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Original article

Inequality in the distribution of rheumatologists in Brazil: correlation with local of medical residency, Gross Domestic Product and Human Development Index

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ABSTRACT

Objective: To assess the distribution of rheumatologists in Brazil and their correlation with Medical Residency specialization offer, Gross Domestic Product (Gdp) And Municipal Human Development Index (HDI-M) of units of the federation (UFs).

Methods: Query to various official databases, data summarization by techniques for descriptive statistics and cross-referenced information. For correlation analysis, we used the Spearman correlation coefficient (r).

Results: There were 1229 rheumatologists regularly registered in the country. The Northern region had only 3.6% of the total ($n = 44$), while the Southeast had 42.2% ($n = 519$). The State capitals, added to the five largest municipalities in each UF, concentrated 75.8% of these specialists ($n = 931$). In total, 49.9% of rheumatologists offered treatment at SUS. A general ratio of 157,809 inhabitants per rheumatologist in Brazil was determined, but with wide variation among UFs with respect to this ratio. In the years 2000-2012, there were 593 Rheumatology Residency graduated physicians in Brazil. We observed a positive correlation among number of rheumatologists compared with GDP ($r = 0.94$), HDI-M of the State capitals ($r = 0.77$) and number of Rheumatology Residency graduated physicians ($r = 0.79$) in UFs.

Conclusions: We noted a strong concentration of rheumatologists in State capitals and larger municipalities, with noticeable inequalities also between UFs and country regions. The distribution of these professionals accompanied GDP, HDI-M of the State capital and number of Rheumatology Residency graduated physicians, suggesting that factors related to income opportunities and human development and the place of speciality training may influence the geographical fixation of rheumatologists.

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Inequalidade na distribuição de reumatologistas no Brasil: correlação com local de residência médica, Produto Interno Bruto e Índice de Desenvolvimento Humano

R E S U M O

Palavras-chave:

Reumatologia
Distribuição de médicos
Política de saúde
Epidemiologia

Objetivo: Avaliar a distribuição dos reumatologistas no Brasil e sua correlação com oferta de residência médica (RM) especializada, Produto Interno Bruto (PIB) e Índice de Desenvolvimento Humano Municipal (IDH-M) das unidades da federação (UFs).

Métodos: Consulta a várias bases de dados oficiais, sumarização de dados por técnicas estatísticas descritivas e cruzamento de informações. Para análise de correlação, utilizou-se o coeficiente de Spearman (r).

Resultados: Foram encontrados 1.229 reumatologistas registrados regularmente no país. A região Norte reunia apenas 3,6% desse contingente ($n = 44$), enquanto o Sudeste, 42,2% ($n = 519$). As capitais somadas aos cinco maiores municípios de cada UF concentraram 75,8% desses especialistas ($n = 931$). No total, 49,9% dos reumatologistas prestavam atendimento pelo Sistema Único de Saúde (SUS). Achou-se razão geral de 157.809 habitantes para cada reumatologista no Brasil, porém com grande variação entre as UF quanto a essa proporção. Entre 2000 e 2012, houve 593 concluintes de RM em reumatologia no Brasil. Achou-se correlação positiva do número de reumatologistas ante o PIB ($r = 0,94$), o IDH-M da capital ($r = 0,77$) e o número de concluintes de RM em reumatologia ($r = 0,79$) das UF.

Conclusões: Observou-se forte concentração de reumatologistas nas capitais e maiores municípios brasileiros, com desigualdades perceptíveis também entre as UF e as regiões do país. A distribuição desses profissionais acompanhou o PIB, o IDH-M da capital e o número de concluintes de RM em reumatologia das UF, sugerindo que fatores relacionados a oportunidades de renda e desenvolvimento humano e ao local de formação especializada podem influir na fixação geográfica dos reumatologistas.

