

## Advancements in Achieving Gender Equity in U.S. Academic Pharmacy

Omar H. Farooq<sup>1\*</sup>, Sana M. Iqbal<sup>1</sup>

<sup>1</sup>Department of Pharmacy Practice and Public Health, Faculty of Pharmacy, University of Lahore, Lahore, Pakistan.

\*E-mail ✉ omar.farooq@outlook.com

### Abstract

To assess the progress in gender equality within the United States pharmacy academia following the prior assessments published in 2004 and 2014. Information was collected from public national datasets, proprietary databases of the American Association of Colleges of Pharmacy (AACP), minutes from AACP meetings, published documents, journal articles, websites of pharmacy organizations, websites of individual institutions, and LinkedIn profiles. Gender comparisons between males and females were conducted regarding degree attainment, academic disciplines, faculty ranks, tenure, research funding, leadership training, administrative roles, compensation, and major professional honors. These findings were also contrasted with those in academic medicine and dentistry. Women comprise 51% of full-time faculty across all pharmacy academic fields. The proportion of women holding the rank of full professor reached 36.6%, up from 25% in 2014. Among 2992 faculty on tenure-track or tenured positions, 39.2% were female. Of 388 department chair positions, 146 were occupied by women. From 2014 to 2021, there were 121 permanent dean appointments at the chief executive level, with males appointed to 91 (75.2%) and females to 30 (24.8%). Females obtained 29.7% of NIH grants awarded to pharmacy institutions (versus 70.3% for males), though the total funding secured by women exceeded that of men. In pharmacy practice as well as in the basic science disciplines, average salaries across all ranks and experience levels were significantly greater for men than for women, including among department chairs; however, no salary gap existed for dean positions. Overall, women have been recipients of only 13% of the premier 13 awards from four major national pharmacy organizations. Progress has been made in closing certain disparities since 2014, yet persistent issues remain that require ongoing efforts and investment to achieve full equity. Female faculty in pharmacy academia require sustained mentorship and resources across their entire professional careers, particularly in promotion, grant writing, salary discussions, pursuing leadership roles, and nominations for awards.

**Keywords:** Women, Leadership, Pharmacy education, Gender, Faculty

### Introduction

Since 1985, females have constituted the majority (54%) of recipients of entry-level pharmacy degrees in the US, a figure that rose to 63% by 2020 [1]. Despite this robust supply of talented individuals, females continue to be underrepresented in senior leadership, prestigious recognitions, tenured positions, promotions, and pay

within pharmacy academia. This pattern mirrors gender disparities documented recently in academic medicine and dentistry [2-9]. The primary aim of this study was to examine advancements in gender equity in US pharmacy education since the earlier reviews in 2004 and 2014 [10, 11]. An additional objective was to benchmark pharmacy data against corresponding metrics in medicine and dentistry academia.

Access this article online

<https://smerpub.com/>

Received: 11 November 2023; Accepted: 28 February 2024

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**How to cite this article:** Farooq OH, Iqbal SM. Advancements in Achieving Gender Equity in U.S. Academic Pharmacy. Ann Pharm Educ Saf Public Health Advocacy. 2024;4:129-36. <https://doi.org/10.51847/bE3ONRlpob>

### Materials and Methods

Sources for this analysis included publicly available national datasets, restricted AACP databases, AACP meeting records, issued reports, peer-reviewed literature, organizational websites in pharmacy, school-specific

web pages, and LinkedIn (LinkedIn Corp) profiles. Gender differences were examined across graduation rates, ranks, tenure, disciplines, leadership roles, major honors, career progression, and compensation using descriptive measures including counts, averages, and standard deviations. Salary comparisons employed the Mann-Whitney nonparametric test due to the skewed nature of financial data.

