Comparing the Status of Women and Men in Academic Medicine

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■ *Objective:* To explore the status and academic productivity of women compared with men in academic internal medicine.

■ *Design:* Mail survey done in 1986.

■ *Setting:* A total of 107 major teaching hospitals in the United States.

■ *Participants:* Full-time (1693 of 2510) faculty in cardiology, rheumatology, and general internal medicine; 67% of eligible men and 70% of eligible women.

■ *Measurements:* Academic productivity defined as research grants awarded, abstracts accepted, and papers published in refereed journals; academic advancement as determined by academic rank and tenure status; and monetary compensation.

■ *Results:* Women entered academic medicine with shorter periods of fellowship training and were less likely to be members in the Alpha Omega Alpha honor society, but they had job descriptions similar to those of men, with similar allocation of work between research, clinical, and teaching activities. After adjustment, women and men were similar in the numbers of research grants funded as principal investigator (1.9 compared with 2.0), abstracts accepted (6.8 compared with 6.1), and papers published in refereed journals (28.8 compared with 29.2; all with $P > 0.20$). Women were as likely as men to have tenure, but they had lower academic rank (full or associate professor; 33% compared with 47%, $P < 0.001$) and received less compensation ($72 000 compared with $79 600 annually; $P < 0.001$).

■ *Conclusion:* Although women do similar professional tasks and achieve similar levels of academic productivity, they receive fewer rewards for their work, both in academic rank and monetary compensation.

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Women enter academic medicine from medical school and residency training in slightly higher proportions than their male colleagues (1–3) and are represented in academia in greater proportion than in medicine as a whole. The numbers of women in upper-level academic or administrative positions has remained relatively level for the past decade, prompting a recent position paper by the American College of Physicians (4) that concluded that women have not gained sufficient advancement. However, another recent study (5) at Columbia suggested that this may be changing at least at that institution and perhaps around the country.

We analyzed national data on academic faculty in three representative divisions of internal medicine: cardiology, rheumatology, and general internal medicine to shed further light on the status of women in academic medicine. We examined job descriptions including hours of work, allocation of time, self-assessment of skills, self-reported job satisfaction, and measures of academic productivity including research grants as principal investigator, abstracts, and publications in refereed journals.

We chose cardiology, rheumatology, and general medicine to obtain a broad spectrum of academic internal medicine, spanning older, more established divisions and newer, more recently added divisions of internal medicine. These three divisions also span differences in procedure orientation, inpatient compared with ambulatory focus, research emphasis, size, and funding. Together they provide a reasonable sample of the diversity of academic internal medicine.

Methods

This study is based on a 1986 survey of full-time faculty in cardiology, rheumatology, and general internal medicine at the major teaching hospitals of each medical school in the United States. The 1985 to 1986 *Directory of American Medical Education* from the American Association of Medical Colleges was used to select the list of medical schools, including all 124 member institutions granting 4-year medical degrees. The teaching hospitals affiliated with these medical schools were evaluated using data reported in the 1985 to 1986 *Directory of Residency Training Programs*. The most important primary teaching hospitals in internal medicine for each medical school up to a total of three were selected using a rating scheme based on the academic status of the chief or chairman of medicine at the hospital, the total number of accredited residency programs sponsored by the hospital, the number of residency positions in the internal medicine program, and the number of hospital beds. The appropriateness of the results of the selection process were verified by telephone interviews with a department of medicine representative at each medical school. A total of 232 primary teaching hospitals were identified.

The chief or chairman or other representative of the department of medicine at each hospital was asked to indicate whether divisions of cardiology, rheumatology, and general internal medicine existed at the hospital. Only 61% (142) of these hospitals had all three divisions and thus were eligible to participate in the study. Of the eligible hospitals, 107 (75%)

Table 1. Characteristics of the Study Group

Characteristic*	Female (n = 265)	Male (n = 1428)
Black or hispanic, %	5	3
Year of graduation from medical school, *mean ± SD*	1974 ± 7	1969 ± 9*
Alpha Omega Alpha honor society membership, %	27	35†
General internal medicine or subspecialty fellowship, %	71	87*
Number of hours of work per week, *mean ± SD*	57.7 ± 11.9	60.0 ± 11.7*
Full or associate professor, %	23.5	55.0*
Division chief, %	13.4	28.1*
Division type, *n(%)*		
General internal medicine	145 (55)	439 (31)
Cardiology	61 (23)	709 (50)
Rheumatology	59 (22)	280 (20)
Number of grants funded from 1983 to 1986 as principal investigator, *mean ± SD*	1.9 ± 3.4	2.6 ± 3.4‡
Number of first authored publications in refereed journals, entire career, *mean ± SD*	6.7 ± 17.4	10.8 ± 16.3

* $P < 0.001$.
† $P < 0.05$.
‡ $P < 0.01$.

agreed to participate. These institutions were asked to provide lists of the names and mailing addresses of the full-time faculty in each of the three divisions. All hospitals sent lists for cardiology, 90% sent them for rheumatology, and 85% sent them for general internal medicine. A total of 1231 faculty in cardiology, 466 in rheumatology, and 846 in general medicine were identified.

