Research Letter | Medical Education

Representation of Women on National Institutes of Health Study Sections

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Introduction

Disparities in gender representation among researchers are well described throughout the career trajectory, including grant awards.1-3 This study aimed to evaluate whether differences exist in gender representation on National Institutes of Health (NIH) study sections, which help determine funding.

Methods

This cross-sectional study examined participants on chartered and special emphasis NIH study sections during one review cycle from May 15 to July 15, 2019. The University of Chicago institutional review board deemed this study exempt because it used publicly available data. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

Data were extracted about study section reviewers (name, degree, academic rank, temporary membership, chair), scientific review officers (SROs; name), and institutes, centers, or offices (hereafter referred to as institutes; chair name, total funding, number of awards, award amount, and success rate for research grants and projects in 2018).

Individuals' gender presentation (man or woman) was determined through name-based internet searches for pictures and pronouns. If unconfirmed, gender was assigned using software (Genderize.io [Demografix ApS]; threshold = 60%). χ2 tests were used to compare gender distributions between institutes. Univariate and multivariate logistic regressions were applied to determine the likelihood of having women on study sections based on institute and section characteristics. Significance was defined by P < .05 using 2-sided tests. Data analyses were performed using SAS version 9.4 (SAS Institute) in August 2020.

Table 1. Gender Representation of Participants on National Institutes of Health Study Sections by Institutes, Center, and Office, May 15 to July 15, 2019a

| Institute, center, or office | Study sections that met in 1 review cycle, No. | Participants on all study sections, total No. | Participants per study section, mean (SD), No. | Proportion of women participants on study sections, mean (SD) [range], % | No. (%) | Woman as scientific review officer for study sections | Woman as chair of study sections | Women participants on study sections | P value to compare gender representation on study sections |
|-----------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|-------------------------------------------------|--------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|--------------------------------------------------|
| Total                       | 367                                           | 8817                                          | 24.0 (13.4)                                   | 39.0 (15.1) [0.0-100.0]                           | 180 (49.0) | 137 (37.3)                                   | 3432 (38.9)                                   | <.001                                          |
| CSR                         | 170                                           | 4907                                          | 28.9 (7.1)                                    | 38.6 (12.3) [14.3-79.4]                           | 83 (48.8) | 54 (31.8)                                    | 1906 (38.8)                                   | <.001                                          |
| NCATS                      | 1                                             | 22                                            | 22.0 (NA)                                     | 22.7 (0.0) [22.7-22.7]                            | 0      | 0                                            | 5 (22.7)                                      | .01                                            |
| NCCIH                      | 5                                             | 158                                           | 31.6 (9.9)                                    | 40.5 (7.6) [33.1-48.8]                            | 7 (100)d | 0                                            | 66 (41.8)                                     | .51                                            |
| NCI                        | 28                                            | 675                                           | 24.1 (8.8)                                    | 38.3 (18.6) [10.5-93.1]                           | 7 (25.0) | 14 (50.0)                                    | 255 (37.8)                                    | <.001                                          |
| NEF                        | 2                                             | 40                                            | 20.0 (9.9)                                    | 34.0 (6.2) [29.6-38.5]                            | 0      | 0                                            | 13 (32.5)                                     | .58                                            |
| NIA                        | 7                                             | 122                                           | 17.4 (9.3)                                    | 44.9 (15.0) [16.7-60.0]                           | 5 (71.4) | 2 (28.6)                                     | 61 (50.0)                                     | .61                                            |
| NIAAA                      | 8                                             | 86                                            | 10.8 (6.0)                                    | 45.7 (10.7) [33.3-63.2]                           | 4 (50.0) | 5 (62.5)                                     | 43 (50.0)                                     | .85                                            |
| NIAID                      | 10                                            | 178                                           | 17.8 (6.1)                                    | 33.5 (11.3) [18.5-57.1]                           | 3 (30.0) | 3 (30.0)                                     | 58 (32.6)                                     | .44                                            |
| NIAMS                      | 3                                             | 69                                            | 23.0 (4.4)                                    | 30.4 (12.2) [16.7-40.0]                           | 1 (33.3) | 3 (100)                                      | 22 (31.9)                                     | .25                                            |
| NIBIB                      | 4                                             | 60                                            | 15.0 (13.3)                                   | 16.1 (21.1) [0.0-44.4]                            | 2 (50.0) | 1 (25.0)                                     | 11 (18.3)                                     | .05                                            |

