



## Prevalence of Persons with Disability Enrolled in Undergraduate Medical Schools in Brazil, 2019

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### Abstract

**Introduction:** The affirmative policies in Brazil guarantee the provision of undergraduate medical education to People with Disability (PWD). The objective was to estimate the prevalence of PWD undergraduate medical students in Brazil in 2019.

**Methods:** This is an exploratory, descriptive study that used census data from the total population of the undergraduate medical students (N=183,646) who were enrolled at the Brazilian medical schools, in 2019. The data are secondary, unidentified and accessed online, and were originally collected by the Higher Education Census conducted by Anísio Teixeira National Institute of Educational Studies and Research (INEP), which used a questionnaire designed to capture information from students and medical courses. The descriptive analysis was based on absolute and relative frequencies.

**Results:** The prevalence of medical students that were PWD was 0.80% (1,460/183,646), and this includes both Brazilian and foreign students. The latter includes people from 76 different countries. Foreign students who are PWD came from eight different countries: Bolivia, Burundi, Cabo Verde, Republic of Congo, Paraguay, Philippines, Singapore and Spain. Most of the PWD were male (51.37%), aged 20 to 24 years (46.78%) and of non-white ethnicity (52.26%). Most students were enrolled in public medical schools (73.97%). A fraction of PWD students (6.51%) was enrolled in medical schools with no specific resource or assistance for PWD. The highest prevalence was the physical disability (39.11%), followed by low vision accuracy (24.45%), intellectual (15.41%), low hearing (14.11%), blindness (3.97%), multiple disabilities (2.47%) and deafness (1.51%).

**Conclusions:** The prevalence of PWD medical students in Brazil is low, and is dominated by students with physical and sensory disabilities but lacks the deaf-blind. Despite the existence of legal regulations favoring PWD to study medicine, some medical schools have not done adequate adjustments to accommodate them. This suggests that affirmative policies for the inclusion of PWD in higher education, particularly in medicine, still need improvement.

**Keywords:** Disability studies; Medical education; Education; Disabled persons

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## Introduction

There is a worldwide ongoing inclusive movement to promote diversity in medical schools by integrating students who are people with disability (PWD) (1). The increase in the number of physicians who are PWD can increase the visibility of these individuals, and this can be augmented when done in concert with the implementation of policies that enforce the introduction and continuity of faculty mentors who identify themselves as PWD (2).

A PWD-physician can improve the quality of care offered to patients who are also PWD, simply because they have a greater understanding of the challenges and singularities that are part of the lives of those with a disability. The benefit of this is also enhanced by the interaction between PWD professionals who work in the healthcare workforce. They help to deconstruct the misconceptions that fuel disparities that are induced by stigmas and stereotypes that harm the lives of PWD (3).

In Brazil, there are legislations in force to increase the access of minority groups to higher education (4). The population of people with disability in 2010 was estimated at 6.7% (12,748,663) of the total Brazilian population (5). This data demonstrates that PWD retain a non-negligible fraction of the population, and highlights the importance of including PWD in various areas or sectors of society. The vacancy reservation policy was expanded in 2016 to increase the access of PWD to various opportunities, chief among them, higher education (6).

This manuscript provides information about People with Disability (PWD) and medical education, using Brazil as a model country to demonstrate a situation potentially occurring in developing countries. This is facilitated by an annual census that provides statistical records regarding the enrollment of individuals at various educational levels, and includes various factors such as race, age, and disability. This study aimed to (i) estimate the prevalence of people with disabilities enrolled in undergraduate medical courses in Brazil in 2019, (ii) characterize these students in terms of demographic profile, access to higher education and type of disability.

## Methods

### *Study design*

This is a descriptive study designed to measure the prevalence and characterize people with disability who are undergraduate medical students in Brazil. According to the Association of American Medical Colleges an individual with a disability is “someone with limitation in one or

more major life activities such as walking, seeing, hearing, speaking, working or learning” (7). It was conducted using primary data collected from the higher education census, coordinated by the Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira (INEP) (8). INEP is an institution of the Ministry of Education that is responsible for producing statistics and education indicators in Brazil (9). The annual census is an official source of de-identified data that was established in 1995, and is made available annually via the web.