## Results and Discussion

Findings on degree conferral showed steady growth in women's shares since 1965, when they earned 14.1% of entry-level professional degrees, 14.8% of MS degrees, and 2.8% of PhD degrees [1]. By 1985, these figures were 54% for entry-level degrees, 41% for MS, and 25% for PhDs [1]. In 2020, women represented 63.0% of PharmD recipients, 65.1% of MS graduates, and 45.9% of PhD graduates [1].

By contrast, women accounted for under 50% (48%) of US medical graduates in 2018-2019, unchanged since

2011-2012 [12]. In dentistry, women made up 51% of 2020 graduates, an improvement from 46.1% in 2009 [10, 13].

Regarding faculty composition by discipline, women held 48% of full-time positions across departments in academic pharmacy during 2012-2013 [10]. This increased to 51% by 2020-2021, according to the AACP 2020-2021 Roster and Faculty Salary Survey (RFSS).

In 2021, 52.3% of all faculty positions were in pharmacy practice [AACP 2020-2021 RFSS]. Women formed the majority in pharmacy practice (65.8%) and pharmacotherapeutics/translational research (54.6%). The lowest female representation was in medicinal/pharmaceutical chemistry/pharmacognosy (19.3%), followed by pharmaceuticals (30.8%), pharmacology/toxicology (33.1%), biological/biomedical sciences (37.9%), pharmacokinetics/dynamics/genetics (41.2%), and social/administrative sciences (47.5%). Refer to **Table 1** for detailed gender breakdown by discipline.

**Table 1.** Proportion<sup>a</sup> of full-time faculty positions in pharmacy occupied by females, broken down by academic area and survey period

Academic Area <sup>b,c</sup>	2020-2021	2012-2013	2002-2003	1990-1991
Pharmacy practice	66	61	53	36
Social/administrative sciences	47	44	31	21
Pharmaceuticals/pharmacy	31	26	18	13
Biological/biomedical sciences	38	41	39	26
Medicinal chemistry <sup>d</sup>	19			
Pharmacology/toxicology <sup>d</sup>	33			
Pharmacokinetics/dynamics/genetics <sup>d</sup>	41			
Pharmacotherapeutics/translational research <sup>d</sup>	55			

<sup>a</sup> Percentages have been rounded to the nearest whole number. <sup>b</sup> Certain academic areas are omitted because they were introduced, reclassified, or merged over time. <sup>c</sup> Before the 2012-2013 period, areas like pharmacokinetics/dynamics/genetics fell under pharmaceuticals, while pharmacotherapeutics/translational research was grouped within pharmaceuticals or pharmacy practice. <sup>d</sup> Historical comparisons are unavailable for these areas prior to 2020-2021 owing to revisions in classification systems.

Shifts were additionally observed in the distribution of academic ranks among female faculty. Based on the AACP 2020-2021 Roster and Faculty Salary Survey (RFSS), among 5426 full-time pharmacy faculty members, women held 36.6% of professor positions and 53.0% of associate professor positions, representing increases from 25% and 46%, respectively, reported in 2014 [10]. The proportion of women at the assistant professor level (59.4%), however, showed little change from the 60% recorded in 2014 [14]. For context, women constituted 43% of full-time faculty in medical schools,

where they accounted for 27% of professors, 40% of associate professors, and 48% of assistant professors [15]. In dental schools, women made up 37% of combined full-time and part-time faculty [2].

Regarding tenure, 13.2% of full-time pharmacy faculty were employed at institutions without tenure systems, and 38.9% held nontenure-track roles. The remaining 47.8% were either tenured or on tenure-track pathways. Among the 2992 faculty in tenured or tenure-track positions, 39.2% were female. By comparison, in 2012-

2013, 45.8% of male faculty and 29% of female faculty were tenured or tenure-eligible.

Research productivity and funding patterns were also examined. Data from the AACP 2020-2021 Funded Faculty Research Grant Survey (along with the Federal Grants Search tool) indicated that 1076 NIH grants were awarded to individuals holding pharmacy academic or administrative titles, with gender reported for 1052 of these. Women received 312 (29.7%) of those grants. In contrast, during 2012-2013, 196 (28.39%) of 710 NIH grants to pharmacy faculty went to women [10]. Differences in grant submission volumes or rejection rates between genders could not be determined due to lack of data on total applications from pharmacy faculty. Notably, the mean funding amount per grant awarded to women in 2020-2021 was \$425,586 (median \$340,152), exceeding the mean for men of \$407,089 (median \$344,250).

