

Addressing the experiences of mothers in academia—a call for structural and cultural change

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Parenthood has been linked to lower retention of women in academia, yet the specific challenges faced by mothers remain underexplored. We interviewed nine mothers across different career stages in the life sciences to qualitatively examine how motherhood intersects with academic milestones. Participants described challenges unique to academia, including dependence on supervisors, publication pressure, financial strain, and limited awareness of available institutional resources. They also shared strategies that supported their success, such as transparent communication with supervisors, designating student–parent coordinators, and creating peer communities for mothers in academia. By highlighting shared barriers and effective solutions, this work underscores the need for structural and cultural reforms to better support mothers in academia and retain talented scientists in STEM fields.

Keywords: barriers in academia; community; equity; mothers; STEM; women in science

Despite major advances in science and inclusion initiatives, gender disparities continue to exist within the STEM fields of academia [1,2]. These disparities are exacerbated as women progress through career stages: in academia, the journey to becoming a tenure-track professor or principal investigator (PI) entails undergraduate studies, PhD training, and (in some cases) postdoctoral scholarship, with some also seeking contract research associate or staff scientist positions to gain additional research experience between training stages [3]. A standard undergraduate biology class consists of a relatively homogenous spread of genders, reflective of population spread. However, women make up only 15% of total tenure-track professors at PhD-granting institutions [4] and are 23.26% more likely to leave life sciences after 10 years compared to men [5], reflecting low retention of female students [4]. Female students often feel “pushed out” in their

journey to tenure-track professors [4], reflecting unique challenges at every step of the process. Graduate training is often undercompensated [6,7] and implicit gender bias within academia, coupled with difficulty in achieving a work–life balance [4], often results in female students being less satisfied with their graduate training compared to their male peers [8]. This also holds true during postdoctoral training, during which female scholars feel marginalized due to workplace discrimination and feelings of “not belonging” [9,10]. A study by Martinez and colleagues surveyed 1300 intramural postdocs from the NIH and found that only half of the women surveyed expressed wanting to become a PI compared to two-thirds of men who wanted to become a PI. Notably, the postdocs married with children were the least represented in the subset who expressed wanting to be a PI, and women were even less inclined than their male counterparts in this

Abbreviations

NIH, National Institute of Health; PI, principal investigator; STEM, Science, technology, engineering and mathematics; UC, University of California.

subset with only 43% of women with children expressing wanting to be a PI. The same study reported that more than 21% of women considered plans to have children as extremely important in their career planning, compared to only 7% of men. Similarly, women were more likely to make career concessions and adjustments such as moving to accommodate their husband's jobs with 31% reporting that they would make adjustments as opposed to just 21% of men [11].

This "leaky pipeline" concept for women in academia was first described by Pell in 1996, who noted that factors such as the role of advisor/mentor and family planning played roles in this leaky pipeline [9]. Family planning is a major obstacle in academia, particularly for women responsible for the lion's share of family care [12]. This unequal role in parenthood was examined by Chopra and Zambelli, who highlighted the imbalance of unpaid work done by women while caring for their families across the workforce [13]. This disparity is also observed within academia, where parenthood is reported to reduce the short-term productivity of women and have lasting negative effects on their academic career trajectories; this trend was not observed in men [12].

This paper aims to highlight and reflect the experiences of parents, specifically mothers, working within the life sciences in academia, through one-on-one interviews. We interviewed nine mothers across different stages of academia including undergraduate students, master's students, PhD trainees, postdoctoral scholars, staff scientists, pre-tenure associate professors, and tenured professors. In doing so, we shed light on the challenges faced by them as mothers in academia, and the "workarounds" and ways in which they balance motherhood with their academic responsibilities. We hope that through presenting the anecdotes of mothers in academia, institutions and programs can gain a better understanding of the challenges that result in lower attrition rates of mothers [12] and integrate solutions to better support mothers and parents to help them stay in academia. Our interviews recognized structures of academia such as the publish-or-perish paradigm [14] and trainee dependence on supervisors for progressing to tenure-track positions [15] as critical and unique challenges faced by mothers. These obstacles compound with the usual challenges broadly experienced by mothers in the workforce, such as maintaining a healthy and productive work-life balance [16–18]. In addition to sharing the experiences of mothers in academic research, this article describes structural and cultural changes to bolster research continuity, communication with supervisors, and community

