Evaluation of gender inequities in Latin American neuroscience community

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Project developed under a technical cooperation agreement between the Latin America Regional Committee of the International Brain Research Organization (IBRO LARC) and the Economic Commission for Latin America and the Caribbean (ECLAC).

EXECUTIVE SUMMARY

This report aims to explore for the first time, the gender gap in the career path of neuroscientists from Argentina, Brazil, Chile, Cuba, Mexico and Uruguay associated with the International Brain Research Organization in Latin America (IBRO-LARC). A convenience sample was used to gather quantitative information about neuroscientists´ academic and family life, seeking to capture the interaction between the gender roles of men and women and their work as researchers. The collected data represents around 33% of the total members from national societies of neuroscience of six countries of Latin America. The data confirm that gender gaps in neurosciences follow similar trends to those observed in other research areas.

There is evidence of **horizontal segregation** in neurosciences. Female neuroscientists come mostly from psychology or chemical sciences. In contrast, most men neuroscientists come from physical sciences, mathematics, and engineering. The **educational background** of neuroscientists does not differ significantly between men and women, nor in the undergraduate and graduate educational attainments, neither in access to scholarships. However, considerable differences are observed in the average **time to earn a PhD´s** of those who have children and those who do not. Men without children are the ones who graduate earlier, whereas women with children take the longest to earn a PhD´s. Women declared that the main reasons for interrupting their training trajectories were pregnancy and children or dependents care. Less **international mobility** is also observed in women's PhD studies. All these differences expose how critical is the interaction between gender roles tied to motherhood and the **beginning of women´s careers in neuroscience.**

The results also confirm the existence of **vertical segregation.** Most women neuroscientists are currently working in low-ranking positions, while men neuroscientists are taking higher ranking roles. It is also found that the average time it takes a woman to achieve a position is greater for their male colleagues at all ranks, but especially at the full professor rank. Unequal access to senior positions translates into various material and symbolic disadvantages and act as a **glass ceiling** for women.

In terms of **reconciling reproductive and academic roles**, the results evidence that women are primarily responsible for household and care tasks, which implies a greater overall workload when combined with their academic labor. The vast majority of women report having experienced conflicts between their academic career and motherhood, and those conflicts are bidirectional. Academic life has affected neuroscientists' decision to be mothers, and motherhood has affected the development of their careers. This is not the case for their male colleagues, who declare that fatherhood has influenced their academic life but not the other way round. The need to alleviate distress and overload of household and care responsibilities seems evident, particularly through mechanisms that promote a higher **co-responsibility** for these tasks, especially when the beginning of the childbearing period coincides with the beginning of the academic career.

Academic science, like any social institution, is not immune to **discrimination** and stereotypes. Many neuroscientists state that they have perceived some discrimination throughout their careers, especially women. Most women perceive discrimination based on gender, age, and pregnancy or dependent care. In contrast, men perceive discrimination due to age, race/ethnicity, or social class mainly. A high proportion of the surveyed neuroscientists claim having heard, seen, or experienced sexual harassment situations throughout their careers. Women are more likely to report having suffered personal experiences of sexual harassment.

Another aspect to highlight is the low degree of **career satisfaction** that women experience. Only 15% of women compared to 32% of men are satisfied with their careers. Beyond the fact that the reasons for dissatisfaction are shared by both sexes and are attributed to the difficulties of scientific work in developing, a high proportion of women are dissatisfied also with the reconciliation of family and academic career.

Regarding how to eliminate these gender differences within neurosciences, the vast majority of respondents perceive the need to implement policies or mechanisms to **promote women´s academic careers in neuroscience**. Equal pay policies and support programs for people who suffer sexual or workplace harassment are considered the most important policies.

Neurosciences face numerous challenges in terms of promoting gender equality at different stages of education and career paths. This report aims to be the first attempt to understand better gender gaps in neuroscience and valuable input for future policy interventions that promote gender equality in this field.

Introduction

This study emerged as an initiative of the Latin American Regional Committee of the International Brain Research Organization (IBRO-LARC) during its 2018 annual meeting held in Colima, Mexico. During this meeting, IBRO-LARC members Cecilia Bouzat (chair, Argentina), Gustavo Murer (Argentina), Jorge Quillfeldt (Brasil), Rosalinda Guevara and Luisa Rocha (México), Adrián Palacios (Chile), and Raúl Russo and Ana Silva (Uruguay), agreed to promote a joint venture with the Economic Commission for Latin America and the Caribbean (ECLAC or CEPAL for its acronym in Spanish) to gather information about gender balance among Latin American neuroscientists. In August, 2019, IBRO and ECLAC signed a Cooperation Agreement to conduct this study, which has been directed by the Director of ECLAC office in Montevideo, Verónica Amarante, with the participation of Cecilia Tomassini and Julieta Zurbrigg (ECLAC) and coordinated by the IBRO-LARC members Cecilia Bouzat (Universidad Nacional del Sur, CONICET, Argentina), Adrian Palacios (Universidad de Valparaíso, Chile), and Ana Silva (Universidad de la República, Uruguay). The study shows an anonymous survey questionnaire for members of scientific societies of neuroscience of Argentina, Brazil, Chile, Cuba, Mexico, and Uruguay. The results describe the development of scientific careers for men and women related to their family life and the perception of obstacles to success.

Over the last several decades, significant advances have been made in women's participation at different levels of the scientific system. The most significant one was the growth in tertiary education enrollment. In the 1970s female tertiary students were a minority; ten years later, women's enrollment rates reached and outnumbered men in North America and Western Europe and twenty years later, in the 90s, in Latin America and the Caribbean. Nowadays, the same is happening in some Central Asian countries.

Despite these advances, gender gaps persist in labor markets in general, and within scientific and technological systems. The most critical points can be grouped in six categories: (i) participation gaps between men and women depending on different areas of knowledge (horizontal segregation); (ii) advancement and retention gaps, -that is, men and women differences in career perspectives and permanence within the scientific system (vertical segregation) (iii) gaps in career development that include barriers preventing access to high-level positions and prestige jobs within the scientific and technological system (glass ceiling).

Multiple studies have confirmed these gaps in the scientific system globally, both in developed and developing countries. (Bielli, et al, 2004; European Commission, 2019; López-Bassols, et al, 2018; UNESCO, 2011, 2017a). However, relevant literature highlights that these gender gaps and their causes vary between areas of knowledge and contexts (Sugimoto et al., 2015). Assessing the causes behind unequal participation of men and women in neuroscience is crucial. It's an expanding field of knowledge, highly demanded and with potential impact on well-being and social development. It is also an unexplored topic in Latin America since no studies that systematically analyze gender inequalities in this scientific field were found.

The document is structured as follows: Section 1 summarizes the conceptual framework defining the most critical aspects of gender gaps in science and their potential causes. This section also includes a brief literature review on gender gaps in neuroscience and present background information related to survey design.

Section 2 details the methodology and survey implementation, while section 3 focuses on a descriptive analysis of all the study variables. The latter is further divided into six thematic blocks:

1. Sociodemographic characterization of the surveyed population;
2. Horizontal Segregation: choice of career field within neuroscience;
3. Progress and performance in undergraduate and graduate education;
4. Vertical Segregation in neuroscience: academic careers and access to high-level positions, including an analysis of the age and time to access high—ranking positions, human resources training, the allocation of working hours between academic activities, and degree of satisfaction with the career;
5. Perception of discrimination in the assessment of academic achievements;
6. Mechanisms and policies to encourage women's progress in neuroscience.

Section 4 of this document summarizes the main results and makes recommendations on some instruments to promote women's advancement in this field.

1. Literature review and background

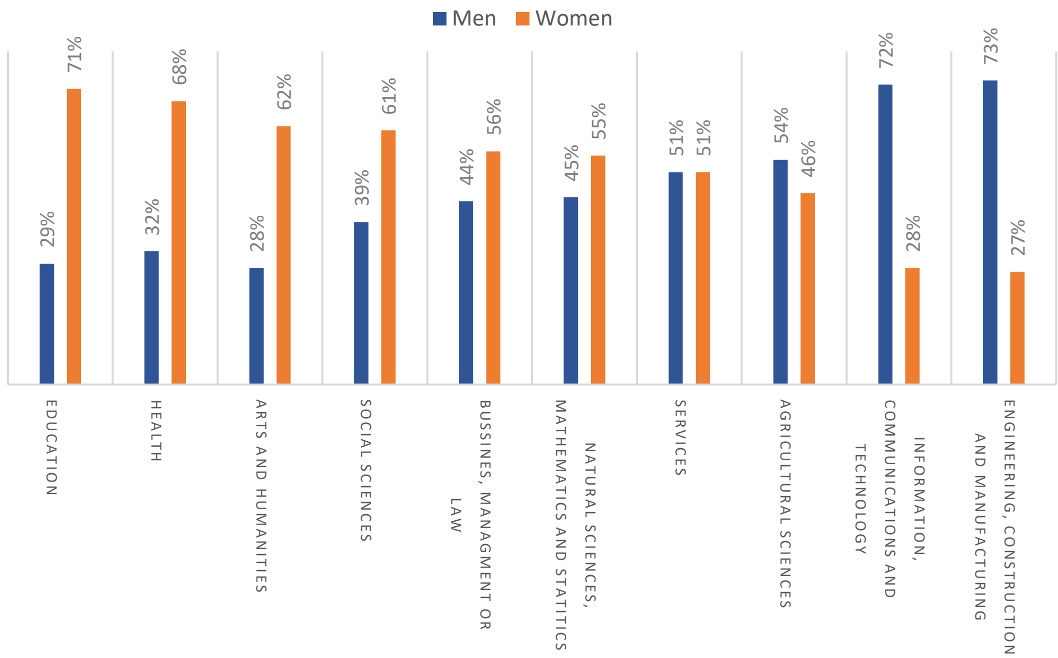
1.1. Horizontal Segregation: selection of study field according to gender

Much of the literature on gender gaps in science indicates horizontal segregation, that is, the unequal distribution of men and women across scientific areas. Globally, women are more likely to choose social sciences, humanities, administration, arts, and health rather than agricultural sciences, engineering and technologies (*Figure 1*). The highest prevalence of gender gaps over time is observed in the so-called STEM areas[1] , which are considered the most strongly gender segregated area for women. In all STEM areas, women represent only 35% of the global enrollment (UNESCO 2017).

[1] Acronym for Science, Technology, Engineering & Mathematics (STEM).

Figure 1: Global enrollment in tertiary education by study field and sex.

(115 countries)



Source: UNESCO 2017, p. 20.

There are many potential causes of horizontal segregation, however, most authors recognize that interests in science vary throughout the life cycle and gender differences in early ages are crucial to explain the differential election of study fields and occupations. Eagly & Wood (1999) point out that men and women‘s the interests arise from socialization processes within the framework of the sexual division of labor. In this process, boys and girls learn that male roles are associated with instrumental and achievement-oriented traits, while female roles are associated with expressive and community traits. Likewise, cultural factors influence observational learning (i.e., which tasks I perceive are associated with my gender) and provide an explanation of why girls and women make educational and vocational decisions.

Much of the literature on this topic seeks to elucidate the influence of stereotypes on boys’ and girls’ values and attitudes at an early age, and subsequent biases in the selection of study fields and types of occupation (Tomassini 2020). For example, Cvencek, Kapur, and Meltzoff (2015) argue that stereotypes about children´s good performance in mathematics are acquired at an early age and influence their selfperception even before the age real differences in mathematics performance start to emerge. Several studies show that men are more likely to perceive that they are more proficient in mathematics than women, despite obtaining similar scores (Weinburgh 1995; Correll 2001). Bian et al (2017) go beyond mathematics and wonder how the acquisition of cultural ideas about talent or brilliance occurs, and which is the potential impact on boys' and girls' interests. They show that at the age of 6 girls are less likely to believe that members of the same gender can be brilliant and begin to avoid roles associated with that higher intelligence in their daily activities. Men's and women's beliefs about personal performance (self-efficacy) in scientific activities affect their career decision making.

Other causal factors are the influence of authority and/or peer groups in shaping values, attitudes and self-esteem of boys and girls (Tenenbaum and Leaper 2003), the importance of male stereotypes in the environment and masculinized cultures in certain scientific fields (Cheryan et al. 2009; 2017), the ways of teaching science the educational experiences, and student-teacher relationships (Kahle et al. 1993), the role of friendship groups (Riegle-Crumb et al., 2006), the importance of extracurricular experiences (Jones, Howe, and Rua 2000), the organization of work in classrooms and the attention that girls receive (Howe & Abedin, 2013), among other relevant topics.

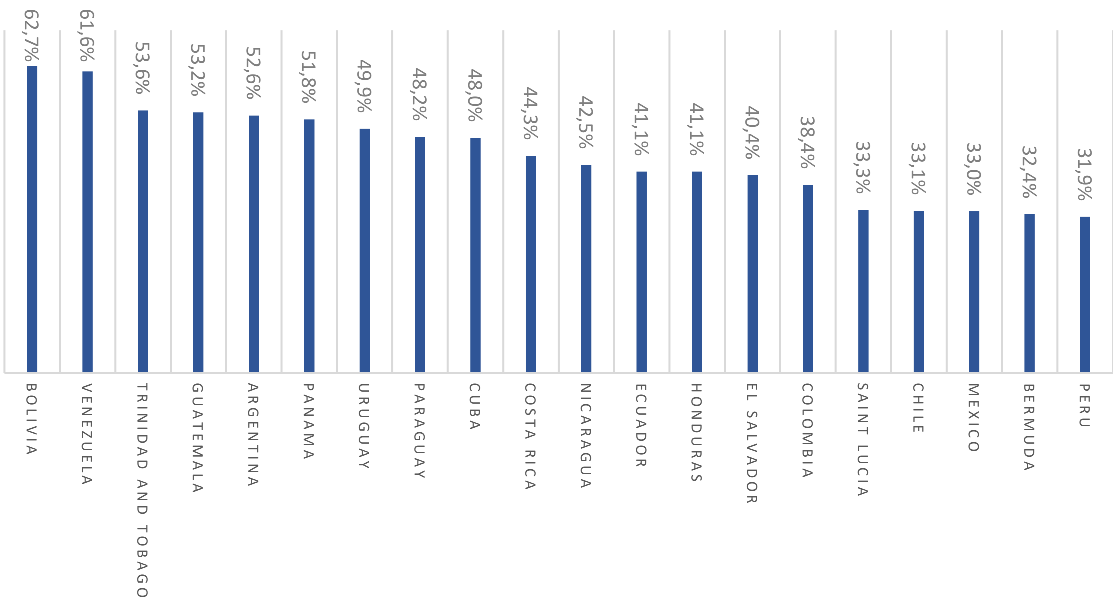
1.2. Vertical segregation and glass ceilings in science

Expanding women's undergraduate enrollments is critical to increasing their participation in science, yet it is only the starting point in their training pathway. The advancement and retention of women in postgraduate levels has been highlighted as another pivotal point to achieve gender equality in science. Recent data show that while young women make up the majority of students at bachelor's and master's levels, this number declines as they move up from master's to doctorate (Unesco 2017, p. 23).

A large body of research has shown how the passage through the education levels entails a greater loss of women than men at transition points (Goulden et al., 2011; Kulis et al., 2002; Morgan et al., 2013; Wolfinger et al., 2008). Likewise, several studies emphasize that gender gaps in international academic mobility have marked effects on the development of women's careers, particularly in the generation of international networks (Cruz-Castro & Sanz-Menéndez, 2010; Jonkers, 2011; Sandström, 2009; Shauman & Xie, 1996).

Nowadays, in some countries over, half of women professionals are involved in research bodies. In Latin America and the Caribbean, the participation of women varies between countries, as observed in *Figure 2*. In six countries, women make up more than 50% (Bolivia, Venezuela, Trinidad and Tobago, Guatemala and Argentina), in three countries, the proportion is close to parity (Uruguay, Paraguay, and Cuba), and in the remaining 11 countries women are between 40 % and 30% of the total. Despite this global increase, essential differences persist along hierarchical scales or teaching grades. Women tend to be the majority in the positions at the base of the pyramid, that is, at the lowest grades, and disappear as we move up the ladder to the highest positions. The gender gaps in career advancement can be understood as glass ceilings that prevent women from accessing the highest levels in science, particularly, the full professor rank. This uneven distribution is not only an attribute of the scientific systems of Latin America. Several reports confirm that women's under-representation in the highest teaching degrees is a worldwide phenomenon (Shen, 2013; UNESCO, 2017a, 2018).

Figure 2: Proportion of women over the total number of research professionals by country - last available data



Note: Venezuela, Guatemala, Argentina, Paraguay, Honduras, El Salvador, Colombia, Bermuda= 2005; Ecuador, Costa Rica = 2014; Panama, Mexico = 2013; Bolivia, Uruguay = 2010; Nicaragua = 2002; Saint Lucia = 1999.

Source: (UNESCO, 2018) Fact Sheet No. 51 p. 2.

The literature on science and gender has highlighted that not only women are a minority at the higher hierarchical levels, but also their advancement and promotion progress more slowly compared to their male colleagues (Valian, 1999). A series of barriers to the advancement of women's careers are identified, ranging from discrimination (Cheryan et al., 2011, 2009) or lack of visibility of their work (Nittrouer et al., 2018, 2018) to the influence of family and care responsibilities on academic performance (Cech & Blair-Loy, 2019; Fox et al., 2011; Mason & Goulden, 2002; Morrison et al., 2011).

