



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.



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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.

References

- 1) Aghjeri, S., & Aghaei Juboni, M. (2024). The Social Identity and Effects on the Threat of Social Solidarity in Urban Neighborhoods (Case study: Mahshahr Port). *New Ideas In The Geographical Sciences*, 2(4), 1-18. (in persian)
- 2) Amini, A. & Rafie, M. (2019). Barriers to the Formation of Rural-Urban linkages in Tehran Metropolis, Case: Central District in Shahriar County. *Preipheral Urban Spaces Development*, 1(1), 95-110. (in persian)
- 3) Asamani, J. A., Alugsi, S. A., Ismaila, H., & Nabyonga-Orem, J. (2021). Balancing Equity and Efficiency in the Allocation of Health Resources-Where Is the Middle Ground?. *Healthcare (Basel, Switzerland)*, 9(10), 1257.
- 4) Ashik, F. R., Mim, S. A., & Neema, M. N. (2019). Towards vertical spatial equity of urban facilities: an integration of spatial and aspatial accessibility. *J Urban Manag*, 9(1), 77-92.
- 5) Ataei, Y., Mahmoudi, A., Feylizadeh, M. R., & Li, D. F. (2020). Ordinal Priority Approach (OPA) in Multiple Attribute Decision-Making. *Applied Soft Computing*, 86, 105893.
- 6) Bayramzadeh, N., & Mousavi, M. N. (2024). Investigating the Relationship Between Development and Resource Allocation in the Creation of New Human Settlements During the Years 2011 to 2021 (Case Study: Iran). *Journal of Geography and Environmental Studies*, 13(49), 120-139. (in persian)
- 7) Berger, T., & Enflo, K. (2017). Locomotives of local growth: The short- and long-term impact of railroads in Sweden. *Journal of Urban Economics*, 98, 124–138.
- 8) Bhatt, J., & Bathija, P. (2018). Ensuring Access to Quality Health Care in Vulnerable Communities. *Academic medicine : journal of the Association of American Medical Colleges*, 93(9), 1271–1275.
- 9) Doiron, D., Setton, E. M., Shairsingh, K., Brauer, M., Hystad, P., Ross, N. A., & Brook, J. R. (2020). Healthy built environment: Spatial patterns and relationships of multiple exposures and deprivation in Toronto, Montreal and Vancouver. *Environment international*, 143, 106003.
- 10) Dong, X., & Wang, Y. (2024). The geography of healthcare: Mapping patient flow and medical resource allocation in China. *Economics and human biology*, 55, 101431.
- 11) Favarão Leão, A.L., Gierbolini-Rivera, R.D., Franco Silva, M. et al. (2025). Spatial indicators of inequity in urban health research: a scoping review. *Discov Public Health*, 22(27), 1-15.



