

Women of medical and health sciences and Brazilian publications on Covid-19

Mulheres das ciências médicas e da saúde e publicações brasileiras sobre Covid-19

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DOI: 10.1590/0103-11042021E1051

ABSTRACT Despite the increasing historical participation of women in Brazilian scientific production, domestic and labor reconfiguration for the control of the Covid-19 pandemic is likely to reduce women scientists' productivity. The GenCovid-Br Research aimed to outline a panorama of female production in Covid-19 papers in medical and health sciences, available in PubMed, with at least one author with Brazilian affiliation. From the 1,013 publications by August 14, 2020, 6.1% were written exclusively by women, 17.2% exclusively by men, 31.1% were mixed with female leadership, and 45.6% were mixed with male leadership. Women participated in more papers led by women (50.1% vs. 35.6% in those led by men). Papers in Clinical Medicine, where female researchers are predominant, have fewer female authors, occurring in publications resulting from international collaborations. Our results point to the possible expansion of previous gender inequalities during the Covid-19 pandemic. New studies should deepen the investigation of the magnitude and determinants of such phenomenon, including temporal analyses. Institutional policies must consider gender inequalities in academic assessments, preventing future impacts on women's careers, particularly young researchers involved in social reproduction.

KEYWORDS Gender and health. Health sciences. Sexism. Gender mainstreaming. Covid-19.

RESUMO Apesar do aumento histórico da participação feminina na produção científica brasileira, reconfigurações domésticas e laborais para o controle da Covid-19 podem estar reduzindo a produtividade das mulheres cientistas. A pesquisa GenCovid-Br objetivou traçar um panorama da participação feminina nos artigos sobre Covid-19 das ciências médicas e da saúde, disponibilizados no PubMed, com ao menos um autor de filiação brasileira. Das 1.013 publicações até 14 de agosto de 2020, 6,1% foram escritas exclusivamente por mulheres; 17,2%, exclusivamente por homens; grupos mistos respondem por 31,1% com liderança feminina, e 45,6% com liderança masculina. As mulheres participam mais de artigos com primeira autoria feminina (50,1% vs 35,6% nos liderados por homens). Nos artigos de áreas da Medicina Clínica, em que as mulheres são maioria, ocorre menos participação de autoras, o que também acontece em publicações resultantes de colaborações internacionais. Os presentes resultados indicam a possibilidade de ampliação de desigualdades de gênero prévias durante a pandemia de Covid-19. Novos estudos devem aprofundar a investigação sobre a magnitude e os determinantes desse fenômeno, incluindo análises temporais. As políticas institucionais devem considerar as iniquidades de gênero nas avaliações acadêmicas, prevenindo impactos futuros nas carreiras das mulheres, em particular, das jovens pesquisadoras envolvidas na reprodução social.

PALAVRAS-CHAVE Gênero e saúde. Ciências da saúde. Sexismo. Transversalidade de gênero. Covid-19.

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Introduction

Scientific production on Covid-19 has increased exponentially in the search for answers to control the pandemic. However, an apparent decline in the productivity of women scientists has aroused interest in the international literature, resulting from the increase in domestic demands and the declining social support for family care, especially for children, in the context of social distancing measures¹⁻⁸, which would be reversing a historical trend of increasing female participation in science^{9,10}. In 2017, an Elsevier report¹¹ had shown that the proportion of women among researchers and inventors was increasing over time in all 12 countries and regions surveyed. Brazil and Denmark had shown the highest growth in this indicator in the period. However, gender inequalities in science remained, which varied greatly between countries and areas of knowledge. However, a lower female presence was generally observed in published papers, mainly as first and last authorships.

Brazilian women have been absent or under-represented in academic spaces⁹ for a long time. This panorama has changed in recent decades when female schooling¹² escalated and its entry into traditionally male fields – such as Medicine, Dentistry, and even Engineering and Exact Sciences⁹. One of the consequences of this process has been the consistent growth in female participation in research activities. In 2010, they matched men among researchers registered in the Directory of Research Groups of the Lattes Platform of the National Council for Scientific and Technological Development (CNPq)^{13,14}. However, women used scholarships abroad less, for example, in the Science without Borders Program¹⁵, and the female disadvantage in accessing Research Productivity Scholarships¹⁶ and prestigious positions, such as, for example, the insignificant participation in

the coordination of National Institutes of Science and Technology (INCT/CNPq)¹⁶ and minority entry into the Brazilian Academy of Sciences¹⁷, was maintained.

Health sciences have great weight in Brazilian scientific production due to significant historical growth, and women are the majority of researchers, although there is a variation between its underpinning sub-areas¹⁸. According to data obtained from the Lattes Panel (CNPq), in 2016, they corresponded to 60.2% of the total of 20,444 doctors involved in research and teaching activities in the health sciences¹⁹. It would then be appropriate to ask: what is their participation in scientific production in response to the most significant global challenge in the last hundred years, especially considering the female researchers directly involved in the production of biomedical and health knowledge?

