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Anselmo Luís dos Santos*
State University of Campinas
Campinas, São Paulo, Brazil

Marcelo Manzano**
State University of Campinas
Campinas, São Paulo, Brazil

André Krein***
University of Coimbra
Coimbra, Portugal

Heterogeneity in the distribution of health professionals in Brazil and the Covid-19 pandemic

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* Professor at the State University of Campinas, Institute of Economics. PhD in Economic Theory, MSc and BSc in Economics from the State University of Campinas. Email: anselmocesit@gmail.com
http://lattes.cnpq.br/8578750972825935 https://orcid.org/0000-0002-5886-3816

** Post-doctoral Researcher Fellow at the State University of Campinas, Center for Union Studies in Labor Economics. PhD in Economic Development, MSc in Social and Labor Economics and BSc in Economics from the State University of Campinas. Email: manzano1968@gmail.com
http://lattes.cnpq.br/7950610452121793 https://orcid.org/0000-0002-1161-9744

*** PhD candidate in Sociology at the University of Coimbra. MSc in Political Science and BSc in Social Sciences from the State University of Campinas. Email: andrehkrein@gmail.com
http://lattes.cnpq.br/7977455444561013 https://orcid.org/0000-0003-4205-2418

Abstract

The paper analyses the distribution of health professionals in Brazil and its implications for the fight against COVID-19. On the one hand, it stresses that disparities in the regional distribution of health professionals is one of the most worrisome aspects of the national health system current structure. On the other hand, it argues that thanks to the extent and decentralization of the Unified Health System, those disparities are partly mitigated by the public network, compensating the relative scarcity of private health services in lower *per capita* income states. It is observed that in the face of the risks of health care activities related to the pandemic conjuncture, the extended working hours and the incidence of Covid-19 cases among health professionals occurred mostly among mid-level workers, revealing greater risks and insecurity among those with more precarious and lower-paid occupations.

Keywords: Covid-19. Health Economic-Industrial Complex (HEIC). Unified Health System (SUS). Industry 4.0. Production and Innovation System.

Introduction

The sanitary and economic crisis that hit the world at the beginning of 2020 hit Brazil at a particularly difficult moment. After the profound 2015/2016 recession, which made the *per capita* gross domestic product (GDP) shrink 11% and left almost 7 million workers unemployed, the persistent fiscal austerity policy impeded a more intense cyclic recovery of the economic activity, as it usually happens after recessive times. Among the obstacles to recovery, the most important one seems to have been maintaining the fiscal austerity policy started in 2015 and strengthened in December 2016. It was approved by Constitutional Amendment 95, known as the Expenditure Gap law.

Since then, without the private motors of consumption and investment – both of them shrunk by the recession effects on income and credit – the legal limits to expand the public expenditure did not only function as brakes stop to recover aggregate demand. They also shrunk the federal expenses with welfare policies, especially the Unified Health System (SUS).

However, implementing such economic policy stopped a more substantial recovery and compromised the funding of a proper goods and services offer. SUS has immediate health access benefits in a country of continental dimensions like Brazil. Its structure and breadth is a shield to avoid even more harmful effects of sanitary crisis like Covid-19. It has been playing a key role in compensating for the dramatic structural inequality that characterizes the Brazilian society.

This is a somewhat contradictory context; it is characterized by the Brazilian peripheral economy structural fragilities, circumstances of serious socioeconomic consequences, as well as the strong construction of a highly effective health system. It is against this background that we aim to investigate some preliminary aspects of the sanitary/economic crisis that began after the Covid-19 pandemic. This study will focus especially on the pandemic relations with the health services job market segment. The pandemic impacts on the job market of the so-called Health Economic-Industrial Complex (HEIC) may have repercussions on multiple dimensions in

the medium and long terms. It may also change the importance of HEIC workers within the regional occupation framework, depending on the frequency and breadth of the HEIC sectors in each federation unit or region. Also, the revitalization of these sectors may be impacted due to the pandemic.

1. Healthcare providers and regional inequalities

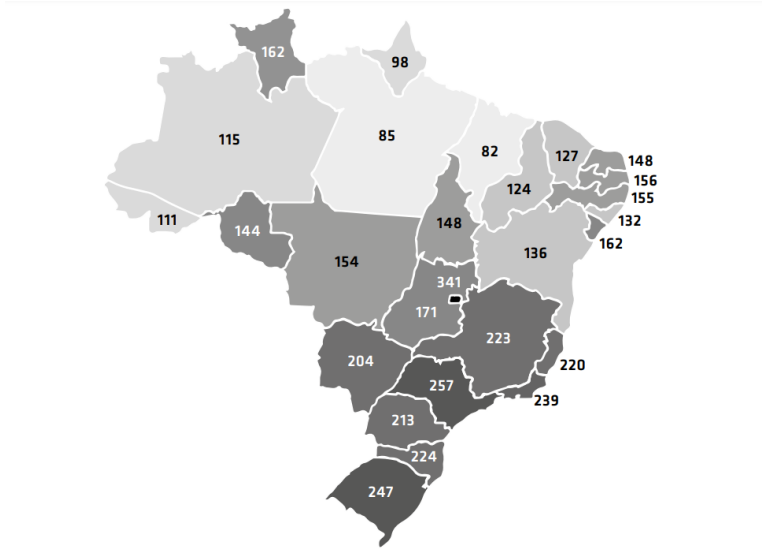
The propagation of the number of cases and deaths due to Covid-19 has been taking place in diverse ways in Brazil's regions and states. This has varied according to the how fast and in what way social isolation measures have been adopted, as well as the international tourist influx, sanitation conditions, social inequalities, the job market structure, the ICU beds, and available equipment, among other factors. However, there is a central question in this characterization that highlights a critical regional inequality: the disproportional availability of health workers to help patients with the coronavirus.

