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ORIGINAL ARTICLE

Research in medical specialties: comparative evaluation of National Council for Scientific and Technological Development research productivity fellows

Pesquisa nas especialidades médicas: avaliação comparativa dos pesquisadores em produtividade científica do Conselho Nacional de Desenvolvimento Científico e Tecnológico

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ABSTRACT

Introduction: The Research Productivity Fellowship is a funding modality offered by the National Council for Scientific and Technological Development (CNPq) to PhD holders with relevant scientific output, as a form of direct incentive for high-level national scientific production. **Objective:** To describe and compare the profile and scientific output of CNPq research productivity fellows across five medical specialties. **Methods:** This cross-sectional study included fellows active in 2024 in the specialties of cardiology, hematology/oncology, nephrology/urology, clinical neurosciences, and pediatrics. Data were retrieved from the Lattes curriculum platform regarding fellows' profiles, human resource training, and scientific production indicators throughout their careers and in the period 2020–2024. **Results:** A total of 288 fellows were identified among 556 researchers. The highest numbers of fellows were found in Clinical Neurosciences (n=86; 29.9%) and Hematology/Oncology (n=68; 23.6%). Male researchers (n=189; 65.6%) and those in category 2 (entry level in the fellowship program) were predominant (n=131; 45.5%). The Southeast region (n=214; 74.3%) and the University of São Paulo (n=84; 29.2%) stood out in terms of concentration of fellows and scientific production. The mean time since PhD completion up to 2024 was shortest in Hematology/Oncology (22.68 years) and longest in Pediatrics (27.72 years). The highest average number of supervised students was observed in Cardiology (mean=70.42), while the lowest was found in Nephrology/Urology (mean=31.72). **Conclusions:** Differences were identified among medical specialties regarding researchers profiles, human resource training, and scientific production indicators. Clinical Neurosciences, Cardiology, and Hematology/Oncology showed higher levels of scientific output and impact, whereas Pediatrics and Nephrology/Urology presented lower values across the evaluated indicators.

Keywords: Scientific production indicators; Medicine; Health sciences; Researchers.

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RESUMO

Introdução: A bolsa de Produtividade em Pesquisa é uma modalidade de financiamento ofertada pelo Conselho Nacional de Desenvolvimento Científico e Tecnológico para doutores com produção científica relevante, como forma de incentivo direto à produção de alto nível. **Objetivo:** Descrever e comparar o perfil e a produção científica dos bolsistas de produtividade em pesquisa do Conselho Nacional de Desenvolvimento Científico e Tecnológico em cinco especialidades da Medicina. **Métodos:** Estudo transversal com bolsistas atuantes em 2024 nas especialidades de cardiologia, hematologia/oncologia, nefrologia/urologia, neurociências clínicas e pediatria. Acessaram-se dados do currículo Lattes sobre perfil, formação de recursos humanos e indicadores de produção científica, extraídos das bases *Web of Science* e Scopus. **Resultados:** identificaram-se 288 bolsistas das cinco especialidades, de um total de 556. Observou-se maior quantidade de bolsistas nas especialidades Neurociências Clínicas (n=86; 29,9%) e Hematologia/Oncologia (n=68; 23,6%). O sexo masculino (n=189; 65,6%) e a categoria 2 (nível de entrada no programa de bolsas) foram predominantes (n=131; 45,5%). A região Sudeste (n=214; 74,3%) e a Universidade de São Paulo (n=84; 29,2%), destacaram-se pela concentração dos bolsistas e produção científica. O tempo médio desde a conclusão do doutorado até 2024 foi menor em Hematologia/Oncologia (22,68 anos) e maior em Pediatria (27,72 anos). Observou-se maior média de orientações na Cardiologia (média=70,42) e menor na Nefrologia/Urologia (média=31,72). **Conclusões:** Houve diferenças entre as especialidades quanto ao perfil, formação de recursos humanos e indicadores de produção científica, com maior concentração de pesquisadores, produtividade e impacto científico nas áreas de Neurociências Clínicas, Cardiologia e Hematologia/Oncologia.

