



Gender Representation on North American Ophthalmology Societies' Governance Boards

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Abstract

Purpose We examined the gender distribution and academic productivity of North American ophthalmology societies' board members.

Methods Cross-sectional and retrospective study of board members on American and Canadian ophthalmology societies. In December 2022, data was gathered from society webpages, online archives, and the Scopus database for publication information.

Results Of the identified 73 board presidents and 876 other board members, 49 (67.1%) board presidents were men and 24 (32.9%) were women, while 554 (63.2%) other board members were men and 322 (36.8%) were women ($p = 0.53$). Overall, board members who were men had significantly higher median h-indexes (men vs. women: 10 [interquartile range [IQR] = 22] vs. 7 [IQR = 12], $p = 0.03$) and median publication numbers (men vs. women: 23 [IQR = 84] vs. 14 [IQR = 52.3], $p = 0.01$). However, m-quotients (h-index divided by length of academic career) were not significantly different (men vs. women: 0.46 [IQR = 0.74] vs. 0.50 [IQR = 0.55], $p = 0.67$). Overall, a significant increase in the proportion of women board presidents comparing periods 1942 to 1961 and 2002 to 2021 was observed for all societies combined (3.1% [2/65] to 23.6% [210/888], $p < 0.001$).

Conclusion The fraction of women on the academic boards in North American ophthalmology societies has increased sevenfold over the past 83 years. The gender composition of ophthalmology society boards is consistent with the gender composition of practicing ophthalmologists in the United States. Women in board or society positions have comparable academic output to men. Existing and new efforts to sustain progress in promoting women's representation and leadership opportunities must continue.

Keywords

- ▶ equity
- ▶ diversity
- ▶ health care workforce
- ▶ medical education and training
- ▶ ophthalmology

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The representation of women in ophthalmology leadership positions has improved over the last few decades.^{1–3} In the 2021 report by the Association of American Medical Colleges, 27.2% of active ophthalmologists were women,⁴ however, these numbers vary significantly by subspecialty.⁵ While women outnumber men when it comes to medical school admissions,⁶ women are underrepresented among applicants, residents, and fellows of accredited ophthalmology programs.^{5,7} Women are underrepresented in ophthalmology department leadership and department chairs,^{1,8,9} journal editorial boards,^{10,11} ophthalmology-associated corporate boards,¹² among presenters within several ophthalmology subspecialty conferences,^{13,14} and as lead investigators of clinical trials in ophthalmology.¹⁵ Furthermore, newly trained ophthalmologists who are women are compensated less than men,¹⁶ and receive less funding from the National Institutes of Health as principal investigators affiliated with ophthalmology departments.¹⁷ Nevertheless, studies demonstrate trends toward increased representation of women receiving awards from major ophthalmology societies,¹⁸ on ophthalmology editorial board leadership positions,¹⁹ and as presenters at ophthalmology conferences.¹³

As the ophthalmology community works toward gender equity in ophthalmological leadership and as judged by other metrics, it is imperative that women are represented on boards associated with ophthalmology. In 2017, nearly half of the American Academy of Ophthalmology (AAO)'s Council (composed of 103 selected representatives from AAO State Societies and Subspecialty and Special Interest Societies), were women.²⁰ This was progress from 27% the preceding year.²⁰ In 2018, Camacci et al showed that among 15 selected ophthalmology subspecialty societies, 13.3% of presidents and 27.5% of board members were female.²¹ Similarly, another study selected six ophthalmology societies and found that women made up 21.5% of executive committee positions and 20% of presidents.³

Our study aims to comprehensively evaluate the extent of gender representation within organizational boards and among board presidents within 99 potential ophthalmology societies across the United States and Canada, as well as trends in gender representation among board presidents from 1938 to 2021.

