JOURNAL HEALTH NPEPS

http://dx.doi.org/10.30681/2526101014583 ORIGINAL ARTICLE

Mapping of clinical neurology specialty care coverage in secondary care in Rio Grande do Sul

Mapeo de la cobertura de atención especializada en neurología clínica en atención secundaria en Rio Grande do Sul

Mapeamento da cobertura de cuidados especializados em neurologia clínica na atenção secundária no Rio Grande do Sul

Soraya Camargo Ito Süffert[1], Carlos Eduardo Aliatti Mantese[2], Alan Delgado de Oliveira[3]

ABSTRACT

Objective: to map the coverage of specialized clinical neurology care in secondary care in Rio Grande do Sul, Brazil. **Method:** cross-sectional study was conducted in May 2024, using public data from Brazilian Institute of Geography and Statistics e da State Health Secretariat of Rio Grande do Sul. Isochrones were used to calculate the coverage of outpatient neurology services. **Results**: thirty-one outpatient services offered consultations with neurologists. Outpatient services in clinical neurology are mainly available in the North and Northeast regions of this state, near Porto Alegre. In the West and South regions, the population needs to travel more than 75 km or more than 60 minutes to access specialized neurology care through the Unified Health System (SUS). **Conclusion**: there is a concentration of outpatient clinical neurology services in the northern region of Rio Grande do Sul, consistent with Brazilian medical demographics. This indicates the need for public policies that encourage the decentralization and retention of neurology services and professionals.

Descriptors: Neurology; Geography, Medical; Health Services Accessibility; Effective Access to Health Services; Referral and Consultation.

RESUMEN

Objetivo: *mapear la cobertura de la atención neurológica clínica especializada en el nivel secundario de atención en Rio Grande do Sul, Brasil.* ***Método:*** *estudio transversal*

[1]Medical Doctor. PhD in Pathology at the Federal University of Health Sciences of Porto Alegre (UFCSPA) and Postgraduate student at the School of Administration at the Federal University of Rio Grande do Sul (UFRGS). Porto Alegre, Rio Grande do Sul, Brasil. E-mail: soraya@ufcspa.edu.br ORCID ID: https://orcid.org/0000-0002-2303-1219 **Corresponding author** – Adress: Rua Washington Luiz, 855 - Centro Histórico, Porto Alegre - RS, CEP: 90010-460.

[2]Medical Doctor. PhD in Medicine. Professor at the Universidade do Vale dos Sinos. São Leopoldo, Rio Grande do Sul, Brasil. ORCID ID: https://orcid.org/0000-0002-8306-803X

[3]Computer Scientist. PhD in Administration at the Federal University of Rio Grande do Sul (UFRGS). Porto Alegre, Rio Grande do Sul, Brasil. ORCID ID: https://orcid.org/0000-0003-4260-5844

CITATION: Ito Süffert SC, Mantese CEA, Oliveira AD. Mapping of clinical neurology specialty care coverage in Secondary Care using isochrones. J Health NPEPS. 2026; 11(1):e14583.

EDITOR IN CHIEF: Vagner Ferreira do Nascimento

se realizó en mayo de 2024, utilizando datos públicos del Instituto Brasileño de Geografía y Estadística y del Secretaría de Salud del Estado de Rio Grande do Sul. Se utilizaron isócronas para calcular la cobertura de los servicios ambulatorios de neurología. ***Resultados****: treinta y un centros de atención ambulatoria ofrecían consultas con neurólogos. Los servicios ambulatorios de neurología clínica se concentran principalmente en las regiones Norte y Noreste de este estado, cerca de Porto Alegre. En las regiones Oeste y Sur, la población debe recorrer más de 75 km o más de 60 minutos para acceder a atención neurológica especializada a través del Sistema Único de Salud (SUS).* ***Conclusión****: en la región norte de Rio Grande do Sul se observa una concentración de servicios de neurología ambulatoria, en consonancia con la demografía médica brasileña. Esto pone de manifiesto la necesidad de políticas públicas que fomenten la descentralización y la retención de los servicios y profesionales de neurología.*
Descriptores*: Neurología; Geografía Médica; Accesibilidad a los Servicios de Salud; Acceso Efectivo a los Servicios de Salud; Derivación y Consulta.*