Since gender gaps in science has reached the agendas of international organizations and national STI agencies, the design of instruments that promote women's careers has been gaining ground, particularly in developed countries. These instruments can be grouped into: (i) incentives for women to enter male dominated careers, particularly STEM areas, (ii) mechanisms for career promotion and advancement related to access to resources, such as prizes, competitive funds, scholarships, etc., (iii) mechanisms to make the scientific work of women visible, such as congresses, dissemination campaigns, etc., (iv) instruments that influence the evaluation of academic careers, for example, “stop the clock" mechanisms to delay the tenure review for a period of time for those who had children, among others.

Although less widely, there are also mechanisms that seek to alleviate care burdens and their impact on academic careers, for example, financial support for female scientists who are mothers[2] or salary supplements to women at the beginning of their career in order to facilitate women´s research work in the first years after childbirth.[3] In general, these instruments are promoted by women's associations in disciplines or universities, mostly in European countries, and the United States.

1.3. Main antecedents

This section presents the main existing antecedents for the construction of the survey form on gender gaps in neuroscience.

There are several antecedents of surveys on women's participation in various scientific areas generally carried out by international organizations, universities, or professional women's associations. For this project, three forms were consulted as direct antecedents. The first one is the UNESCO SAGA project launched in 2015 to strengthen gender equality in Science, technology and innovation. Its main goal is to offer tools that address the reduction of global gender inequalities in all levels of education, and research, particularly, in the areas of Science, Technology, Engineering and Mathematics (STEM). The SAGA project is currently implementing the first survey of Drivers and Barriers to Careers in Science, and Engineering, and the Interinstitutional Table of Women in Science, Innovation, and Technology is conducting an adaptation of this form to the Uruguayan context, as the first test in Latin America.[4]

The second one is the survey carried out by the European Platform of Women Scientists (EPWS), which brings together women scientists' networks and organizations

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[2] https://www.crg.eu/content/about-us-women-science/woss-women-scientists-support-grant
[3] For example, the NIAID-NIH "Primary Caregiver Technical Assistance Supplements (PCTAS)": https://www.niaid.nih.gov/grants-contracts/research-supplements#A4
[4] https://unesdoc.unesco.org/ark:/48223/pf0000266146.locale=en

committed to gender equality. The "General Survey on Women Scientists 2018" revealed information on: daily work life, doctoral research, career progression, mobility, institutional policies for the advancement of women's careers and European research networks and policies.[5] The third survey was the “Global Survey of Mathematical, Computational and Natural Scientists”, carried out within the Gender Gap in Science project framework, funded by the North American International Council for Science (ICSU) in collaboration with many scientists’ organizations and associations. This form includes a wide variety of topics on women's participation, including questions about performance, training, career advancement, family-academy conflict, expectations, evaluations, among others.[6]

In the particular case of neuroscience, in recent years, women researchers of leading institutions have a complaint about the difficulties that women face to advance in their scientific careers (Brodock, 2013; Pâmela B. Mello-Carpes & & Ana Lloret, 2018). For instance, in 2016, Bibiana Bielekova, head of the Neuroimmunological Diseases Section at the National Institute of Allergies and Infectious Diseases in Washington, reported that women´s access to senior lecturer positions at the National Institutes of Health (NIH) had improved only 1% in 25 years.[7]

Compared to other areas, such as computer engineering, physics, or biology, very few academic papers look at gender gaps in neuroscience. Most published studies come from associations of neuroscientists that promote the participation of women in neurosciences worldwide. («Women in Neuroscience Conference 2019»[8]; "WiNEu - European Women in Neuroscience"[9]; Women in Neuroscience (WIN)[10]).

Likewise, some reports of national associations, which disaggregate their postgraduate course data by sex, allow us to see how the trends observed in women’s participation in

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[5] https://epws.org/general-survey-on-women-scientists-2018/
[6] https://statisticalresearchcenter.aip.org/cgi-bin/global18.pl?id=&stage=5&sesid=&language=3
[7] https://www.washingtonpost.com/national/health-science/at-nih-one-woman-says-gender-bias-has-blocked-promotions/2016/08/28/e529171e-63cf-11e6-96c0- 37533479f3f5_story.html
[8] https://www.attentioninthebrain.com/women-in-neuroscience-win-2020-conference
[9] https://wineurope.eu/
[10] https://pubmed.ncbi.nlm.nih.gov/12012581/

science also applies in the case of neuroscience. For example, the ANDP in USA (Association of Neuroscience Departments & Programs) has carried out biannual surveys - since 2000 – gathering data from more than 60 departments and programs in this area. The time series analysis on doctoral enrollments shows an increase in women´s participation, which rose from 38% in 2000-2001 to 57% in 2016-2017 (ANDP 2017 p.66). Despite this growth, differences are observed in women's retention across training levels, in particular in the transition from receiving a Ph.D. to full-time faculty member. While women's participation in teaching neuroscience has grown, they are still poorly represented with low percentages ranging between 29 and 30% (Stricker 2003; ANDP 2017).

Another group of research focuses on the differences in productivity between men and women in neuroscience. McDermott et al. (2018) study gender gaps in US' top-ranked academic neurology programs[11]. Among its conclusions, it was pointed out that only 31% of the academic staff are women, and also that men publish almost twice as much as their female colleagues in all academic positions. However, this gap has narrowed in high-ranking positions. Other studies show that despite the persistent gender gap in publications in specialized journals,[12] there has been a significant increase in articles authored by women, in particular since 2015.

Antecedents evidence that women are underrepresented at some levels of scientific endeavor in neurosciences. However, the information they provide is minimal and refers to the North American or European reality only. For Latin America, no reports or articles studying the existence of gender gaps in neuroscience were found.

2. Methodological design and field work

For the proposes of this project, a survey through *Survey Monkey* platform was carried out among members of six neuroscience societies of Latin American. The national societies included in the survey were:

- Sociedade Brasilera de Neurociencias e Comportamento;

[11] According to USNews and World Report ranking of Best Graduate Schools.
[12] Neurology, JAMA Neurology and Annals of Internal Medicine

- Sociedad de Neurociencias del Uruguay;
- Sociedad Cubana de Neurociencias;
- Sociedad Mexicana de Ciencias Fisiológicas;
- Sociedad Chilena de Neurociencias;
- Sociedad Argentina de Investigación en Neurociencias.

The survey form includes 42 questions grouped in five blocks:

i) personal characteristics,

ii) family structure,

iii) area of interest and academic experience,

iv) academic career and access to high-level positions, and finally,

v) policies and instruments.

These blocks contain questions aimed to analyze how gender gaps are expressed in the key dimensions highlighted by the relevant literature, namely:

i) gaps in the women’s participation according to areas of knowledge (horizontal segregation);

(ii) gaps in advancement and retention, how men and women advance through scientific training and academic careers (vertical segregation) and

(iii) gaps in consolidation, that is gaps in access to positions of greater hierarchy and prestige within the scientific and technological system (glass ceilings).

Information on gender roles within the family and care responsibilities is also included, and information on the perception of discrimination and the need for mechanisms or policies to promote women´s careers. The next section of the report analyzes the information collected in each dimension. The form and all the statistical information for data processing will be available together with this report.

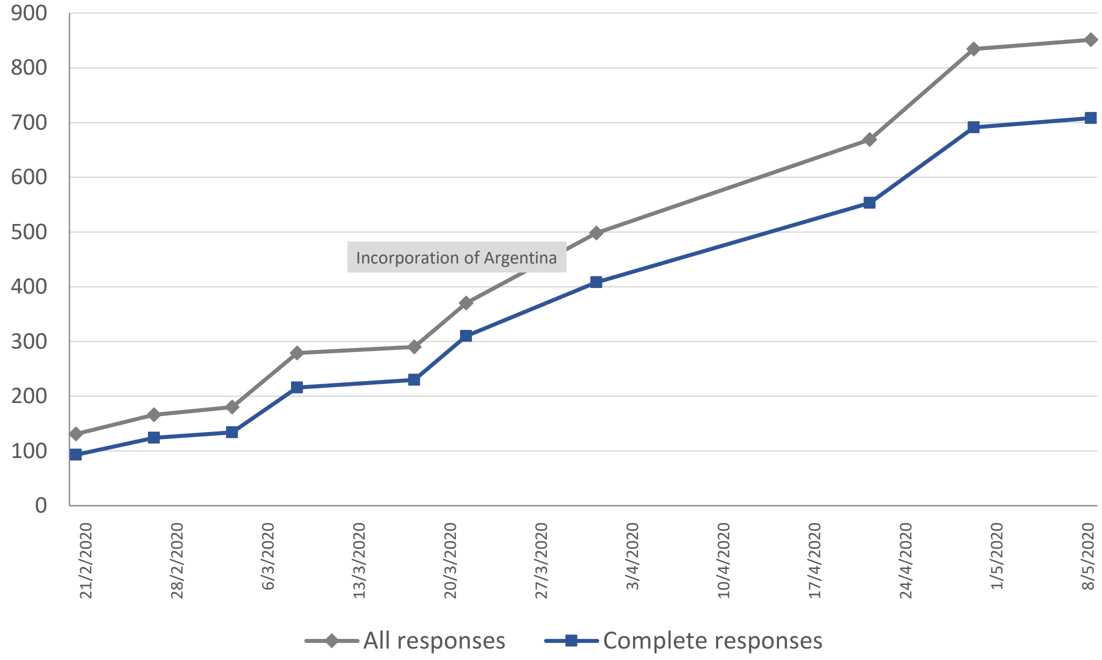
In this study, a non-probability sampling technique, or convenience sampling, was used. This type of sampling allows greater access to the population, as it includes all individuals who agreed to participate in the survey. Contact with members of the national societies was established using contact lists provided by each society. The survey form was sent for the first time on February 19 to the members of five national societies associations (Chile, Cuba, Brazil, Mexico and Uruguay) and a month later, the survey was sent to members of the Argentinian society. According to the contact lists, these six associations congregate a total of 2,687 people; the invitation to participate in the survey was sent to all of them; however, only 2,337 received the invitation.

The survey was voluntary, and, luckily, the respondents´ reaction was positive. In this sense, it is worth stressing the importance of close monitoring of the respondents to secure the information. After sending the survey to all association's members, reminders were sent periodically to those who had not yet filled it out or had incomplete fields. Thus, the evolution of the responses' presented significant increases when the reminders were sent (*Figure 3*). [13] Likewise, specific reminders were sent seeking to reduce the selection biases of survey participants, in particular, biases by country and by sex.

When the fieldwork came to an end, 851 responses were collected, which represents 36% of the sent invitations. Of this total, 708 forms were complete (83%), and the rest were incomplete. To draw the final sample, incomplete forms with information that could be retrieved from the analysis (those forms that contained at least the answers to the questions about academic trajectory) were included. Therefore, the final sample is made up of 776 people, which represents 33% of the total of those invited to participate. The Uruguayan association was the one that had the highest participation (in relation to the number of members of its society) with a percentage of 80%, followed by Mexico (63%) and Chile and Argentina (around 40%). In the case of Brazil, this percentage is 27% and in Cuba, 19%.

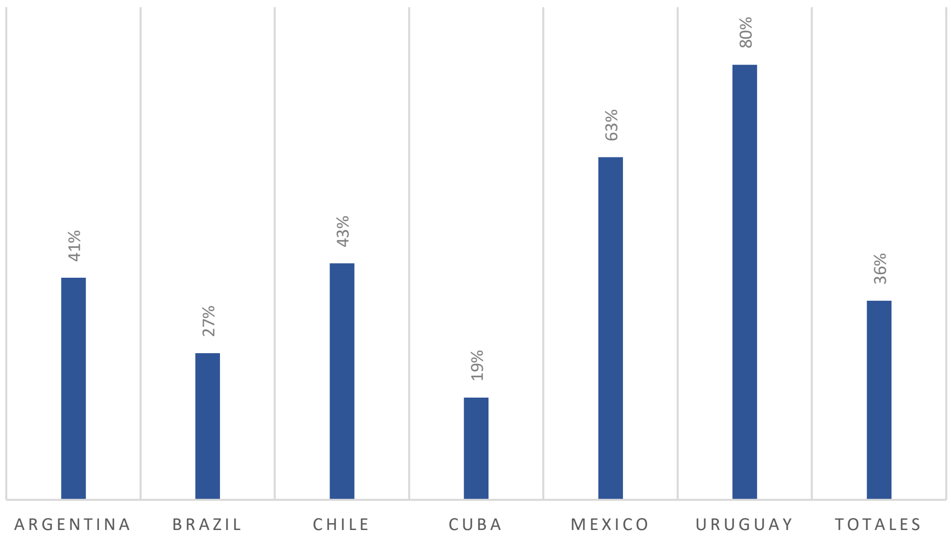
[13] The first reminder was sent on March 4, the second on March 25, the third on April 1 and the last reminder was sent on April 23

Figure 3: Evolution of responses



Source: IBRO LARC-CEPAL Survey 2020

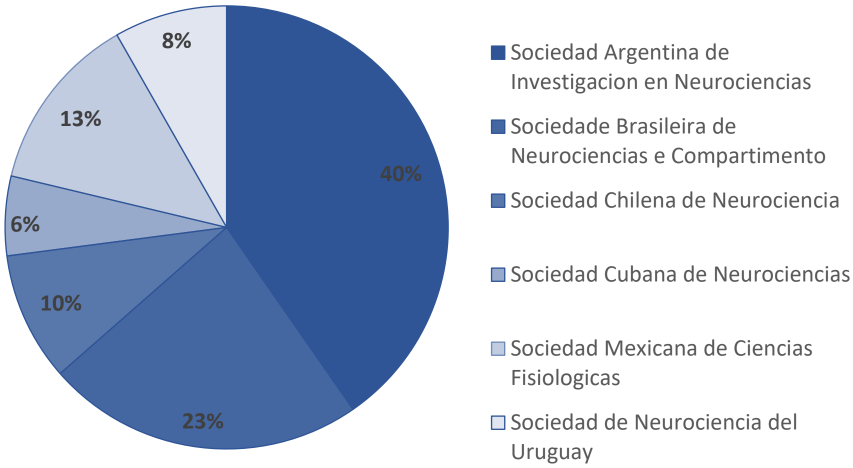
Figure 4: Proportion of responses over total sent invitation by country



Source: IBRO LARC-CEPAL Survey 2020

The composition of the final sample is presented in *Figure 5*. Although Argentina and Brazil are not the countries with the highest response rates -as the associations from these countries have the largest number of members - more than 60% of the population surveyed are from those countries.

Figure 5: Sample composition by IBRO-LARC association

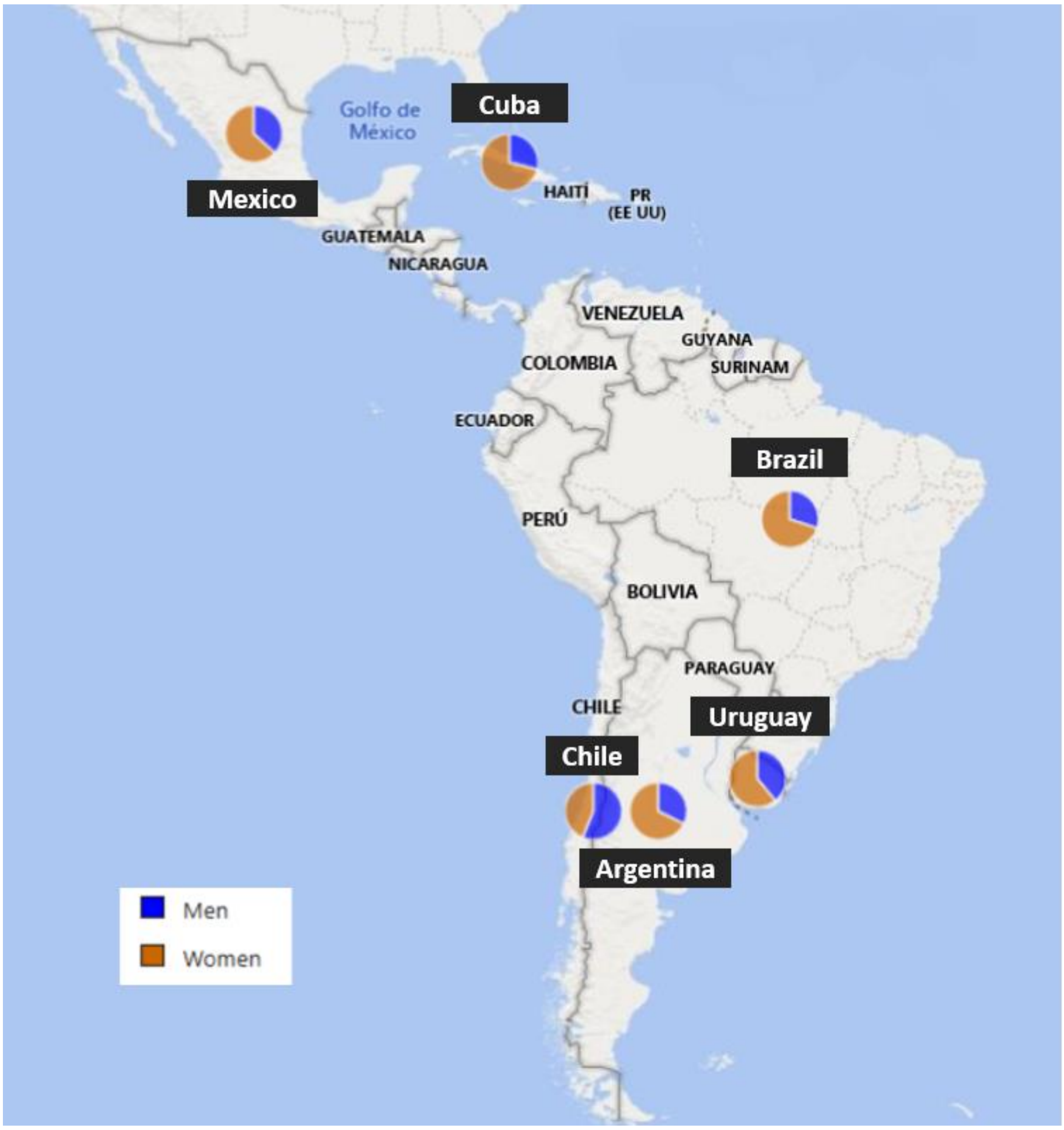


Source: IBRO LARC-CEPAL Survey 2020

The gender distribution of the responses shows that, except in the Chilean Society for Neuroscience, the majority of those who responded to the survey were women. Women represent 70% of the total in Argentina, Brazil and Cuba. In the case of Uruguay and Mexico, the women's share is around 60%, while in Chile the situation is reversed and more than half of the surveyed population are men (56%). The distribution by sex for each country is detailed in *Figure 6*.

