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Four years of the COVID-19 pandemic: how does Brazil deal with the impacts? A DOHaD perspective

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Abstract

Over the last few years, during the pandemic, the Brazilian population has suffered several problems, ranging from health to socioeconomic impacts. When we consider Brazilian science, there has been an undeniable scientific delay generated by the pandemic, especially in areas that are not related to the coronavirus. In this context, with the aim of fostering collaboration among researchers in the field of Developmental Origins of Health and Diseases (DOHaD) and enhancing the potential for implementing public health strategies to prevent noncommunicable chronic diseases, the Brazilian Association of Developmental Origins of Health and Diseases (DOHaD Brazil) was established in 2020. In this narrative, we explore the effects of the COVID-19 pandemic in Brazil, focusing on its impacts on scientific research conducted in universities. Additionally, we underscore the significance of the DOHaD Brazil Association, particularly from the perspective of young researchers engaged in DOHaD research in Brazil.

General overview of COVID-19 in Brazil

On February 3, 2020, the Brazilian Ministry of Health declared a public health emergency of national importance due to human infection by the coronavirus (SARS-CoV-2). With an estimated population of 203,080,756 individuals,[1] Brazil recorded 38,078,411 COVID-19 cases between February 2020 and December 2023, resulting in 707,789 deaths, representing a mortality rate of 336.8 per 100,000 inhabitants. The pandemic situation also led to profound negative social, economic, and cultural consequences, amplifying social inequalities. The population went through phases of intense economic and psychosocial stress, as well as food insecurity due to the long period of isolation, a milestone that could impact the health of the population in the long term.[2]

At the same time, Brazilian science also suffered devastating impacts, especially when referring to areas that were already suffering from limited funding. Researchers were forced to halt their ongoing research and their funding sources were reduced or cut. Considering that young researchers in Brazil are mostly graduate students, many had personal difficulties and were forced to abandon their courses, and there were moments of uncertainty regarding the continuity of their work. On the other hand, while also suffering from the effects of the pandemic, some researchers saw the opportunity to expand their research field in different ways. Here, we report the impact of the COVID-19 pandemic on Brazilian science from the perspective of young scientists working in the field of Developmental Origins of Health and Disease (DOHaD) research.

Editorial

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The pandemic and its impacts on Brazilian higher education

Before the COVID-19 pandemic, work-related physical and mental health problems in the teaching profession in universities were already a major concern, because the teaching activities include multiple actions, research, and university outreach programs. In response to the health emergency caused by the COVID-19 pandemic and the implementation of physical distancing measures, universities were compelled to swiftly adopt online teaching and learning models.[3] This process had several impacts on university professors, with increased workload; adaptation to remote working; restructuring of their teaching plans; use of online platforms without any previous experience; difficulty setting boundaries between work and personal routines; difficulty in maintaining concentration and the participation of students; difficulty creating new evaluation processes; physical and mental health problems; and dedication to research activities.[4]

The sudden disruption of the traditional teaching model, the interference in ongoing research, and the inexperience with remote education systems affected students in different aspects (socio-economic, mental, interactions, and different issues involving research). This was particularly difficult for students from disadvantaged backgrounds. Given the scenario in which distance learning became the primary modality during the pandemic, problems were highlighted because not all students had the means to access the classes. In response, the Ministry of Education developed scholarship programs to enable low-income students to acquire equipment, such as computers, routers, modems, tablets, chips, or smartphones, among others.[5] Some universities made efforts to extend the loan periods for books and technological devices, including computers, to ensure that all students had access to the necessary resources for the continuity of their studies, even during remote learning.

Many students faced financial difficulties and had to make the difficult decision to suspend their enrolment at universities due to the challenging socioeconomic conditions in the country. The need to work while studying posed a significant obstacle, making it hard for some students to sustain their academic pursuits. A knowledge gap was pointed out by teachers, arising from students' lack of interest in classes that were taught remotely, i.e., some more basic knowledge was neglected due to the various difficulties faced by students, such as mourning family members who died, psychological damage due to isolation, and financial difficulties, among others.[6] The negative impacts arising from the psychological damage during the pandemic are still observed today, which directly impacts the quality and quantity of future professionals.