RESUMO
Objetivo*: mapear a cobertura de cuidados especializados em neurologia clínica na atenção secundária no Rio Grande do Sul, Brasil.* ***Método****: estudo transversal, realizado em maio de 2024, utilizando dados públicos do Instituto Brasileiro de Geografia e Estatística e da Secretaria Estadual da Saúde do Estado do Rio Grande do Sul. Isócronas foram utilizadas para calcular a cobertura dos serviços ambulatoriais de neurologia.* ***Resultados****: trinta e um serviços ambulatoriais ofereciam consultas com neurologistas. Os serviços ambulatoriais em neurologia clínica estão disponíveis principalmente nas regiões Norte e Nordeste deste estado, próximo a Porto Alegre. Nas regiões Oeste e Sul a população precisa percorrer mais de 75 km ou mais de 60 minutos para acessar atendimento especializado em neurologia pelo Sistema Único de Saúde (SUS).* ***Conclusão****: há concentração de serviços ambulatoriais em neurologia clínica na região Norte do Rio Grande do Sul, em conformidade com a demografia médica brasileira. Isso indica a necessidade de políticas públicas que incentivem a interiorização e fixação dos serviços e profissionais de neurologia.*
Descritores*: Neurologia; Geografia Médica; Acessibilidade aos Serviços de Saúde; Acesso Efetivo aos Serviços de Saúde; Encaminhamento e Consulta.*

INTRODUCTION

The Sistema Único de Saúde (SUS), established by the 1988 Constitution, offers every Brazilian citizen access to comprehensive universal healthcare services[1]. To provide assistance, it structures the regionalization and hierarchization of Redes de Atenção à Saúde (RAS) according to levels of technological complexity and a process of regulating access to levels of care, enabling users to have comprehensive and longitudinal care[1,2]. However, the theoretical proposal of the SUS faces practical challenges in organizing the provision of universal health services[3], because changes in Brazil's population profile over the last decade have impacted

users' health needs and pose challenges for public health policies.

According to the 2022 census, the total number of individuals aged ≥65 years reached 10.9% of the population, an increase of 57.4% compared to 2010[4]. The greater aging of the population promotes a greater prevalence of chronic non-communicable diseases (NCDs)[5]. As part of the NCD group, neurological diseases, such as stroke, Alzheimer's disease, Parkinson's disease, and demyelinating diseases, require specialized neurological care with complementary examination resources for adequate coordination of patient care[6].

Considering that reported deaths from Alzheimer's disease increased by 145% between 2000 and 2017 and that in 2018, >16 million family members and other unpaid caregivers dedicated approximately 18.5 billion h of care to individuals with neurological diseases, Alzheimer's disease, or other dementias[7], it is important to develop neurological care policies and establish access to specialized neurology services for the population.

Neurological diseases involve diagnostic complexity and the need for specialized monitoring[8]. Patients and families need resources and support for the limitations involved in many diagnosed chronic neurological conditions[9], which directly impact the difficulty of patients traveling to receive medical care and additional tests, since the distribution of neurologists varies substantially by region[6,10].

Chile faces difficulties in distributing neurologists who serve the public health system[11]. According to a study evaluating the effect of telemedicine on reducing waiting lists and improving access, only 50% of the country's adult neurologists were linked to the public health system in December 2016, and >55,000 patients were waiting for their first consultation as of June 30, 2019[11]. In Porto Alegre, Southern Brazil, the average waiting time for a neurology consultation was 342 days in December 2018[12]. Data from the Brazilian Federal Council of Medicine from 2020 indicate that neurologists are more readily available in capital cities[13].

Thus, this study aimed to map the coverage of specialized clinical neurology care in secondary care in Rio Grande do Sul, Brazil.

METHOD

This article followed the guidelines of *Strengthening the*

Reporting of Observational Studies in Epidemiology (STROBE) for cross-sectional studies[14]. This cross-sectional observational study was conducted in May 2024, using public data from Brazilian Institute of Geography and Statistics (IBGE) and public information on outpatient referrals in clinical neurology from the Health Department of the State of Rio Grande do Sul.

To identify the population and population density of Rio Grande do Sul, data from IBGE, Censo de 2022, were obtained from https://www.ibge.gov.br/estatisticas/downloads-estatisticas.html, and the maps were structured using the QGIS program (version 3.34.2-Prizren).

To analyze the population coverage of outpatient health services in clinical neurology offered in Rio Grande do Sul using a demographic density map, all outpatient referrals in clinical neurology offered by the SUS were identified using the State Health Secretariat of Rio Grande do Sul, available on the website https://ti.saude.rs.gov.br/dgae/referencias in May 2024. All clinical neurology services in the state available through the health department information system were included, whereas information relating to other specialties was excluded.

Clinical neurology coverage was defined as the area served by the specialty, considering a maximum distance of 75 km or travel time of 60 min necessary for the patient to reach the clinical neurology service using a motorized vehicle.