Surveys were mailed early in 1986. Potential respondents were not aware that the data would be analyzed by sex. They were only informed that this was a study of academic internal medicine. Each questionnaire contained 55 questions, some with multiple parts, requiring about 45 minutes to complete. The questionnaire included items on demographics, job description, measures of research productivity, academic rank, tenure, job satisfaction, and compensation. The clarity of the questionnaire was evaluated by extensive pretesting. Test respondents who had characteristics similar to the study sample were debriefed question by question after they completed the instrument to determine if they understood the questions and answered them appropriately. The wording of questions was modified accordingly.

All initial nonrespondents were contacted by mail and telephone. The final sample included 63% of the eligible cardiology faculty, 73% of rheumatology faculty, and 69% of general internal medicine faculty, including 1428 men (67% of the eligible men) and 265 women (70% of the eligible women). No descriptive data were available from the nonrespondents, except for sex, which was estimated for 99% of the nonrespondents based on their first names. No statistical differences were noted in the distribution of sex between respondents and nonrespondents within the three internal medicine divisions ($P > 0.05$).

Analysis

Data were analyzed using SAS software (Statistical Analysis System Inc., Cary, North Carolina). We generated frequency distributions and descriptive statistics for comparisons of responses by sex. For compensation, faculty were asked to report the precise amount of their total compensation; 95% of respondents completed this question. Nonrespondents on that question were omitted from the compensation analysis.

Means were recalculated for the sex variable using multivariate methods. Independent variables controlled for in all multivariate models included the following dichotomous variables (Table 1): race, membership in the Alpha Omega Alpha honor society (AOA), fellowship training, faculty rank (associate or full professor or other), division chief, and division type. The intervention effect controlled for in the multivariate analysis was sex by specialty. Nondichotomous variables in the multivariate models were hours of work per week (continuous variable) and year of graduation from medical school (5-year intervals), as a proxy for seniority. The results were unaffected by whether year of graduation was treated as a continuous variable, was dichotomized at the median, or was constructed as a step function with 5-year intervals.

For the outcomes of academic rank, tenure, position of division chief, and compensation, additional variables were included in the models as measures of research productivity, including the number of grants funded as principal investigator and the number of refereed journal publications as first author. For models with annual compensation as the outcome, sex by faculty geographic location was a covariable. The method for classifying locality into nine regions of the United States was taken from the U.S. Census Bureau.

Table 2. Time Allocation of Female and Male Internal Medicine Faculty*

Dependent Variable	Adjusted Mean†		Adjusted Mean Difference (95% CI)‡
	Men	Women	
Hours of work per week, *n*	58.1	56.4	−1.8 (−3.5 to 0)
Time in patient care, %	40	41	1 (−3 to 4)
Time in teaching or education or both, %	24	26	2 (0 to 4)
Time in research, %	18	16	−2 (−6 to 1)
Time in administration, %	18	18	0 (−2 to 2)
Ideal time in patient care, %	32	31	−1 (−4 to 2)
Ideal time in teaching or education or both, %	25	27	2 (0 to 4)
Ideal time in research, %	32	31	−1 (−4 to 3)
Ideal time in administration, %	11	11	0 (−2 to 2)

* Summing general internal medicine, cardiology, and rheumatology (*see* Methods). Data were collected from 265 women and 1428 men.
† Adjusted for eight variables: race, year of graduation from medical school, membership in Alpha Omega Alpha honor society, fellowship training, hours of work per week, faculty rank (associate or full professor versus other), division chief, and division type.
‡ Adjusted mean difference is defined as the value for women minus the value for men.

