

How Long Are We Going to Accept Stark Gender Imbalances Across the Publishing System?

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Introduction

The underrepresentation of women at multiple levels of the publishing system has been systematically and compellingly documented across diverse scientific fields over the years.¹ Overall, women account for about 1 in 3 first authors and 1 in 4 last authors of scientific papers.^{2,3} Although fields such as the humanities, psychology, and the social sciences have long been considered more friendly to women, in fields such as science, technology, engineering, and mathematics (STEM), men disproportionately publish more manuscripts and in more prestigious journals, irrespective of the specific field.⁴⁻⁶ Furthermore, the proportion of women has been consistently found to be lower in last authorship than in first authorship positions.^{7,8} This clearly illustrates the concept of the “leaking pipeline,” which describes how gender inequalities are magnified as we ascend the academic ladder. The underrepresentation of women among authors is replicated among editors and peer reviewers. For instance, our recent study in a sample of journals published by the British Medical Journal Publishing Group found that women accounted for about 1 in 3 peer reviewers and editors and 1 in 5 editors-in-chief.⁹ Five journals did not even have a single woman in their editorial boards. This is in keeping with previous evidence from other scientific fields and compellingly demonstrates how pervasive gender inequalities are across the publishing system.^{1,10-12} In the current hypercompetitive academic environment, women’s underrepresentation across the publishing system is likely to undermine their career progression in a vicious cycle where women’s disadvantage begets disadvantage. This may

explain why women are less likely to obtain research grants and be promoted to senior academic positions, which may ultimately lead to dropping out from academia.¹³ Despite the myriad studies documenting stark gender inequalities in the publishing system over the past decades, progress has been slow, or even absent, in most scientific fields.^{6,7,14} It is, thus, pertinent to reflect on the underlying causes and potential solutions.

Why Are Women Underrepresented in the Publishing System?

In this scenario, it is reasonable to ask whether women truly represent half of the world population—have the demographers just got it wrong? In fact, detractors of gender equality have argued that women’s representation in the publishing system should be compared with women’s representation in the source population. Although it is, in practice, impossible to determine the source population for the authors, editors, and peer reviewers of scientific journals, considering how women’s representation has evolved in academic institutions may be instrumental to understand the root causes of women’s underrepresentation in the publishing system. Albeit to different extents and at varying pace, women have made substantial strides in education and the workplace worldwide.^{15,16} In academia, a recent U.S. study in the showed that women’s representation has been increasing, even if women remain broadly underrepresented.¹⁷ Indeed, the majority (64%) of tenure-track faculty are still men, with substantial heterogeneity by area of study. Women’s representation has been consistently the lowest in mathematics and computing, and natural sciences, and the highest in education and medicine/health. Importantly, this study demonstrated that women’s representation among new hires has remained flat over the past decade, and newly hired faculty are still more likely to be men, thus suggesting that gender parity in academia, and especially in STEM fields, will not be achieved without further changes in women’s representation among new faculty. Sadly, this situation is not specific to the United States. In the UK, despite an increase from 40% to 47% in women’s representation among academic staff between 2003 and

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2021, women remain underrepresented, particularly in STEM fields, senior management, and professorial roles.¹⁸

Notwithstanding the importance of promoting gender balance in academic institutions, this is not a silver bullet to fix the longstanding gender inequalities in the publishing system. Successful policies and initiatives to increase gender diversity in academic institutions, such as the Athena Scientific Women's Academic Network (SWAN) program, which has been supporting and recognizing higher education institutions in advancing the careers of women since 2005, have not yet translated into significant improvement in women's representation in the publishing system.¹⁹ In addition, a recent study of 1.5 million academics suggested that the relative increase of participation of women in STEM fields over the past 60 yr has not reduced the gap in women's academic recognition and representativeness.²⁰ The lack of substantial improvement in women's representation among authors, editors, and peer reviewers over the past decade, in comparison to the progress made in academia and research in general, thus hints at additional causes.

The underlying reasons for the persisting women's underrepresentation across the publishing system are likely manifold and involve vicious cycles that have proven hard to break. On one hand, gender bias, even if unconscious, may prevent women from becoming authors of scientific papers, particularly as last authors, as these tend to be senior and/or principal investigators. This, in turn, may result in women being less likely to be invited as peer reviewers and editors, as these are typically senior experts in their fields with outstanding publication records.²¹ Women's underrepresentation as peer reviewers and editors may, thus, be both a symptom and a cause of broader underrepresentation among authors and in senior positions in the academic and publishing systems as taking part in the peer review and editorial processes can be a stepping stone to senior and leadership roles, which themselves increase success in obtaining funding and high-impact publications.^{22,23} Therefore, gender bias can have a pervasive effect that permeates through the academic into the publishing system and vice-versa. Furthermore, affinity bias may synergise with gender bias to perpetuate women's disadvantage. Previous studies have demonstrated that men are disproportionately overrepresented in editorial boards, and this is associated with a lower representation of women as authors and peer reviewers in comparison to men.²⁴⁻²⁶ Although association does not prove causation, editors seem to have substantial same-gender preference when selecting peer reviewers irrespective of whether they are women or men.²⁷ Entrenched biases may, hence, underpin women's lack of power and ability to influence even when there is apparently gender parity.