Methods

The Queen's Health Sciences and Affiliated Teaching Hospitals Research Ethics Board (HSREB) ruled that approval was not required for this study. The research conducted adhered to the tenets of the Declaration of Helsinki. We conducted a cross-sectional review, in December 2022, of a total of 99 societies from the AAO Subspecialty and Special Interest Societies Directory,²² the AAO State Ophthalmological Societies Directory ("State Societies"),²³ and the Canadian Ophthalmological Society (COS)-affiliated societies.²⁴

Included societies had a governance or working board of directors representing the organization that was present on their Web site. Societies were excluded if they did

not have an organizational webpage or did not include board member names on their webpages. General information about each society was collected and extracted for reference (► **Supplementary Table S1**, available in the online version). The information present on board members (e.g., degrees, term period) was also collected and summarized (► **Supplementary Table S2**, available in the online version). This information was considered present if at least half the board members had this displayed. Governance board information was extracted, including names, degrees, subspecialty, governance positions, gender pronouns, and photographs. When academic degrees, subspecialty, or country were not listed, institutional profiles were used. The information on previous society board presidents of all included societies was extracted from organizational webpages and publicly available Internet archives.^{25,26}

The gender of individual board members was determined using the National Provider Identifier (NPI) database as it includes self-reported gender for all physicians in the United States.²⁷ For Canadian board members, provincial physician registrant directories were utilized.²⁸ If such profiles could not be located, the gender-specific pronouns of each board member from the society webpage were used to inform gender. The pronouns she, her, and hers were assigned woman, and the pronouns he, him, and his were assigned man. If pronouns were not provided, professional Web sites (e.g., private clinic, organizational affiliations, university pages, conference pages, private practice pages, articles, ResearchGate, Google Scholar, Twitter, LinkedIn) were used to derive gender-specific pronouns by R.K., M.K., and M.B. If this information could not be reliably obtained, a robust online gender assignment software,^{29,30} Gender-API,³¹ was used in conjunction with board member photographs. The accuracy of this gender assignment application program interface has been found to be 98% accurate.^{29,30}

The h-index of each board member, total publications, and date of first publication were extracted from Scopus using first name, last name, and institutional affiliation. When profiles could not be found, or reviewers were uncertain about which profile to use when multiple profiles were listed, organizational affiliations, alternate names, publication in ophthalmology or ophthalmology-related journals, and names used on other publications listed on institutional or other research profiles were used to aid in correct identification. The h-index is derived from the number of papers, h, that meet the requirement of having h or more citations each within a researcher's publication record. The m-quotient is a measure of research productivity that accounts for varying lengths of academic careers. It was calculated by dividing the h-index by the number of years between the date of the researcher's first publication and December 2022.²¹ Although those selected for board leadership in medicine often have a record of academic productivity,^{3,12} organizations consider other factors during selections, including previous leadership experience.

Nevertheless, publication disparities may help explain the gender imbalance in leadership roles.

Statistical Analysis

Data were summarized using descriptive statistics. For categorical variables, Pearson's chi-square tests of independence and Fisher's exact test were used to assess the association between gender and location, subspecialty, and board position. For continuous variables, the Wilcoxon rank sum test (Mann-Whitney *U* test) was used to assess the relationship between gender and measures of research productivity such as the number of publications, h-index, and m-quotient. The Cochran-Armitage trend test was used to assess changes in the proportion of women board presidents from 1942 to 2021.

Results

A total of 74 societies met the inclusion criteria, which included 29 AAO Subspecialty and Special Interest Societies (including the AAO), 36 AAO State Societies, and 9 COS-affiliated societies (including the COS). In 2022, 949 board members from the 74 included societies were identified, including 73 board presidents and 876 other board members. Only 73 board presidents were identified as one society, the American Uveitis Society, did not list a board president (► **Supplementary Table S1**, available in the online version). In total, the gender of 40/949 (4.2%) of board members were assigned using Gender-API, while the rest were self-reported on the NPI database (United States), provincial registries (Canada), or by using personal pronouns.

The most common board information present included board positions (74/74, 100%) and degrees (65/74, 87.8%) (► **Supplementary Table S2**, available in the online version). Only one society, the AAO, listed financial or other relevant disclosures of board members (1/74, 1.4%). The majority (48/74, 64.9%) of societies did not have organizational bylaws publicly available (► **Supplementary Table S2**, available in the online version).

