

Parent in Science: the impact of parenthood on the scientific career in Brazil

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Abstract— Gender affects all facets of life and the academic and scientific universe presents no exception. For women, motherhood represents a special and tense period in order to reconcile professional life with family responsibilities. Few studies based on quantitative data evaluate the impact of motherhood on the scientific life of women in Brazil and there is no comparative data between the career of female researchers and the career of male researchers. In this view, we present here preliminary results on the real impact of parenthood on the academic and scientific career of Brazilian researchers. These results might be used to support the development of new policies to increase women's participation in science.

Keywords—motherhood, scientific career, gender, Latin America

I. INTRODUCTION

With the increase of women's participation in the most varied professional fields, women have been faced with the challenge of reconciling personal and professional life, especially with regard to maternity. A report on Gender in the Global Research Landscape published in 2017 by Elsevier, showed that the number of female scientists in Brazil has reached 49%. But data from the "Young Researchers" program of the National Council for Scientific and Technological Development (CNPq) [1] indicate that the number of women in science in Brazil decreases as the scientific career progresses, that is, in positions that are considered more prestigious and in high academic positions. An example is the number of CNPq productivity fellows (a mark of excellence in the scientific career in Brazil): in 2017, only 36% of the scholarships were held by female researchers. In addition, the woman's entry into the productivity fellowship system is later than the men's. Most fellowships are awarded to men aged 45 to 54 years,

while for women the age group with the largest number of fellows is between 50 and 59 years, and only 19% of the fellowships granted to female researchers are for women between 30 and 34 years of age, and 25% for women between the ages of 35 and 39 years.

The same scenario is found when we evaluate the leading researchers from the groups registered in the Directory of Research Groups of CNPq [1]. According to the census of 2016 [2], the percentage of women group leaders is only 38.3% in the age group between 25 and 29 years, 41.4% between 30 and 34 years, 43.4% between 35 and 39 years and 45.5% between 40 and 44 years. It should be noted that in none of the age groups the number of women leaders is larger than that of men, with the smallest difference found in the 50-54 age group, where 49% of the leaders are women. It is evident that these age groups of lesser representativeness in the productivity fellowships and leadership of research groups coincide with the fertile age of the woman. Few studies evaluate the impact of motherhood on the scientific life of women in Brazil. According to Silva and Ribeiro [3], in a paper that addresses the academic and professional trajectory of women in science, the choice for maternity can mean, among other things, a decrease in productivity for some women. This view had already been reported by Ichikawa et al. [4], after interviews with professors from the State University of Maringá, where it was found that for female professors, motherhood and science end up competing for their time, and this can slow their rise in the scientific environment. However, there are no quantitative data on the impact of motherhood on women's scientific

careers in Brazil, at any stage (masters, doctorates and postdoctoral, professors/researchers).

In view of this scenario, it is necessary to understand the real impact of motherhood on the academic and scientific life of university professors and researchers, aiming to support new policies to increase women's participation in science. In addition, there is no comparative data between the impact of motherhood on the career of female researchers and the impact of paternity on the career of male researchers. With this in mind, a more in - depth study on the real impact of parenthood on the academic and scientific life of Brazilian researchers in the different stages of their education / career is mandatory.

II. SUPPORTIVE INITIATIVES

The Parent in Science Group¹ was founded in 2017, with the main goal of investigating the impact of parenthood in the scientists' career in Brazil. Using online surveys, initial data was gathered and indicated a direct impact of motherhood on scientific production and, in consequence, funding obtention by female scientists. This data was presented in the "I Brazilian Symposium on Maternity and Science: present and future in research institutions", held in Porto Alegre in 2018. Around 140 scientists from different scientific fields and geography were present. The symposium was the scene of an intense discussion on the theme of motherhood within the academic and scientific universe in Brazil, constantly permeating the topic of gender equality and women's participation in science. A series of propositions were made, aiming at a change in the current scenario of women's participation, mainly of mothers, in Brazilian science. The Parent in Science group is an unprecedented initiative in Brazil. Some countries have been invested to support the retention, development and progression of female researchers. An example is the Australian Advance Queensland Women's Academic Fund initiative [5], which is based on universities and publicly funds research institutions/organizations in order to increase women, especially mothers, participation in science.

III. RESEARCH DESIGN

A. Goal

The aim of this work is to produce quantitative data to understand how parenthood impacts the

academic and scientific life, especially regarding productivity, in Brazil.

