



## **Geographical Distribution of Health and Medical Indicators in Iran**

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### **Abstract**

In recent years, improving health and medical indicators has become one of the central priorities of national and regional health policies. These indicators play a vital role in promoting population health and reducing inequalities, making their geographical distribution a subject of particular importance. The present study investigates the geographical distribution of health and medical indicators in Iran. This study is applied in purpose and follows a descriptive–analytical approach, with data collected through library research. Quantitative analysis was carried out using GIS, Excel, and SPSS. The OPA model was applied for indicator weighting, provincial rankings were determined through the CoCoSo decision-making model, and provinces were classified using the K-Means clustering method in SPSS. The findings highlight significant regional inequalities in the distribution of health and medical indicators across Iran. Major cities and provincial capitals enjoy broader facilities and higher-quality services, while rural and marginalized regions frequently struggle with shortages of infrastructure, medical personnel, and equipment. These disparities directly affect health outcomes, quality of life, mortality rates, and access to treatment. Addressing such imbalances is critical for advancing health equity and should be a central consideration in national health policy.

**Keywords:** Spatial Analysis, Healthcare, Regional Inequality, Iran.



## Extended Abstract

### Introduction

In recent years, improving health and medical indicators has become one of the central priorities of national and regional health policies. These indicators play a vital role in promoting population health and reducing inequalities, making their geographical distribution a subject of particular importance. Spatial analysis of such indicators helps identify underserved regions and guides the prioritization of health development programs. Previous research shows that, despite significant efforts, considerable geographical disparities in the distribution of healthcare services remain evident in Iran. These imbalances not only limit the quality and accessibility of health services but also negatively affect overall population health and the country's sustainable development. Therefore, understanding the spatial distribution of health indicators and the factors driving such inequalities is essential for policymakers and planners. The present study investigates the geographical distribution of health and medical indicators in Iran, evaluating the level of access across provinces and providing a spatial analysis of their distribution. The central hypothesis assumes that "health and medical indicators in Iran are unevenly distributed across regions."

### Data and Method

This study is applied in purpose and follows a descriptive–analytical approach, with data collected through library research. The statistical information was obtained from the Economic, Social, and Cultural Status of the Provinces report published by the Statistical Center of Iran (2024/1403). To assess the spatial distribution of healthcare services, ten indicators were used: active hospitals per 100,000 people, hospital beds per 10,000 people, primary healthcare centers per 100,000 people, rural comprehensive health centers per 10,000 rural residents, active rural health houses per 10,000 rural residents, medical diagnostic laboratories per 100,000 people, rehabilitation centers per 100,000 people, nuclear medicine, radiology, and imaging centers per 100,000 people, pharmacies per 10,000 people, and urban EMS 115 bases per 100,000 urban residents. The data refer to the year 2023/1402. Quantitative analysis was carried out using GIS, Excel, and SPSS. The OPA model was applied for indicator weighting, provincial rankings were determined through the CoCoSo decision-making model, and provinces were classified using the K-Means clustering method in SPSS into four groups—well-developed, relatively developed, moderately developed, and less developed. The clustering results were finally mapped through GIS.

### Results and Discussion

The findings highlight significant regional inequalities in the distribution of health and medical indicators across Iran. Major cities and provincial capitals enjoy broader facilities and higher-quality services, while rural and marginalized regions frequently struggle with shortages of infrastructure, medical personnel, and equipment. These disparities directly affect health outcomes, quality of life, mortality rates, and access to treatment. Addressing such imbalances is critical for advancing health equity and should be a central consideration in national health policy.



Received: 03/07/2025

Accepted: 18/09/2025

## Conclusion

The analysis reveals that Tehran, owing to its concentration of advanced medical facilities and specialized professionals, stands as a major hub of healthcare development in Iran. This concentration enhances service quality and supports the establishment of national centers of expertise. Nevertheless, the study also shows that the distribution of indicators does not always correspond with actual health development levels. Regional disparities and concentration of resources in specific areas call for more targeted and equitable policymaking. Another key finding relates to population-based ratios. Because indicators were measured relative to population size, highly populated provinces such as Tehran ranked lower despite having large numbers of facilities and skilled staff. For example, Tehran ranked 24th overall, reflecting the impact of its large population base on proportional indicators. This suggests that population-adjusted ratios alone may not fully capture the true state of healthcare development, and complementary analyses are needed for a more accurate assessment.

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Received: 03/07/2025

Accepted: 18/09/2025

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Accepted: 18/09/2025

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Received: 03/07/2025

Accepted: 18/09/2025

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