The limitations of this study are associated to the type of sampling; as it is a convenience sampling, it is likely that we have captured a more significant proportion of women and men sensitive to the topics under study. Therefore, the generalization of the sample data cannot be carried out in other populations. On the other hand, the differential response rates by country make it difficult in many cases to disaggregate data at this level, particularly in the case of Cuba.

Figure 6: Sample composition by sex and IBRO-LARC association



Source: IBRO LARC-CEPAL 2020 Survey.

3. Survey results

3.1. Sociodemographic characterization of the population surveyed

This section begins by characterizing the neuroscientists that completed the survey in sociodemographic terms. We assessed the age composition of the sample, racial/ethnic descendent, current geographic location, and homes' characteristics . Likewise, special attention was given to reproductive patterns and care burdens by sex, seeking to identify age differences in motherhood or parenthood, the number of children and the division of unpaid work in the family.

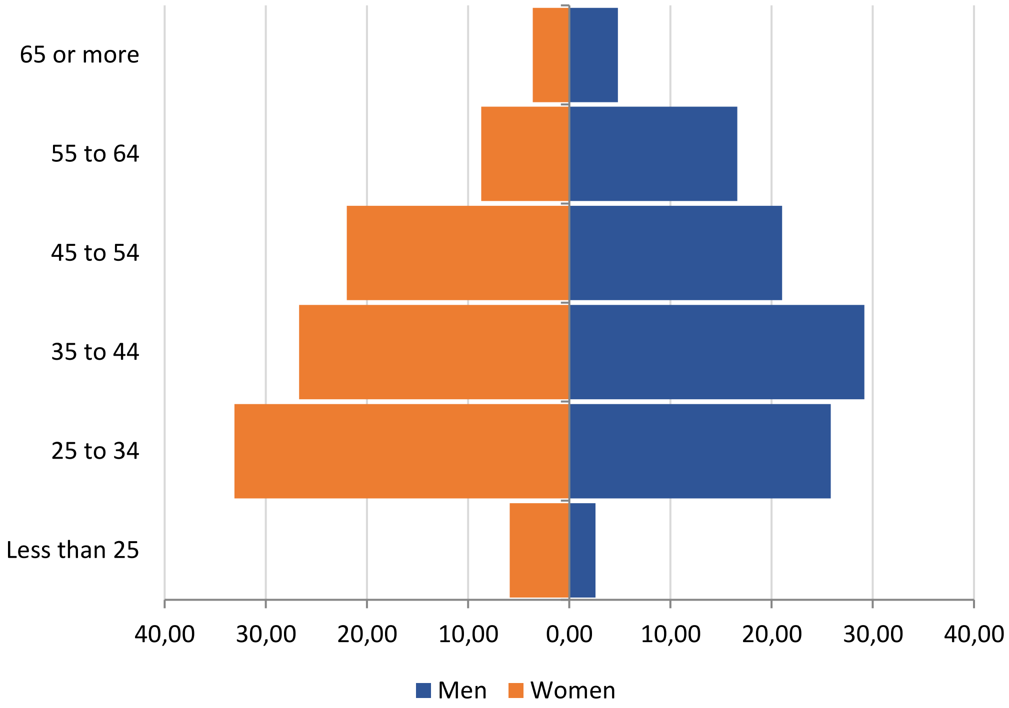
A total of 776 neuroscientists (271 men and 505 women) provided information on their sociodemographic characteristics and their households composition. Most of them are aged between 25 and 34 years and between 35 and 44 years. The average age of female respondents is 40 and that of male respondents 43; the youngest person who answered the survey was 20 years old and the oldest 82 years old.

Figure 7 shows the proportion of respondents by age and sex, considering six age groups.

The ethnic/racial composition of the sample accounts for a higher representation of neuroscientists with white descent (67%), followed by mestizos (22%). A smaller share of the respondents state being of African American descent or other. The ethnic/racial composition is similar between men and women.

The vast majority of the neuroscientists who participated in the survey have nationality and residence in the 6 reference countries of the study, Argentina, Brazil, Mexico, Chile, Uruguay and Cuba. A smaller group of researchers reside in these countries but are from other Latin American countries (in particular Colombia and Venezuela), or from other European countries and North America. Similarly, a small proportion of national researchers from the six reference countries currently reside in third countries, most of them in the United States.

Figure 7: Age pyramid by sex



Source: IBRO LARC-CEPAL 2020 Survey.

Figure 8: Ethnic/racial descent

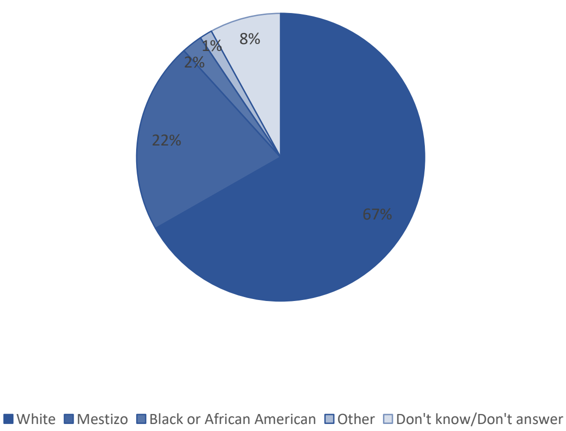
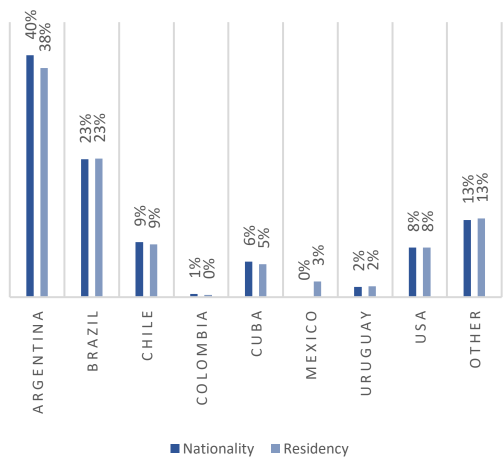


Figure 9: Nationality and country of residence



Source: IBRO LARC-CEPAL Survey 2020

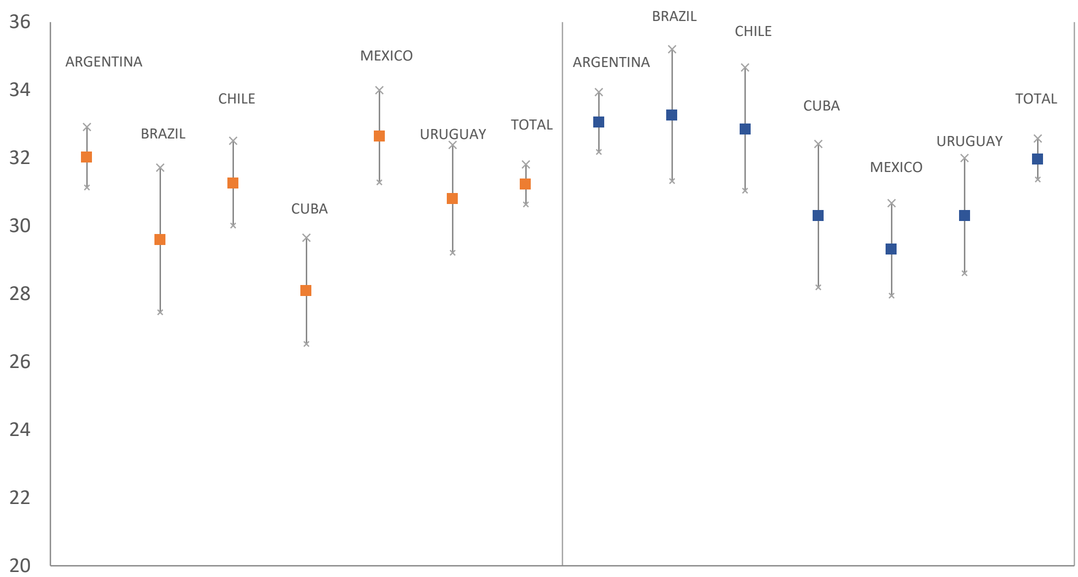
Just over half of the neuroscientists surveyed have children. 54% of men and 50% of women have children. Regarding the number of children, no significant differences were found: men have an average of 2 children while women of 1.7.

The delay childbearing is a phenomenon verified for women with high educational levels worldwide and in Latin America. According to Cabella & Pardo (2014), Latin American countries show significant heterogeneity in women‘s average ages with tertiary education at first birth. In 2010, university-educated women who had been mothers were 11% in Uruguay and 45% in Ecuador. Despite this heterogeneity, women with tertiary education in several Latin American countries systematically reduce fertility at the youngest years.

Among the neuroscientists surveyed, the average age at first birth presets similar calendars; half of them have children after 30. The father´s mean first birth is 32, and mother´s mean age is 31. However, some differences are found by country. Women neuroscientists from Uruguay and Mexico are older at first birth than their male colleagues. In Uruguay, on average, the age difference is one year (31 years old) and in Mexico, there is a three year-difference (33 years old). In the rest of the countries, women have their first child a few years earlier than their male counterparts: in Brazil, 4 years earlier in the case of Chile 2 years earlier, and in Argentina one year earlier**¡Error! No se encuentra el origen de la referencia.** (*Figure 10*). These differences among countries warns us that we need to complement these statements with more comprehensive information for populations with high educational levels.

Household composition is similar for male and female neuroscientists. A higher prevalence of couples without children is observed between both sexes, followed by one-person households and couples with children (*Figure 11*). In female neuroscientist households, 1 in 10 are lone-parent households with children, while around 2 out of 10 live with other relatives. Among the latter, more than 40% live with other relatives over 65 years of age. For male neuroscientists, households made up of other family members are 1 in 10.

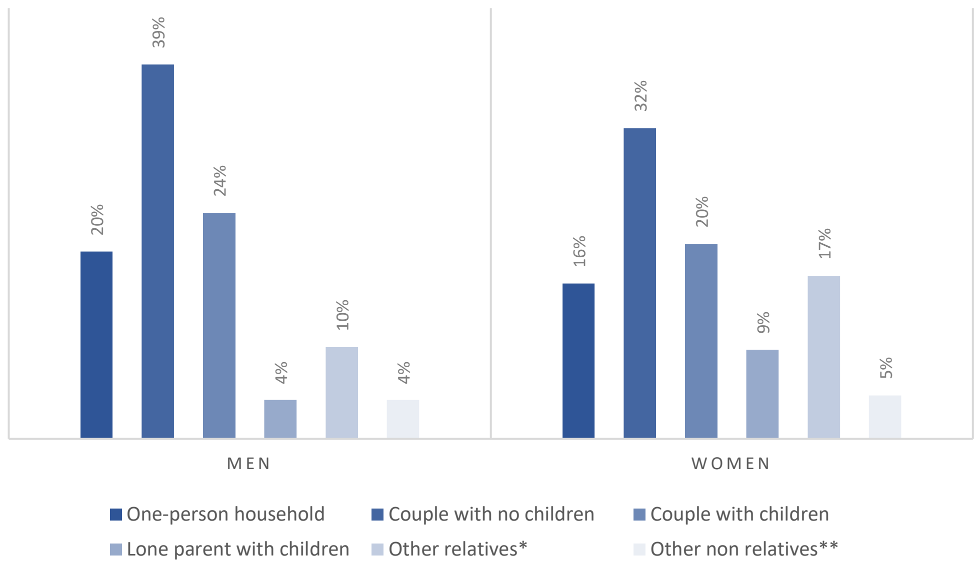
Figure 10: Average age of childbearing by country and sex



Note: the points show the means and the crosses the confidence intervals (95%).

Source: IBRO LARC-CEPAL Survey 2020

Figure 11: Household composition by sex



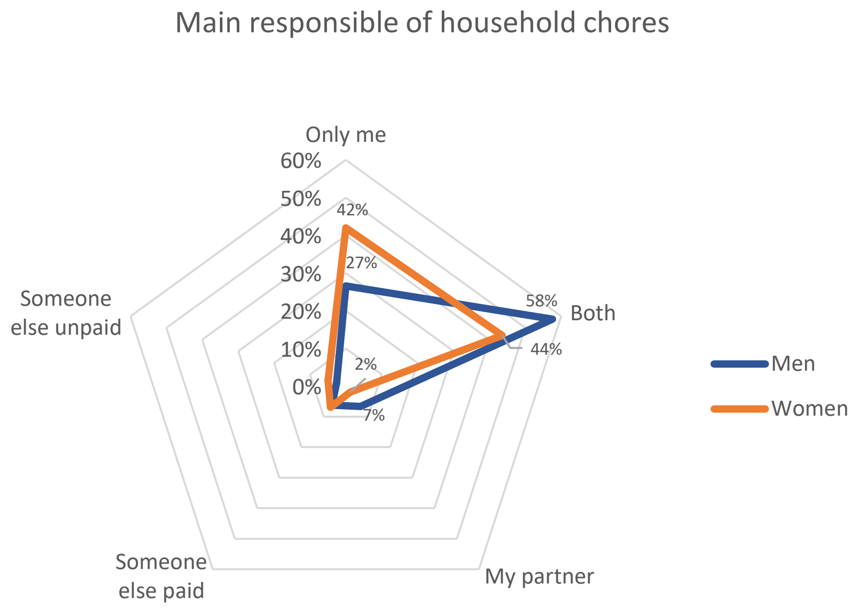
Source: IBRO LARC-CEPAL Survey 2020

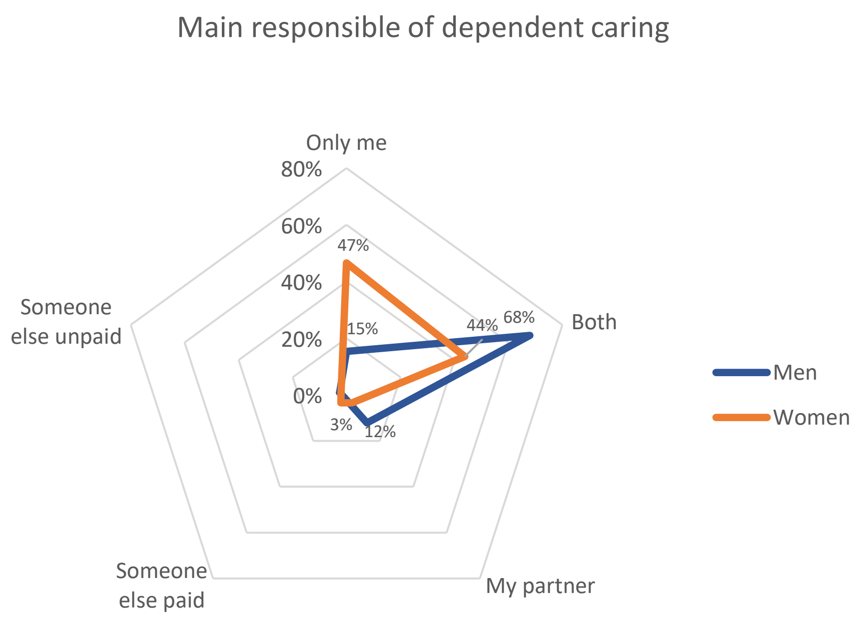
The distribution of domestic and care responsibilities shows marked differences by sex. Household responsibilities include daily household chores, such as cleaning the house, shopping for groceries, and paying bills. Among men, 27% declare that they are the main responsible of household chores , while among women this percentage rises to 42%. For the men surveyed, it is more usual to share domestic responsibilities with their partners, 6 out of 10 men selected this option. Among women, this occurs only for 4 out of 10. Resorting to pay for domestic work and to unpaid work assistance -probably from other family members- is similar for both sexes (*Figure 12*).

Care tasks, meanwhile, include caring for dependents such as children, the elderly, or people with disabilities. These tasks involve many types of manual and affective activities, such as preparing food, clothing, taking care of personal hygiene, medical care, and keeping company or emotionally supporting dependent people. Differences between men and women in the time dedicated to these activities are even more salient. Among men, 15% declare that they are the principal caregivers, while among women this proportion rises to 47%. 7 men out of 10 whereas 4 women out of 10 declare sharing care tasks with their partners. The differences are also noteworthy about pointing the partner as the primary provider of care: among men, 12% declare their partners as the primary providers, and among women, only 3% do so. (*Figure 12*).