Table 3. Differences with Respect to Support Staff and Self-Assessment of Skills among Female and Male Internal Medicine Faculty*

Dependent Variable†	Adjusted Mean‡		Adjusted Mean Difference (95% CI)§
	Men	Women	
Access to research assistants (number of FTEs)	0.7	0.5	−0.2 (−3.4 to 0.5)
Access to secretaries (number of FTEs)	0.6	0.5	−0.1 (−2.1 to 0.7)
Self-assessed skills in teaching/education‖	5.0	5.0	−0.1 (−0.2 to 0.1)
Self-assessed skills in research‖	3.6	3.4¶	−0.2 (−0.5 to −0.0)
Self-assessed skills in training‖	4.5	4.5	−0.1 (−0.2 to 0.1)
Self-assessed skills in administration‖	3.6	3.8	0.2 (−0.1 to 0.3)

* Summing general internal medicine, cardiology, and rheumatology (*see* Methods). Data were collected from 265 women and 1428 men.
† FTE = full-time equivalent.
‡ Adjusted for eight variables: race, year of graduation from medical school, membership in Alpha Omega Alpha honor society, fellowship training, hours of work per week, faculty rank (associate or full professor versus other), division chief, and division type.
§ Adjusted mean difference is defined as the value for women minus the value for men.
‖ Self-assessed skills were rated on scales of 1 to 6, where 1 = very poor and 6 = exceptional.
¶ $P < 0.05$.

The initial analysis consisted of doing either a logistic regression for predicting a dichotomous outcome variable or an ordinary least-squares regression for a continuous outcome. To make the results more interpretable to the readers, we reanalyzed the data using ordinary least-squares regression with forced entry of variables into all models whether the dependent variable was dichotomous or continuous. The adjusted means reported are the main effect of sex comparison controlling for all the other independent variables in the model. Regardless of which multivariate technique was used, the conclusions were identical as to which outcomes differed by sex.

Results

Demographic Data

Women faculty were younger (mean age, 39 compared with 43 years for men; $P < 0.001$) and graduated from medical school more recently than did their male counterparts (1974 compared with 1969, on average; $P < 0.001$) (Table 1). Race (white and nonhispanic compared with others) was similarly distributed between male and female faculty ($P > 0.20$). Men more often than women were members of Alpha Omega Alpha (35% compared with 27%, $P = 0.04$) and had more often completed fellowship training (87% compared with 71%, $P < 0.001$).

Work Conditions and Skill Self-Assessment

On average, women worked fewer hours than did men (−1.8 hours; 95% CI, −3.5 to 0 hours) but had similar allocations of actual and ideal time devoted to specific professional activities (Table 2). No statistical differences were noted in access to secretaries (−0.1 full-time equivalent difference; CI, −2.1 to 0.7), and the only difference in self-assessed skills was the lower perception of research skill among women compared with men (Table 3).

Grants and Publications

Table 4 shows that no statistical differences existed in the number of grants submitted or funded or the percentage of grants funded as principal investigator (−3% difference; CI, −14% to 9%), nor were there differences in the number of publications in refereed journals as first author during an entire career (−0.5 difference; CI, −2.8 to 1.9), or second or "other" author, or authorship in refereed journals during the previous 2-year period. Similarly, no statistical differences were noted in abstracts submitted or accepted or membership on the editorial board of a refereed journal. Fewer women (47%) reviewed articles for refereed journals (−7% difference; CI, −14% to 0%).

Academic Rank, Position, Compensation, and Job Satisfaction

Fewer women (33%) attained the ranks of full or associate professor compared with men (47%) (a difference of −14%; CI, −20% to −7%) (Table 5). In addition, their adjusted compensation was less than that for men (−$6500 difference; CI, −$11 900 to −$1000). However, no statistical difference for salary was noted for tenured faculty ($P = 0.20$) or for nontenured faculty ($P = 0.08$). For cardiology, women earned $9500 less (CI, −$15 800 to −$3200), and women earned $7500 less for rheumatology ($P > 0.2$) (Tables 5 and 6).

Women reported similar levels of satisfaction with their careers compared with men and were no more likely than male faculty to consider leaving academic medicine (Table 5). The most important factors reported by women that would make them consider a career change were precisely the same as for their male colleagues: time allocation to less desirable professional activities, insufficient institutional support, and low financial compensation.

Discussion

Women completing their medical training have entered positions in academic medicine in slightly higher proportions than have their male colleagues during the past several decades and in large numbers since the early 1970s (1). Despite the numbers of women in medical academia, a number of studies have documented the paucity of women in more senior positions including full professors, endowed chairs, division chiefs, and academic deans (3, 6). The recent position paper by the American College of Physicians (4) supported this finding. Nickerson and colleagues (5) recently concluded that women were breaking through the "glass ceiling."

That study, however, was limited to a single cohort at one academic center and did not apply to all academic faculty throughout the United States. Further, it did not control for the range of variables in addition to sex likely to influence the level of attainment of rank and position.