According with data from the Brazilian Health Care Establishments Registry (CNES) made by the Health Ministry, and the Continuous National Household Sample Survey (Continuous PNAD/IBGE), there is a clearly unequal distribution of health providers across the country. The richer regions are favored, notably, the Southeast and South regions, and the Federal District, to the detriment of the North and Northeast regions. Even though the number of doctors per thousand inhabitants may be considered satisfactory comparted to other countries,[1] the distribution inequality of these professionals is very pronounced regionally. As observed in Graph 1, in March 2020, the federation units that received the highest number of doctors were the Federal District, with 341 doctors for each 100,000 inhabitants; the state of São Paulo, with 257 doctors, and the state of Rio Grande do Sul, with 247 doctors. On the other hand, the states with the lowest number of doctors per

1 According with the 2018 Brazilian Medical Demography study (SCHEFFER et al., 2018), Brazil has a 2.1-doctors per thousand inhabitant rate. This is close to countries such as South Korea, Japan, Mexico, and Türkiye, and a bit below countries such as the USA, United Kingdom, and Canada, whose rates are close to 2.7. Nevertheless, there is still an absolute insufficiency in the number of doctors in the Unified Health System.

100,000 inhabitants were Maranhão, with 82 doctors; Pará, with 85 doctors; and Amapá, with 98 doctors.

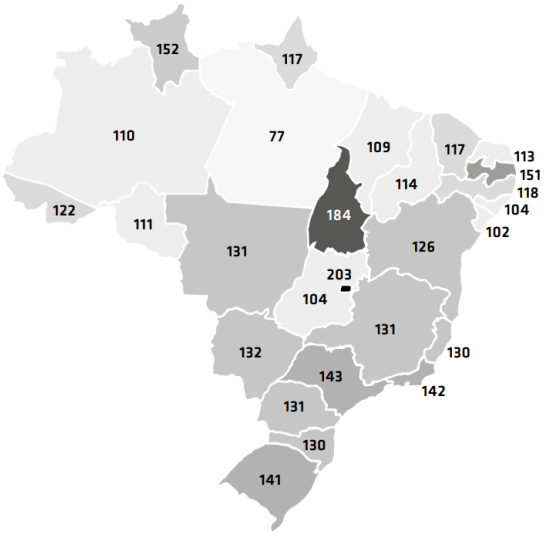
Graph 1 - Number of doctors per 100 thousand inhabitants (Brazil, March 2020)



Source: CNES/Ministério da Sáude (2020); PNADC/IBGE (2020).

As for the number of nurses per each 100,000 inhabitants, it can be seen that the regional distribution is a bit less inequal, but still significant. The Federal District continues to be the federation unit with the highest number of such professionals (203 nurses per 100,000 inhabitants). The state of Tocantins takes the second place, with 184 nurses, and the state of Roraima takes the third place, with 152 nurses. The states with the smallest number of nurses were Pará, which had only 77 employed nurses per each 100,000 inhabitants, followed by Sergipe, with 102; Goiás and Alagoas had 104 nurses each (Graph 2).

Graph 2 - Number of nurses per 100 thousand inhabitants (Brazil, March 2020)

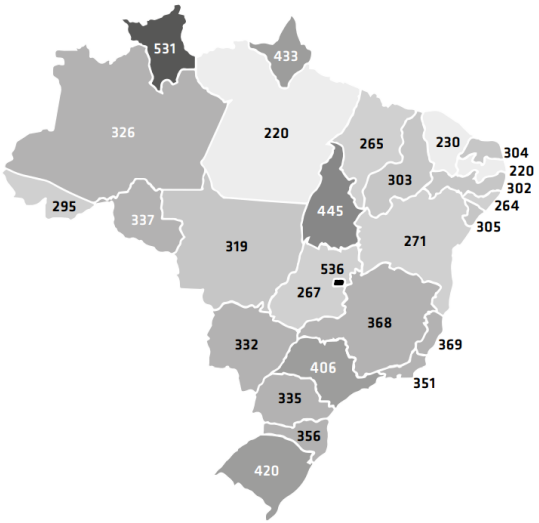


Source: CNES/Ministério da Sáude (2020); PNADC/IBGE (2020).

As in the previous cases, the Federal District had the largest concentration of nurse technicians and assistants in March 2020: 536 practitioners per each 100,000 inhabitants. Roraima takes the second place (531), and Tocantins takes the third place (445). The state of Pará is on the other side, with only 220 employed practitioners, followed by Ceará (230) and Paraíba (220 nurse technicians and assistants per each 100,000 inhabitants) (Graph 3).

Finally, the clear tendency of a higher concentration of the number of doctors in the richer states of the federation is not applied in the same way for college-graduated nurses, nurse technicians, and nursing assistants. Even though the poorer regions are the ones whose states have the smaller number of professionals in all areas, these regions also have some states with high numbers of nursing practitioners with higher education degrees and vocational-school training, as well as assistants.

