

ORIGINAL ARTICLE

Profile of heart transplants in Brazil: an overview of the last decade

Perfil dos transplantes cardíacos no Brasil: um panorama da última década

Perfil de los transplantes de corazón em Brasil: un panorama de la última década

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Abstract

Objective: To analyze the profile of heart transplants performed in Brazil from 2014 to 2023. **Methods:** Time series with data from the Brazilian Transplant Registry from 2014 to 2023. Heart transplant indicators in the Brazilian regions were evaluated, using descriptive statistics and correlation analysis. **Results:** Despite the population growth, the estimated need for heart transplants remained stable, above the number of procedures performed. During 2020, there was a drop in the number of transplants. The number of patients on the waiting list, teams registered to perform the procedure and Intra-Hospital Committees for Organ and Tissue Donation for Transplantation increased. **Conclusion:** Regions with more inhabitants and better infrastructure had more heart transplants, showing regional inequalities in access to the procedure. The reduction in 2020 may be a reflection of the Covid-19 pandemic. The increase in registered teams signals efforts to expand the capacity of the National Transplant System. **Descriptors:** Heart Transplantation; Demographic Indicators; Epidemiology; Public Health.

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Resumo

Objetivo: Analisar o perfil dos transplantes de coração realizados no Brasil no período de 2014 a 2023. **Métodos:** Série temporal com dados do Registro Brasileiro de Transplantes de 2014 a 2023, sendo avaliados indicadores de transplantes cardíacos nas regiões brasileiras, com análises estatísticas descritivas e de correlação. **Resultados:** Apesar do crescimento populacional, a necessidade estimada manteve-se estável, acima do número de procedimentos realizados. Durante 2020 houve queda no número de transplantes. Aumentou o número de pacientes em lista de espera, de equipes cadastradas para a realização do procedimento e de Comissões Intra-Hospitalares de Doação de Órgãos e Tecidos para Transplante. **Conclusão:** Regiões com mais habitantes e melhor infraestrutura apresentaram maior número de transplantes cardíacos, evidenciando desigualdades regionais no acesso ao procedimento. A redução em 2020 pode ser reflexo da pandemia de Covid-19. O aumento nas equipes cadastradas sinaliza esforços governamentais para ampliar a capacidade do Sistema Nacional de Transplantes.

Descritores: Transplante de Coração; Indicadores Demográficos; Epidemiologia; Saúde Pública.

Resumen

Objetivo: Analizar el perfil de los trasplantes cardíacos en Brasil de 2014-2023. **Métodos:** Series temporales con datos del Registro Brasileño de Trasplantes de 2014-2023 e indicadores de trasplante en las regiones brasileñas, con análisis estadísticos descriptivos y correlacionales. **Resultados:** A pesar del crecimiento poblacional, la necesidad estimada se mantuvo estable, superior a los procedimientos realizados. Durante 2020 hubo una caída en el número de trasplantes. Aumentó el número de pacientes en lista de espera, de equipos registrados para realizar el procedimiento y de Comisiones Intrahospitalarias. **Conclusión:** Las regiones con más habitantes y mejores infraestructuras tuvieron un mayor número de trasplantes de corazón, lo que muestra desigualdades regionales en el acceso al procedimiento. La reducción en 2020 puede deberse a la pandemia de Covid-19. El aumento de los equipos registrados señala los esfuerzos del gobierno para ampliar la capacidad del Sistema Nacional de Trasplantes.

Descriptor: Trasplante de Corazón; Indicadores Demográficos; Epidemiología; Salud Pública.



INTRODUCTION

Heart transplantation is the treatment of choice for advanced heart failure (HF)¹, and nurses play an important role in the care of these patients.² Despite this, the number of transplants is limited, mainly due to organ availability.¹ It is important to highlight that the prognosis of transplant patients is associated with factors such as donor and recipient characteristics, the quality of the surgical procedure, and the effectiveness of immunosuppressive treatment, which can lead to risks such as opportunistic infections, hypertension, diabetes, renal failure, and neoplasms.³

A retrospective cohort study conducted in Brazil between 2000 and 2015 indicated an average survival of 8.3 years for transplant patients, with survival rates of 70.9% after one year, 59.9% after five years, and 45.1% after ten years. It was also observed that male patients have lower survival rates.⁴ Furthermore, return-to-work rates after heart transplantation vary between 30 and 60%, being lower in patients nearing retirement age.⁵

Internationally, the first heart transplant was performed in 1967 in South Africa, while in Brazil it occurred in 1968, conducted by physician Euryclides de Jesus Zerbini at the Hospital das Clínicas in São Paulo. Since then, various technological

advances and improvements in surgical techniques have increased the success rates of transplants.⁶ In this context, it is important to highlight that Brazil has one of the largest public transplant systems in the world.⁷

Therefore, it is important to understand the landscape of heart transplants in Brazil in order to identify weaknesses and strengths of the services, to support the planning of actions and decision-making within this public policy. Given this context, the research question guiding this study is "what is the profile of heart transplants in Brazil from 2014 to 2023?". Thus, this work aims to analyze the profile of heart transplants performed in Brazil from 2014 to 2023.

METHOD

This is a descriptive, quantitative time-series study conducted using data from 2014 to 2023, based on heart transplant indicators from the five regions of Brazil (North, Northeast, Midwest, Southeast, and South).

Data collection was carried out between August and September 2024, using secondary data provided by the Brazilian Transplant Registry (RBT), published annually by the Brazilian Association of Organ Transplantation (ABTO). This



database is in the public domain and does not require authorization from the Research Ethics Committee (CEP) or the use of the Free and Informed Consent Form (TCLE), as stipulated in Resolution No. 510 of April 7, 2016, of the National Health Council.

The following variables were used for data collection: total Brazilian population, estimated need for heart transplants, number of active patients on the waiting list, absolute number of transplants performed in the country, number of teams registered to perform heart transplants, and number of Intra-Hospital Commissions for Organ and Tissue Donation for Transplantation (CIHDOTT).

The information was organized into a Microsoft Office Excel® spreadsheet and subsequently analyzed with the help of the statistical software used was the Statistical Package for the Social Sciences (SPSS) version 25. Initially, a simple descriptive statistical analysis was performed, in which the qualitative variables were described using absolute (n) and relative (%) frequencies or presented in graphs.