On the other hand, barriers to women's participation in academia and research may not only reduce their ability

to publish but also to accept invitations to become peer reviewers and editors. Deeply entrenched gendered roles in our contemporary societies mean that women still bear the brunt of homemaking, childcare, and other unpaid care roles.^{28,29} Furthermore, women undertake a greater share of internal service in academic institutions (e.g., activities related to faculty governance, faculty recruitment, evaluation and promotion, student admissions and scholarships, program supervision, development and marketing, internal awards) in comparison to men.³⁰ Taken together, these unpaid commitments reduce women's availability to engage with scholarly activities with unscheduled and tight deadlines. Although a recent study showed a minimal difference between women and men's acceptance of peer review invitations (37% for women vs. 41% for men), the decline observed during the COVID-19 pandemic in acceptance rates for women, but not for men, suggests that the greater burden of caring and family responsibilities posed on women, which was exacerbated during the pandemic, may jeopardize women's ability to commit to peer review or editorial roles.³¹

What Can We Do to Fix the Longstanding Gender Imbalances in the Publishing System?

Although gender imbalances in the publishing system have been known for decades, serious commitment to stem deep-rooted gender inequalities has been lacking. This may be, at least in part, because there is no magic wand for such a complex problem. On the contrary, solutions need to be multipronged and involve multiple stakeholders, hence requiring significant investment of time and resources. On one hand, scientific journals and publishers should adopt transparent policies and practices on gender equality. These may include establishing gender quotas for editors and peer reviewers, which although controversial because invitations for these roles should be based on merit rather than gender, could have a remarkable impact on women's representation akin to that seen in politics and business.³² Nonetheless, evidence from a researcher-led journal showed that senior editors and authors were more likely to select men than women as reviewing editors, even after correcting for the gender imbalance in the pool of reviewing editors available.³³ This clearly illustrates that gender quotas should be one among many tools in the "gender equality toolkit," which should also include providing training to editors and other editorial staff on inclusion, diversity, and unconscious bias,³⁴ as well as ensuring digital technologies, such as algorithms used to identify potential reviewers and editors, do not discriminate against women, as has been shown for other artificial intelligence search algorithms.³⁵ In addition, these policies and practices should be accompanied by

greater transparency and accountability by making real-time data on gender statistics for submissions and publications, reviews, and editorial functions at all levels publicly available.

On the other hand, academic institutions need to fix the longstanding “leaking pipe” in the academic ladder. This requires worldwide implementation of cross-cutting gender-friendly policies, such as the Athena SWAN program.³⁶ Enabling women to reach their full potential and climb to top positions in their fields is key to ensure they are proportionately represented across the publishing system, particularly in positions associated with seniority and prestige. This will, in turn, trigger a virtuous cycle where women’s representation in the academic and publishing system, particularly at senior and leadership level, are mutually reinforced. More broadly, researchers and academics in all fields have a pivotal role to play in addressing barriers that hinder women’s careers. Although it is arguable that homemaking and caring responsibilities should be fairly shared between women and men, this may take generations to achieve. In the meantime, digital technology enhances work flexibility and allows people to conciliate research with other commitments, thus mitigating against the detrimental impact of gendered roles in our contemporary societies on their careers. Mentoring and role modeling may also be pivotal to empower women to breach through the glass ceiling to reach top leadership positions.³⁷ We all have a role to play in improving gender equality within our spheres of influence by exposing discrimination, uprooting gender biases, and promoting an environment where women can thrive.³⁸

Conclusion

The wider benefits of gender equality for science have been compellingly demonstrated for women and men alike.^{39,40} Indeed, a research community that is more inclusive, diverse, and representative, and works to ensure that everyone counts, is more likely to generate research that is universally beneficial and not limited by inequalities.⁴¹ Lack of gender diversity means evidence published in the highest impact journals might be swayed in favor of topics or methods that are preferred by men and framed from their point of view, thus failing to account for the important perspective and priorities of women. It is high time that the scientific community, in general, and scientific journals/publishers in particular, adopt policies and practices that promote women’s inclusion and demonstrate accountability for steady and sustained progress towards gender equality. For as long as the academic and publishing systems are rigged against women, gender equality will remain a mirage to the detriment of science and, broadly, society welfare and wellbeing.

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