Sustainable Urban & Regional Development Studies Quarterly

Volume 6, Issue 1 - Serial Number 19, Spring 2025 **Online ISSN: 2783-0764**
Journal Hompage https://www.srds.ir/
https://www.srds.ir/article_220929.html?lang=en

Analysis of the spatial pattern of distribution and service coverage of trade units using spatial statistics analyses and indicators in the GIS environment: (case study :medical eyewear stores in Ardabil city)[1]

Abolfazl Kohi Heris[1], Ata Ghafari Gilandeh[*2], Mansour Rahmati[3]
1. MSc of Geography and Urban Planning, Faculty of Social Sciences, University of Mohaghegh Ardabili, Ardabil
2.Professor, Department of Geography and Urban and Rural Planning, Faculty of Social Sciences, University of Mohaghegh Ardabili, Ardabil
3. Associate Professor, Department of Geography and Urban and Rural Planning, Faculty of Social Sciences, University of Mohaghegh Ardabili, Ardabil

Received Date: 10 March 2025 **Accepted Date:** 15 may 2025

Abstract

Background and Objective: The spatial distribution of urban services is a key factor in quality of life and the realization of spatial justice. Centers offering goods and services related to visual health, in addition to their economic role, are also important from a public health perspective. With population growth and the physical expansion of Ardabil city, the need for proper organization of these services has increased. The aim of this study is to investigate the spatial distribution pattern and service coverage of eyeglass retail units in the city of Ardabil using the relevant capabilities and tools in the ArcGIS environment.

Methodology: This research follows a descriptive–analytical approach, and data were collected through both documentary studies and field surveys. The statistical population includes all visual health service centers across Ardabil city. Spatial analysis was conducted using geographic tools within the ArcGIS environment.

Results and Findings: Out of a total of 38 identified units, 34 are located in Region 1, while Regions 4 and 5 lack any such services. Districts 1-1 and 2-1 show the highest concentration. Cluster analysis revealed that District 1-1, particularly Neighborhood 08-1, constitutes a hotspot with a 99% confidence level, indicating that service density there significantly exceeds the city's average. This high concentration can lead to congestion and unequal access. In contrast, in the fourth to seventh rings away from the city center, no units have been deployed in these areas. The Nearest Neighbor Index (0.215602) confirms a clustered distribution pattern. Therefore, targeted expansion of these services in underserved areas is essential to promote spatial equity and improve access for all citizens.

Keywords: Spatial analysis, Ardabil city, Geographic information system, Optical shops.

[1] This article is extracted from the first author's MSc Dissertation" entitled" Analysis of the spatial dispersion and distribution of pharmacy and eyeglass stores in the city of Ardabil using spatial analysis and spatial statistics tools in the ArcGIS environment."

[*] **Correspong Author Email** :a_ghafarigilandeh@uma.ac.ir

Cite this article: Kouhi Heris, A., Ghaffari Gilandeh, A. and Rahmati, M. (2025). Analysis of the spatial pattern of distribution and service coverage of trade units using spatial statistics analyses and indicators in the GIS environment: (case study: medical eyewear stores in Ardabil city). *Journal of Sustainable Urban & Regional Development Studies (JSURDS)*, *6*(1), 368-387.

Extended Abstract

Introduction:
In recent decades, with the expansion of urbanization and the growth of urban populations, attention to spatial justice in the distribution of services and urban facilities has become a central priority in urban planning and policymaking. One of the most critical aspects of this justice is equitable and balanced access to health-related services, which plays a direct role in improving the quality of life. Among these, commercial units operating in the field of visual health—such as medical eyewear stores—serve not only an economic function but also fulfill a specialized health-related role. These establishments provide services such as eye examinations, lens prescriptions, and the sale of medical frames, acting as complementary components to optometry clinics and healthcare centers. Due to the specialized nature of their services, the spatial distribution and location of these units across the urban landscape can significantly affect citizen access, spatial equity, and the overall efficiency of visual health service delivery.

Methodology
This research follows a descriptive-analytical approach, and data collection was conducted using both documentary and field methods. The statistical population includes all optical shops in Ardabil. Since this study focuses on the distribution, dispersion, and spatial allocation of optical shops in the city, relevant tools and analytical features in the ArcGIS environment were employed for data processing and analysis.