This question motivated the realization of the GenCovid-Br Research, whose first results are presented here. This paper aimed to provide an overview of women's participation in Brazilian scientific publications on Covid-19, focusing on medical and health sciences.

Material and methods

The *corpus* of this study gathers all the references on Covid-19, which are available on the PubMed portal of the U.S. National Library of Medicine (NLM), from December 1, 2019, to August 14, 2020. The main component of this portal is the Medline database (responsible for 83.9% of indexed references), the largest database of references and citations in the biomedical literature in the world. Moreover, it includes ahead-of-print papers, full texts available at PubMed Central, manuscripts by authors funded by the National Institutes of Health (NIH), and books available at the National Center for Biotechnology Information (<https://>

www.nlm.nih.gov/bsd/difference.html). All references with at least one author affiliated with a Brazilian institution were included, regardless of language and type of publication, and the following search strategy was defined: (“Covid-19” OR “2019 novel coronavirus infection” OR “Covid19” OR “coronavirus disease 2019” OR “coronavirus disease-19” OR “2019-nCoV disease” OR “2019 novel coronavirus disease” OR “2019-nCoV infection” OR “severe acute respiratory syndrome coronavirus 2” OR “Wuhan coronavirus” OR “Wuhan seafood market pneumonia virus” OR “Covid19 virus” OR “Covid-19 virus” OR “coronavirus disease 2019 virus” OR “Sars-CoV-2” OR “Sars2” OR “2019-nCoV” OR “2019 novel coronavirus”) AND (“Brazil” [Affiliation] OR “Brasil” [Affiliation]).

Paper extraction and filtering were performed with the easyPubMed²⁰ package in the statistical environment R 4.0.2²¹. Then, a manual search on internet sites was performed to retrieve authorships identified only with the author’s first initials. The authors’ gender was coded using the gender package²². We adopted the most used scheme internationally proposed by the Organization for Economic Co-operation and Development (OECD)²³ to classify areas of knowledge in medical and health sciences. It covers five broad categories: “Basic medicine” (includes nine underlying fields, such as immunology, pharmacology, biochemistry, and neuroscience); “Clinical Medicine” (includes 27 clinical specialties); “Health Sciences” (includes 14 categories such as epidemiology, health care sciences – comprising hospital administration and health care financing –, health policy and services, infectious diseases, medical ethics, nursing, nutrition and dietetics, occupational health, parasitology, public and environmental health, biomedical social sciences – including family planning, sexual health, psycho-oncology, political and social effects of biomedical

research – sports sciences, substance abuse, and tropical medicine); “Biotechnology for health”; and “Other medical sciences”. The following fields were considered for the encoding: institutional affiliation of the first author, the title of the publishing journal, and the paper’s keywords. The curriculum of the first author was examined to establish the field in any disagreement between the fields or doubt about the predominant area. Finally, information about the countries of the researchers was extracted from the institution of affiliation, and researchers were grouped into continents.

This analysis divided the papers into four groups by gender structure and position of women and men in the first authorship: consisting exclusively of women and exclusively of men, and papers of mixed authorship with women as first authors and men as first authors. For each group, relative and absolute frequencies of published papers were described, and the participation of women in authorship was measured (as the first author and in any position); measures of central tendency and dispersion (mean, standard deviation, median, interquartile ranges, and amplitude) were calculated referring to the number of authors of the papers; and charts and a frequency map representing international collaborations were elaborated. These analyses were performed in the dplyr²⁴, ggplot2²⁵, and maps²⁶ packages.

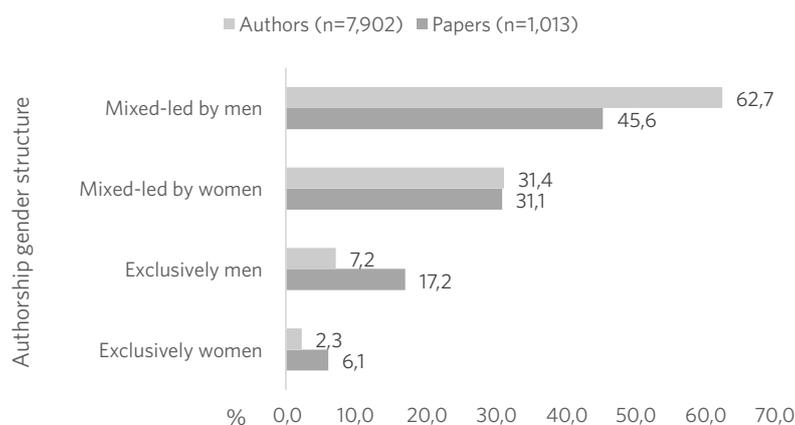
Results

On August 14, 2020, 40,888 references on Covid-19 were identified, published since the beginning of the pandemic in December 2019. With the proposed syntax, 1,046 papers were located in PubMed, with at least one author affiliated with a Brazilian institution linked to Brazilian institutions. After excluding 33 from other scientific areas, 1,013 were classified as members of the medical and health sciences, with 7,902 authors involved.