Palavras-chave: Indicadores de produção científica; Medicina; Ciências da saúde; Pesquisadores.

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Introduction

Within the academic and governmental landscape, topics related to knowledge production, technological development, and human resources training have occupied a position of prominence[1,2]. Brazilian scientific production, particularly over the last two decades, has demonstrated significant growth and increased international visibility, especially driven by the performance of federal government funding agencies, comprising the National Council for Scientific and Technological Development (CNPq) and the Coordination for the Improvement of Higher Education Personnel (CAPES), which are responsible for the majority of research resources funded for scientists in the country[3].

The National Council for Scientific and Technological Development primarily focuses on researcher funding, while CAPES evaluate postgraduate programs and finances postgraduate scholarships. Nine major knowledge areas comprise the scientific divisions of the National Council for Scientific and Technological Development, which are subdivided into areas, subareas, and specialties[4]. The Research Productivity Fellowship is a specific funding modality offered by the National Council for Scientific and Technological Development to doctorate holders with relevant scientific output, serving as a form of recognition and direct incentive to high-quality national scientific production[5]. Researchers are classified into two main categories, 1 and 2. Category 1 is subdivided into four hierarchical levels (1A, 1B, 1C, and 1D) and represents the highest stratum, being awarded to researchers with outstanding scientific productivity, greater academic maturity, scientific leadership, and significant research impact. Category 2 corresponds to the entry level of the fellowship program and includes researchers in a consolidation phase who demonstrate consistent and

relevant scientific output[4,6]. Recently, CNPq revised this classification system from five to three levels, reclassifying researchers into levels A (fully consolidated activity), B (development category), and C (entry category)[5].

The Consultative Committee of the National Council for Scientific and Technological Development establishes criteria for receiving a Research Productivity Fellowship, including outstanding scientific production, human resources training, and contribution to innovation[4,6]. However, due to the limited number of fellowship quotas, classification parameters also include the number of publications and impact factor of journals, number of national and international patents, number of doctoral and master's degree supervisions, and the H-index[7]. Thus, a systemic evaluation considering the performance of researchers, universities, research institutions, and journals is essential for decision-making in research policies, funding allocations, fellowship awards, and consequently, for promoting the growth of national scientific and technological production[8].

The principal available sources enabling the measurement of Brazilian scientific production are bibliometric databases compiled by the Institute for Scientific Information/Thomson Scientific (ISI/Thomson) in the Web of Science platform and by Elsevier in the Scopus database[9]. These platforms allow quantitative and qualitative analysis of national scientific production, providing indicators on the volume, impact, and visibility of research conducted in the country[10].

In this scenario, numerous studies have examined the profile and scientific output of National Council for Scientific and Technological Development researchers in different knowledge areas, with emphasis on those in the broad area of "Health Sciences," including Medicine[11], Dentistry[2], Physical Therapy[12], and Nursing[6]. Within this structure, the field of Medicine stands out, demonstrating notable growth in scientific production in recent years[4,11]. This advancement demonstrates the relevance of Medicine in the national context, accompanying the movement of valorization of scientific production observed in various knowledge areas[2]. However, there is a lack of studies specifically addressing medical specialties, particularly regarding differences in researchers' profiles and in scientific production and impact indicators across distinct medical fields. Therefore, understanding potential differences in the structure and development of scientific activity among these specialties is of particular relevance.

This study aimed to describe and compare the profile and scientific output of research productivity fellowship holders from the National Council for Scientific and Technological Development in five medical specialties.

Methods

An observational cross-sectional study with a quantitative approach was conducted.

