The gap between male and female author-inventors: Who counts as an inventor?

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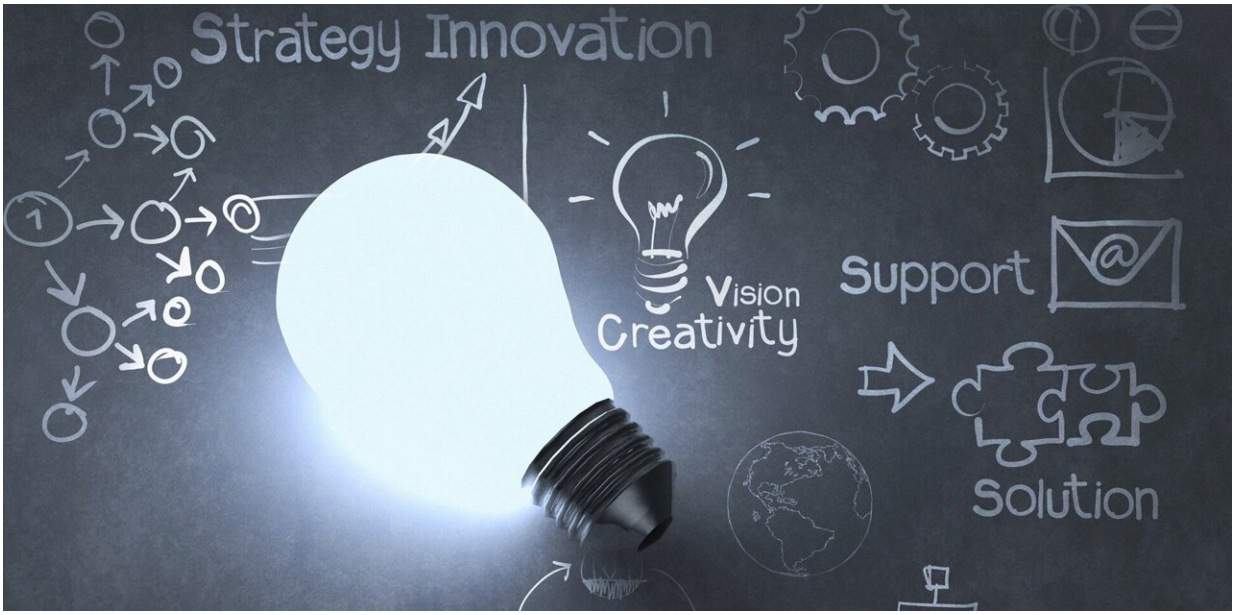

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New research, undertaken by an interdisciplinary team of Stanford Law and Stanford Medicine students, looks at the overlap between biomedical research paper authors and those authors who go on to be named inventors of their research on patents. Among the findings is a gender discrepancy between male and female authors, with male authors receiving patents more frequently.

The team created a comprehensive patent-to-publication citation map that includes 430,000 biomedical inventor-research teams. The findings, published in *Nature Biotechnology* on May 16, are discussed here with Ishan Kumar, JD/Ph.D. '23, who led the project.

What was the spark for this project? And what was the timeline? Was it conducted in a policy practicum or course?

My team had previously published a map connecting all biomedical publications with all patents (published in *Nature Biotechnology* in 2021). As I had simultaneously been a wet lab researcher and had focused on intellectual property law while at SLS, I appreciated that the path to patenting a discovery in the lab is opaque to the outside world and often to the researchers themselves.

More concerningly, there was a lack of real-world information on how credit is apportioned between junior and senior researchers because of the patenting process. I and my co-authors saw an opportunity to shed light on that process with our unique dataset.

What are the most striking findings?

We were struck first by how academic authors have started to patent their own findings—this trend has grown in recent years to the extent that more than one in four publications which are cited by a patent will be a "self-citation" from a patent inventor who is also an author on the cited paper. Given the attention and funding that has been devoted to bridging the "valley of death" in drug development, it is reassuring to observe such a broad push to translate bench research into the clinic.

Next, we saw that a large share of these self-cited publications excluded

their first authors from patent inventorship. As first authors are generally trainees, students, and professional scientists under the guidance and mentorship of a last author who typically runs the lab, determines its scientific direction, and writes the papers and grants, this finding revealed a bit more about the dynamic between the two groups. And, yes, when we incorporated gender into this kind of analysis of the scientific hierarchy we were really surprised by how significant and persistent the gap between male and female author-inventors is, and further by how seniority seems to influence this.

This is despite real advancements in improving gender balance within biomedical research, and so there should certainly be some deeper investigations into whether there may be procedural issues causing an improper distribution of credit along seniority and gender lines. A downstream question is whether there is an improper distribution of financial gain owing to this dynamic, though these are difficult to address given current methodological constraints.

Biomedical research is typically shared and updated in research journals. Can you talk about the importance of the order of authors and who had most to do with the research discovery?

In biomedical research, convention holds that first authors perform the actual experiments and analyses for the study. The authors in the middle of the author list have a supporting role with data analysis, technical help, and so on. The last author runs the lab, conceptualizes each study, determines the scientific direction of the lab, and will write up the results and secure grant funding for the lab. Thus, the dynamic is that most of the time the first author is a trainee being mentored by the last author.

How often do lead authors get named on patents?

In recent years, first authors have been named on patents with the last authors about 30% of the time. And they are alone on patents about 7% of the time. But last authors alone (without the first authors) have been named on patents about 30% of the time as well.

And of that group, there is a gender gap?

Yes, female last authors and male last authors have a nearly 25% difference in recent years. The gap between female first authors and male authors is smaller, at around 10 to 15%, but is slowly growing.

Did anything in your research surprise you?

Yes, the persistence of the gender gap despite improving gender balance in biomedical research is very surprising. It indicates that perhaps we should consider supplementary metrics for fairness of process and access to opportunities in addition to representation.

Why does this matter?

It matters because researchers dedicate their lives to generating high-quality research, often for little reward other than acknowledgement and an opportunity to share their findings. In cases where they may have discovered or developed a finding with practical value, ensuring there is fair access to credit and perhaps even financial benefits at the tail end is critical to incentivize them to risk spending years of effort on a project.

More information: Anoop Manjunath et al, Who counts as an inventor? Seniority and gender in 430,000 biomedical inventor–researcher teams, *Nature Biotechnology* (2023). DOI:

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