The first three papers, with at least one author affiliated with a Brazilian institution, were registered on March 18, 2020, all with mixed gender structures. However, only one had female leadership²⁷; the other two^{28,29} had male leadership and were attributed to foreign authors. Very few single-author papers were found, 17 written by women and 46 (almost triple) by men.

Considering the 1,013 papers published between March and August, a considerable variation is observed in the gender structure of the papers' authorship: 6.1% were written exclusively by women; 17.2%, exclusively by men; 31.1% have mixed authorship and females as first authors; and 45.6% have mixed authorship and males as first authors (*graph 1*).

Graph 1. Proportional distribution of authors and papers on Covid-19 in medical and health sciences, by gender structure of the group of authors and authorship position - March to August 2020



Source: Own elaboration.

The gaps increase if we consider the distribution in the four groups of all 7,902 authors. Papers with mixed structure have the most significant number of authors, but those led by men have the highest

percentage (62.7%) (*graph 1*). This is confirmed in the quantitative analysis of the number of authors that make up each group and their mean distribution (*table 1*).

Table 1. Mean and median number of authors (interquartile range, standard deviation, and range of variation) of papers on Covid-19 in Medical and Health Sciences, by author group gender structure and authorship position – February to august 2020

Central tendency and dispersion measures	Authorship gender structure ¹				Total (n=7.968)
	Exclusively women (n =178)	Exclusively men (n=569)	Mixed led by women (n=2.507)	Mixed led by men (n=4.674)	
Median (Interquartile Range)	2 (1-4)	3 (1-4)	6 (4-9)	6 (4-10)	5 (1-8)
Median (Standard Deviation)	2.9 (2.0)	3.3 (3.1)	8.0 (7.6)	10.2 (12.3)	7.9 (9.9)
Amplitude (minimum and maximum value)	1-11	1-24	2-55	2-120	1-120

Source: Own elaboration.

¹Twenty-three observations were lost in the variable authorship gender structure.

Papers of exclusive female or male authorship have fewer authors than those of mixed authorship, and while their median values are close, the mean and amplitude of papers written only by men are higher, with a higher maximum number of authors. When the mixed groups are analyzed, even though the medians are equivalent, those led by women have a maximum of 55 authors, while those led by men reach a maximum value of 155 authors.

In the set of 1,013 papers, women represent only 39.2% of the authors (*table 2*). Female participation is higher in papers led by women (50.1%) than in those with men as first authors (35.6%). Their participation grows in both categories when analyzing only papers with only Brazilians (57.6% and 40.2%, respectively) regarding paper including foreigners (44.3% and 33.0%, respectively).

Table 2. Relative participation (%) of women in the authorship of articles on Covid-19 in medical and health sciences, by author group gender structure authors and authorship positions – February to August 2020

Authors' nationality	Authorship structure ¹				Total % (n)
	Exclusively women % (n)	Exclusively men % (n)	Mixed led by women % (n)	Mixed led by men % (n)	
Exclusively Brazilian authors	100.0% (n=140)	- (n=301)	57.6% (n=1101)	40.2% (n=1678)	45.0% (n=3220)
Brazilian and foreign authors	100.0% (n=38)	- (n=268)	44.3% (1406)	33.0% (n=2996)	35.2% (n=4715)
Total	100.0% (n=178)	- (n=569)	50.1% (2507)	35.6% (n=4674)	39.2% (n=7928)

Source: Own elaboration.