### *Setting and participants*

Brazil is the third largest country in the Americas surpassed only by Canada and the United States of America. Constitutionally, Brazil is a federal republic formed by five macro regions (North, Northeast, Southeast, Midwest and South), one Federal District and 26 states. According to the 2019 INEP data (8), there were 340 medical schools distributed across the 26 federative units and the Federal District, of which a total of 199,478 undergraduate medical students were actively enrolled.

Participants of the study are undergraduate medical students whose data were transmitted from medical schools to INEP (N=199,478) in 2019. The inclusion criterion was based on the complete information about having or not having disability. The absence of information on whether the students had motor or sensory limitations determined his or her exclusion from this study (N=15,832). The study population comprised 183,646 undergraduate medical students.

### *Data collection*

The primary database of the INEP is fed annually via a higher education census. The present study was conducted with secondary, unidentified, publicly accessible data, which are freely available online through the INEP website.

Data collection was carried out by the following steps: “statistical surveys and educational indicators”, “higher education census”, “results”, “higher education microdata 2019” (10). The data analyzed belong to two independent databases that store information from the higher education census. Course microdata (“DM\_CURSO\_2019”) were analyzed after selecting the variable NO\_CURSO == ‘MEDICINA’. The selection of the subset of medical students was made in the “DM\_ALUNO\_2019” database, following the INEP instructions for the use of big data and selecting the variable “CO\_CINE\_ROTULO” registered as “0912M01”, a code that corresponds to “medicine” (11).

### Selected Variables

The characterization of the demographic profile was carried out by considering the variables (i) gender (female and male), (ii) age (<20, 20-24, 25-29, ≥30 years), (iii) race/ethnicity (white, non-white, missing data), (iv) nationality (Brazilian, Naturalized Brazilian, foreign nationality). The characterization of students in relation to access to enrollment into the medical course performed by describing the variables (i) management and funding of the school where the student attended high school (public/private), (ii) management and funding of the higher education institution where the student is enrolled (public/private), (iii) mode of enrollment through the “quota system” (yes/no) and (iv) accommodation for PWD at the medical school (yes/no). The characterization of the types of disability was carried out considering the following types of disability reported in the INEP census: hearing loss, physical impairments, intellectual, multiple, deafness, deaf-blindness, low vision and blindness.

### Data analysis

We used the RStudio program and the *ffbase* package (12) to import higher education census microdata and select the subset of medical students following the step-by-step process recommended by INEP (11). Data analysis consisted of descriptive statistics of ordinal variables presented as counts and proportions. The age variable was transformed into a nominal variable and presented in categories. The prevalence of the ‘PWD’ students was presented with their respective 95% confidence intervals (95%CI) estimated for proportion of the finite population. The comparison between complete data about having or not having disabilities and missing data about disabilities was done using the chi square test (categorical variables) and student t-test (continuous variable). The analyses were conducted using the RStudio program.

### Ethical Considerations

The present study was conducted in accordance with the principles established by the Declaration of Helsinki. The study protocol was assessed and approved by the Research Ethics Committee of the University Hospital, with file N°. 3,490,540, issued on 08/07/2019. As the data used in the study are secondary, unidentified and freely available on the internet, the study was exempted from presenting and signing an Informed Consent Statement.

### Results

The Higher Education Census revealed that

a total of 199,478 individuals were enrolled in medical schools in Brazil. A high rate of them (183,646/199,478) (92.06%; 95% CI: 91.94%; 92.18%) of the students had indicated if they had some type of disability (N=1,460) or if they did not have (N=182,186), indicating a study population of 183,646 participants.

The differences between complete data about having or not having disabilities (N=183,646) and missing data about disabilities (N=15,832) showed that the absence of information about disability was higher among students who did not also inform their skin color (P<0.01) and who were male (P<0.01), but it was lower among older individuals (P=0.02). The prevalence of PWD (1,460/183,646) enrolled in undergraduate medical education in Brazil was 0.80% (95% CI: 0.75%; 0.84%) in 2019.