Results and discussion
This study analyzes the distribution and spatial layout of optical shops in Ardabil. Among the 38 optical shops in the city, Region 1 has the highest number, with 34 units, making it the main concentration area for these businesses. Regions 2 and 3 have 3 and 1 optical shop, respectively, while Regions 4 and 5 lack any optical shops, leading to accessibility limitations in these areas. At the district level, District 1-1 has the highest number of optical shops, with 23 units, followed by District 2-1 with 10 units. Districts 1-3 and 3-1 each have only one optical shop, and other districts lack such services. This distribution highlights the concentration of these establishments in central areas, which may limit access to these services in peripheral neighborhoods. The hot spot analysis results indicate that Region 1, District 1-1, and Neighborhood 08-1 have the highest concentration of optical shops and are recognized as the primary service centers. These areas were identified as hot spots with a 99% confidence level. The distance rings analysis from the city's geographic centroid shows that the first ring contains 25 optical shops, indicating a high concentration in these areas. However, there are no optical shops in the fourth to seventh rings, demonstrating an imbalanced service distribution. Finally, the nearest neighbor analysis yielded a value of 0.215602, confirming a clustered distribution pattern of optical shops in central areas, while emphasizing limited accessibility in farther districts.

Conclusion
The spatial distribution of optical shops in Ardabil follows a distinct pattern of concentration in specific regions. According to the findings, Region 1, District 1-1, and Neighborhood 08-1 have the highest number of optical shops and serve as key service centers in this field. These areas, due to their favorable geographic locations and high concentration, attract more customers. Conversely, Regions 4 and 5 face a lack of optical shops, creating service gaps that may hinder access for residents. Regarding the city's geographic centroid and the distance rings, a significant concentration of optical shops is observed in the first ring, followed by the second ring. This concentration in central areas facilitates access to optical

services and attracts customers from various parts of the city, including peripheral neighborhoods. However, this centralization should not prevent the balanced distribution of services across other areas. To ensure the needs of all citizens are met, it is essential to expand optical shops in various districts and neighborhoods so that all areas can benefit from these services. This study emphasizes the importance of a well-balanced and strategic distribution of such businesses. Expanding optical shops to different parts of the city can improve accessibility and enhance urban life quality. Additionally, ensuring a diverse and balanced distribution of these units not only facilitates access but also fosters competition and enhances service quality. Ultimately, these measures contribute to increased public satisfaction with optical services.

Conclusion:
The current distribution pattern of pharmacies in Rasht reveals high service concentration in some districts and relative deprivation in others. This spatial imbalance reduces spatial equity, places pressure on high-density service areas, and limits access in underserved districts. The results highlight the urgent need for targeted urban planning interventions to redistribute pharmacy services and ensure equitable access throughout the city.

Declarations

•**Funding**: There is no funding support for this study.
•**Authors' Contributions**: All authors contributed equally to the conceptualization and writing of the article. The authors approved the manuscript's content and agreed on all aspects of the work.
•**Conflict of Interest:** The authors declare no conflict of interest.
•**Acknowledgments**: The authors extend their gratitude to all scientific consultants who provided invaluable insights during this research.

References

Aftab, A., Soleimani, A., & Hassanpour, N. (2018). Spatial Distribution Analysis and Location of 24-Hour Pharmacies (Case Study: Urmia City). *Health and Treatment Management, 9*(1), 33-45. https://sanad.iau.ir/fa/Article/806035?FullText=FullText

Bahadori, F., Yazdani, M.H., Mohammadi, A., & Rahmati, M. (2026). A Comparative Study of Tabriz Metropolitan Areas Based on Urban Furniture Components. *Journal of Sustainable Urban and Regional Development Studies, 7*(1), 91-103. https://www.srds.ir/article_220199.html

Tahami, S.A.A. (2024). An Analysis of the Spatial Distribution Pattern of Pharmacies in Rasht City Using Spatial Analysis and Spatial Statistics Tools in ArcGIS. *Master's Thesis, University of Mohaghegh Ardabili*. https://ganj.irandoc.ac.ir/#/articles/fddf06b44b666f591db76bd788388154