Box 1

Questions posed to interviewees:

- 1 What's your motherhood journey within academia been like?
- 2 How have things changed through your journey?
- 3 What were some of the most challenging aspects?
 - a Did you feel challenged by your day-to-day interactions e.g. with your lab or supervisor?
 - b Did you feel challenged by a lack of facilities? e.g. lactation rooms – no cleaning equipment, no fridge, no reservation system, daycare, lack of housing/transport subsidies
 - c In terms of research, did you feel like you were missing out on conferences?
 - d Did you feel like your institution was not supportive, even if your supervisors had your best interests in mind?
- 4 On the flipside, what changes would you like to see at the supervisor and institution level to make this journey easier?
- 5 Do you think co-parenting made/would've made this easier?
- 6 How can mothers in academia be better supported?

building among mothers in research that represent solutions to further support mothers within academia.

Methodology

We conducted interviews with nine mothers in the life sciences at various levels in academia: undergraduate (1), graduate (masters and PhD) (1), postdoc (2), staff scientist (1), tenure-track assistant professors (3), and full professor (1) across San Diego research institutions (UC San Diego, UC San Diego Health, Salk Institute, and Sanford Consortium of Regenerative Medicine). The participants were recruited via (i) personal contacts and (ii) snowball sampling, which limited participants to those who conducted life sciences wet-lab research in San Diego institutions

Interviews were conducted confidentially; interviewees were asked questions about the challenges they have faced through their academic career and ways in which they felt supported, including their workarounds to challenges. The workarounds proposed below were based on solutions that were suggested by all the interviewees. Specific questions are shown in Box 1.

As there were only nine interviewees, the challenges and solutions we report are drawn from a small sample size. We acknowledge effects of limited generalizability and potential self-selection bias. Further studies and surveys including a larger sample size from institutions that are geographically distinct will further elucidate challenges and proposed solutions for mothers in academia.

Challenges faced by mothers in academia

Interviewees revealed that in addition to challenges faced by parents in trying to balance careers with parenthood, the structure of academia, especially in the life sciences where in-person wet lab or dry lab work are required, adds an additional layer of complexity that mothers need to navigate. Below we discuss four of these additional challenges:

Dependence on supervisors

Eight interviewees who became mothers during their training (undergraduate, graduate, or postdoctoral) highlighted that their experiences, either positive or negative, were shaped by their supervisors. Specifically, it was noted that supportive mentors, who were often parents themselves, were able to make accommodations (specific accommodations described in the “Proposed workarounds and solutions” section) to support new parents’ research goals during maternity leave and accommodate a work schedule that might require work outside of ‘normal working hours’ (defined for this study as 9 am to 5 pm on weekdays) to support career milestones.

However, four interviewees recalled that unsupportive mentors inadvertently created hostile work environments for mothers by continuing to schedule lab group meetings outside of normal working hours and expecting all trainees to consistently work after hours or weekends. Moreover, unsupportive mentors also inculcated hostile lab cultures: an interviewee shared that an important project that she had spent time setting up before she took maternity leave was passed over to another lab mate during her absence. This lab mate refused to involve her with the project on her return, resulting in a major loss of a potentially career-changing publication.

An interviewee also recalled that in addition to lab meetings, most seminars, happy hours, and professional development opportunities would often be scheduled after 5 pm, resulting in her and other student–parents missing out on these essential career-building opportunities such as networking.

For most trainees in their graduate or postdoctoral training, letters of recommendation from their supervisors outlining trainees’ work ethics are essential for career development [19]. Two interviewees felt intimidated to transparently ask supervisors for additional time off to care for their newborns over fear of being perceived to have a “poor work ethic.” This variability with supervisors’ mentalities leads to significant disparities in experiences among student–parents, especially mothers, and is a challenge unique to academia.

The “publish or perish” culture and maternity leave

A unique aspect of the academic workspace is the importance of publications, specifically first-author publications, serving as the primary means in advancing in an academic career and other careers in the life sciences. This pressure to continuously publish to secure further career opportunities and funding can create an environment wherein taking time away from work is especially difficult and can have lasting consequences [14]. In this environment, therefore, taking maternity leave was often seen as a setback, as shared by five of nine interviewees. As a result, new mothers may feel pressure to continue working during their time off. Three interviewees shared that although they could not physically be in the laboratory, they were still actively working from home during their maternity leave.