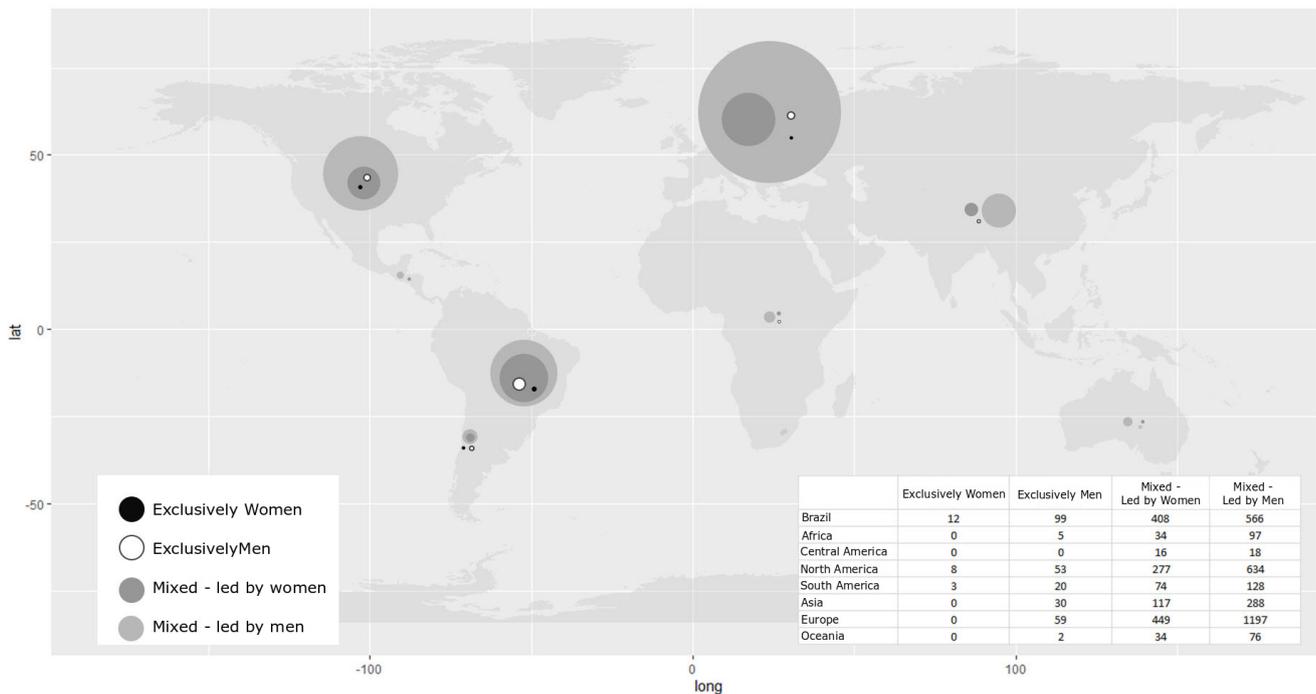
¹Twenty-three observations were lost in the variable authorship gender structure.

Note: The 'n' corresponds to the sum of women and men in each group in the stratum.

The lower international collaboration of women is shown by the predominance of mixed papers led by men over the other

categories of authorship in the global panorama (*figure 1*).

Figure 1. Number of authors of Brazilian scientific publications on Covid-19 in medical and health sciences involving foreign collaborators, by continental origin and author group gender structure - February to August, 2020



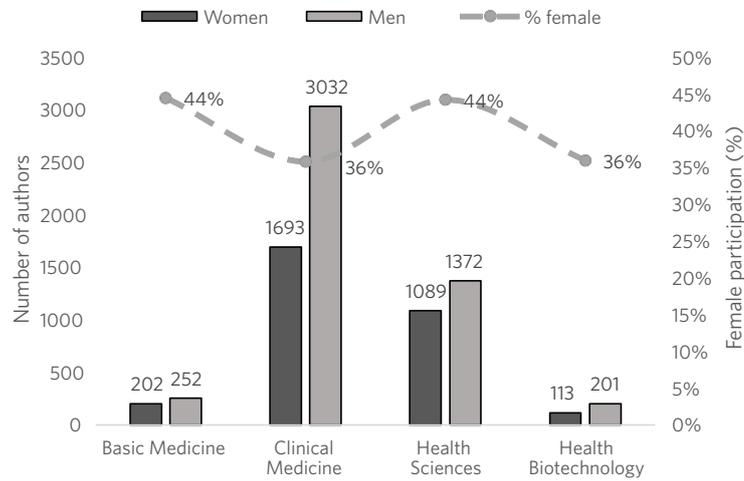
Source: Own elaboration.

Generally speaking, most international collaborations take place in mixed papers. The primary connections are with Europe and North America. It should be noted that among mixed papers led by men, European and North American authors are even more numerous than Brazilian collaborators. The number of European authors in this category, in particular, represents more than twice that of Brazilians. However, among the mixed papers with female authorship, only those by European collaborators outnumber those by Brazilians. Finally, the connections with Asia and Latin America are also noteworthy, proportionally much more frequent in mixed papers led by men than in those led by women.

The analysis of female participation in medical and health sciences (*graphs 2a and 2b*) allows us to identify that the most considerable differences are in Clinical Medicine, either in any position among authors (36%) or, mainly, in the first authorship (33%). Biotechnology also has a low proportion of female authors, although they are equivalent to men in the first authorship. In Health Sciences, the percentage of women is 44% of authors in any authorship position and is equivalent to that found in Basic Medicine. However, the proportion of female first authors is smaller (respectively, 40% and 48%). In Biotechnology, the number of women and men as first authors is low and the same.

