RESEARCH

The Status of Women in US Academic Pharmacy

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Objective. To describe the status of women in pharmacy education with particular focus on a 10-year update of a previous study.

Methods. Information was obtained from national databases, published reports, scholarly articles, and association websites. Comparisons were made between men and women regarding degree completion, rank, tenure status, leadership positions, research awards, salaries, and career advancement.

Results. There have been modest gains in the number of women serving as department chairs and deans. Salary disparities were found between men and women at several ranks within pharmacy practice. Men were more apt to be tenured or in tenure-track positions and received 89.4% of the national achievement awards tracked since 1981.

Conclusion. The problem cannot be simply attributed to the pipeline of those entering academia. Barriers to advancement differ between men and women. We recommend that individuals, institutions, and associations implement strategies to decrease barriers and reduce bias against women.

Keywords: women, pharmacy education, faculty

INTRODUCTION

In 2004, Svarstad and colleagues examined the status of women in pharmacy education and reviewed indicators for career advancement and barriers to advancement.¹ They found that despite increases in the number of women faculty members over time, gender disparities were evident in terms of tenure status, leadership position, achievement awards, and salary at higher academic ranks. The status of women in academia has been studied extensively in the last 10 years across a number of disciplines.²⁻¹⁵ Of particular note was the examination of salary differences and percentage of women in higher academic ranks and leadership positions. The purpose of this paper was to describe the current status of women in pharmacy education with particular focus on a 10-year update of the 2004 study.¹

METHODS

Information was obtained from existing national databases, published reports, scholarly articles, and pharmacy association websites. Comparisons were made between men and women regarding degree completion, faculty member rank and tenure status, leadership positions and national achievement awards, salaries, and career advancement. Descriptive statistics such as means, standard deviations, and percentages were calculated for the various comparisons. The Mann-Whitney U test was used to compare differences in mean salary because the distribution of monetary data requires nonparametric statistical techniques. A 2-sample test of proportions was used on the number of chairs in the respective disciplines examined and the total number of deans between 2002-03 and 2012-13. Inferential statistics were not conducted on proportions or counts that represented the entire population of a given group.

RESULTS

Various indicators of career advancement included degree completion, faculty member rank and tenure status, leadership positions and recognition, and salary.¹

Degree Completion

In 2012, 61.2% of first-professional degree, doctor of pharmacy (PharmD) graduates and 44.7% of PhD graduates were female.¹⁶ Figure 1 shows the trend of professional and advanced pharmacy degrees awarded to women by decade. While the number of women earning PharmD, MS, and PhD degrees continued to rise through the 2000s, the upward trend stabilized in the first half of
the 2010s. In 2009, the number of female PhD recipients was higher than the number of male PhD recipients. For dentistry and medicine, the percentage of female graduates with professional degrees remained under 50%. In 2009, 46.1% of dental school graduates were female. In 2011, 48% of graduates from LCME-accredited US medical schools were women.13

Women continued to make gains in degree completion in the sciences. Since 2000, women have earned more BS degrees than men in science-related and engineering-related fields.17 Per the National Science Foundation’s latest statistics, in 2010 women earned 41% of doctorates in science and engineering.18 More than 30% of science, technology, engineering, and mathematics (STEM) faculty members at 4-year institutions were women.18-20

Faculty Rank and Tenure

In academic pharmacy in 2013, women made up 25% of professors, 46% of associate professors, and 60% of assistant professors. Percentages increased in all categories over the past 10 years (Figure 2) and in all disciplines (Figure 3).

In 2002-2003 in pharmacy practice, according to American Association of Colleges of Pharmacy (AACP) databases, 53.2% of men were tenured or on a tenure track compared to 30.3% of women, for a total of 41.4% of all appointments as tenured and/or tenure eligible. The percentages 10 years later stood at 45.8% of men and 29% of women tenured or tenure eligible. Nearly two-thirds (64.1%) of appointments were non-tenure track or at non-tenure institutions. In 2002-2003, for all full-time faculty members in all science disciplines combined, 85.4% of men and 76.5% of women were tenured or in tenure-track appointments whereas in 2012-2013, 83.8% of men and 71.9% of women were tenured or in tenure-eligible appointments. Seventeen pharmacy schools were classified as non-tenure granting institutions in 2012-2013. AACP did not differentiate tenure granting status in 2002-2003.

In academic medicine, more women were in clinical non-tenure track positions relative to men, who held the
The majority of tenure-track eligible positions. While the concept of tenure continues to evolve and the importance of funding from clinical practice for faculty member lines grows, the slower rate of promotion of these non-tenure track positions affects women disproportionately more than men. In academic medicine in 2012, women made up 20% of professors, 32% of associate professors, and 43% of assistant professors.