To accurately calculate service coverage, a simple radius of 75 km does not effectively represent the possible routes through streets and roads with geographical barriers. Therefore, we used isochrones, which are lines that connect geographic points in which the travel time or distance is equal and represent areas of equal travel time or distance from a central point[15]. To structure an isochron map, it is important to highlight graph theory, which is the mathematical representation of networks and connections; in the context of isochron maps, graphs represent roads, train tracks, public transport routes, and other transport routes[16].

Routing algorithms are fundamental in structuring maps[17] as they consider factors, such as average speed, distance, obstacles, transport restrictions, and geospatial data[18], which involve information about speed limits,

public transport timetables, topography, and other relevant details.

Therefore, isochrones enable the assessment of the reality of the times or distances involved in the routes that the population can access health services, and not just to draw a possible coverage radius for each clinical neurology service in the state.

The isochrone times of 15, 30, 45, and 60 min were calculated based on software availability, and a maximum distance of 75 km was established based on the literature[19]. The locations of outpatient services in the specialty of clinical neurology were geocoded in longitude and latitude using Google Maps® and verified using the Latitude and Longitude Finder website available at https://www.latlong.net/

Thus, we used the open-source software QGIS version 3.34.2-Prizren with the HCMGIS® and ORS tools® plugins based on Google Maps® to calculate isochrones. Consequently, we estimated the coverage of clinical neurology outpatient clinics in Rio Grande do Sul using these isochrones.

This study did not involve research on human beings, in accordance with the CNS resolution 196/96, item II.2, and is a report on a process of analyzing open public data; it was not submitted for approval by a Research Ethics Committee.

RESULTS

According to data from the State Health Department of Rio Grande do Sul, outpatient referrals in clinical neurology in 2024 was identified. There are 31 outpatient services offering appointments with a neurologist (Table 1 and Figure 1).

According to preliminary data from the Censo 2022, the highest population densities are concentrated in North and Northeast Rio Grande do Sul, which have the highest supply of outpatient clinical neurology services in the state (Figure 2).

Outpatient healthcare services in the specialty of clinical neurology in RS are most available in the Northeast region, near Porto Alegre, in which the city's university referral hospitals are concentrated. We highlight the presence of services in the Northern region and other regions that require travel times of >60 min or 75 km to perform a specialized neurological evaluation (Figures 3 and 4).

Considering distances (km), with a maximum travel distance of 75 km, the coverage of outpatient services in

clinical neurology is greater than the distance traveled in 60 min (Figure 4).

Table 1 - Outpatient referrals in the specialty of clinical neurology in the state of Rio Grande do Sul.

Reference in Clinical Neurology	latitude and longitude
Associação Hospitalar Comunitária Regional de Saúde - Constantina	-27.73568735751456, -52.99072714546417
Associação Hospitalar Vila Nova (POA)	-30.119205968567215, -51.20740111839777
Centro Especializado de Saúde - Caxias do Sul	-29.16868271444129, -51.184858945416984
Grupo Hospitalar Conceição (POA)	-30.012155890424147, -51.15811959107241
Hospital Beneficente São Vicente de Paulo - Osório	-29.886245743947896, -50.26537051655689
Hospital Bruno Born – Lajeado	-29.462966473515216, -51.966584054269156
Hospital de Caridade de Três Passos - Três Passos	-27.450832305456355, -53.936493947322106
Hospital de Caridade e Beneficência de Cachoeira do Sul - Cachoeira do Sul	-30.051970897371895, -52.89023280305781
Hospital de Clínicas de Passo Fundo - Passo Fundo	-28.256007067276567, -52.40299214544729
Hospital de Clínicas de Porto Alegre - HCPA (POA)	-30.03857190256487, -51.20668470717067
Hospital de Viamão - Viamão	-30.081309179675152, -51.030163123803014
Hospital Montenegro - Montenegro - Central 1 CRS - Neurologia	-29.686553643199137, -51.46399949815738
Hospital Municipal Getúlio Vargas - Sapucaia do Sul	-29.823286969952264, -51.16608473112067
Hospital Nossa Senhora das Graças - Canoas	-29.926650309065767, -51.16075276128581
Hospital Pompéia - Caxias do Sul	-29.166893080112267, -51.1833482337722
Hospital Regional de Santa Maria - Santa Maria	-29.705128158859072, -53.8635121742342
Hospital Santa Luzia - Capão da Canoa	-29.765244015039116, -50.024692989574184
Hospital Santa Terezinha - Erechim	-27.635799560652444, -52.28291880313846
Hospital São Francisco de Paula – Pelotas	-31.757261290475203, -52.3408690318332
Hospital São José - Dois Irmãos	-29.58845765431195, -51.08793170726728
Hospital São Lucas PUCRS (POA)	-30.055009259140157, -51.17341816072872
Hospital São Roque - Getúlio Vargas	-27.883748496336217, -52.22290690128178
Hospital São Vicente de Paulo - Cruz Alta	-28.632028504881724, -53.60716254913208
Hospital São Vicente de Paulo - Passo Fundo	-28.259682799106386, -52.413356245867206
Hospital Universitário de Santa Maria - Santa Maria	-29.714172223111223, -53.7153414877273
Hospital Universitário Dr. Miguel Riet Correa Júnior - Rio Grande	-32.02854945518295, -52.102542460658924
Hospital Vida & Saúde - Santa Rosa	-27.866727444544026, -54.48518955895324
Irmandade Santa Casa de Misericórdia de Porto Alegre	-30.03079147265516, -51.221521016551925
Santa Casa de Caridade de Uruguaiana - Uruguaiana	-29.773223509906185, -57.083292445396324
Santa Casa de Misericórdia de Pelotas - Pelotas	-31.765370873521032, -52.34674150484604
Santa Casa do Rio Grande - Rio Grande	-32.03003158457281, -52.1022863355207