We did an analysis of the current status of women faculty using a national sample of representative faculty in internal medicine. In contrast to previous studies, our database contained detailed information about professional activities and academic productivity of both male and female faculty members as well as comprehensive information on their academic rank, tenure, and compensation.

Previous studies (7) have indicated that women in medical practice may not work as many hours per week as their male colleagues, and that female physicians may actually be influencing their male colleagues to decrease their number of working hours (8). Our results show that for faculty in full-time academic positions in internal medicine, a small difference exists in the number of hours worked per week by women compared with men and that this difference is accounted for by variables other than sex. Not only are the hours worked per week similar but the allocation of those hours to the various professional activities of academic medicine are also similar. Moreover, male and female faculty appear to have similar desires to increase their time allocation to research and to decrease it for patient care. It would appear that women and men have similar job descriptions and preferences.

Our data show that women rate the adequacy of their professional skills at the same level as their male counterparts in all areas except research. We have no way of determining whether the difference in the perception of research skills is real or imagined, and if it is real, what the explanatory factors are. Previous studies (9) have suggested that women are not as productive in their research as their male colleagues and that sex differences in the number of papers published actually increased during the course of faculty careers. Using all of the parameters of research productivity that we investigated, we could find no statistical differences after multivariate adjustment. This included research grants awarded as principal investigator, abstracts, publications in refereed journals, as well as roles in journal manuscript review and editorial function. Although the quantitative productivity of men and women are similar, we have no way to assess the quality of their contributions. Despite the fact that women assess their research skills more harshly than do men, their academic output is similar to that of their male colleagues.

Several recent studies (6, 10) have shown that women faculty are less likely to be promoted. One of these studies (10) described faculty in academic internal medicine and radiology. Another study by Nickerson and colleagues (5) found that women in the academic track at Columbia were as likely as men to be promoted and tenured but that more women than men left the academic track for a clinical track. We found that women are less likely than men to be promoted despite similar job descriptions, hours of work, and publications and controlling for a number of other factors that could affect promotion. Women do, however, have a similar likelihood of obtaining tenure. Because tenure decisions take place relatively early in an academic career, this may indicate that women are beginning to achieve parity with their male counterparts and that higher academic rank may follow.

Women physicians in practice are not compensated at the same level as their male colleagues despite controlling for many factors, including the type of practice and the hours of work (7, 11, 12). Wage differentials between men and women in high-level careers have been shown to have a negative effect on women's self-esteem (12). Disillusionment relative to employment situations has been tied to a lack of comparable increases in wages for women and men (13). The actual average difference in annual compensation between men and women in our study is $7600 and represents about a 10% differential even after adjustment for factors relating to seniority and region of the country.

A potential limitation of our study is that the data are obtained from faculty self-reports, and we cannot verify the accuracy. It is unlikely that there is bias by sex because faculty did not know that their answers would be analyzed by sex. A second potential limitation is that the data were collected in 1986. It is possible that

Table 4. Grants and Publications of Male and Female Internal Medicine Faculty*

Dependent Variable	Adjusted Man†		Adjusted Mean Difference (95% CI)‡
	Men	Women	
Grants submitted from 1983 to 1986 as principal investigator, *n*	3.4	3.1	−0.3 (−1.0 to 0.3)
Grants funded from 1983 to 1986 as principal investigator, *n*	2.1	1.9	0.2 (−0.7 to 0.3)
Grants funded, %	70	68	−3 (−14 to 9)
Refereed journal publications, 1984 to 1986, *n*	6.7	6.2	−0.5 (−1.6 to 0.6)
Refereed journal publications, entire career, *n*	29.2	28.8	6 (−7.3 to 6.4)
First authored publications in refereed journals, entire career, *n*	9.6	9.1	−0.5 (−2.8 to 1.9)
Second or other authored publications in refereed journals, entire career, *n*	16.6	15.8	−0.8 (−4.5 to 2.8)
Abstracts submitted, *n*	7.5	7.9	0.4 (−1.5 to 2.2)
Abstracts accepted, *n*	6.1	6.8	0.7 (−1.1 to 2.6)
Reviewer for a journal, %	54	47	−7 (−14 to 0)
Member of an editorial board, %	15	16	1 (−7 to 5)

* Summing general internal medicine, cardiology, and rheumatology (*see* Methods). Data were collected from 265 women and 1428 men.

† Adjusted for eight variables: race, year of graduation from medical school, membership in Alpha Omega Alpha honor society, fellowship training, hours of work per week, faculty rank (associate or full professor versus other), division chief, and division type.

‡ Adjusted mean difference is defined as the value for women minus the value for men.