Six of the interviewees also shared that they felt compelled to return to work earlier than they should: most contracts offer a guaranteed 8 weeks of maternity leave with the option for four additional weeks. However, six interviewees shared that they did not utilize the four additional weeks offered to them and chose to return to work immediately after 8 weeks of mandatory leave due to fear of potential setbacks on their research project. Upon reflection, two interviewees stated that the hasty return-to-work and incomplete break during maternity leave contributed to increased feelings of burnout and a reduced sense of motivation on their return. Conversely, interviewees who had structural support from their laboratory (as described in the “Proposed workarounds and solutions” section) shared they felt motivated and confident on their return to work.

Financial constraints and career decisions

Compensation in academia has historically been inadequate for graduate students and often limits the agency

of students [20]. Many master's and undergraduate students deal with student loans [21] that already dissuade them from conducting STEM research. Even at the professor level, female scientists are undercompensated in comparison to their male counterparts with similar publishing history [22]. Interviewees who had children when they were undergraduate, master's, or PhD students stated that low compensation made it extremely challenging to afford childcare or take time off, especially in a state with a high cost-of-living like California. All the interviewees in this situation stated that they were able to maintain a normal lab schedule only due to having a partner or close family living nearby who provided them with trustworthy childcare free of cost. Accessibility of affordable or free childcare can also limit where parents do their graduate training. One interviewee stated that their decision on where to attend graduate school was contingent on their parents' house being within driving distance to allow for free and reliable childcare.

Mothers face unique financial and practical barriers that can make attending conferences difficult. Interviewees expressed hesitation in attending conferences [23] due to the cost of additional childcare required in their absence, and a lack of conference programming breaks or lactation facilities required for new mothers. Missing out on conferences can negatively affect academic careers, and interviewees shared that conference attendance was a major dilemma for them during their training.

The challenges presented by having children while working in academia can strongly influence female scientists' decisions regarding both family and career planning. Interviewees shared that early-career financial constraints were a major factor in their decision to have children later in life as a postdoc or a new professor. One interviewee shared that this delay in their biological age contributed to difficulties with fertility and childbirth [24]. Deciding to stay in academia after graduate training is an often difficult choice students must make, particularly mothers. In one interviewee's experience, motherhood was a key factor in their decision to not pursue further training in academia after having a child during their PhD, rather opting to work in a more structured hours-based role, marking an exit from the classical academic route to becoming a professor.

Limited awareness of available resources

Most of the interviewees worked in institutions that do have policies to support parents: this includes childcare

grants (included in graduate students' contracts and postdoc grant applications), parental leave extensions, and infrastructure such as lactation facilities across most buildings. However, the utility of such resources is limited if mothers are not aware of their existence. A majority of interviewees recalled learning of these resources purely through tedious personal research or through word-of-mouth from other recent mothers; one interviewee recalled finding an outdated file by chance on a campus resource website that outlined a subsidized food stamp resource offered to student parents.

Another interviewee shared that an undetected glitch in the system resulted in them not getting paid for the first few weeks of their maternity leave. Ultimately, they were able to resolve it with HR and their supervisor. However, this was accomplished only because the interviewee single-handedly pursued the issue, which was a major source of stress during their dedicated maternity leave.

Five interviewees also noted that while their institution did provide a designated space for lactation, they did not provide other necessities such as a fridge for milk, a sink to clean up post-lactation, or privacy screens in the chance that multiple people were using the lactation space. This limited awareness of resources, coupled with often incomplete infrastructure, resulted in added stress and uncertainty for mothers, especially when they were still expecting.