Participation in leadership training programs was reviewed as well. AACP records show that, across cohorts 11–15 (2014-2015 to 2018-2019) of the Academic Leadership Fellows Program, 80 (54.8%) of the 148 pharmacy faculty participants were women. (Data for cohorts 16 and 17 remain incomplete.) In the now-discontinued AACP Catalyst program (previously the Academic Research Fellows Program), designed to foster research leadership among mid-career faculty, only 16 (27.1%) of the 59 participants were female.

**Table 2** presents trends in women serving as department chairs from 2002 through 2021. Overall, 146 (37.6%) of 388 department chair positions were held by women. Over time, female representation in these roles increased, particularly within pharmacy practice and social/administrative sciences. The latter discipline stands out as the only one in which the proportion of women among department chairs matched their overall representation within the field.

**Table 2.** Number of female and male department chairs and deans in U.S. colleges and schools of pharmacy, along with the percentage of positions held by women, by academic area and survey year

Position	2002–2003 Women (No.)	2002–2003 Total (No.)	2002–2003 Women (%)	2012–2013 Women (No.)	2012–2013 Total (No.)	2012–2013 Women (%)	2020–2021 Women (No.)	2020–2021 Total (No.)	2020–2021 Women (%)
Chair, pharmaceuticals	3	37	8.1	8	46	17.4	9	45	20.0
Chair, chemistry	2	38	5.3	8	44	18.2	7	44	15.9
Chair, pharmacology or biology	3	49	6.1	17	70	24.3	17	74	23.0
Chair, pharmacy practice	27	92	29.3	50	137	36.5	88	166	53.0
Chair, social and administrative sciences	4	31	19.1	8	29	27.6	16	33	48.5
Chair, other <sup>a</sup>	3	5	50.0	3	9	33.3	5	18	27.8
Deans <sup>b</sup>	12	81	14.8	28	114	24.6	31	119	26

<sup>a</sup> The "other" category encompasses areas such as continuing professional development, liberal arts, library and information sciences, pharmacokinetics/dynamics/genetics, and pharmacotherapeutics/translational research. Before 2012, this category covered continuing professional education, liberal arts, and library/educational resources. <sup>b</sup> Dean figures represent permanent appointments only.

The fields of pharmacokinetics/dynamics/genetics and pharmacotherapeutics/translational research were categorized under pharmaceuticals and pharmacy practice, respectively. Data on permanent chief executive dean appointments are also available.

Between 2014 and 2021, 121 permanent dean positions were filled, with men securing 91 (75.2%) and women 30 (24.8%). Among the 30 women appointed as deans, 14 were selected for newly created schools, 14 were

promoted internally, and two were recruited externally. In contrast, of the 91 men appointed, four were at new institutions, 53 were internal promotions, and 34 were external hires.

For benchmarking, the 2020 AAMC Faculty Roster Snapshots reported that women held 18% of 136 permanent dean positions and 20% of 2959 permanent department chair roles in medical schools [15]. In dental

education, as of 2017-2018 data, 15 (23%) of 66 U.S. dental schools had female deans [2].

Comparisons accounted for rank, years at rank, and overall totals for full-time calendar-year positions in pharmacy practice and across all combined science disciplines. In both pharmacy practice and the aggregated science fields, men's total salaries across all ranks were significantly higher than women's, with average gaps of \$7,961 and \$13,148, respectively (both  $p < .001$ ).