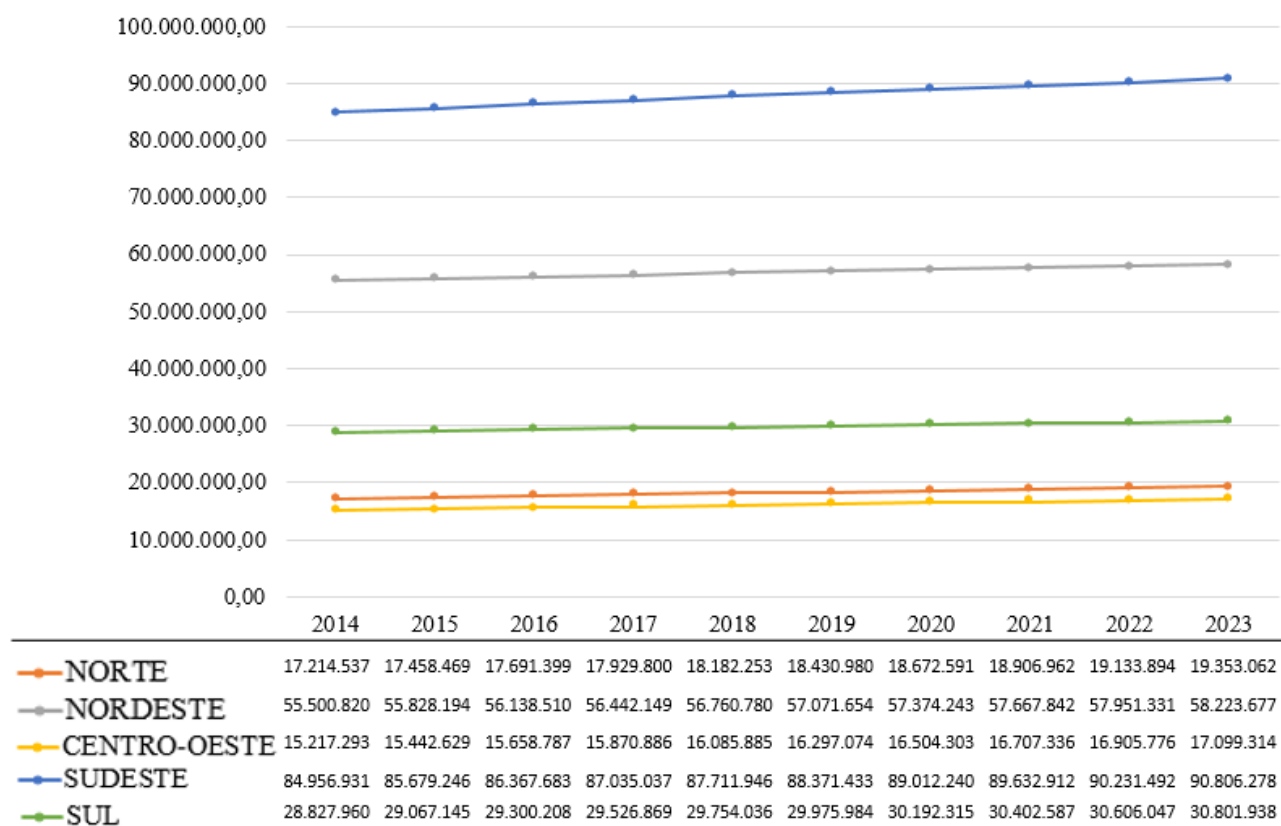
To verify the correlation between quantitative variables, Pearson's correlation test was used (variables expressed as a ratio). A very high correlation was considered when r values were obtained from 0.90 to 1.00; high from 0.70 to 0.90; moderate from 0.50 to 0.70; low from 0.30

to 0.50; and insignificant from 0.00 to 0.30. A significance level of 5% was considered for the analyses.

RESULTS

Brazilian population growth between 2014 and 2023 shows a progressive increase in all geographic regions (Figure 1). The Southeast region stands out with the largest population increase over the decade, while the Central-West region showed the smallest increase compared to the other regions during the same period.



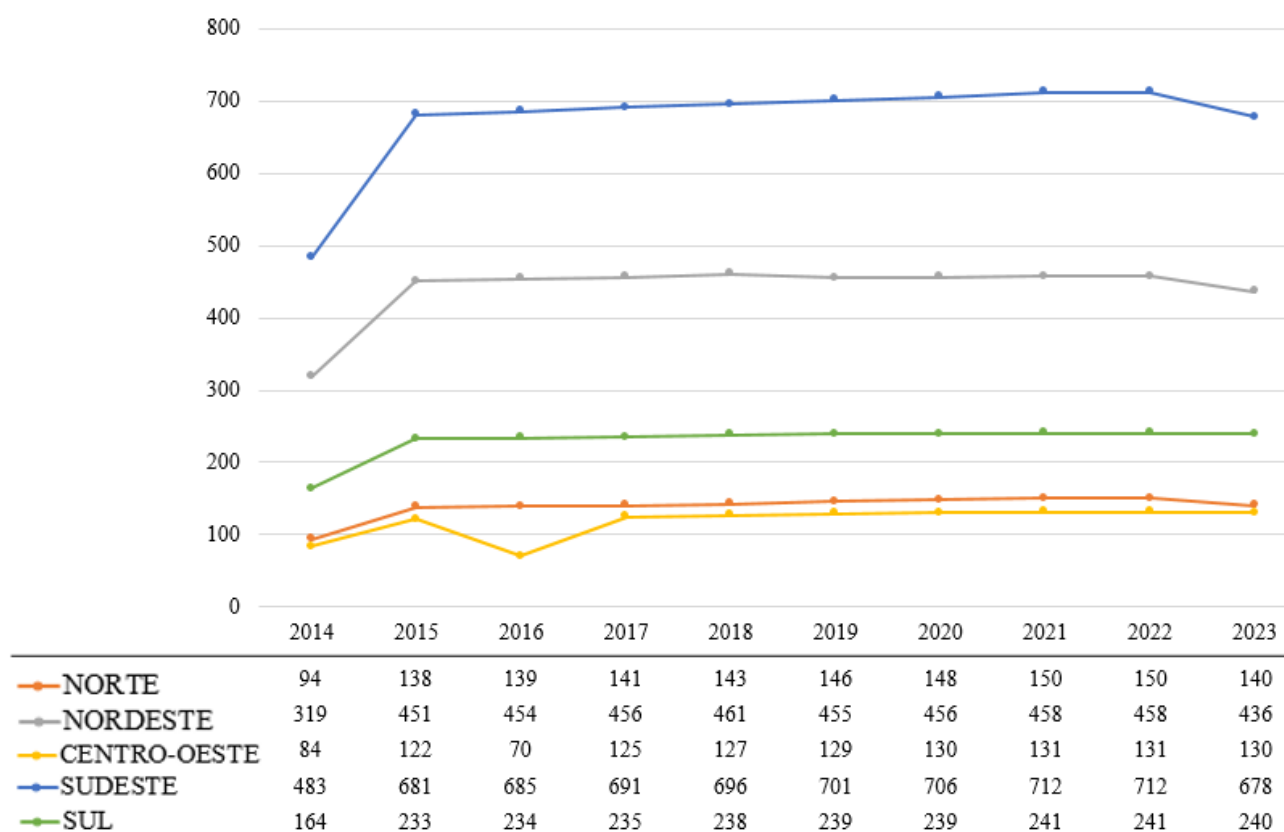


Source: Data extracted from the Brazilian Transplant Registry (RBT) published by the Brazilian Association of Organ Transplantation (ABTO).