Proposed workarounds and solutions

Interviewees were asked about positive experiences, as well as workarounds and solutions that helped them balance the challenges of motherhood with expectations in academia. Below are the recurring workarounds and solutions provided by interviewees:

Encouraging open conversations with supervisors to ensure safety and continuity of research goals

Three interviewees who are now tenure-track professors shared that when they were planning their maternity leave, they had candid conversations with their supervisors about expectations and deliverables during and after their maternity leave. Two interviewees shared that in the months leading up to their maternity leave, they trained a research associate on key lab techniques to ensure continuity of experiments during their leave. This enabled them to devote time to their newborn during maternity leave without the worry of "missing out" on essential

results required for submission of career-defining grants and opportunities. Another interviewee shared that they had a clear conversation with their supervisor on ownership of their project and experimental plans to ensure that it would not be transferred to another trainee in their absence. These practices not only ensured steady research continuity and therefore a minimal delay in publishing or applying to career-defining grants, but also a more stress-free maternity leave and an increased sense of motivation on return to work. The caveat remains that these situations were possible due to supervisors understanding their trainees' needs.

This practice of open conversations to explicitly understand joint and personal goals is an effective strategy for improving team efficiency as described in an article from Wake Forest University [25]. The authors showed that developing a "team charter" where a research group's goals were clearly defined showed a positive impact on a research group's cognition and research effectiveness.

Therefore, a proposed solution to better support mothers in academia is for institutions to foster a culture that is more inclusive and allows for open conversations with supervisors. Clear guidelines and even training given by the institutions (in collaboration with the student–parent coordinator described in the section below) to supervisors can help ensure research continuity without fears of career stagnation.

Establishing a student–parent coordinator role

As described in the "Challenges faced by mothers in academia" section, although institutions have some resources in place for new mothers in academia, these are often unknown and therefore underutilized. Therefore, establishing a student–parent coordinator role can help increase transparency about not only resources available to mothers in academia, but also any changes in policies that might affect mothers. All interviewees stated that having a student–parent coordinator would have been extremely helpful for them in navigating both their pregnancy and return to work post-maternity leave. Specifically, the interviewee that recalled a delay in their paycheck during maternity leave shared that having a coordinator or designated administrator to interface with the university and resolve this issue would have alleviated a lot of stress. Further, the existence of such a liaison would provide institutions with guidelines on how to provide improved and effective infrastructure for mothers.

Creating a community for mothers in academia

All interviewees echoed their reliance on their community of other new mothers— their lab mates, peers, or supervisors— for their ability to navigate resources, manage schedules, and balance work with having a newborn. This sentiment is also reflected within some online forums and groups such as [Mama is an Academic](#). Creating a more official community for mothers in academia at an institutional level would help relieve concerns and share resources. For example, an interviewee shared that they created an unofficial group for new mothers within their laboratory building where they shared daycares, babysitters, and lactation facility schedules. Another interviewee shared that they organized a "Mothers in Academia" panel at a conference that drew a large number of attendees and provided insights into making conferences more accessible for new mothers. Creation of interest groups can also generally help alleviate feelings of isolation [26], which was a feeling experienced by half the interviewees. Therefore, having universities or potential student–parent coordinators create a community for new mothers in academia would allay feelings of isolation and confusion, and help alleviate the added burden of unpaid work that interviewees took on to create these groups themselves, thereby better supporting mothers' careers in academia.

Conclusion/future perspectives

Overall, our interviews revealed pervasive challenges faced by a majority of interviewees (Fig. 1A), as well as "workarounds" and solutions that the interviewees recalled helped them balance motherhood with careers in academia. As discussed in the "Challenges" section, both structural and cultural reform is required to prevent the "leaky pipeline" of academia in STEM (Fig. 1B). Cultural reforms such as university policies encouraging open conversations about personal milestones in addition to research milestones will ensure continuity of research goals, ultimately benefitting all parties involved. Structural reforms such as the establishment of a student–parent coordinator role will alleviate confusion and increase knowledge of resources that might already be available to mothers. Additionally, the creation of communities for mothers in academia, either within universities, or by geographical areas will help provide support and allay feelings of isolation often felt in academia.