Our analysis is based on data obtained from online surveys and the researchers' *curriculum*. In Brazil, there is a large and integrated on-line database named Lattes Platform [6], that gathers information about the academic work of Brazilian scholars. Thus, publication metadata from Lattes Platform were retrieved using the GetLattesData software through the academic curriculum link provided in the survey.

B. Survey design

Using online surveys, over 2000 researchers were interviewed between 2017 and 2018.

Data was gathered in five groups: female researchers with children, childless female researchers, male researchers with children, female post-doctoral fellows with children, and female under/graduate students with children.

The survey consisted of 24 questions distributed in a series of questions about demographics, age, number of children, and affiliation.

Following are the questions related to maternity leave, breastfeeding and child care. Finally, questions about productivity in scientific career were presented. In this final section, people interviewed had an option of filling the data (publication records, funding grants, students advisory) or providing their academic Lattes curriculum link.

IV. RESPONDENT DEMOGRAPHICS

To date (February 1st, 2019), our online surveys were answered by 2136 scientists, divided as follow: 1608 female researchers with or without children, 138 male researchers with children, 44 female post-doctoral fellows with children, and 346 female undergraduate students with children. Here, data from male researchers, post-doctoral and students will not be presented, due to the small number of answers obtained so far.

From the female scientists interviewed, the majority were mothers (78%), and the number of children distribution was: one (56.2%), two (38.5%) and three or more children (5.14%). Researchers were affiliated to institutions from all Brazilian states, supporting a nation-wide analysis. Most of the researchers were from the Life and

¹ <http://www.parentinscience.com.br>

Health (31%) and Biological (18%) science fields, but all expertise areas were represented (Figure 2).

The rate of mothers' researchers in the STEM fields (Science, Technology, Engineering, and Mathematics) was 23%, represented in Figure 2 by "Exact sciences" (18%) and "Engineering" (5%) group.

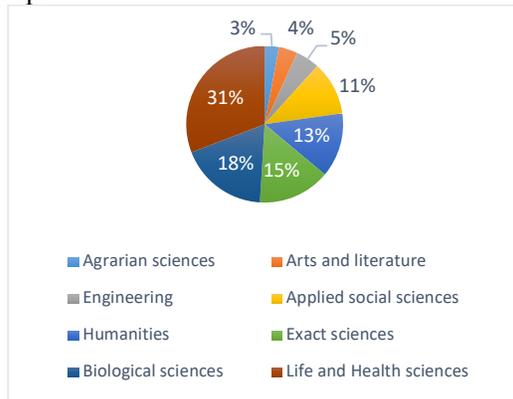


Figure 2. Distribution of answered surveys in different scientific areas

V. THE PARENTHOOD IMPACT

A. Child care and at home routine

In order to evaluate the impact of parenthood on the scientific career, we first needed to understand how the arrival of a child changed the researcher daily routine. First, we asked who the main at home child care provider was. For 54% of the respondents, the mother was the sole child care provider, and only 34% shared the care equally between both parents. 7% of the researchers had outside help, and 5% answered the father only helped occasionally. As a consequence, female researchers face a reduced time availability to work at home: only 14% were able to work regularly at home. Most scientists found extremely hard to work at home (45%) or could only perform simple tasks (20%) or work after the children bedtime (21%).

B. Productivity

The time restraint experience by female researchers after becoming a mother has an immediate impact on their productivity, where a decrease in the number of scientific publications is observed (Figure 3). The data from researchers' curriculum show this reduction seems to last at least four years after the birth of the first child. When the publication record of childless female scientists is analyzed, no similar drop is observed (data not shown).

The publishing rates shown in Figure 3 have been calculated through the number of publications by year divided by total publications in the period evaluated.

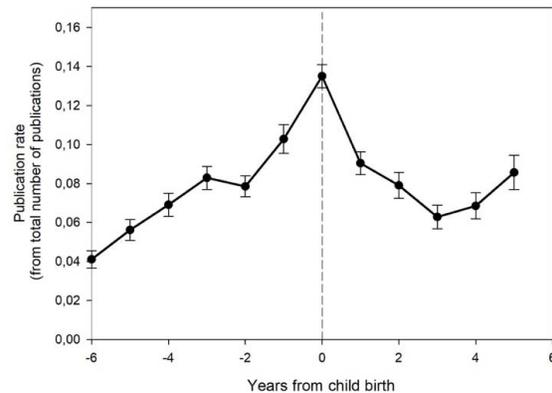


Figure 3: Effect of motherhood in publishing rates

As mentioned in the Elsevier report, gender differences in publication number suggest that issues of work-life-balance may interfere more in women careers compared to men's, and maternity has a significant relevance in this scenario.

