The effect of mentee and mentor gender on scientific productivity of applicants for NIH training fellowships

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May 17, 2022
Women pursuing careers in biomedical sciences face formidable barriers

• Their work accrues fewer citations than that of their male colleagues

• Less likely to be judged as stars in their field by reviewers of R01 applications

• Members of the National Academy of Science, which is 85% male, are more likely to train other men as postdoctoral fellows, and train 58% of future faculty

• Awarded half of all doctoral degrees, represent a third of tenured or tenure-track faculty

• Women of color face a double bind
Do female mentors help female mentees overcome barriers to success?

• Previous attempts to characterize the effect of mentor gender on the career progress of female mentees have reached opposite conclusions

• Answering these types of metascience questions requires pursuit and confirmation of the highest level of data quality for study parameters, including...
  o gender identification
  o name disambiguation
  o author attribution
  o accurate identification of scientific relationships
  o it is essential to avoid metrics that are invalid, overly simplified, and/or improperly normalized, e.g., raw citation data or Journal Impact Factor (JIF)
OPA analysis of the effect of mentee and mentor gender on the scientific productivity of applicants for NIH fellowships

We analyzed the relationship between mentoring and productivity with a carefully designed analytical approach and high quality data:

- 18,600 pre- and post-doctoral fellowship applications
  - F30, F31 and F32, K01, K08, K23, K99 respectively
  - FY2011 through FY2017
- Separated into four mentee-mentor dyads: FF, FM, MF, and MM
- Mentees identify their mentor(s) in every application
- Since fellowships are salary only, productivity relies upon (and was therefore normalized to) the research funds available to the mentor
- Publications were linked to mentees with high quality disambiguation, and productivity was measured with a multi-faceted framework
Figure 2 from Yu et al. The effect of mentee and mentor gender on scientific productivity of applicants for NIH training fellowships. bioRxiv 10.1101/2021.02.02.429450 (February 3, 2021)
The effect of mentee/mentor gender on mentee productivity

Not normalized

Normalized per $M
of mentor funding

# of publications

RCR top decile

Years since first training application
(both awarded and unawarded)

mentee

mentor

MM

MF

FM

FF
The effect of mentee/mentor gender on mentee productivity

- Not normalized
- Normalized per $M of mentor funding

Graphs showing tech impact and clinical impact (APT score) over years since first training application (both awarded and unawarded).
OPA analysis of the effect of mentee and mentor gender on the scientific productivity of applicants for NIH fellowships

The effect of mentee and mentor gender on scientific productivity of applicants for NIH training fellowships

Hao Yu, Kristine A. Willis, Aviva Litovitz, Robert M. Harriman, Matthew T. Davis, Payam Meyer, Brad Busse, Rebecca A. Meseroll, Hashanthi D. Wijayatilake, Matthew J. Perkins, James M. Anderson, George M. Santangelo

doi: https://doi.org/10.1101/2021.02.02.429450

This article is a preprint and has not been certified by peer review [what does this mean?].
Summary and Conclusions

• After normalizing to the funding level of each mentor, the productivity of female and male mentees is independent of mentor gender.

• Productivity is indistinguishable other than in clinical impact, where female mentees, especially those with female mentors, outperform their male counterparts.

• This demonstrates the importance of a multi-faceted approach to measuring the return on research investments.

• High-quality disambiguation (with both high precision and high recall) is essential to matching research outputs with the correct individuals.

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Fraction of female or male mentors with x awards

Number of NIH awards held by the mentor in 2017

- Female
- Male
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Yu et al. 2021 bioRxiv 10.1101/2021.02.02.429450

Fraction of female or male mentors with x awards

Number of NIH awards held by the mentor in 2017