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- 12) Hafez Nia, M. R., & Ghaderi Hajat, M. (2019). Foundations of Spatial Injustice in Iran. *Political Organizing of Space*, 1(2), 117-127. (in persian)
- 13) Hankey, S., & Marshall, J. D. (2017). Urban Form, Air Pollution, and Health. *Current environmental health reports*, 4(4), 491–503.
- 14) He, Y., Wang, Y., & Chen, X. (2019). Spatial patterns and regional differences of inequality in water resources exploitation in China. *Journal of Cleaner Production*, 227, 835–848.
- 15) Hegazy, N., El Deeb, S., Salem, M. R., Shaguy, J. A., Mohammed, R. N., Khawari, A., Tanoli, J., & Abouzeid, A. (2025). The availability and distribution of health services and resources across different regions in Afghanistan. *Frontiers in public health*, 12, 1371104.
- 16) Jafari, F. , Shamaie, A. & Hatami, A. (2019). An analysis spatial inequality based on health and care indicator (Case study: Counties of Tehran province). *Geography (Regional Planning)*, 8(33), 17-28. (in persian)
- 17) Johansen, P. H., Fisker, J. K., Thuesen, A. A., (2021), ‘We live in nature all the time’: Spatial justice, outdoor recreation, and the refrains of rural rhythm, *Geoforum*, 120, 132-141.
- 18) Kjellstrom, T., Friel, S., Dixon, J., Corvalan, C., Rehfuess, E., Campbell-Lendrum, D., Gore, F., & Bartram, J. (2007). Urban environmental health hazards and health equity. *Journal of urban health : bulletin of the New York Academy of Medicine*, 84(3), 86–97.
- 19) Macedo, J., & Haddad, M. A. (2016). Equitable distribution of open space: Using spatial analysis to evaluate urban parks in Curitiba, Brazil. *Environment and Planning B: Planning and Design*, 43, 1096–1117.
- 20) Marein, B. (2022). Colonial roads and regional inequality. *Journal of Urban Economics*, 131(103492), 103492.
- 21) Mohammadi, S. , Mohammadi, C. & Hedayat, A. (2019). Measuring and analyzing inequal health services provision in Kermanshah province. *Physical Social Planning*, 5(4), 27-44. (in persian)
- 22) Mohammadpour, A. , Eghbal, M. & Hatami, A. (2023). Spatial analysis of defense-security planning in Khuzestan province. *Scientific- Research Quarterly of Geographical Data (SEPEHR)*, 32(126), 49-73. (in persian)
- 23) Mortazavi, Seyyed A & Akbarzadeh, Meisam. (2017). A Framework for Measuring the Spatial Equity in the Distribution of Public Transportation Benefits. *Journal of Public Transportation*, 20(1), 44-62.
- 24) Mousavi, M. , Eskandari Sani, M. , Kahaki, F. S. & Mafakheri, A. (2019). Spatial Analysis of the Effects of Lar Cement Factory on Regional Development with Resilient Approach) Case study: Roudab section of Sabzevar city). *Geography (Regional Planning)*, 9(34), 393-408. (in persian)
- 25) Mousavi, M. N. & Bayramzadeh, N. (2024). Investigating the Relationship between Regional Development and Competitiveness in Border Towns (Case Study: Border Towns of West Azerbaijan Province). *Journal of Geography and Regional Development*, 22(3), 231-259. (in persian)
- 26) Mousavi, M. N. , Bayramzadeh, N. & Hasanpour Ghotoulu, A. (2025). Investigating the process of centralization in Iran with an emphasis on economic indicators. *Economic Geography Research*, 6(19), 85-99. (in persian)
- 27) Mousavi, M. N. , Majnoui Toutakhane, A. , Aftab, A. & Mofareh Bonab, M. (2019). Assessment of Spatial Equity Index in Tourism Villages (Case Study: East Azerbaijan Province). *Human Geography Research*, 51(3), 551-569. (in persian)
- 28) Mousavi, M., Bahramijaf, S. & Mazandarani, D. (2021). Analysis of Tourism Competition Management in Border Areas (Case Study: Baneh Border Area). *Border Science and Techniques*, 10(2), 109-142. (in persian)
- 29) Najafi, E. & Shali, M. (2023). The position of environmental studies in Iran's spatial planning - Case study: regional physical plan and provincial training program. *Scientific- Research Quarterly of Geographical Data (SEPEHR)*, 32(128), 159-174. (in persian)