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Introduction

A recently published study by the Federal Council of Medicine (Conselho Federal de Medicina, CFM) and the Regional Council of Medicine of São Paulo (Conselho Regional de Medicina do Estado de São Paulo, CREMESP) demonstrates poor distribution of physicians in the country, not considering any absolute deficiency in the number of these professionals. This inequality is observed both in relation to doctors in general as to specialists, who concentrate their activity on State capitals and larger municipalities, resulting in a shortage of physicians in the periphery and in the hinterland.¹ The Brazilian government has sought strategies to achieve greater internalization of physicians, some of them questionable, as the liberal authorization for opening medical schools, which multiply without strict criteria of geographical necessity, and the proposal of compulsory civil service, which does not attack the bases of the problem and imposes on this particular profession a social obligation not uniformly distributed to the other ones.²

Historically, it has been easier to attract physicians (temporarily) for the poorest and remote areas than to fix the professionals in these regions, with consequent turnover of professionals working in the hinterland and in the periphery, particularly in the case of primary care. The determinants of the geographical fixation process of the physician are complex and include factors such as the region where the pro-

fessional was born, his/her alma mater, formative content and experiences during graduation, job/chief satisfaction, adequacy of resources for the professional performance, quality and safety in the workplace, opportunities for development/ updating of her/his career, personal respect and professional prestige, opportunities for cultural development, nature of employment relationship, besides the perception of a remuneration consonant with the investment in training and the responsibilities of profession, among others.³⁻⁵ Studies suggest that the existence of Medical Residency (MR) programs in a particular locality may have attractive effect, functioning as a “medical fixator”; furthermore, the regions holding the higher gross domestic product (GDP) – and therefore with a greater generation of wealth – also bear the greatest numbers of these professionals.⁶⁻⁸ Although the priority in the search for better distribution in the provision of medical services should be the primary care, we must not lose sight that the access to specialists continue to be essential in more complex cases, and this need cannot be fully supplied by telemedicine capabilities.

In the particular case of rheumatology, there is a current perception, among physicians and users (patients), of a relative scarcity of these specialists, possibly even in State capitals, resulting in difficulties in accessing their services. In the UK, the Royal College of Physicians postulated as ideal a ratio of 1 full-time-available rheumatologist (40 hours per week) for each 86,000 inhabitants.⁹ Although an universally recognized methodology to estimate the ideal physician/popula-

tion ratio is lacking, and although the needs certainly may differ between regions and countries, this number gives us a starting point for comparisons.

This study adopts the premise that the same determinants of the geographical fixation process of physicians in general apply to rheumatologists. If this is the case, and if the factors related to the institution where the MR was obtained and to opportunities for income generation and human development are determinant for the choice of the fixation local by the physician, then the distribution of rheumatologists in the country should accompany the levels of indicators that measure (even partially) such constructs. The objective of this study is to evaluate the distribution of rheumatologists in Brazil, as well as its correlation with the number of Rheumatology Residency graduated physicians, GDP and municipal human development index (HDI-M) from federal units (UFs).

Materials e methods

We conducted a direct research (online) in databases of Conselho Federal de Medicina (CFM), Instituto Brasileiro de Geografia e Estatística (IBGE), Cadastro Nacional de Estabelecimentos de Saúde (CNES) of the Ministry of Health, Comissão Nacional de Residência Médica (CNRM) of the Ministry of Education and the United Nations Program for Development (UNDP).¹⁰⁻¹⁵ These databases provide public access via World Wide Web (Internet). All searches were conducted between March 1st and March 20th, 2013. The variables analyzed with their respective original bases were: from CFM, number of rheumatologists with active registration, by UF and municipalities; IBGE's residents' population and GDP by UF and municipalities; from CNES, number of rheumatologists providing attendance to SUS by UF; from CNRM, number of certificates of Rheumatology Residency issued by UF; from UNDP, the HDI-M by UF. The research methodology did not include pediatric rheumatologists, whose CFM registration takes place nowadays under the designation of area of activity, and not of specialty.

