

# Race and Gender Shift among Academic Glaucoma Specialists in the Last 5 Decades

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## ABSTRACT

**Purpose:** To evaluate the demographic composition of academic glaucoma specialists currently practicing in the United States.

**Design:** Retrospective and observational study.

**Subjects:** Academic glaucoma specialists identified from ophthalmology residency programs listed on the Dximity database.

**Methods:** The American Board of Ophthalmology (ABO) membership directory, Dximity database, publicly available data, and direct communications were used to identify academic glaucoma specialists and their demographics. Information collected included—name, gender, race/ethnicity, geographic location, board certification date, academic affiliation, and academic rank. Ophthalmic age was defined as the number of years since ophthalmology board certification. Underrepresented minority (URM) groups were defined as Hispanics, Black or African Americans, Latinos, American Indians, or Alaskan Natives as defined by San Francisco match. In addition, the temporal, geographic, and academic rank distributions among females and URMs were explored.

**Main outcome measures:** Women and URMs representations among academic glaucoma specialists across academic ranks, geographic regions, as well as ophthalmic age.

**Results:** There were 457 active academic glaucoma specialists identified from 110 institutions in 38 states. Among them, 185 (40.5%) were women and 42 (9.2%) were URM. The proportion of women glaucoma specialists in academia had increased significantly with a rate of 1.049 in odds ratio (OR) per year ( $p < 0.001$ ). However, there were no significant changes in the proportion of URMs over time. The earliest year of certification was 1,964 for males and 1,974 for females. When controlled for ophthalmic age, there were no significant differences in the distribution of women or URMs between the different academic ranks ( $p = 0.572$  and  $p = 0.762$ , respectively). Among assistant professors, women had a significantly higher ophthalmic age compared to men ( $p < 0.001$ ), but there was no significant difference in ophthalmic age in both the associate and full professor groups. There were no significant differences in the geographic distribution of gender ( $p = 0.516$ ) and URM across United States regions ( $p = 0.238$ ).

**Conclusion:** The proportion of women among academic glaucoma specialists has significantly increased over the past 5 decades; however, the proportion of URMs has been stagnant in the same period. Enhancing URM representation among academic glaucoma specialists deserves to be a future priority.

**Keywords:** Drainage devices, Fenestration, Glaucoma, Glaucoma drainage devices, Glaucoma drainage implants, Glaucoma surgery, Surgical technique, Technique.

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## INTRODUCTION

Improving racial and gender diversity in the physician workforce may improve patient care and benefit the healthcare field as a whole. Patients who are of the same race as their provider report improved satisfaction, have an increased likelihood of seeking preventative care or care for a new health problem, and experience decreased total healthcare expenditures.<sup>1–3</sup> The demographic composition of practicing physicians does not mirror the current United States population, and it is projected that more than half of Americans will belong to an ethnic or racial group other than non-Hispanic White by 2044.<sup>4</sup> As of 2018, the current academic physician workforce was 63.9% white and 9.2% underrepresented minority (URM) defined as black, Hispanic, American Indian, Alaskan Native, Native Hawaiian, and Pacific Islander groups by both the Association of American Medical Colleges (AAMC) and the SF Match.<sup>5</sup>

Additionally, female physicians may have slightly different practice patterns from male physicians. Female physicians have been shown to counsel more on preventative health and have improved outcomes in hospitalized and surgical patients.<sup>6–8</sup> While female physicians comprise 36% of practicing physicians in

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the United States, this proportion varies widely among different specialties.<sup>9</sup> In ophthalmology, 22.7% of the practicing physicians are women and only 6% are from URM groups.<sup>10</sup> Furthermore, the proportions of women or URM in academic ophthalmology were lower compared to other specialties.<sup>11</sup>

While there has been a modest increase in the proportion of female ophthalmology residents, there was no change in

the proportion of URM in this same period.<sup>10</sup> Subspecialty ophthalmologists such as ophthalmic plastic and reconstructive surgery recently reported an increase in the proportion of females and URMs in the field over the past 3 decades.<sup>12</sup> Demographic trends among glaucoma specialists have not yet been described. This study aimed to characterize the change in gender and URM representation over time among academic glaucoma specialists.

