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Gender Differences in Scholarly Productivity Within Academic Gynecologic Oncology Departments

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Abstract

OBJECTIVE—To estimate whether there is a gender difference in scholarly productivity among academic gynecologic oncologists.

METHODS—In this cross-sectional study, the academic rank and gender of gynecologic oncology faculty in the United States were determined from online residency and fellowship directories and departmental web sites. Each individual's *h-index* and years of publication were determined from Scopus (a citation database of peer-reviewed literature). The *h-index* is a quantification of an author's scholarly productivity that combines the number of publications with the number of times the publications have been cited. We generated descriptive statistics and compared rank, gender, and productivity scores.

RESULTS—Five hundred seven academic faculty within 137 U.S. teaching programs were identified. Of these, 215 (42%) were female and 292 (58%) were male. Men had significantly higher median *h-indices* than women, 16 compared with 8, respectively ($P<.001$). Women were more likely to be of junior academic rank with 63% of assistant professors being female compared with 20% of full professors. When stratifying *h-indices* by gender and academic rank, men had significantly higher *h-indices* at the assistant professor level (7 compared with 5, $P<.001$); however, this difference disappeared at the higher ranks. Stratifying by the years of active publication, there was no significant difference between genders.

CONCLUSION—Female gynecologic oncologists at the assistant professor level had lower scholarly productivity than men; however, at higher academic ranks, they equaled their male counterparts. Women were more junior in rank, had published for fewer years, and were underrepresented in leadership positions.

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Despite increasing numbers of female surgeons, the academic advancement of women within surgical fields lags behind men.[1–3] Reasons include few senior female role models, lack of mentoring, sexism in medicine, and issues of work–life balance.[4–6] The coincidence of training and early career timelines with childbearing and peak family demands influence women in their decision to pursue a surgical career.[7–10]

Several metrics used to assess research productivity, including total number of publications or citations,[11–13] fail to capture an author's academic influence.[13–16] The *h-index* evaluates effect and quantity of an individual's research contributions by combining the number of published articles with the citation frequency.[14,17]

Previous studies within fields with male preponderance demonstrated higher overall research contribution of males than females using the *h-index*.[11,17–20] However, women exhibited different productivity curves than men with less productivity early but equal or superior productivity later in their careers.[1,17,18,21,22]

We searched both PubMed and Ovid MEDLINE from 1946 to the present using an advanced search with MeSH terms identified from known related articles including: "Publishing/statistics & numerical data," "Research," "Sexism/statistics & numerical data," "Gynecology/statistics & numerical data," "Obstetrics/statistics & numerical data," "Faculty, medical/statistics & numerical data," and "Career mobility." Based on our search results, we determined that this topic has not yet been studied in obstetrics and gynecology or gynecologic oncology. Women comprise 51.8% of obstetrician–gynecologists, compared with 12–20% of these other surgical subspecialties[11,17,23] with the highest proportion of female residents of any specialty (82.6%).[23] Women make up 35.7% of gynecologic oncologists and 74.2% of gynecologic oncology fellows.[24] Despite this, women are still underrepresented in leadership positions, representing 20.4% of department chairs and 29.6% of division directors.[25]

Our objective was to compare academic productivity between genders in gynecologic oncology as measured by *h-index* and academic rank.

MATERIALS AND METHODS

In this cross-sectional study, gynecologic oncology department listings were obtained from the Association of Professors of Gynecology and Obstetrics online residency directory, American Board of Obstetrics and Gynecology fellowship directory, and departmental web sites. Online searches of 210 U.S. obstetrics and gynecology residency databases were conducted to determine the presence of gynecologic oncology teaching faculty and to obtain information about faculty members including academic rank and gender. Faculty were initially identified by their affiliation with a teaching program and academic ranks confirmed with additional searches of academic institution and medical practice web sites. We searched all 210 residency programs in the residency directory and, of these, were able to identify 137 programs with gynecologic oncologists with identifiable academic affiliations. The most common reason for excluding programs was that they numerically included gynecologic oncologists in their faculty but we were either unable to confirm the names of these gynecologic oncologists or for those that were identified, we were unable to confirm an academic title.

Gynecologic oncologists were organized into categories of professor, assistant professor, and associate professor. Faculty with the distinction of gynecologic oncology division chair, obstetrics and gynecology department chairs, or both were noted for additional separate analyses. In our final analysis, leadership positions were not included as a separate academic rank category as a result of the inconsistency of academic rank among designated division directors and the relatively small number of gynecologic oncologists who served as departmental chairs. We did not differentiate among various academic tracks (ie, clinical compared with academic tenure track) as a result of inconsistency in the available information and heterogeneity among academic institutions. Nonacademic, meaning those who did not have an academic title at an institution of higher education, and nonphysician faculty were excluded from this analysis. Each faculty member's gender was independently determined using both their names and faculty listings from the individual online sites.