Overall, 49 (67.1%) board presidents were men and 24 (32.9%) were women, while 554 (63.2%) other board members were men and 322 (36.8%) were women ($p = 0.53$) (► **Table 1**). When compared with the proportion of active women ophthalmologists in the United States (5,152/18,938, 27.2%),⁴ there is a higher proportion of women board presidents (21/64, 32.8%, $p < 0.001$) and other board members (299/799, 37.4%, $p < 0.001$) among societies with their headquarters in the United States (► **Supplementary Table S1**, available in the online version).

Within Subspecialty and Special Interest Societies, board members who were men had significantly higher median h-indexes (men vs. women: 24 [interquartile range [IQR] = 29] vs. 12 [IQR = 15], $p < 0.001$) and median publication numbers (men vs. women: 88 [IQR = 166] vs. 32 [IQR = 83.8], $p < 0.001$) (► **Table 1**). However, the m-quotients (h-index/length of academic career) were not significantly different

(men vs. women: 0.84 [IQR = 0.89] vs. 0.68 [IQR = 0.67], $p = 0.13$). No significant differences in median h-index, number of publications, or m-quotient were found in AAO State Societies or Canadian societies (► **Table 1**). When all societies were combined, board members who were men had significantly higher median h-indexes (men vs. women: 10 [IQR = 22] vs. 7 [IQR = 12], $p = 0.03$) and median publication numbers (men vs. women: 23 [IQR = 84] vs. 14 [IQR = 52.3], $p = 0.01$). However, m-quotients (h-index divided by length of academic career) were not significantly different (men vs. women: 0.46 [IQR = 0.74] vs. 0.50 [IQR = 0.55], $p = 0.67$) (► **Table 1**).

The largest proportion of board presidents who are women has been seen most recently, in 2021 (17/46, 37.0%) and 2022 (17/46, 37.0%). ► **Table 2** illustrates an increase in the percentage of women board presidents from 1942 to 2021 in both Canadian and American societies. Increases in the proportion of women board presidents comparing periods 1942 to 1961 and 2002 to 2021 were significant for all societies combined (3.1% [2/65] to 23.6% [210/888], $p < 0.001$), State Societies (4.4% [2/45] to 23.2% [91/393], $p < 0.001$), and Canadian societies (0.0% [0/20] to 13.8% [11/80], $p = 0.015$) (► **Table 2**). No data was available for Subspecialty and Special Interest Societies from 1942 to 1961. Increases in the proportion of women board presidents comparing periods 1962 to 1981 and 2002 to 2021 were significant for Subspecialty and Special Interest Societies (4.2% [3/71] to 26.0% [108/415], $p < 0.001$) (► **Table 2**).

Discussion

The cross-sectional portion of our analysis of the gender distribution identified a lower proportion of board presidents (32.9%) and other board members (36.8%) to be women in 2022. These proportions were higher than the proportion of active women ophthalmologists in the United States reported in 2021 (27.2%).⁴ These results suggest ophthalmology boards have good relative gender representation, as the representation of women on these boards is proportional to as in practice.

A 2018 study of representation on 15 ophthalmology subspecialty societies found 13.3% of presidents to be women,²¹ while our study identified a larger proportion of women presidents in 2022 (32.9%) when 29 ophthalmology societies were considered. A study found that women made up 20.0% of presidents of six major ophthalmology societies from 2010 to 2019.³ In our larger sample size, a similar proportion of women was noted when curated from 2000 to 2019 (183/855, 21.4%) (► **Fig. 1**).

While board members who were men had higher median h-indexes and publication numbers, no significant differences in m-quotients were found. The m-quotient accounts for variations in career duration or stage of career (i.e., early or late stage) by dividing h-index by the duration of publishing. Based on the m-quotient, no difference in research productivity was observed. On average men in this study