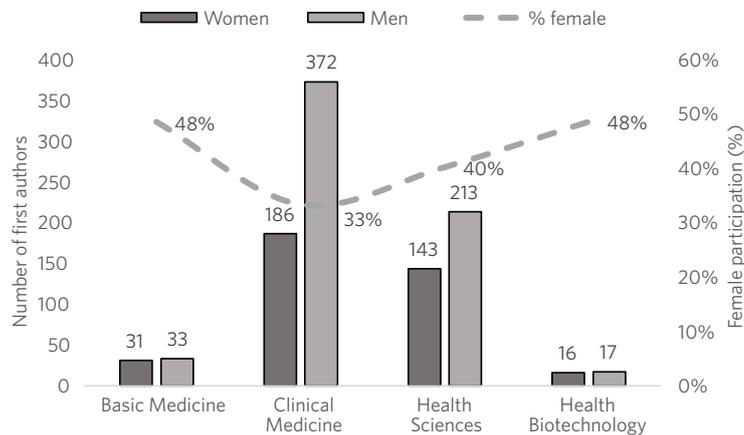
Graph 2. Distribution of authors and female participation in the authorship of Brazilian papers on Covid-19, by gender and areas of knowledge in the health sciences

2a - Authors in any authorship position



* 10 women and 4 men from other medical sciences were excluded due to their negligible number

2b - Authors in first authorship position



* 1 man and 1 woman from other medical sciences were excluded due to the negligible number

Source: Own elaboration.

Discussion

The results converge with the international^{2-4,7,30-34} and national^{33,35} literature. Furthermore, they show a gender disparity in the scientific production analyzed on Covid-19. Women have lower participation in the set of papers and as first authors than men, as found in other works^{3,32,34,35}.

One of the limitations of this study at the current research stage is that it does not have temporal analyses to identify whether this represents an increasing trend in male publications or a decrease in female publications during the pandemic. In any case, a clearly lower proportion of papers with exclusively female authorship is observed, and women lead fewer papers with

mixed authorship in a field of knowledge in which they are the majority in Brazil^{18,19}. Single-authorship papers – very few – are written mainly by men, as pointed out in the literature².

Another limitation to be commented upon is the use of PubMed as the only source of papers. This may have excluded part of the production from other areas, especially Human and Social Sciences, on health, published in specialized journals that are not part of the database used, which may have influenced the distribution by field of knowledge and should be investigated in the future studies.

However, it can be assumed that the magnitude of the proportion of women in the total number of publications does not change substantially since it is the most comprehensive base of references on Covid-19. This is a relevant debate that deserves further studies and is being included in the new analyses of the GenCovid-Br Survey. In any case, this study's strength was its great breadth, which was also ensured by the inexpressive number of records lost and the careful retrieval of information about authors' names and field of knowledge.

Among the findings that instigate new analyses and studies are the conditions in which women participate less: when the paper has male leadership, includes foreign authors, or the first author is in the field of Clinical Medicine.

Androcentrism influences academic performance at all levels, from the choice of fields of knowledge to access and career progression mechanisms, including the occupation of posts, in a profoundly hierarchical structure³⁶. This hierarchy imposes itself on the dynamics of power and prestige distribution, including the coordination of research projects and the authorship of academic papers. In the androcentric model, the ideal scientist gives priority to work and has few interests or responsibilities from other spheres, including the

family³⁷. Academic excellence implies long work hours with sustained performance – incompatible with women's life cycles and role in social reproduction^{37,38}. Studies show that the first authorship position has been occupied by younger researchers at the onset of their careers. Regarding women, this period corresponds to the reproductive period³¹, hindering their professional engagement or implying the postponement of motherhood. However, sustained performance reaches other moments of vulnerability, such as crises, illness, aging, and the death of family and friends. In this sense, it can affect women and men at different stages of life. In the Covid-19 pandemic, these situations proliferate and particularly affect females, who are the most involved in caring for older adults and the sick.

One aspect that cannot be minimized concerns the potential exacerbation of gender biases^{4,39} in the evaluation of publications, due to the exponential increase in scientific production and the acceleration of peer review mechanisms (fast-track peer review) in scientific journals, under the imperative of immediate circulation of knowledge that support control actions. A possible question to be investigated is whether there are gender disparities in the effective publication of preprint papers.

The lower participation of women in international partnerships can express specific dynamics of scientific areas, which deserves to be studied in the future. However, it is consistent with the prior observation of their lower access to foreign scholarships and consortia initiatives and multicenter studies between countries¹¹.

Another aspect that can accentuate gender disparities in scientific production on Covid-19, especially in Brazil, marked by social inequalities, concerns the rearrangements in household and professional tasks imposed by the pandemic. The social distancing measures adopted by almost all countries resulted in the transfer of

professional work to the domestic environment, in a context of increasing household demands resulting from the closing of schools and reduced social support for child care, older adults, and the sick – including those in isolation due to Covid-19, who did not require hospitalization⁴⁰. This situation has had a direct impact on the time spent on housework. Hours dedicated to family care, including supervision of children's schoolwork, are unevenly distributed, imposing a burden on women, a phenomenon widely documented in the pandemic^{4,31,38,41}.