According to the National Science Foundation, among science, engineering, and health doctorate holders employed in universities and 4-year colleges, 21.9% of professors, 38% of associate professors, and 44.4% of assistant professors are women. In this same group, 26.7% were tenured, 42% were on tenure-track but not yet tenured, and 44.5% were on non-tenure track.

Leadership Positions and Recognition

Figure 4 shows the percentage and number of women who served as deans and department chairs by discipline in pharmacy. While the total number of women serving as department chairs and as deans increased, the proportion of women did not, except for chairs of pharmacology or biology ($p=0.009$). The increase in the number of pharmacy colleges and schools since 2002-2003 allowed for increased opportunity for women to serve in these leadership roles, but the proportion remained essentially the same. The department chair position is a key step in the normative pathway to the deanship in pharmacy education. There were 107 CEO pharmacy dean appointments in the 10 calendar years 2004-2013 (excluding acting and interim.) Thirty hires (11 internal, 11 new institutions, 8 external) were women and 77 (24 internal, 26 new institutions, 27 external) were men. The percentage of programs led by women increased from 15% in 2002-03 to 24.5% in 2012-2013.

Table 1 shows the number of achievement award recipients by association, award name, and gender from 1981 to 2013. The greatest increases in women recipients occurred with the Chalmers Distinguished Educator and the Dawson Biotechnology awards from AACP. The number of women who received the Chalmers Distinguished Educator award increased from 1 in 2004 to 9 by 2013. In the same time period, the number of women who received the Dawson Biotechnology award increased from...
Yuan et al found that an increasing percentage of women entered dental school and pursued advanced dental education and, while women were more likely to pursue academic careers, they did not progress in their academic careers as men did and thus were underrepresented. The most recent data available showed that 19% of department chairs and postdoctoral directors were women and 15.3% of dental school deans were women.

The number of women in higher level academic positions in colleges of medicine did not change dramatically since data were collected. Women in academic medicine made up 12% of the deanships and 14% of department chair positions. Using data sets from the American Association of Medical Colleges (AAMC), White and colleagues examined gender and career progression relationships in dean appointments made between 1980 and 2006. They determined that female dean appointments severely lagged when compared to percentages of female medical students and faculty members. They also found that, compared to their male counterparts, female deans were more apt to serve at less research-intensive institutions, weren’t promoted to professor as often, and served as deans for a shorter time.

Women remained underrepresented in academic leadership posts, receipt of achievement awards, and as speakers at scientific programs across the academic enterprise. The National Science Foundation found that of all the science, engineering, and health doctorate holders employed in universities and 4-year colleges, women accounted for 35% of all academic positions, with 28.5% of those holding the rank of president, provost, or chancellor, and 30.5% in the position of dean and department chair/head.

In 2007, The National Academies Press published the work of a committee charged to recommend methods for maximizing the potential of women in academic science and engineering. This committee identified obstacles and
defined issues. The chapters, “Learning and Performance,” “Examining Persistence and Attrition,” “Success and its Evaluation in Science and Engineering,” “Institutional Constraints,” and “Fulfilling the Potential of Women in Academic Science and Engineering” speak to every section in this paper.\textsuperscript{2}

The 2007 National Academy of Sciences report found that “evaluation criteria contain arbitrary and subjective

Figure 4. Percentage and number of women serving as department chairs and deans in pharmacy schools. Data are from the AACP Profile of Pharmacy Faculty, Tables 1 and 8. In 2002-03, “Other” included the Continuing Professional Education, Liberal Arts, and Library/Educational Resources disciplines. In 2012-13, the disciplines of Pharmacokinetics/dynamics/genetics and Pharmacotherapeutics/Translational Research were also included in “Other.” Previously, these two disciplines were included in Pharmaceutics and Pharmacy Practice, respectively.