Source: website https://ti.saude.rs.gov.br/dgae/referencias in 2024.

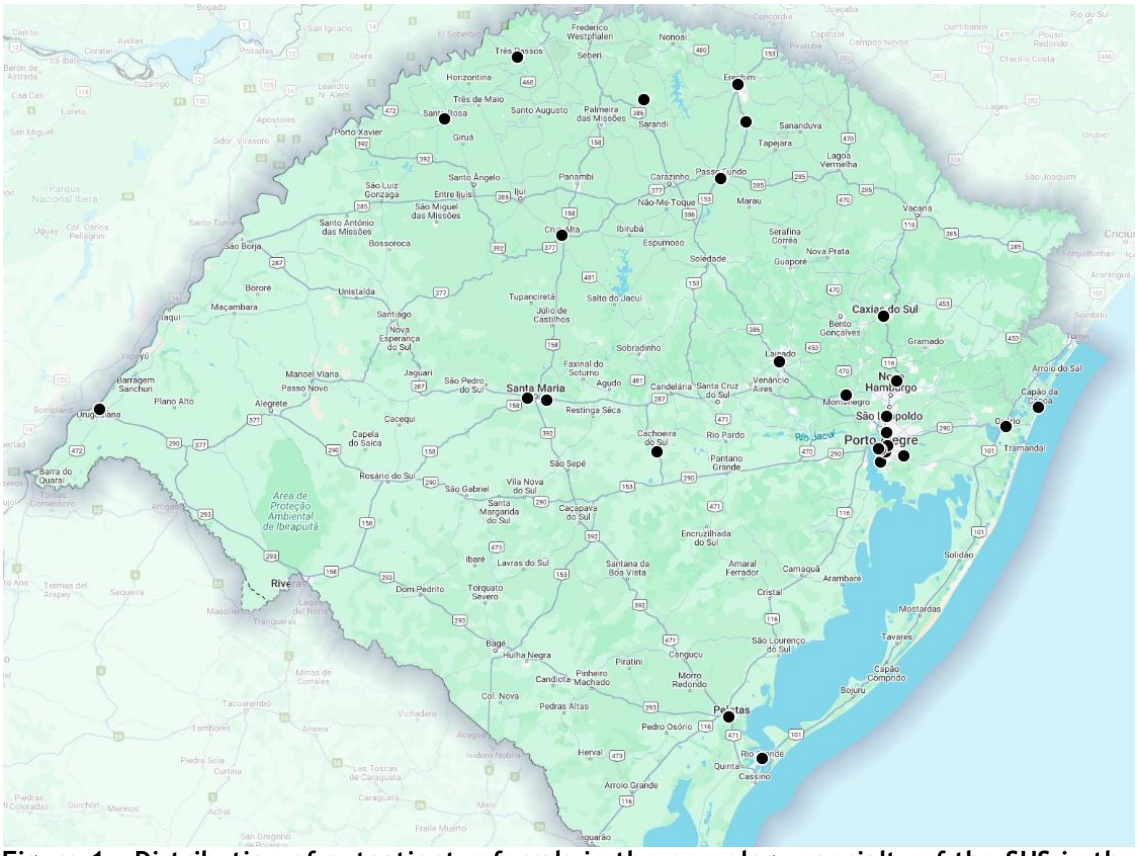

Figure 1 - Distribution of outpatient referrals in the neurology specialty of the SUS in the State of Rio Grande do Sul, Brazil. 2024.