Each faculty member's *h-index* and years of publication range were obtained from the Scopus database (www.scopus.com), which is a citation database of peer-reviewed literature. The *h-index*, first described by Dr. J.E. Hirsch in 2005, evaluates both the effect and quantity of an individual's research contributions.[14] An author's *h-index* is valued as the number of published articles, *h*, that have been cited at least *h* times in peer-reviewed journals. For example, an author with 50 total publications, of which 10 have been cited at least 10 times, would have an *h-index* of 10. Another author with 25 publications, of which 20 have been cited at least 20 times, would have an *h-index* of 20. Although the former author has twice the absolute number of publications, the latter has double the *h-index* as a result of the fact that more of his or her publications have been cited frequently, which suggests an overall greater contribution to academic research. Combining these two metrics is considered a more valuable assessment than simply considering the absolute number of publications alone. The *h-index* can be calculated using various biomedical publication databases, including Scopus, Google Scholar, ISI Web of Knowledge, and Publish or Perish.[17] Although some results vary among the resources, an analysis evaluating *h-index* among academic neurosurgeons found a high degree of correlation between *h-index* calculations using Scopus and Google Scholar.[26] It is important to note that an author's *h-index* varies with time, because when he or she publishes another article or one of his or her articles is additionally cited, it has the potential to increase his or her *h-index*.

When searching for common names in the Scopus database, numerous authors with similar names sometimes appeared in the search results. To mitigate this, current and previous departmental affiliations, as listed on faculty members' online departmental profiles, were compared with those listed on Scopus to ensure that the correct faculty member's *h-index* was being recorded. In addition, the names of journals in which faculty members published and titles of their publication as listed in Scopus search results also helped to confirm the accuracy of search results. Publication range was defined as year of an individual's first publication to the year of his or her most recent publication. This was not intended to represent duration of time in practice or time since fellowship completion, but instead reflect the years of research productivity as the span between when a given physician published his or her first and most recent article.

Statistical analyses were performed with Stata 10. Categorical variables were compared by χ^2 test and continuous variables compared between groups by the nonparametric tests, Wilcoxon rank-sum test, or Kruskal-Wallis test. Comparisons by gender were also performed after stratification by academic rank, fellowship at institution, and years of publication activity. All *P* values were two-tailed with statistical significance set at $P<.05$. This study qualified as nonhuman subject research per the institutional review board of Women & Infants Hospital and therefore was exempt.

RESULTS

A total of 137 programs had 514 academic gynecologic oncology faculty members who were able to be identified and reviewed. Five faculty members were excluded because their individual academic ranks were not available. In addition, two faculty members had duplicate listings under two separate programs. These programs were contacted and the faculty member was listed in our analysis under their current institution. A total of 507 faculty members were included in the final analysis.

The *h-index* of the 507 gynecologic oncologists was calculated and organized according to academic rank (Table 1). Of the 137 programs, 47 (34.3%) had fellowship programs in gynecologic oncology. Overall, median *h-indices* increased with rising academic rank, from 6 for assistant professors to 14.5 for associate professors to 23 for professors. An analysis of the number of years encompassing each faculty member's publication range demonstrated that professors had longer numbers of years of active research productivity than did assistant and associate professors. Overall, 57.6% of faculty members were male and 42.4% were female. There were higher proportions of women at the assistant professor level; however, men outnumbered women at both the associate professor and professor levels (Table 1). Additionally, of the 108 faculty who were division directors, only 23 (21.3%) were women, whereas 85 (78.7%) were men.

The *h-indices* organized by gender show that men had significantly higher research productivity with median values of 16 and 8 for men and women, respectively ($P<.001$) (Table 2). When *h-indices* were broken down by academic rank, the median values for men were significantly greater than those of women only at the level of assistant professor ($P<.001$) (Table 2). Men and women had comparable *h-indices* at both the associate professor and professor levels.

Overall, the median years of research productivity were significantly greater among men than women at 21 and 11 years, respectively ($P<.001$). When gynecologic oncologists were analyzed by 5-year increments of publication activity, there were no significant differences in *h-indices* between genders (Table 2). Men with 11–15 years of research activity had a higher *h-index* of 11 compared with 9 for women, which approached statistical significance.

DISCUSSION

Despite having a greater percentage of women in the field, we found similar results to other surgical specialties with women in gynecologic oncology having lower scholarly productivity than men in their early careers.[11,17] At the assistant professor level, their *h-index* was lower than that of males but this discrepancy disappeared at more senior ranks. Women were more junior in rank with only 16% being full professors compared with 49% of men. Women had published for fewer years with more than half publishing for 15 years or less. We also saw a dearth in female leadership with only 22% of division directors being female.

In this cohort of women, there are many possible reasons for lower scholarly productivity only in assistant professors. Women in this group may be earlier in their careers than men and consequently have had less time to publish. We cannot rely on the lack of significant difference in *h-indices* when stratified by years of publication to confirm this because the years of publication metric is in itself dependent on research productivity rather than simply career duration.