The unbalances found for the neuroscientists support previous research findings that account for the more significant burdens of domestic work and care in women's working hours, compared to men. Studies on the use of time have shown that even among professional men and women with high educational levels, women experienced higher levels of caregiver and domestic work-burden than men (Batthyány, 2015).

Figure 12: Distribution of domestic and care responsibilities by sex





Source: IBRO LARC-CEPAL Survey 2020

3.2. Selection of study disciplines and main area within neurosciences

This section describes the distribution of male and female researchers in the cognitive areas comprising neuroscience and analyzes the explanation they give for choosing those areas of study.

Neuroscience is, as already mentioned, a multidisciplinary field of knowledge that covers different branches of biological sciences, natural sciences, cognitive and educational sciences, and various neurological specialties within medicine and, more recently computing science and engineering. In this sense, it is relevant to ask ourselves whether the horizontal segregation patterns, according to gender, are reproduced within neuroscience.

Table 1 synthesizes data from male and female undergraduate disciplines showing that more than half of the neuroscientists, surveyed come from the Biological Sciences. Among women neuroscientists 55% come from this area, followed by Health Sciences (11%), Psychology (7%), and Chemical Sciences (5%). Among men, the majority also come from Biological Sciences (57%), followed by Clinical Medicine (11%), Health Sciences (8%), Psychology, and Physical Sciences (both 5%).

Among male neuroscientists, 10% have bachelor´s degrees in mathematics, physics, computer science, and engineering[14], while among women neuroscientists, this occurs in 4% of cases. This distribution shows that the traditional horizontal segregation pattern also appears to be affecting the neuroscience.

Among the specific accumulation areas of neuroscience, it is observed that both sexes are the majority in molecular and cellular neuroscience, followed by behavioral neuroscience, neurophysiology, and cognitive neuroscience. Some accumulation areas, such as neurophysiology and theoretical neuroscience show a higher proportion among the men surveyed (Table 2). As it can be seen in the table, the category "others"

[14] Other engineering and technologies, Physical sciences, Computing and informatics, Electrical engineering, Mathematics, Nano-technology, Chemical engineering, Industrial biotechnology, Mechanical engineering and Medical engineering.

accumulated between 7% and 8% of responses, so it will be necessary to review their coding in the future.

Both genders main motivation to study neuroscience is vocation and teachers' influence, followed by personal skills and career challenge. Material factors, linked to salary or employment prospects, are the least mentioned justification for selecting this field (*Figure 13*).

Table 1: Bachelor's degree disciplines by each sex

Disciplines	Men	Women	Disciplines	Men	Women
Biological Sciences	56.98%	54.62%	Electric engineering	1.13%	0.40%
Health Sciences	7.92%	11.04%	Economics and business	0.00%	0.40%
Psychology	4.91%	6.83%	Chemical engineering	0.75%	0.20%
Chemical sciences	2.64%	5.22%	Mathematics	0.38%	0.20%
Clinical medicine	11.32%	4.82%	Industrial biotechnology	0.38%	0.20%
Other medical sciences	1.51%	4.42%	Other humanities	0.38%	0.20%
Basic medicine	2.26%	3.61%	Nanotechnology	0.00%	0.20%
Other natural sciences	0.75%	2.41%	Animal and dairy science	0.00%	0.20%
Other engineering and technology	0.38%	1.00%	Educational sciences	0.00%	0.20%
Physical sciences	4.91%	0.80%	Law	0.00%	0.20%
Health biotechnology	0.38%	0.80%	Mechanical Engineering	1.51%	0.00%
Veterinary science	0.38%	0.80%	Medical engineering	0.38%	0.00%
Computer and information sciences	0.38%	0.60%	History and archeology	0.38%	0.00%
Languages and literature	0.00%	0.60%	Total	100.00%	100.00%

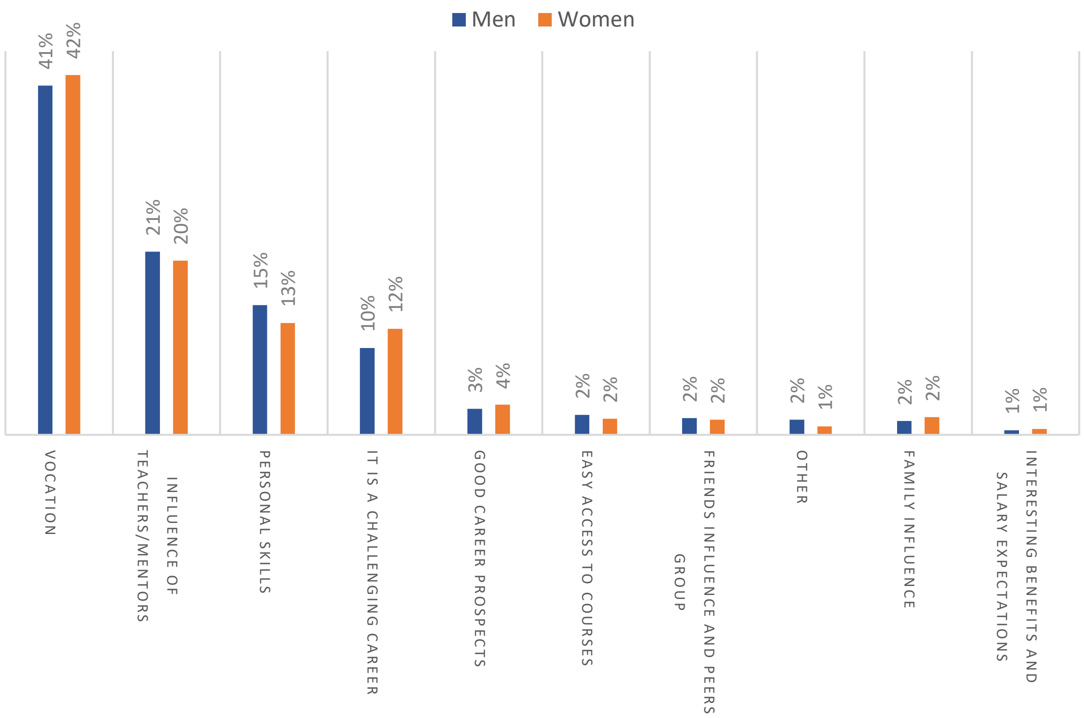
Source: IBRO LARC-CEPAL Survey 2020

Table 2: Main area of accumulation within the neurosciences by sex

	Men	Women
Molecular and cellular	27%	32%
Behavioral neuroscience	19%	24%
Neurophysiology	17%	13%
Cognitive neuroscience	11%	12%
Developmental neuroscience	6%	5%
Sensory neuroscience	6%	2%
Clinical neuroscience	4%	2%
Theoretical neuroscience	3%	0%
Neurogenetics	0%	1%
Others	7%	8%

Source: IBRO LARC-CEPAL 2020 Survey.

Figure 13: Main motivation to study neuroscience by sex



Source: IBRO LARC-CEPAL Survey 2020

3.3. Neuroscientists’ training trajectories

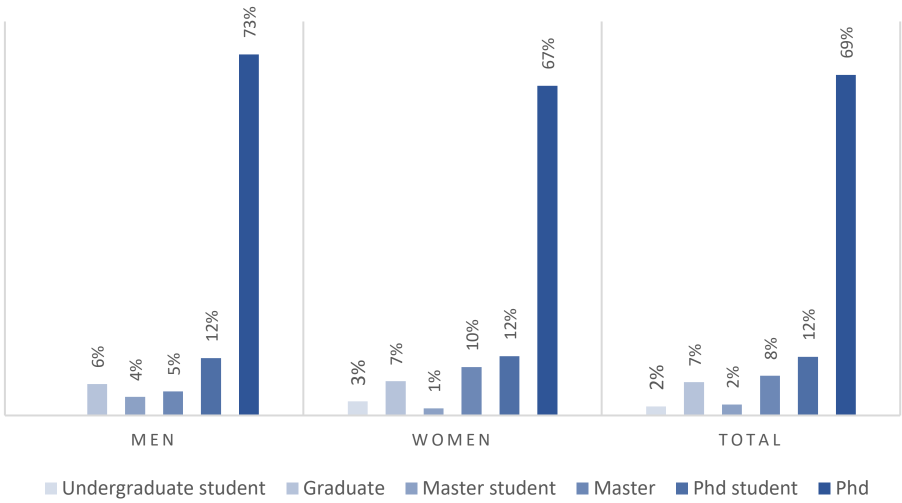
This section analyzes the gender gaps at the different levels of undergraduate and postgraduate training (master's and doctorate), incorporating a review of the access to scholarships and the completion of studies abroad. It is particularly interesting to compare the length of training and their possible interaction with gender roles, particularly at doctoral levels.

The vast majority of neuroscientists have completed their PhDs training levels (69%): a small proportion are currently PhDs students (12%), masters (8%), master's students (2%), graduates (7%), or undergraduate students (2%) (*Figure 14*). Among women, 67% are Ph.D., 12% are Masters and 7% are graduates, while 73% of men are PhDs, 5% are Masters and 6% are graduates. This distribution remains similarly between countries, except for Cuba where the low proportion of responses does not allow disaggregation for this level of analysis.

The survey also inquired about access to financing for undergraduate and postgraduate studies. In particular, they were asked about their access to total or partial scholarships at all study levels. The data do not show differences between men and women´s access to scholarships. 33% of the researchers completed their undergraduate studies with scholarships. At the same time , at the postgraduate level, a more significant number of neuroscientists received some type of scholarship, 80% for their master's studies, and more than 90% for their Ph.D. studies (*Figure 15*). In most cases, the respondents received full scholarships to complete their graduate training levels (*Figure 16*).

Regarding studying abroad, differences are observed between each sex, particularly at the postgraduate level. As seen in *Figure 17*, the proportion of men studying abroad increases from master's level to doctoral level, this does not occur among women. Among men, 18% complete master's degrees and 30% earn a doctoral degree outside their country of origin whereas 24% of the women are pursuing their master's and doctoral studies abroad. The possibilities of international mobility for postgraduate training, especially at the doctoral level, can be a key point for the construction of international networks at the beginning of academic life. Exploring what type of limitations women face at this level is key to remedying possible situations of inequity in the construction of their career future.

Figure 14: Higher educational level achieved by sex



Source: IBRO LARC-CEPAL Survey 2020

Figure 15: Access to scholarships by education level and sex

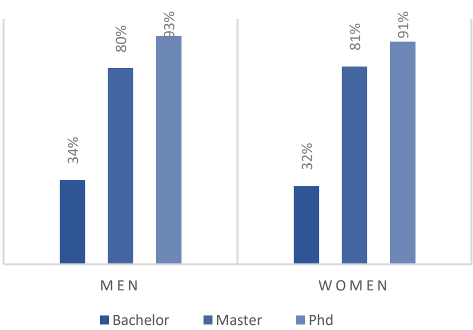
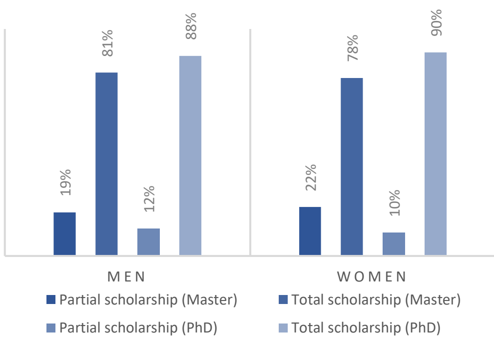
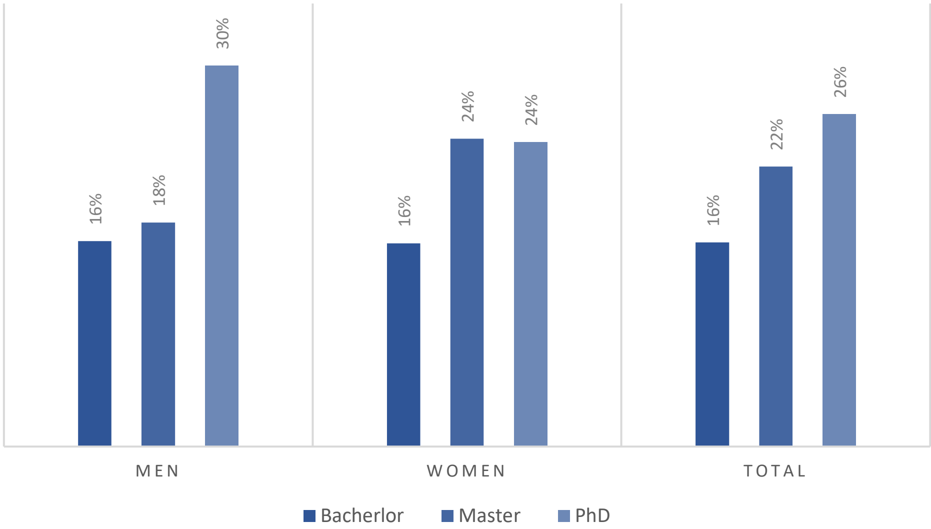


Figure 16: Type of graduate scholarship by sex



Source: IBRO LARC-CEPAL Survey 2020

Figure 17: Studies abroad by education level and sex

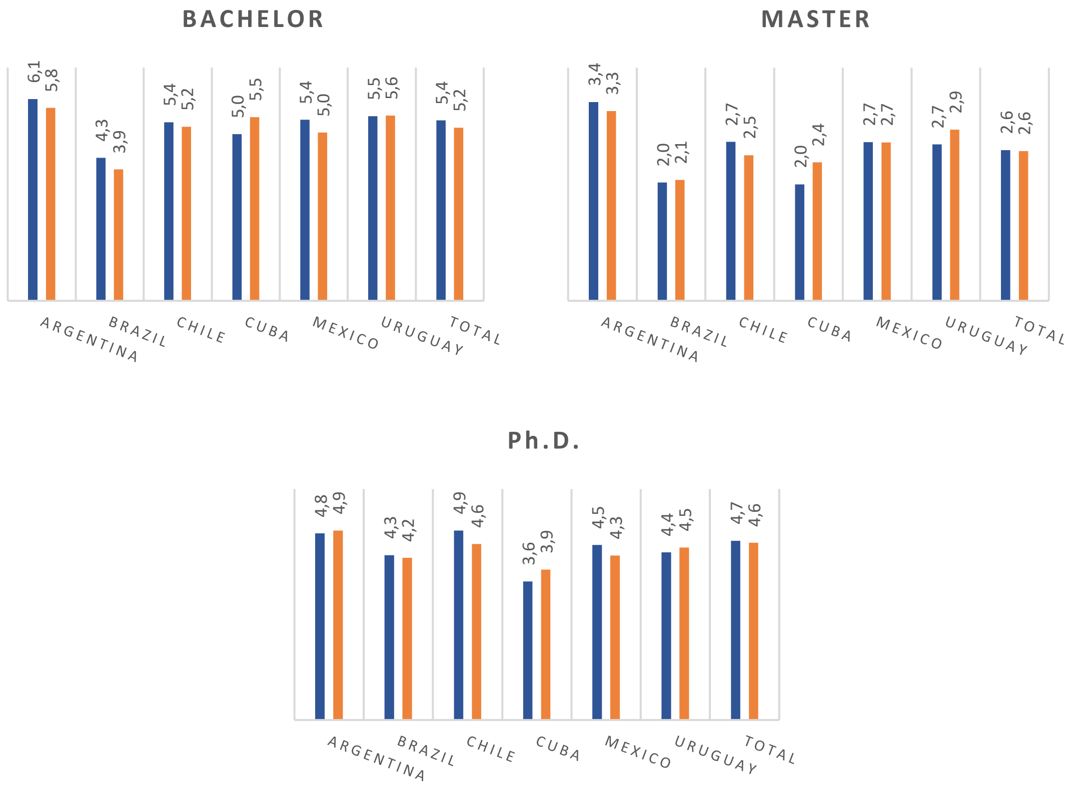


Source: IBRO LARC-CEPAL Survey 2020

3.3.1. Interruptions in undergraduate and graduate studies

Figure 18 evidences that the duration of undergraduate and graduate studies varies by country but does not show significant differences by sex. Brazil is the country with the shortest undergraduate and graduate degrees. Those with the most extended training length are Argentina and Uruguay (in undergraduate and master's degrees) and Argentina and Chile (in Ph.D.).

