

Profile and specialization of the alumni of the University of São Paulo Medical School

Perfil dos médicos formados na FMUSP e ingresso na residência médica

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ABSTRACT: Medical schools in Brazil have an impact on the country's public health care system (SUS). Among Brazilian universities, the "Faculdade de Medicina da Universidade de São Paulo" (FMUSP) has a central role as a training center for specialists. This way, we sought to describe the profile of FMUSP graduates and their trajectory pursuing specialization between the years of 1998 and 2018. This is an observational cross-sectional study based on the analysis of secondary databases. Of the 3,637 records analyzed, 38.8% were women, a proportion that has increased over time. The average age at graduation was 24.2 years. Most graduates were born (89%) and stayed (91%) in the State of São Paulo, 82.5% did their medical residency at the "Hospital das Clínicas da FMUSP", 3.7% did a medical residency in another institution and 13.8% did not get in any medical residency until 2019. Among those who did a specialization, 69.6% entered the residency right after graduation from medical school, 22.6% waited 1 year, 4.9% waited 2 years and 2.9% waited 3 years or more. Considering all graduates, 58.6% entered the medical residency at HC FMUSP right after graduation. To sum up, the HC FMUSP residency program was responsible for the specialization of the vast majority of doctors and most of those students entered residency shortly after graduation.

Keywords: Medical education, Graduate medical education, Medical school; Internship and residency.

RESUMO: A graduação em medicina no Brasil tem impacto no Sistema Único de Saúde (SUS) do país. Dentre as universidades brasileiras, a Faculdade de Medicina da USP (FMUSP) merece destaque como centro formador de especialistas. Considerando esse cenário, buscou-se descrever o perfil dos egressos da graduação da FMUSP entre os anos de 1998 e 2018 e sua trajetória de ingresso na residência médica. Trata-se de um estudo observacional de delineamento transversal baseado na análise de bases de dados secundárias. Dos 3.637 registros analisados, 38,8% eram mulheres, proporção que aumentou ao longo do tempo. A média de idade na graduação foi de 24,2 anos. A maioria dos egressos nasceu (89%) e permaneceu (91%) no Estado de São Paulo, 82,5% fez residência no HC FMUSP, 3,7% fez residência em outra instituição e 13,8% não ingressou em nenhuma residência médica até 2019. Dentre os que fizeram alguma residência, 69,6% entraram direto (no ano seguinte após a graduação), 22,6% aguardaram 1 ano, 4,9% aguardaram 2 anos e 2,9% aguardaram 3 anos ou mais. Considerando todos os egressos, 58,6% entraram direto na residência médica do HC FMUSP. Em suma, a residência HC FMUSP foi a principal responsável pela especialização dos graduandos e abrigou a maior parte dos alunos que buscaram alguma especialização logo em seguida à conclusão da graduação.

Descritores: Educação médica, Graduação médica, Escola médica; Internato e residência.

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INTRODUCTION

The availability of well-trained health professionals, including doctors, is essential for the functioning of health systems and for guaranteeing access to resolute and qualified services. At the same time that undergraduate education in medicine trains professionals for the health system in which it is inserted, it is also influenced by it. Challenges for healthcare in several countries are: low investment in medical training; incompatibility between teaching strategies and the real health needs of the population; and poor distribution of the medical workforce, leading to a shortage of professionals^{1,2,3,4}. Understanding the impact of medical schools on local health workforce, the World Health Organization (WHO) included in the goals of the “Global strategy on human resources for health: Workforce 2030”² the requirement that educational establishments adapt their institutional set-up so that they are aligned with national health strategies and population health needs².

Medical education has been affected by several changes in recent decades, such as the implementation of new teaching methods^{5,6}, the strengthening of international accreditation systems^{1,6,7} and the elaboration of new curriculum guidelines^{7,8}. It is also important to mention the recent recognition of the need for continuous evaluation mechanisms for both students and medical schools^{1,5,6,7}. Demographic and epidemiological changes, new forms of organizing health systems and the rapid technological advances have raised concerns about the necessary innovations in health education^{9, 10, 11}.

International institutions define common basic requirements for medical education, taking regional particularities into account⁷. However, different countries have different characteristics, regulations, forms of entry and duration of courses, both in undergraduate and specialized training. For instance, medical school usually lasts six years in the European Union, Japan and Brazil, and seven years in Argentina¹². The United States, nevertheless, considers medicine to be a four-year graduate course, which requires a previous four-year undergraduate degree¹².

In Brazil, the most recent national curriculum guidelines, established by the Ministry of Health in 2014, require that medical undergraduate courses last at least six years and 7200 hours⁶. Training must be multidisciplinary and based on three main areas: health care, health management and health education⁸. In addition, students have to be evaluated periodically and part of their curricular internship must be carried out in Primary Care, seeking greater insertion of professionals in the Unified Health System (SUS)^{13,14}.

In addition to curriculum changes, there has been an expansion of medical education in Brazil. This expansion was accompanied by the privatization and inland expansion

of universities. In ten years, from 2011 to 2020, more than 20 thousand new university spots were opened, 84% of them offered by private institutions and 71% located outside the capital cities¹⁵. In November 2020, there were 357 medical schools in the country, with a total of 38 thousand spots¹⁵. This scenario has drawn the attention of specialists to the quality of teaching and to the capacity of the specialist training system to absorb the growing number of graduates¹⁴.

