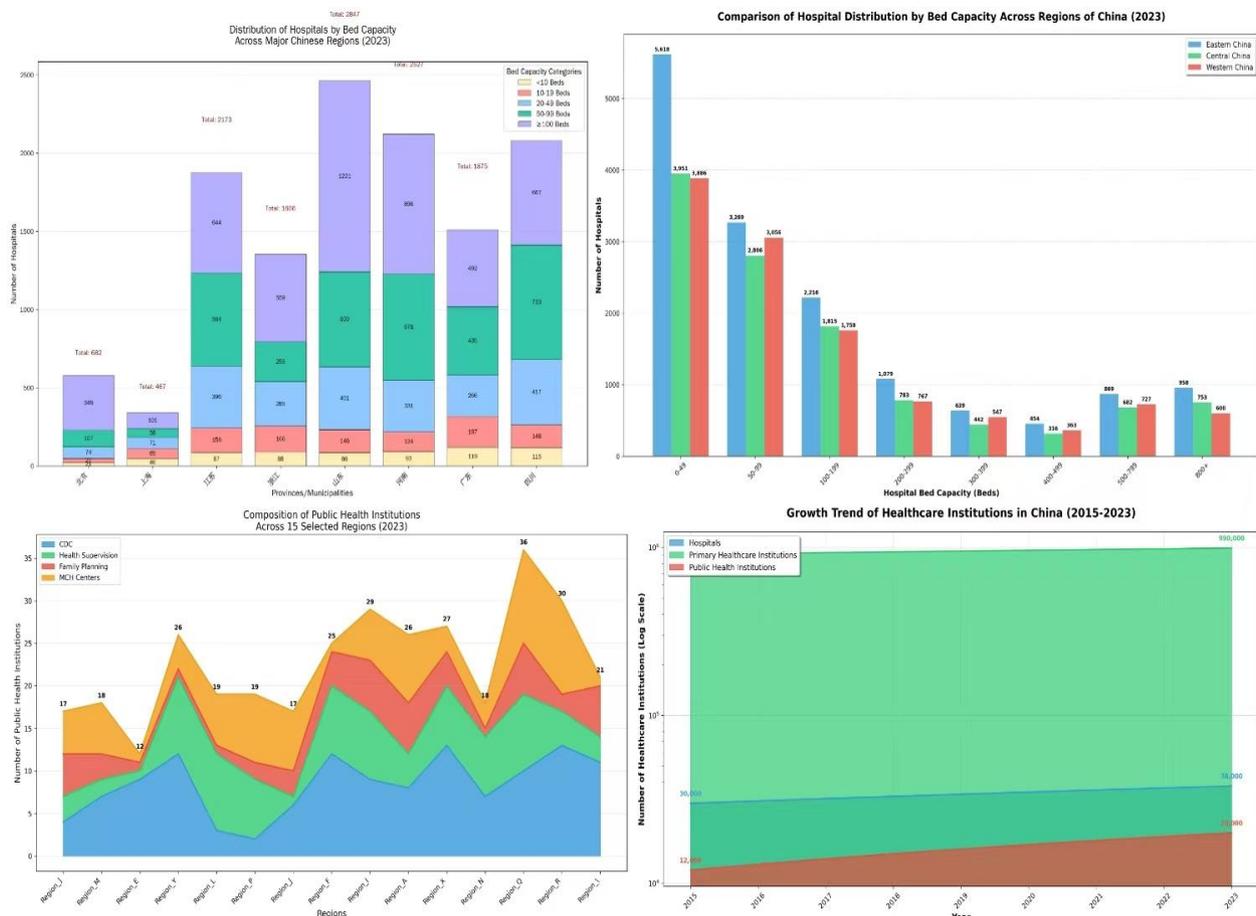
Note: This figure contains data of four core dimensions: ① Upper left sub-figure: Quantity distribution of national hospitals by bed capacity interval in 2023 (covering intervals such as "beds ≤ 49 ", "50–99", etc., among which the number of hospitals with 100–199 beds is the largest, reaching 26,683); ② Upper right sub-figure: Bubble chart of regional medical institutions, presenting the quantity distribution and regional identification of different types of institutions such as town hospitals; ③ Lower left sub-figure: Quantitative relationship between the total number of hospitals and the total number of primary-level medical institutions in each region (the trend line equation is $y = 14.47x + 2212$); ④ Lower right sub-figure: Quantitative correspondence between public and private hospitals in various provinces of China (the slope of the trend line is 0.86). The data in the figure intuitively reflect the configuration characteristics of "small and medium-sized bed capacity hospitals as the leading factor and linkage between hospitals and primary-level medical resources in the region", providing quantitative basis for the informatization functions of hospitals with different bed capacities (such as the demand for basic diagnosis and treatment systems in small-bed hospitals).