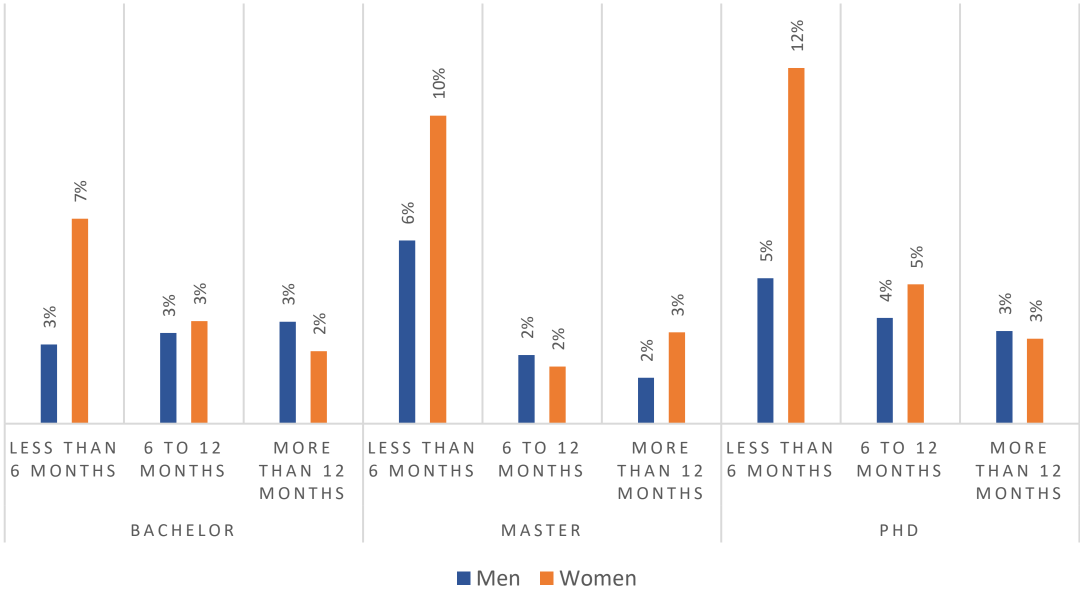
Figure 18: Average years of duration of each level of study by country and sex



Source: IBRO LARC-CEPAL Survey 2020

Although the duration of each education level does not evidence significant differences by sex, there are differences in the interruptions that women and experience during their training trajectories. Among the women surveyed, 36% state that they have interrupted their training career at some point. Most of those interruptions occur in their doctorate (19%) and master’s (15%) studies. Among men, 24% declare having interrupted their training trajectory at some point, 11% do so in their doctorate and 10% in their master's degree. In most cases, these are short-term interruptions, less than six months, for both men and women (*Figure 19*).

Figure 19: Duration of interruptions by education level and sex

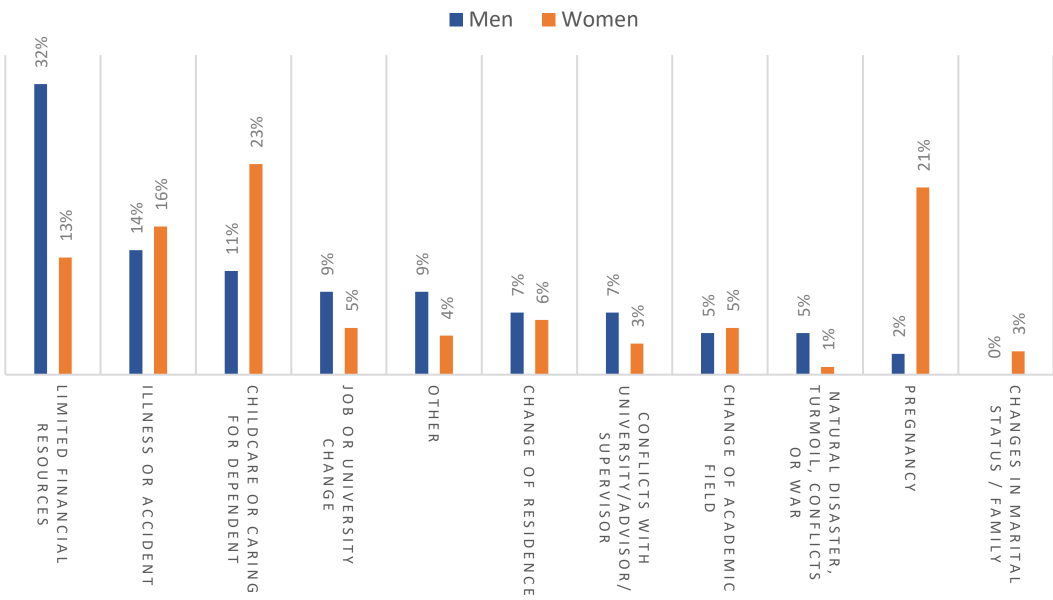


Source: IBRO LARC-CEPAL Survey 2020

The causes of interruption vary substantially by sex (*Figure 20*). Women interrupt their career trajectories due to child, and dependent care responsibilities, followed by pregnancies and thirdly due to illness or accidents. While among the men surveyed, most of the interruptions are justified by limitations in financial resources, followed by illness or accidents, and in third place, dependent care responsibilities.

The different causes determining interruptions seem to be indicating a traditional structure of gender roles regarding the productive and reproductive responsibilities. The remaining causes of interruption are distributed in a similar way between men and women, with variations of one or two percentage points. Changes in marital status (marriage, separation, widowhood, etc.) are only reported by women, however, in a much smaller proportion of the responses.

Figure 20: Cause of the main interruption for each sex



Source: IBRO LARC-CEPAL Survey 2020

The influence of gender roles, particularly those associated with childcare responsibilities, is one of the hypotheses to explain gender gaps in academic science. In this sense, it is relevant to explore in greater depth the potential influence of care responsibilities of both men and women on their academic careers. In particular, it is interesting to explore such influence on Ph.D.´s levels, since not only it is a key level for the advancement of future researchers, but it is also where we find greater coincidence with the age at which women´s begin their reproductive years, as we observed when we analyzed the average age at first birth.

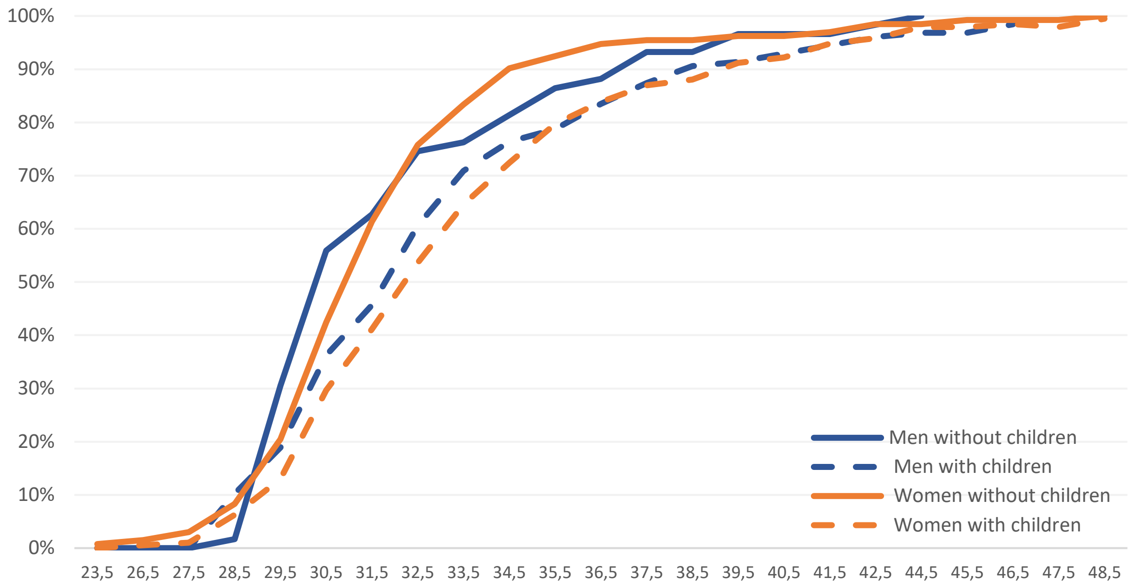
To explore this possible influence, a survival analysis is performed using the Kaplan Meier technique. This technique allows us to observe the survival curves to specific events, in this case, achieving a doctorate. It also allows us to compare the calendars of events; this is, the moment when the event is experienced according to population groups. We can also compare the age at which men and women neuroscientists with and without children receive PhD´s.

Figure 21 shows the survival curve as the cumulative proportion of doctorate graduation ages according to sex and childbearing. The first relevant observation is that women and men with children graduate later than their childless colleagues. The calendars show the earliest graduation ages for men without children and the later ones for women with children. We also observe some interesting differences when comparing these groups. The earliest graduation calendars for men without children are in the first quartile of graduates, that is, 25% of students who graduate first do so before the age of 29.5, while 25% of women who graduate first do so a year later, at the age of 30.5. The same happens with the median of graduations; 50% of them in the case of men without children accumulates at the age of 30.5, while among women, this happens a year later.

As already mentioned, the graduation calendar for men and women with children is the latest. The graduation ages for the first and second quartiles of PhDs are 30.5 a 32.5 for both men and women. In the third quartile of graduations, women with children accumulate one more year of difference with their male colleagues with children. The age of graduation for women with children is 35.5.

Figure 21: Age of graduation from the doctorate according to sex and presence of children

Kaplan Meier survival curves (Cumulative percentage).[15]



Note. Pr> chi2 = 0.0002.

Source: IBRO LARC-CEPAL Survey 2020

Table 3: Summary measures of doctoral graduation ages according to sex and presence of children

	First quartile (25%)	***Median (50%)***	***Third quartile (75%)***	***Interquartile range***
Men without Children	29.5	30.5	33.5	4
Men with Children	30.5	32.5	34.5	4
Women without Children	30.5	31.5	32.5	2
Women with Children	30.5	32.5	35.5	5

Note. Pr> chi2 = 0.0002.

Source: IBRO LARC-CEPAL Survey 2020

[15] Expenses after age 50 are excluded.

3.4. Access to teaching and research positions in neurosciences

This section explores the forms of vertical segregation in access to teaching and research positions, and other relevant dimensions of neuroscientist´ academic careers. In addition to exploring some fundamental indicators by sex, it is interesting to deepen the analysis by comparing (i) the average time it takes for men and women to access the highest teaching positions, (ii) the distribution of hours that they allocate to different academic activities, (iii) the training of undergraduate and graduate human resources, (iv) the participation in evaluation and negotiation of academic careers (v) the degree of satisfaction with the career, and (vi) how they consider motherhood / fatherhood has impacted on their academic careers (and vice versa).

There is no common definition or scale of academic and research positions in Latin America that allows us to compare the distribution by sex for the six countries. For this reason, a standard categorization was proposed in the survey form [16]: (i) Grade A: defined as the highest grade in which research is normally conducted. Example: Full professor. (ii) Grade B: represents researchers working in a position not as high as the top position (A), but higher than recent Ph.D. graduates. Example: associate professor or principal investigator, (iii) Grade C: this is the first grade in which a newly qualified Ph.D. would usually be recruited. Example: assistant professor or postdoctoral fellow. (iv) Grade D: Ph.D. students participating as researchers or researchers working in positions that do not usually require a Ph.D. Example: Ph.D. junior students or researchers. An open option was also enabled to include the description of the cases that were outside these options.

Among the women neuroscientists surveyed, 50% currently occupy positions of lower hierarchical rank, grade C or D positions, 25% occupy academic positions in grade B, corresponding in general to associate professors or principal investigators and 17%

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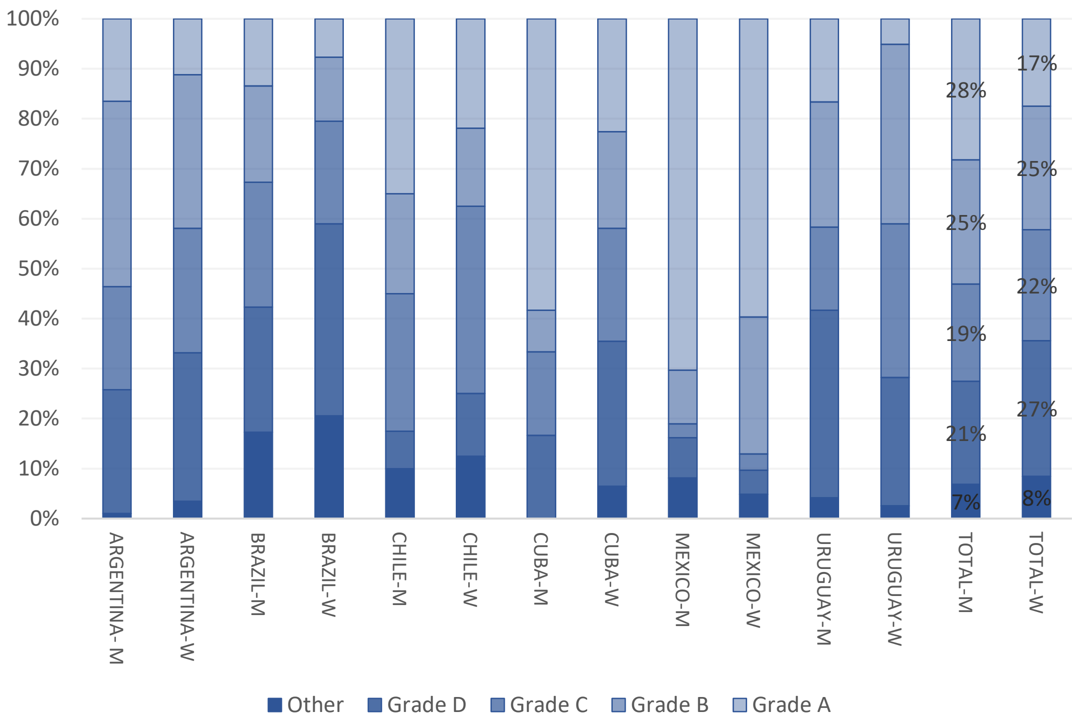
[16] Based on European Union’s classification in 2013 and recommended by UNESCO, (2017) b to study gender inequalities in science.

occupy positions grade A or of tenured professors. Among men, 40% are located in the lowest career positions, C or D, 25% in B grade positions and 28% in A grade position (*Figure 22*). This distribution is similar for most of the countries analyzed, except for Mexico, where over 80% respondents occupy high-ranking positions (grade A and B) In most countries, respondents have full-time contracts

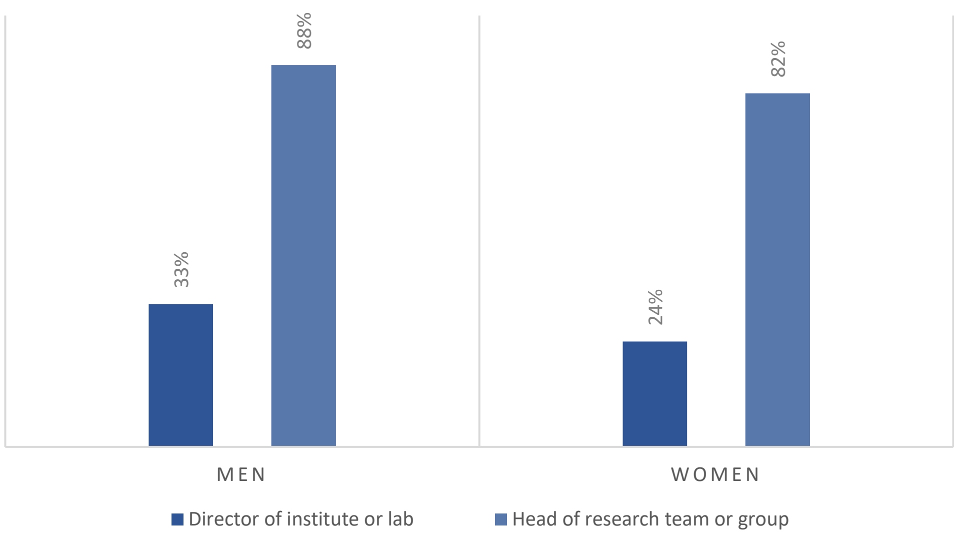
A minimal share of the respondents declared having accessed the highest hierarchical positions in the academic structure: 2 women have been Rectors or Vice-Rectors and 5 have been Deans. In contrast 5 men have been Rectors and another 5 Deans. Regarding leadership positions within institutes or research groups, it is observed that among men with higher positions (grades A or B) 33% have reached management positions. In comparison among women, this happens only in 24% of the cases. A more significant proportion of respondents at the higher grades have served in leadership positions for research groups. Among women full or associate professors, 82% have been leaders of research groups, while among men, 88% have exercised leadership (***¡Error! No se encuentra el origen de la referencia.***).

Figure 22: Distribution of teaching and research positions by sex and country



Source: IBRO LARC-CEPAL Survey 2020

Figure 23: Academic leadership positions *



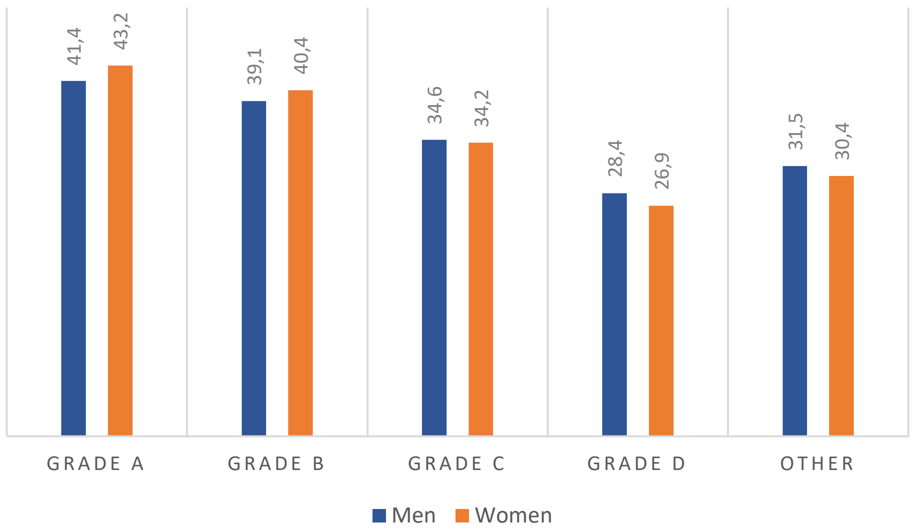
*Note: the proportion of directors and group leaders is calculated on the total of grades A and B for each sex.
Source: IBRO LARC-CEPAL Survey 2020

Ages and duration of access to hierarchical positions

Access to hierarchical positions is not the only relevant indicator of vertical segregation in science. A complementary indicator is how much time it takes for men and women to access these positions. This can be analyzed from two perspectives: the number of years it takes them to reach high-rank positions and the age at which they access such positions. Studying these two indicators allows us to understand the process that men and women must go through until they reach their positions.

