Gender Differences in Successful National Institutes of Health Funding in Ophthalmology

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OBJECTIVE: To determine whether gender differences in individual National Institutes of Health (NIH) awards and in funding totals exist in ophthalmology, and to further characterize whether factors such as experience, academic rank, and terminal degree play a role.

DESIGN: A retrospective review of awards granted to primary investigators (PIs) in ophthalmology departments from 2011 through the present was conducted. PIs were classified by gender, degree, experience, and academic position. The NIH funding database was used to gather award data.

SETTING: Academic medical center.

RESULTS: Men had higher mean NIH awards ($418,605) than their female colleagues ($353,170; $p = 0.005$) and had higher total funding per PI ($p = 0.004$). Men had statistically higher awards at the level of assistant professor than their female counterparts ($p < 0.05$). A gender difference was statistically significant and most marked among researchers holding an MD (or equivalent) degree. When controlled for publication experience, men had higher NIH awards throughout their careers, although this difference only reached statistical significance on comparison of faculty with 10 or fewer years of experience.

CONCLUSIONS: Male PIs receiving grants since 2011 had higher awards than their female colleagues did, most markedly among PIs in the earlier portions of their career. Differences in gender representation among senior faculty and in positions of leadership in academic ophthalmology may be partially a result of disparities in research output, as scholarly productivity is an important component of the academic advancement process in ophthalmology. (J Surg 71:680-688. © 2014 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: gender, NIH funding, gender disparity, NIH funding gender disparity, academic promotion, NIH RePORTER

COMPETENCIES: Professionalism, Interpersonal and Communication Skills, Practice-Based Learning and Improvement

INTRODUCTION

Numerous studies have documented the increasing representation of women in academic medicine. In 2012, females constituted 47.8% of US medical school graduates, an increase from 44.3% in 2001.[1] Similarly, women accounted for 43.1% of ophthalmology residents in 2011. Significant differences in gender representation, however, do persist among senior faculty and in positions of leadership. Of the nearly 120 ophthalmology departments in the United States, only 3 have a female chairperson, while only 34% of residency program directors are women.[2]

Differences in scholarly productivity may play a role in the underrepresentation of women in these positions. Along with other factors such as clinical performance and contributions to medical education, research output is an important component of the academic appointment and promotion process.[3-13] A review of ophthalmic peer-reviewed publications from 2009 noted that 29.2% of first authors, only 12.5% of assistant editors, and none of the editors in chief of ophthalmic scientific journals were

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women.[14] Similarly, a study of 60 peer-reviewed journals across specialties published in 2011 found that 17.5% of 4112 editorial board members were women, whereas only 15.9% of editors in chief were women. Consistent with the previously mentioned analysis from 2009, no women held the position of editor in chief of any journals dedicated to ophthalmology.[15]

Several measures commonly used to assess scholarly productivity may be integral to academic advancement at many institutions. Research output as measured by total number of publications in the peer-reviewed literature, and measures of scholarly relevance such as the *h-index* are both objective and easily calculable measures.[5-7,16-22] Successful procurement of research grants may also be used to assess faculty, as such awards (1) increase research output, and consequently, the impact of an institution on discourse within a field; (2) decrease financial pressures on institutions to support research via internal mechanisms; and (3) potentially affect the reputation of institutions and departments.[5,20,23,24]

Grants awarded by the National Institutes of Health (NIH) are often regarded as the gold standard in biomedical research, as the NIH is the largest supporter of biomedical research in the US.[5,20,23,24] Although gender disparities in research productivity have been described in other specialties and with other measures of scholarly impact,[3,6,22,25-27] there has been no examination of whether any such differences exist in the funding of primary investigators (PIs) in academic ophthalmology departments. The objectives of this analysis are to determine whether gender differences in individual NIH awards and funding totals exist, and further characterize whether factors such as years of experience, academic rank, and terminal degree play a role in the disparity.

MATERIALS AND METHODS

The NIH Research Portfolio Online Reporting Tool Expenditures and Results (RePORTER) site (http://projectreporter.nih.gov/reporter.cfm) was used to obtain a list of the 590 NIH grants awarded to ophthalmology departments listed online as of February 2013, ranging from fiscal year 2011 to 2013. Although the effect of gender has not been previously examined in ophthalmology, this online database has proven valuable in analyses of NIH funding trends in radiology, urology, and otolaryngology.[5,20,24] The 590 NIH grants were awarded to 408 unique PIs, as many had multiple awards. In this analysis, both individual NIH awards as well as the NIH funding totals per each PI (i.e., the aggregate of individual awards to a PI) were considered.

Online faculty listings from the home institutions of PIs on this database were searched for information regarding academic rank (assistant professor, associate professor, professor, or nonfaculty positions, including postdoctoral fellows, research fellows, and research associates) and terminal degree (MD, MD-PhD, PhD, or other doctorate). PIs were further organized by gender, determined independently by 2 authors (P.F.S. and A.A.P.) using both names and photographs from online listings.

The Scopus database (www.scopus.com) was used to determine the publication experience (in years) of all PIs, as well as the *h-index* of all PIs. Although this database comprehensively details sources from more than 18,000 peer-reviewed journals[28] and has been of value in previous bibliometric analyses,[7,8,21,25-27,29-44] multiple search results can arise when common names are searched.[22] Previous and current departmental affiliations as well as source history were used to ensure that the publication range obtained for each author was referring to the appropriate PI.

Statistical Analysis

Mann-Whitney *U* tests were performed for comparison of continuous variables as appropriate, with threshold for significance set at $p < 0.05$. SPSS version 20 (IBM Company, Chicago, IL) was used for statistical calculations.

RESULTS

Of 590 NIH grants included in this analysis, 433 (73.4%) were awarded to male PIs and 157 (26.6%) to female PIs. The mean grant awarded to male PIs ($418,605) was significantly higher than the mean awarded to female PIs ($353,170) (Fig. 1A, $p = 0.005$). This gender disparity persisted when accounting for PIs with multiple grants and examining total NIH funding per individual (Fig. 1B).

When controlled for by academic rank, a gender difference in NIH awards reached significance at the level of assistant professor (Fig. 2A, $p = 0.046$). Male PIs had higher mean NIH awards among associate professors, professors, and nonfaculty members (Fig. 2A and B), although this difference did not reach statistical significance ($p = 0.14$ and 0.06, respectively). On organization by terminal degree, male MDs had statistically higher NIH awards than their female colleagues (Fig. 3, $p = 0.03$). The smallest gender difference was noted among PIs with PhDs, for which awards to men were greater by only an average of $22,452 ($p = 0.16$).

Men had higher NIH awards than their female colleagues throughout nearly all years of publication experience, although this difference only reached significance on comparison of PIs with 0 to 10 years of experience ($272,360 vs $192,067; $p = 0.03$) (Fig. 4). There was a nearly equivalent breakdown of types of grants awarded between genders. The only series of grants for which a statistical difference was noted in mean awards were R-series grants; the mean R-grant to male PIs was $408,934, statistically higher than those awarded to women ($359,212; $p = 0.03$). R-series grants comprised 75.0% of NIH awards to men and 75.1%