The investigation was conducted with research productivity fellowship holders in the medical specialties of Cardiology, Hematology/Oncology, Nephrology/Urology, Clinical Neurosciences, and Pediatrics, registered according to the list provided by the National Council for Scientific and Technological Development in 2024[13]. The selection of these five specialties was based on a previous study[11] that evaluated the profile and scientific productivity of 411 researchers in Medicine from the National Council for Scientific and Technological Development during the triennium 2006-2008 in areas with the greatest scientific representativeness in the context of Brazilian Medicine. The aim was to maintain methodological consistency and enable direct comparisons with previous findings to ensure greater validity and recognition of the results.

Data collection was performed through the Lattes curricula of the National Council for Scientific and Technological Development[14]. To determine the predominant specialty, the explicit indication in the researcher's Lattes curriculum was considered. In cases where this information was not clearly specified, an analysis of scientific production and supervisions registered in 2024 was conducted to allocate the researcher to the specialty with the greatest predominance of published and/or supervised topics. The fellowship holders were allocated to the previous classification of the National Council for Scientific and Technological Development to standardize result comparisons with a previous study conducted by the same research group[11] (Chart 1).

Based on data retrieved from the Lattes Curriculum platform, a database was constructed to enable comparisons

Chart 1. Categories of the Research Productivity Fellowship of the National Council for Scientific and Technological Development and researcher profile. Brazil, 2024.

Category	Description	Researcher Profile
Senior	Senior researcher	Retired scientists who maintain relevant production and research leadership.
2	Level 2	Researchers undergoing consolidation, with scientific independence and recognized production.
1D	Level 1D	Consolidated researchers with recently demonstrated excellence.
1C	Level 1C	Consistent production and increasing impact in the area.
1B	Level 1B	Significant contributions and national/international recognition.
1A	Level 1A	Academic leadership, high-impact production, and influence in the area.

Source: Brazilian National Council for Scientific and Technological Development (CNPq), 2024[5].

across specialties, comprising three dimensions: a) profile: sex, fellowship category, institutional affiliation, federal state, geographic region, and time since PhD completion (year of PhD completion to 2024); b) human resource training: total number and mean values of completed supervisions at the levels of undergraduate research (scientific initiation), master's, and doctoral training; and c) scientific production indicators: total number and mean annual number of scientific articles published throughout the career and in the last five years (2020–2024). The counts of supervisions and scientific publications were adjusted for time since PhD completion, calculated as the ratio between the total number of supervisions and publications and the number of years since PhD completion up to 2024.

Publications were identified in the ISI/Web of Science[15] and Scopus[16] databases, which allowed calculation of total indexed publications, citations received, and H and M indices. The H-index, as defined by Hirsch, corresponds to the number of works with at least H citations each, and is used to measure the academic impact of the researcher. The M-index was calculated by dividing the H-index by the number of years since obtaining the doctoral degree; this calculation adjusts productivity to time in career[11].

To reduce measurement bias, theoretical-practical training was conducted with four evaluators, supported by a standardized electronic form created by the authors. A pilot study was performed with 10 curricula of faculty members from Stricto sensu postgraduate programs in Medicine not included in the final sample, with discussion of cases and refinement of definitions. Data extraction was performed in duplicate and independently; discrepancies were resolved by consensus or by a third reviewer.

The universe comprised 556 research productivity fellowship holders in the field of Medicine in 2024. The analytical sample was composed of the subset of 288 researchers (51.8%) working in the five previously selected specialties, which constituted the final sample.

The data obtained were analyzed descriptively and comparatively among medical specialties. The Statistical Package for the Social Sciences (SPSS)® was used in the analyses.

Results

A total of 556 research productivity fellowship holders in the field of Medicine in 2024 were identified. Of these, 288 (51.8%) were selected for working in the five previously defined specialties: Cardiology (n=57; 19.8%), Hematology/Oncology (n=68; 23.6%), Nephrology/Urology (n=45; 15.6%), Clinical Neurosciences (n=86; 29.9%), and Pediatrics (n=32; 11.1%).