More granular findings in pharmacy practice revealed that men with over 20 years at rank earned more than women at the full professor level ( $p = .003$ ). Across all experience levels in this discipline, men outearned women at both professor ( $p \leq .001$ ) and assistant professor ranks ( $p = .027$ ). The average pay difference for assistant professors favored men by \$3,295, widening to \$12,051 at the professor level. The starkest disparity appeared among professors with more than 20 years of experience, where men earned an average of \$41,401 more annually than women. Overall in pharmacy practice, men's salaries exceeded women's by \$7,961 across all ranks and experience levels.

In the combined non-practice science disciplines, most data points favored men. However, two exceptions emerged where women professors earned more: \$24,150 higher in the 11–15 years category ( $p = .029$ ) and \$57,774 higher in the >20 years group ( $p = .008$ ), though the latter group included only nine women versus 80 men. Despite these outliers, across all experience levels, male professors averaged \$4,777 more than female professors,

and men across all ranks and years in these science fields earned \$13,148 more overall.

At higher administrative levels, female department chairs received lower average compensation (\$169,105, SD = \$47,249) than male chairs (\$188,539, SD = \$52,905;  $p < .001$ ). No gender-based salary difference was observed for permanent dean positions.

Comparative data from other fields show persistent gaps. Medical school faculty salaries rose 2.3% in fiscal year 2019, yet significant gender disparities remained even after adjusting for age, experience, and specialty, with the widest gaps at senior leadership levels [16]. The 2018 AAMC Faculty Salary Survey indicated that women in basic sciences earned 90 cents for every dollar men earned, while in clinical sciences the figure was 77 cents, with larger inequities at advanced leadership roles [17]. The 2018-2019 ADEA Survey of Dental School Faculty reported that women were paid less than men across all ranks and in department chair positions [18].

Recognition and award outcomes are summarized in **Table 3**, which lists recipients by organization, specific award, gender, and years from inception through 2021. For AACP honors, trends from 2013 to 2021 showed modest gains for women: the Chalmers Distinguished Pharmacy Educator Award rose from 27.3% to 29.3% female recipients, the Dawson Excellence in Patient Care Research Award from 21% to 26%, and the Volwiler Research Achievement Award from 5.4% to 11.1%. The Lifetime Achievement Award, introduced in 2017, has been given four times, with two awards going to women.

**Table 3.** Number of achievement award recipients by association, award name, and gender through 2021, N=513 awards

Award name	First awarded	AACP		AAPS		APhA		ASHP	
		Men	Women	Men	Women	Men	Women	Men	Women
Chalmers Distinguished Pharmacy Educator	1981	29	12						
Dawson Excellence in Patient Care Research <sup>a</sup>	1993	20	7						
Lifetime Achievement	2017	2	2						
Volwiler Research Achievement	1977	40	5						
Distinguished Pharmaceutical Scientist	1989			18	0				
Outstanding Educator (ended 2016)	2000			8	2				
Wurster Research	1990			14	2				
Remington Honor Medal	1919					86	7		
Research Achievement	1962 <sup>b</sup>					110	5		
Tyler Prize	1962					25	0		

John W. Webb	1985	31	6
Harvey A. K. Whitney	1950	57	14
William A. Zellmer	2010	7	4

Abbreviations: AACP<sup>5</sup>American Association of Colleges of Pharmacy; AAPS<sup>5</sup>American Association of Pharmaceutical Scientists; APhA<sup>5</sup>American Pharmacists Association; ASHP<sup>5</sup>American Society of Health-System Pharmacists.

<sup>a</sup> Formally Dawson Biotechnology.

<sup>b</sup> In 1962-1994 there were multiple recipients per year. Since 1995, a single award has been available each year.

As of 2013, women had never been recipients of the three most prestigious awards offered by the American Association of Pharmaceutical Scientists (AAPS). This pattern changed when the Outstanding Educator Award was given to a female honoree in 2014, followed by another woman in 2015; the award was subsequently discontinued in 2016. The Dale E. Wurster Research Award in Pharmaceutics has recognized two women, in 2018 and 2020, while the Distinguished Pharmaceutical Scientist Award, first presented in 1989, has yet to be awarded to a woman. In 2020, former AAPS President Alice Till established the Alice E. Till Advancement of Women in Pharmaceutical Sciences Recognition Award to honor women who have significantly contributed to the advancement and visibility of women in pharmaceutical sciences; two recipients have received this award.