Figure 1: Representation of the evolution of the growth of the Brazilian population (number of inhabitants), according to geographic regions, in the period between 2014 and 2023.

Regarding the variation in the estimated need for heart transplants in Brazil, according to year and region, a consistent growth in this demand was observed from 2014 to 2015 at the national level, followed by some stability in the following years. The trend in the regions followed the national trend, with the exception of the Central-West region, which registered a one-off reduction in 2016. The Southeast and Northeast regions stood out for presenting the highest estimated needs for heart transplants throughout the analyzed period (Figure 2).



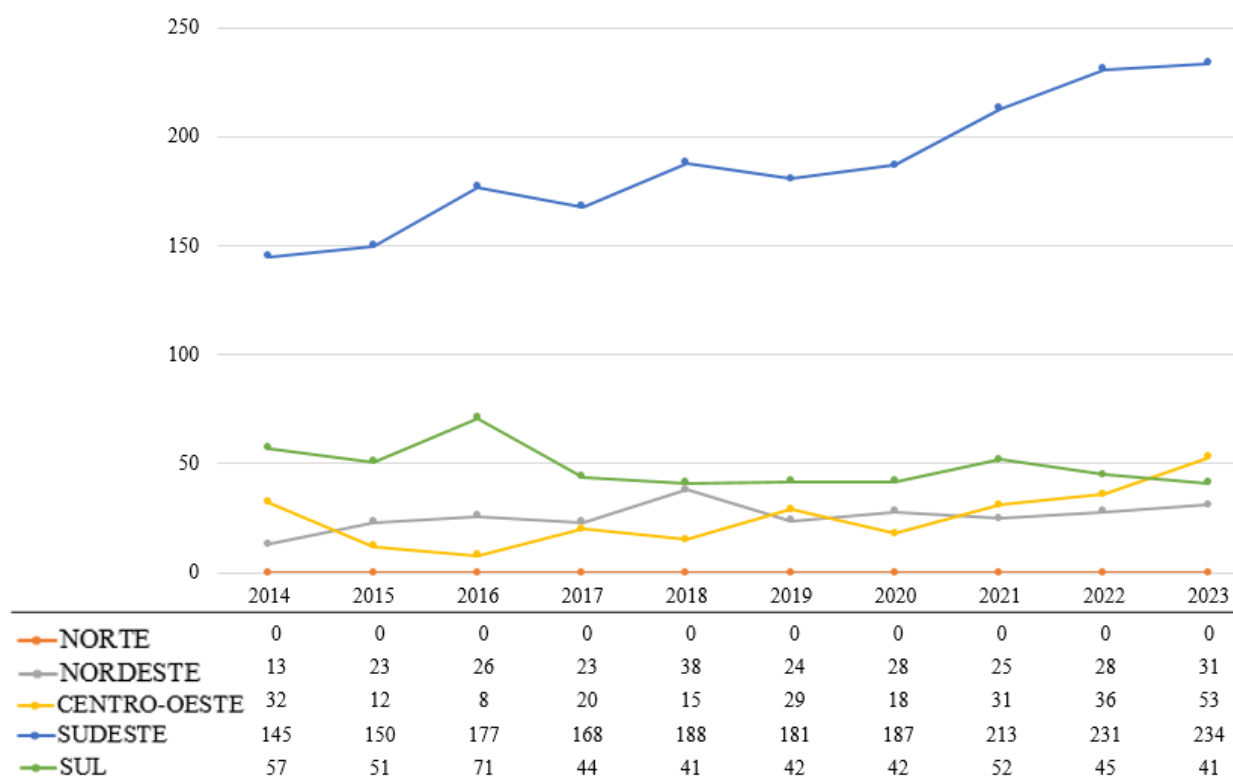


Source: Data extracted from the Brazilian Transplant Registry (RBT) published by the Brazilian Association of Organ Transplantation (ABTO).

Figure 2: Evolution of the estimated need for heart transplants (in absolute numbers) according to the geographic regions of Brazil, between 2014 and 2023.

Figure 3 shows variations in the absolute frequency of active patients on the waiting list for heart transplants, both for Brazil and for the five geographic regions. Nationally, as well as in the Central-West and Southeast regions, an increase in this parameter was observed between 2020 and 2023. It is noteworthy that there were no patients listed for heart transplants in the North region.





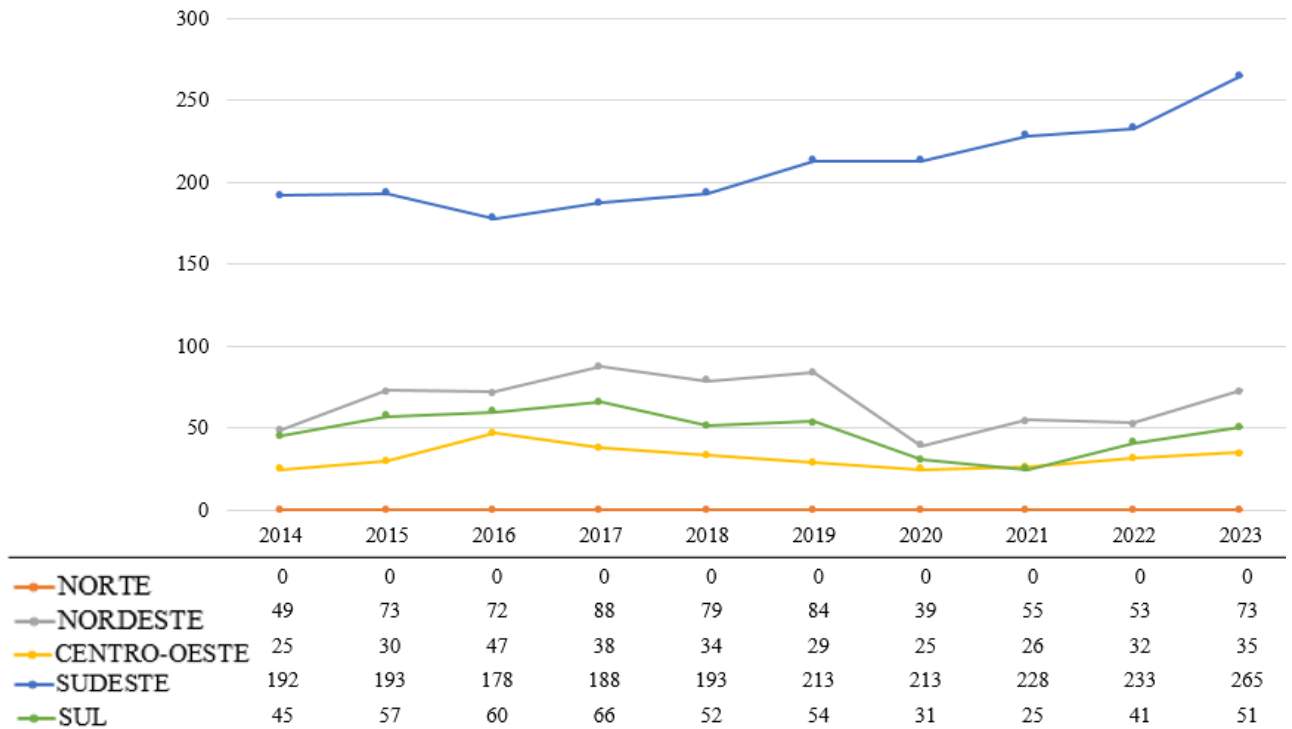
Source: Data extracted from the Brazilian Transplant Registry (RBT) published by the Brazilian Association of Organ Transplantation (ABTO).