The data presented in *Figure 24* show that a differentiating factor in men and women's trajectories among the neuroscientists surveyed is the age at which they access to their current positions. Although, on average, women access the lowest positions (Grades D) at younger ages (27 years) than their male colleagues (28 years), the situation is reversed in the highest positions (Grades B and A). In the latter, women reach the position a year or two later than men.

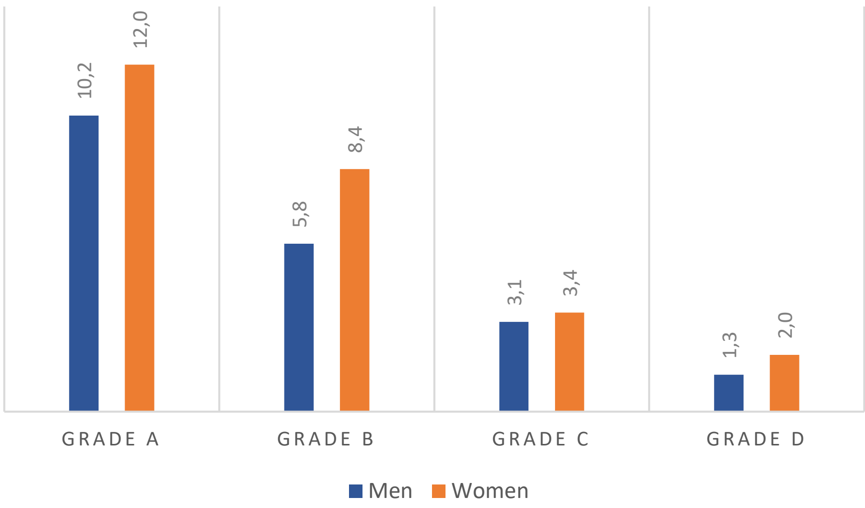
Figure 24: Average age of access to the position by grade and sex



Source: IBRO LARC-CEPAL Survey 2020

Regarding the timing to reach each position, we observe that it takes longer for women to access teaching positions at all levels, particularly at higher levels. It takes women 2.5 and 2 more years to reach grades B and A, respectively (*Figure 25*).

Figure 25: Average access time to the current position by grade and sex (in years)



Source: IBRO LARC-CEPAL Survey 2020

Survival analyze is performed using the Kaplan Meier technique to analyze these differences in access to higher-ranking positions. To do this, we considered the access to Grade A position as an event and analyzed how long it took (in years) for men and women to obtain this position since they first entered the institution.

The survival curve of *Figure 26***¡Error! No se encuentra el origen de la referencia.** shows that men are more likely than women to access high-ranking positions in all durations, both at the beginning of the curve, -where people who access in earlier durations are located, as well as those who access in later durations. *Table 4* summarizes the calendars that show access to these positions by quartiles, evidencing that women access to high-ranking positions several years later than their male colleagues in all cases. The differences are more significant among teachers with the earliest calendar (first quartile), which shows that it takes men 10.5 years to become tenured teachers, whereas it takes women 15.5 years. In the median, men and women difference is reduced to 3 years and then rises again for teachers with later calendars (third quartile), where the differences are also 5 more years for women. There are significant differences between men and women teachers who access these positions earlier (first quartile) and teachers who enter later (third quartile), which is reflected in an interquartile range of 14 years for both sexes.

The factors that lead to a lower representation of women in high-ranking positions are multiple and complex. The main hypotheses in the literature point out the importance of studying biases in the evaluation of women's merits (Nielsen, 2016), in the submission of women to the positions, calls (Bosquet et al., 2019), as well as in the differences in men and women performance, mainly in terms of productivity in articles publication. Lower productivity rates for women is a phenomenon widely observed in science in general (Cole & Zuckerman, 1984; Huang et al., 2020) and in neuroscience in particular (Schrouff et al., 2019). There is, however, no consensus in the literature on the causes of such lower productivity; some studies seek explanations in the scientific activity itself, such as the impact of collaboration, participation in international networks, access to resources, among others(Lee & Bozeman, 2005; Uhly et al., 2017; West et al., 2013), whereas, others problematize the influence of gender roles, in particular care responsibilities. (Fox & Faver, 1985; Kyvik, S & Teigen, M, 1996; Xie & Shauman, 1998).

The causes determining inequality in access to positions among the neuroscientists surveyed should be analyzed in the future, considering the factors mentioned, particularly, productivity in publications and care responsibilities.

Table 4: Summary measures of the time required to access the position of full professor (in years) by sex

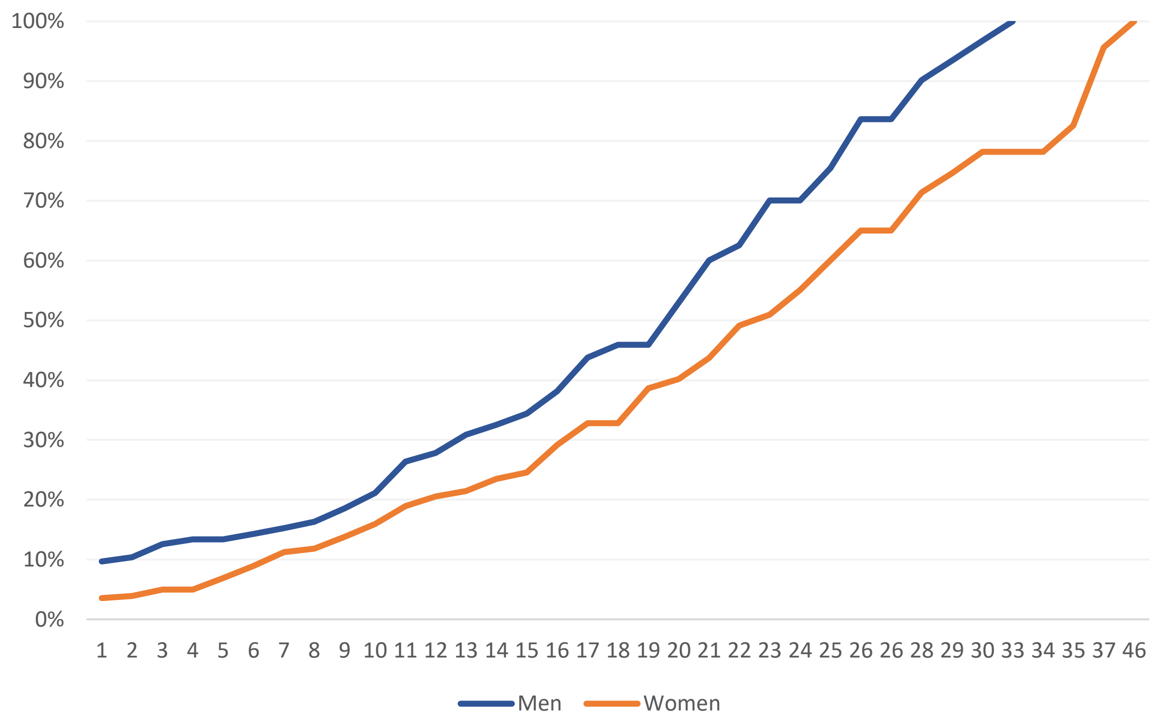
	First quartile (25%)	Median (50%)	Third quartile (75%)	Interquartile range
Males	10.5	19.5	24.5	14
Women	15.5	22.5	29.5	14

Pr> chi2 = 0.0000

Source: IBRO LARC-CEPAL 2020 Survey.

Figure 26: Time from first entrance to the institution to full professor grade (in years).

Kaplan Meier survival curves (Cumulative percentage)



Pr> chi2 = 0.0000

Source: IBRO LARC-CEPAL Survey 2020

3.4.1. Human resources training

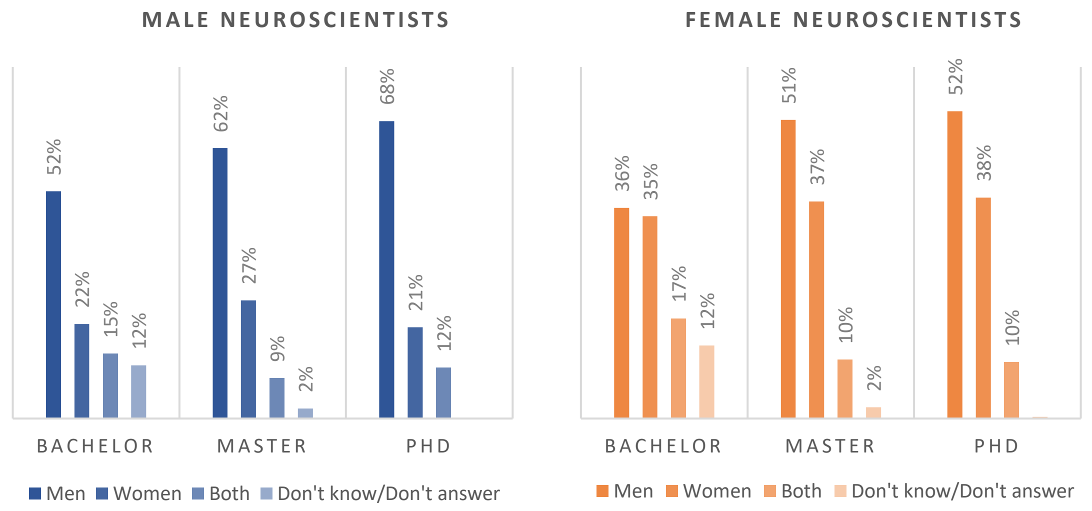
Human resources training is one of the main activities of academic careers. New teaching bodies are formed, research lines are reproduced and the critical mass that nourishes research teams is generated. Observing whether there are differences in how men and women train undergraduate students, and especially graduate students, is key to understanding whether this is a dimension that may be marking differences in the academic careers of neuroscientists. This analysis can be carried out considering who the respondents´ tutors were and whom the students they are currently training are.

In the first case, we observed that male tutors trained the majority of neuroscientists. Among the male respondents, more than 50% had a male tutor in their bachelor's, master’s, and doctorate degrees. At this last level, the proportion of male tutors is the highest, 68% of the surveyed male neuroscientists were trained in their doctorate by a male tutor, only 20% had a female tutor and 12% both.

Among the female neuroscientists surveyed, the majority had male tutors at all levels, but in this case, the differences were smaller. At the doctoral level, 51% of the women had male tutors, another 38% were trained by female tutors, while the remaining 10% were tutors of both sexes (*Figure 27*). The possibility of having positive gender role models regarding leading women scientists has been pointed out as one of the driving factors for the advancement and retention of women in science. Mentorships are a privileged space to reproduce gender models that empower female students, particularly in masculinized areas. The fact that the majority of women and men neuroscientists are trained with male tutors could be hampering the presence of these leadership models. In the future, it would be necessary to make this analysis more complex, for example, by comparing different birth cohorts to see what happens to the younger generations.

By the time the respondents were completing the survey, women neuroscientists were tutoring an average of five undergraduate students and men an average of three. At the postgraduate level, both tutors average two master's students and two doctoral students (*Figure 28*). When discriminating between teaching grades, we see, as might be expected, that the higher grades have a higher average number of students tutored. However, it is striking that women in the highest positions accumulate more undergraduate students than their male peers, at least 4 more students. At the same time, this does not occur with master's and doctoral students where the averages are similar (*Figure 29*¡**Error! No se encuentra el origen de la referencia.**).

Figure 27: Sex of the undergraduate and graduate tutor



Source: IBRO LARC-CEPAL Survey 2020

Figure 28: Average of tutored students according to student's level and sex

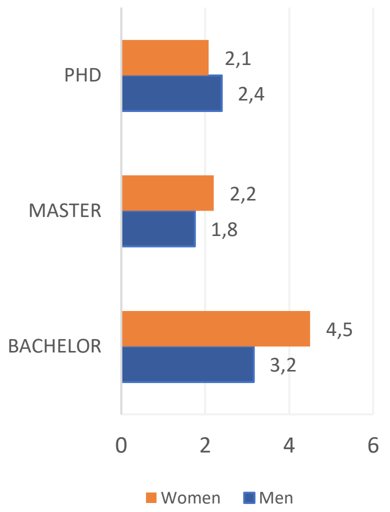
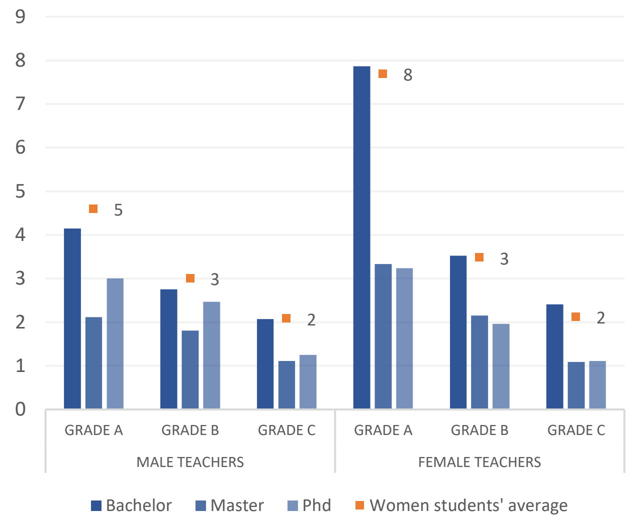


Figure 29: Average number of tutored students according to teacher's grade and sex *



* Note: the bars show the average of students at each level and the squares the total average of female students.

Source: IBRO LARC-CEPAL Survey 2020

3.4.2. Academic activities

The survey inquired about the distribution of weekly hours dedicated to the various activities that make up academic work, including hours dedicated to teaching, research, dissemination of results, extension, institutional or administrative management, and university government activities. When we collectively analyze the hours allocated to the various activities, we observe that 35% of those surveyed declare weekly workdays of less than 40 hours, 54% between 40 and 60 hours and, 11% more than 60 hours. Dedication to academic activities of men and women is distributed similarly way in these groups. Among women, 32% work less than 40 hours, 55% between 40 and 60 hours and, 13% declare working more than 60 hours per week. Among men, 40% are positioned in less than 40 hours, 52% work between 40 to 60 hours and, 8% dedicated more than 60 hours per week.

The time allocated to the different activities varies substantially according to the stages of academic careers and teaching grades. *Figure 30* shows the distribution of the academic week (taking the total weekly hours as 100%) with the different activities that researchers usually do. The evidence shows that neuroscientists at all levels dedicate the most significant amount of time of their weekly days to research activities, followed by teaching activities and management / administration activities.

Among the highest levels (grades A and B), men spend a more significant part of their day on research activities, than to their female colleagues at the same level. This situation is equated for Grades C and reversed for lower hierarchy (Grades D), where women spend more time on research than their male colleagues. The distribution of teaching hours is similar between men and women for most grades. The only group that presents differences in the proportion of hours is Grade B teachers, where women have slightly higher teaching loads. The proportion of hours devoted to extension activities is the lowest for all teaching grades. Again, differences, although small, are found between men and females Grade B teachers.

The tasks of institutional management and administration take up more time for higher grade teachers, as expected. Women in Grades A and B are the ones who dedicate the greatest amount of time to institutional management and administration activities, 14% and 12% of the hours of their weekly shift, respectively. Men in Grades A and B allocate 12% and 10%, respectively. Female Grade D teachers spend the least time on this activity, 6% of their working day, while their male colleagues spend a little more, 8% of their hours weekly.

Dedication to university government activities is more remarkable among A and B grade males, who, on average, consume 6% of their weekly workloads. In comparison their female colleagues at the same levels consume a maximum of 5% of their working hours. The lower grades, both men and women, dedicate a smaller percentage of their weekly days to these activities.

Finally, women in all grades are the ones who spend the most time on dissemination results activities, 13% (grades A), 11% (grades B and D), and 10% (grades C). In the case of men, grades A and D allocate around 10% of their workload, while a similar percentage is allocated in the remaining grades (7%).

Future explanations of men’s and women’s differences regarding their dedication to different academic activities should consider the influence of structural factors, such as the incentive and evaluation systems for scientific careers in each country, and subjective factors derived from gender roles. Some studies have shown how the distribution of academic work hours can reproduce gender inequalities with consequences in job satisfaction, productivity, and retention of women within scientific careers (Winslow, 2010).