GDP is defined as the total of goods and services produced, with the purpose of final consumption, equivalent to the sum of values added by the various economic activities plus taxes (free of subsidies) on products.¹⁶ GDP represents the sum of the wealth generated by the different economically active sectors in a particular region/time period. HDI aims to be a general, synthetic, measure of human development, calculated from three pillars: (i) health, as measured by life expectancy; (ii) access to knowledge, measured by average years of adult education and expected years of schooling for children at early school age; and (iii) income.¹⁷

The query to CNES by number of rheumatologists attending at SUS used the option of search by individuals; this technique computes the professional only once, even in the case of multiple links. We used the number of certificates issued for Rheumatology Residency as an estimator of the number of trainees in the specialty, by MR modality, in the UF. All certificates of Rheumatology Residency completion registered at CNRM from 2000 to 2012 were included. The choice of this inclusion period was based on two criteria: (a) the registration data of the CNRM prior to 2000 have greater likelihood of

inconsistencies; and (b) the searches aimed to comprise the latest consolidated information. Information from CFM, CNES and CNRM was up-to-date with reference to the time of access.¹⁰⁻¹² The GDP used refers to the year 2010, and population data are estimates for the year 2012.^{13,14} HDI-M was calculated by UNDP, based on information from the 2000 Brazilian census; the UF's HDI-M corresponds to the average of its municipalities.¹⁵

The Federal District was considered as an equivalent of a single municipality. Considering the small number of rheumatologists in the country compared to the number of inhabitants, with the aim to avoid notations of the type 1/x or an excessive number of decimals, in this paper the commonly reported rates in form of physician/habitants are reported in its inverse form (inhabitants/physician). UFs are referred to by their usual abbreviations (ex: DF, GO, PB, RJ, SP, etc.). Data were summarized by descriptive statistics techniques. In the correlation analysis, we used the correlation coefficient of Spearman (r), with a two-tailed significance level of 0.01. The analyses were performed using SPSS software for Windows.

Results

Table 1 summarizes the results by UF. At the time of the survey, there were 1,229 rheumatologists with active registries in databases from CFM throughout our country. The Northern region had only 3.6% of the contingent ($n = 44$); Midwest, 12.1% ($n = 149$); Northeast, 17.5% ($n = 215$); South, 24.6% ($n = 302$); and Southeast, 42.2% ($n = 519$). The 27 State capitals concentrated 64% of registered rheumatologists ($n = 787$), 93% of the rheumatologists in the Northern Region lived in its capitals; in the Midwest, 85%; in the Northeast, 80%; in the South, 52%; and in the Southeast, 56%. Taking the five largest municipalities in each state, a concentration of 75.8% of all registered rheumatologists ($n = 931$) was reached. There was only one rheumatologist with active registry in Acre, while the State of São Paulo showed 241 active registries.

In our country, 49.9% ($n = 614$) of the rheumatologists offered their services to SUS, with heterogeneity noted between the regions: in the Northern Region, this proportion was 70.5% ($n = 31$); Midwest, 37.6% ($n = 56$); Northeast, 58.1% ($n = 125$); South, 19.2% ($n = 58$); and Southeast, 68.2% ($n = 354$). A general rate of 157,809 inhabitants/rheumatologist was observed. By region, the rate was 370,867 inhabitants/rheumatologist in the Northern Region; 250,731 in Northeast; 157,160 in Southeast; 120,819 in Midwest; and 91,827 in South. But UFs differed considerably in this respect, with a median of 192,624 inhabitants/rheumatologist (interquartile range = 175,981) and extremes of 41,383 in DF and 758,786 in AC. If we consider only the specialists who offer their services to SUS, the median was 413,692 inhabitants/rheumatologist (interquartile range = 338,273), with extremes of 156,071 in RJ and 1,053,583 in PI.

From 2000 to 2012, Brazil has certified 593 Rheumatology Residency graduated physicians, of whom 66.9% were graduated in the Southeast ($n = 397$), 12.5% in the Midwest ($n = 74$), 11.1% in the South ($n = 66$), 8.4% in the Northeast ($n = 50$), and 1% in the North ($n = 6$) region. A strong positive correlation among number of rheumatologists with respect to GDP ($r = 0.94$), HDI-M for the capital ($r = 0.77$) and number of Rheu-

Table 1 – Population, number of rheumatologists, GDP, HDI-M, medical resident finishers in rheumatology and habitants/rheumatologist ratio per state