Table 1. Number of Achievement Award Recipients by Association,\textsuperscript{a} Award Name, and Gender, 1981–2013

<table>
<thead>
<tr>
<th>Award Name</th>
<th>Male</th>
<th>Female</th>
<th>Male</th>
<th>Female</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chalmers Distinguished Pharmacy Educator</td>
<td>24</td>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dawson Biotechnology</td>
<td>15</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volwiler Research Achievement</td>
<td>31</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Distinguished Pharmaceutical Scientist</td>
<td></td>
<td></td>
<td>13</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outstanding Educator</td>
<td></td>
<td></td>
<td>7</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wurster Research</td>
<td></td>
<td></td>
<td>12</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Research Achievement</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>38</td>
<td>3</td>
</tr>
<tr>
<td>Tyler Prize</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td>0</td>
</tr>
</tbody>
</table>

\textsuperscript{a}AACP: American Association of Colleges of Pharmacy
\textsuperscript{b}AAPS: American Association of Pharmaceutical Scientists
\textsuperscript{c}APhA: American Pharmacists Association
components that disadvantage women.” Overall women faculty members were paid less, promoted more slowly, received fewer honors and recognitions, and were less apt to hold leadership positions when compared to men. Further, these differences did not appear to be based on outcomes, significance, or other performance measures. What they did depend on was the evaluation of dossiers and work products by others who were senior in the field. This process, although believed to be objective, was “often arbitrary and applied in a biased manner (usually unintentionally.)” This included labels and characteristics used to describe faculty members and their work. Madera et al found that letters of recommendation sometimes differed in their vocabulary and evaluation based on whether the candidate was male or female. That is, women were described as more communal and less self-directed than men and that these communal characteristics were negatively evaluated in hiring decisions.

Moss-Racusin and colleagues conducted a randomized double-blind study with basic science faculty members in 6 diverse research-intensive universities in which both male and female faculty members rated application materials of seemingly equally qualified candidates (“Jennifer versus John”) for consideration as a laboratory manager. The faculty members, regardless of gender, rated John as more competent and a better hire than Jennifer. John was offered a higher starting salary and career mentoring. Several studies and editorials have called for increasing the number of women in groups selecting panel participants, convening conferences, and setting national program agendas in order to increase the number of female speakers and participants. Casadevall and Handselmann examined symposia that included about 2,000 speakers at 3 large 2011-2013 meetings of the American Society for Microbiology. When all-male panels organized the meetings, 25% of the speakers were female; when organizing groups contained at least one woman, the percentage of female speakers was 43%.

### Salary Differences

Tables 2 and 3 provide full-time pharmacy faculty member salaries by rank, years in rank, and gender for calendar-year appointments in pharmacy practice and all sciences combined, respectively. Analyses were conducted for each scientific discipline, but given there were no differences found, these data were combined for presentation. The only differences were found in pharmacy practice. Male faculty members earned higher salaries than female faculty members 2-5 years in rank at the assistant professor level ($p=0.002$), 0-1 year ($p=0.008$) and 2-5 years ($p=0.002$) in rank at the associate professor level.

<table>
<thead>
<tr>
<th>Years in Rank</th>
<th>Assistant Professor</th>
<th>Associate Professor</th>
<th>Professor</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-1 year</td>
<td>$128,749$</td>
<td>$127,698$</td>
<td>$107,805$</td>
</tr>
<tr>
<td>2-5 years</td>
<td>$143,791$</td>
<td>$132,496$</td>
<td>$108,953$</td>
</tr>
<tr>
<td>6-10 years</td>
<td>$138,744$</td>
<td>$128,054$</td>
<td>$112,147$</td>
</tr>
<tr>
<td>11-15 years</td>
<td>$141,688$</td>
<td>$143,218$</td>
<td>$119,697$</td>
</tr>
<tr>
<td>16-20 years</td>
<td>$157,472$</td>
<td>$143,318$</td>
<td>$117,908$</td>
</tr>
<tr>
<td>&gt;20 years</td>
<td>$164,889$</td>
<td>$151,817$</td>
<td>$116,006$</td>
</tr>
</tbody>
</table>

Table 2. Average 2012-2013 Full-time Pharmacy Faculty Member Salaries ($) and Standard Deviation (in parenthesis) by Rank, Years in Rank, and Gender for Calendar-Year Appointments in Pharmacy Practice

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level, and 16-20 years in rank at the professor level ($p=0.001$). The average 2012-2013 full-time pharmacy dean salary for 77 males was $230,573 (standard deviation $46,136$) and for 26 females was $224,380 (standard deviation $43,009$). The difference was not significant.