It is important to know the trajectories of the medical graduates to better understand the role of medical schools in the national scenario. The dialogue between the training centers and the community around them is fundamental. It is necessary to know the profile of recent graduates, their choice of specialization, professional trajectory and insertion in the job market, which have been the subject of several studies^{16,17,18,19,20}. In the University of São Paulo, this concern led to the creation of the Office for the Management of Academic Performance Indicators (EGIDA) in 2018, with the objective of monitoring metric and academic statistics to better understand the impact of the public university in the state and in the country^{21,22,23}.

Among Brazilian medical schools, the Medical School of the University of São Paulo (FMUSP) is an important training center for doctors and specialists^{19,24}. Founded in 1912, FMUSP has the largest hospital complex in Latin America, the *Hospital das Clínicas* (HC FMUSP). The complex has 66 Medical Research Laboratories (LIMs) and 230 research groups²⁴ and has become one of the main centers of scientific production in the country, with an average of 1300 scientific articles published annually. FMUSP has 175 medical graduates a year, and most of them look for additional specialization¹⁹.

In the FMUSP, the interest in getting to know its former students led to the creation of the Longitudinal Study of Physicians Graduated from FMUSP (ELMU). Within the scope of this research, Gameiro et al.¹⁹ described the profile of the 7,419 FMUSP graduates. The authors concluded that, after graduating, a considerable number of students stay in the city of São Paulo. Compared to graduates from the group of medical schools in Brazil, the former students of FMUSP have a lower proportion of women and a higher proportion of specialists¹⁹.

This article aims to go further by assessing the profile of FMUSP graduates addressing characteristics of specialization and admission to the Medical Residency over time. The objectives of this study are: 1- to describe the profile of the graduates of the undergraduate course of the USP Medical School (FMUSP) regarding gender, age, place of origin and place of medical practice, this time focusing on graduates from 1998 to 2018. 2- understand the trajectory of FMUSP graduates in their search for specialization and how the trends of admission to the Medical Residency varied over time.

METHODS

This is an observational cross-sectional study on physicians graduated from FMUSP, based on the analysis of the following secondary databases: study of Medical Demography, Federal Council of Medicine (CFM) and National Medical Residency Commission (CNRM). The following variables were extracted and evaluated: gender, place of birth, place of the most recent job, date of birth, date of graduation, date of beginning of Medical Residency (MR) and institution of MR. It is worth noting that it is mandatory that medical workers be registered in the CFM and CNRM databases.

The descriptive analysis included frequency distributions for categorical variables and measures of central tendency and dispersion for continuous variables. All analyzes were performed with the IBM 24.0 SPSS® software.

RESULTS

Among the 3,685 records of doctors graduated from FMUSP between 1998 and 2018, 48 were excluded due to data inconsistencies (2 for the absence of an identification code, 11 for the absence of the name of the institution of medical residence, 32 for the absence of the date of entry in the residence and 3 for inconsistency between the date of graduation and the date of entry in the medical residence). Thus, 3,637 doctors graduated from FMUSP were included in this study.

In total, women represented 38.8% of graduates. The proportion of women graduated increased slowly and irregularly over the 21 years included in the study (Table 1). As for age, 69% of the graduates finished college before age 25, and the mean age at the time of graduation was 24.2 years (SD 2.3). There was a slight increase in the mean age in the last 21 years: it was 23.6 (SD 1.8) in 1998, 24.0 (SD 1.4) in 2008 and 24.8 (SD 2.2) in 2018.

As for the geographic distribution (registration in the CRM at the time of the study) of FMUSP alumni (Figures 1a and 1b), 93% worked in the Southeast Region, 2.3% in the South, 1.8% in the Center-West and 1.4 % in the Northeast and North Regions. As for the place of birth, 93.8% were born in the Southeast Region, 2.1% in the South, 1.9% in the Northeast, 1.7% in the Center-West and 0.5% in the North. Most of the graduates were born (89%) and stayed (91%) in the State of São Paulo, while 60.8% were born and 82.2% worked in the city of São Paulo.

Table 1- Percentage of women in relation to the total number of doctors graduated from FMUSP, between 1998 and 2018, according to the year of graduation. Brazil, 2020

Year	%
1998	39.9
1999	39.0
2000	28.8
2001	39.3
2002	31.4
2003	35.3
2004	35.6
2005	37.1
2006	38.8
2007	40.6
2008	42.4
2009	37.9
2010	42.8
2011	39.2
2012	39.8
2013	34.4
2014	34.5
2015	46.3
2016	46.3
2017	47.3
2018	40.0