The medical school data in Brazil recorded a higher frequency for: female students (59.52%; 95% CI: 59.29%; 59.74%), the age range of 20-24 years (56.78%; 95% CI: 56.56%; 57.01%), and for those with white skin color (61.79%; 95% CI: 61.56%; 62.01%). A small proportion of the students were of Naturalized Brazilian nationality (0.13%; 95% CI: 0.11%; 0.14%). Foreigners (0.39%; 95% CI: 0.36%; 0.42%) came from 76 different countries. The largest contingents are from Paraguay (n=100), Cabo Verde (n=85) and the United States of America (n=62). Foreign students who are PWD came from eight different countries: Bolivia, Burundi, Cabo Verde, Republic of Congo, Paraguay, Philippines, Singapore and Spain. The demographic profile of the study population is summarized in Table 1.

Information regarding the route of enrollment into the medical course showed that most students who are PWD used the quota system (n=865) and most of the vacancies accessed by them were really intended/reserved for PWD (n=705). With regards to the guarantee of accommodation for PWD by schools, it was observed that 6.5% of PWD-students were enrolled in medical schools that did not offer resources or help to students with disability. Table 2 shows the conditions/route of access to medical education in Brazil.

Regarding the different types of disability reported by INEP, a higher frequency (43.6%) of sensory alterations was detected (hearing loss, deafness, deaf-blindness, low vision and blindness), followed by physical disability (38.7%), intellectual disability (15.3%), and multiple disabilities (2.5%). There was no record of students with simultaneous deaf-blindness. Public schools absorbed most of the PWD-students, with the exception of intellectual disability since it was the only type that predominated in private schools (69.78% versus 30.22%).

**Table 1:** Demographic profile of actively enrolled undergraduate medical students in Brazil, 2019

Variable	Total		PWD*		Non-PWD	
	N (183,646)	% (95%CI)**	N (1,460)	% (95%CI)	N (182,186)	% (95%CI)
Gender						
Female	109,308	59.52 (59.29; 59.74)	710	48.63	108,598	59.61
Male	74,388	40.48 (40.25; 40.70)	750	51.37	73,588	40.39
Age (Years)						
<20	20,510	11.17 (11.02; 11.31)	122	8.36	20,388	11.19
20-24	104,288	56.79 (56.56; 57.01)	683	46.78	103,605	56.87
25-29	39,954	21.75 (21.56; 21.94)	320	21.92	39,634	21.75
≥30	18,894	10.29 (10.14; 10.42)	335	22.95	18,559	10.19
Race/Ethnicity						
White	113,477	61.79 (61.56; 62.01)	618	42.33	112,859	61.95
Non-White	51,220	27.89 (27.68; 28.09)	763	52.26	50,457	27.70
Missing data	18,949	10.32 (10.17; 10.45)	79	5.41	18,870	10.36
Nationality						
Brazilian	182,693	99.48 (99.44; 99.51)	1,450	99.32	181,243	99.48
Naturalized***	234	0.13 (0.11; 0.14)	2	0.14	232	0.13
Foreigner	719	0.39 (0.36; 0.42)	8	0.55	711	0.39

\*People With Disability; \*\*Confidence Intervals; \*\*\*Naturalized Brazilian

**Table 2:** Medical schools and People With Disability-students: mode of enrollment, and the provision of accommodation

Variable	Total		PWD*		Non-PWD	
	N (183,646)	% (95%CI)	N (1,460)	% (95%CI)	N (182,186)	% (95%CI)
Funding of high school						
Public	52,108	28.37	917	62.81	51,191	28.10
Private	131,243	71.47	539	36.92	130,704	71.74
Missing	295	0.16	4	0.27	291	0.16
Funding of medical school						
Public	58,485	31.85	1,080	73.97	57,405	31.51
Private	125,161	68.15	380	26.03	124,781	68.49
Use of quota system						
Yes	18,055	9.83	865	59.25	17,190	9.44
No	165,591	90.17	595	40.75	164,996	90.56
Accommodation						
Yes	175,880	95.77	1,365	93.49	174,515	95.79
No	7,766	4.23	95	6.51	7,671	4.21

\*PWD: People with Disability

The distribution of PWD-students according to type of disability, enrolled in public and private institutions is shown in Figure 1.