The Remington Honor Medal, created in 1918, acknowledges either outstanding contributions to American pharmacy over the past year or sustained excellence in the field. The American Pharmacists Association (APhA) assumed responsibility for the award in 1979. As the highest distinction in U.S. pharmacy, it has been presented 93 times: 86 awards went to men (92.5%) and only seven to women (7.5%). The APhA Research Achievement Award, founded in 1961, initially consisted of six separate awards covering different areas of pharmaceutical sciences, although not all were given each year. From 1962 through 1994, men received 90 awards, while only one woman was recognized in 1988. Between 1995 and 2021, 20 men and four women received this honor. The APhA Tyler Prize for Stimulation of Research, created in 1962 and awarded 25 times, adopted a three-year rotation among APhA Academy of Pharmaceutical Research and Science disciplines in 1996; no woman has yet received this award.

The American Society of Health-System Pharmacists (ASHP) annually confers three lecture awards. The John W. Webb Award, recognizing excellence in pharmacy administration, has included women in 16.2% of its

lectures since 1985. The Harvey A.K. Whitney Award, the premier award in health-system pharmacy since 1950, has been awarded to women in 19.7% of cases. The William Zellmer Award, established in 2010 to invite distinguished speakers to address ASHP practice leaders, has been delivered seven times by men (63.6%) and four times by women (36.4%).

Over the past nearly four decades beginning in the mid-1980s, female graduates have consistently strengthened their dominant position among recipients of entry-level professional pharmacy degrees.[1] This pattern differs markedly from medical education, where females continue to represent less than half of degree earners, and dental education, where females have only lately achieved majority status.[12, 13] Such predominance carries over to full-time faculty roles in pharmacy practice, with females holding most positions at the assistant and associate professor levels. Although these trends might appear encouraging for the academic community—particularly when viewed alongside progress in medicine and dentistry—it remains puzzling why greater balance across genders has not emerged during this extended period. Further advancements are required to promote fairness in fields like pharmaceutical sciences PhD completions, as well as female representation among faculty and department heads in those areas [1, 12].

Persistent imbalances are evident in full professor ranks for full-time female faculty and in high-level administrative roles, such as associate deans and chief executive deans. While the count of pharmacy schools headed by female deans has risen gradually over the past two decades, the growth slowed dramatically in recent years, showing just a 1.6% rise over seven years.[10,11] This modest shift equates to adding only one more woman dean between 2014 (30 out of 107 deans) and 2021 (31 out of 119 deans). The reasons behind this limited progress warrant deeper examination.

Findings on gender balance in academic research show varied results. During the 2020-2021 period, average NIH funding per award to pharmacy institutions was

greater for females than males. Given that females occupy only 34.5% of science-related roles overall, this higher per-grant amount stands out positively. Yet, in the most recent data, females secured just 29.7% of NIH awards in pharmacy, with only a 1.4% rise in their share over nine years; details on submission rates remain unavailable. Another key research metric involves scholarly publications. Though this analysis did not assess gender variations in output rates, work by Ni and colleagues indicated that female contributions to articles were often undervalued by both genders, females faced more authorship disputes than males, and they more frequently appeared in mid-author slots suggesting supportive rather than leading roles.[19] These patterns raise concerns that overlooked claims to primary authorship could harm females' scholarly standing, since position in author lists factors heavily into tenure and promotion reviews.[20] Research prominence is further reflected through membership on journal editorial boards. An analysis by Awad of 20 pharmacy journals identified females as 326 (40%) of 813 members, with proportions varying widely (8% to 63%) across titles and 80% featuring male editors-in-chief.[21] Comparable disparities have appeared in journals linked to medical and dental academic groups.[22, 23] The academic pharmacy field must probe deeper into obstacles hindering female research involvement and their persistence, as scholarly productivity forms a core element of the faculty evaluation triad.