Although these interviews elucidated the experiences of mothers specifically conducting life sciences research in the San Diego area, larger studies that utilize

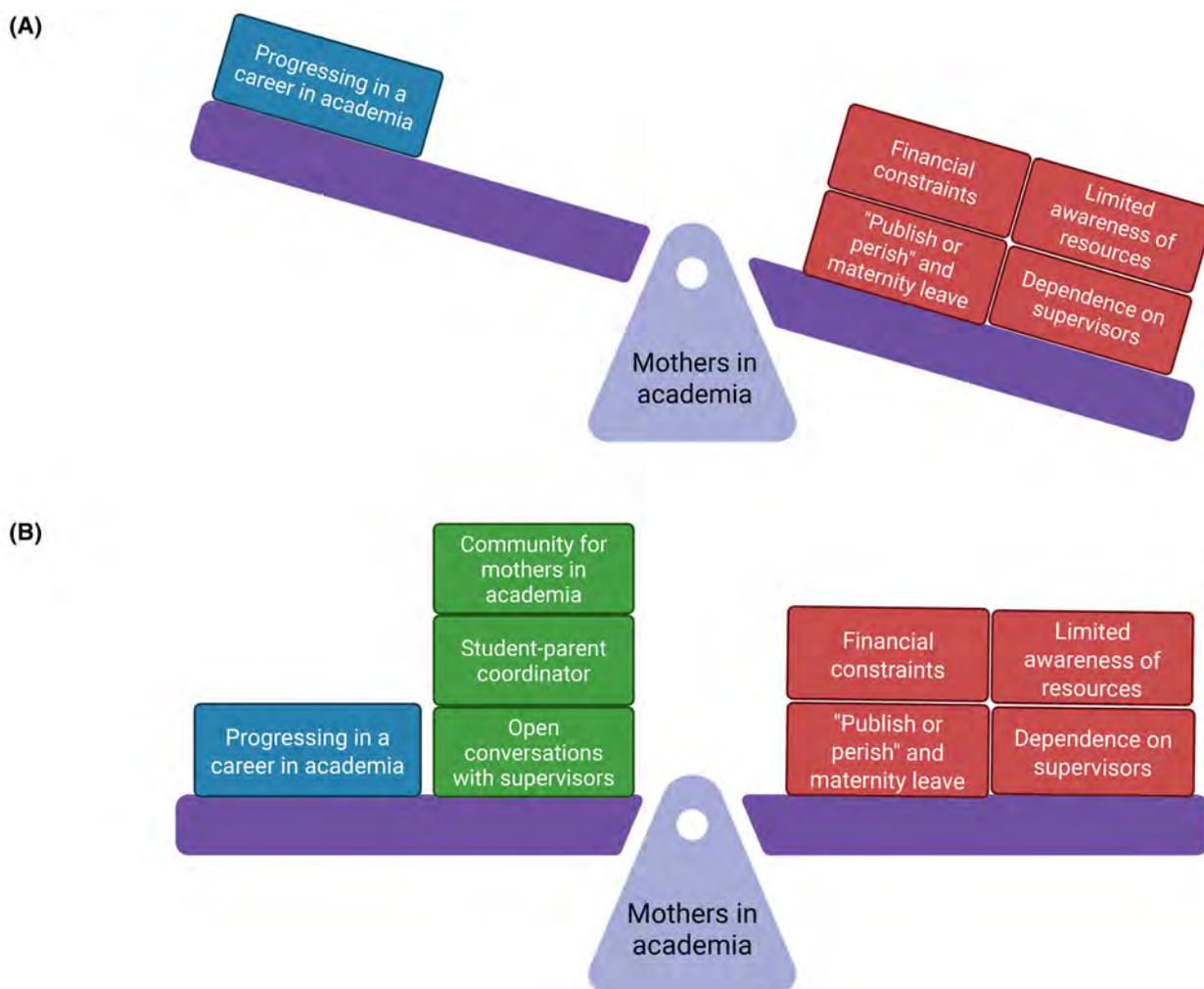


Fig. 1. (A) Challenges faced by mothers in academia can offset the balance, making it difficult to progress in careers in academia. (B) Proposed solutions that can help balance the scales through structural and cultural reforms, potentially leading to higher retention of mothers in academia.

surveys and quantitatively measure the impact of motherhood on various facets of the academic career will likely prove helpful in further understanding challenges. Cross-institutional surveys that span various areas of research within academia will also shed light on some challenges that might be different depending on the type of research being conducted by an academic; solutions or workarounds will also be tailored to factors such as type of research, time spent in a laboratory setting, geographical region, and policies.

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Author contributions

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