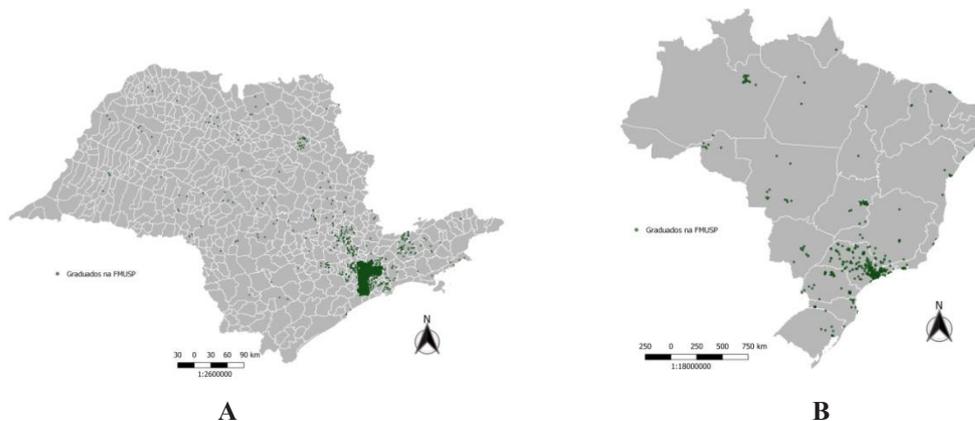


Figure 1 - Geographic distribution of doctors graduated from FMUSP between 1998 and 2018, according to their place of work in 2020. Brazil, 2020

The analysis of the specialization of the FMUSP alumni showed that 82.5% did their residency at the HC FMUSP. Only 3.7% did their residency in another institution and 13.8% had not entered a medical residency until 2019. Excluding the HC FMUSP, the five institutions with the largest number of FMUSP alumni were: *Hospital das Clínicas* of the *Ribeirão Preto* Medical School of the University of São Paulo (25.5% of those who did their MR outside the HC FMUSP), Federal University of São Paulo (20.2%), *Irmandade da Santa Casa de Misericórdia* of São

Paulo (13.8%), School of Medical Sciences of Unicamp (10.6%) and *Hospital do Servidor Público Estadual Francisco Morato Oliveira SP* (7.4%).

In the 21-year period from 1998 to 2018, there was a variation in the annual percentage of graduates who did their residency in the HC, outside the HC or did not do it (Table 2). During this period, it was possible to notice a slight drop in the percentage of graduates who did their medical residency outside the HC FMUSP (Figure 2).

Table 2 - Distribution of doctors graduated from FMUSP between 1998 and 2019 according to whether or not they entered the Medical Residency (MR), location of the MR and year of graduation. Brazil, 2020

Year	Graduates	MR at the HCFMUSP (any time after graduation) N (%)	MR at another institution (not HCFMUSP) N (%)	Did not do it or still did not start MR N (%)
1998	173	106 (61.3)	18 (10.4)	49 (28,3)
1999	177	106 (59.9)	11 (6.2)	60 (33,9)
2000	177	119 (67.2)	14 (7.9)	44 (24,8)
2001	178	145 (81.5)	12 (6.7)	21 (11,8)
2002	175	148 (84.6)	14 (8)	13 (7,4)
2003	170	151 (88.8)	10 (5.9)	9 (5,3)
2004	180	156 (86.7)	3 (1.7)	21 (11,7)
2005	175	137 (78.3)	18 (10.3)	20 (11,4)
2006	183	159 (86.9)	12 (6.5)	12 (6,5)
2007	180	161 (89.4)	4 (2.2)	15 (8,3)
2008	177	161 (90.1)	8 (4.5)	8 (4,5)
2009	182	169 (92.8)	1 (0.5)	12 (6,6)
2010	159	150 (94.3)	2 (1.2)	7 (4,4)
2011	176	165 (93.7)	1 (0.6)	10 (5,7)
2012	171	157 (91.8)	0 (0)	14 (8,2)
2013	163	151 (92.6)	0 (0)	12 (7,4)
2014	171	141 (82.4)	3 (1.7)	27 (15,8)
2015	162	140 (86.4)	1 (0.6)	21 (13,0)
2016	164	138 (84.1)	0 (0)	26 (15,8)
2017	169	130 (76.9)	2 (1.2)	37 (21,8)
2018	175	110 (62.8)	0 (0)	65 (37,1)
Total	3637	3000 (82.5)	134 (3.7)	503 (13,8)