Despite the challenges, researchers in the DOHaD field in Brazil reported that universities have implemented various actions to control the spread of the virus. With the purpose of ensuring the continuity of academic activities, programs were created such as the "COVID Call Center," a program to provide safe and secure information about the symptoms.

Impact of COVID-19 pandemic on Brazilian science productivity

Considering scientific production, the pandemic led to a large-scale increase in publications about COVID-19 all around the world.[7] However, to conduct research with SARS-CoV-2 and other viruses, biosafety levels are required in the NB-3 or NB-4 laboratory, and there are a reduced number of laboratories with these adequate levels in Brazil.[8] Studies reported a significant fall in academic productivity of non-COVID-19 publications,[7] especially among female scientists who were also responsible for the majority of childcare responsibilities at home.[9] Associated with this scenario, and with activities paralyzed due to social isolation, many Brazilian scientists were required to adapt their planning and change work schedules, which led to the postponement of results. Researchers who rely on experimental animals for their studies were also impacted by the pandemic. Due to the suspension of institutional activities at universities across the country and challenges in the supply chain for maintenance, vivaria were forced to reduce the number of animals kept. In addition, the circulation of people within the universities was reduced, leading to suspension or cancellation of experiments. This delay in obtaining results and publications disrupted the training of professionals and created conditions of stress and anxiety for many researchers.[10] In addition, universities faced a financial crisis and a decline in research funding.[6] Internships and international fellowships were interrupted, which hampered the versatility of research with international groups.

Several government cuts in student funding and scholarships made it impossible for students to remain in the programs, increasing the number of student dismissals and decreasing the number of new students joining. The vast majority of research activities from well-regarded postgraduate programs, with over 150 master's and doctoral students, with high scientific production, were suspended, which resulted in an absurd number of delays, requests for extensions of deadlines, and consequently, a drop in scientific productivity. Given the consequences for students and postgraduate programs, the Coordination for the Improvement of Higher Education Personnel (CAPES), a national research promotion agency, decided to extend the term of all scholarships (social inclusive program) for six months and a more collaborative approach was adopted by postgraduate programs including an ordinance extending the deadlines for defences by one year.[11]

After the pandemic, it was possible to assess a range of impacts on postgraduation, encompassing both unfavorable and favorable aspects. Brazil experienced the largest percentage drop in scientific production, with approximately 164,318 studies published in 2022, compared to 184,982 in 2021.[5] Although the initial impact was more significant in 2020, the effects began to be noticed in 2022 due to the considerable gap between the execution, writing, and publication of research projects. Additionally, the mental health of researchers was deeply affected by the pandemic.[6] Brazilian postgraduate students faced demotivation, difficulty concentrating, and insomnia, as well as high levels of anxiety and depression. To continue classes, discussions, and meetings between researchers and academics, video conferencing tools were adopted, using the widest types of applications, a practice that continues to this day, even without the frightening scenario of COVID-19. However, the recovery of academic productivity can be a lengthy process, even with significant investments in the sector.

Despite the negative impacts of the pandemic, some positive effects emerged during and after the crisis, such as the increased use of virtual software, driving technological advancements, and the offer of several distance learning courses. Furthermore, the pandemic fostered global collaboration among scientists and researchers, intensifying interactions between different countries and institutions.[12] In the state of Rio de Janeiro, for example, DOHaD researchers published experimental and clinical research together with virologists and neurologists, in which they evaluated post-COVID memory loss in adult mice and patients at the Gaffrée

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and Guinle University Hospital from December 2020 to July 2021.[13] Awareness of mental health was also enhanced, leading to open discussions and a reduction in the stigma associated with psychological issues. As a result, this period may result in greater prioritization of mental well-being in society.