Region	Population	Rheumatologist			GDP†	HDI-M††		RM‡	Hab/Rheum.#	
		State	Capital	SUS		State	Capital		General	SUS
North										
AC	758.786	1	1	0	8.477	0,697	0,754	0	758.786	dna
AM	3.590.985	10	10	10	59.779	0,753	0,774	6	359.099	359.099
AP	698.602	4	4	4	8.266	0,713	0,772	0	174.651	174.651
PA	7.792.561	19	18	12	77.848	0,723	0,806	0	410.135	649.380
RO	1.590.011	3	2	2	23.561	0,735	0,763	0	530.004	795.006
RR	469.524	1	1	1	6.341	0,746	0,779	0	469.524	469.524
TO	1.417.694	6	5	2	17.240	0,710	0,800	0	236.282	708.847
Northeast										
AL	3.165.472	22	18	19	24.575	0,649	0,739	0	143.885	166.604
BA	14.175.341	47	32	16	154.340	0,688	0,805	11	301.603	885.959
CE	8.606.005	38	33	17	77.865	0,700	0,786	19	226.474	506.236
MA	6.714.314	12	10	7	45.256	0,636	0,778	0	559.526	959.188
PB	3.815.171	29	18	23	31.947	0,661	0,783	0	131.558	165.877
PE	8.931.028	30	26	24	95.187	0,705	0,797	18	297.701	372.126
PI	3.160.748	10	10	3	22.060	0,656	0,766	2	316.075	1.053.583
RN	3.228.198	16	14	11	32.339	0,705	0,788	0	201.762	293.473
SE	2.110.867	11	11	5	23.932	0,682	0,794	0	191.897	422.173
Midwest										
DF	2.648.532	64	64	15	149.906	0,844	0,844	47	41.383	176.569
GO	6.154.996	44	35	20	97.576	0,776	0,832	16	139.886	307.750
MS	2.505.088	26	19	4	43.514	0,773	0,814	11	96.350	626.272
MT	3.115.336	15	9	7	59.600	0,778	0,821	0	207.689	445.048
Southeast										
ES	3.578.067	34	17	10	82.122	0,765	0,856	5	105.237	357.807
MG	19.855.332	148	71	49	351.381	0,773	0,839	55	134.158	405.211
RJ	16.231.365	96	72	104	407.123	0,807	0,842	63	169.077	156.071
SP	41.901.219	241	130	191	1.247.596	0,820	0,841	274	173.864	219.378
South										
PR	10.577.755	131	77	19	217.290	0,787	0,856	37	80.746	556.724
RS	10.770.603	114	61	29	252.483	0,814	0,865	29	94.479	371.400
SC	6.383.286	57	19	10	152.482	0,822	0,875	0	111.987	638.329
Brazil	193.946.886	1.229	787	614	3.770.086	dna	dna	593	157.809	315.874

† GDP is the gross domestic product, in millions of reais; †† HDI-M is the human development index per municipality; ‡ RM is the number of conclusers of medical residence in rheumatology between 2000 and 2012; # Hab/Rheum. is the ratio between the number of habitants and the number of rheumatologists in a given region.; dna = does not apply.

matology Residency graduated physicians in the UF ($r = 0.79$), respectively, was found. A moderate correlation between number of rheumatologists and HDI-M of the UF ($r = 0.56$) was observed.

Discussion

We found imbalances in the distribution of rheumatologists in this country, who were concentrated in State capitals and larger municipalities, following a similar pattern to that reported by CFM/CREMESP for physicians in general.¹ Inequalities were also observed between regions: the seven UFs of South and Southeast regions gathered about two-thirds of rheumatologists, with the remainder distributed among the remaining twenty UFs. North, Northeast and Midwest regions had the highest concentrations of rheumatologists in the State capitals, which housed 80% or more of these professionals. In South and Southeast regions, although this phenomenon of concentration also had been observed, it is less intense, with slightly more than half of rheumatologists in the

capitals. The Northern region exhibited the lowest presence of rheumatologists, both in absolute (number of professionals, $n = 44$) and relative (370,867 inhabitants/rheumatologist) terms.