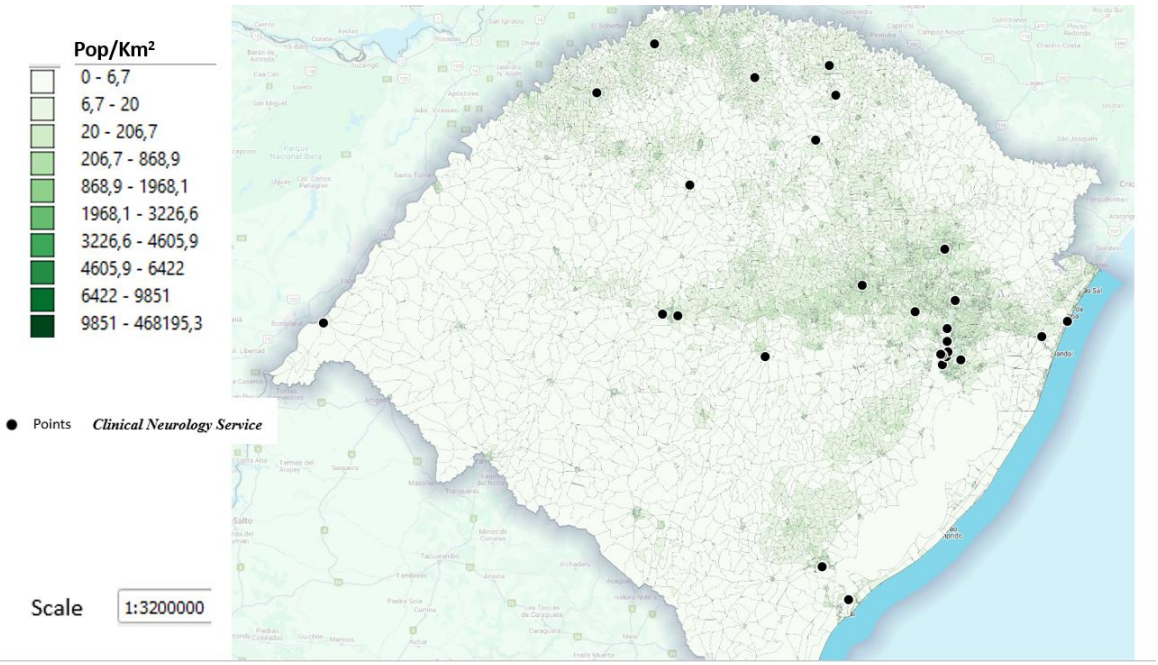

Figure 2 - Population density per km2 according to preliminary data from the 2022 Censo.