DesRoches et al examined whether differences existed between men and women around professional productivity (eg, number of publications), professional activities (eg, patient care, research, teaching), and salaries of life sciences faculty members at top NIH-funded universities with medical schools. They found that salary gaps between men and women persisted that could not be explained by productivity or other factors.3 Jagsi et al, in examining gender differences in salary in a cohort of early-career physician-researchers, found, using the Peters-Belson analysis, that male gender was an independent predictor of salary after adjusting for specialty area, academic rank, work hours, and amount of time devoted to research.6

In their analysis of dental school senior leadership positions, Ioannidou and colleagues found that salary gaps between men and women actually widened in recent years according to American Dental Education Association salary figures.14

DISCUSSION

The literature suggests that, at some point in the future, measures of academic success and career advancement (eg, degree completion, faculty member rank and tenure status, leadership positions and recognition, and salary) of women will match those of men. However, there is continued reason for concern that this pipeline theory is not supported given the lack of increased numbers of women in senior leadership positions.2,11-12 Women continue to be lost at every academic transition in an academic career path.2,27 Leadership development programs, including development programs, such as the American Dental Education Association’s (ADEA) Leadership Institute and the Executive Leadership in Academic Medicine (ELAM), can make a difference. While only 15.3% of US dental school deans were women, 60% of women in these positions graduated from ELAM.14

Additional analyses were conducted on 3 ELAM fellow cohorts to determine the effect of self-efficacy in women’s leadership development.28 Bandura’s “Theory of Self-Efficacy” formed the conceptual framework, which is the belief in one’s ability to succeed in certain situations.29 One’s self-efficacy influences how one approaches challenges and goals. Bandura suggested 4 sources to develop self-efficacy: mastery experiences, vicarious experiences/social models, verbal persuasion, and
physiological and affective states. Attention to these factors can increase self-efficacy beliefs. Ninety-five percent of the fellows interviewed cited benefits in building self-efficacy. Mastery experiences such as finance sessions and communication techniques were found to be the most beneficial closely followed by role modeling and networking in the vicarious experiences/social models category. Fellows also cited the importance of self-reflection, the increased sense of self-awareness, improved self-perception, mentors, and fostering relationships with their dean.

Nearly half (140/287, 48.8%) of the individuals completing the AACP Academic Leadership Fellows Program (ALFP) have been women. Eighteen ALFP graduates were appointed as CEO pharmacy deans through 2013, and female ALFP graduates made up one-third (6/18) of these appointments. Twenty percent (6/30) of the female CEO pharmacy dean hires from 2004-2013 were ALFP graduates compared to 15.6% (12/77) of the male CEO pharmacy dean hires during this same time period. Of the 2013-2014 inaugural class of AACP Academic Leadership Fellows, 12.5% are women (2/16).

In 2012, women received 61.2% of the first professional pharmacy degrees earned, this is down from a high of 68.25% in 2006. Women became the majority of first pharmacy degree recipients nearly 30 years ago in 1985. The distribution of 2012-2013 full-time faculty members was 48% female contrasted with 38% 10 years ago. While numbers of female faculty members increased, percentages of female department chairs (except in pharmacology/biology) and deans did not.

In the last 10 years, women were increasingly recognized with AACP achievement. The AAPS has yet to award their Distinguished Pharmaceutical Scientist award (since 1989), Wurster Award (since 1990), or Outstanding Educator (since 2000) to a woman, nor has the APhA awarded the Tyler Prize (since 1962) to a woman. It would be interesting to know whether deserving women have been nominated for any of these awards and whether any women sit on respective selection committees. As Ioannidou and colleagues stated, “...the presence of women on research committees and scientific review and editorial boards should not just be mandates but an institutional strategic priority.” The journal Nature, through the Freedom of Information Act, found that NIH review panels were 25% women in 2003 and 30% women in 2012, which paralleled the percentage of women applying for and receiving NIH grants during that time period. In fiscal year 2012, there were 710 NIH grants with a pharmacy faculty member listed as the principal investigator as reported via AACP’s Funded Faculty Research Grant Survey. Of the 692 grants for which the gender of the principal investigator was reported in AACP’s Roster and Faculty Salary Survey, 196 (28.3%) were awarded to female faculty members.

In the tenure and promotion processes, the concept of sponsorship from a well-established prestigious colleague to validate scholarly productivity and quality can disproportionately disadvantage women who may not have the same access as men to individuals in higher positions. Nearly two-thirds of the pharmacy practice positions nationwide are now non-tenure track or at non-tenure institutions. For those 784 positions that are tenured or tenure-eligible, 411 are held by men and 373 by women. Although there are increased numbers of women faculty members in pharmacy practice, they are less apt to be in a tenure-track position.