3.2 Regional Distribution Differences: Dense Resources in the East, Significant Informatization Investment Gap in the Central and Western Regions

The allocation of medical resources in eastern, central and western China presents significant imbalance characteristics, which can be reflected through three core dimensions: the number of tertiary hospitals, bed density, and informatization investment level (see Table 3). The previously calculated Theil index $T = 0.18$ further confirms the imbalance of regional medical resource

distribution. This difference in regional resource allocation directly leads to a significant gap in hospital informatization investment between eastern, central and western regions. It is urgent to make up for the shortcomings of informatization construction in central and western regions through policy inclination and resource coordination.

Figure 4 Subdivided Bed Scale, Public Health Composition and Growth Trend of Regional Medical Resources in China in 2023



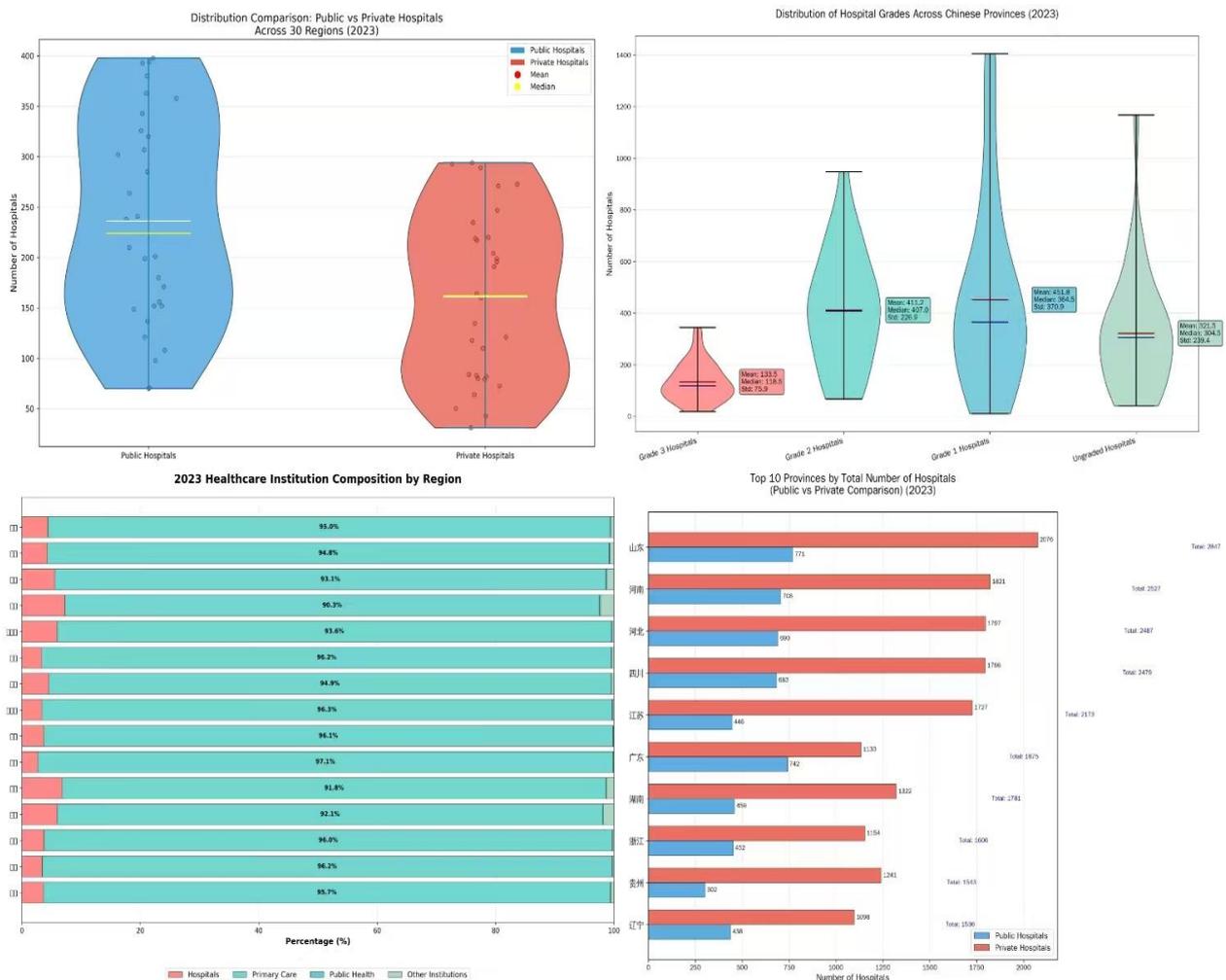
Note: This figure contains data of four core dimensions: ① Upper left sub-figure: Quantity distribution of hospitals in key regions of China by bed capacity (1–19 beds, 20–99 beds, 100–199 beds, ≥ 200 beds); ② Upper right sub-figure: Comparison of the number of hospitals by bed capacity in eastern, central and western regions (the number of hospitals of all bed capacities in the eastern region is significantly higher than that in central and western regions); ③ Lower left sub-figure: Composition of public health institutions in 15 key regions (covering CDC, home care, MCH centers and other types); ④ Lower right sub-figure: Growth trend (logarithmic scale) of the number of medical institutions (hospitals, primary medical care, public health) in China from 2015 to 2023. The data in the figure not only reflect the regional difference of "more concentrated hospital resources of all bed capacities in the eastern region", but also present the regional type composition of public health institutions, providing detailed basis for informatization resources to "incline to small and medium-sized bed hospitals in central and western regions and match regional public health institution types".