Figure 3: Representation of the absolute frequency of active patients on the waiting list for heart transplantation according to the geographic regions of Brazil, in the period between 2014 and 2023.

Figure 4 shows the absolute number of heart transplants performed in Brazil between 2014 and 2023, demonstrating a progressive increase from 2014 to 2017. A sharp drop in transplants performed in 2020 is observed, both nationally and in the Northeast, Central-West, and South regions.

From 2020 onwards, there was a progressive increase in the number of transplants nationwide. In 2022 and 2023, this increase was evident in all regions, except for the North region, where no transplants were performed during that period. In 2023, Brazil and the Southeast region recorded the highest number of transplants. The Southeast region stands out for the greater homogeneity in the number of transplants performed over the years, with uniform growth between 2014 and 2023, except for a slight reduction in 2016, 2019, and 2020 (Figure 4).





Source: Data extracted from the Brazilian Transplant Registry (RBT) published by the Brazilian Association of Organ Transplantation (ABTO).

Figure 4: Representation of the evolution of the absolute number of heart transplants performed in Brazil between 2014 and 2023.

In Brazil, there has been a growing increase in the number of teams registered to perform the procedure, except in the years 2016 and 2018. In the Northeast region, a reduction in the number of teams was observed in 2020, while in the Central-West region, this decrease occurred in 2021 (Figure 5).

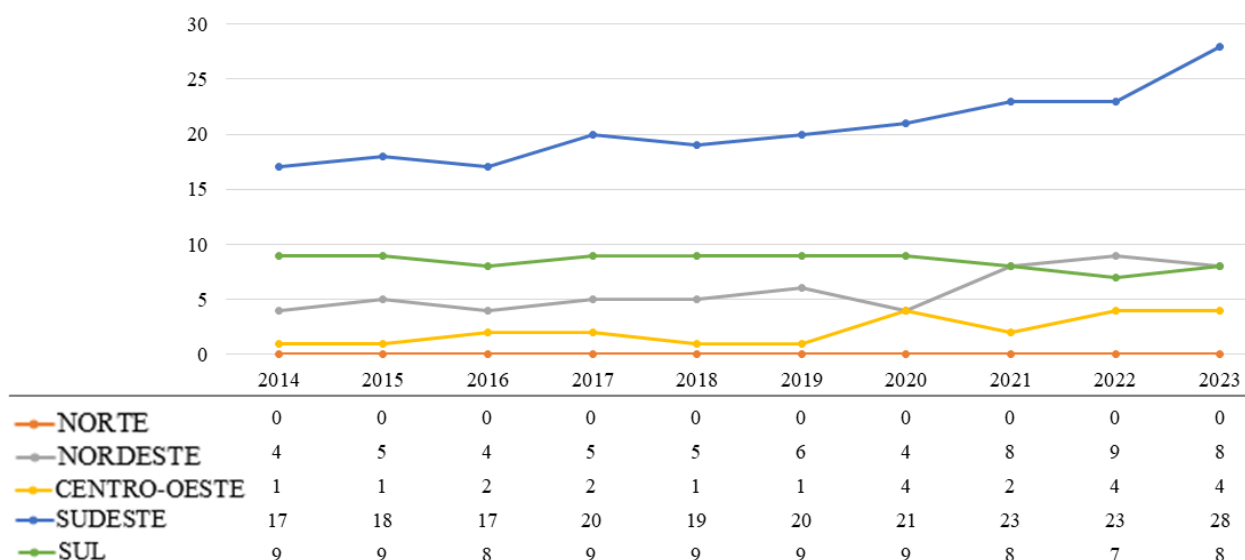
The Central-West region has the fewest registered teams in the country. In the North region, there are no registered teams to perform heart transplants, which prevents this procedure from being offered in the region. In contrast, the Southeast region registered the highest number of registered teams throughout the analyzed period, consolidating itself as the main region for performing this type of transplant in Brazil (Figure 5).

Regarding the number of Intra-Hospital Commissions for Organ and Tissue Donation for Transplantation (CIHDOTT), there was continuous growth between 2014 and 2016, followed by a reduction in 2017, followed by similar numbers until 2023.

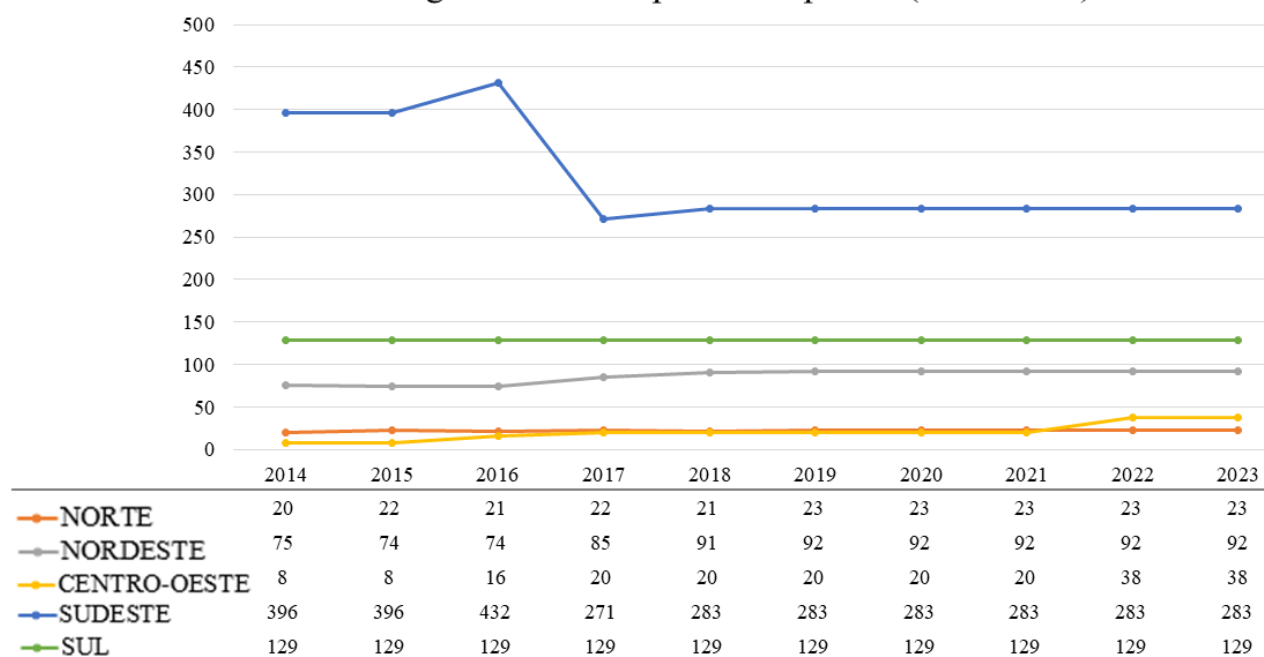
The Northern region showed variations between 2014 and 2018, and there were no changes from 2019 to 2023. The Northeastern region registered an increase in 2017 and 2018. In the Southeastern region, there was growth in 2016, followed by a decrease in 2017, and