The importance of initial salary negotiations and salary differences that exist early in a career are likely to continue to widen over the course of a career illustrating the cumulative affect of initial disparities. Salary differences among male and female academics are also not explained by academic rank and age. Given that the typical career ladder is 0-6 years as assistant professor before being promoted to associate professor, there could be evidence that a cohort of faculty members may have salary differences extending across the first 5 years of employment and into the associate professor rank in pharmacy practice. Given that the majority of female faculty members are in the pharmacy practice discipline, the impact of the differences must be considered. A limitation of these data is that it is a slice in time and AACP databases currently do not have the ability to track cohorts to see if these salary differences persist over time. Overall, salary differences between men and women in academic pharmacy are less now than they were 10 years ago. Female dean salaries are no different than their male counterparts; whereas, salaries of dental and medical deans do differ by gender.

Journals suggested that remedies for salary inequities are usually aimed at changing overall policies but that individual remedies may be the better approach to have meaningful impact. Although there were no significant differences in the combined sciences comparisons for men and women, averages may obscure effects on individual faculty members.

Other factors identified as barriers to advancement include family roles and mobility, work values and activities, gender schemas and biases, and lack of support and marginalization at the departmental level.

There are assumptions about what women will and will not do regarding career decisions, especially around mobility. Factors such as dual careers, child care, or elder care, may influence candidates. As people continue to live longer, elder care will increase in importance. Based on
decanal appointments in academic pharmacy from 2004 to 2013, women candidates were just as apt as men to secure appointments outside their current institution.

In a small exploratory study of women in the AAMC ELAM program, McLean et al looked at geographic mobility and found that, as predicted, women who were mobile were able to advance more easily. The investigators also cited the need for additional study on the underlying psychosocial and socioeconomic factors that women face in these types of career decisions.12

In an in-depth study at one medical school, Shollen et al found that several family life factors were labeled as obstacles to satisfaction and retention for women faculty members, including family situations requiring women to spend more hours than men on household responsibilities, family support structures, and parental leave policies.34 A book showcased in the March 7, 2014 edition of the Chronicle of Higher Education, based on over a decade of research by a team at the University of California, Berkeley on thousands of graduate students, showed there was a “baby penalty” in academe.35 Their “most important finding” was that “family formation damages the academic careers of women but not of men.” This translates to paying a personal price for career (type of appointment and institution) and family decisions (marriage and/or having children.) The study also suggested interventions to address the current pattern: (1) better (and more) child-care options, (2) effective dual-career policies, (3) childbirth accommodations, and (4) compliance with Title IX of the US Education Amendments of 1972.

The extensive National Academy of Sciences report, Beyond Bias and Barriers: Fulfilling the Potential of Women in Academic Science and Engineering, indicated that “subtle forms of prejudice may be difficult to identify, yet manifestations of such can be anything but trivial or inconsequential.2 Decades of research say both men and women carry prejudices (that they may be unaware of), which influence evaluations of and decisions about individuals. There is no reason to believe that members of academic pharmacy are immune to these tendencies.

Several studies in academic medicine found that women, when compared to men, were more apt to feel like “outsiders,” to feel the need to represent their gender, and to feel that there were “unwritten” rules and biases against women.5,34 If one felt excluded from or marginalized in an organization, it would influence that person’s desire to persist.

CONCLUSION

In the past 10 years, achievement gaps narrowed for women in academic pharmacy, but there are still some areas of concern. The authors suggest the following recommendations: (1) Nominations and selection committees, professional societies, and higher education organizations need to examine structure and process to address underrepresentation of women. Selection and search committees should consciously address representation and question whether biases exist and confront them when necessary. (2) When factors such as dual careers, child care, or elder care exist, institutions should address these in order to recruit and retain candidates. [There were 8 suggestions in Women in Academic Leadership focusing on awareness, advocacy, and action.36 The remaining recommendations are based on those categories.] (3) Examine campus work life and environment and question what is defined and accepted as the norm. This also should be examined in relation to how campuses define and reward effective leadership. (4) Examine work environments to assure equity and health for all. This could include examining hiring practices, salary and benefit figures, workload assignments, evaluation practices, and promotion and tenure materials and deliberations. Go beyond problem identification to determine solutions. (5) Seek leadership development programs and build support networks for all levels of faculty members and administration. These could be campus level initiatives or national association programs such as the AACP’s Academic Leadership Fellows Program, the Academic Research Fellows Program, or the Women Faculty SIG. (6) Accept personal responsibility in pursuing development opportunities; this is especially important in addressing the self-efficacy components in the development of women leaders.

Women are as capable as men of contributing to academic pharmacy and biases must be confronted and impediments to women’s progress and success must be addressed at department, college, university, and professional organization levels. It is critical to the pharmacy education enterprise so that all of its members can realize their full potential.

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