Table 3 Comparison of Medical Resources and Informatization Investment in Eastern, Central and Western Regions in 2023

Region	Number of Tertiary Hospitals (10,000 units)	Bed Density (beds/10,000 people)	Informatization Investment (10,000 yuan/institution)	Data Interoperability Rate (%)	Informatization Gap Rate (%)
Eastern	0.13	65.2	58.3	72.5	12.8
Central	0.05	48.7	32.1	51.3	38.5
Western	0.03	42.3	25.7	43.8	47.2

After clarifying the regional density differences of medical resources in eastern, central and western regions, the institutional attribute (public and private) structure within regions, the composition ratio of different types of medical institutions, and the hospital grade distribution characteristics at the provincial level further refine the differentiated picture of medical resource allocation — differences in these dimensions also directly correspond to the priority and functional focus of informatization construction. Figure 5 presents the configuration characteristics of China's medical resources in terms of region, attribute and type from multiple dimensions in 2023:

Figure 5 Institutional Attribute, Grade and Regional Composition Characteristics of China's Medical Resources in 2023

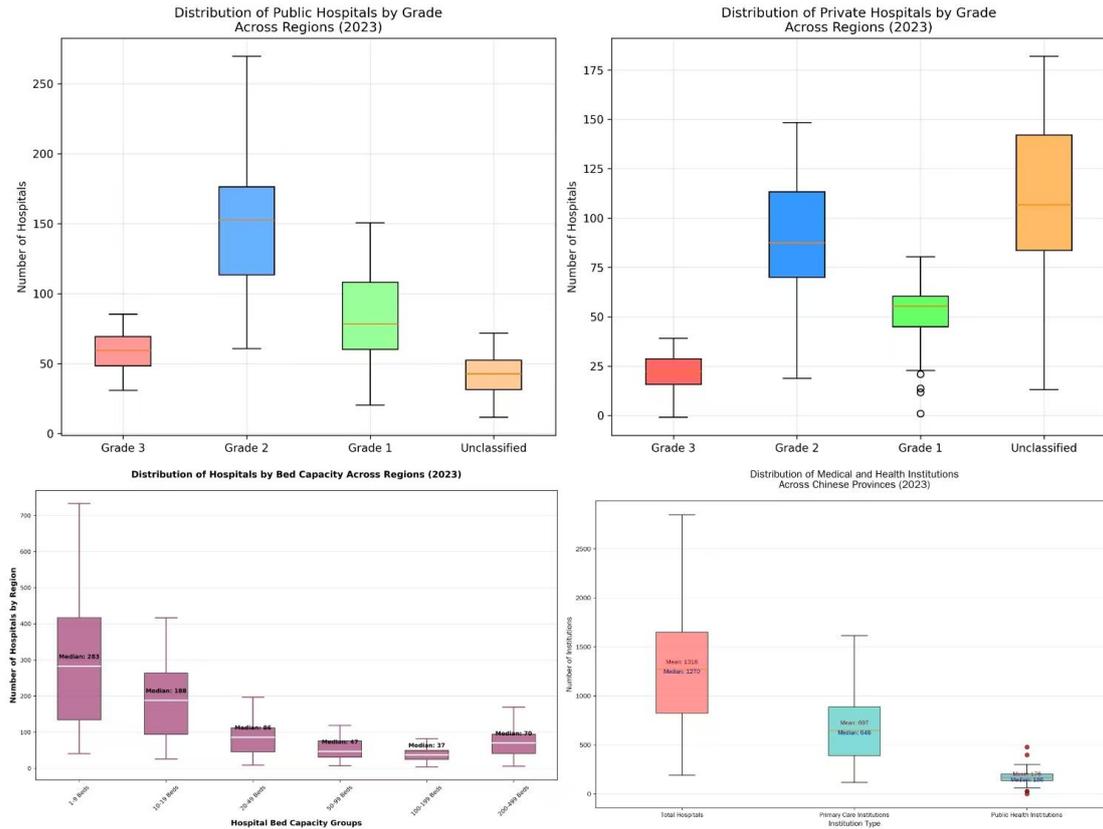


Note: This figure contains data of four core dimensions: ① Upper left sub-figure: Quantity distribution of public and private hospitals in 30 regions (blue for public hospitals, red for private hospitals, yellow line for the median number of hospitals of the corresponding type); ② Upper right sub-figure: Quantity distribution of tertiary, secondary, primary and ungraded hospitals in various provinces of China, marking statistical characteristics such as the mean and median number of hospitals of each grade; ③ Lower left sub-figure: Composition ratio of medical institutions in each region in 2023, covering hospitals, primary medical care, public health and other institutional types; ④ Lower right sub-figure: Comparison of the number of public and private hospitals