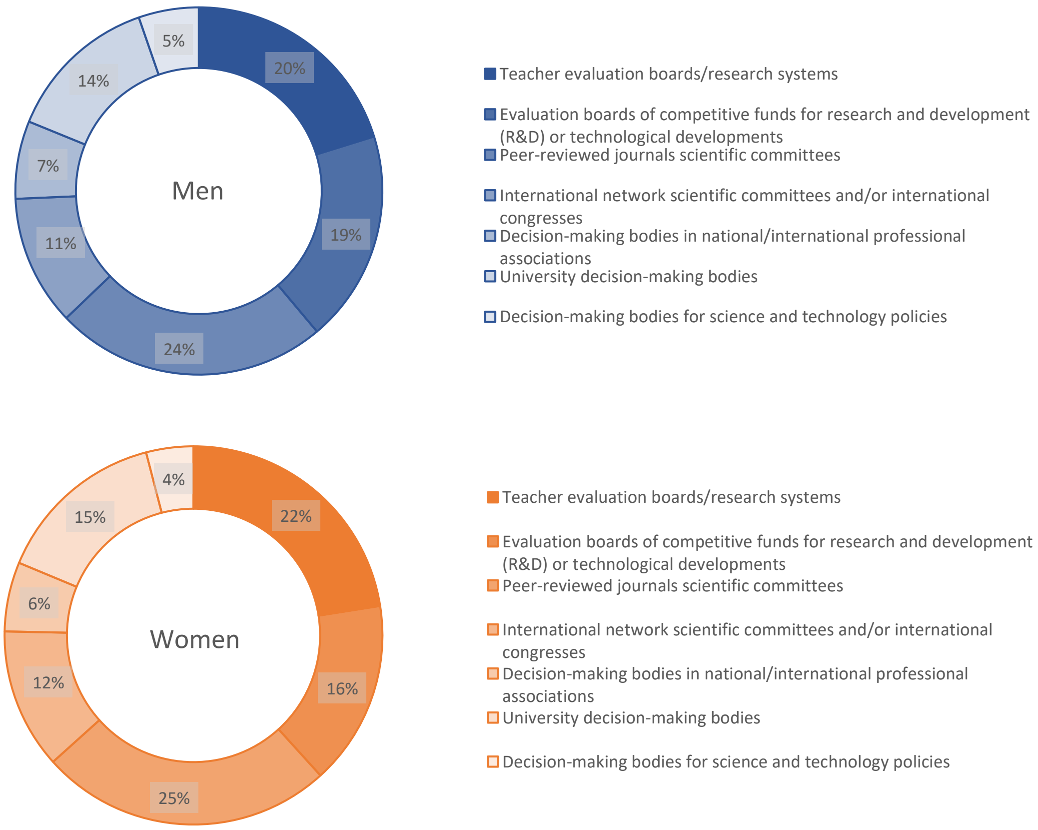
Figure 30: Allocation of working hours among different academic activities (% weekly hours)

Note: Total hours in the academic week= 100.

Source: IBRO LARC-CEPAL Survey 2020

Overall, participation in academic assessment activities is similar between men and women. However, small differences are observed; for example, fewer women participation is reported in evaluating of competitive research funds, typically, R&D project evaluation committees, and more participation in the evaluation of teaching competitions. In contrast, men participate in similar percentages in both activities. Both sexes declare to carry out peer evaluations for journals or scientific committees in similar percentages. Similarly, in the rest of the decision activities, similar percentages are observed for each sex.

Figure 31: Participation in evaluation and decision activities

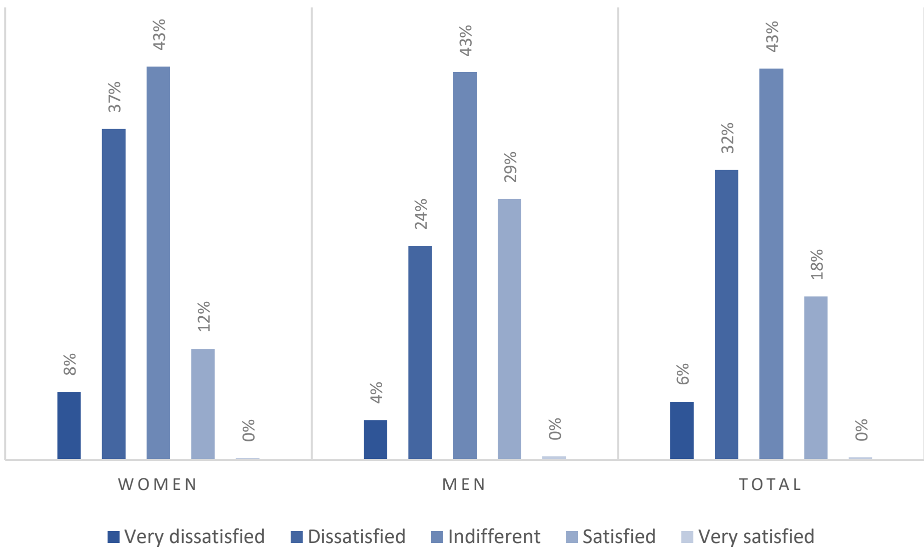


Source: IBRO LARC-CEPAL Survey 2020

3.4.3. Degree of satisfaction with the academic career

To analyze the degree of satisfaction with the career, a composite index of seven dimensions was constructed according to a Likert scale of 5 values (very dissatisfied, dissatisfied, indifferent, satisfied, very satisfied). The assessment of career satisfaction investigated issues like access to material resources (such as financing, human resources, and access to positions), peer groups recognition, comfort with the work environment, and reconciliation with family life. Although the majority of those surveyed are in a neutral position, the degree of satisfaction varies substantially between men and women neuroscientists. 37% of women declare they are dissatisfied with their academic careers while this happens to 24% of male neuroscientists. Likewise, 29% of the men declare that they are satisfied while this happens only to 12% of the women in this area. The main reasons for career dissatisfaction also vary by sex, as shown in *Table 5***¡Error! No se encuentra el origen de la referencia.**.

Figure 32: Degree of satisfaction with the academic career



Note: Cronbach's Alpha = 0.71.[17]
Source: IBRO LARC-CEPAL Survey 2020

Access to financial resources seems to be a conflictive dimension for both sexes: most of neuroscientists declare to be dissatisfied in this dimension. More than half of women and 37% of men surveyed are dissatisfied with their access to funds. In terms of human resources training, the opposite occurs: most both sexes declare to be satisfied. In this case, 23% of women and 19% of men declared that they were dissatisfied. Access to positions seems to be another conflictive dimension, particularly for women, where 30%

[17] Cronbach's Alpha measures the reliability of a scale in a set of variables. The statistician's assumption is that to create a reliable scale on a non-directly observable construct, in this case the degree of satisfaction with the career, the items that compose it must be strongly correlated with each other. It varies between 0 and 1, by convention alpha values of 0.7 or 0.8 enable the use of scales.

declare they are dissatisfied compared to 18% of men who express dissatisfaction with access to positions.

The recognition of national or international peer groups is a crucial dimension of any academic career. Among neuroscientists, the majority declare they are satisfied or very satisfied, however, among women, there is also a high percentage that declares they are dissatisfied or very dissatisfied. This happens to 35% of women in terms of recognition from national peers and 32% concerning international peers. Among males, this proportion is 23% and 14%, respectively. The subjective assessment of the work environment is similarly distributed among neuroscientists, 73% of men and 70% of women are satisfied or very satisfied. On the other hand, the dimension of family and academic life reconciliation presents a high proportion of satisfaction in both sexes, among women 52% and men 65%. In this dimension, a significant part of women seems to be experiencing conflicts, 30% are dissatisfied, and 9% are very dissatisfied. Among men, 16% state that they are dissatisfied with the work-life balance, and 4% very dissatisfied.

In summary, the dimensions that generate the greatest dissatisfaction in men's careers are access to funding, access to positions, and human resource training. Similarly, among women, the dimensions of access to positions and funding are the ones that generate the most significant dissatisfaction. However, in this case the reconciliation between academic and family life also appears as one of the dimensions with the greatest dissatisfaction. To delve into the influence of gender roles in academic life, the survey added specific questions to determine the influence of family life on academic life, and vice versa, as analyzed below.

Table 5: Degree of career satisfaction in each dimension by sex

Scale	*Access to financial resources*		*Human resource training*	
	Men	Women	Men	Women
Don't know/Don't answer	0,79%	1,07%	2%	3%
Very dissatisfied	17,86%	18,42%	4%	7%
Dissatisfied	36,90%	52,46%	19%	23%
Indifferent	7,54%	2,36%	11%	6%
Satisfied	29,76%	21,84%	44%	43%
Very satisfied	7,14%	3,85%	21%	17%
Total	100%	100%	100%	100%

	National peer recognition		*International peer recognition*	
	Men	Women	Men	Women
Don't know/Don't answer	2%	4%	6,35%	6,85%
Very dissatisfied	8%	9%	2,38%	7,28%
Dissatisfied	15%	26%	11,90%	24,63%
Indifferent	18%	21%	25,79%	24,41%
Satisfied	37%	33%	40,08%	30,41%
Very satisfied	19%	8%	13,49%	6,42%
Total	100%	100%	100%	100%

	Access to research/teaching positions		*Work environment*	
	Men	Women	Men	Women
Don't know/Don't answer	2,38%	3,00%	1,98%	1,28%
Very dissatisfied	10,71%	14,78%	3,57%	6,21%
Dissatisfied	18,25%	29,55%	15,87%	17,13%
Indifferent	14,29%	8,35%	5,95%	6,21%
Satisfied	34,52%	34,26%	42,86%	44,33%
Very satisfied	19,84%	10,06%	29,76%	24,84%
Total	100%	100%	100%	100%

	Family and academic life balance	
	Men	Women
Don't know/Don't answer	1,19%	2,14%
Very dissatisfied	3,57%	9,42%
Dissatisfied	16,67%	29,55%
Indifferent	13,10%	6,42%
Satisfied	41,27%	42,40%
Very satisfied	24,21%	10,06%
Total	100%	100%

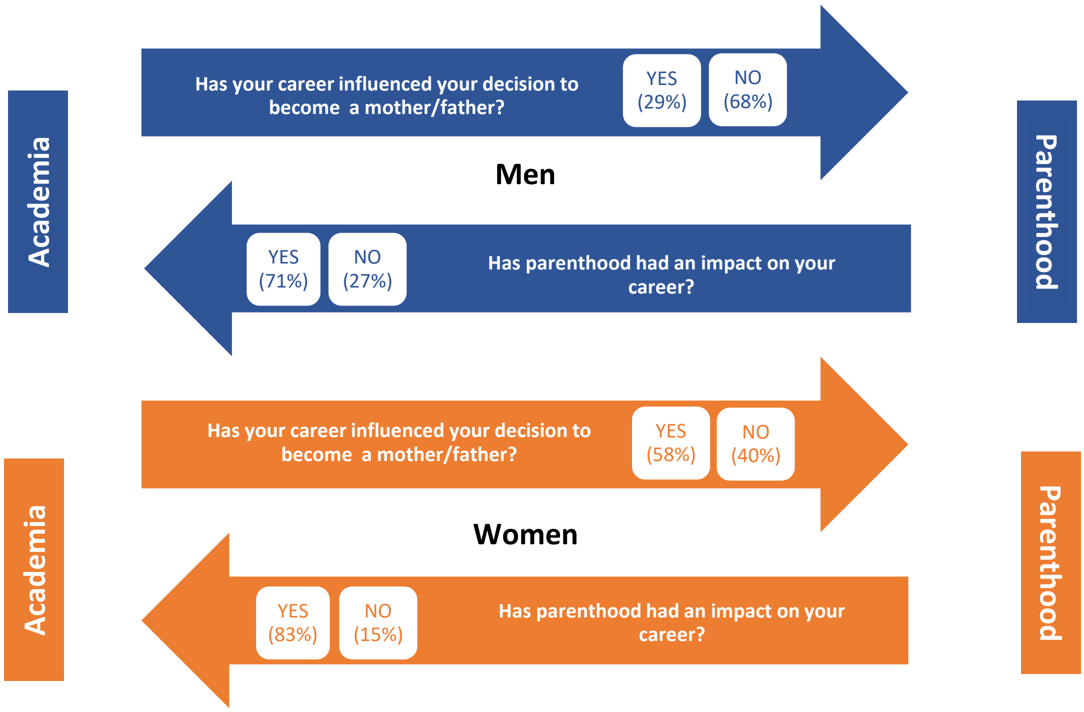
Source: IBRO LARC-CEPAL Survey 2020

3.4.4. Relationship between parenthood and academic career

Among women, 58% of women and only 29% of men state that their career has influenced their decision to become parents. Conversely, 83% of women than 71% of male neuroscientists declare that their motherhood/fatherhood had generated some impact on their academic careers (*Figure 33***¡Error! No se encuentra el origen de la referencia.**).

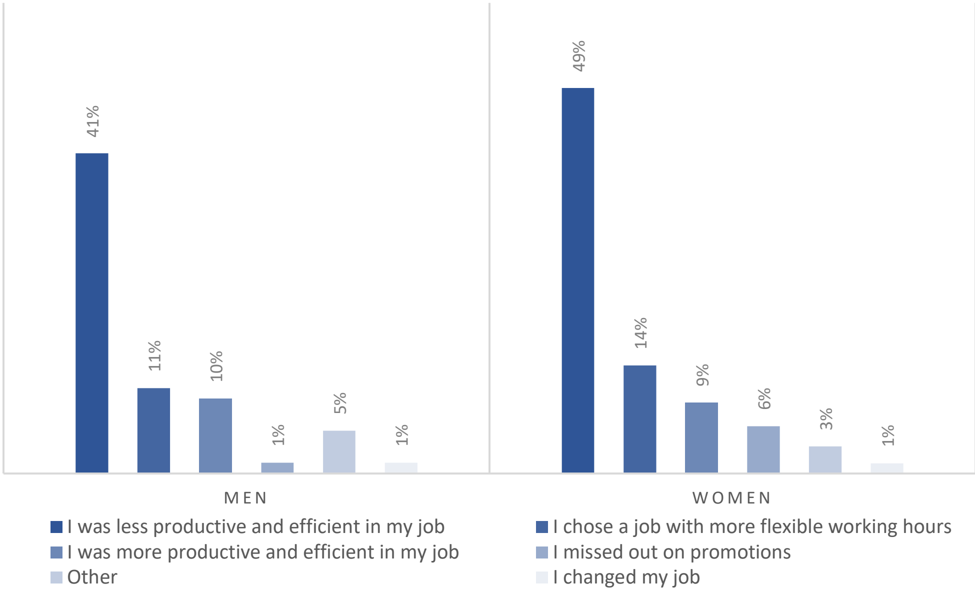
Figure 34 shows that the major impact declared by both sexes is the fall in labor productivity. In contrast a smaller proportion of men and women declare conversely, that motherhood, and fatherhood led them to be more productive in their working hours. Among the women, 14% chose a job with greater time flexibility and 6% declared having lost a promotion competition after becoming mothers. Among the men, 11% looked for another job, and a significantly smaller proportion declared having lost a promotion after becoming fathers.

Figure 33: Influence between motherhood / fatherhood and academic career



Source: IBRO LARC-CEPAL Survey 2020

Figure 34: How do motherhood/fatherhood impact on your career?



Source: IBRO LARC-CEPAL Survey 2020

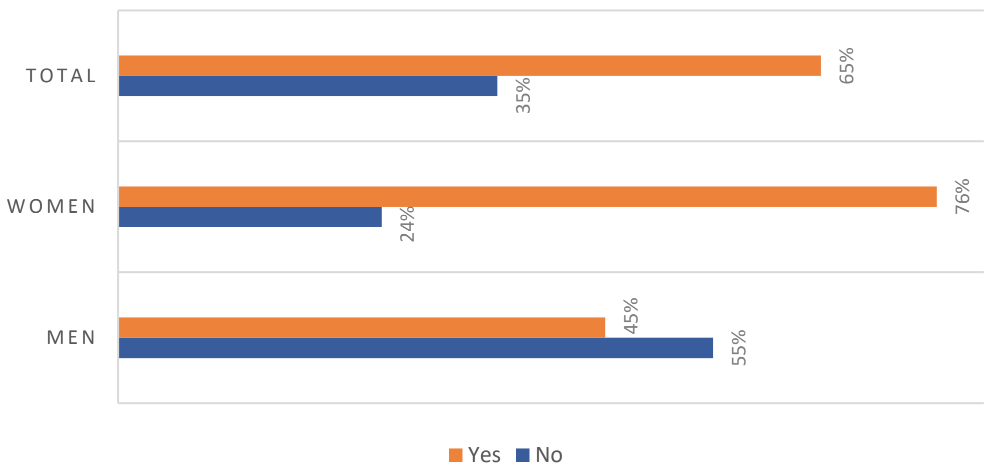
3.5. Discrimination in the evaluation of academic achievements

Academic science, like other social institutions, is permeated by different forms of discrimination and stereotyped treatments. An important part of the literature on gender gaps in science analyzes the influence of stereotypes and various forms of discrimination on women as determinants for hiring and performance evaluation. For example, gender bias in the evaluation and hiring of teachers (Moss-Racusin et al. 2012), in the award and recognition of the scientific work of women (Lincoln et al., 2012), as well as in the selection of presenters for conferences and colloquia of scientific renown (Nittrouer et al. 2018). The scientists' gender is far from being the only factor that can induce stereotyped evaluations in academic science; age, race/ethnicity, sexual orientation are also dimensions indicated as relevant. This section investigates the extent to which the neuroscientists surveyed have experienced some form of discrimination in their academic achievements.

65% of those surveyed state that they have felt discriminated against in the evaluation of their academic achievements at some point in their career (*Figure 35*). Among women, 76% declare perceiving some form of discrimination in their career success, while this happens to 45% of men. According to women, gender is the main cause of discrimination, and to men, the most common form of discrimination is age (*Figure 36*).