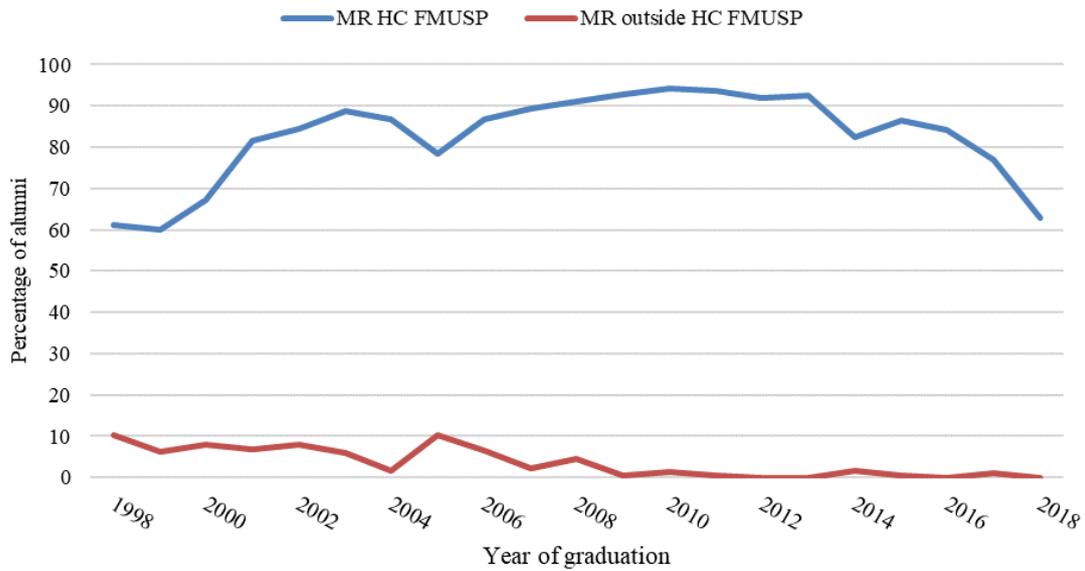


Figure 2 - Distribution of doctors graduated from FMUSP between 1998 and 2019 according to year of graduation and beginning of Medical Residency (RM) at HC FMUSP or other institutions. Brazil, 2020

The study compared characteristics of alumni who did their medical residency at the HC FMUSP (n=3000), those who did their MR outside the HC (n=134) and those who did not start a MR until 2019 (n=503). There are more women in the group who did their MR in the HC (40.3%) than among those who did their MR outside the HC (28.4%) or who did not start a MR (33%). There were

no differences in place of birth between the three groups. However, the group that did their MR outside the HC had a lower percentage of alumni working in the Southeast region (73.9%) compared to the group that did their MR in the HC FMUSP (94.2%) and the group that did not start a MR (90.7%) (Table 3).

Table 3 - Distribution of doctors graduated from FMUSP between 1998 and 2019 according to admission or not in a Medical Residency (MR), location of the MR and gender, place of birth, place of work, time until beginning the MR and age of admission to the MR. Brazil, 2020

		Residency at the HC (N=3000)	Residency outside the HC (N=134)	Did not do a residency (N=503)
Gender	Men	1792 (59.7)	96 (71.6)	337 (67.0)
	Women	1208 (40.3)	38 (28.4)	166 (33.0)
Place of birth	North	14 (0.5)	1 (0.8)	1 (0.2)
	Northeast	50 (1.7)	3 (2.3)	14 (2.9)
	Southeast	2761 (93.9)	116 (90.6)	457 (94.2)
	South	65 (2.2)	4 (3.1)	6 (1.2)
	Center-West	51 (1.7)	4 (3.1)	7 (1.4)
	State of São Paulo	2636 (89.6)	110 (85.9)	427 (88.0)
	City of São Paulo (Capital)	1816 (61.7)	65 (50.0)	284 (58.1)
Location of most recent job	North	28 (0.9)	12 (9.0)	12 (2.4)
	Northeast	32 (1.1)	6 (4.5)	13 (2.6)
	Southeast	2827 (94.2)	99 (73.9)	456 (90.7)
	South	63 (2.1)	8 (6.0)	14 (2.8)
	Midwest	50 (1.7)	9 (6.7)	8 (1.6)
	State of São Paulo	2795 (93.2)	86 (64.2)	450 (89.5)
	City of São Paulo (Capital)	2532 (84.4)	75 (56.0)	371 (73.8)
Time between graduation and beginning of MR	1 year	2133 (71.1)	48 (35.8)	-
	2 years	664 (22.1)	46 (34.3)	-
	3 years	133 (4.4)	20 (14.9)	-
	4 years	70 (2.3)	20 (14.9)	-
Mean age (standard deviation) at admission to the MR (p<0,001)		25.3 (2.0)	26.3 (2.3)	-

The graduates who did a MR outside the HC FMUSP started residency at an older age than those who did their MR at the HCFMUSP, with mean ages of 26.3 years (SD 2.3) and 25.3 years (SD 2.0), respectively.

Among those who did a medical residency (N=3134), 69.6% began the MR in less than one year after graduation, 22.6% waited one year, 4.9% waited two years and 2.9% waited three years or more. Among all graduates, 58.6% entered the medical residency at the HC FMUSP

right after graduation, but this percentage varied over time (Table 4 and Figure 3). In the first decade analyzed (from 1998 to 2008), the percentage of FMUSP graduates who began a MR at the HC FMUSP shortly after graduation was 52.4%; in the second decade (2008 to 2018), this percentage rose to 54.6%. In the group that did their MR outside the HC FMUSP, 35.8% started residency right after graduation; in the group that did their MR at the HC FMUSP, this percentage was 71.1% (Table 3).

Table 4 – Distribution of doctors graduated from FMUSP between 1998 and 2018 according to the year of graduation and the time between graduation and admission to the Medical Residency of the HC FMUSP