Some UFs reached levels close to or even exceeding the ideals proposed by the British Royal College of Physicians,⁹ of about 86,000 inhabitants/rheumatologist (e.g., DF, 41,383; PR, 80,746; RS, 94,479; MS, 96,350), while still others fell far short of this level (e.g., AC, 758,786; RO 530,004; MA 559,526; RR 469,524). Considering only the number of rheumatologists offering their services to SUS, all UFs were far from optimal levels of provision, and the best positioned UF was RJ with 156,071 inhabitants/rheumatologist. Data on SUS rheumatologists were generated from CNES, whose records are used in the calculation of financial transfers for service providers, with mandatory periodic updating of the system by its administrators.¹⁸ In general, CNES is a good indicator of human resources at SUS, but there is an overestimation bias: the reduction of registered human resources can result in reduced financial transfer to the management unit. Thus, despite the requirement for periodic updating, not always a physician

who leaves SUS will have his/her registration status at CNES immediately modified by the administrator. Therefore, the situation of rheumatologists' provision to SUS can be even worse than the picture reported here.

About two-thirds of Rheumatology Residency graduated physicians attended specialization in the Southeast, and the state of São Paulo alone accounted for 46.2% ($n = 274$) of all graduates. At the other extreme, the entire Northern region accounted for only 1% ($n = 6$) of these graduates. In 13 UFs, there was no active program and/or any physician who finished their Rheumatology Residency in the years 2000-2012. Among these UFs, four presented general rates larger than 400,000 inhabitants/rheumatologist, namely AC, PA, RO, RR, and MA. Despite these numbers, the rheumatology specialty is not contemplated as a priority specialty by the national program for supporting the training of medical specialists in strategic areas (Pró-Residência).^{19,20} The results presented here argue in favor of the reconsideration of that position by the officials of Public Administration. The Brazilian Society of Rheumatology can exercise a preponderant role in this subject.

We observed a strong positive correlation between the number of rheumatologists and GDP, HDI-M of State capitals and the number of Rheumatology Residency graduated physicians in each UF, suggesting that some elements related to income opportunities and human development elements, besides the place where the specialized training was offered, may influence the geographical fixation of these specialists. Póvoa and Andrade observed a greater likelihood of finding non-native physicians,⁷ i.e., those coming from other regions, in UFs with a highest number of MR vacancies, and thus also in those UFs with the highest GDP per capita, suggesting that these two factors function as local physician concentrators.

Other studies show that physicians tend to stay in the place where they did their MR, and that there are more physicians in UFs with greater GDP.^{6,8} The only moderate correlation with HDI-M of the UF (average of the municipalities) is not surprising, given the concentration of rheumatologists in the States' capitals. Moreover, it seems reasonable to assume that factors operating at local (municipal) level exert greater influence on the individual's choice as to where to fix his/her living, because the local problems and opportunities will occur mainly at this level.

The study published by CFM/CREMESP, previously cited, adopted different methodology for its counting of physicians.¹ This study used other sources, in addition to the CFM records, performing data cross-checking with the goal of identifying specialists. For that research, 1,631 rheumatologists were operating in Brazil in 2012, different from the 1,229 professionals reported here. The system of administrative and notary record of CFM is integrated with those of the Conselhos Regionais de Medicina (CRMs), so that all specialist qualification titles registered in CRM are automatically also included in CFM basis. Thus, a specialists' underreporting CRM/CFM system was noted. That is, there were physicians with a rheumatologist title, obtained either through completion of medical residency or by approval at Brazilian Society of Rheumatology specific scrutiny; but these entities do not register titles in CRM/CFM system. This underreporting leads to curious situations, as in Table 1, where it can be seen that the total rheumatologists registered at CRM/CFM in Rio de Janeiro

was inferior to the number of rheumatologists who worked in the SUS in that UF.

Therefore, the present work, in considering rheumatologists from CFM records, underestimates by approximately 24.6% the total number of rheumatologists in the country. For the calculation of inhabitants/rheumatologist rate, the CFM system search was not restricted to primary enrollments, considering that a rheumatologist with active registration in more than one UF will be available to each of them (unevenly, or not). If only the primary registrations were considered, then 1,187 registered rheumatologists across the country would be computed, bringing the sub-registry in CFM to 27.2%, compared with the study of CFM/CREMESP. Given this limitation, we must evaluate to what extent this difference impacts the results presented here.

First, data on number of rheumatologists in the SUS and its relationship versus number of inhabitants do not change, because, at that point, the sources of both studies (CNES and IBGE) are identical. As for the correlation analysis, we recalculated the tests using the data published by CFM/CREMESP for number of rheumatologists versus GDP, HDI-M of State capital and number of MR graduates in rheumatology in each state, and the coefficients (r) were 0.94, 0.74 and 0.82, respectively – very similar to our original coefficients. Thus, here the findings also do not change.