Male predominance was observed in nearly all specialties, with 70.2% in Cardiology, 64.4% in Nephrology/Urology, 69.8% in Clinical Neurosciences, and 61.8% in Hematology/Oncology. Category 2 (n=131; 45.5%) was the most representative in all specialties, with greater occurrence in Hematology/Oncology (n=38; 29%) and fewer in Pediatrics (n=16; 12.2%). The sublevels of category 1 (1A, 1B, 1C, and 1D) showed a relatively homogeneous distribution across specialties, although greater variability was observed at the 1A level, ranging from 5.1% in Pediatrics (n=2) to 51.3% in Clinical Neurosciences (n=20). The remaining sublevels showed more balanced distributions, with ranges from 10.6% to 38.3% for 1B, 13.2% to 34.2% for 1C, and 9.4% to 28.1% for 1D (Table 1).

A high concentration of fellows was observed in the Southeast region (n=214; 74.3%), followed by the South region (n=50; 17.4%). São Paulo concentrated more than half of the fellows (n=167; 58.0%), particularly the University of São Paulo (n=84; 29.2%). The majority had completed postdoctoral training (n=181; 62.8%); among these, 42.7% (n=123) were conducted abroad (Table 2).

The group presented a mean time since PhD completion up to 2024 of 24.32 years, with the shortest mean observed in Hematology/Oncology (22.68 years) and the longest in Pediatrics (27.72 years). Researchers were actively involved in human resource training at all levels. In undergraduate research (scientific initiation), the mean number of

Table 1. Distribution of National Council for Scientific and Technological Development researchers in the field of Medicine according to sex and fellowship category. Brazil, 2024 (n=288).

Specialty	Fellows	Sex		Research productivity fellowship categories					
		Male	Female	1A	1B	1C	1D	2	Senior
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
Cardiology	57 (19.8)	40 (21.2)	17 (17.2)	7 (17.9)	9 (19.1)	7 (18.4)	8 (25)	26 (19.8)	0 (0)
Hematology/ Oncology	68 (23.6)	42 (22.2)	26 (26.3)	7 (17.9)	8 (17)	6 (15.8)	9 (28.1)	38 (29)	0 (0)
Nephrology/ Urology	45 (15.6)	29 (15.3)	16 (16.2)	3 (7.7)	7 (14.9)	7 (18.4)	5 (15.6)	23 (17.6)	0 (0)
Clinical Neurosciences	86 (29.9)	60 (31.7)	26 (26.3)	20 (51.3)	18 (38.3)	13 (34.2)	7 (21.9)	28 (21.4)	0 (0)
Pediatrics	32 (11.1)	18 (9.5)	14 (14.1)	2 (5.1)	5 (10.6)	5 (13.2)	3 (9.4)	16 (12.2)	1 (100)
Total	288 (100)	189 (100)	99 (100)	39 (100)	47 (100)	38 (100)	32 (100)	131 (100)	1 (100)

supervisions ranged from 24.19 in Pediatrics to 35.77 in Cardiology. At the master's level, the means varied from 18.57 in Clinical Neurosciences to 25.72 in Pediatrics. At the doctoral level, the averages were similar across specialties, ranging from 15.91 in Clinical Neurosciences to 16.03 in Pediatrics (Table 3).

The group published a total of 60,420 articles throughout their careers (mean=209.79) and 14,509 between 2020 and 2024 (mean=50.38). Clinical Neurosciences accounted for the highest absolute number of publications over the career span (n=21,044; mean per researcher=244.70). Cardiology and Hematology/Oncology also showed high values, with 13,270 (mean=232.81) and 11,821 (mean=173.84), respectively. In contrast, Nephrology/Urology (n=8,149; mean=181.09) and Pediatrics (n=6,136; mean=191.75) presented lower values (Table 4).