The growth of the DOHaD Brazil association during COVID-19 and future perspectives

To develop and spread knowledge regarding the field of DOHaD and to expand the accessibility of the concept for the lay and scientific community, as well as connecting individuals interested in the area, the Brazilian Association of Developmental Origins of Health and Disease (DOHaD Brazil) was founded in 2019, being legally established in 2020. The first board of the association was made up of four positions: president, vice president, secretary, and treasurer. The first assembly was held in 2021, with the election of the deliberative and fiscal council, and their respective regional representations. After DOHaD Brazil became officially established, different categories of members were created to allow new researchers to join the group. In addition, two committees were set up, the "DOHaD Brazil Young group" to promote scientific dissemination in the emerging area, and "Mothers in Science Commission" to contribute to the process of inclusion and appreciation of mothers in research.

The DOHaD Brazil Association membership began in 2022, with 140 members. In 2023, 343 people were affiliated with the DOHaD Brazil Association, including 96 effective and honorary founders, 106 undergraduate students, 47 master students, 75 PhD students, 8 post-doctoral researchers, and 11 individuals classified as other members. To reduce the distance and impact on education caused by the COVID-19 pandemic, in 2020, the association created a series of "Webinars" on a YouTube channel addressing different themes surrounding the DOHaD concept (https://www.youtube.com/@dohadbrasil8887/videos). A positive and different side of the virtual classes was the access to other forms of learning through networking and, for example, bringing together Brazilian researchers from different states who work on the topic of DOHaD. In addition, there was the possibility of taking part in national and international congresses held online, including the 1st DOHaD Brazil Congress, allowing researchers from different countries to meet each other and the start of collaborations between research groups. After the pandemic, in-person congresses were resumed, but with the possibility of some speakers and guests participating online.

When considering the DOHaD concept in the context of the COVID-19 pandemic, there is an expectation of more publications involving the main windows of development, as well as public policy issues. Following the DOHaD concept, an unfavorable environment, with the development of windows of vulnerability can increase the predisposition for the establishment of noncommunicable chronic diseases (NCDs), such as obesity, diabetes, cardiovascular diseases, and depression, throughout life. These critical periods of development include pre-conception, pregnancy, lactation, and adolescence.[14,15] Thus, given the scarce knowledge about the different effects of COVID-19, especially on women and developing children, new lines of DOHaD research are being developed to answer questions involving the direct and indirect biological effects of SARS-CoV-2 exposure. One of the direct lines will seek to answer how exposure to the pandemic in early life affects pregnancy outcomes, infant growth, neurodevelopment, health, and learning; while indirect lines will try to understand whether changes in prenatal and postnatal care contribute to improvements in maternity and child outcomes.[16]

Regarding the group's current perspectives, a new cycle began in 2024, with new members for the administrative council. As mentioned earlier, the DOHaD Brazil Young group, created to assist in broad scientific dissemination and responsible for producing this editorial, was expanded at the end of 2023. Thus, the association can be expected to continue expanding, improving the reach of its publications, and potentially reaching out to public and private institutions, to arouse interest in the DOHaD perspective, in order to improve current and future quality of life. More information about the DOHaD Brazil Association can be viewed on the website (https://www.dohadbrasil.com.br/).

Recently, the DOHaD Brazil association has started encouraging its members to join the Latin American DOHaD Association, with a view to expanding the DOHaD network. Internally, other means of communication are being encouraged, such as the creation of a monthly newspaper, which publicises work and actions involving the DOHaD research, and lectures, conferences, disciplines, and postgraduate courses that address the DOHaD concept as a research line. Another important step was the resumption of the DOHaD Brazil webinars, to expand the network of connections between the different research groups and attract new researchers. On the other hand, one of the barriers that the association seeks to break down is the dissemination of the DOHaD concept, developing effective actions for nonacademic groups, especially in different social media.

In conclusion, the pandemic has had far-reaching effects on Brazil, spanning various aspects of society. These impacts are likely to endure for an extended period. The pandemic period has underscored social, public health, and scientific problems. On the other hand, it has improved the capacity of Brazilian scientists to promote networking and enhance their potential through technology. Furthermore, it is essential to intensify epidemiological and basic research in relation to the COVID-19 pandemic period. This effort aims to mitigate, at least in part, the impact on future generations, and to gain understanding of the long-term consequences of this period.

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