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JAMA Network Open. 2021;4(2):e2037346. doi:10.1001/jamanetworkopen.2020.37346 February 15, 2021 1/4

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Table 1. Gender Representation of Participants on National Institutes of Health Study Sections by Institutes, Center, and Office, May 15 to July 15, 2019 (continued)

| Institute, center, or office | Study sections that met in 1 review cycle, No. | Participants on all study sections, total No. | Participants per study section, mean (SD), No. | No. (%) | Woman as scientific review officer for study sections | Woman as chair of study sections | Women participants on study sections | P value to compare gender representation on study sections |
|-----------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|---------|---------------------------------------------|--------------------------------|-------------------------------------|---------------------------------|
| NICHDd | 7 | 97 | 13.9 (5.2) | 56.9 (21.7) [20.0-83.3] | 6 (85.7) | 2 (28.6) | 57 (58.8) | .02 |
| NIDCDc | 2 | 48 | 24.0 (19.8) | 52.6 (3.7) [50.0-55.3] | 1 (50.0) | 0 | 26 (54.2) | .77 |
| NIDRC | 8 | 120 | 15.0 (10.0) | 37.7 (16.0) [16.7-66.7] | 6 (75.0) | 6 (75.0) | 47 (39.2) | .24 |
| NIDA | 17 | 208 | 12.2 (11.3) | 34.9 (15.0) [15.8-66.7] | 6 (35.3) | 9 (52.9) | 72 (34.6) | .67 |
| NIDDK | 10 | 237 | 23.7 (9.7) | 40.7 (14.2) [21.9-60.0] | 5 (50.0) | 2 (20.0) | 90 (38.0) | .10 |
| NIEHS | 2 | 56 | 28.0 (15.6) | 39.1 (13.7) [29.4-48.7] | 1 (50.0) | 1 (50.0) | 24 (42.9) | .18 |
| NHGRI | 5 | 56 | 11.2 (3.4) | 45.5 (16.7) [30.0-63.6] | 0 | 2 (40.0) | 25 (44.6) | .35 |
| NHLBI | 20 | 341 | 17.1 (10.8) | 34.4 (10.9) [16.7-50.0] | 10 (50.0) | 7 (35.0) | 218 (37.5) | .81 |
| NIGMS | 14 | 455 | 32.5 (46.1) | 39.4 (16.7) [18.8-66.7] | 7 (50.0) | 4 (28.6) | 156 (34.3) | .001 |
| NIMH | 16 | 305 | 19.1 (8.5) | 40.2 (21.3) [0.0-75.0] | 10 (62.5) | 6 (37.5) | 136 (44.6) | <.001 |
| NIMHD | 1 | 21 | 21.0 (NA) | 61.9 (0.0) [61.9-61.9] | 0 | 1 (100) | 13 (61.9) | .28 |
| NINDS | 18 | 432 | 24.0 (11.8) | 34.4 (13.5) [14.3-64.7] | 11 (61.1) | 10 (55.6) | 150 (34.7) | .04 |
| NINR | 4 | 38 | 9.5 (5.1) | 75.8 (25.4) [40.0-100.0] | 1 (25.0) | 3 (75.0) | 30 (75.0) | .10 |
| NLM | 4 | 52 | 13.0 (6.9) | 43.5 (13.3) [25.0-55.6] | 4 (100) | 1 (25.0) | 23 (44.2) | .61 |
| Office of director | 1 | 34 | 34.0 (NA) | 44.1 (0.0) [44.1-44.1] | 0 | 1 (100.0) | 15 (44.1) | .49 |