Table 5. Academic Rank, Position, Compensation, and Satisfaction of Male and Female Internal Medicine Faculty*

Dependent Variable	Adjusted Value†		Adjusted Mean Difference (95% CI)‡
	Men	Women	
Full or associate professor, %	47	33§	−14 (−20 to −7)
Tenure, %	42	45	3 (−3 to 10)
Chief of division, %	32	25	−6 (−14 to 1)
Compensation (all faculty) (*mean*, $1000)	79.1	72.6‖	−6.5 (−11.9 to −1.0)
Compensation (faculty with tenure) (*mean*, $1000)	79.3	70.3	−9.0 (−22.6 to 4.8)
Compensation (faculty without tenure) (*mean*, $1000)	75.7	71.0	−4.7 (−1.0 to 0.6)
Satisfaction¶	3.8	3.6	−0.2 (−0.4 to 0.0)
Likelihood of leaving academic medicine**	2.2	2.1	−0.1 (−0.2 to 0.3)

* Summing general internal medicine, cardiology, and rheumatology (*see* Methods). Data were collected from 265 women and 1428 men.
† Adjusted for 10 variables: race, year of graduation from medical school, membership in Alpha Omega Alpha honor society, fellowship training, hours of work per week, faculty rank (associate or full professor versus other), division chief and division type, number of grants funded as principal investigator, and number of refereed journal publications as first author.
‡Adjusted mean difference is defined as the value for women minus the value for men.
§ $P < 0.001$.
‖ $P < 0.05$.
¶ Satisfaction was rated on a scale from 1 to 5, where 1 = very happy and 5 = very unhappy.
** Likelihood of leaving academic medicine was rated on a scale from 1 to 5, where 1 = very likely to leave and 5 = very unlikely to leave.

changes have occurred in the status of women in academic medicine since that time. However, no evidence exists that changes have occurred that would substantially alter the conclusions of this paper.

Another potential limitation relates to the complexity of decisions about academic advancement that entail judgments about the quality of research and publications and the performance of various patient care, teaching, and administrative tasks, all of which cannot be easily measured. Although we do not have information on the performance quality of faculty, the rich database available to us on quantitative measures of performance as well as data on variables likely to confound an interpretation allow us to make tentative conclusions about the role of sex in professional advancement and compensation in academic internal medicine.

Women enter academic medicine with some differences in background and training from their male colleagues but largely do similar tasks and achieve similar academic productivity as measured by research grants awarded, abstracts accepted, and papers published in refereed journals. However, they receive fewer rewards for their work, both in academic promotion and financial compensation. This suggests the existence of sex bias in academic medicine. Alternatively, men and women may differ in aspects of their academic performance not measured in this study, such as the quality of their teaching or administrative work, thus explaining the differences in rewards. No data in the literature, however, support this hypothesis. Women may achieve as much as men but may lack the job-negotiating skills of men, accounting for differences in what they achieve in promotion and salary. Further study is required to evaluate alternative explanations for the differences in the observed academic rewards of men and women. Nevertheless, because the results of our study and others support the conclusion that sex bias exists, it behooves academic departments to scrutinize their policies and attitudes toward women faculty, including the opportunities they provide for promotion and advancement and the compensation they offer.

Table 6. Academic Rank, Position, Tenure, and Compensation of Male and Female Faculty by Internal Medicine Division

Dependent Variable	Rheumatology		Cardiology		General Medicine	
	Men (n = 280)	Women (n = 59)	Men (n = 709)	Women (n = 61)	Men (n = 435)	Women (n = 145)
	← Adjusted Value* (95% CI)† →					
Full or associate professor, %	50	38 (−24 to 0)	46	22‡ (−39 to −13)	47	38 (−14 to 6)
Tenure, %	43	45 (−11 to 15)	43	49 (−6 to 20)	38	40 (−8 to 10)
Chief in division, %	33	31 (−12 to 17)	19	18 (−12 to 11)	43	27§ (−33 to −7)
Compensation, (all faculty; *mean*, $1000)	75.7	68.3 (−15.2 to 0.4)	86.5	77.0‖ (−15.8 to −3.2)	74.9	72.5 (−7.7 to 2.9)

* Adjusted for 10 variables: race, year of graduation from medical school, membership in Alpha Omega Alpha honor society, fellowship training, hours of work per week, faculty rank (associate or full professor versus other), division chief and division type, number of grants funded as principal investigator, and number of refereed journal publications as first author.
† The adjusted mean difference with the 95% CI.
‡ $P < 0.001$.
§ $P < 0.01$.
‖ $P < 0.05$.

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