This new configuration, marked by the confluence of professional and domestic work in the same space, occupied by the family – on a 24/7 basis – may be incompatible with the academic production process, which requires time and concentration for long, uninterrupted hours³⁷. Structuring gender norms maintain the attribution to women most of the responsibility (when not exclusive) for the care of the family and dependent adults^{4,42}. Covid-19 seems to impose on researchers an escalation of traditional gender roles, which may impact their academic performance – especially women with small children³³. This occurs even among highly educated couples or couples from the academic environment^{13,43}. The effort to reconcile work and family demands implies decisions, which are not always easy. In general, they are not even considered for men, for whom the academic work demands seem to be already prioritized. However, this choice is always in place for women researchers, and the so-called work-family conflict is abundantly documented in the pre-pandemic literature.

Final considerations

The GenCovid-Br Research (GenCovid-Br Research) has a rich base that allows for new and more in-depth analyses on the subject. In this sense, given the heterogeneity of the conformation of disciplines in

medical and health sciences, we intend to continue to analyze this *corpus*, considering the participation of women in the underlying fields of action. Likewise, we aim to verify the evolution of production over the months to identify temporal trends and their determinants. Future studies should be carried out to analyze the long-term effects of the Covid-19 pandemic on the academic trajectories of women^{2,3}, especially those with young children and at the onset of their careers.

Also, as far as possible, new investigations should adopt an intersectional perspective, including gender and other categories of analysis that are identified in the literature as markers of inequalities, such as the race/ethnicity of researchers³³ and their current professional stage^{2,3}. Likewise, new studies should consider regional inequalities in the distribution of research resources, especially when the relationship is with an institution outside the major centers and the Rio de Janeiro-São Paulo axis. Gender inequalities in the scientific field are also strongly influenced by family arrangements, parenting experience, and children's age^{4,31,33}.

Gender inequalities in scientific productivity in the times of Covid-19 should be considered in the assessment and career advancement systems of female scientists⁴. Editorial teams must monitor the underrepresentation of women in their compositions, and scientific policies must be adopted for greater inclusion of the diverse groups of researchers.

Social distancing and confinement can serve not only to reduce the transmission of Sars-CoV-2 and prevent Covid-19. They can also be an unprecedented opportunity to rethink practices and ways of life, including in the academic sphere. It is necessary to prioritize collective well-being over productivity and recognize that sustained performance in academic work is maintained based on social inequalities. Many people perform technical and administrative work

and allow researchers to produce knowledge. In Brazil, black women represent a large part of the workforce that sustains scientific institutions, such as secretaries, administrative employees, and cleaning staff^{44,45}. On the other hand, they represent just under 1% of the total of doctoral advisors and CNPq productivity scholarship holders (0.8% in 2015)^{46,47}. Given the minority participation of men in the domestic sphere, females, primarily black domestic workers, often release scientists and researchers from taking care of the home and the family⁴⁸. This support was reduced during the pandemic, exposing the social inequalities that seem to increase during the health crisis.

Therefore, it is time to reflect on the changes required to overcome the logic of productivity at any price and establish care ethics, as argued by Catalan researchers in their beautiful article 'Academia in the Time of COVID-19: Towards an Ethics of Care'⁴⁹.

A crucial aspect is related to the prioritized themes and those not explored due to the under-represented contribution of

women in their diversity. In 'normal' times, people were already aware that science cannot do without the intellectual capacity of women, who represent an expressive part of the academic community. In the Covid-19 pandemic, this could mean giving up answers that humanity urgently needs.

Collaborators

Aquino EML (0000-0002-8204-1249)* and Diele-Viegas LM (0000-0002-9225-4678)* conceived the idea of the study and the initial structure of the manuscript and shared the first authorship. Diele-Viegas LM performed the collection, visualization, and analysis of data, collaborating with Aquino EML and Pilecco FB (0000-0001-8316-8797)*. All the authors, Aquino EML, Diele-Viegas LM, Pilecco FB, Reis AP (0000-0002-6750-0187)* and Menezes GMS (0000-0002-8393-2545)* performed the literature review, interpreted the results, and wrote and approved the main manuscript. ■