Abbreviations: CSR, Center for Scientific Review; NCATS, National Center for Advancing Translational Sciences; NCCIH, National Center for Complementary and Integrative Health; NCI, National Cancer Institute; NEI, National Eye Institute; NHGRI, National Human Genome Research Institute; NHLBI, National Heart, Lung, and Blood Institute; NIA, National Institute on Aging; NIAAA, National Institute on Alcohol Abuse and Alcoholism; NIAID, National Institute of Allergy and Infectious Diseases; NIAMS, National Institute of Arthritis and Musculoskeletal and Skin Diseases; NIBIB, National Institute of Biomedical Imaging and Bioengineering; NICHD, National Institute of Child Health and Human Development; NIDA, National Institute on Drug Abuse; NIDCR, National Institute on Dental and Craniofacial Research; NIDDK, National Institute of Diabetes and Digestive and Kidney Diseases; NIEHS, National Institute of Environmental Health Sciences; NIGMS, National Institute of General Medical Sciences; NIMH, National Institutes of Mental Health; NIMHD, National Institute of Minority Health and Health Disparities; NINDS, National Institute of Neurological Disorders and Stroke; NIH, National Institute of Nursing Research; NLM, National Library of Medicine.

Table 2. Characteristics Associated With Gender Representation on National Institutes of Health Study Sections

| Characteristic | Univariate OR (95% CI) | P value | Multivariate OR (95% CI) | P value |
|----------------|------------------------|---------|------------------------|---------|
| Academic rank | | | | |
| Instructor or none | 1.39 (1.19-1.61) | <.001 | 1.43 (1.17-1.75) | .001 |
| Assistant professor | 1.86 (1.60-2.15) | <.001 | 1.81 (1.45-2.26) | <.001 |
| Associate professor | 1.63 (1.47-1.80) | <.001 | 1.49 (1.27-1.75) | <.001 |
| No doctoral degree (MD or PhD) | 1.61 (1.45-1.78) | <.001 | 1.72 (1.47-2.02) | <.001 |
| Temporary member on study section | 1.02 (1.01-1.03) | <.001 | 0.99 (0.77-1.26) | .91 |
| Standing study section | 0.996 (0.995-0.998) | <.001 | 0.76 (0.63-0.92) | .006 |
| Woman as study section chair | 0.98 (0.97-0.999) | .03 | 1.40 (1.20-1.63) | <.001 |
| Woman as scientific review officer | 0.98 (0.96-1.005) | .13 | 1.02 (0.88-1.19) | .75 |
| Woman as institute, center, or office chair | 1.17 (1.00-1.38) | .049 | 0.98 (0.59-1.62) | .93 |
| Total funding of institute, center, or office | 0.92 (0.87-0.97) | .002 | 1.02 (0.26-4.02) | .98 |
| No. of research grants awarded | 0.94 (0.91-0.97) | <.001 | 0.89 (0.43-1.85) | .76 |
| Research grant average funding | 0.99 (0.96-1.03) | .61 | 0.98 (0.88-1.08) | .64 |
| Research project | | | | |
| Award amount | 0.75 (0.56-1.02) | .06 | 1.61 (0.23-11.09) | .63 |
| Success rate | 0.995 (0.98-1.01) | .33 | 0.99 (0.96-1.03) | .75 |

Abbreviations: NIH, National Institutes of Health; OR, odds ratio.

* Univariate and multivariate logistic regression models were applied to determine the likelihood of having a woman on a study section based on NIH institute and study section characteristics (eg, academic rank, degree, temporary membership, standing study section, leadership, grants, funding).
Results

A total of 367 study sections convened with 8817 participants analyzed (Table 1). Of these, 3432 were female (38.9%). Among the 25 institutes, the mean (SD) proportion of women reviewers was 39.0% (15.1%). Women constituted more than half of reviewers in 4 institutes (16%). Less than half of study sections had a woman SRO (49.0% [180 of 367]) or chair (37.3% [137 of 367]). Nine institutes (36%) were chaired by a woman.

Overall, reviewers were more likely to be men than women (61.1% vs 38.9%, \( P < .001 \)). Six institutes (24%) were more likely to have men as reviewers and one was more likely to have women.