Another possibility is women are truly less academically productive in the early part of their careers. There are many complex reasons why women lag behind men. In recent reviews of academic surgery and neurosurgery, issues contributing to a glass ceiling effect were traditional gender roles, sexism in the medical environment, lack of mentors, and gender inequalities in salary and academic promotion.[2,27] For example, women commit a greater proportion of their time to teaching and committee responsibilities, which divert time from publishing and may be undervalued in promotion.[2] Women are more often on a clinical academic track or part-time, which results in less time devoted to research.[28] Not only must pregnancy and childbearing fit into demanding careers, but as a result of traditional gender roles, women shoulder a disproportionate amount of responsibility for family life.[6] A 1998 survey of 550 female physicians showed that 78% believed that having children had slowed their career progress.[5] In a 2015 survey of gynecologic oncologists, 79% of women thought that having children decreased their academic productivity compared with 57% of men (Fiascone S. Balancing personal and professional life among gynecologic oncologists. Oral presentation, NEAGO annual meeting, June 12–14, 2015, Kennebunkport, Maine). A recent economics article found that men’s research productivity was not associated with family situation, but a mother of two children had an average 2.5 years loss of research output.[29]

We saw that women at senior academic ranks had similar scholarly productivity as men but our cross-sectional study design limits conclusions. Certainly, this is attributable at least in part to selection bias, because the most academically productive women faculty members are more likely to be promoted. Other contributing factors include the possibility that as women advance in their lives, the limitations on their time discussed here wane and they publish more. Another possible explanation is that generational differences exist such that women from previous cohorts who currently hold senior academic rank are more productive than current women assistant professors. An explanation for the shortage of women in senior positions is that fewer women chose an academic medical career 20–30 years ago and those currently in academics have not been working long enough to develop the contributions needed to achieve higher ranks. However, these differences could also be a reflection of underlying gender biases in methods of assessment for academic advancement.[28] Lastly, publishing itself is not without bias with evidence of sexism that could affect women's academic portfolio.[30,31]

There are several limitations to our study. The *h-index* has limitations including potential for self-citation, authorship contribution variability, and no inclusion of publication effort complexity.[17] Women change their surname more often than men, which could limit Scopus' ability to detect publications. We attempted to identify maiden or hyphenated names when possible. Inability to identify faculty in some teaching programs meant that our data collection was not exhaustive. We were unable to separate by academic tracks and there are often more women in clinical tracks than academic tenure and research tracks. We could not stratify between part- compared with full-time work with both women and assistant professor ranks typically more likely to be part-time. Our study design only captured faculty at one point in time and did not follow the faculty longitudinally.

Our study supports that women in gynecologic oncology exhibit decreased productivity in early but not late career. Typically, solutions to such gender disparities include mentorship, modified timelines for academic promotion, and family-friendly policies like flexible hours.[1] In a large organizational study by Harvard Business School, the initial response to sparse female leaders had been to create "family-friendly" policies; women took advantage of them and, as a consequence, stalled their careers. Men, for cultural reasons, did not formally use these policies but worked fewer hours without asking permission. Part of the researchers' solution was to reduce work hours for both genders rather than focusing on policies aimed at women.[32] A salient concept is the subtle "Second Generation Gender Bias," in which "invisible barriers…arise from cultural assumptions, and organizational structures, practices, and patterns of interaction that inadvertently benefit men and put women at a disadvantage."[33] The Harvard group's recommendations for promoting women in leadership include educating both genders about this subtle bias, creating safe "identity workspaces" for transition to leadership roles, and focusing women's development efforts in leadership purpose. These ideas have mainly been directed toward a business model but could prove beneficial in the academic medical environment.

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Table 1

Gynecologic Oncologists' *h-index* and Characteristics by Academic Rank

	Academic Rank			
Characteristic	**Assistant**	**Associate**	**Professor**	***P***
n	208	120	179	NA
h-index	6 (4–10)	14.5 (9–20)	23 (15–34)	<.001
Publication range (y)	8 (5–13)	17 (12–22)	26 (20–33)	<.001
Gender				
Women	131 (63.0)	49 (40.8)	35 (19.6)	<.001
Men	77 (37.0)	71 (59.2)	144 (80.5)	

NA, not applicable.

Data are n, median (interquartile range), or n (%) unless otherwise specified.

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Table 2

Gynecologic Oncologists' *h-index* by Gender, Overall, and by Rank and Years of Publication Activity

	Median *h-index* (Interquartile Range) [n]		
	Women	**Men**	***P***
Total	8 (5–16) [215]	16 (8.5–27) [292]	<.001
Academic rank			
Assistant	5 (3–9) [131]	7 (5–12) [77]	<.001
Associate	15 (10–20) [49]	14 (8–20) [71]	.6
Professor	22 (16–31) [35]	23.5 (15–34) [144]	.8
Publication range (y)			
0–5	3 (2–5) [50]	3 (2–6) [13]	.9
6–10	7 (5–9) [53]	7 (5–12) [39]	.7
11–15	9 (5–13) [35]	11 (6–18) [45]	.06
16–20	19 (15–26) [39]	14 (11–23) [45]	.3
21–25	15 (12–23) [24]	18.5 (12–25) [46]	.4
More than 25*	22 (15–29) [14]	23 (14.5–35.5) [104]	.8

Data are median (interquartile range) [n] unless otherwise specified.

*Combined because there were few women with more than 25 years of experience.