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References

1. Cardel ML, Dean N, Montoya-Williams D. Preventing a Secondary Epidemic of Lost Early Career Scientists: Effects of COVID-19 Pandemic on Women with Children. *Ann Am Thorac Soc*. 2020; 17(11):136-170.
2. Amano-Patiño N, Faraglia E, Giannitsarou C, et al. The Unequal Effects of Covid-19 on Economists' Research Productivity. 2020. [acesso em 2020 mar 20]. Disponível em: <https://www.repository.cam.ac.uk/bitstream/handle/1810/310888/cwpe2038.pdf?sequence=1&isAllowed=y>.
3. Andersen JP, Nielsen MW, Simone NL, et al. Meta-Research: COVID-19 medical papers have fewer women first authors than expected. *Elife*. 2020; (9):e58807.
4. Cui R, Ding H, Zhu F. Gender Inequality in Research Productivity During the COVID-19 Pandemic. 2020. [acesso em 2021 mar 20]. Disponível em: https://papers.ssrn.com/sol3/Data_Integrity_Notice.cfm?abid=3623492.
5. Maas B, Grogan KE, Chirango Y, et al. Academic leaders must support inclusive scientific communities during COVID-19. *Nat. Ecol. Evol*. 2020; (4):997-998.
6. Muric G, Lerman K, Ferrara E. COVID-19 amplifies gender disparities in research. *arXiv preprint arXiv:200606142*. 2020. [acesso em 2020 mar 20]. Disponível em: <https://arxiv.org/ftp/arxiv/papers/2006/2006.06142.pdf>.
7. Viglione G. Are women publishing less during the pandemic? Here's what the data say. *Natur*. 2020; 581(7809):365-6.
8. Fox CW. The representation of women as authors of submissions to ecology journals during the COVID-19 pandemic. *bioRxiv*. 2020. [acesso em 2021 mar 20]. Disponível em: <https://www.biorxiv.org/content/10.1101/2020.05.29.123455v1.full.pdf>.
9. Leta J. As mulheres na ciência brasileira: crescimento, contrastes e um perfil de sucesso. *Estud. avanç*. 2003; 17(49):271-84.
10. Aquino EM. Gênero e ciência no Brasil: contribuições para pensar a ação política na busca da equidade. In: Heilborn ML, Aquino EM, Barbosa RM, et al., editores. *Sexualidade, reprodução e saúde 1*. Rio de Janeiro: Editora FGV; 2009. p. 57-72.
11. Elsevier. *Gender in the Global Research Landscape: Analysis of Research Performance Through a Gender Lens Across 20 Years, 12 Geographies, and 27 Subject Ares*. [acesso em 2020 mar 20]. Disponível em: https://www.elsevier.com/_data/assets/pdf_file/0008/265661/ElsevierGenderReport_final_for-web.pdf.
12. Beltrão KI, Alves JED. A reversão do hiato de gênero na educação brasileira no século XX. *Cad. Pesquisa*. 2009; 39(136):125-56.
13. Ferrari LP. Mulheres na Ciência. *Revista Expressão*. 2019; 8(1):55-59.
14. Conselho Nacional de Desenvolvimento Científico e Tecnológico. *Pesquisadores por sexo Plataforma Lattes CNPq*. 2015. [acesso em 2020 mar 20]. Disponível em: <http://lattes.cnpq.br/web/dgp/pesquisadores-por-sexo>.
15. Feltrin RB, Costa JOP, Velho L. Mulheres sem fronteiras? Uma análise da participação das mulheres no Programa Ciência sem Fronteiras da Unicamp: motivações, desafios e impactos na trajetória profissional. *Cadernos Pagu*. 2016; (48):e164804.
16. Lima BS, Santana Braga ML, Tavares I. Participação das mulheres nas ciências e tecnologias: entre espaços ocupados e lacunas. *Revista Gên*. 2016; 16(1):11-31.
17. Ferrari NC, Martell R, Okido DH, et al. Geographic and gender diversity in the Brazilian Academy of Sciences. *An. Acad. Bras. Cienc*. 2018; 90(2):2543-52.
18. Melo HPD, Oliveira AB. A produção científica brasileira no feminino. *Cadernos Pagu*. 2006; (27):301-31.