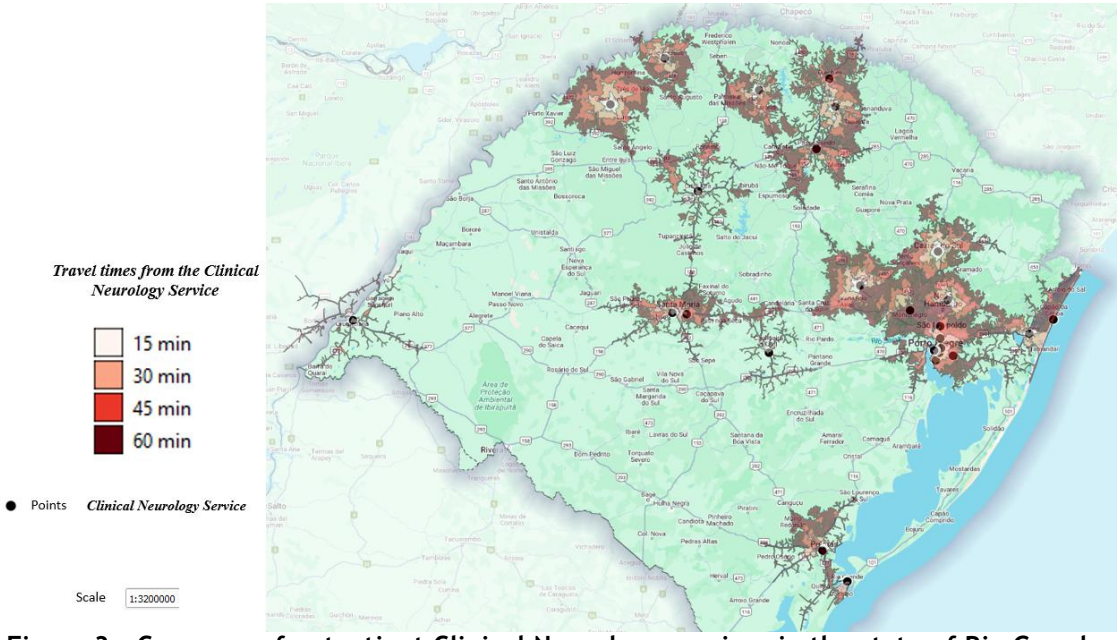

Figure 3 - Coverage of outpatient Clinical Neurology services in the state of Rio Grande do Sul in 2024 considering travel times of 15, 30, 45 and 60 minutes by car.

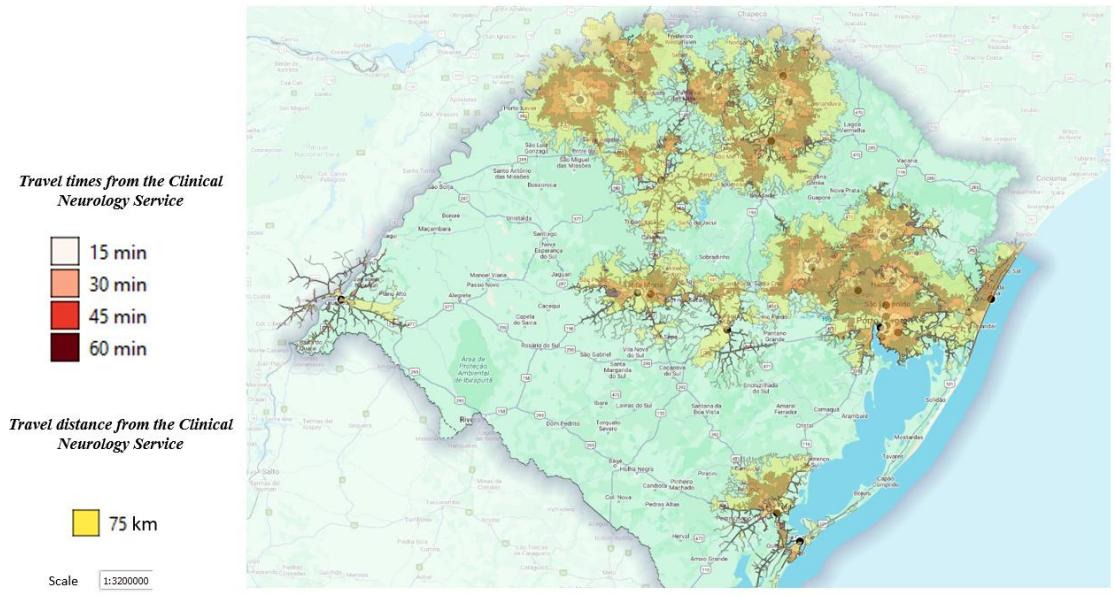

Figure 4 - Coverage of outpatient Clinical Neurology services in the state of Rio Grande do Sul in 2024, considering a distance of 75 km.

DISCUSSION

This study presents the healthcare coverage of Rio Grande do Sul, considering patient travel times of >75 km or >60 min to an outpatient service specializing in clinical neurology, demonstrating that Western and Southern Rio Grande do Sul population must travel longer distances to access specialized neurological care through the SUS. Thus, geographic accessibility,

characterized by the distance and travel time between the user's residence and healthcare service[3], presents challenges for part of the population of Rio Grande do Sul who need care from a clinical neurologist. A study conducted by Assis et al[3] in 2012 addressed the importance of facilitating access within the geographic limits of each territory, enabling the integration of care levels via referral and counter-referral in the SUS.

In the hierarchy of the Unified Health System, medical consultations and clinical examinations are considered low- and medium-complexity services because they do not require hospitalization. According to the study" Regiões de Influência das Cidades, conducted by IBGE in 2018, the average distance to access these types of services was 72 km in Brazil[19]. Our study considered a distance of 75 km to assess coverage related to distances in km to compare with the national average. In Rio Grande do Sul, this distance, associated with the number of references in clinical neurology, cannot cover the entire state (area; 281,707.15 km2)[20].

A recent descriptive study conducted in the United States by Lin et al. indicated that the density of neurologists in a specific geographic region varies greatly nationwide and that of 563,216 Medicare beneficiaries with consultations with neurologists in 2018, 17% traveled long distances for treatment, considering long distance as trips ≥50 miles. The median distance was 81.3 (interquartile range [IQR]; 59.9–144.2) miles and time was 90 (IQR; 69–149) min for patients with long-distance travel[21].