However, when relating data from CNES (rheumatologists in SUS) with those published by CFM/CREMESP (total of rheumatologists), we conclude that only 37.6% of rheumatologists in the country are available to SUS, compared to those 49.9% reported here. There are also differences in the inhabitants/rheumatologist general rates by UF. Fig. 1 associates the results obtained here (from databases of CFM) with those published by CFM/CREMESP. The main differences were seen in SP and RJ, where – by the methodology of CFM/CREMESP – more 283 and 76 rheumatologists were respectively computed, compared with our data in this study. As for MG and PE, more 12 and 11 rheumatologists, respectively, were noted. For all remaining states, the differences in absolute numbers between

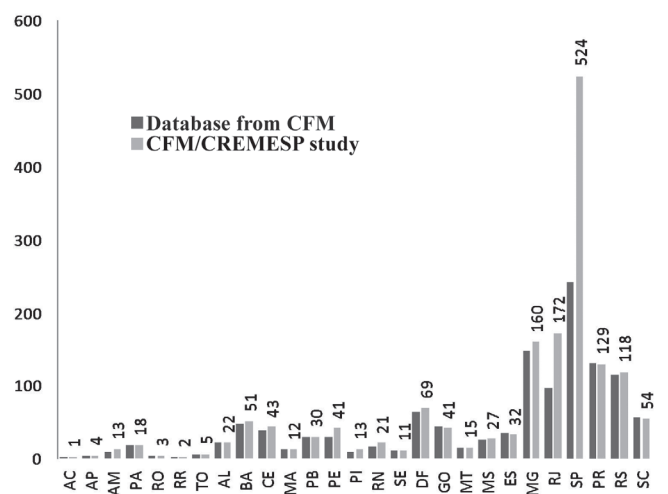


Fig. 1 – Distribution of rheumatologists by UF by two counting procedures. Note: In the figure, only the numbers of CFM/CREMESP study are indicated; the values obtained from databases of CFM are listed in Table 1.

forms of counting ranged from 0 to 5 rheumatologists by UF (either more or less).

Data of CFM/CREMESP imply that Brazil has an overall ratio of 118,913 inhabitants/rheumatologist. When analyzed by UF, the median of this ratio is 174,651 inhabitants/rheumatologist (interquartile range = 144,670), with extremes of 38,385 in DF and 758,786 in AC. These numbers show a better scenario for the inhabitants/rheumatologist rate, compared to that obtained from CFM registry data, but do not modify the pattern of poor distribution of rheumatologists among UFs, as noted in Fig. 1. Even using CFM/CREMESP data, several UFs still present inhabitants/rheumatologist general rates distant from the levels postulated as ideal (e.g., AC, 758,786; MA, 559,526; RO, 530,004; PA, 432,920; TO, 283,539; BA, 277,948; AM, 276,230), while others exhibit proper proportions or even an excess of rheumatologists (e.g., DF, 38,385; SP, 79,964; PR, 81,998; RS, 91,276; MS, 92,781; RJ, 94,368). So, no matter which data set used, whether CFM's (methodology adopted for this study) or CFM/CREMESP's – the general conclusions of this paper do not change.

In short, we observed imbalance in the distribution of rheumatologists in our country, with a concentration of these specialists in Brazilian State capitals and larger municipalities. The South and Southeast gathered about two-thirds of rheumatologists, the remaining third being distributed by North, Northeast and Midwest regions. Some units of the federation reached levels postulated as ideal for the inhabitants/rheumatologist rates (particularly in Southeast, South and Midwest), while others exhibited severe shortage of these professionals (especially in North and Northeast). Half or less of the total number of rheumatologists in Brazil were available to SUS. The distribution of rheumatologists in our country paralleled the GDP, the HDI-M from the state capital and the number of Rheumatology Residency graduates of UFs, suggesting that factors related to income opportunities and human development, besides the site where the specialized training occurred, may influence the choice of their geographical settlement.

Conflicts of interest

The author declares no conflicts of interest.

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