Year	Graduates	Started MR at the HCFMUSP in one year or less N (%)	Started MR at the HCFMUSP in two years N (%)	Started MR at the HCFMUSP in three years N (%)	Started MR at the HCFMUSP in four years or more N (%)
1998	173	62 (35.8)	29 (16.8)	14 (8.1)	1 (0.6)
1999	177	73 (41.2)	25 (14.2)	4 (2.2)	4 (2.2)
2000	177	76 (42.9)	36 (20.3)	6 (3.4)	1 (0.6)
2001	178	109 (61.2)	29 (16.3)	4 (2.2)	3 (1.7)
2002	175	99 (56.6)	42 (24.0)	6 (3.4)	1 (0.6)
2003	170	111 (65.3)	36 (21.2)	3 (1.8)	1 (0.6)
2004	180	97 (53.9)	48 (26.7)	6 (3.3)	5 (2.8)
2005	175	90 (51.4)	41 (23.4)	3 (1.7)	3 (1.7)
2006	183	107 (58.5)	40 (21.8)	8 (4.4)	4 (2.2)
2007	180	102 (56.7)	49 (27.2)	5 (2.8)	5 (2.8)
2008	177	101 (57.1)	43 (24.29)	10 (5.6)	7 (3.9)
2009	182	84 (46.1)	68 (37.4)	11 (6.0)	6 (3.3)
2010	159	105 (66.0)	37 (23.3)	4 (2.5)	4 (2.5)
2011	176	139 (79.0)	19 (10.8)	5 (2.8)	2 (1.1)
2012	171	124 (72.5)	17 (9.9)	10 (5.8)	6 (3.5)
2013	163	136 (83.4)	11 (6.7)	3 (1.8)	1 (0.6)
2014	171	111 (64.9)	9 (5.3)	7 (4.1)	14 (8.2)
2015	162	97 (59.8)	25 (15.4)	16 (9.9)	2 (1.2)
2016	164	106 (64.6)	24 (14.6)	8 (4.9)	-
2017	169	94 (55.6)	36 (21.3)	-	-
2018	175	110 (62.8)	-	-	-
Total	3637	2133 (58.6)	664 (18.2)	133 (3.6)	70 (1.9)

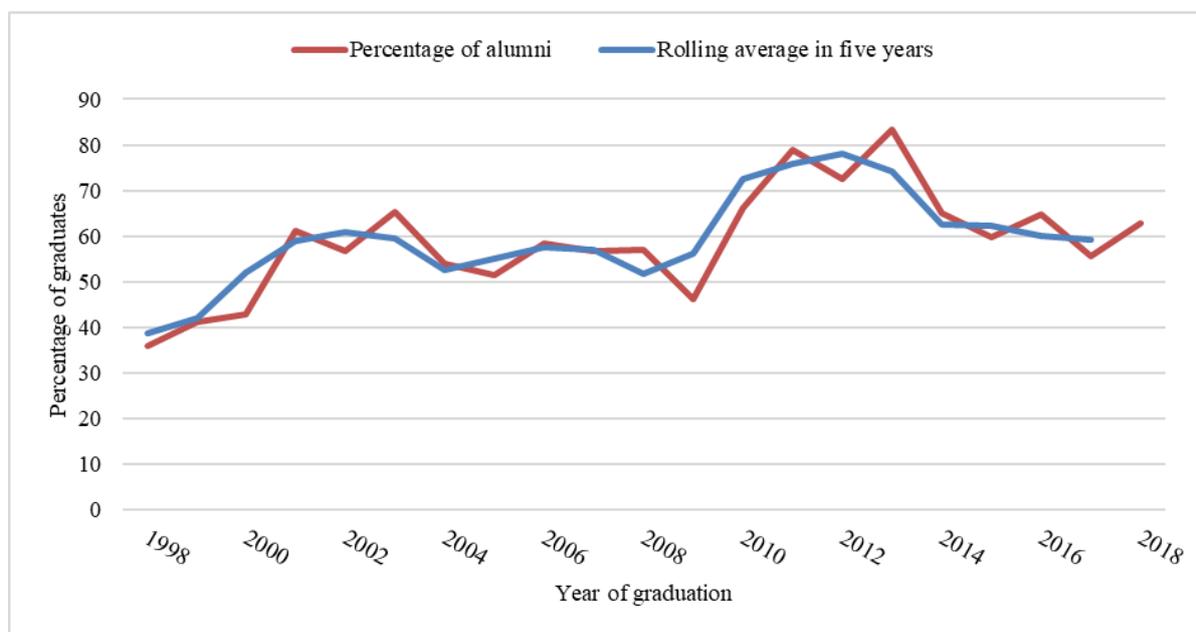


Figure 3 – Percentage of doctors graduated from FMUSP who started a MR at the HC FMUSP within one year after graduation, according to five-year periods from 2000 to 2015. Brazil, 2020

DISCUSSION

The profile of FMUSP graduates in the last 20 years matches profiles found in previous studies¹⁹. The majority are men, born in São Paulo and who remained in the state and in the capital after graduating. Most of the graduates joined a medical residency (86.2%) and most of these residencies were at the HC FMUSP.

It was observed that the percentage of women (38.8%) graduated from FMUSP in the last 20 years was higher than the percentage found in the study by Gameiro et al.¹⁹, in which the authors evaluated all doctors graduated from the university since its foundation and found a percentage of women of 31.4%.

These results show a greater presence of women in the FMUSP in recent years. However, the percentage of women in the present study was lower than that observed in the entire medical profession in Brazil (46.6%)¹⁵. Since 2009, there are more women than men among the new doctors registered in CRMs²⁵, which also occurs in other countries²⁶. According to the Organisation for Economic Co-operation and Development (OECD), in 2018, the percentage of female doctors under 35 years old was 47.7% in the USA, 66.7% in Belgium, 60.5% in Switzerland and 48.7% in Chile²⁶. That is, the feminization of Medicine in FMUSP is slower and more irregular than in Brazil as a whole and than in other countries.

