Department Invited Speakers Do Not Reflect Trainee Diversity

Running title: Invited Speaker Diversity Does Not Reflect Trainee Diversity

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1 Abstract

2 Keywords

Background

500 words

Representation of white women and historically underrepresented minorities (HURM) in science, technology, engineering, and math (STEM) in the workforce remains low despite equal enrollment in undergraduate STEM majors. Longitudinal data indicates that these discrepancies might be partially explained by low retention of women and URM in undergraduate STEM programs where academic performance is a key predictor of retention. A growing body of evidence suggests that women and URM under-perform in introductory science courses compared to their white male colleagues, even when representation is equal. Additionally, there is evidence to suggest that women and URM participate less in class, which could inhibit the learning process and subsequent success. A prevailing hypothesis to explain achievement gaps and a lack of participation in class for women and URM is that, many students have an unconscious fear of being seen as a negative stereotype, termed stereotype threat. This is prevalent in fields that have historically been dominated by white males, such as in STEM. In order to retain a diverse population of students in STEM, in an effort to ensure all students have equal opportunities and resources to be successful, under-performance and a lack of participation in introductory science courses needs to be addressed. One mechanism to address the issue is through the use of inclusive teaching practices –teaching methods that promote the full participation, learning, and success of all students.

- introduce invited speaker series - what are the goals, who attends, etc.

- previous examinations have focused on conferences and panels, large number of people in a short period of time – easy to make comparisons & see trends

- more difficult to see trends over long time period – asked cumulative trends of speakers over 5 year period, "normative" to trainees in the department

Methods

Each academic year, each faculty member in the Department of Microbiology and Immunology at the University of Michigan has the opportunity to invite one speaker per year for a weekly seminar series. Some of these seminar slots are dedicated to named lectureships, which are decided by committee, and three trainee-invited speakers. We analyzed the demographics of invited speakers and faculty hosts for five

academic years (Fall 2014 - Spring 2019), and compared them to the current trainees when the data were analyzed (Spring 2019). Each speaker was only counted once and those listed as departmental faculty members or as a "host" at any point could not also be considered "invited speakers". The list of faculty hosts was used as a proxy for faculty demographics since as hosts, these faculty members are visible representatives of the department. The trainee lists were obtained from department listservs that included masters students, doctoral students, and post-doctoral fellows.

This is a retrospective study, so individuals were not asked for their identities. Instead we hand-coded proxy demographics using personal knowledge, photos, and CVs. The presenting gender of each individual was assigned using a binary system (man/woman). Due to the low number of individuals in the study, race/ethnicity demographics were split in three groups: Caucasian, Historically Under-represented Minority (HURM), and Non-Caucasian/Non-HURM (NCNH), each with a binary (yes/no) possibilty. Caucasian was assigned using the current U.S. Census definition where those of Middle Eastern, European, and Russian descent are included. HURM individuals were restricted to those with African-American, Indigenous, Alaskan/Hawaian Native, Latinx and/or Hispanic heritage. All others were placed into the NCNH group. We recognize that our proxy demographics are a limitation of the analysis and want to acknowledge that the presenting gender may not reflect the gender(s) that an individual identifies as. We also want to acknowledge that there are many other identities that are not captured in this limited analysis.

Results

To understand the representation of women, we compared the proportion of women in each academic role. At the trainee level, more than half of students and postdoctoral fellows were women. That dropped to 46.77% of faculty hosts and 38.73% of the invited speakers (Fig. 1A). Of 27 lectureships over the five year period, 37.04% were awarded to women. The proportion of women as faculty hosts and speakers is equivalent to global estimates that 40% of microbiologists are women (Elseiver), with a slightly lower representation of women in lectureships.

Our analysis identified an over-representation of Caucasian individuals as hosting faculty and invited speakers, relative to the proportion of Caucasian trainees (Fig. 1B). We also observed declines in the representation of HURM and NCNH faculty and speakers relative to the trainees (Fig 1B). Caucasian scientists also dominated the more prestigous invited speaker lectureships, comprising 81.48% of those awarded (Fig. 1C). HURM and NCNH scientists were awarded 3 and 2 lectureships, respectively. Because

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the intersection of identities can compound biases and outcomes, we further examined the lectureships by gender and race/ethnicty status. Caucasian men and women accounted for 44.44% and 37.04% of the lectureships, respectively. Just 18.52% of lectureships were held by non-Caucasian men while none were held by non-Caucasian women (Fig. 1D).