in the top 10 provinces with the total number of hospitals. The data in the figure intuitively reflect the characteristics of China's medical resources of "public hospitals as the leading factor, differentiated composition of institutional types within regions, and uneven distribution of hospital grades among provinces", providing visual basis for the informatization needs of institutions of different attributes and types (such as the demand for integrated systems in public hospitals and the demand for lightweight functions in primary medical care).

3.3 Characteristics of Primary-Level Institutions: Large Quantity but Weak Foundation, Informatization Needs "Lightweight Coverage"

As the "bottom line" of China's medical service system, primary-level medical and health institutions (including community health service centers, township health centers, and village clinics) account for an absolute advantage in the total number of national medical institutions. Statistical data show that in 2023, the total number of primary-level medical and health institutions in China reached 977,300, accounting for 92.1% of the total number of national medical institutions. They are the key carriers for directly serving urban and rural residents and implementing hierarchical diagnosis and treatment policies. However, from the perspective of the current situation of informatization construction, primary-level institutions generally have prominent problems of "small scale, scattered distribution, and weak informatization foundation" (see Table 4). Traditional informatization systems are difficult to adapt to the operational characteristics of primary-level institutions. It is urgent to realize full coverage of informatization and improvement of service capacity of primary-level institutions through cloud-based, lightweight and zero-maintenance informatization solutions.

Figure 6 Grade Regional Distribution of Public/Private Hospitals and Regional Characteristics of Bed Scale and Institutional Type in China in 2023