Table 1 Characteristics of ophthalmology board members by gender

Characteristic	Subspecialty societies ^a		p	State societies		p	Canadian societies		p	All societies combined		p
	Men	Women		Men	Women		Men	Women		Men	Women	
Total board members, no. (%)												
Chair or President	19 (67.9)	9 (32.1)	0.32	24 (66.7)	12 (33.3)	0.85	6(66.7)	3 (33.3)	1	49 (67.1)	24 (32.9)	0.53
Other board members	222 (56.3)	172 (43.7)		278 (68.6)	127 (31.4)		54 (70.1)	23 (29.9)		554 (63.2)	322 (36.8)	
Degrees, no. (%)												
MD or DO	194 (80.5)	144 (79.6)	< 0.001	282 (93.4)	128 (92.1)	< 0.001	55 (91.7)	25 (96.2)	0.66	531 (88.1)	297 (85.8)	0.06
MD, PhD	31 (12.9)	16 (8.8)		13 (4.3)	7 (5.0)		5 (8.3)	1 (3.8)		49 (8.1)	24 (6.9)	
Other ^b	16 (6.6)	21 (11.6)		7 (2.3)	4 (2.9)		0 (0)	0 (0)		23 (3.8)	25 (7.2)	
Subspecialty, no. (%)												
Comprehensive ophthalmology	18 (6.1)	22 (10.2)		61 (14.6)	33 (16.7)		6 (6.8)	6 (17.1)		85 (10.6)	61 (13.6)	
Pediatric ophthalmology	24 (8.1)	22 (10.2)		24 (5.7)	10 (5.1)		5 (5.7)	4 (11.4)		53 (6.6)	36 (8.0)	
Neuro-ophthalmology	14 (4.7)	11 (5.1)		3 (0.7)	3 (1.5)		2 (2.3)	2 (5.7)		19 (2.4)	16 (3.6)	
Oculoplastic ophthalmology	12 (4.1)	6 (2.8)		24 (5.7)	11 (5.6)		11 (12.5)	5 (14.3)		47 (5.9)	22 (4.9)	
Cornea	38 (12.9)	31 (14.4)		31 (7.4)	13 (6.6)		4 (4.5)	1 (2.9)		73 (9.1)	45 (10.0)	
Ocular immunology or uveitis	22 (7.5)	15 (7.0)		42 (10.0)	23 (11.6)		9 (10.2)	2 (5.7)		73 (9.1)	40 (8.9)	
Cataract and refractive surgery	56 (19.0)	34 (15.8)		101 (24.1)	47 (23.7)		20 (22.7)	7 (20)		177 (22.1)	88 (19.6)	
Retina and vitreoretinal surgery	60 (20.3)	28 (13.0)		68 (16.2)	17 (8.6)		11 (12.5)	3 (8.6)		139 (17.3)	48 (10.7)	
Glaucoma	33 (11.2)	22 (10.2)		58 (13.8)	37 (18.7)		20 (27.7)	5 (14.3)		111 (13.8)	64 (14.3)	
Non-Ophthalmologist	18 (6.1)	24 (11.2)		7 (1.7)	4 (2.0)		0 (0)	0 (0)		25 (3.1)	28 (6.3)	
Country of residence, no. (%)												
U.S.	234 (97.1)	173 (95.6)	0.44	302 (100)	139 (100)	-	0 (0)	0 (0)	-	536 (88.9)	312 (90.2)	0.59
Outside the U.S.	7 (2.9)	8 (4.4)		0 (0)	0 (0)		60 (100)	26 (100)		67 (11.1)	34 (9.8)	

Table 1 (Continued)

Characteristic	Subspecialty societies ^a		p	State societies		p	Canadian societies		p	All societies combined		p
	Men	Women		Men	Women		Men	Women		Men	Women	
Publication measures												
Publications, median (IQR)	88 (166)	32 (83.8)	< 0.001	6 (19.5)	6 (11)	0.92	27 (51)	13 (21)	0.11	23 (84)	14.0 (52.3)	0.03
H-index, median (IQR)	24 (29)	12 (15)	< 0.001	4 (8)	4 (6)	0.59	11 (11)	6 (9)	0.14	10 (22)	7 (12)	0.01
M-quotient, median (IQR)	0.84 (0.89)	0.68 (0.67)	0.13	0.25 (0.38)	0.31 (0.40)	0.15	0.43 (0.53)	0.37 (0.35)	0.46	0.46 (0.74)	0.50 (0.55)	0.67
Years publishing, median (IQR)	30 (16)	20.0 (13.8)	< 0.001	20 (21)	16 (12)	< 0.001	21 (14)	16 (16)	0.26	25 (19)	17 (14)	< 0.001

Abbreviations: DO, Doctor of Osteopathic Medicine; IQR, interquartile range; MD, Doctor of Medicine; OD, Doctor of Optometry; PhD, Doctor of Philosophy.