Discussion

Several papers have investigated the representation of women at scientific conferences, however, we have only identified one that focused on invited speakers at universities (Nittrouer, 2018). In their study, Nittrouer et. al., examined 3,652 talks at 50 U.S. institutions in 2013 - 2014 and found that women faculty are less likely to be invited speakers, despite similar acceptance rates. These results suggest that women faculty are less often invited as speakers, a decision that may be negatively impacted by assumptions about competency and dedication. The dedication of women who have children to their work is perceived to be less than that of their colleagues, i.e., men who also have children. The perceived prioritization and commitments of women to family over work may cause faculty to doubt their acceptance of a speaking invitation (despite the prestigious nature of these invitations and evidence to the contrary). As a result, the faculty member invites a different colleague who they feel is more likely to agree (and is a man). Departments have different processes and criteria for selecting invited speakers, but it is a matter of pride to bring the best scientists possible. It may be that the definition of "best" poses a problem to women, who need three-times as many publications as their men colleges to be considered equally competent. Some departments only invite tenured faculty, which severely limits the number of potential women speakers. Another scenario is that pre-tenure faculty members invite prestigious, tenured faculty in their field to network and secure letters for their own tenure package. The increased burden of women to prove competency decreases their likelihood to be considered for either tenure or as possible source of tenure letters.

We have not been able to identify any other publications examining scientific speaker diversity beyond gender. This seems to be the first. This is concerning since conclusions drawn from gender-based studies are often framed, and considered, to be applicable to other marginalized groups (e.g., HURM). This is a flawed assumption. While there is no doubt some overlap, each group remains marginalized due to a complex set of factors that are unique to each group and cannot always be solved by gender-based solutions. US-serving institutions, such as the University of Michigan have a particular responsibility to the historically suppressed populations included in our definition of HURMs. We therefore implore US

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90 institutions to apply this framing to their discussions and research.

91 According to social role theory, this department is not adequietly serving their non-Caucasian trainees.
92 Implict biases that affect perceptions of marginalized groups are the primary issue, but we must
93 acknowledge that it is not always possible to identify members of historically under-served communities.
94 For instance, after data analysis, we learned that at least one speaker in our data set should have been
95 categorized as a HURM instead of Caucasian, but it wasn't readily apparent from their internet presence
96 or CV. This limitation makes two important points: that percieved identity often plays a larger role than
97 self-identification, and that we need better tools to identify members of marginalized groups.

Building Diversify

99 To help address this issue, we make some suggestions (Table 1) and have developed a resource to identify
100 scientists who are members of marginalized and/or historically under-served groups. Motivated by a lack
101 of such resources and inspired by similar resources–DiversifyEEB and DiversifyChemistry–we created
102 DiversifyMicrobiology and DiversifyImmunology. These resources are a tool for symposium organziers,
103 award committees, search committees and other scientists to identify individuals to diversify their pools.
104 Additionally, we have built these as a tool for use by other fields and organizations to create their own
105 lists. Importantly, since these lists are compiled by self-nomination, we can ensure that only scientists
106 comfortable revealing their marginalized identities are included.

107 • Development of Diversify tools

108   – describe maintenance of lists (Rebecca)

109 The website provides an interface to the Google forms and spreadsheets with template pages for viewing
110 the list, adding a name to the list, and finding additional resources. Importantly, our website creation tool is
111 hosted for free by GitHub, which provides a free website for each GitHub organization (citation). Basic tools
112 and skills required to set up a Diversify site include knowledge of, or experience with, the version control
113 tool git, the webtool GitHub, and a text editor. A tutorial in the DiversifyMicrobiology repository on GitHub
114 provides links to these resources and instructions for adapting the tool to your own field.

Conclusion

To increase the retention of white women and HURMS in STEM, they must also be represented as experts. However, the invited speaker diversity at one department does not represent the diversity of trainees. There is a lack of research on invited speakers examining factors other than gender. To facilite the identification and recruitment of individuals in these historically under-served groups, we have built a tool to create self-nominated, field-specific lists.

Acknowledgements

Author Contributions

A.K.H. collected the data, assigned demographics, analyzed the data, and created the website. R.M.P. created the Google lists, forms, and website content and the description of their maintenance. J.L. wrote the introduction and provided conceptual advice. All authors contributed to the final manuscript.