Teymouri, R., Roustaei, S., Akbari Zaman, A., & Ahadnejad, M. (2010). Evaluating the Spatial Suitability of Urban Parks Using GIS (Case Study: Neighborhood Parks in District 2 of Tabriz Municipality). *Geographical Space, 10*(30), 137-168. https://magiran.com/p770576

Cheshmishi, M., & Mobaraki, O. (2018). Investigating the Approach of Spatial Justice in the Distribution of Hospital and Clinic Services in Mashhad Using the VIKOR Technique. *Journal of Geography and Urban Planning of Zagros Landscape, 10*(38), 27-48. https://www.magiran.com/p2227478

Khormali, M. (2021). Spatial Analysis of Commercial and Service-Commercial Land Uses in Ardabil City Using GIS Capabilities. *Master's Thesis, University of Mohaghegh Ardabili*. https://ganj.irandoc.ac.ir/#/articles/26904420c07600eca69a4066b6747bed

Khomar, G., & Sargolzaei, S. (2012). Evaluating Land Use Compatibility in the Old Texture of Zabol City Using GIS. *Spatial Planning, 2*(3), 35-49. https://sid.ir/paper/223686/fa

Hafeznia, M.R., Ghaderi Hajat, M., Ahmadipour, Z., Roknoddin Eftekhari, A., & Gohari, M. (2015). Designing a Model for Measuring Spatial Justice (Case Study: Iran). *Human Sciences Modares, 19*(1), 33-52. https://sid.ir/paper/171890/fa

Rahmati, M., & Risi, L. (2024). Strategic Planning for the Development of Medical Tourism in Ardabil City. *Geography and Human Relations, 6*(4), 227-239. https://doi.org/10.22034/gahr.2024.434769.2025

Dolatyar, K., Yazdani, M.H., Ghaffari Gilandeh, A., & Nazmfar, H. (2026). Geographical Analysis of Indicators and Examples of a Happy City with Emphasis on Ray Oldenburg's Third Place Theory (Case Study: Khorramabad City). *Journal of Sustainable Urban and Regional Development Studies, 7*(1), 44-72. https://www.srds.ir/article_219235.html

Darwishi, Y. (2014). A Field-Analytical Look at the Physical Challenges of Sidewalks in Ardabil City. *Journal of Art and Architecture Studies, 2*(4), 111-117. https://www.sid.ir/paper/501125/fa

Iran University of Medical Sciences. (2022). Regulations for the Establishment of Optical Shops. Retrieved from https://vct.iums.ac.ir/uploads/26/2022/Jun/21/parvane_glass_31.pdf

Ziari, K. (2009). Principles and Methods of Regional Planning (5th ed.). Yazd: Yazd University Press. https://press.yazd.ac.ir/book_508.html

Ziari, K. (2020). Urban Land Use Planning (7th ed.). Tehran: University of Tehran Press. https://press.ut.ac.ir/book_2307.html

1Zendedel, H., & Dastyaran. (2011). Iran Tourism Guide: Ardabil Province. Iran Gardan Publications, Vol. 3. https://taaghche.com/book/12714/%D8%A7%D8%B1%D8%AF%D8%A8%DB%8C%D9%84

Shahnazi, A., Mirabi, V.R., Hagh Shenas Kashani, F., & Shahroudi, K. (2023). Location of Hypermarkets with Emphasis on Spatial and Locational Indicators (Case Study: Rasht Metropolis). *Human Settlement Planning Studies, 18*(2), 189-191. https://dorl.net/dor/20.1001.1.25385968.1402.18.2.6.5

Shahabzadeh, M., Pivastegar, Y., & Heidari, A.A. (2016). Spatial Distribution Analysis of Modern Urban Commercial Centers and Their Optimal Location Using GIS and AHP (Case Study: Shiraz Metropolis). *Regional Planning, 6*(23), 99-112. https://sid.ir/paper/230600/fa