Received: 03/07/2025

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- 30) Nijkamp, P., Kourtit, K., Krugman, P., & Moreno, C. (2024). Old wisdom and the New Economic Geography: Managing uncertainty in 21st century regional and urban development. *Regional Science Policy & Practice*, 16(10), 100124.
- 31) Pitarch-Garrido, M.-D. (2018). Social sustainability in metropolitan areas: Accessibility and equity in the case of the metropolitan area of Valencia (Spain). *Sustainability*, 10, 371.
- 32) Poorrahi, M. & Argany, M. (2024). investigation and evaluating hospital indicators with population as a measure of health in smart life (Case of study: District 15 to 20 of Tehran). *Journal of Geography and Planning*, 28(88), 256-235. (in persian)
- 33) Rafiian, M., Piri, E., & Piri, H. (2020). Spatial analysis of the distribution of health services in the country. *Geographical Sciences (Applied Geography)*, 16(33), 65-74. (in persian)
- 34) Rakhshaninasab, H. , Khatar, M. H. & Soleimani Damaneh, M. (2025). Review of Regional Inequalities in Development of Health services(Case Study: Counties of Tehran Province). *Sustainable Development of Geographical Environment*, 7(12), 110-127. (in persian)
- 35) Rakhshaninasab, H. R. , Azari tabas, K. & Soleimani Damaneh, M. (2025). Assessing and Analyzing the Spatial Distribution of Indicators of Health Services with Emphasis on Social Justice, Case study: Cities of South Khorasan Province. *Journal of Urban Ecology Researches*, 16(1), 19-36. (in persian)
- 36) Rey, S. J., & Casimiro Vieyra, E. (2023). Spatial inequality and place mobility in Mexico: 2000–2015. *Applied Geography (Sevenoaks, England)*, 152, 102871.
- 37) Rostaei, S. , Hakimi, H. & Alizadeh, S. (2020). Study of Space Equity of Quantitative and qualitative indicators of housing in urban areas (Case study:Urmia city). *Human Geography Research*, 52(3), 1009-1029. (in persian)
- 38) Rostami, A. (2023). Evaluating Spatial Distribution of Public Urban Services (Case Study: Gotvand Township). *New Ideas In The Geographical Sciences*, 1(1), 31-44. (in persian)
- 39) Saraei, M. H. & Dasta, F. (2023). Analysis of the Inequality of Spatial Distribution of Medical Services by the approach of Spatial Justice the case study of Isfahan neighbourhoods. *Sustainable city*, 6(1), 71-87. (in persian)
- 40) Sejoodi, M. , Zayyari, K. , Poorahmad, A. & Yasoori, M. (2021). Analyzing the role and position of pathology and presenting a model of regional development in domestic and foreign studies. *Economic Geography Research*, 2(4), 17-37. (in persian)
- 41) Seraydar, N. , Saeidirezvani, N. & ziari, K. (2023). Measurement of Spatial Justice in the Distribution of Health Care Services based on Justice-Oriented City Indicators the Case Study of Arak city. *Sustainable city*, 6(1), 89-109. (in persian)
- 42) Shen, C., Zhou, Z., Lai, S., Lu, L., Dong, W., Su, M., Zhang, J., Wang, X., Deng, Q., Chen, Y., & Chen, X. (2020). Measuring spatial accessibility and within-province disparities in accessibility to county hospitals in Shaanxi Province of Western China based on web mapping navigation data. *International journal for equity in health*, 19(1), 99.
- 43) Soltani, N. & bayramzadeh, N. (2025). The Impact of Development Inequality on Security in Border and Non-Border Provinces of Iran: A Comparative Study. *Geography and Development*, Articles in Press. (in persian)
- 44) Statistics Center of Iran. (2023). *Statistical Yearbook of the Whole Country*. (in persian)
- 45) Statistics Center of Iran. (2024). *Economic, Social and Cultural Position of the Provinces 2023-2019*. (in persian)
- 46) Taleai, M., Sliuzas, R., & Flacke, J. (2014). An integrated framework to evaluate the equity of urban public facilities using spatial multi-criteria analysis. *Cities*, 40, 56–69.
- 47) Teymouri, R. (2019). Investigating the impact of growth poles on regional socio-economic development with the approach of reducing informal economic activities. *Quarterly Journal of Hidden Economy*, 4(15), 79-101. (in persian)



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- 48) Wei, Y. D., Wu, Y., Liao, F. H., & Zhang, L. (2020). Regional inequality, spatial polarization and place mobility in provincial China: A case study of Jiangsu province. *Applied Geography (Sevenoaks, England)*, 124, 102296.
- 49) Woodward, A., & Kawachi, I. (2000). Why reduce health inequalities?. *Journal of epidemiology and community health*, 54(12), 923–929.
- 50) World Health Organization (2023). *Universal health coverage (UHC): Key facts: World Health Organization*.
- 51) Yazdani, M., Zaraté, P., Zavadskas, E. & Turskis, Z. (2018). A Combined Compromise Solution (CoCoSo) method for multi-criteria decision-making problems. *Management Decision*. 57.
- 52) Yongheng D, Shan X, Fei L, Jinglin T, Liyue G, Xiaoying L, Tingxiao W and Hongrui W (2024) GIS-based assessment of spatial and temporal disparities of urban health index in Shenzhen, China. *Front. Public Health*. 12:1429143.
- 53) You, H. (2016). Characterizing the inequalities in urban public green space provision in Shenzhen, China. *Habitat International*, 56, 176–180.