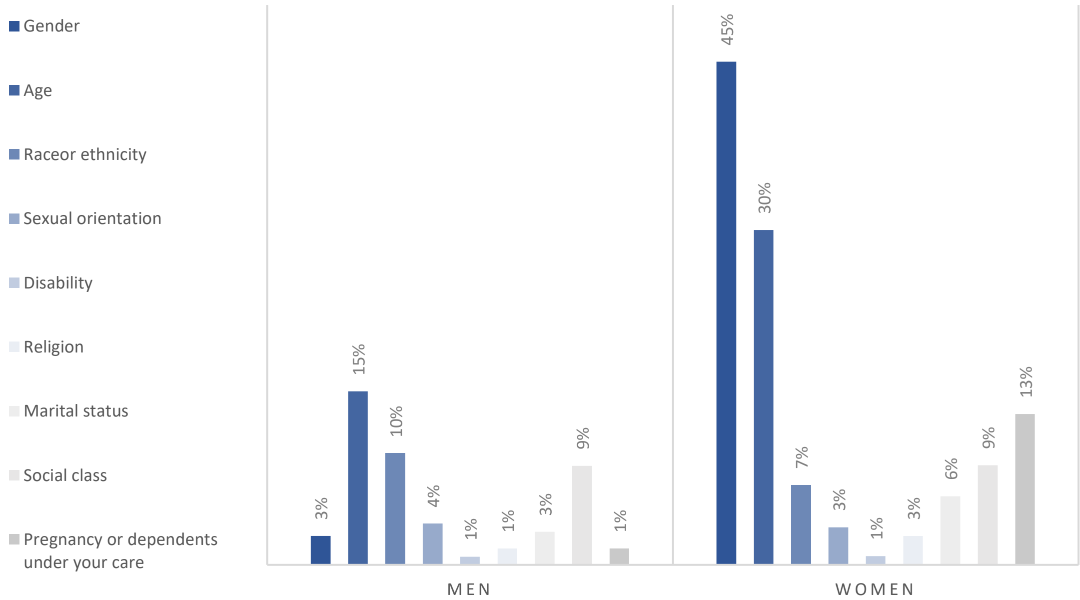
In addition to gender, 30% of women also point to discrimination based on, age followed by pregnancy or dependent care (13%), social class (9%), race or ethnicity (7%), and marital status (6%). Sexual orientation and religion appear to a lesser extent. In the case of men, their perception of age discrimination is followed by race/ethnicity (10%), social class (9%), and, to a lesser extent, sexual orientation and gender (*Figure 36*).

Figure 35: Perception of some form of discrimination in the evaluation of their academic achievements by sex



Source: IBRO LARC-CEPAL Survey 2020

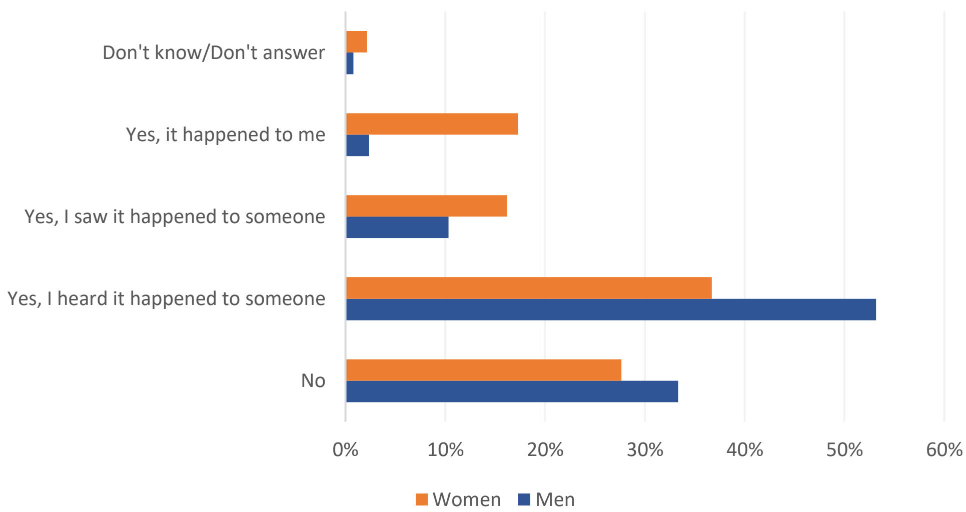
Figure 36: Perception of the main cause of discrimination by sex



Source: IBRO LARC-CEPAL Survey 2020

Sexual harassment is an extreme form of discrimination based on gender. Among the respondents, a high percentage declare that they have heard (seen or heard) some harassment situation in their institution (*Figure 37*). In the case of women, 17% state that they experienced situations of sexual harassment.

Figure 37: Have you ever experienced or known of any case of sexual harassment during your career?



Source: IBRO LARC-CEPAL Survey 2020

3.6. Perception of policies for the advancement of women in neuroscience

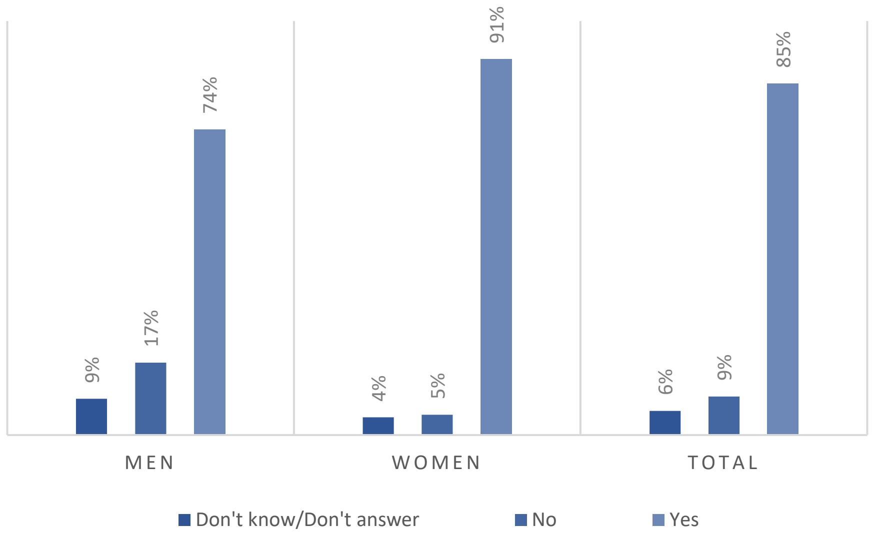
This section analyzes the respondents´ perception of the need for specific programs to promote women´s e careers in neuroscience in Latin America. The vast majority (85%) consider that it is necessary to generate this type of policy. 91% of women and 74% of men stated that it is necessary to develop specific policies (*Figure 38*).

Regarding what type of policies are necessary, we asked the respondents if in a context of limited resources, where part of the funds for research activities of their institution would have to be used for the development of the scientific careers of women in neuroscience: ¿How important do you think the following policies and instruments would be? (**¡Error! No se encuentra el origen de la referencia.**). Although both sexes seem to consider all mechanisms and policies as important, or very necessary, we find some differences. Among women, the most important programs, in order of importance, are: “Equal Pay for Equal Work”; support programs for people who suffer sexual or workplace harassment, “Stop the clock” mechanisms to postpone the evaluation of women who have recently had children, and the possibility of having childcare services or solutions.

Among men, the most important programs are: support programs for people who suffer sexual or workplace harassment, possibility of having childcare services or solutions, "Equal pay for equal work" and "Stop the clock" mechanisms.

The improvement in young women´s postgraduate enrollment seems to be the least important mechanism among those mentioned. While the possibility of having postgraduate scholarships for young women is indicated as very important by 51% of the women, 42% of the men stated it is very important. The mechanisms to promote greater women´s visibility are the ones generating greatest indifference among men (13%), but not among women (5%).

Figure 38: Do you think it is necessary to implement policies or instruments to promote the scientific careers of women in neuroscience?



Source: IBRO LARC-CEPAL Survey 2020

Table 6: Perception of the importance of implementing mechanisms and policies to promote women's careers

Programs to improve enrollment of young women in graduate courses	Men	Women	Total
Not important	5%	3%	4%
Not very important	5%	6%	6%
Indifferent	15%	9%	11%
Important	32%	35%	34%
Very important	43%	43%	43%

Care service programs, childcare solutions, help to pay for care costs.	Men	Women	Total
Not important	0%	0%	0%
Not very important	0%	2%	1%
Indifferent	2%	3%	2%
Important	13%	18%	17%
Very important	81%	71%	74%

Postgraduate scholarships for young women	Men	Women	Total
Not important	4%	2%	2%
Not very important	4%	3%	3%
Indifferent	16%	6%	9%
Important	34%	36%	35%
Very important	42%	51%	48%

"Stop the clock" policies to postpone the tenure evaluation of women who have recently had children.	Men	Women	Total
Not important	0%	0%	0%
Not very important	1%	1%	1%
Indifferent	4%	3%	3%
Important	19%	17%	17%
Very important	73%	71%	94%

Mentoring and support for young women researchers.	Men	Women	Total
Not important	2%	1%	2%
Not very important	2%	2%	2%
Indifferent	8%	4%	5%
Important	38%	29%	32%
Very important	50%	61%	58%

Promotion of mechanisms to ensure equal participation of men and women in roundtables, panels, boards, etc.	Men	Women	Total
Not important	2%	1%	1%
Not very important	3%	1%	2%
Indifferent	8%	5%	6%
Important	21%	22%	22%
Very important	63%	66%	65%

Programs encouraging women´s career advancement.	Men	Women	Total
Not important	2%	0%	1%
Not very important	1%	1%	1%
Indifferent	7%	3%	4%
Important	34%	28%	30%
Very important	54%	64%	61%

Programs to address work-related conflicts.	Men	Women	Total
Not important	2%	1%	1%
Not very important	1%	3%	2%
Indifferent	6%	4%	5%
Important	33%	31%	31%
Very important	55%	55%	55%

Equal-wages policies: "Equal pay for equal work".	Men	Women	Total
Not important	2%	0%	1%
Not very important	1%	1%	1%
Indifferent	4%	5%	5%
Important	11%	12%	12%
Very important	77%	72%	74%

Programs to support people suffering from sexual or work harassment.	Men	Women	Total
Not important	1%	1%	1%
Not very important	0%	1%	1%
Indifferent	3%	2%	2%
Important	9%	18%	16%
Very important	83%	72%	75%

Programs to improve visibility of women´s work.	Men	Women	Total
Not important	2%	1%	1%
Not very important	3%	2%	2%
Indifferent	12%	5%	7%
Important	29%	25%	27%
Very important	51%	62%	59%

Source: IBRO LARC-CEPAL Survey 2020

4. Conclusions

This study analyzed for the first time the gender gaps in the careers of Latin American neuroscientists belonging to the International Brain Research Organization-Latin America (IBRO-LARC). The data collected in the survey represent 33% of members of six neuroscientific societies in Argentina, Brazil, Chile, Cuba, Mexico, and Uruguay. Most neuroscientists who responded to the survey are women in all countries except Chile. The response rate varies by country: Uruguay´s response rate is the highest, whereas Cuba is the lowest. The uneven distribution of response rates by country, and the potential selection biases of convenience sampling, alert us of the difficulties of generalizing the data beyond the population analyzed. Despite these limitations, the study constitutes a novel and original contribution to evaluating the expression of gender gaps in neuroscience in Latin America. The data analyzed allows us to evaluate where the most critical points of gender inequalities are and formulate hypotheses that guide future analysis.

Neuroscience is a multidisciplinary field where researchers from various backgrounds converge. As we saw in this survey, most of the respondents come from biological sciences and health sciences degrees. Horizontal segregation in science also affects neuroscience, where fewer women participate in STEM disciplines. In particular, we found that women neuroscientist's representation is the highest in psychology or chemical sciences, while male neuroscientists outnumber women in physical sciences, mathematics, and engineering. Gender diversity in scientific fields has been pointed out as an enriching factor in knowledge production, not only in daily practices of research teams but also because gender diversity comes up with new problems and perspectives (Haraway, 1989). In the future, it would be interesting to investigate in greater detail how the different forms of horizontal segregation in science impact the development and composition of research groups in neuroscience in Latin America. Likewise, it would be relevant to investigate how this multidisciplinary field of knowledge could attract more women from traditionally male-dominated areas (such as STEM areas) or males from traditionally female areas (such as psychology or chemistry).

Most neuroscientists surveyed are doctors working at research institutions and universities in the six countries included in the study. Their training trajectories do not show significant differences by gender in undergraduate and postgraduate levels or in their access to scholarships. In addition, there are not significantly differences in how long it takes for men and women to complete each level of education. Nonetheless, significant differences are observed in the doctorate length of neuroscientists who have children and the childless ones. In this case, men without children show the earliest doctoral graduations, while women with children show the latest. Although this should be explored in greater detail in the future, the differences seem to be showing a critical point of interaction between gender roles tied to motherhood and the academic careers of women neuroscientists. This argument is reinforced when observing the main reasons for interrupting their educational trajectories: pregnancy and children or dependents care.

Some differences in men´s and women´s international mobility in postgraduate studies are also observed, particularly at Ph.D. level. The proportion of men who study abroad increases from master's to Ph.Ds, while this does not happen among women. International mobility, particularly during postgraduate studies, is a critical factor in building international networks and social capital in science. In the future, it seems relevant to investigate the mobility barriers that women face at the doctoral level and their impact on subsequent professional insertion. One of the main hypotheses to verify is the coincidence of the beginning of the reproductive cycle with the doctorate beginning.

The six countries included in the study stratify teaching and research grades very differently; in some countries, more than one classification system coexists. To enable the comparison of the positions within the neuroscience community of Latin America, a scale with four levels of advancement was selected, from the predoctoral level to the full professor level. The data confirm the existence of forms of vertical segregation in access to positions. Among women neuroscientists, a higher proportion are currently in the lower hierarchical positions, at the bottom of the scientific stratification pyramid (50% in grades D and C), whereas among men, most of the neuroscientists surveyed are in the highest grades (53% in grades B and A). Unequal access to higher-ranking positions in the teaching and research scales, such as full professor positions, translates into various material and symbolic disadvantages for women. These disadvantages can range from lower wages (Barbezat & Hughes, 2005), to even less access to material and human resources, less access to political decisions in universities, or less access to spaces to make their work visible.

Access to the most prestigious positions continues to act as a glass ceiling for women in the area. This does not mean that some women in neuroscience cannot overcome these barriers, but it demands them considerable time and effort investment. On the one hand, we saw that most of the women surveyed state that they are the main responsible for domestic and care tasks, which implies a more significant overall workload when combined with their academic work hours. On the other hand, we observe that the average time it takes them to access high-ranking positions in particular, are greater for women than for their male colleagues at all levels,

The low degree of career satisfaction that women experience is another factor to highlight. Only 15% of women compared to 32% of men are satisfied with their careers. Beyond the fact that both sexes share dissatisfaction and are attributed to the difficulties of scientific work in developing countries (such as scarce financial resources and availability of positions), there are marked differences regarding the influence of gender roles. For example, a high proportion of women indicate that they are dissatisfied with family and academic career reconciliation.

To dig into this phenomenon, the form includes questions about the influence of motherhood and fatherhood in the academic career and vice versa. The vast majority of women declare influences in both senses, that is, their career affects their motherhood, and their motherhood affects their career. This is not the case for their male colleagues, who declare that fatherhood has influenced their academic life but not the other way around. It is worth mentioning that when motherhood and fatherhood affected their academic careers, it was generally in terms of reducing the neuroscientists productivity.

Like any other social institution, academic science, is not immune to perpetuating different forms of discrimination and stereotypes. There is evidence in the literature to affirm that gender, age, race/ethnicity, etc. could act as potential biases in evaluating scientific performance. The present study sought to understand what neuroscientists' perception was about these forms of discrimination in the evaluation of academic achievements. A high proportion of respondents state that they have perceived some discrimination throughout their careers, especially women. Most women perceive discrimination based on gender, age, pregnancy or dependent care, while men think discrimination occurs because of their age, race/ethnicity or social class.

The vast majority of those surveyed perceive the need to implement policies or mechanisms to promote women's academic careers in neuroscience, in particular, equal pay policies and support programs for people who suffer sexual or workplace harassment. In the latter case, a high proportion of those surveyed declares having heard/seen or experienced some sexual harassment situation throughout their career. Women experience sexual harassment to a greater extent. These data call attention to the increasing importance of generating mechanisms for preventing, reporting and punishing sexual harassment in university and research environments.

Other mechanisms for advancing women´s academic careers in neuroscience were: "Stop the clock" mechanisms and childcare services. The entry and retention of young women in neuroscience are not one of the main demands of equity instruments. Mechanisms to generate greater visibility of women appear like those that generate more indifference among men but not among women.

In light of this preliminary review, it is evident that, as in other areas, the neurosciences face various challenges of promoting gender equality. The mechanisms for the promotion of gender equality should consider the different stages of academic careers, and the institutional contexts where they are uncertain.

Analyzed data indicate, on the one hand, the need to alleviate the stress and burden derived from domestic and care responsibilities. The need to generate mechanisms that foster greater co-responsibility for these tasks throughout their careers seems evident, particularly when the beginning of the reproductive cycle coincides with the beginning of the academic career. In this sense, international examples of funds allow women to access services to alleviate their care burdens and improve their academic dedication.

On the other hand, the data analysis shows how equal access to higher-ranking positions is a multidimensional problem that should be analyzed in greater detail to understand the determining factors and its potential solutions. However, it seems essential to begin by recognizing that women face more significant obstacles in their pathway to reach incumbent positions than their male colleagues. The time and the differential duration that we found in this study are the first indicator of these obstacles. Among the potential policy instruments to promote women's advancement at these levels, we can point out, for example, mechanisms to make their work more visible. Other mechanisms have to do with improving acceptable evaluation practices, seeking to ensure that competitions do not reproduce gender biases that affect women's progress. Several organizations seek to promote the advancement of women in this area[18]. Many others, including IBRO, have special programs and mechanisms of evaluations towards supporting gender and diversity equalities in neuroscience. However, as shown from this report, more efforts and novel strategies are required to allow each woman to be in the place she deserves.

[18] https://www.winrepo.org/.

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