from 2018 onwards it remained unchanged, standing out as the region with the highest number of CIHDOTTs in Brazil. The Southern region, in turn, maintained the same number of CIHDOTTs (n=129) throughout the entire period analyzed.

Número de equipes cadastradas



Número de Comissões Intra-Hospitalares de Doação de Órgãos e Tecidos para Transplante (CIHDOTT)



Source: Data extracted from the Brazilian Transplant Registry (RBT) published by the Brazilian Association of Organ Transplantation (ABTO).

Figure 5: Representation of the absolute frequency of registered teams for performing heart transplants and of Intra-Hospital Commissions for Organ and Tissue Donation for Transplantation (CIHDOTT) in Brazil between 2014 and 2023.

The correlation analysis between the variables can be seen in the supplementary material (Appendix B, Table 2). A very high positive correlation was identified between:

- a) Brazilian population and number of active patients on the waiting list in the Southeast region ($r=0.953$; $p<0.001$);
- b) Brazilian population and number of teams in the Southeast region ($r=0.904$; $p<0.001$) and in Brazil ($r=0.920$; $p<0.001$);
- c) Brazilian population and year in all regions and in Brazil ($r=1.000$; $p<0.001$);
- d) number of active patients on waiting lists and year in the Southeast region ($r=0.957$; $p<0.001$) and in Brazil ($r=0.902$; $p<0.001$);
- e) number of registered teams and year in the Southeast region ($r=0.914$; $p<0.001$) and in Brazil ($r=0.928$; $p<0.001$);
- f) Number of registered teams and number of transplants in the Southeast region ($r=0.958$; $p<0.001$).

DISCUSSION

In all five Brazilian regions, progressive population growth was identified throughout the analyzed period, a fact also observed in the mortality rate from cardiovascular diseases (CVD), particularly in the Southeast and South regions.⁹ Despite this, the estimated need for heart transplants remained relatively stable, with higher values in the Southeast and Northeast regions, which concentrate the largest part of the country's population.

The number of heart transplants performed in Brazil is not reached the estimated need for this body in none of the years analyzed the results corroborate the findings of Soares and colleagues¹⁰, who described that the number of heart transplants performed is substantially lower than the needs of the country's population.

Brazil faces an imbalance between the availability and demand for solid organs¹¹, including heart transplants, which favors regions with larger populations, such as the Southeast and Northeast, where the highest number of transplants are performed. This scenario points to a national shift compared to the period from 2012 to 2017, when the Southeast and South regions led in heart transplants in the country.¹⁰

During the study period, the Northern region did not perform any heart transplants

(lack of availability), possibly due to a shortage of specialized centers, registered and trained teams. A study conducted in 2017 identified 153 transplant centers, with 11.8% located in the North and Central-West regions¹⁰, revealing regional inequalities and the difficulties faced by less developed regions, especially with regard to access to health services.

Furthermore, it is important to emphasize that family refusal regarding organ donation is one of the reasons why potential donations do not materialize.¹² Another limitation regarding heart transplantation is the cold ischemia time, the period during which the organ can be kept viable outside the body, estimated between four and six hours. After this interval, the lack of circulation and oxygenation compromises the organ's functionality, constituting a significant risk factor for early mortality in transplant patients.¹³

The presence of a multidisciplinary team available for heart transplantation is essential for the care of the recipient and the efficiency of all stages of the procedure, including organ procurement. Furthermore, the speed and coordination of the procurement team are essential to reduce the risk of organ waste and rejection, maximize the use of donors, and increase the effectiveness of transplants

performed.¹⁴ Therefore, the presence of a nursing professional becomes fundamental to improving the care and attention to the health of transplant patients. In fact, Ordinance No. 2,600 of October 21, 2009, from the Ministry of Health, which governs the Technical Regulations of the National Transplant System, mandates that the CIHDOTT (Intrahospital Commission for Organ and Tissue Donation and Transplantation) include a nurse.

However, the results indicate that the Northern region does not have registered teams for performing heart transplants, which results in the absence of patients on waiting lists for the procedure. Consequently, patients in this region are redirected to waiting lists in other states, a situation far from ideal, since it is preferable for the patient to reside near a transplant center or be able to travel quickly to it¹⁰, considering the limited ischemia time of the organ.

It is worth highlighting that the presence of CIHDOTTs (Intrahospital Commission for Organ and Tissue Donation and Transplantation) in hospitals is a strategy to optimize the process of identifying potential donors, procurement, allocation, and transplantation. This support is essential, as efficiency and response time are critical factors for the success of the procedure. Transplant teams need to act



quickly in procurement of the donated heart, keeping the cold ischemia time as short as possible to increase the chances of transplant success.¹⁰

It is known that the Covid-19 pandemic intensified the weaknesses of the National Transplant System (SNT)¹⁵, which may justify the increase in the number of active patients on the waiting list for heart transplants in the period from 2021 to 2023. This growth can be attributed to the difficulty of accessing healthcare and the lack of regular follow-up of chronic patients.¹⁶ It is worth noting that the prolonged waiting time for transplantation can result in long periods of hospitalization for these patients.¹⁷

Considering the period analyzed, there was an increase in the number of heart transplants, except for the drop in 2020. This reduction can be explained by the reallocation of material and human resources to address the Covid-19 pandemic, which mobilized numerous professionals to work in the pandemic and caused structural limitations in health services, such as the number of beds in Intensive Care Units (ICUs), the absence of safe treatment protocols, uncertainties about the effects of immunosuppression, concern about the mortality of transplant patients who contracted the virus¹⁸ and the

increase in absolute contraindications for transplantation.¹⁹

Compared to 2020, a progressive increase in the number of heart transplants was identified in the years 2021, 2022, and 2023, signaling a growing recovery in national rates. In 2023, the indicators exceeded the values of 2019, the year before the pandemic, suggesting a successful recovery from the adverse impacts caused by the health crisis.²⁰

Given these results, it is clear that the nurse's role is fundamental in ensuring ethics and efficiency in the organ donation process, from the procurement stage onwards, guaranteeing support for donor families before, during, and after the entire process. This implies working within a multidisciplinary team with a commitment to addressing the ethical and emotional issues related to donation and, thus, positively affecting the profile of heart transplants performed in Brazil.