Graph 3 - Number of nurse technicians and assistants per 100 thousand inhabitants (Brazil, March 2020)



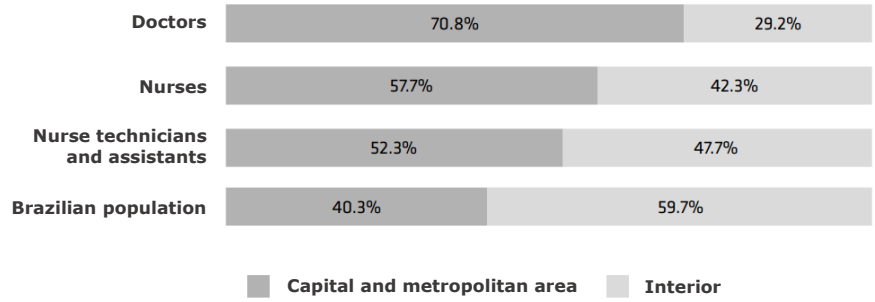
Source: CNES/Ministério da Sáude (2020); PNADC/IBGE (2020).

In a first stage, the Covid-19 cases were concentrated in the big cities which are visited by domestic and international tourists. After that, the virus contagion started to propagate towards the countryside.

In this case, the disproportion between the number of inhabitants and the presence of health professionals is concerning. According to the Continuous PNAD by the Brazilian Geography and Statistics Institute (IBGE), in the first quarter of 2020, while 40.3% of the Brazilian population is concentrated in capital cities or metropolitan areas, 59.7% of the population was found in the countryside of the states. These proportions do not reflect the health professional distribution (IBGE, 2020). As observed in Graph 4, 70.8% of the total number of doctors in the country were located in capitals or metropolitan areas, while 29.2% of them were located in countryside areas. As for the university-graduated nurses, these proportions were 57.7% and 42.3%, respectively, while the vocational school-trained nurses' proportions were

52.3% and 47.7%, respectively.[2]

Graph 4 - Proportion of healthcare professionals by location (Brazil, 1st quarter of 2020)



Source: Microdata PNAD Contínua Trimestral/IBGE (2020). Authors' elaboration.

The most acute situation is registered in the Northeast. Although only 33.9% of the population live in the capital and metropolitan regions, they concentrated 83.7% of the doctors and 62.4% of the university-graduated nurses. This distribution follows a similar pattern in the North region. While 39.2% of the population live in the capital and metropolitan regions, 81.4% of the doctors and 61.7% of the university-graduated nurses were found in those areas. In the South region, the disproportion between capital and countryside is less acute: 70.2% of the population live in the countryside of those states, but the health professionals were found in virtually equal proportions in capitals and countryside cities (Table 1).

2 The Continuous PNAD data refer to the main work only, not secondary work or other work. For instance, a doctor may have as main occupation the management of a hospital or some teaching activity. In those cases, these data would not count as medical activity. Moreover, because that is a sample survey, the figures divulged by Continuous PNAD of workers in each occupation are not exact. They may also diverge from the figures divulged by the federal councils of each occupation or the Brazilian Health Care Registry.

Table 1 - Proportion of health professionals by capital and metropolitan area (MA) or interior and large regions (Brazil, 1st quarter of 2020)

Region	Doctors		Nurses		Nurse technicians and assistants		Brazilian population	
	Capital and MA	Interior	Capital and MA	Interior	Capital and MA	Interior	Capital and MA	Interior
North	81.4%	18.6%	61.7%	38.3%	57.2%	42.8%	39.2%	60.8%
North East	83.7%	16.3%	62.4%	37.6%	52.1%	47.9%	33.9%	66.1%
Southeast	71.0%	29.0%	55.0%	45.0%	55.2%	44.8%	47.2%	52.8%
South	49.9%	50.1%	49.9%	50.1%	37.9%	62.1%	29.8%	70.2%
C.O	74.4%	25.6%	70.8%	29.2%	56.3%	43.7%	46.0%	54.0%
Brazil	70.8%	29.2%	57.7%	42.3%	52.3%	47.7%	40.3%	59.7%

Source: Microdata PNAD Contínua Trimestral/IBGE (2020). Authors' elaboration.

The profound regional inequalities highlighted here are part of a historic issue in the country. There have been several initiatives by the public power in Brazil to stimulate the allocation of health professionals in farther regions, such as the Health and Sanitation in the Countryside Program (Piass) in 1976, the SUS in the Countryside Program (Pisus) in 1993, the Health Work in the Countryside (Pits) in 2001, and the Basic Care Professionals Appreciation Program (Provab). As of 2011, the latter started recruiting health professionals for work in vulnerable areas. Nevertheless, none of these programs was as encompassing as the 2013's More Doctors Program. In less than a year after its implementation, it allocated 14,462 doctors in 3,785 municipalities (Oliveira *et al*., 2015, p. 627). As a result of this program,

between March 2013 and September 2014 the number of municipalities with scarce numbers of doctors in Basic Health Care was reduced in 53.5%. The number of cities decreased from 1,200 to 588, and the priority regions were the ones with the lower numbers of doctors per municipality (Santos; Costa; Girardi, 2015, p. 3.549). The federal government announced that the More Doctors program would be replaced with the Doctors for Brazil program in 2020. Nonetheless, there were tenders for More Doctors, even emergency ones, to manage Covid-19.

Despite the last decade's advances, especially due to the More Doctors program, the regional inequalities remain significant. In the pandemic context, this scenario takes greater proportions. Although the larger number of professionals in greater urban centers may be partially understood by the very health system organization logic, this picture deserves attention. These professionals face restrictions and difficulty in access in situations that demand quick service, as it frequently occurs, especially in the Center-West, North, and Northeast regions.