The mean annual number of publications after PhD completion up to 2024 ranged from 7.0 in Pediatrics to 11.3 in Clinical Neurosciences. In the recent period (2020–2024), Clinical Neurosciences and Cardiology again showed the highest outputs, with 5,092 (mean=59.21) and 3,176 publications (mean=55.72), respectively, whereas Pediatrics had the lowest values (n=1,270; mean=39.69) (Table 4).

Regarding the proportion of articles indexed in the ISI/Web of Science (WoS) and Scopus databases, all specialties showed good representation, with values exceeding 60%. Clinical Neurosciences achieved the highest indexing indicators (13,799 articles indexed in WoS and 14,957 in Scopus), whereas Pediatrics presented the lowest values (3,559 in WoS and 4,045 in Scopus). Clinical Neurosciences also showed the highest mean H and M indices (H-index=32.21; M-index=1.40), while Pediatrics had the lowest (H-index=25.03; M-index=0.93). The overall mean H and M indices were 29.71 and 1.35, respectively; a total of 38,846 articles were cited in WoS and 42,902 in Scopus (Table 5).

Table 2. Distribution of research productivity fellowship holders in the field of Medicine according to postdoctoral training completion, work location, and professional affiliated institution. Brazil, 2024 (n=288).

Variables	n (%)
Postdoctoral training	
Yes	181 (62.8)
No	107 (37.2)
Postdoctoral training location	
Brazil	45 (15.6)
Abroad	123 (42.7)
Sandwich program	13 (4.5)
Geographic region	
Southeast	214 (74.3)
South	50 (17.4)
Center-West	2 (0.7)
Northeast	20 (6.9)
North	2 (0.7)
State	
São Paulo	167 (58.0)
Rio Grande do Sul	40 (13.9)
Minas Gerais	28 (9.8)
Rio de Janeiro	19 (6.7)
Ceará	11 (3.8)
Paraná	8 (2.8)
Bahia	5 (1.7)
Santa Catarina	2 (0.7)
Sergipe	2 (0.7)
Pará	2 (0.7)
Pernambuco	1 (0.3)
Piauí	1 (0.3)
Distrito Federal	1 (0,3)
Goiás	1(0.3)

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Variables	n (%)
Affiliated institution	
Universidade de São Paulo (USP)	84 (29.2)
Universidade Estadual de Campinas (Unicamp)	22 (7.6)
Universidade Federal de São Paulo (Unifesp)	22 (7.6)
Universidade Federal de Minas Gerais (UFMG)	19 (6.6)
Universidade Federal do Rio Grande do Sul (UFRGS)	16 (5.6)
Universidade Estadual Paulista Júlio de Mesquita Filho (Unesp)	14 (4.9)
Universidade Federal do Rio de Janeiro (UFRJ)	9 (3.1)
Hospital de Clínicas de Porto Alegre (HCPA)	8 (2.8)
Universidade Federal do Ceará (UFC)	8 (2.8)
Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS)	8 (2.8)
Instituto de Cardiologia do Rio Grande do Sul (IC/FUC)	4 (1.4)
Universidade Federal de Juiz de Fora (UFJF)	4 (1.4)
Faculdade de Medicina de São José do Rio Preto (FAMERP)	3 (1)
Faculdade de Medicina do ABC (FMABC)	3 (1)
Fundação Antônio Prudente (FAP)	3 (1)
Pontifícia Universidade Católica do Paraná (PUC/PR)	3 (1)
Universidade do Estado do Rio de Janeiro (UERJ)	3 (1)
Universidade Federal da Bahia (UFBA)	3 (1)
Universidade Federal do Triângulo Mineiro (UFTM)	3 (1)
Other institutions	49 (17.2)

Table 3. Mean value and standard deviation (SD) of years since doctorate completion and absolute number and mean value of human resources training by research productivity fellows per specialty. Brazil, 2024 (n=288).