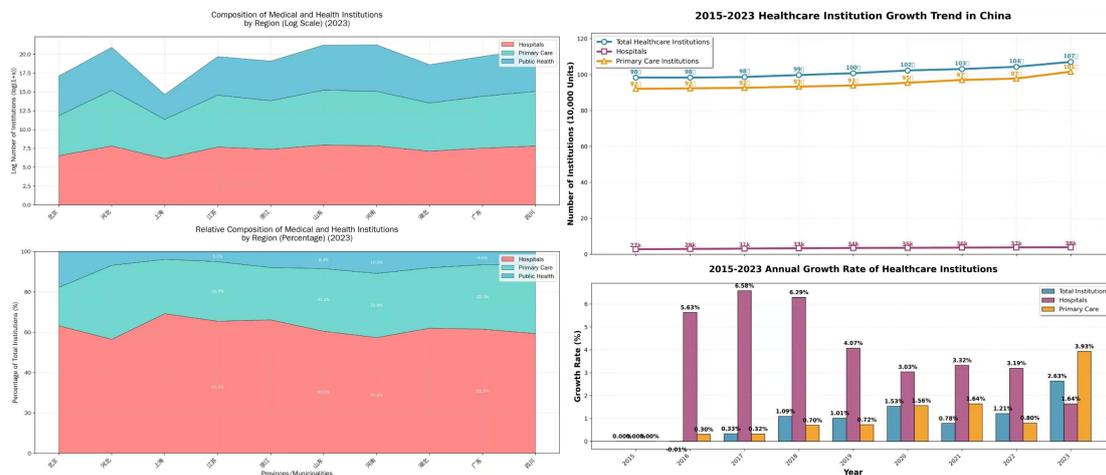
Note: This figure contains data of four core dimensions: ① Upper left sub-figure: Quantity distribution of public hospitals by grade (tertiary, secondary, primary, ungraded) in each region (the regional number median of secondary public hospitals is relatively high); ② Upper right sub-figure: Quantity distribution of private hospitals by grade in each region (the regional number of ungraded private hospitals is significantly higher than that of other grades); ③ Lower left sub-figure: Quantity distribution of hospitals by bed capacity group in each region (the regional number median of small-bed-scale hospitals is lower); ④ Lower right sub-figure: Quantity distribution of different types of medical and health institutions (general hospitals, primary medical care, public health) in various provinces of China. The data in the figure intuitively reflect the attribute differences of "more perfect grade structure of public hospitals and ungraded private hospitals as the mainstay", as well as the regional distribution characteristics of bed capacity, providing detailed basis for the informatization needs of public and private hospitals (such as the demand for complex systems in public tertiary hospitals and the demand for lightweight functions in ungraded private hospitals).

Table 4 Current Situation of Informatization in Primary-Level Medical and Health Institutions in 2023

Type of Primary-Level Institution	Quantity (10,000 units)	Average Number of Beds (beds)	Informatization System Coverage Rate (%)	Data Interoperability Rate with County-Level Hospitals (%)	Annual Average Informatization Investment (10,000 yuan)
Community Health Service	0.35	28.5	89.2	58.7	8.3

Type of Primary-Level Institution	Quantity (10,000 units)	Average Number of Beds (beds)	Informatization System Coverage Rate (%)	Data Interoperability Rate with County-Level Hospitals (%)	Annual Average Informatization Investment (10,000 yuan)
Centers					
Township Health Centers	3.52	32.1	76.5	45.2	6.7
Village Clinics	62.17	1.2	38.9	12.3	1.2

Figure 7 Regional Type Composition of China's Medical Resources and Institutional Growth Trend from 2015 to 2023



Note: This figure contains data of four core dimensions: ① Upper left sub-figure: Logarithmic scale composition of the number of medical and health institutions (hospitals, primary medical care, public health) in various provinces in 2023; ② Lower left sub-figure: Relative proportion of types of medical and health institutions in various provinces in 2023 (primary medical institutions account for more than 50% in most regions); ③ Upper right sub-figure: Growth trend of the total number of medical institutions, the number of hospitals, and the number of primary medical institutions in China from 2015 to 2023 (the total number shows a steady upward trend); ④ Lower right sub-figure: Annual growth rate of medical institutions from 2015 to 2023 (hospitals had a high growth rate from 2016 to 2018, and the growth rate of primary medical care reached 3.93% in 2023). The data in the figure not only reflect the current configuration characteristic of "primary medical care as the main body of regional institutions", but also reflect the growth rhythm of medical institutions in recent years, providing dynamic reference for the "regional coverage adaptation and expansion and upgrading with institutional growth" of informatization systems.

4. Core Challenges of Hospital Informatization Construction Under Resource Allocation Constraints



4.1 Investment Imbalance: Mismatch Between Resource-Intensive Regions and Investment in Small and Medium-Sized Institutions

Combined with the statistical data in Table 2 and Table 3, it can be seen that China's hospital informatization investment presents significant characteristics of "regional imbalance and scale imbalance". From the regional dimension, the annual average informatization investment of large hospitals with more than 500 beds in the eastern region is as high as 1.02 million yuan, while that of small and medium-sized hospitals with 100–300 beds in the central and western regions is only 180,000 yuan, with an investment gap of 5.7 times; from the scale dimension, small and medium-sized hospitals with 100–300 beds, which have the highest informatization investment efficiency ($E = 1.23$), account for only 32.5% of the total national hospital informatization investment, far lower than the investment proportion of large hospitals with more than 500 beds ($E = 0.89$). This investment mismatch leads to insufficient supply of informatization resources for small and medium-sized hospitals with "high demand and high efficiency", further exacerbating the imbalance of hospital informatization construction.