2. Health services and SUS

The difficulties and inequalities in medical care are not limited to the professionals' localization and health equipment.[3] They are also limited to their access conditions. According to the Supplementary Health National Agency (ANS), there were 47.1 million people using private health care services in 2020. This means that 163.2 million people exclusively depend on SUS, equaling 77.6% of the Brazilian population. On the other hand, according to CNES, 74% of doctors, 86.5% of nurses, and 85.5% of nursing technicians and assistants provided some kind of service in SUS. This means broad coverage and a proportion that is remarkably close to the SUS-dependent population (Graph 5).

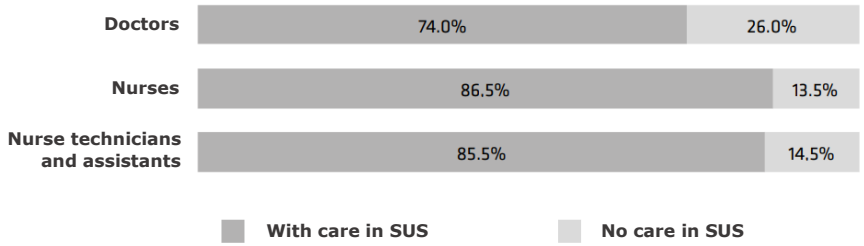
3 On the health equipment distribution inequality, see Mota (2020).

The analysis of the proportion of professionals who work at public administration establishments indicated a significant difference in relation to those who work in SUS: only 46.1% of doctors, 66.7% of nurses, and 59.5% of nurse technicians and assistants. These data lead to two crucial questions. Firstly, many health professionals, including doctors, work on multiple contracts, which could be either in the public or private sectors simultaneously.[4] This means that professionals who work at public administration establishments may also work at private institutions, and vice-versa. Secondly, there is an important proportion of health professionals who are linked to SUS but work at health services that do not belong to the public administration, including non-profit organizations and private companies. This is a clear sign of how extensive the unified system is, reaching beyond public and state institutions (Graph 6). This interlink between the public and private sector is today one of the main causes of labor precarity in the health area, especially via outsourcing and using legal entities for employment relationships. Funding comes from the State. However, if it is managed by social organizations (SOs), private companies, public consortiums, civil society public interest organizations (Oscips), collectives or society consortiums, the way the workforce is managed, their established rights, income, and safety standards are not guided by the same public administration principles. They are usually extremely low.[5]

4 On multiple work contracts in the health area, see Sheffer et al. (2015).

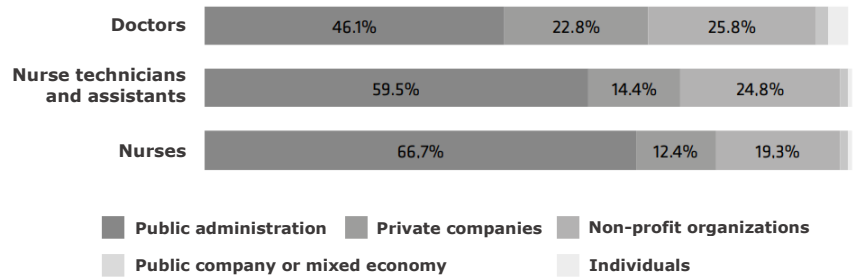
5 On privatization, outsourcing and labor precarity in the health area, see Andreazzi & Bravo (2014) and Druck (2016).

Table 5 - Proportion of health professionals per service in the SUS (Brazil, March 2020)



Source: Microdata PNAD Contínua Trimestral/IBGE (2020). Authors' elaboration.

Table 6 - Proportion of health professionals by legal nature of the establishment of activity (Brazil, March 2020)



Source: Microdata PNAD Contínua Trimestral/IBGE (2020). Authors' elaboration.

Insofar as the relation between professionals who work for SUS and those who only work for the private health sector, there are glaring disparities in some federation units. As found in tables 2 and 3, the federation units (FU) of the richest regions in the country that are characterized by a *per capita* higher household income are frequently those who concentrate the higher number of health practitioners as a whole. They are oftentimes those areas where there are the highest numbers of professionals working on SUS per

each 100,000 inhabitants. A preliminary analysis was conducted using the chromatic resources of the two tables mentioned. It indicated that the *per capita* household income values of the North and Northeast regions are below the national average. They are the very regions where there are the smaller numbers of health professionals, either in SUS or in the private services. These are notably university-graduated practitioners (doctors and nurses).

A remarkable example of this disproportion is the Federal District case, whose *per capita* household income is 86% over the national income. The FD has the highest number of doctors per 100,000 inhabitants (218), nurses (203), and technical level personnel (490) working for SUS. The same thing happens in the private health service rates: doctors (123), nurses (47), technical-level personnel (175).

On the other hand, a more detailed analysis of these data indicates that the regional health distribution of practitioners, especially doctors, is largely inequal and favors more prosper FUs. The percentage of health professionals working for SUS is significantly higher in the North and Northeast states, while it is relatively low in the states of São Paulo, Rio de Janeiro, Espírito Santo, and the Federal District.

Although there are persistent imbalances in the distribution of doctors in the public system, SUS gives an important contribution to compensate an even greater imbalance in the distribution of professionals working for the private system.