In 2016, intracerebral hemorrhage, ischemic stroke, and dementia were described among the top five causes of death[22]. Simultaneously, in Brazil, dementia had the second highest age-standardized prevalence in the world, with Alzheimer's disease accounting for approximately 70% of cases[23]. The number of deaths from dementia worldwide increased by 148% (140–157) from 1990–2016[22]. Therefore, tackling chronic neurological conditions requires strategic planning with the development of public health policies with greater integration of primary, secondary, and tertiary health care[24] that enable timely and agile access to care levels appropriate to the needs of users and guarantee comprehensive care for SUS users[1].

Challenges in accessing and long waiting times for specialist neurology

consultations have been described in recent studies in Brazil and Chile[11,12,25]. The adequate supply of clinical neurology services must be associated with regulatory strategies that enable the flow of care between levels of health care in a structured and evidence-based manner, through regulatory guidance protocols, to strengthen the decision-making process according to the user's needs and priorities, reduce the queue and waiting time for specialized consultations[5], and avoid a pilgrimage through the SUS without effective health care[26].

Data are fundamental for adequate planning of public policies for the care of chronic neurological conditions; a descriptive study conducted in Brazil in 2014 by Gomes presented the first survey on the resources available in neurology, neurologists, and diagnostic equipment through imaging, according to the Brazilian states and their population distribution. This highlights the need to stimulate the internalization of training and specialized neurological services with subsidies and state promotion[6].

Thus, assessing the distribution and supply of health services in the neurology specialty presents important information for updating data and health planning. The latest medical demographics conducted by the Departamento de Medicina Preventiva da Faculdade de Medicina da Universidade de São Paulo indicate that in 2022, there were 6,776 doctors registered in the neurology specialty in Brazil. Despite the increase in the supply of neurologists in the last decade, the number of neurologists registered with this specialty was 3,212, access remains complex for most of the population[27].

Our study analyzed the coverage of secondary care in clinical neurology in 2024; however, the distribution by health regions of patients referred from primary care in need of evaluation with neurologists in the regulatory queue of Rio Grande do Sul cannot be identified. This study excluded the assessment of the supply of emergency neurology care in the state.

CONCLUSION

The coverage of clinical neurology services in Rio Grande do Sul demonstrates that part of the population in the Western and Southern regions of the state must travel distances >75 km or >60 min to access specialized neurological care through SUS. The concentration of outpatient services in

clinical neurology in Northern Rio Grande do Sul reflects the reality identified by medical demographics in Brazil, need for public policies that encourage the interiorization of the supply of neurology services, and coverage of care for patients with neurological conditions is necessary to guarantee the comprehensiveness and longitudinality of care for SUS users in Rio Grande do Sul. New studies on the distribution and provision of specialized care in the SUS are opportune to identify gaps in assistance and possibilities for expanding coverage.

REFERENCES

1. Brasil. Constituição (1988). Constituição da República Federativa do Brasil de 1988. Brasília, DF: Presidente da República, 2016.
2. Santos L. Região de saúde e suas redes de atenção: modelo organizativo-sistêmico do SUS. Ciênc Saúde Coletiva. 2017; 22(4):1281–9.
3. Assis MMA, Jesus WLAD. Acesso aos serviços de saúde: abordagens, conceitos, políticas e modelo de análise. Ciênc Saúde Coletiva. 2012; 17(11):2865–75.
4. Secretaria de Comunicação Social. Censo: número de idosos no Brasil cresceu 57,4% em 12 anos, https://www.gov.br/secom/pt-br/assuntos/noticias/2023/10/censo-2022-numero-de-idosos-na-populacao-do-pais-cresceu-57-4-em-12-anos (accessed 5 October 2010).
5. Katz N, Roman R, Rados DV, Oliveira EBD, Schmitz CAA, Gonçalves MR, et al. Acesso e regulação ao cuidado especializado no Rio Grande do Sul: a estratégia RegulaSUS do TelessaúdeRS-UFRGS. Ciênc Saúde Coletiva. 2020; 25(4):1389–400.
6. Gomes MM. A neurologia no Brasil: considerações geodemográficas. Rev Bras Neurol. 2014; 50(4):83–7.
7. Alzheimer's Association. 2019 Alzheimer's disease facts and figures. Alzheimers Dement. 2019; 15(3):321–87.
8. Masanneck L, Räuber S, Schroeter CB, Lehnerer S, Ziemssen T, Ruck T, et al. Driving time-based identification of gaps in specialised care coverage: An example of neuroinflammatory diseases in Germany. Digit Health. 2023; 9:205520762311529.
9. Farias ECMDH, Hussein NMDC, Graczcki EF, Penna EM, Almeida APA, Carvalho JLDS, et al. Impactos das doenças neurológicas na qualidade de

vida. Rev Contemp. 2024; 4(3):e3623.