## MATERIALS AND METHODS

This study was a retrospective, observational study based on public data and did not require Institutional Review Board approval. The authors used publicly available information from the Dximity database to identify all residency programs within the United States and profiled glaucoma specialists in academia affiliated with the programs. American Board of Ophthalmology (ABO) directory, publicly available data, and direct communication were used to collect the following data—name, gender, race/ethnicity, geographic location, board certification date, academic affiliation, and academic rank. Diversity and gender designations were based on publicly available information. For all intents and purposes, gender was defined as apparent biological sex. We defined the criteria for glaucoma specialists as having a glaucoma specialist designation on the institution's website, completing a formal glaucoma fellowship training, or having substantial published research in the field of glaucoma. We predicted the ethnicity and gender of glaucoma specialists using the Forebears database, an online genealogy directory, and cross-referencing the results with a combination of publicly available information obtained from members' professional profiles, biography, and pictures. Two authors profiled all members independently, and the two databases were cross-referenced. In case of any discrepancies, a third author would independently profile the member for a tiebreaker.

Ophthalmic age was defined as the number of years since earning the certification from the ABO. Ophthalmic age data for all glaucoma specialists included in this study were obtained from the search function at the ABO website [www.abop.org](http://www.abop.org).

The AAMC defines URM as groups underrepresented in medicine relative to their numbers in the general population. These include Hispanics, African Americans, and Native Americans. Although Asian and South Asian (Indian) populations are minorities in the United States, they are not underrepresented in medicine and are not counted as URMs in this study. Specialists who were affiliated with institutions without formal academic appointments were designated as instructors. States were classified into four regions according to the US Census Bureau's classification: West, South, Midwest, and Northeast.<sup>13</sup>

We used logistic regression to analyze the temporal trends in the composition of women and URM in the academic glaucoma specialist population.  $\chi^2$  test was conducted to evaluate the association between gender and URM groups with location and academic rank. A one-way analysis of variance test was used to assess the means of years since board certification between academic ranks. Student *t*-test was used to compare the average of years since certification between men and women at different academic ranks. We applied binary logistic regression models to examine the association between gender and URM status and academic rank. For all *p* values, *p* < 0.05 was considered to be statistically significant. The statistical analyses were conducted with IBM Statistical Package for the Social Sciences version 26.0.

## RESULTS

The authors identified 457 active academic glaucoma specialists from 110 institutions in 38 states. Faculties and instructors with credentials other than MD or DO, including PhD, MS, and OD, were excluded from the analysis. We identified board certifications as early as 1,964 (male) or 1,974 (female) until 2019.

### Demographics of Academic Glaucoma Specialists

Out of the 457 identified glaucoma specialists in academia, 40.5% were women (Table 1). A total number of 42 URMs comprised 10.8% of women, 8.1% of men, and 9.2% of all specialists. Within the URM subgroup, 47.7% were women. Full professors, associate professors, and assistant professors comprised 20.4%, 22.8%, and 44.6% of total specialists, respectively.