Table 2 - Regional distribution of professionals in the higher education health services sector (Brazil, March 2020)

Region	FU	All	Doctors				Nurses				Monthly household income 2019 (R$)*
			All	working at SUS		Private sector	All	Working at SUS		Private sector	
		per 100k inhab.	per 100k inhab.	per 100k inhab.	In % Total	per 100k inhab.	per 100k inhab.	per 100k inhab.	In % Total	per 100k inhab.	
Midwest	FD	811	341	218	63,9%	123	203	156	76,8%	47	2.685,76
	GO	491	171	130	76,1%	41	104	96	92,6%	8	1.306,31
	MS	585	204	169	83,0%	35	132	120	90,9%	12	1.514,31
	MT	485	154	104	67,4%	50	131	113	86,4%	18	1.402,87
	TO	594	148	130	87,5%	19	184	180	97,9%	4	1.055,60
Noth	AC	388	111	100	90,1%	11	122	117	95,8%	5	889,95
	AM	350	115	97	84,5%	18	110	103	93,6%	7	842,08
	AP	408	98	91	92,8%	7	117	114	97,5%	3	879,67
	PA	274	85	70	81,7%	16	77	74	95,6%	3	806,76
	RO	463	144	117	81,3%	27	111	102	92,2%	9	1.136,48
	RR	539	162	155	96,1%	6	152	148	97,2%	4	1.043,94
North East	AL	458	132	116	87,6%	16	104	99	95,2%	5	730,86
	BA	437	136	109	80,0%	27	126	119	93,9%	8	912,81
	CE	411	127	99	77,9%	28	117	101	85,7%	17	942,36
	MA	317	82	71	86,2%	11	109	105	97,1%	3	635,59
	PB	540	156	136	87,1%	20	151	148	98,2%	3	928,86
	PE	432	155	133	86,2%	21	118	111	94,6%	6	970,11
	PI	423	124	112	90,8%	11	114	111	97,4%	3	826,81
	RN	456	148	124	83,8%	24	113	108	95,1%	6	1.056,59
	SE	449	162	134	82,8%	28	102	98	96,1%	4	979,78

Region	FU	All	Doctors				Nurses				Monthly household income 2019 (R$)*
			All	working at SUS		Private sector	All	Working at SUS		Private sector	
		per 100k inhab.	per 100k inhab.	per 100k inhab.	In % Total	per 100k inhab.	per 100k inhab.	per 100k inhab.	In % Total	per 100k inhab.	
Soth	PR	599	213	152	71,1%	62	131	115	87,8%	16	1.620,88
	RS	642	247	194	78,7%	53	141	128	91,0%	13	1.842,98
	SC	629	224	160	71,4%	64	130	117	89,9%	13	1.769,45
Southeast	ES	580	220	151	68,5%	69	130	108	83,0%	22	1.476,55
	MG	614	223	160	71,6%	63	131	112	85,8%	18	1.357,59
	RJ	583	239	167	69,8%	72	142	115	81,1%	27	1.881,57
	SP	630	257	178	69,4%	78	143	110	77,1%	33	1.945,73
Brazil		539	197	146	74,0%	51	129	112	86,5%	17	1.438,7

Source: Ministry of Health - National Registry of Health Establishments in Brazil (CNES). Reference date: March 1st, 2020.

***** Source: IBGE/PNADC (2020).

Table 3 - Regional distribution of professionals in the health services sector with technical level and elementary qualification (Brazil, March 2020)

Region	FU	All	Technical-level personnel				Elementary Qualification				Monthly household income 2019 (R$)*
			All	working on SUS		Private sector	All	Working on SUS		Private sector	
		per 100k inhab.	per 100k inhab.	per 100k inhab.	In % Total	per 100k inhab.	per 100k inhab.	per 100k inhab.	In % Total	per 100k inhab.	
Midwest	FD	665	490	73,7%	175	646	313	48,5%	332	2.685,76	665
	GO	321	288	89,8%	33	489	447	91,5%	42	1.306,31	321
	MS	383	342	89,3%	41	679	634	93,4%	45	1.514,31	383

Region	FU	All	Technical-level personnel				Elementary Qualification				Monthly household income 2019 (R$)*
			All	working on SUS		Private sector	All	Working on SUS		Private sector	
		per 100k inhab.	per 100k inhab.	per 100k inhab.	In % Total	per 100k inhab.	per 100k inhab.	per 100k inhab.	In % Total	per 100k inhab.	
	MT	375	321	85,5%	55	643	572	89,0%	71	1.402,87	375
	TO	500	479	95,9%	21	760	738	97,1%	22	1.055,60	500
Noth	AC	359	341	95,0%	18	715	679	95,0%	36	889,95	359
	AM	402	367	91,2%	35	735	659	89,7%	76	842,08	402
	AP	506	490	96,8%	16	525	507	96,5%	18	879,67	506
	PA	251	231	91,9%	20	472	444	94,0%	28	806,76	251
	RO	403	365	90,5%	38	655	594	90,8%	60	1.136,48	403
	RR	624	600	96,2%	24	665	642	96,6%	23	1.043,94	624
North East	AL	312	288	92,3%	24	561	523	93,3%	38	730,86	312
	BA	316	291	91,9%	26	537	508	94,5%	30	912,81	316
	CE	269	237	88,0%	32	527	494	93,7%	33	942,36	269
	MA	305	288	94,4%	17	596	568	95,3%	28	635,59	305
	PB	303	293	96,4%	11	537	513	95,6%	24	928,86	303
	PE	349	317	90,8%	32	449	419	93,4%	30	970,11	349
	PI	344	324	94,2%	20	542	524	96,7%	18	826,81	344
	RN	357	339	94,7%	19	598	575	96,2%	23	1.056,59	357
	SE	353	334	94,7%	19	604	581	96,1%	24	979,78	353
Soth	PR	381	334	87,7%	47	448	406	90,7%	41	1.620,88	381
	RS	468	411	87,8%	57	440	388	88,2%	52	1.842,98	468
	SC	405	346	85,3%	60	497	434	87,2%	63	1.769,45	405
Southeast	ES	438	335	76,5%	103	644	538	83,6%	106	1.476,55	438
	MG	441	370	83,8%	71	593	518	87,4%	75	1.357,59	441

