The gendered system of academic publishing

Gender is a sociocultural and economic concept and an institutionalised system of social practices that translates into different experiences and uneven advantages for men and women at the individual, organisational, and societal levels.[1] This system manifests as the persistent gender pay gap, endemic sexual harassment,[2] and the proverbial glass ceiling limiting women's representation and advancement in social and economic life. Academia, including academic publishing, is not immune to this gendered system of social practices.

Academic careers are built and maintained through participation in publishing. It is not only the means through which research is communicated, but also a critical measure of academic productivity and distinction. Being the author of a paper, acting as a peer reviewer, and obtaining an appointment as an editorial board member, associate editor, or editor-in-chief are important recognitions for merit and promotion. The academic publishing process is purportedly built upon objectivity[3] and presumed gender neutrality. Yet, despite growing numbers of women in the research workforce, most authors,[4] peer reviewers,[5,6] and editors at academic journals are men.[7–9]

In 2012, *Nature* called attention to what it deemed to be its own "sexism", reporting that only 14% of peer reviewers and 18% of profiled researchers in 2011 were women.[10] The American Geophysical Union studied all articles published in its 20 earth and space sciences journals between 2012 and 2015 and found that women made up only 20% of peer reviewers.[5] A 2015 study found that just 14·8% of editorial board members at 69 dental journals were women;[9] and between 2002 and 2008 just 34% of *Obstetrics & Gynecology* editorial board members were women.[8] Of the estimated 27·3 million researchers who authored the 5·5 million research papers indexed in the Web of Science database between 2008 and 2012, just over 70% were men.[11] A review of the Scopus database between 2011

and 2016 found men's average output in the UK for the 5-year period to be 2·4 and women's 1·9.[12] Meanwhile, women in first authorship positions increased from 27% in 1994 to 37% in 2014 in six high-impact medical journals (*Annals of Internal Medicine*, *Archives of Internal Medicine* (now called *JAMA Internal Medicine*)*, The BMJ, JAMA, The Lancet,* and *The New England Journal of Medicine)*, but progress has stagnated or declined since 2009.[13]

The gendered system of academic publishing is both a reflection and a cause of women's under-representation and disadvantage in other areas of the scientific enterprise. Women receive less research funding in science and medicine.[3,14] This funding gap inevitably leads to women publishing fewer research articles,[11] and their articles may receive fewer citations.[11] Therefore, women are less visible as researchers and authors, and thus less likely to be invited as peer reviewers and editors. This situation, in turn, reduces their funding success.[3] Other explanations for less funding include gender bias, which results in women being seen as less qualified than men even with evidence to the contrary.[3,14,15] Bias and structural sexism affect women at every stage in the research and publishing cycle**,** cumulatively disadvantaging women and their advancement throughout their careers.

Leading journals have made commitments to addressing gender imbalances. *Nature* recorded limited progress since 2011; in terms of reviewers, 12% were women in 2012 and 22% in 2015; 27% of first authors of commentaries were women in 2013 and 20% in 2016.[16] A *Science* audit of the gender of published authors said its own editorial decision making was not contributing to low numbers of junior and senior women authors, but the journal reported that it received a third fewer papers from women authors than are in the scientific fields they represent.[17] *The Lancet* has committed to examining its own internal practices, recognising gender bias in the publishing system.[18]

To discuss progress towards gender equity in academic publishing, a diverse group of constituents from academia, research, and publishing in Canada, Kenya, Nepal, Switzerland, and the UK convened a workshop, Gender Equality in Academic Publishing: Challenges and Opportunities in Health Journals, on Nov 30, 2017, at the London School of Hygiene & Tropical Medicine in London, UK (appendix). Our focus was on identifying strategies to improve gender equity in peer review and publication processes.

Our conversations led us to identify a set of priorities for future research and action. Foremost, we recognise the need for better data collection to understand the extent of the gender gap in authors of papers, among peer reviewers, and in various editorial roles.[5] Publishers can ensure that submission and editorial systems collect self-reported gender and other diversity indicators. Real-time data collection will allow editors to track, analyse, and publish gender statistics for submissions and publications, reviews, and editorial functions at all levels. Journal editors can be advocates in requesting this change from their publishers.

Given the attention being paid to gender equity across broader social and policy areas, it is incumbent upon journals and publishers to take action and be part of the solutions. Editors and publishers can make public commitments to address gender gaps and set diversity targets for commissioned content, peer reviewers, and editorial roles, against which they can be held accountable. More women in journal leadership positions have been shown to be associated with greater numbers of women on editorial and advisory boards.[9] Furthermore, a study showed that women authors recommend a higher proportion of women peer reviewers than authors who are men.[6] A deliberate strategy to increase women's participation in peer review can thus include promoting women to leadership positions. Finally, a further benefit is that women researchers would be more likely to

include sex and gender analysis in their research articles, which improves the accuracy and quality of research findings.[19]

Academic journals need not look far to find promising practices. They can learn from other targeted gender equity initiatives in the academy. The ADVANCE programme, for example, funded by the National Science Foundation in the USA, is a long-standing funding initiative that combines research and action to improve recruitment, retention, and promotion of women in science, technology, engineering, and mathematics. The Athena SWAN Charter in the UK is another government-supported programme to increase women's engagement in science, technology, engineering, mathematics, and medicine. A standard setting external body could provide strong incentives for journals to set public targets and monitor them regularly.

As advocated by *Science*, providing training to editors and other editorial staff on diversity initiatives and unconscious gender bias could counteract its effects.[20] Work in academic medicine suggests that effective training includes feedback on one's own implicit association test scores, practice in identifying situations of bias, and developing written commitments to reducing gender bias.[21] Finally, while progress has been made towards developing best practices, there is a need for more rigorous research and evaluation of interventions to counter systemic bias in peer review.

We have been involved in, and support efforts to expand, the adoption of the Sex and Gender Equity in Research (SAGER) Guidelines[22] that address the inclusion of sex and gender analysis in research content. Complementary guidelines are under development (SAGER II) to provide a framework for publishers and journals to strive for gender balance in their workforce.

The academic publishing community must recognise that it is not immune to sexism and gender bias. Now is the time to take decisive action to challenge the status quo.

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