Abedi, S. (2021). Spatial Analysis of the Distribution of Health and Medical Land Uses Using Spatial Analysis Tools in GIS (Case Study: Ardabil City). *Master's Thesis, University of Mohaghegh Ardabili*. https://ganj.irandoc.ac.ir/#/articles/81b5d28d973d4d2de54d2580a7c3a67d

Azizi, A., & Sadeghi, R. (2023). Spatial Analysis of Migration and Drought in Iran Using Hot Spot Analysis and Standardized Precipitation Index. *Geography and Environmental Hazards, 12*(2), 81-100. https://doi.org/10.22067/geoeh.2022.76710.1230

Alijani, B. (2015). Spatial Analysis. *Spatial Analysis of Environmental Hazards, 2*(3), 1-14. https://sid.ir/paper/264790/en

Ghaffari Chandanaq, N. (2022). Spatial Distribution Analysis of Laundry and Dry-Cleaning Units in Ardabil City Using Spatial Analysis Capabilities in GIS. *Master's Thesis, University of Mohaghegh Ardabili*.

Jahani Dolatabad, E., & Mohammadi, C. (2023). Explaining the Happy City from the Perspective of Ardabil Citizens. *Journal of Social Welfare and Development Planning, 14*(54), 317-348. https://ganj.irandoc.ac.ir/#/articles/27ca579ed86cc3333ab962fd851a181a

Ghaffari Chandanaq, N., Ghaffari Gilandeh, A., & Safarian Zangir, V. (2024). Evaluating Accessibility and Spatial Distribution of Urban Services Using GIS in Ardabil Neighborhoods (Case Study: Laundry and Dry-Cleaning Units). *Urban Economics and Planning, 5*(1), 106-118. https://doi.org/10.22034/uep.2024.454750.1479

Fatemi, Z. (2023). Investigating the Distribution of Bakeries in Ardabil City Using Spatial Analysis Tools in ArcGIS. *Master's Thesis, University of Mohaghegh Ardabili*. https://ganj.irandoc.ac.ir/#/articles/65d73ede7b5034ccb2fc13ec57c982ab

Kiani, A., & Kazemi, A.A. (2015). Analysis of Public Service Distribution in Shiraz City Using Spatial Autocorrelation Models in ArcGIS and Geoda. *Urban Research and Planning, 6*(22), 1-14. https://sid.ir/paper/509683/fa

Mohammadi, A., Hashemi Masoumabad, R., & Mohammadi, C. (2021). Spatial Analysis of Service Distribution and Accessibility in Urban Neighborhoods with a Spatial Justice Approach (Case Study: Commercial Land Uses in Ardabil). *Applied Research in Geographical Sciences, 21*(63), 99-117. https://sid.ir/paper/958047/en

Masoumi, M.T., & Rajabzadeh Niaragh, M. (2021). Assessing the Vulnerability of Ardabil's Road Network to Earthquakes (Case Study: Imam Khomeini Street). *Environmental Hazards, 10*(3), 141-161. https://doi.org/10.22067/geoeh.2021.67019.0

Hedayati, R. (2022). Analysis of the Distribution of Jewelry Shops in Ardabil City Using Spatial Analysis Tools in GIS. *Master's Thesis, University of Mohaghegh Ardabili*. https://ganj.irandoc.ac.ir/#/articles/a617b60076490878de3d63e87a4c6fb9

Vaezi, H. (2024). An Analysis of Reducing Environmental Risks with Emphasis on Community-Based Disaster Management Components (Case Study: Ardabil City). *PhD Dissertation, University of Mohaghegh Ardabili*. https://ganj.irandoc.ac.ir/#/articles/0a4a8892f3ca48e1af85a6aa8184b410

Yari Hisar, A., Yazdani, M.H., & Pashazadeh, A. (2019). Spatio-Temporal Analysis of Theft in Ardabil City. *Urban Studies Quarterly, 33*, 77-92. https://doi.org/10.34785/J011.2019.46

Yaghouri, H., Fotouhi, S., & Beheshtifar, J. (2013). Application of GIS in Spatial Distribution Analysis and Location of Pharmacies (Case Study: Jahrom City Pharmacies). *Urban Research and Planning, 4*(14), 1-20. https://sid.ir/paper/220204/en