Region	FU	All	Technical-level personnel				Elementary Qualification				Monthly household income 2019 (R$)*
			All	working on SUS		Private sector	All	Working on SUS		Private sector	
		per 100k inhab.	per 100k inhab.	per 100k inhab.	In % Total	per 100k inhab.	per 100k inhab.	per 100k inhab.	In % Total	per 100k inhab.	
	RJ	423	325	76,9%	98	445	402	90,4%	43	1.881,57	423
	SP	474	364	76,8%	110	447	373	83,4%	74	1.945,73	474
Brazil		400	337	84,3%	63	514	458	89,1%	56	1.438,7	400

Source: Ministry of Health - National Registry of Health Establishments in Brazil (CNES). Reference date: March 1st, 2020.

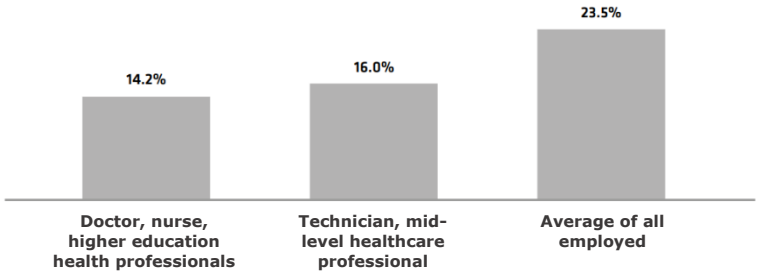
***** Source: IBGE/PNADC (2020).

3. Sick leave rate among healthcare providers during the pandemic

According to the Covid-19 Pnad,[6] healthcare providers had a temporary sick leave rate in May that was very inferior to the average of all the employed people in Brazil. While 14.2% of doctors, nurses, and other university-graduated health professionals and 16.0% of technicians and other vocational-school health professionals were on temporary sick leave in May 2020, the national sick leave rate average for all occupations was 22.3%.

6 IBGE states that the Covid-19 Pnad statistics are classified as experimental and are supposed to be used cautiously. They are new statistics that are still under testing. Moreover, inasmuch as they are different studies that used different methods and structures, the Covid-19 Pnad data cannot be compared to the Continuous PNAD in the same historical series.

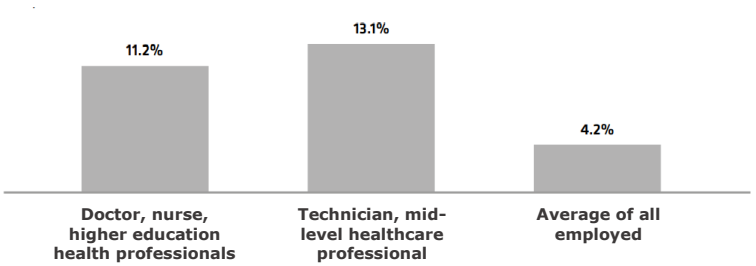
Graph 7 - Proportion of employed people who were temporarily away from work in the week before the reference week (Brazil, May 2020)



Source: Microdata Pnad Covid19/IBGE (2020). Authors' elaboration.

The vast majority of the employed people in Brazil who were on sick leave during that period did it for quarantine or social isolation reasons. However, among the employed people who were on sick leave, the health professionals were in the group with the highest rates. While the sick leave rate for all the employed people in the country among those who were on sick leave was 4.3% in May, the rate for doctors, nurses, and other university-graduated health professionals was 11.2%; the rate for technicians and other vocational school-trained health professionals was 13.1% (Graph 8).

Graph 8 - Proportion of employed persons on sick leave in relation to the total number of employed persons on leave in the week prior to the reference week (Brazil, May 2020)



Source: Microdata Pnad Covid19/IBGE (2020). Authors' elaboration.

This picture indicates that the health professionals were more requested in this period and were on sick leave less frequently than the average of most occupations. Secondly, most healthcare providers fell ill and had to go on sick leave, on a rate that was much higher than the Brazilian workers' total average. It must be noticed that healthcare providers were on sick leave more frequently than university-graduated healthcare providers professionals. This indicated a higher contagion and falling ill propensity for these workers because of Covid-19.

Another relevant aspect to be highlighted is that because healthcare providers are the ones who were on fewer sick leaves, they were also among those who had less reductions in their working days. According to the Covid-19 Pnad, doctors, nurses and other university-graduated health professionals usually work 40.4 hours per week. In the week prior to the research reference, they worked 30.5 hours on average, i. e., 75.5% of their habitual working time. According to the Covid-19 Pnad, doctors, nurses and other university-graduated health professionals usually work 40.0 hours per week. In the week prior to the research reference, they worked 32.5 hours on average, i. e., 81.3% of their habitual working time. To make a comparison, the average of hours currently worked per week was 39.6h. In the week prior to the research reference, this figure dropped to 27.4h, which equals 69.2% of the current hours (Table 4).