19. Conselho Nacional de Desenvolvimento Científico e Tecnológico. Estatísticas da Base de Currículos da Plataforma Lattes. Brasília, DF: CNPq; 2016. [acesso em 2020 ago 31]. Disponível em: <http://estatico.cnpq.br/painelLattes/sexofaixaetaria/>.
20. Fantini D. easyPubMed: Search and Retrieve Scientific Publication Records from PubMed. 2019. [acesso em 2020 ago 31]. Disponível em: https://cran.r-project.org/web/packages/easyPubMed/vignettes/getting_started_with_easyPubMed.html.
21. R Core Team. R: A language and environment for statistical computing. [acesso em 2020 mar 30]. Disponível em: <http://r.meteo.uni.wroc.pl/web/packages/dplyr/vignettes/intro-dplyr.pdf>.
22. Blevins C, Mullen L. Jane, John... Leslie? A Historical Method for Algorithmic Gender Prediction. *DHQ*. 2015; 9(3).
23. Organisation for Economic Co-operation Development. Revised field of science and technology (FOS) classification in the Frascati manual. [acesso em 2020 mar 30]. Disponível em: <https://www.oecd.org/science/inno/38235147.pdf>.
24. Wickham H, Francois R, Henry L, et al. dplyr: A Grammar of Data Manipulation. R package version 1.0.1. Vienna: R Found. Stat. Comput; 2020.
25. Wickham H. ggplot2: elegant graphics for data analysis. Suíça: springer; 2016.
26. Minka T, Deckmyn A. maps: Draw Geographical Maps. R package version 3.3. 0 2018.
27. Giovanetti M, Benvenuto D, Angeletti S, et al. The first two cases of 2019-nCoV in Italy: Where they come from? *J Med Virol*. 2020; 92(5):518-21.
28. Benvenuto D, Giovanetti M, Ciccozzi A, et al. The 2019-new coronavirus epidemic: evidence for virus evolution. *J Med Virol*. 2020;92(4):455-9.
29. Biscayart C, Angeleri P, Lloveras S, et al. The next big threat to global health? 2019 novel coronavirus (2019-nCoV): What advice can we give to travellers?—Interim recommendations January 2020, from the Latin-American society for Travel Medicine (SLAMVI). *Travel Med Infect Dis*. 2020; (33):101567.
30. Gabster BP, van Daalen K, Dhatt R, et al. Challenges for the female academic during the COVID-19 pandemic. *Lancet*. 2020; 395(10242):1968-70.
31. Oleschuk M. Gender Equity Considerations for Tenure and Promotion during COVID-19. *Can Rev Sociol*. 2020; 57(3):502-515.
32. Pinho-Gomes A-C, Peters S, Thompson K, et al. Where are the women? Gender inequalities in COVID-19 research authorship. *BMJ Glob. Health*. 2020; 5(7):e002922.
33. Staniscuaski F, Kmetzsch L, Soletti RC, et al. Gender, race and parenthood impact academic productivity during the COVID-19 pandemic: from survey to action. *Front Psychol*. 2020; (12):663252
34. Vincent-Lamarre P, Sugimoto C, Larivière V. The decline of women's research production during the coronavirus pandemic. *Nature index*. 2020. [acesso em 2021 jul 30]. Disponível em: <https://www.natureindex.com/news-blog/decline-women-scientist-research-publishing-production-coronavirus-pandemic>.
35. Candido MR, Campos LA. Pandemia reduz submissões de artigos acadêmicos assinados por mulheres. *Blog Dados*. [acesso em 2021 jul 30]. Disponível em: <http://dados.iesp.uerj.br/pandemia-reduz-submissoes-de-mulheres/>.
36. Bandeira L. A contribuição da crítica feminista à ciência. *Rev. Estud. Fem*. 2008; 16(1):207-28.
37. Fox MF. Gender, family characteristics, and publication productivity among scientists. *Soc Stud Sci*. 2005; 35(1):131-50.
38. Melo HPd, Castilho M. Trabalho reprodutivo no Brasil: quem faz? *Rev de Econ. Contemp*. 2009; (13):135-58.

39. Goyal L. Let's Focus on Gender Equity. *Cell Host & Microbe*. 2020; 27(3):307.
40. Aquino EML, Silveira IH, Pescarini JM, et al. Social distancing measures to control the COVID-19 pandemic: potential impacts and challenges in Brazil. *Ciênc. Saúde Colet*. 2020; 25(supl1): 2423-46.
41. Adams-Prassl A, Boneva T, Golin M, et al. Inequality in the impact of the coronavirus shock: Evidence from real time surveys. IZA Institute of Labor Economics. [acesso em 2021 jul 2]. Disponível em: <http://ftp.iza.org/dp13183.pdf>.
42. Minello A. The pandemic and the female academic. *Nature*. 2020; (17):2020.
43. Schiebinger L, Davies Henderson A, Gilmartin S. Dual-career academic couples: what universities need to know. [acesso em 2021 jul 2]. Disponível em: <https://stanford.app.box.com/s/y5bicy7o3cxwtmgy22iu>.
44. Pace ÂF. Afro-brasileiros e racismo institucional: o papel do concurso na democratização de acesso aos cargos públicos. [dissertação]. Seropédica: Universidade Federal Rural do Rio de Janeiro. 2012. 152 p. [acesso em 2021 jul 2]. Disponível em: <https://tede.ufrjr.br/jspui/handle/jspui/1498>.
45. Viana RR, Tokarski CP. Burocracia Representativa: uma (re) produção de Desigualdades de Gênero e Raça no Setor Público Federal? *NAU Social*. 2019; 10(19).
46. Lima BS, Santana Braga ML, Tavares I. Participação das mulheres nas ciências e tecnologias: entre espaços ocupados e lacunas. *Revista Gên*. 2015; 16(1).
47. Silva J. Doutoradas professoras negras: o que nos dizem os indicadores oficiais. *Perspectiva*. 2010; 28(1):19-36.
48. Castro MG. Trabalhadoras domésticas no Brasil. *Princípios*. 2020; 1(159):126-50.
49. Corbera E, Anguelovski I, Honey-Rosés J, et al. Academia in the Time of COVID-19: Towards an Ethics of Care. *Plan. Theory Pract*. 2020; 21(6485):1-9.

Received on 09/05/2020

Approved on 06/07/2021

Conflict of interests: non-existent

Financial support: Research Productivity Scholarship from the National Council for Scientific and Technological Development (CNPq) (Process nº 306295/2017-2) by the author Estela Maria Motta Lima Leão de Aquino