### Temporal Changes

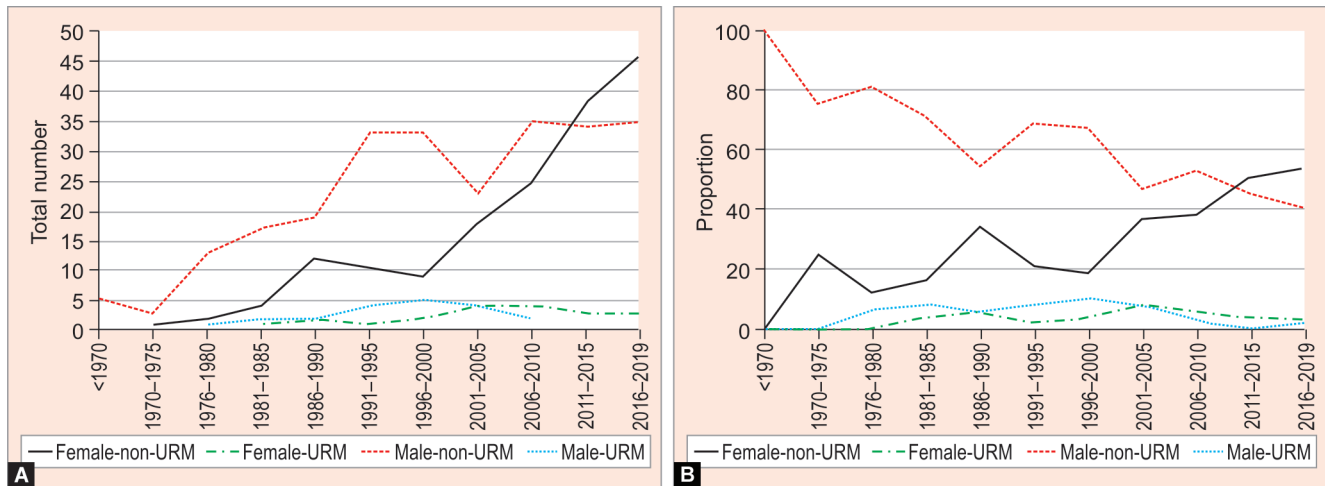
We used logistic regression to assess the temporal trend in gender and URM distribution based on specialists' board certification dates. Figure 1 plots the percentage of women by the board certification date in 5-year increments from 1964 to 2019. The women's representation in academic glaucoma specialists grew within the last few decades with a rate of 1.049 in odds ratio (OR) per year [95% confidence interval (CI) 1.030–1.068, *p* < 0.0001; Table 2]. While there were no women among specialists who obtained their board certification before the 70s, 55.9% of academic glaucoma specialists who were board-certified after 2010 were women. This is a 3.6-fold increase in ratio and a 30-fold increase in number from the three women who obtained their board certifications in the 70s. Although the number of URMs increased from one individual certified in the 70s to 8 URMs certified after 2010, we did not detect any significant change in the ratio of URMs over this period (*p* = 0.445).

### Academic Positions

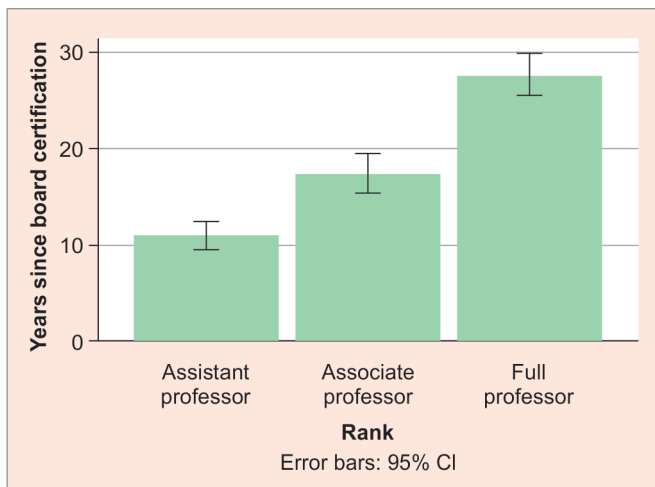
While women comprised 45.6% and 39% of assistant professors and associate professors, 24.7% of full professors were women. URM's proportion of assistant, associate, and full professors was 12.5%, 9.8%, and 4.8%, respectively. There was a significant difference in the average years since board certification between academic