4.2 Supply-Demand Mismatch: Disconnection Between System Functions and Institutional Needs

At present, there is a significant disconnection between the market supply of hospital informatization systems in China and the needs of hospitals of different sizes, and the problem of supply-demand mismatch is prominent. From the perspective of market supply, current mainstream hospital informatization systems are mostly designed with the needs of large hospitals as the core, with complex system functions and high operation and maintenance costs, which are difficult to adapt to the actual needs of small and medium-sized hospitals; from the demand side, as shown in Table 2, small and medium-sized hospitals with 100–300 beds account for 46.3% of the total number of national hospitals, and their informatization needs are concentrated on core basic functions such as basic diagnosis and treatment management and medical insurance settlement, with low demand for high-end informatization applications. Statistical data show that 68% of high-end informatization systems in the current market are targeted at large hospitals with more than 500 beds, while only 22% of lightweight basic systems are targeted at small and medium-sized hospitals with 100–300 beds. The serious imbalance between supply and demand leads to 38.7% of small and medium-sized hospitals being forced to purchase high-end systems with redundant functions, wasting an average of about 82,000 yuan per institution in informatization investment annually.

4.3 Data Fragmentation: Lack of Standard Support for Inter-Institutional Collaboration

It can be seen from the statistical results in Table 4 that the data interoperability rate between China's primary-level medical and health institutions and county-level hospitals is at a low level, only 12.3%–58.7%. The weak inter-institutional data collaboration capacity has become a key bottleneck restricting the implementation of hierarchical diagnosis and treatment policies and the improvement of medical service efficiency. An in-depth analysis of its core reasons lies in the inconsistent informatization data standards across institutions: currently, 32% of hospitals in China adopt custom data formats, and 28% of informatization systems of primary-level medical and health

institutions do not have standardized data interfaces, making it difficult for regional health data platforms to realize "one-time collection and multi-party sharing" of medical data, forming a "data silo" phenomenon. This seriously restricts the collaborative linkage between hospitals, primary-level institutions, and professional public health institutions, and affects the overall operational efficiency of the medical service system.

5. Hospital Informatization Construction Path Based on Resource Matching

5.1 Construct a "Scale-Demand-Investment" Hierarchical Construction System

Based on the scale characteristics of China's medical resource allocation in 2023 and the differences in informatization needs of different types of institutions (see Table 2 and Table 4), to maximize the efficiency of informatization investment and precise demand adaptation, this study constructs a "Scale-Demand-Investment" three-dimensional hierarchical informatization construction system, and formulates differentiated informatization construction plans for medical institutions of different sizes and levels (see Table 5), ensuring that informatization construction is highly matched with the institutional resource scale and service needs.

Table 5 Hierarchical Hospital Informatization Construction Plan in 2023

Type of Institution	Core Construction Content	Investment Standard (10,000 yuan/year)	Responsible Subject	Expected Target (Data Interoperability Rate %)
Hospitals with more than 500 beds	Level 5 electronic medical records, AI-assisted diagnosis, regional data hub	80-120	Hospitals Provincial Finance	+ 90+
Hospitals with 100-300 beds	Level 3 electronic medical records, direct medical insurance connection, reserved upgrade interfaces	15-25	Hospitals Municipal Finance	+ 85+
Community/Township Institutions	Cloud-based electronic health records, teleconsultation terminals	6-10	County-level Finance + Health Bureau	75+
Village Clinics	Lightweight health management APP, medical insurance	1-3	Township Finance Supporting	+ 60+

Type of Institution	Core Construction Content	Investment Standard (10,000 yuan/year)	Responsible Subject	Expected Target (Data Interoperability Rate %)
	settlement module		Hospitals	