Although both selected occupations have an effective journey above the national average, and their reduction is lower in the period, the technicians and other vocational school-trained health professionals had a smaller reduction in their working time relatively to the university-graduated professionals. This indicates a higher demand for these professionals. This picture could even help understand the data presented in Graph 8, which show a higher sick leave rate among vocational school-trained health professionals.

Table 4 – Average hours usually worked per week and actually worked in the last week for selected occupations in the area of health services (Brazil, May 2020)

Job position/Hours	Habitual	Effective	H/E
Doctors, nurses and other higher education health professionals	40,4	30,5	75,5%
Technicians and other mid-level healthcare professionals	40,0	32,5	81,3%
Everyone busy	39,6	27,4	69,2%

Source: Microdata Pnad Covid19/IBGE (2020). Authors' elaboration.

4. People employed in the industrial and trade sectors of HEIC

Beyond the employed people in the health services who directly work providing service to patients, some characteristics and trends in the occupations and employed people in the production and trade of medicines, pharmaceutical products, and health equipment deserve highlight. This is because these workers are also extremely important to manage Covid-19, as well as improve the health system as a whole. This related to the economic development pulled by this sector, which has become increasingly necessary. Also, its strategic role and influence in Brazil's ability to address the population's health needs must be considered, especially at pandemic times, when world trade is affected.[7]

7 For a better understanding of the Health Economic-Industrial Complex (HEIC) and its strategic role, see Gadelha (2003) and Gadelha & Temporão (2018).

According to the Annual Social Information Report (Rais), there has been a 7.4 %-increase in the number of employed people in manufacturing medicines and health equipment between 2012 and 2018, that is, an increment from 145,000 workers to 155,700 workers. This increase was greater than the total increase in the number of employed people in Brazil, which was only 3.2%. However, in 2018 the number of workers in production in the health industry was incredibly low. This represented only 0.3% of the formally employed people in the country and nearly 0.2% of the total of employed people in Brazil (see Table 5).

Table 5 - Employees registered in the CEIS industrial segment, by CNAE 2.0 class - selected activities (Brazil, 2012-2018)

Activities/Year	2012	2014	2016	2018	2012-2018
Manufacturing of pharmochemical products	5.784	5.230	5.114	4.966	-14,1%
Manufacture of medicines for human use	79.022	87.136	86.094	83.280	5,4%
Manufacturing of pharmaceutical preparations	3.474	1.342	1.759	3.392	-2,4%
Manufacturing of electronic devices and electrot. and irradiation equipment	5.218	5.577	4.765	5.492	5,3%
Manufacture of instruments and materials for medical, dental and optical articles	51.490	58.897	56.503	58.574	13,8%
Total health production	144.988	158.182	154.235	155.704	7,4%
Total formal employees Brazil (Rais – 12/31)	47.458.712	49.571.510	46.060.198	46.631.115	-1,7%
Total employed Brazil (PNADC/4th quarterly)	89.856.814	92.396.401	89.871.362	92.736.430	3,2%

Activities/Year	2012	2014	2016	2018	2012-2018
Production participation / Total formal employees (Rais)	0,3%	0,3%	0,3%	0,3%	-
Production participation / Total employed (PNADC)	0,2%	0,2%	0,2%	0,2%	-

Source: Rais/Secretariat of Labor/Ministry of Economy and PNADC/IBGE (2020). Authors' elaboration.

Moreover, among the employed people in the medicine and health equipment trade industry, an increase was found in the analyzed period. The number of workers in this industry grew from 589,000 to 711,000 individuals, that is, a 20 %-increase. In 2018, these workers accounted for 1.5% of the formally employed workers and about 0.8% of the total of employed people in the country (Table 6).

Table 6 - Employees registered in the HEIC commerce segment, by CNAE 2.0 class - selected activities (Brazil, 2012-2018)

Activities/Year	2012	2014	2016	2018	2012-2018
Wholesale trade of pharmaceutical products for human and veterinary use	59.911	64.438	65.886	69.231	15,6%
Wholesale trade of instruments and materials for medical, surgical, orthodontic and dental use	35.432	41.080	41.259	44.447	25,4%
Wholesale trade of machinery, apparatus and equipment for dental and medical-hospital use	9.395	10.702	9.929	10.147	8,0%
Retail trade of pharmaceutical products for human and veterinary use	399.928	442.512	473.777	493.580	23,4%

Activities/Year	2012	2014	2016	2018	2012-2018
Retail trade of medical and orthopedic items	22.398	22.320	19.772	20.027	-10,6%
Retail trade of optical articles	61.910	69.196	70.931	73.700	19,0%
Total health commerce	588.974	650.248	681.554	711.132	20,7%
Total formal employees Brazil (Rais – 12/31)	47.458.712	49.571.510	46.060.198	46.631.115	-1,7%
Total employed Brazil (PNADC/ 4th quarterly)	89.856.814	92.396.401	89.871.362	92.736.430	3,2%
Trade participation / Total formal employees (Rais)	1,2%	1,3%	1,5%	1,5%	-
Trade participation / Total employed (PNADC)	0,7%	0,7%	0,8%	0,8%	-

Source: Rais/Secretariat of Labor/Ministry of Economy and PNADC/IBGE (2020). Authors' elaboration.