**Table 1:** Diversity and gender in academic glaucoma specialists

	Total no.	% Subgroup % Women	% Total
Total	457		100.0%
Men	272		59.5%
URM	22	8.1%	4.8%
Non-URM	250	91.9%	54.7%
Women	185		40.5%
URM	20	10.8%	4.4%
Non-URM	165	89.2%	36.1%
URM	42		9.2%
Men	22	52.4%	4.8%
Women	20	47.6%	4.4%
Academic rank			
Instructor	56	50.0%	12.3%
Assistant Professor	204	45.6%	44.6%
Associate Professor	104	39.4%	22.8%
Full Professor	93	24.7%	20.4%



**Figs 1 A and B:** Temporal trends in 5-year increments of academic glaucoma specialists by gender and URM status. (A) Illustrates the change in the number of academic glaucoma specialists by gender and URM status. (B) Illustrates the change in the proportion of academic glaucoma specialists by gender and URM status



**Fig. 2:** The average years since certification for each academic rank. Assistant, associate, and full professors have an average of 11.0, 17.5, and 27.7 years since certification, respectively. Error bars are representative of the 95% CI

**Table 2:** Diversity and gender in academic glaucoma specialists across academic ranks

	Total no.	% Women	% URM	% Total
Total		40.5%	9.2%	100.0%
Instructor	56	50.0%	12.5%	12.3%
Assistant professor	204	45.6%	9.8%	44.6%
Associate professor	104	39.4%	4.8%	22.8%
Full professor	93	24.7%	10.8%	20.4%

ranks ( $p < 0.001$ ). Figure 2 plots the average years since certification for each academic rank. The average number of years since board certification for full professors was 2.5 times larger than for assistant professors (Table 3).

Academic rank is affected by the faculty's years of experience. We used a binary logistic regression model to control years of experience while investigating the difference in gender and

diversity in academic ranks. In this model, gender and URM status were designated as exposure variables, and board certification year was treated as a confounding variable. When controlled for the number of years in practice, there was no significant difference in the distribution of gender across academic groups ( $p = 0.572$ ). Similarly, the URM ratio difference between academic groups was not significant when controlled for years of experience ( $p = 0.762$ ). We defined ophthalmic age as the number of years since board certification. Among assistant professors, women have significantly higher ophthalmic age compared to men ( $p < 0.001$ ); this difference was not observed in the associate professor ( $p = 0.335$ ) and full professorship ( $p = 0.280$ ) levels (Table 3).

### Geographic Distribution

Figure 3 depicts the regional distribution of academic glaucoma specialists, where darker colors correspond to higher female specialists' percentages. The distribution was assessed by calculating the percentage of women and URMs by state and region. New York had the highest number of academic glaucoma specialists (81), followed by California (45). Correspondingly, New York (15) and California (10) had the largest number of ophthalmology residency programs in the United States. There was no significant difference in the distribution of gender ( $p = 0.516$ ) and URM across US regions ( $p = 0.238$ ).