CONCLUSIONS

This study analyzed the profile of heart transplants in Brazil from 2014 to 2023, showing an increase in procedures, especially in the Southeast and Northeast regions, which concentrate the majority of the population and infrastructure. Regional disparities in access to heart transplants



persist, with the North region being disadvantaged by the absence of registered centers and teams. The decreases identified in 2020 may be associated with the Covid-19 pandemic.

The effective implementation of public policies can be seen in the increase in the number of registered teams, reflecting national efforts to expand the capacity of the National Transplant System. However, there is a pressing need for actions that broaden access to transplantation in all regions of the country through infrastructure improvements.

Regarding healthcare teams, the presence of nurses is fundamental, as this professional plays an important role in humanizing healthcare, contributing to the quality of care and promoting the well-being of patients and families involved in the organ donation process.

Regarding limitations, this study was based on secondary data obtained from the Brazilian Transplant Registry, an official source fed by data from the Ministry of Health. However, it may be subject to deficiencies, such as underreporting and incompleteness of available information. Future studies are suggested to further analyze the performance of organ transplants in Brazil, addressing the national reality and regional disparities in access to these procedures.

REFERENCES

1. Coniglio AC, Bryner BS, Devore AD, Patel CB. Trends in cardiovascular medicine: Update on cardiac transplantation. *Trends Cardiovasc Med*. [Internet]. 2023 [citado em 22 jan 2025]; 33(1):46-50. doi: 10.1016/j.tcm.2021.11.005
2. Nascimento MNR, Vieira NR, Aguiar CAS, Coelho MEAA, Félix NDC, Oliveira CJ. Aspects of nursing assistance for the person with heart failure. *Rev Enferm Atenção Saúde* [Internet]. 2019 [citado em 22 jan 2025]; 8(2):123-134. doi: 10.18554/reas.v8i2.3899
3. Lessa WP, Chaccor P, Rossi Neto JM, Finger MA, Santos CC, Souza JPS, et al. Prolongando a sobrevida no paciente transplantado cardíaco. *Arq Bras Cardiol*. [Internet]. 2021 [citado em 22 ago 2024]; 116(6 Supl 1):26. Disponível em: https://abccardiol.org/wp-content/uploads/2020/10/DEIC_2021.x44344.pdf
4. Freitas NCC, Cherchiglia ML, Simão Filho C, Alvares-Teodoro J, Acurcio FA, Guerra Junior AA. Sixteen years of heart transplant in an open cohort in Brazil: analysis of graft survival of patients using immunosuppressants. *Arq Bras Cardiol*. [Internet]. 2021 [citado em 22 ago 2024]; 116(4):744-53. doi: 10.36660/abc.20200117
5. Rivera EL, Aponte J, Montes MC, Adams CD, Gómez-Mesa JE. Factors associated with return to work after heart transplantation: a systematic review of the literature. *Am J Med Sci*. [Internet]. 2021 [citado em 22 jan 2025]; 362(6):586-591. doi: 10.1016/j.amjms.2021.06.022
6. Beserra PJF, El Bazi TC, Saviato GAP, Mazzucca GS, Sartori EM, Coelho MEG, et al. Cirurgia de transplante de órgãos: avanços mais recentes, novas estratégias de preservação de órgão e abordagens para minimizar a rejeição do enxerto. *Revista Centro de Pesquisas Avançadas em*



- Qualidade de Vida [Internet]. 2024 [citado em 4 nov 2024]; 16(1):2-4. doi: 10.36692/V16N1-44
7. Marinho A. Avaliação da evolução da eficiência e da produtividade em transplantes de órgãos no Brasil. Rio de Janeiro: Ipea; 2025. 34 p.
8. Mukaka MM. A guide to appropriate use of correlation coefficient in medical research. *Malawi Med J.* [Internet]. 2012 [citado em 11 mai 2026]; 24(3):69-71. Disponível em: <https://pmc.ncbi.nlm.nih.gov/articles/PMC3576830/pdf/MMJ2403-0069.pdf>
9. Pellense MCS, Amorim MS, Dantas ESO, Costa KTS, Andrade FB. Evaluation of mortality from cardiovascular diseases in Brazil: a temporal series from 2015 to 2019. *Rev Ciênc Plur.* [Internet]. 2021 [citado em 30 out 2024]; 7(3):202-219. doi: <https://doi.org/10.21680/2446-7286.2021v7n3ID25186>
10. Soares LSS, Brito ES, Magedanz L, França FA, Araújo WN, Galato D. Transplantes de órgãos sólidos no Brasil: estudo descritivo sobre desigualdades na distribuição e acesso no território brasileiro, 2001-2017. *Epidemiol Serv Saúde* [Internet]. 2020 [citado em 30 out 2024]; 29(1):e2018512. doi: 10.5123/S1679-49742020000100014
11. Assis PC, Favoretto CK, Balbinotto Neto G, Gomes CE. Fatores associados à taxa de doações efetivas de órgãos sólidos por morte encefálica: uma análise espacial nas Unidades Federativas do Brasil (2012-2017). *Estud Econ.* [Internet]. 2023 [citado em 8 nov 2024]; 53(2):257-303. doi: <https://doi.org/10.1590/1980-53575322pcgc>
12. Santos FGT, Mezzavila VAM, Rodrigues TFCS, Cardoso LCB, Silva M, Oliveira RR, et al. Trend of transplants and organ and tissue donations in Brazil: a time series analysis. *Rev Bras Enferm.* [Internet]. 2021 [citado em 2 nov 2024]; 74(1):e20200058. doi: <https://doi.org/10.1590/0034-7167-2020-0058>
13. Bacal F, Marcondes-Braga FG, Rohde LEP, Xavier Júnior JL, Brito FS, Moura LAZ, et al. 3ª Diretriz Brasileira de Transplante Cardíaco. *Arq Bras Cardiol.* [Internet]. 2018 [citado em 30 out 2024]; 111(2):230-89. doi: <https://doi.org/10.5935/abc.20180153>
14. Cardoso IFS. Obstáculos para doação de órgãos e tecidos no Brasil: a logística do transporte de órgãos e tecidos para transplantes [Internet]. [Trabalho de Conclusão de Curso]. Rio de Janeiro: Universidade Federal do Rio de Janeiro; 2023 [citado em 4 nov 2024]. Disponível em: <https://pantheon.ufrj.br/bitstream/11422/22991/1/IFSCardoso-min.pdf>
15. Adriano VV, Westin LG, Castro YA, Oliveira JFP. Impacto da pandemia de Covid-19 na doação e nos transplantes de órgãos no Hospital de Base e no estado de São Paulo. *Braz J Transplant.* [Internet]. 2022 [citado em 30 out 2024]; 25(3):e0822. doi: https://doi.org/10.53855/bjt.v25i3.458_pt
16. Silva WT. Pandemia de Covid-19 e seu reflexo na lista de pacientes à espera de um transplante. *Revista Multidisciplinar em Saúde* [Internet]. 2021 [citado em 31 out 2024]; 2(4):103. doi: <https://doi.org/10.51161/rem/s/2862>
17. Melo CF, Mota NGJ, Silva AL, Araújo Neto JL. Entre el pulsar y el morir: la vivencia de pacientes que esperan el trasplante cardíaco. *Enferm Glob.* [Internet]. 2020 [citado em 30 out 2024]; (58):351-363. doi: <https://doi.org/10.6018/eglobal.379421>
18. Ribeiro Junior MAF, Costa CTK, Néder PR, Aveiro IA, Elias YGB, Augusto SS. Impact of COVID-19 on the number of transplants performed in Brazil during the pandemic. *Rev Col Bras Cir.* [Internet]. 2021 [citado em 31 out 2024]; 48:e20213042. doi: <https://doi.org/10.1590/0100-6991e-20213042>
19. Garcia VD, Pêgo-Fernandes PM. Organ transplantation and Covid-19. São