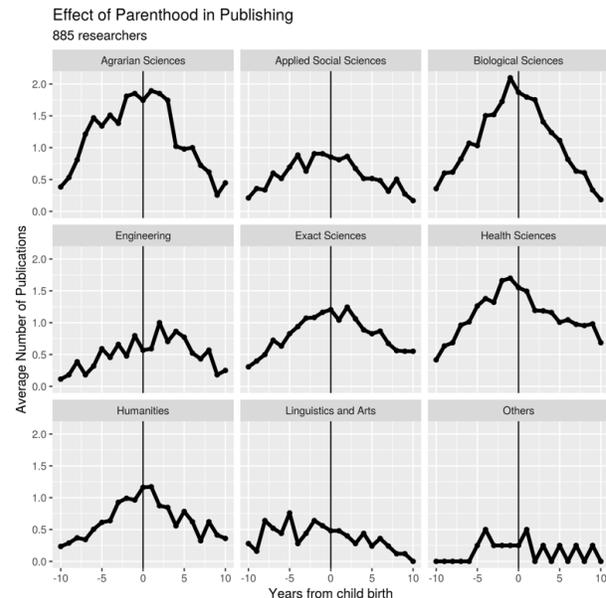


Figure 4: Effect of parenthood in publishing by scientific area

When we evaluate the effect of parenthood in publication productivity in each science field (Figure 4), it is possible to observe that there is no exception regarding the reduction of the number of publications after child birth. In STEM areas, represented by Engineering and Exact sciences, we

can see lower productivity in the 2-3 years after parenthood, as well in the other areas.

C. Impact of motherhood on scientific career

The great majority of the respondents (81%) reported that motherhood had an impact on their scientific career in a negative (59%) and strongly negative (22%) way, while a “positive” and “strongly positive” impact was reported by 5 and 2%, respectively (Figure 5).

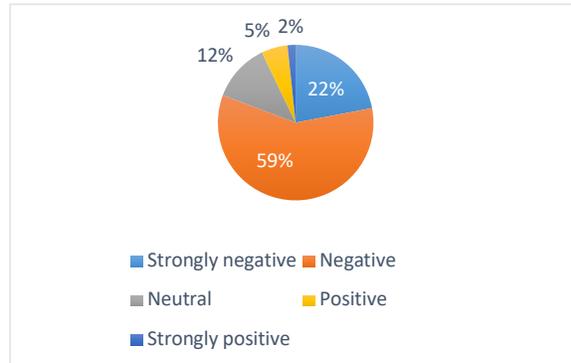


Figure 5: Motherhood impact on the scientific career

The data presented here highlights the urgent need of efforts in developing programs to support more woman in science and to encourage female researchers to return to their research careers after a break, such as the maternity leave. Maternity leave in Brazil has a period between 120 and 180 day for women and between 5 and 20 days for men.

VI. OUTCOMES OF PARENT IN SCIENCE GROUP

We presented a preliminary quantitative broad perspective of the parenthood and scientific career in Brazil, based on results from a user survey with over 2000 responses. The data indicates a relevant impact of motherhood on the productivity of the female scientists, that will in turn impact their progress and permanence on the scientific career.

Such insights can be powerful in research related to social issues and public policies. The Parent in Science initiative illustrated the necessity of supportive actions for parents in Brazil.

We are at the beginning of our exploration and the current results represent a first step towards the broader research agenda we are pursuing.

VII. ONGOING WORK

It is still early to draw any strong conclusions, but we have started to understand the real impact of motherhood on the academic and scientific life, aiming to support new policies to increase women’s participation in science.

Next steps include hosting the “II Brazilian Symposium on Maternity and Science: advances in Brazilian research institutions” in 2019 that it will be the opportunity to continue the discussion on this very relevant topic, highlighting the progress made after the previous event of 2018. A series of talks on the situation and the support policies for women in science in different countries will be held.

At the moment, we are conducting more extensive analyses, in order to complement the data already gathered, especially examining each scientific field [7] to better understand their differences.

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