Code and data availability

The anonymized data, code for all analysis steps, and an Rmarkdown version of this manuscript is available at https://github.com/akhagan/Hagan_SpeakerDiversity_XXXX_2019/. Template and complete instructions for generating a field-specific Diversity website are available at https://github.com/diversifymicrobiology/DiversifyMicrobiology.github.io/.
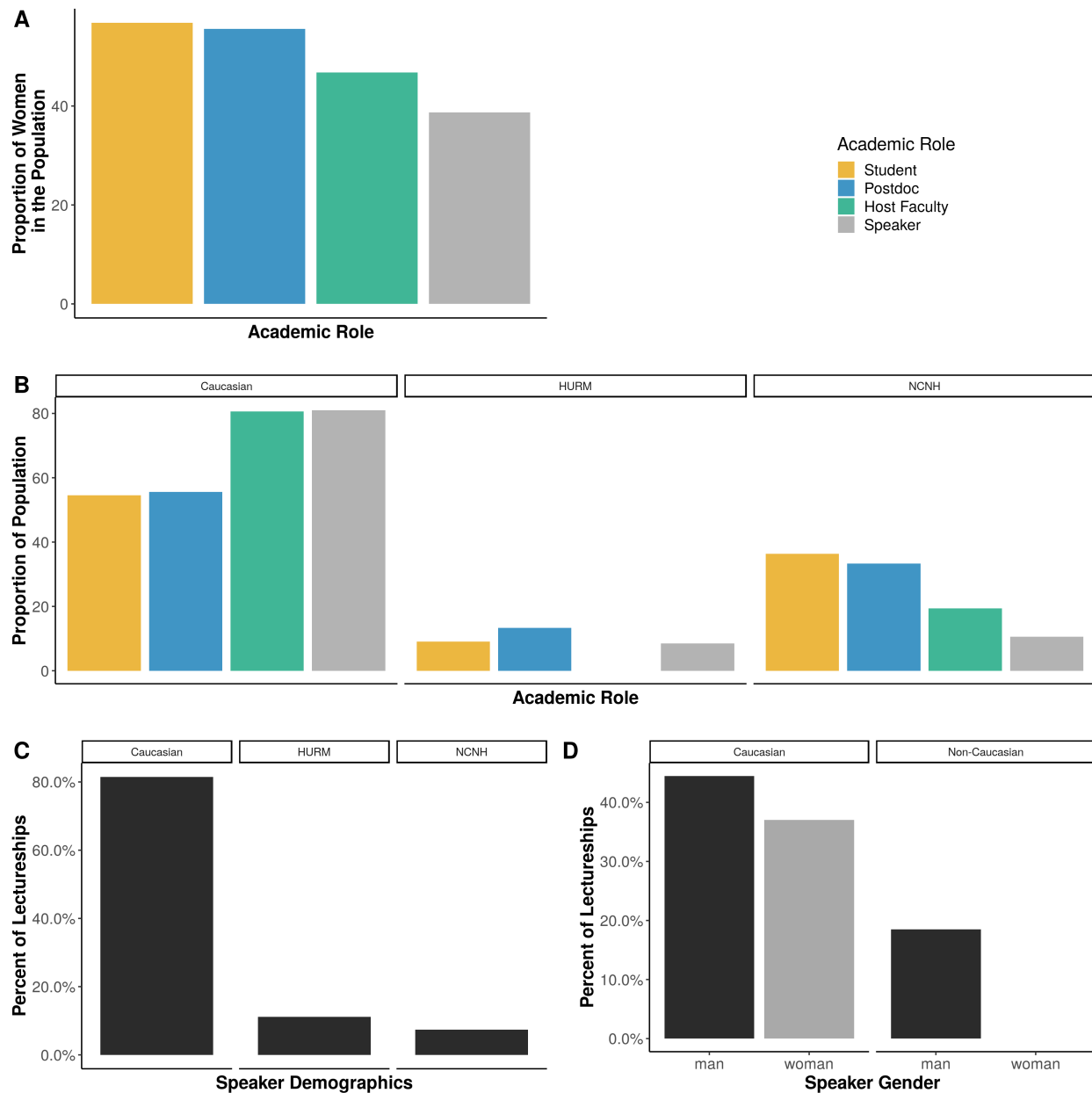
Figure 1: **The demographics of invited speakers, hosting faculty, and trainees.** A) The proportion of women in each academic role. B) The proportion of each academic role represented by individuals that are Caucasian (left), Historically Underrepresented Minorities (HURM, center) or International (right). C-D)The percent of lectureships awarded to individuals that are C) Caucasian, HURM, International or D) Caucasian or Non-Caucasian by gender.

Table 1: List of suggestions and resources to increase invited speaker diversity.

Suggestion	Description	Resource
Lab-invited speakers	Faculty members can request suggestions from trainees	
Use a list	Many lists of scientists from under-represented and underserved groups are available	https://DiversifyMicrobiology.github.io/resources
Create a list	Use the GitHub template create a self-nomination list and resource for your field	https://github.com/diversifymicrobiology/DiversifyMicrobiology.github.io
Highlight the journey	Invite all speakers to spend a few moments describing their personal science journey	

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[136] **References**