Paulo Med J. [Internet]. 2021 [citado em 4 nov 2024]; 139(4):301-304. doi: <https://doi.org/10.1590/1516-3180.2021.139420052021>

20. Garcia VD, editor. Um marco histórico: a doação e o transplante, enfim, decolando [editorial]. Associação Brasileira de Transplante de Órgãos.

Dimensionamento dos Transplantes no Brasil e em cada estado (2016-2023).

RBT: Registro Brasileiro de Transplantes [Internet]. 2023 [citado em 31 out 2024]; 30(4):3-100. Disponível em:

<https://site.abto.org.br/wp-content/uploads/2024/04/rbt2023-restrito.pdf>



Annex A

Table 1 -Data on heart transplants in Brazil between 2014 and 2023.



Variable	2014 n (%)	2015 n (%)	2016 n (%)	2017 n (%)	2018 n (%)	2019 n (%)	2020 n (%)	2021 n (%)	2022 n (%)	2023 n (%)	TOTAL n (%)
Northern Region											
Total population	17,214,537	17,458,469	17,691,399	17,929,800	18,182,253	18,430,980	18,672,591	18,906,962	19,133,894	19,353,062	
Estimated need	94 (100.0%)	138 (100.0%)	139 (100.0%)	141 (100.0%)	143 (100.0%)	146 (100.0%)	148 (100.0%)	150 (100.0%)	150 (100.0%)	140 (100.0%)	1,389 (100.0%)
Active patients on the waiting list	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Number of transplants	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
CIHDOTs	20 (3.1%)	22 (3.4%)	21 (3.1%)	22 (4.1%)	21 (3.8%)	23 (4.2%)	23 (4.2%)	23 (4.2%)	23 (4.0%)	23 (4.0%)	221 (3.8%)
Northeast Region											
Total population	55,500,820	55,828,194	56,138,510	56,442,149	56,760,780	57,071,654	57,374,243	57,667,842	57,951,331	58,223,677	
Estimated need	319 (100.0%)	451 (100.0%)	454 (100.0%)	456 (100.0%)	461 (100.0%)	455 (100.0%)	456 (100.0%)	458 (100.0%)	458 (100.0%)	436 (100.0%)	4,404 (100.0%)
Active patients on the waiting list	13 (4.1%)										259 (5.9%)
Number of transplants	49 (15.4%)	23 (5.1%)	26 (5.7%)	23 (5.0%)	38 (8.2%)	24 (5.3%)	28 (6.1%)	25 (5.5%)	28 (6.1%)	31 (7.1%)	665 (15.1%)
CIHDOTs	75 (11.9%)	74 (11.7%)	74 (11%)	85 (16.1%)	91 (16.7%)	92 (16.8%)	92 (16.8%)	92 (16.8%)	92 (16.2%)	92 (16.2%)	859 (14.8%)
Central-West Region											
Total population	15,217,293	15,442,629	15,658,787	15,870,886	16,085,885	16,297,074	16,504,303	16,707,336	16,905,776	17,099,314	
Estimated need	84 (100.0%)	122 (100.0%)	70 (100.0%)	125 (100.0%)	127 (100.0%)	129 (100.0%)	130 (100.0%)	131 (100.0%)	131 (100.0%)	130 (100.0%)	1,179 (100.0%)
Active patients on the waiting list	32 (38.1%)	12 (9.8%)	8 (11.4%)	20 (16.0%)	15 (11.8%)	29 (22.5%)	18 (13.8%)	31 (23.7%)	36 (27.5%)	53 (40.8%)	254 (21.5%)
Number of transplants	25 (29.8%)	30 (24.6%)	47 (67.1%)	38 (30.4%)	34 (26.8%)	29 (22.5%)	25 (19.2%)	26 (19.8%)	32 (24.4%)	35 (26.9%)	321 (27.2%)
CIHDOTs	8 (1.2%)	8 (1.2%)	16 (2.3%)	20 (3.7%)	20 (3.6%)	20 (3.6%)	20 (3.6%)	20 (3.6%)	38 (6.7%)	38 (6.7%)	208 (3.6%)
Southeast Region											
Total population	84,956,931	85,679,246	86,367,683	87,035,037	87,711,946	88,371,433	89,012,240	89,632,912	90,231,492	90,806,278	
Estimated need	483 (100.0%)	681 (100.0%)	685 (100.0%)	691 (100.0%)	696 (100.0%)	701 (100.0%)	706 (100.0%)	712 (100.0%)	712 (100.0%)	678 (100.0%)	6,745 (100.0%)
Active patients on the	145 (30.0%)	150 (22.0%)	177 (25.8%)	168 (24.3%)	188 (27.0%)	181 (25.8%)	187 (26.5%)	213 (29.9%)	231 (32.4%)	234 (34.5%)	1,874 (27.8%)