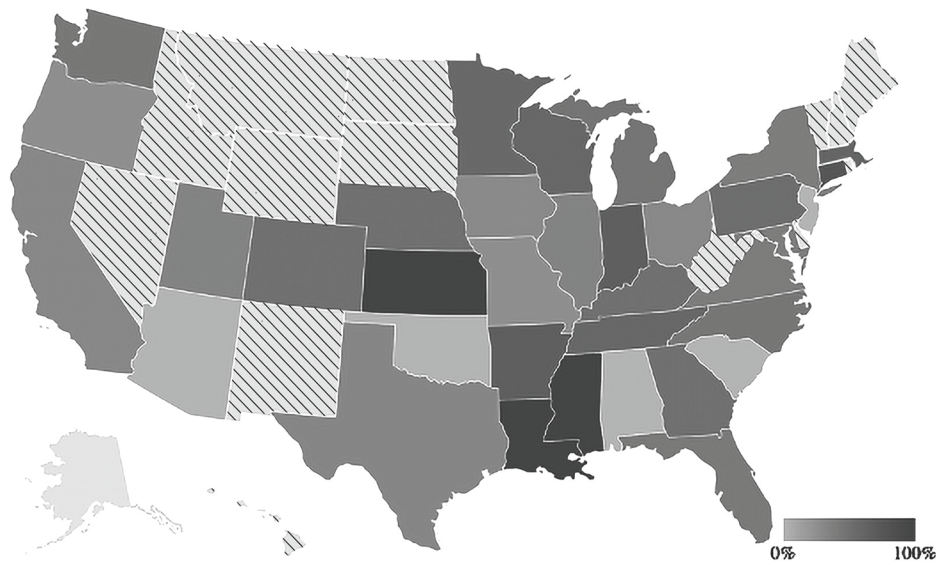
### DISCUSSION

In our longitudinal study on the trend of diversity in the US ophthalmology faculty who specialize in glaucoma, we profiled >450 faculty members from over 100 American ophthalmology programs. We examined gender and racial diversity among academic glaucoma specialists specifically focusing on temporal trends over the last 5 decades and current demographic distribution in the different academic ranks. Our investigation revealed an increase in the proportion of female glaucoma faculty over the past 5 decades but no increase in URM glaucoma faculty during the same time period. Additionally, females were found to have significantly longer ophthalmic age in assistant professors for glaucoma but there was no significant difference in the proportion of URM faculty in the academic ranks.



**Table 3:** The average years since board certification across academic rank

	N	Mean	Standard deviation	Standard error	95% CI	
					Lower bound	Upper bound
<i>Assistant professor</i>	204	11.03	11.179	0.783	9.49	12.58
Men	111	7.29				
Women	93	14.17				
<i>Associate professor</i>	104	17.50	10.991	1.078	15.36	19.64
Men	63	18.30				
Women	31	16.27				
<i>Full professor</i>	93	27.74	9.656	1.001	25.75	29.73
Men	70	28.27				
Women	23	26.13				
Total	401	16.59	12.683	.633	15.34	17.83



**Fig. 3:** Regional distribution of academic glaucoma specialists by gender. Darker colors correspond to higher percentages of female specialists. Hash lines depict states where no data was available

We found that the ratio of women within the glaucoma faculty (40.5%) was higher than the overall US ophthalmology faculty (35.1%). Moreover, the temporal trend shows a promising increase in women’s representation in the academic glaucoma faculty over the past few decades. Interestingly, women comprise more than half (55.9%) of the younger generation of glaucoma faculties who have been certified in the past 10 years. Recent studies have shown similar trends in ophthalmologists in both workforce and academia. The proportion of female ophthalmology residents has grown over the past few decades, and more women have entered academic ophthalmology than men in recent years.<sup>10,12,14</sup>

The recent increase in the representation of women in faculty positions is an essential early step. However, it is vital to ensure women have equal opportunities to climb up academic ranks and attain leadership positions.

Given the rise in the proportion of women among glaucoma specialists, we expect to see more women in higher academic ranks as the new generation of women in academia is promoted to higher ranks. According to studies on diversity in academic ophthalmologists, despite the closing gap between the number

of women and men among ophthalmology faculty, women are not being promoted to the professor rank at the same rate as other specialties.<sup>14</sup> Moreover, women are still significantly less present among editorial boards and leadership positions.<sup>15,16</sup>

Our analysis shows that among glaucoma faculty, women are significantly less represented in higher academic ranks. Nonetheless, the difference was not significant anymore when we controlled for years since the board certification. We also found no significant difference in years of experience between men and women in associate professor and professor ranks. Nevertheless, at the assistant professor level, the ophthalmic age for women was almost two times higher than for men. There may be several explanations for this phenomenon.