Specialty	Time after completing the doctorate	Human resources development (career formation)			
		Scientific initiation	Master's degree	PhD	Total
	Mean (DP)	n (mean)	n (mean)	n (mean)	n (mean)
Cardiology	25.23 (8.62)	2.039 (35.77)	955 (16.75)	1.020 (17.89)	4.014 (70.42)
Hematology/ Oncology	22,68 (8.19)	1.193 (17.54)	1.213 (17.84)	872 (12.82)	3.278 (48.21)
Nephrology/ Urology	25.82 (8.88)	951 (21.13)	949 (21.09)	678 (15.07)	2.578 (31.72)
Clinical Neurosciences	22.98 (9.31)	1.805 (20.99)	1.597 (18.57)	1.368 (15.91)	4.770 (55.47)
Pediatrics	27.72 (8.47)	774 (24.19)	823 (25.72)	513 (16.03)	2.110 (65.94)
Total	24.32 (8.87)	6.762 (24.32)	5.537 (19.23)	4.451 (15.45)	16.750 (58.16)

Table 4. Absolute number and mean value of scientific productivity of National Council for Scientific and Technological Development fellows by medical specialty throughout career and in the last five years. Brazil, 2024 (n=288).

Specialty	Articles published in career	Articles published after doctorate.	Articles published between 2020- 2024
	n (mean)	mean	n (mean)
Cardiology	13.270 (232.81)	9.5	3.176 (55.72)
Hematology/ Oncology	11.821 (173.84)	7.8	3.084 (45.35)
Nephrology/Urology	8.149 (181.09)	7.6	1.887 (41.93)
Clinical Neurosciences	21.044 (244.70)	11.3	5.092 (59,21)
Pediatrics	6.136 (191.75)	7.0	1.270 (39.69)
Total	60.420 (209.79)	–	14.509 (50.38)

Table 5. Mean H- and M-index values and absolute and mean numbers of citations in Web of Science and Scopus among CNPq research productivity fellows by medical specialty, throughout their careers and in the last five years. Brazil, 2024 (n=288).

Specialty	H-index	M-index	Scientific articles cited in the Web of Science	Scientific articles cited in Scopus
	mean	mean	n (mean)	n (mean)
Cardiology	32.21	1.40	8.564 (150.25)	9.567 (167.84)
Hematology/ Oncology	25.47	1.21	7.875 (115.81)	8.654 (127.26)
Nephrology/Urology	25.73	1.09	5.049 (112.20)	5.679 (126.20)
Clinical Neurosciences	35.22	1.73	13.799 (160.45)	14.957 (173.92)
Pediatrics	25.03	0.93	3.559 (111.22)	4 045 (126.41)
Total	29.71	1.35	38.846 (134.88)	42.902 (148.97)

Discussion

The results of the present study demonstrated inequalities and particularities related to the profile and scientific output of research productivity fellowship holders in the analyzed medical specialties, particularly regarding sex, qualifications, institutionalization, geographic region, and scientific production, highlighting existing challenges and advances in consolidating research in Medicine in Brazil.

The specialty of Clinical Neurosciences concentrated the largest number of fellows in the analyzed period, followed by Hematology/Oncology, Cardiology, Nephrology/Urology, and Pediatrics. The number of fellows in the Clinical Neurosciences specialty may reflect the robust research infrastructure available in Brazilian universities, particularly in the Neurology subspecialty, as well as significant funding from agencies such as the National Council for Scientific and Technological Development and public-private partnerships focused on neurodegenerative diseases and the growing valorization of this theme on the international scientific agenda[13].

Male predominance observed in the specialties is consistent with previous evidence[6,14-17]. A study encompassing various knowledge areas demonstrated that 63% of fellows are men, with this disparity intensifying at higher levels; it was observed that 73.7% of 1A fellows and 88.8% of Senior fellows were men[17]. When analyzing Brazilian postgraduate education, institutional and cultural mechanisms that perpetuate inequality and female underrepresentation are evident, including in research productivity fellowships, such as male predominance in decision-making positions, evaluation criteria based on male career trajectories, difficulties in reconciling career and personal life, and implicit barriers to women's advancement[14].