The mean age of graduation from FMUSP, 24.2 years, is lower than the mean age of newly graduated doctors in Brazil, which is 27 years old, according to a study by Scheffer et al.²⁸. This age is also lower than in other countries^{28,29}. For instance, in Australia, half of medical

students were aged 25 to 29 years at completion of medical school²⁸, while in Israel, where undergraduate studies last seven years, men enter college at age 23 and women at age 21 on average²⁹. The difficulty to get in competitive medical schools in Brazil²⁷; the fact that part of the students attended other courses before entering medical school, in Australia²⁸; and the obligation to serve the army before college, in Israel²⁹, are some of the possible explanations for the higher mean age at completion of medical school.

In the FMUSP, the increase in the mean age at graduation from 23.6 years in 1998 to 24.8 years in 2018 diverges from the results of the Medical Demography study¹⁵, which found that the medical population in Brazil is getting younger. While the workforce in the country is becoming younger due to the increase in new medical vacancies (especially at private universities)¹⁵, FMUSP students are graduating older. The present study was not able to assess whether the increase in age at the time of graduation is because students are entering college later or are staying there for more than the six years of the medical course.

Regarding the place of birth and current job of doctors who went to the FMUSP, the results showed that most were born (93.8%) and work (93.0%) in the Southeast, specifically in the State of São Paulo (where 89% was born and 91% works) and in the city of São Paulo (where 60.8% was born and 91% works). These results are in line with the findings of the study by Gameiro et al.¹⁹.

The high percentage of graduates who work close to the university showed there is a low geographic dispersion of FMUSP students, which also occurs in other universities in the State³⁰. New studies should be conducted

to understand the reasons why FMUSP alumni stay in São Paulo, considering possible multiple factors that include: individual characteristics and choices, training profile, and jobs available in the market. It is noted that doing residency outside the HC FMUSP seems to be a factor that increases the geographical mobility of the graduates, given that 73.9% of those who did their MR outside the HC remained in the Southeast region, compared to 94.2% of those who did their MR at the HC FMUSP.

Regarding the specialization of FMUSP alumni, it was found that most of them joined a medical residency (86.2%). This data differs from the total population of doctors in Brazil, as only 61.3% of doctors have a specialist title¹⁵. According to Gameiro et al. one of the factors contributing to the higher rate of specialization among FMUSP alumni in relation to the whole country is the close relationship between the University and the *Hospital das Clínicas* of FMUSP, which is the undergraduate teaching hospital along with the University Hospital (UH)²³.

Indeed, the HC is the main center of specialization for FMUSP alumni, destination of 82.5% of the alumni. The *Hospital das Clínicas* of the Medical School of the University of São Paulo has 8 specialized institutes, 2 auxiliary hospitals and a total of 2400 beds^{31,32}. It is a tertiary care center and a reference in the treatment of highly complex diseases, and it is associated with the USP School of Medicine since its foundation in 1944³³. FMUSP alumni's choice for residency at the HC may be due both to the proximity between their college and this institute and to the prestige of the hospital.

It is interesting to highlight some characteristics of the five institutions with the largest number of residents after HCFMUSP: *Hospital das Clínicas* of the *Ribeirão Preto* Medical School of the University of São Paulo, Federal University of São Paulo, Irmandade da Santa Casa de Misericórdia of São Paulo, School of Medical Sciences of Unicamp and *Hospital do Servidor Público Estadual Francisco Morato Oliveira SP*. All these institutions are located in the State of São Paulo, three are in the City of São Paulo, four of them are public and all have a teaching hospital.

The percentages of students who did a MR at the HCFMUSP, outside the HC or who did not do a MR varied over the years studied, showing heterogeneity. Further studies are necessary to find which characteristics of each class that lead to these disparities.

It was found that 69.6% of the graduates joined medical residency soon after graduation. This percentage is lower among those who did their MR at the HC FMUSP, with 58.6% (percentage that increased over the two decades of the study). This study did not analyze the reasons for the delay to start specialization among alumni who did not start it immediately after graduation. This pause can happen because the graduate failed the admission test in the first attempts or due to a personal choice to wait a year or more

before taking the test. The survey on "Medical Specialties" from the 2018 Medical Demographic study³⁴ showed that, even though 39.4% of medical residency positions in Brazil are available, competition for the positions is uneven, as traditional programs with many years tend to be more popular among candidates³⁴. This is evidenced by the analysis of the candidate/vacancy ratio of public tenders of the most recognized institutions. In the 2020/2021 selection process, the HC FMUSP had a competition of 41.67 candidates per vacancy in general surgery, 11.18 in pediatrics and 23.59 in medical clinic³⁵, which are the three specialties most attended by FMUSP alumni¹⁹.

Those who did their MR at other institutions, outside the HC FMUSP, began specialization older and with more time after graduating. These factors can help explain the reduction in the percentage of graduates who did their MR outside the HC FMUSP in the last four years (2014-2018) (Figure 1). It is possible to suppose that part of the recent graduates will still start a MR in an institution other than the HC FMUSP.