With the exception of the state of Amapá, the process for the enrollment and training of physicians in Brazil registered the inclusion of PWD in all federative units in 2019. The lowest prevalence of PWD students was registered in the Federal District (0.18%) and the state of São Paulo (0.25%). The highest prevalence of PWD students was found in the state of Acre (8.95%) which is located in the northern region of the country and borders Peru and Bolivia (Table 3).

## Discussion

The present study showed that PWD students are reaching the highest level of education and enrolling in very competitive courses such

as medicine. However, the representation of these students in medical schools is still small. Estimates indicate that there are less than 8 PWD for every 1,000 undergraduate medical students in Brazil. About 60% of them gained access to the Medicine course via the quota system, but a portion of them enrolled in schools that are not fully prepared to have PWD. This scenario suggests that affirmative policies aimed at the inclusion of PWD in higher education, particularly in Medicine, still need improvement, and effective implementation.

The prevalence of the PWD medical students in Brazil seems to be even lower in comparison to those of developed countries. At the University of Aberdeen (UK), 4% of medical school applicants admitted have a disability, but the frequency increased to 13% when they realized that learning

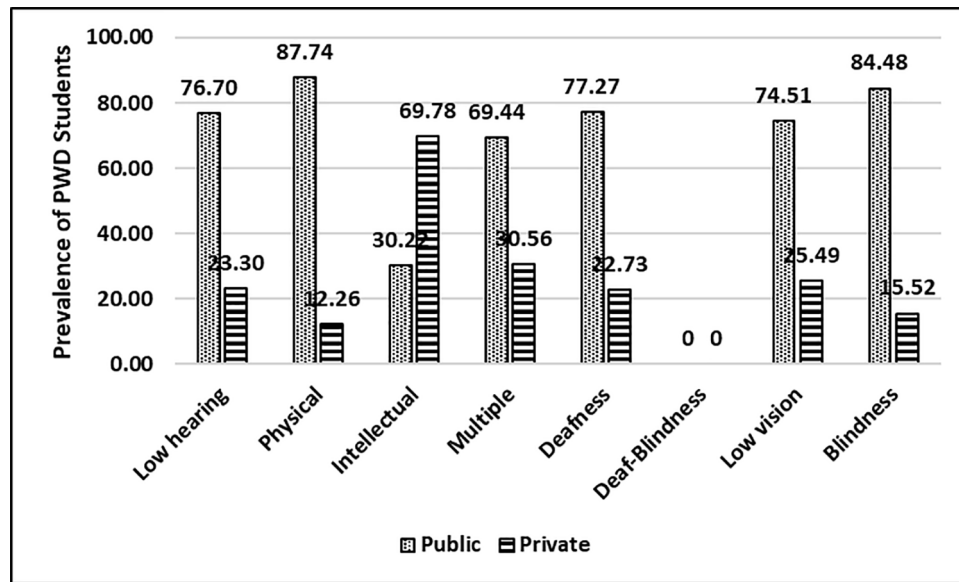


Figure 1: Distribution of students with different types of disabilities according to public or private medical schools

Table 3: Prevalence of actively enrolled PWD undergraduate medical students, according to the Federative Unit, Brazil, 2019