It can be concluded that in 2012 there were four times more workers in the trade industry than in the manufacture of medicines and health equipment. This difference increased between 2012 and 2018. There may be an incorporation of workforce substitutive technologies and productivity concentration processes that increase this sector productivity. However, the trend found in the HEIC job market segments also indicates that there may be a process of substitution of the national production of medicines and health equipment by imported goods from other countries.

5. Public policy recommendations

Considering the above mentioned picture of imbalance of the regional distribution of health professionals and its negative impacts on the efficacy of

the Brazilian health system, some measures could be suggested. Not only would they help mitigate the dysfunctionalities that were found in this system, but they could also contribute towards its improvement and compliance to the SUS guiding principles: universality, equality, regionalization, hierarchization, and social participation.

Firstly, in the face of the unwanted correlation between *per capita* household income and the public health professional offer alongside the hospital service concentration in the richer areas of the country and the metropolitan areas, the offer of health professionals (doctors, nurses, technicians, health agents etc.) in basic care must be increased. Also, they could be offered better working conditions and material inputs so that they could intensify basic care, as mentioned by Regina Daumas and other researchers (Daumas *et al*., 2020; Medina *et al*., 2020).

Secondly, it would be appropriate to accelerate measures to stimulate remote health services, especially in basic care.[8] There is a large set of technologies linked to the so called Industry 4.0, notably, in the diagnostic medicine field. They were dramatically advanced in the past few years and are key tools to reduce the imbalances in the access to health services in a country of continental dimensions and high social/regional inequality such as Brazil.

Thirdly, considering stronger, more structuring measures, defending health professionals in the public health system must be a priority. This is already present in the historic propositions of the 8th National Health Conference of 1986, which was ratified by its successors. Creating a nationwide, unified career plan for SUS health professionals, defining a minimum wage, and implementing a civil service career that would guarantee exclusivity and incentives for working in the countryside. A more lasting measure, signed by the respective boards in the three federative instances and that could even advance towards a regional management model would be of significant help to face regional inequalities, especially in basic care.

8 On the remote health service technologies, see a study by the Centers for Disease Control and Prevention (CDC, 2020). For a summarized list of remote procedures enabled by new information technologies, see Greenhalgh, Koh & Car (2020).

This would contribute to a more lasting fixation of health professionals in the farthest health regions and/or populations that are more dependent on the public system (Campos, 2018).

Fourthly, to improve the health system and expand the country economically, there is an increasingly urgent need to improve the Health Economic-Industrial Complex in Brazil that will be based on the Industry 4.0 technological innovations. Inasmuch as Brazil has a deficit in the HEIC balance of trade, developing this area internally will enable a greater availability of these products and equipment, and consequently, better health service for the population. The need for this complex is even more evident in moments of economic and (especially) sanitary crises when the offer of products and inputs in the world market is restricted. Thus, importing becomes more expensive and harder, and sometimes impossible. Besides, such advances are key to creating jobs and improvements in creating jobs and improving occupations directly and indirectly related to HEIC on a qualitative level and the whole Brazilian occupation structure. Finally, the access to health inequalities that affect professionals, equipment, and medicines, are also a consequence of social inequalities caused by the way the Brazilian society is organized socioeconomically. The population in the poorer areas, whether they are in neighborhoods, cities, or states, have a greater propensity to fall ill and a more restricted access to health.[9] Thus, from a structural perspective, social inequalities must be fought. Many of them are associated with improving access to the job market so that the health inequality problem can be managed effectively.

6 Final Remarks

Despite the time proximity in relation to the beginning of Covid-19 in Brazil and its still ongoing effects on the society and the economy, this study aimed to highlight some of the most prevalent aspects of the relations between the

9 On social inequalities, regional inequalities, and health, see Neri & Soares (2002) and Albuquerque et al. (2017).

pandemic and the HEIC job market, notably, the health services sector. For obvious reasons, this is the most impacted segment up to now.

The disparities in the regional-level health professional disparities, where the federation units with greater average *per capita* household income and the state capitals are favored, stands out as one of the most concerning aspects of the current national health system structure. This directly affects its capacity of providing adequate responses to the Brazilian population. However, thanks to the wide range of SUS, its decentralized structure, and its three-level management logic, with responsibilities being shared between the Union, states, and municipalities, the spatial inequality found in the distribution of health professionals is partly attenuated. The public sector compensates for the relative scarcity of private health services in the states with lower per *capita income*, which are less attractive to them.

Furthermore, thanks to the already produced data that are made available by Covid-19 Pnad, it was found that the health professionals working directly in Brazil's health services have been affected by the disease more intensely. This could be either because they are working overtime compared to the employed population average or because they present a higher sick leave rate. Analyzing the varied health sector occupational groups, it was found that working time and sick leave rate occurs in on a higher scale among vocational school-trained health professionals, and on a lower scale among university-graduated professionals (doctors and nurses). This indicates greater risks and insecurity for those who already have the most precarious occupations and lower income in the health service sector.

To conclude, the need for implementing public policies to address the need to higher the offer of health professionals is urgent. Some important aspects must be considered, such as those associated with regional issues in a country of continental dimensions and marked by strong inequalities. Those policies must improve working conditions on many dimensions and focus on the new professional training and qualification requirements due to relevant productivity, organizational, and technological changes. They are of utmost importance to strengthen HEIC due to the impacts of Industry 4.0.

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