Due to the use of secondary databases, some limitations of the present study should be highlighted. It is not possible to confirm if all the analyzed information was duly updated, although they are compulsory registration bases. In addition, different bases were used, each with its peculiarities. The database of the National Medical Residency Commission (CNRM) may have inconsistencies regarding the dates of beginning of the MR or the registration of institutions and MR programs attended. As for the database of the Federal Council of Medicine, the same doctor can legally be registered in more than one CRM, which would cause duplication in the count of this professional when analyzing the state variable (for this study, the information on the most recent record was considered). There may also be discrepancies between the course completion date in the database (enrollment in the CRMs) and the graduation date. It is common for doctors to complete the course at the end of a given year and do their formal professional enrollment at the beginning of the following year. Thus, the period between graduation and beginning of medical residency may have been, in part, underestimated.

Nevertheless, the present study was the first to describe the beginning of the medical residency among the alumni of one of the main training centers in the country. The databases used, despite of the limitations inherent to secondary data, are the best available sources of medical records in Brazil. The completeness of the records is guaranteed by the institutions and the records are mandatory for active physicians.

CONCLUSIONS

The importance of the HC FMUSP in the specialization of FMUSP alumni was evidenced. Knowledge

of the profile of FMUSP alumni is relevant for the USP Medical School, for the Hospital das Clínicas and for the University of São Paulo as a whole, as it helps measuring the social role and the return on public investment in the training of doctors and specialist doctors who start to work in the Brazilian health system.

The present work is also a case study that can

promote new research on the factors that affect the choices, trajectories and medical residency of recent medical graduates. Recent changes such as the expansion of medical courses and vacancies, the adoption of affirmative actions and the greater social inclusion in medical school will require further studies on training, specialization, and medical work in Brazil.

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REFERENCES

- World Health Organization. Health workforce [cited 2020 October 20]. Available from: https://www.who.int/health-topics/health-workforce#tab=tab_1.
- World Health Organization. Global strategy on human resources for health: workforce 2030. Sixty-Ninth World Health Assembly WHA69.19 Agenda item 16.1. May 2016. Available from: https://apps.who.int/iris/bitstream/handle/10665/252799/A69_R19-en.pdf?sequence=1&isAllowed=y.
- World Health Organization. World Health Report 2006 - working together for health. Geneva: World Health Organization; 2006. Available from: <https://www.who.int/whr/2006/en/>.
- Dal Poz Mario Roberto. A crise da força de trabalho em saúde. *Cad Saúde Pública*. 2013;29(10):1924-6. <https://doi.org/10.1590/0102-311XPE011013>.
- Watmough S, O'Sullivan H, Taylor D. Graduates from a traditional medical curriculum evaluate the effectiveness of their medical curriculum through interviews. *BMC Med Educ*. 2009;9(1). <https://doi.org/10.1186/1472-6920-9-6>.
- General Medical Council. About the outcomes. *Gmc-uk.org*. 2019 [cited 2020 October 23]. Available from: <https://www.gmc-uk.org/education/standards-guidance-and-curricula/standards-and-outcomes/outcomes-for-graduates/outcomes-for-graduates/about-the-outcomes>.
- World Federation for Medical Education. Basic medical education WFME global standards for quality improvement. Ferney-Voltaire: WFME; 2016 [cited 2020 October 23]. Available from: <https://wfme.org/standards/bme/>
- Brasil. Ministério da Educação. Resolução nº 3, de 20 de junho de 2014 da Câmara de Educação Superior do Conselho Nacional de Educação do Ministério da Educação Disponível em: http://portal.mec.gov.br/index.php?option=com_docman&view=download&alias=15874-rces003-14&category_slug=junho-2014-pdf&Itemid=30192.
- Webb DJ, Maxwell SR. A spoonful of sugar? Tomorrow's doctors 2002. *Br J Clin Pharmacol*. 2002;54(4):341-3. doi: 10.1046/j.1365-2125.2002.t011-1-01715.x.
- General Medical Council. Tomorrow's doctors. London: GMC; 1993.
- Lewis AD, Menezes DA, McDermott HE, Hibbert LJ, Brennan SL, Ross EE, Jones LA. A comparison of course-related stressors in undergraduate problem-based learning (PBL) versus non-PBL medical programmes. *BMC Med Educ*. 2009;9:60. doi: 10.1186/1472-6920-9-60.
- World Directory of Medical Schools. *Wdoms.org*. 2020 [cited 2020 October 20]. Available from: <https://www.wdoms.org/>.
- Brasil. Governo Federal. Programa Mais Médicos. Estudantes. O novo currículo. Brasília; 2020 [citado 21 out. 2020]. Disponível em: <http://maismedicos.gov.br/o-novo-curriculo>.
- Conselho Federal de Medicina (CFM). Formação em medicina no Brasil: cenários de prática, graduação, residência médica, especialização e revalidação de diplomas. Brasília: CFM; 2018. Disponível em: <http://www.flip3d.com.br/web/pub/cfm/index10/?numero=16&edicao=4394>.
- Scheffer M, Cassenote A, Guerra A, Guilloux AGA, Brandão APD, Miotto BA, et al. Demografia médica no Brasil 2020. São Paulo: CFM; 2020. Disponível em: https://www3.fm.usp.br/fimusp/conteudo/DemografiaMedica2020_9DEZ.pdf.
- Association of American Medical Colleges. Medical School Graduation Questionnaire. 2017 All Schools Summary Report. Washington, DC: AAMC; 2017 [cited 2020 October 21]. Available from: <https://www.aamc.org/system/files/reports/1/2017gallschoolsummaryreport.pdf>.
- Dale J, Potter R, Owen K, Parsons N, Realpe A, Leach J. Retaining the general practitioner workforce in England: What matters to GPs? A cross-sectional study. *BMC Fam Pract*. 2015;16(1):1–11. <https://doi.org/10.1186/s12875-015-0363-1>.
- Purim KSM, Borges LMC, Possebom Ana C. Profile of the newly graduated physicians in southern Brazil and their professional insertion. *Rev Col Bras Cir*. 2016;43(4):295-300. <https://doi.org/10.1590/0100-69912016004006>.
- Gameiro GR, Koyama LKS, Cruz ALIB, Cassenote AJF, Guilloux AGA, Segurado AAC, et al. Who and where are the University of São Paulo Medical School Graduates? *Clinics*. 2019;74:e1147. <https://doi.org/10.6061/clinics/2019/e1147>.
- Castellanos MEP, Silveira AFMH, Martins LC, Nascimento VB, Silva CS, Bortolotte FHB, et al. Perfil dos egressos da Faculdade de Medicina do ABC: o que eles pensam sobre atenção primária em saúde? *Arq Bras Ciên Saúde*. 2009;34(2):71-9. <https://doi.org/10.7322/abcs.v34i2.130>.
- Universidade de São Paulo (USP). Escritório de Gestão de Indicadores de Desempenho Acadêmico (Egida). São Paulo; 2020 [citado 21 out. 2020]. Disponível em: <https://www5.usp.br/egida/>.