Across all institutes (Table 2), women reviewers were more likely to hold lower academic rank (instructor or none: OR, 1.39; 95% CI, 1.19-1.61; \( P < .001 \); assistant professor: OR, 1.86; 95% CI, 1.60-2.15; \( P < .001 \); associate professor: OR, 1.63; 95% CI, 1.47-1.80; \( P < .001 \)) and non-doctoral degrees (OR, 1.61; 95% CI, 1.45-1.78; \( P < .001 \)). Women were more likely to be temporary members (OR, 1.02; 95% CI, 1.01-1.03; \( P < .001 \)) and less likely to be on standing study sections (OR, 0.996; 95% CI, 0.995-0.998; \( P < .001 \)).

Study sections chaired by women were less likely to have women as reviewers (OR, 0.98; 95% CI, 0.97-0.999; \( P = .03 \)), whereas study sections within an institute with a woman chair were more likely to have women as reviewers (OR, 1.17; 95% CI, 1.00-1.38; \( P = .049 \)). There were lower odds of having women as reviewers among institutes with higher total funding (OR = 0.92, 95% CI = 0.87-0.97, \( P = .002 \)) and higher number of research grant awards (OR = 0.94, 95% CI = 0.91-0.97, \( P < .001 \)). Institutes' research grant average funding, project award amount, and project success rate were not associated with the proportion of women reviewers on study sections.

Discussion

To our knowledge, this study is the first to describe differences in gender representation among NIH study sections. Men were more likely to be reviewers and chairs. Women were more likely to have temporary affiliations and serve on study sections with lower total funding and research grants awarded, suggesting less influential opportunities to impact the nation's research agenda. These findings may partially explain gender bias in peer review and differences in funding and promotion with potential ramifications for gender representation in academia.

Intentional efforts to increase gender representation on study sections are critical. NIH's Early Career Reviewer Program has helped diversify the reviewer pool. Creating study sections through committees or applications, rather than individual recruiters, may further reduce disparities. Implicit bias training may be important for individuals selecting reviewers. At minimum, data about study section composition should be routinely reviewed and shared.

This study had some limitations. Because only one grant cycle was examined, generalizability may be limited. Selection bias could occur since attendance and program officer information were unavailable on meeting rosters. Effect sizes varied and practical impacts of small effects are unknown. Future studies should longitudinally examine gender representation on study sections and evaluate interventions. Deliberate efforts are necessary to reach equitable gender representation on NIH study sections given potential long-term effects on the nation's research agenda and workforce.
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Author Contributions: Dr Volerman had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Concept and design: Volerman, Arora, Press.

Acquisition, analysis, or interpretation of data: Volerman, Cursio, Wei, Press.

Drafting of the manuscript: Volerman, Cursio, Press.

Critical revision of the manuscript for important intellectual content: Volerman, Arora, Wei, Press.

Statistical analysis: Arora, Cursio.

Obtained funding: Volerman.

Administrative, technical, or material support: Volerman, Press.

Supervision: Volerman, Press.

Conflict of Interest Disclosures: Dr Volerman reported receiving grants from National Heart, Lung, and Blood Institute, Health Resources and Services Administration, Robert Wood Johnson Foundation, and American Thoracic Society Foundation outside the submitted work. Dr Arora reported receiving grants from National Heart, Lung, and Blood Institute; National Institute of General Medical Sciences; and Josiah Macy Jr Foundation outside the submitted work; and personal fees from American Board of Internal Medicine outside the submitted work. Dr Press reported receiving grants from National Heart, Lung, and Blood Institute and American Lung Association outside the submitted work; and personal fees from Vizient Inc, Humana, and RoundGlass outside the submitted work. No other disclosures were reported.

Funding/Support: This work was funded by an award from the University of Chicago Diversity Research and Small Grant Program.

Role of the Funder/Sponsor: The funder had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Additional Contributions: We would like to thank Isabella Xu and Rory Kopplin for their assistance with data collection; they received hourly compensation as research assistants. We would also like to thank Mary Akel, MPH, for help with manuscript preparation.

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