5.2 Establish an Investment Mechanism of "Regional Coordination + Policy Inclination"

In view of the significant differences in medical resources and informatization investment between eastern, central and western regions (see Table 3), to solve the problem of unbalanced regional informatization investment and promote the coordinated development of regional medical informatization, this study proposes an informatization investment mechanism of "regional coordination + policy inclination", focusing on efforts from three dimensions: first, strengthen the overall guidance of central finance, set up a special support fund for hospital informatization construction in central and western regions, and implement targeted and precise subsidies according to the informatization gap rates calculated in Table 3 (47.2% in western regions and 38.5% in central regions), focusing on making up for the shortcomings of informatization investment in primary-level institutions in central and western regions; second, establish a counterpart support mechanism for informatization between eastern and central-western regions, clearly requiring tertiary hospitals in eastern regions to output no less than 15% of informatization technologies, talents and resources every year to help small and medium-sized hospitals and primary-level institutions in central and western regions improve their informatization construction level; third, improve the performance appraisal constraint mechanism, include "regional data interoperability rate" and "effectiveness of primary-level informatization support" into the performance appraisal system of large hospitals with a weight of no less than 8%, forcing large hospitals to assume the responsibility of coordinated regional informatization development.

5.3 Unify "Cross-Institutional Data Standards" and Security System

To solve the prominent problems such as cross-institutional data fragmentation and "data silos", and promote the efficient sharing and collaborative utilization of medical data, it is necessary to take standardization construction as the core to build a unified, safe and efficient cross-institutional data interoperability system. On the one hand, based on the "Guidelines for the Application Functions of Hospital Information Platforms" issued by the National Health Commission, unify the format standards and interface specifications of three types of core medical data: diagnosis and treatment records, health records, and inspection and test reports, clarify the unified requirements for data collection, storage, and transmission, and complete the upgrading and transformation of existing systems within a time limit to ensure that 100% of informatization interfaces of medical institutions at all levels in the country are standardized by 2025; on the other hand, build a data security guarantee system of "hierarchical authorization + encrypted transmission + full traceability", and realize the hierarchical authorization management of medical data calls relying on the resident health code to ensure the privacy and security of patients and the compliance of data use. Based on this path, it is expected that by 2025, the data interoperability rate between China's primary-level medical and health institutions and county-level hospitals can be increased from the current 12.3%–58.7% (see



Table 4) to more than 75%, significantly improving the efficiency of cross-institutional medical collaboration.

6. Conclusion

Based on the core data of 15 national medical and health institution statistical documents in 2023, through quantitative analysis, table sorting and formula calculation, this study clarifies that China's medical resource allocation presents the core characteristics of "small and medium-sized hospitals as the mainstay, uneven regional distribution, and weak foundation of primary-level institutions". These characteristics have formed significant constraints on China's hospital informatization construction, leading to three core challenges in current hospital informatization construction: investment imbalance, supply-demand mismatch, and data fragmentation. The research shows that hospital informatization construction must be based on the actual situation of medical resource allocation, abandon the "homogeneous" construction model, and realize the in-depth coupling of medical resource allocation, informatization needs and investment efficiency by constructing a "Scale-Demand-Investment" hierarchical construction system, establishing an investment mechanism of "regional coordination + policy inclination", and unifying cross-institutional data standards and security systems. The optimization path proposed in this study has both data support and practical feasibility, which can provide theoretical reference and practical guidance for the high-quality development of China's hospital informatization construction and help the implementation of the "Healthy China 2030" Strategy.

Data Availability

The data used in this paper are collected from institutions and not fully public.

Appendices and References

[1-1 医疗卫生机构数.xlsx](#)

[1-2 2023年各地区医疗卫生机构数.xlsx](#)

[1-3 2023年各类医疗卫生机构数.xlsx](#)

[1-4 医院数.xlsx](#)

[1-5 2023年各地区公立医院数.xlsx](#)

[1-6 2023年各地区民营医院数.xlsx](#)

[1-7 2023年医院等级情况.xlsx](#)

[1-8 2023年各地区医院等级情况.xlsx](#)

[1-9 2023年按床位数分组的医院数.xlsx](#)

[1-10 2023年各地区按床位数分组医院数.xlsx](#)

[1-11 基层医疗卫生机构数.xlsx](#)

[1-12 2023年各地区按床位数分组的社区卫生服务中心\(站\)数.xlsx](#)

[1-13 2023年各地区按床位数分组乡镇卫生院数.xlsx](#)

[1-14 村卫生室数.xlsx](#)

[1-15 专业公共卫生机构数.xlsx](#)