Gender imbalance is accompanied by regional inequalities, which remains latent in various knowledge areas, including Health Sciences, where women have significant participation at the base but minority presence among researchers with greater productivity and prestige[18]. Inequalities in scientific productivity and access to research productivity fellowships go beyond academic performance and reflect structural barriers that limit women's entry, retention, and advancement in scientific careers[19].

The majority of fellows in category 2 suggests the presence of a relatively young researcher base or those in intermediate career stages. This same pattern was observed in other different areas such as Speech-Language Pathology[20], Physical Therapy[12], Physical Education[21], and Dentistry[2]. This reflects the dynamics in which most researchers begin their trajectory as category 2 fellows, having to demonstrate consistent scientific production and engagement in human resources training to progress to subcategories of category 1 (1A, 1B, 1C, 1D) over the years[22].

Homogeneous distribution among subcategories 1A, 1B, 1C, and 1D in different specialties indicates that advancement to higher categories follows uniform evaluation criteria that prioritize academic and productive performance comparably across areas, as highlighted by official documents of the National Council for Scientific and Technological Development[7]. On the other hand, the low percentage of 1A fellows in specialties such as Pediatrics, for example, may be a consequence of historical differences in research group insertion, size and tradition, as well as difficulties in consolidating positions of excellence, including gender inequalities. These differences may also be associated with lower vacancy availability, high competitiveness, and the requirement for continuous productivity for progression and retention at higher levels[21].

Regarding the regional analysis of fellow distribution in Brazil, hegemony of the Southeast region was observed, where more than 74% of fellows are affiliated with institutions in this region. This pattern, previously observed in other studies, demonstrates the historical configuration of the Brazilian scientific system, whose infrastructure, funding, and academic tradition are concentrated predominantly in this region[2,11,12,21]. The South, in turn, emerges as the second most representative region, with lower presence in the Center-West, Northeast, and North, reinforcing regional inequalities in access to fellowships and scientific resources[11].

The predominance of the University of São Paulo is notable, concentrating the largest share of fellows. This university's national prominence may be related to its international recognition as a center of excellence, innovation, and internationalization in research[2]. The remaining Federal Institutions of Higher Education (FIHE) in the region also encompass a significant portion of affiliations,

a pattern accompanying the historical centralization of scientific resources in larger public universities, reflecting accumulated expertise and available infrastructure[12]. Additionally, Stricto sensu programs at public universities are recognized for quality and comprehensiveness in doctoral training, contributing to consolidating these institutions as academic references and providers of the scientific elite in the country[4,23]. However, despite this strategic institutional concentration, challenges persist regarding unequal distribution of resources and opportunities at the regional level, demanding specific initiatives to promote inclusion and strengthening of less represented regions[4].

Notably, however, there is greater Northeast participation in the Pediatrics specialty, with nearly 30% of fellows, which may indicate advances linked to specific regional policies, local institutional development, or the presence of specific demands and potentialities of that region[2].

Regarding the variable time since doctorate completion, a mean of 24.32 years was observed, with Hematology/Oncology presenting the shortest time recorded (mean=22.68 years) and Pediatrics the longest (mean=27.72 years). This variation may indicate different patterns of academic development and consolidation among specialties, possibly resulting from postgraduate program structure and the faculty and researcher renewal cycle in each specialty[24,25].