- usp.br/reitoria/escritorio-de-gestao-de-indicadores-de-desempenho-academico-egida/.
22. Escritório de Gestão de Indicadores de Desempenho Acadêmico (Egida). São Paulo; 2020 [citado 21 out. 2020]. Disponível em: <http://egida.usp.br/>.
 23. Agopyan V. Portaria GR Nº 7256, de 29 de junho de 2018 - Normas USP. São Paulo; 2018 [citado 21 out. 2020]. Disponível em: <http://www.leginf.usp.br/?portaria=portaria-gr-no-7256-de-29-de-junho-de-2018>.
 24. Faculdade de Medicina da Universidade de São Paulo (FMUSP). A Faculdade de Medicina da Universidade de São Paulo. São Paulo; 2020 [citado 21 out. 2020]. Disponível em: <https://www.fm.usp.br/fmusp/institucional/a-fmusp>
 25. Scheffer MC, Cassenote AJF. A feminização da medicina no Brasil. *Rev Bioética*. 2013;21(2):268-77. <https://doi.org/10.1590/S1983-80422013000200010>.
 26. Organisation for Economic Co-Operation and Development (OECD). OECD Statistics. 2020 [cited 2020 November 12]. Available from: <https://stats.oecd.org/Index.aspx?ThemeTreeId=9>.
 27. Scheffer MC, Guilloux AGA, Poz MRD, Schraiber LB. Reasons for choosing the profession and profile of newly qualified physicians in Brazil. *Rev Assoc Med Bras*. 2016;62(9):853-61. <https://doi.org/10.1590/1806-9282.62.09.853>.
 28. Kaur B, Carberry A, Hogan N, Robertson D, Beilby J. The medical schools outcomes database project: Australian medical student characteristics. *BMC Med Educ*. 2014;14:180. doi: 10.1186/1472-6920-14-180.
 29. Bitterman N, Shalev I. Profile of graduates of Israeli medical schools in 1981--2000: educational background, demography and evaluation of medical education programs. *Isr Med Assoc J*. 2005;7(5):292-7.
 30. Senger MH, Campos MCG, Servidoni MFCP, Passeri SMRR, Velho PENF, Toro IFC, et al. Trajetória profissional de egressos do curso de Medicina da Universidade de Campinas (Unicamp), São Paulo, Brasil: o olhar do ex-aluno na avaliação do programa. *Interface (Botucatu)*. 2018;22(Suppl 1):1443-55. <http://dx.doi.org/10.1590/1807-57622017.0190>.
 31. Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo (HCFMUSP). Quem Somos [citado 14 nov. 2020]. Disponível em: https://www.hc.fm.usp.br/index.php?option=com_content&view=article&id=69&Itemid=225.
 32. São Paulo (Estado). Governo. HC, maior complexo hospitalar da América Latina, completa 70 anos. São Paulo; 2014 [citado 14 nov. 2020]. Disponível em: <https://www.saopaulo.sp.gov.br/ultimas-noticias/hc-maior-complexo-hospitalar-da-america-latina-completa-70-anos/>.
 33. Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo (HCFMUSP). Instituição [citado 14 nov. 2020]. Disponível em: https://www.hc.fm.usp.br/index.php?option=com_content&view=article&id=68&Itemid=214
 34. Scheffer M, et al. Demografia médica no Brasil 2018. São Paulo: FMUSP/CFM/CREMESP; 2018.
 35. Faculdade de Medicina da Universidade de São Paulo (FMUSP). FMUSP - Residência Médica 2021. São Paulo; 2020 [citado 6 jan. 2021]. Disponível em: https://www.tekyou.com.br/fmusp/selecao2021/relacao_candidato_vaga.php.

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