Societal stereotypes may impede the advancement of women at all stages in their academic medicine careers.<sup>17</sup> Science faculty tend to rate male applicants as more competent than female applicants, providing men with better mentoring and career opportunities.<sup>18</sup> The preexisting gender bias is even reflected in the letters of recommendation for applicants of ophthalmology residency applicants.<sup>19</sup> The continued and prolonged discrimination

that women face throughout their medical education leads to early burnout and a lack of confidence in their abilities to pursue their career goals.<sup>20</sup>

Additionally, women are more likely to assume roles that are less likely to impact promotion. These roles may include participation in committees and volunteering.<sup>21</sup> Moreover, women are more likely to be constrained by domestic workload and childcare responsibilities.<sup>22</sup> Another key factor in the disproportionate advancement of men and women in academia is the imposter phenomenon.<sup>23</sup> The imposter phenomenon is the self-imposed belief that one is not intelligent, and anyone who believes otherwise has been tricked.<sup>24</sup> Women suffer from the imposter phenomenon significantly more than men.<sup>20</sup> This occurs at the level of medical students, residents, and faculty and can be a serious barrier to advancement.<sup>25</sup> Lack of confidence in their abilities prevents women from pursuing competence-related advancements.<sup>16</sup> As a matter of fact, men tend to apply for advancement opportunities when they met 60% of the requirements for the position, whereas women did not apply until they met 100% of the requirements.<sup>26</sup>

Although we see a promising number of women joining academic glaucoma faculty, the pace at which racial and ethnic diversity is growing in glaucoma specialists' academic society remains slow. The underrepresentation of minorities in academic glaucoma specialists is representative of the ethnic diversity of the larger ophthalmology community (6%) and academic medical community (9.2%).<sup>5,10</sup> Additionally, the ratio of URM among ophthalmologists continued to be static from the year 2005 to 2015.<sup>10</sup> When compared to other medical specialties, ophthalmology is one of the least diverse.<sup>11</sup> Notably, ophthalmologists are also less diverse than currently enrolled medical students, as 23% of medical students are from URM groups.<sup>27</sup> These differences highlight the need to increase efforts to recruit a diverse student background into the field of ophthalmology. Mentorship has been identified as a potential area of improvement. Programs like the Minority Ophthalmology Mentoring program and the Rabb-Venable Excellence in Ophthalmology Program aim to provide URMs with individual exposure to ophthalmology and subsequently support their pursuit of a career within the field.<sup>28,29</sup> In addition, individual medical schools are providing programs to support URMs interested in ophthalmology.<sup>30,31</sup> With the recent creation of these programs, the improvements in diversity are not yet seen. Minority groups remain less represented in leadership for global ophthalmology associations as well as attendees in leadership development programs.<sup>32,33</sup> Efforts to improve diversity in ophthalmology will be an ongoing endeavor that needs prioritization and dialogues from the level of medical trainees to professional societies leaders to ensure improved representation.

While this paper aims to describe the demographic makeup of academic glaucoma specialists, there are limitations to this analysis. The sample of physicians may not be all-inclusive due to potential changes in departments or outdated department rosters online. Additionally, the characterization of gender and ethnicity is implied through information gathered from publicly available information rather than self-reporting, which can also lead to potential discrepancies. Although self-reported ethnicity and gender are considered the gold standard procedure when available, there is a paucity of data regarding race and ethnicity. This is particularly challenging as institutions do not routinely collect or publicly report these data. Alternative strategies, such as Bayesian Surname and Geocoding and Categorical Surname and Geocoding, propose

indirect approaches that utilize geographical and demographic data to predict ethnic information.<sup>34,35</sup> However, these methods typically rely on extensive geographical data and large samples not available in this study. Lastly, we used the board certification year as a surrogate for the length of academic experience. However, this data is in line with previously published data from the field of ophthalmology as a whole, and as such it is likely to be well representative of the academic glaucoma physicians.

In summary, despite a gradual increase over the past decades, women and URMs still face significant internal and external barriers to advancement in academic ophthalmology. Mitigating these barriers would require recognizing the challenges faced by women and URMs and then necessitating a concerted effort by institutions to support and encourage these groups to pursue academic ophthalmology.

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