10. Lin CC, Callaghan BC, Burke JF, Skolarus LE, Hill CE, Magliocco B, et al. Geographic Variation in Neurologist Density and Neurologic Care in the United States. Neurology. 2021; 96(3).
11. Constanzo F, Aracena-Sherck P, Hidalgo JP, Peña L, Marrugo M, Gonzalez J, et al. Contribution of a synchronic teleneurology program to decrease the patient number waiting for a first consultation and their waiting time in Chile. BMC Med Inform Decis Mak. 2020; 20(1):20.
12. Aquino ERS, Ito Suffert SC, Rodrigues L, Basso J, Ferreira AG, Menezes AL, et al. Reason for referrals to neurology: a community-based study in Brazil. J Health NPEPS. 2022; 7(1):e6397.
13. Scheffer M. Demografia Médica no Brasil 2020.São Paulo (SP) FMUSP, CFM, 2020.
14. Malta M, Cardoso LO, Bastos FI, Magnanini MMF, Silva CMFPD. Iniciativa STROBE: subsídios para a comunicação de estudos observacionais. Rev Saúde Pública. 2010; 44(3):559–65.
15. Otamendi F, García-Heredia D. Isochrones as Indicators of the Influence of Traffic in Public Health: A Visual Simulation Application in Ávila, Spain. Int J Environ Res Public Health. 2015; 12(10):12556–76.
16. Wilson RJ. Introduction to graph theory. Harlow Munich: Prentice Hall; 2009.
17. Oliveira RR, Wangham MS. Comparativo entre Algoritmos de Roteamento Utilizados em Redes Veiculares. Universidade do Vale do Itajaí (UNIVALI) - São José, SC – Brasil 2021;
18. IBM. O que são dados geoespaciais? [cited 2024 Oct 7]. Available from: https://www.ibm.com/br-pt/topics/geospatial-data
19. Pacheco HCDA. Regiões de influência das cidades 2018: Um estudo para compreender a diversidades dos centros urbanos no Brasil. Confins 48. Epub ahead of print 2020.
20. Instituto Brasileiro de Geografia Estatística. Censo 2022. Rio de Janeiro; 2022 [cited 2024 Oct 28]. Available from: https://censo2022.ibge.gov.br/panorama/
21. Lin CC, Hill CE, Kerber KA, Burke JF, Skolarus LE, Esper GJ, et al. Patient Travel Distance to Neurologist Visits. Neurology. 2023; 101(18).

22. Nichols E, Szoeke CEI, Vollset SE, Abbasi N, Abd-Allah F, Abdela J, et al. Global, regional, and national burden of Alzheimer's disease and other dementias, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016. Lancet Neurol. 2019; 18(1):88–106.

23. Feter N, Leite JS, Caputo EL, Cardoso RK, Rombaldi AJ. Who are the people with Alzheimer's disease in Brazil? Findings from the Brazilian Longitudinal Study of Aging. Rev Bras Epidemiol. 2021; 24:e210018.

24. Mendes EV. As Redes de Atenção à Saúde. Brasília: Organização Pan-Americana da Saúde; 2011.

25. Aquino ERDS, Rodrigues DLG, Batista CEA, Basso J, Gadenz SD, Kim KY, et al. Teleconsultations in neurology in a universal health system amid COVID-19: a descriptive study. Rev Assoc Médica Bras. 2022; 68(10):1376–82.

26. Basto LBR, Barbosa MA, Rosso CFW, Oliveira LMDAC, Ferreira IP, Bastos DADS, et al. Practices and challenges on coordinating the Brazilian Unified Health System. Rev Saúde Pública. 2020; 54:25.

27. Ribas S. Demografia Médica no Brasil 2023. 6th ed. São Paulo (SP) : FMUSP; 2023.

Funding: The author declare that there was no funding.

Conflict of interest: The authors declare no conflicts of interest.

Acknowledgments: We would like to thank Editage (www.editage.com.br) for English language editing.

Authors' participation:
- **Design:** Ito Süffert SC, Mantese CEA, Oliveira AD.
- **Development:** Ito Süffert SC, Mantese CEA, Oliveira AD.
- **Writing and proofreading:** Ito Süffert SC, Mantese CEA, Oliveira AD.

Submited: 17/12/2025
Accepted: 28/05/2026