The fellows engaged in human resources training at all teaching levels. Cardiology stood out with the highest mean number of supervisions per researcher in scientific initiation and doctorate, while Pediatrics had the highest mean in master's degree programs. This activity profile reflects the national relevance of Stricto sensu postgraduate programs in Medicine, in which successful supervision constitutes an essential criterion for evaluation and career advancement in scientific research[7]. Furthermore, supervision of new researchers represents one of the most relevant dimensions of fellow impact, being also a fundamental criterion for fellowship awards according to National Council for Scientific and Technological Development regulations. Although Clinical Neurosciences includes the largest number of fellows, the mean number of supervisions per researcher is higher in Cardiology and Pediatrics, possibly reflecting differences in academic activity profiles and in the organization of graduate programs, which may favor greater direct involvement in human resource training[26].

The analysis of scientific productivity throughout career reveals impressive performance in terms of publication volume, impact, and international insertion of production. The Clinical Neurosciences specialty consistently stands out as the area with the largest absolute production (21,044 publications) and highest mean per researcher (mean=244.70), accompanied by Cardiology (n=13,270; mean=232.81) and Hematology/Oncology (n=11,821; mean=173.84). In addition to the tradition and robust research infrastructure of major universities in biomedical fields, these findings reflect the integration of these groups into internationally relevant scientific agendas, including studies on neurological, cardiovascular, and oncological diseases. These research areas attract substantial funding, foster international collaboration networks, and generate high publication output, thereby enhancing the visibility and dissemination of scientific production[24].

The intensity of annual productivity is another parameter proving dedication to scientific advancement and fellows' capacity to maintain continuous research lines, high publication rates per year, and constant updating in light of emerging scientific challenges[27]. The high proportion of articles indexed in Web of Science and Scopus, exceeding 60% in all specialties, points to fellows' alignment with internationalization, transparency, and editorial quality requirements[28], consistent with a previous study that reported 56% of publications indexed in WoS and 78% in Scopus[11]. The mean H and M indices reflect sustained impact and continuity of contributions over time[29]. In this study, Clinical Neurosciences and Hematology/Oncology stand out, indicating that, beyond volume, there is consistency in quality and impact of published works in these areas[11,24].

Despite these advances, caution is recommended when exclusively valuing quantitative indicators. Strengthening qualitative standards, the pertinence of studies to national public health challenges, and stimulus to applied research are fundamental dimensions for consolidating more equitable and relevant scientific production, aligned with international impact and social commitment[26].

Among the limitations of the present study, the analysis is restricted to five medical specialties and to the sample of research productivity fellows, without including other areas or fellowship modalities, which restricts result generalization. Additionally, data were extracted from the Lattes platform, whose updating depends on researchers themselves[5,12]. These factors should be considered in interpreting the findings.

Conclusion

Differences were observed among medical specialties regarding fellows' profiles, human resource training, and scientific production indicators. Clinical Neurosciences, Cardiology, and Hematology/Oncology presented higher levels of scientific productivity and academic impact, as reflected by greater numbers of publications, higher H- and M-indices, and more citations in international databases. In contrast, Pediatrics and Nephrology/Urology showed lower values in recent production (2020–2024), post-PhD publication rates, M-index, and number of citations.

Although research productivity fellowship holders from the National Council for Scientific and Technological Development demonstrate high productive capacity and broad contribution to human resources training, there is still need for public policies promoting resource decentralization, strengthening of institutions outside the Southeast-South axis, and fostering gender equity in research opportunities.

Authors' contributions

We describe contributions to the papers using the taxanomy (CRediT) provide above:

Conceptualization: H Martelli-Júnior; AAD Sousa. *Investigation, Methodology, Visualization & Writing–review & editing*: ECO Ribeiro; GD Macedo; MJS Magalhães; JTLS Maia; H Martelli-Júnior; AAD Sousa. *Project administration & Supervision*: H Martelli-Júnior; AAD Sousa. *Writing–original draft*: ECO Ribeiro; GD Macedo; AAD Sousa; MJS Magalhães; JTLS Maia; H Martelli-Júnior. *Validation, software, data curation & Formal Analysis*: ECO Ribeiro; GD Macedo; MJS Magalhães; JTLS Maia; H Martelli-Júnior; AAD Sousa.

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