waiting list												
Number of transplants	192 (39.8%)	193 (28.3%)	178 (26.0%)	188 (27.2%)	193 (27.7%)	213 (30.4%)	213 (30.2%)	228 (32.0%)	233 (32.7%)	265 (39.1%)	2,096 (31.1%)	
CIHDOT Ts	396 (63%)	396 (62.9%)	432 (64.2%)	271 (51.4%)	283 (52%)	283 (51.7%)	283 (51.7%)	283 (51.7%)	283 (50%)	283 (50%)	3,193 (55.3%)	
Southern Region												
Total population	28,827,960	29,067,145	29,300,208	29,526,869	29,754,036	29,975,984	30,192,315	30,402,587	30,606,047	30,801,938		
Estimated need	164 (100.0%)	233 (100.0%)	234 (100.0%)	235 (100.0%)	238 (100.0%)	239 (100.0%)	239 (100.0%)	241 (100.0%)	241 (100.0%)	240 (100.0%)	2,304 (100.0%)	
Active patients on the waiting list	57 (34.8%)	51 (21.9%)	71 (30.3%)	44 (18.7%)	41 (17.2%)	42 (17.6%)	42 (17.6%)	52 (21.6%)	45 (18.7%)	41 (17.1%)	486 (21.1%)	
Number of transplants	45 (27.4%)	57 (24.5%)	60 (25.6%)	66 (28.1%)	52 (21.8%)	54 (22.6%)	31 (13.0%)	25 (10.4%)	41 (17.0%)	51 (21.3%)	482 (20.9%)	
CIHDOT Ts	129 (20.5%)	129 (20.5%)	129 (19.1%)	129 (24.4%)	129 (23.7%)	129 (23.5%)	129 (23.5%)	129 (23.5%)	129 (22.8%)	129 (22.8%)	1,290 (22.3%)	
Brazil												
Total population	201,717,541	203,475,683	205,156,587	206,804,741	208,494,900	210,147,125	211,755,692	213,317,639	214,828,540	216,284,269		
Estimated need	1,145 (100.0%)	1,622 (100.0%)	1,636 (100.0%)	255 (100.0%)	1,661 (100.0%)	1,876 (100.0%)	1,681 (100.0%)	1,681 (100.0%)	1,681 (100.0%)	1,625 (100.0%)	14,863 (100.0%)	
Active patients on the waiting list	247 (21.6%)	236 (14.5%)	282 (17.2%)	255 (15.5%)	282 (17.0%)	282 (15.0%)	275 (16.4%)	321 (19.1%)	340 (20.2%)	359 (22.1%)	2,879 (19.4%)	
Number of transplants	311 (27.2%)	353 (21.8%)	357 (21.8%)	380 (23.0%)	357 (21.5%)	378 (20.1%)	308 (18.3%)	334 (19.9%)	356 (21.2%)	424 (26.1%)	3,558 (23.9%)	
CIHDOT Ts	628 (100.0%)	629 (100.0%)	672 (100.0%)	527 (100.0%)	544 (100.0%)	547 (100.0%)	547 (100.0%)	547 (100.0%)	565 (100.0%)	565 (100.0%)	5,771 (100.0%)	

*The percentage was calculated in relation to the estimated need.

**The percentage of Intra-Hospital Commissions for Organ and Tissue Donation for Transplantation (CIHDOTTs) was calculated in relation to the total number of CIHDOTTs in the country per year.

Source: Prepared by the authors, with data extracted from the Brazilian Transplant Registry (RBT) published by the Brazilian Association of Organ Transplantation (ABTO).

Annex B

Table 2 –Correlation between the variables population, estimated need for heart transplantation, number of active patients on the waiting list, number of registered teams, year, number of transplants performed, and number of CIHDOTT (Intrahospital Commission for Organ and Tissue Donation and Transplantation) by region in Brazil between 2014 and 2023.



Variables	Estimated need for transplants		Number of active patients on the list.		Number of teams		Year		Number of transplants		CIHDOTT Number	
	r	p-value	r	p-value	r	p-value	r	p-value	r	p-value	r	p-value
Northern Region*												
Population	0.65	0.042c	-	-	-	-	1,000	<0.001a	-	-	0.821	0.004b
Estimated need for transplants	1	-	-	-	-	-	0.646	0.044c	-	-	0.770	0.009b
Year							1	-	-	-	0.817	0.004b
Northeast Region												
Population	0.48	0.153	0.560	0.093	0.797	0.006b	1,000	<0.001a	-	0.644	0.875	0.001b
Estimated need for transplants	1	-	0.701	0.024b	0.298	0.404	0.474	0.166	0.348	0.324	0.466	0.174
Number of active patients on the list.			1	-	0.276	0.440	0.553	0.097	0.234	0.516	0.583	0.077
Number of teams					1	-	0.803	0.005b	-	0.905	0.601	0.066
Year							1	-	-	0.641	0.868	0.001b
Number of transplants									1	-	-0.067	0.854
Central-West Region												
Population	0.67	0.033c	0.641	0.046c	0.753	0.012b	1,000	<0.001a	-	0.742	0.891	0.001b
Estimated need for transplants	1	-	0.344	0.330	0.323	0.362	0.667	0.035c	-	0.209	0.494	0.146
Number of active patients on the list.			1	-	0.471	0.170	0.653	0.041c	-	0.411	0.674	0.032c
Number of teams					1	-	0.753	0.012b	0.293	0.951	0.777	0.008b
Year							1	-	0.022	0.740	0.895	<0.001b
Number of transplants									-	-	0.160	0.658
Southeast Region												
Population	0.58	0.068	0.953	<0.001a	0.904	<0.001a	1,000	<0.001a	0.876	<0.001b	-0.754	0.012b
Estimated need for transplants	1	-	0.532	0.113	0.382	0.276	0.579	0.080	0.256	0.475	-0.511	0.131
Number of active patients on the list.			1	-	0.874	<0.001b	0.957	<0.001a	0.843	0.002b	-0.603	0.065
Number of teams					1	-	0.914	<0.001a	0.958	<0.001a	-0.652	0.041c
Year							1	-	0.889	<0.001a	-0.744	0.014b
Number of transplants									1	-	-0.562	0.091
Southern Region**												
Population	0.63	0.051	0.134	0.711	-0.588	0.074	1,000	<0.001a	-	0.160	-	-
Estimated need for transplants	1	-	-0.553	0.098	-0.301	0.398	0.615	0.058	0.480	0.996	-	-
Number of active patients on the list.			1	-	-0.180	0.618	-0.548	0.101	0.002	0.711	-	-
Number of teams					1	-	-0.597	0.069	0.134	0.431	-	-
Year							1	-	0.281	0.160	-	-
Number of transplants									-	-	-	-
Brazil												
Population	0.54	0.106	0.894	<0.001b	0.920	<0.001a	1,000	<0.001a	0.384	0.273	-0.610	0.061
Estimated need for transplants	1	-	0.295	0.407	0.330	0.325	0.525	0.119	0.421	0.225	-0.470	0.170
Number of active patients on the list.			1	-	0.890	<0.001b	0.902	<0.001a	0.455	0.186	-0.299	0.402
Number of teams					1	-	0.928	<0.001a	0.525	0.119	-0.515	0.127



Year			1	-	0.391	0.264	0.600	0.066
Number of transplants					1	-	-0.200	0.580

*The Northern region has no transplant teams, active patients on the waiting list, nor any transplants performed during the period. **In the Southern region, the number of CIHDOTT (Intra-Hospital Commission for Organ and Tissue Donation for Transplants) remained constant during the analyzed period.

*** Pearson correlation test. p-value significant at a significance level of 5%. a Very high correlation. b High correlation. c Moderate correlation.