^aSubspecialty and Special Interest Societies.

^bIncludes board members without an MD or DO (e.g., PhD, Master's, OD).

Table 2 Distribution of women board presidents by 20-year intervals from 1942 to 2021

Year	Subspecialty societies ^a		p	State societies		p	Canadian societies		p	All societies combined		p
	Women, proportion (%)	Women, proportion (%)		Women, proportion (%)	Women, proportion (%)		Women, proportion (%)	Women, proportion (%)		Women, proportion (%)		
1942–1961	–	< 0.001	2/45 (4.4)	< 0.001	0/20 (0)	< 0.001	2/65 (3.1)	< 0.001	< 0.001	2/65 (3.1)	< 0.001	
1962–1981	3/71 (4.2)		0/119 (0)		0/21 (0)		3/211 (1.4)			3/211 (1.4)		
1982–2001	11/213 (5.2)		8/145 (5.5)		3/34 (8.8)		22/392 (5.6)			22/392 (5.6)		
2002–2021	108/415 (26.0)		91/393 (23.2)		11/80 (13.8)		210/888 (23.7)			210/888 (23.7)		

^aSubspecialty and Special Interest Societies.

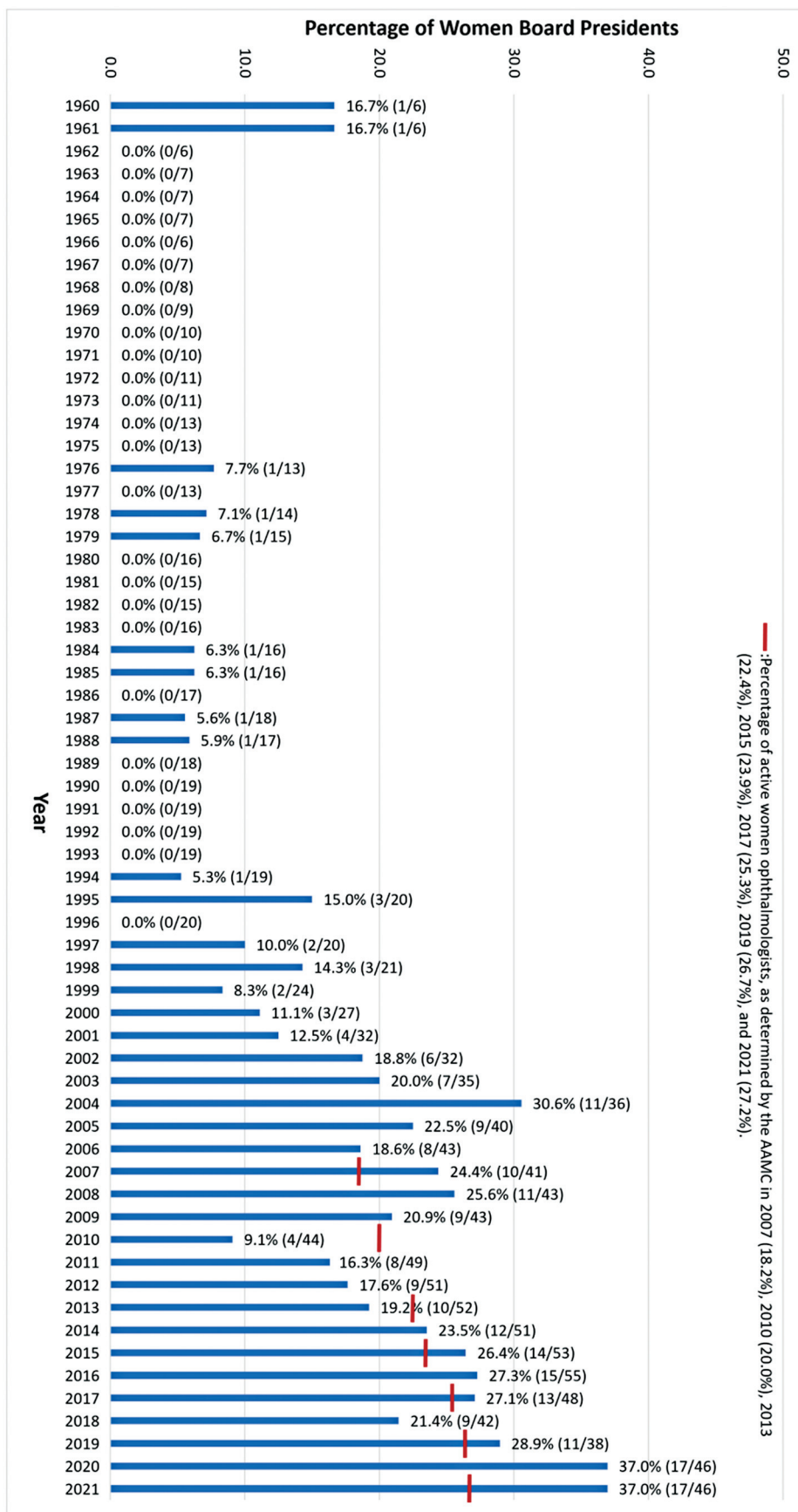


Fig. 1 Distribution of women board presidents by year from 1960 to 2021. Data from 1942 to 1959 was not listed as there were no women board chairs found during this period. The percentages of active women ophthalmologists were extracted from the AAMC Physician Specialty Data Reports. AAMC, Association of American Medical Colleges.

had longer academic careers, which may be because women are becoming involved in these positions earlier in their careers, or simply because there is a larger pool of women ophthalmologists who are younger due to an increase in women going into ophthalmology in recent years.³² Data on board member age and the age of practicing ophthalmologists in the United States by gender may help contextualize this finding. In Canada, the proportion of women ophthalmologists decreases by increasing age, while the opposite is seen for men.³³ While the m-quotient does not account for parental leave, a study of ophthalmology residents in the United States found no significant differences in parental leave duration by gender.³⁴ In our study, a sevenfold increase in the proportion of women was found when comparing periods 1942 to 1961 and 2002 to 2021. Meanwhile, from 1938 to 1997, no more than one women board president was found among all Canadian and American societies analyzed.

While it is now standard that authors disclose financial or other conflicts of interest, the AAO was the only organization that listed financial or other relevant disclosures of its board members in this study.