Federative state	Medical students			95%CI**		Absolute number of the different types of disability							
	Total (n)	PWD* (n)	PWD (%)			Low-hearing	Phys-ical	Intel-lectual	Mul-tiple	Deaf-ness	Deaf-blind-ness	Low-Vision	Blind-ness
Rondônia	2479	11	0.44	0.18	0.70	2	3	2	0	1	0	3	0
Acre	1128	101	8.95	7.28	10.62	8	27	65	2	0	0	8	0
Amazonas	1890	17	0.90	0.47	1.33	2	6	5	0	0	0	4	0
Roraima	570	40	7.02	4.92	9.12	6	22	3	0	0	0	9	0
Pará	4173	27	0.65	0.41	0.89	3	16	1	1	0	0	4	2
Amapá	370	0	0.00	0.00	0.00	0	0	0	0	0	0	0	0
Tocantins	3335	21	0.63	0.36	0.90	3	7	4	2	1	0	4	0
Maranhão	3176	63	1.98	1.50	2.46	8	31	1	1	0	0	16	6
Piauí	3690	18	0.49	0.26	0.72	2	13	1	1	0	0	0	1
Ceará	6142	57	0.93	0.69	1.17	6	26	9	1	1	0	14	0
Rio Grande do Norte	2778	50	1.80	1.31	2.29	8	32	0	0	0	0	10	0
Paraíba	6767	109	1.61	1.31	1.91	13	40	9	1	1	0	40	6
Pernambuco	7602	46	0.61	0.43	0.79	7	20	4	1	1	0	5	9
Alagoas	2854	28	0.98	0.62	1.34	1	5	1	1	0	0	17	3
Sergipe	1967	41	2.08	1.45	2.71	3	22	3	0	1	0	12	0
Bahia	10715	55	0.51	0.38	0.64	11	18	7	1	3	0	16	2
Minas Gerais	24932	202	0.81	0.70	0.92	30	74	40	7	1	0	42	8
Espirito Santo	3899	13	0.33	0.15	0.51	1	3	1	1	0	0	6	1
Rio de Janeiro	16869	91	0.54	0.43	0.65	11	37	7	4	5	0	15	12
São Paulo	36169	91	0.25	0.20	0.30	15	35	19	3	2	0	18	0
Paraná	11235	55	0.49	0.36	0.62	7	13	16	3	1	0	13	2
Santa Catarina	6543	45	0.69	0.49	0.89	10	22	2	1	0	0	8	2
Rio Grande do Sul	9588	133	1.39	1.16	1.62	30	58	5	3	0	0	35	2
Mato Grosso do Sul	2240	49	2.19	1.58	2.80	6	17	3	1	3	0	19	0
Mato Grosso	1864	35	1.88	1.26	2.50	6	9	4	0	0	0	14	2
Goiás	7265	56	0.77	0.57	0.97	6	12	13	1	1	0	23	0
Distrito Federal	3408	6	0.18	0.04	0.32	1	3	0	0	0	0	2	0
Brazil	183.646	1.460	0.80	0.76	0.84	206	571	225	36	22	0	357	58

\*People With Disability; \*\*Confidence Intervals

difficulties, mental disorders, sensory differences, chronic illnesses and mobility problems were part of the list supported by the legislation of that country (13). The same happens in the United States, where estimates point that about 4.6% of PWD students are enrolled in allopathic medical schools, in which the classification includes various conditions such as mental health and chronic diseases (14).

In the United Kingdom, it was also observed that 2% of physicians had some type of disability (15). In countries within the United Kingdom, medical schools are giving importance to diversity (1). Diversity is a broad term that encompasses race/ethnicity, gender, religion, social class, sexual orientation, abilities, age, identity, nationality and health/disease (16). Under the culture of inclusion and diversity, medical training benefits both in terms of reducing disparities in health and in increasing the health of minorities, since PWD is the most underrepresented group in medicine (17).

#### *Implications of study*

The low representativeness of PWD students in Brazil can be attributed to the strong competition that historically marks the selection of students entering medicine courses, but it can be, above all, the reflection of the disproportionate relationship between PWD and the level of education required to gain entry into higher education, in comparison to the non-PWD population. In 2019, Brazilian data showed that there was a higher prevalence among the PWD, of those with “lack of formal education or incomplete primary education” in the age group of 18 years or older (67.6%), compared to the equivalent age group without a disability (30.9%). In the same age group, the differences also remained in relation to higher education (5.0% versus 17%) and secondary education (16.6% versus 37.2%) (18). Despite the current legislation aimed at increasing access to higher education, it is necessary to put a spotlight on secondary education and better understand the preparation, adjustments and support for PWD students being executed/performed at this level of education in Brazil.