Regarding compensation, fair pay serves as a key benchmark for gender fairness, per Pew Research Center findings.[24] Nationwide over the last 15 years, the U.S. pay disparity has held steady, with females recently earning 84% of male wages—equivalent to requiring an additional 42 workdays annually for equivalent earnings.[24] Similar wage differences persist within pharmacy academia. Addressing these pay imbalances is crucial due to their long-term compounding impacts. Evidence indicates disparities for females starting their initial faculty roles, and these do not resolve with advancing ranks or promotions, likely tied to how initial pay sets the baseline for subsequent increments and benefits. This ongoing pattern underscores the need for institutions and units to vigilantly track pay variations, eliminate current discrepancies, block new ones from arising, and foster lasting compensation fairness.

Females face notable disadvantages in prestigious recognitions, as they have earned only 12.9% of 513 top honors from four major pharmacy associations, versus

87.1% for males. Within research-specific accolades, AACP's two primary awards have overwhelmingly gone to males. Among AAPS honors, the Distinguished Pharmaceutical Scientist Award has never gone to a female (18 recipients all male), and the Wurster Research Award has favored males 87.5% of the time. For APhA research prizes, notably few females won from 1962-1994 (one out of 91), and post-1995 (single-recipient format), only four females versus 20 males. The Tyler Prize for Stimulation of Research has gone exclusively to males across 25 presentations. Application and nomination volumes for females are unclear, yet the low receipt rates prompt scrutiny: do fewer qualified females seek or get nominated, or are dossiers less robust? Alternatively, might issues lie in evaluation standards or panel makeup? Rather than simply increasing female winners to match numbers, organizations should review nomination processes, encourage strong candidates with guidance on building strong submissions, and assess selection panels and protocols.

Programs focused on building leadership capabilities have proven effective for advancing female faculty careers.[10, 25] Growing emphasis on enhancing women's leadership competencies is seen in AACP's Academic Leadership Fellows Program participation, where over half of 148 attendees were female. In contrast, aligning with earlier noted imbalances in basic sciences, females comprised just 27.1% in the AACP Academic Research Fellows Program (renamed AACP Catalyst) before its pause. Ongoing initiatives should prioritize boosting female pharmacy faculty engagement in leadership training, mentorship, and related activities—whether discipline-specific or broader, like the Bryn Mawr Leadership Institute or Hedwig van Ameringen Executive Leadership in Academic Medicine (ELAM) initiative [25, 26].

Study constraints include reliance mainly on 2020-2021 AACP Profile of Pharmacy Faculty data, the field's most comprehensive source with about 95% survey participation, though minor omissions could slightly alter figures. Additionally, unknowns surround application or nomination counts for leadership initiatives, roles, or honors, as well as rejection outcomes, leaving uncertainty about applicant pools and results by gender.

## Conclusion

Although certain disparities have lessened since 2013-2014, lingering issues demand ongoing focus. Pharmacy

academia must recognize and correct gender imbalances in administrative roles, while scrutinizing award standards and processes to guarantee fair opportunities for females in national recognitions, executive posts, invited presentations, and funding success.[27] Obstacles to women's involvement in organizational governance require attention, including overt or subtle prejudices, confidence in leadership potential, and difficulties balancing professional and personal demands.[28] Pay gaps must be closed given their lifelong accumulative consequences. Female faculty require ongoing assistance across career stages, achievable via deliberate, readily available mentorship in professional growth and leadership, ideally through an interdisciplinary national mentoring framework in health sciences for varied perspectives and thorough support.

**Acknowledgments:** Special thanks to AACP staff including Lynette Bradley-Baker, Dorothy Farrell, and Terry Ryan for their assistance in gathering and describing the data.

**Conflict of Interest:** None

**Financial Support:** None

**Ethics Statement:** None

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