Future studies should explore strategies for increasing diversity, such as commitment to diversity and increasing transparency of board diversity composition.^{35,36} Additional efforts to increase gender representation in ophthalmology at all levels (e.g., residency, fellowships, editorial boards) are needed.^{1,11,12,37} As mentioned by AAO's former longstanding chief executive officer, the goal should be "...that the 50% of women ophthalmologists now in training will constitute 50% of the leadership positions."²⁰

Several strategies have already been adopted by S&P 500 companies, with 46% of newly appointed directors in 2022 being women.³⁶ Increasing diversity at senior organizational levels may improve diversity in lower-level leadership positions, as a "trickle-down effect."³⁸ Other studies have found bottom-up strategies more effective in industries dominated by men,³⁹ like ophthalmology.⁴ Currently, 42.1% of ophthalmology residents in the United States are women.³² Exploring the motivations, experiences, and barriers of women interested in pursuing leadership positions in ophthalmology may provide further insight into our study findings.

Limitations

Our study has several limitations. Since only American and Canadian society boards were studied, the conclusions drawn herein are not generalizable on an international scale. The metrics used to quantify research productivity, such as the h-index and m-quotient, may have limited applicability, as board member selection may be based on additional factors, such as reputation, industry relations, as well as prior leadership and board experience. Future research may explore how each of these factors is weighed in the selection process. A small percentage (4.2%) of current board members' gender was determined using a gender-assigning software (Gender-API), which has limitations, while the remainder were self-reported. Societies that did not have

Web sites or a board of directors listed on their Web sites were not represented in this study.

The fraction of women on the academic boards in North American ophthalmology societies has increased sevenfold over the past 83 years. The proportion of women on ophthalmology boards is representative of the proportion of practicing ophthalmologists who are women. Women in executive positions have comparable academic output to men when the number of years they have been academically active is accounted for. While the increasing representation of women board members is encouraging, we must continue efforts to sustain progress in promoting women's representation in both ophthalmology and leadership opportunities.

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Conflict of Interest

None declared.

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