The data drawn from medical schools in Brazil shows that physical disability was the most prevalent in 2019. A comment on barriers faced by Canadian medical students draws attention to the lack of information about the presence of people with physical disability studying in the medical schools in Canada (19). The authors believe that learning environments suitable for this type of disability are lacking or perhaps candidates decline from studying medicine due to the barriers against people with physical

disabilities. As shortcomings, they cite: (i) lack of space in the examination rooms that allow adequate movement, (ii) lack of examination tables equipped with height adjustment for people on wheelchairs, (iii) lack of automatic doors and (iv) hand washing equipment in sufficient numbers and suitable for people on wheelchairs (19). Given the high number of students with physical disabilities in Brazil, such issues require further investigation in the country.

In addition to the absence of students who are deaf-blind, an issue to be highlighted is the almost invisible presence of people with deafness in medical schools in Brazil. McKee, et al. highlighted some motivating issues that can open doors to people who have hard-of-hearing: (i) improved communication between physicians and patients who are deaf-blind, (ii) educational effect due to interaction with other students and teachers, (iii) inclusion of PWD to contribute at an academic level as opposed to being patients, thereby increasing their representation, and consequently diversity in the workforce, and (iv) by the late deafened sharing their own experience with colleagues who are losing their hearing as they age (20).

An interesting observation was that PWD students with intellectual disability were the third most represented group, only behind those with physical disability and low-vision. In the United States, an estimated 6,000 students with intellectual disabilities are enrolled in American colleges and universities (21). Although the definition of intellectual disability lacks precision, an important feature is that it is a functional alteration not always manifested by learning difficulties, but always requiring special education and adaptation of the school to meet the students' needs (22).

As mentioned earlier, affirmative policies seem to be discreetly promoting access for some PWD-students; however, there is need to investigate their maintenance in medical schools, and consequent graduation in Brazil. Data from 2010/2011 provided by 86 American medical schools showed that the ratio of graduated-to-matriculated students with disability was 0.76. Although the list of needed emergent assistive technologies are long, medical schools more frequently implement non-complex accommodations such as extra time to perform tasks, ramps/lifts/entrances and dictated or audio-recorded lectures, and suggest that these changes help maintain PWD students within the faculty of Medicine (23, 24). In addition, there is lack of information in Brazil regarding the existence of assistive technology such as

amplified stethoscopes, digital stethoscopes, height-adjustable chairs, adjustable examination table, and assistant for physical examination, which can optimize and potentiate the theoretical and practical learning of PWD medical students. These questions remain to be addressed by future researches.

### Limitations

The present study has the merit of presenting a theme that is less studied in the national and international literature. However, it does have some limitations. One issue to point out is the quality of the information since the microdata are transmitted to INEP after the collection is performed within educational institutions, and this has received criticism. However, in 2019 various legislations were enforced and may have motivated greater commitment in the collection and transmission of data. Despite the provision of some mechanisms by Brazilian legislation for the inclusion of the minorities, discrimination, stigma and stereotypes still exists, potentially leading to the omission of information by the students, consequently underestimating prevalence measures. This problem needs to be better investigated by future studies.

### Conclusions

The prevalence of PWD medical students in Brazil is low and includes both Brazilians and foreigners. The PWD group is dominated by students with physical and sensory disability but lacks the deaf-blind. Despite the existence of legal regulations favoring PWD to study medicine, some medical schools have not done adequate adjustments to accommodate them. This scenario suggests that affirmative policies aimed at the inclusion of PWD in higher education, particularly in medicine, still need improvement.

### Authors' Contributions

All authors contributed to the discussion, read and approved the manuscript and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated resolved.

**Conflicts of Interest:** None declared.

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