Women Less Likely Than Men to Receive Major Funding for Scientific Research

Jagsi R, Motomura AR, Griffith KA, et al. Sex differences in attainment of independent funding by career development awardees. Ann Intern Med 2009;151:804–11.

Study Overview

Objective. To determine the rates at which men and women with K08 and K23 awards receive R01 grants.

Design. Review of the National Institute of Health's online database.

Setting and participants. The authors used the Computer Retrieval of Information on Scientific Projects (CRISP) online database to identify National Institute of Health award recipients from 1997 to 2003 (K08 awards); 1999 to 2003 (K23 awards; this program did not begin until 1999); and 1997 to 2007 (R01 awards). Two independent reviewers determined the sex for each K08 and K23 award recipient based on first name (and middle name when available). For all recipients with first names for which either reviewer felt the sex was ambiguous, sex was determined by checking the project abstracts provided in CRISP for use of sex-specific pronouns or by search of the internet to locate institutional web pages with information about the sex of the individual. Information was extracted on each recipient's institution and department at the time of K award receipt. Institutions were grouped into 4 tiers on the basis of total NIH funding received in 2000. Departments were grouped into 6 specialty categories: medical specialties; surgical specialties; clinical specialties for women, children and families; hospital-based specialties; basic sciences; and missing. CRISP was also used to determine the NIH funding institute that granted the K award. Funding institutes were grouped into 3 tiers of activity based on the total dollar amount of R01 awards granted in 2000.

Methods. An automated algorithm was developed using Microsoft Excel to search for the full name of each K08 and K23 award recipient among a list of names of R01 award recipients and the years in which a match appeared. Matches were verified on the basis of other information in the CRISP database including e-mail address, middle name or initial, institution, and department or subject area. To account for female surname changes due to marriage or divorce, an algorithm was developed to further scrutinize all female K08 and K23 award recipients whose full names did not appear on the lists of R01 award recipients. If the female K award recipient's first name was not listed on the R01 recipient list, it was determined that she did not receive an R01 award. If the female K award recipient's first name was listed on the R01 recipient list, a systematic internet search was performed for evidence of a surname change. If evidence of a name change was found, the CRISP database was searched for R01 awards under the new name and under all combinations of the old and new names. The Kaplan-Meier product-limit method was used to construct estimates of the probability of the receipt of R01 awards for the period after K award receipt through the 2007 award cycle, by sex and K award type. For K award recipients who received multiple R01 awards, the date of the first R01 received was used for analysis. The log-rank test statistic was used to assess differences in attainment of R01 awards between male and female K award recipients. A multivariate Cox proportional hazards model was used to determine whether sex was an independent significant correlate of R01 award receipt after controlling for type of K award (K08 or K23), year of K award, institution, specialty, and funding institute.

Main results. Of the 2799 K08 and K23 award recipients identified, sex was determined for 2784 recipients (99.5%). One recipient was excluded because he received his R01 award in the year before his K award, leaving a sample of 2783 recipients for analysis. More men than women received K awards in the years studied ($P < 0.001$): 31.4% of K08 awardees and 43.7% of K23 awardees were female. The percentage of K08 award recipients who were female remained stable from 1997 to 2003 ($P = 0.57$) as did the percentage of K23 award recipients who were female from 1999 to 2003 ($P = 0.84$). From the year of K award receipt through 2007, 836 (29.9%) of all K award recipients had received an R01 award. K awardees from the NIH funding institutes that awarded the highest amount of R01 funding were more likely to be male ($P < 0.001$), as were those from the institutions that received the highest level of NIH funding ($P < 0.001$). Among those who received an R01 award during the study period, the median time from receipt of a K award to

attainment of an R01 award was 5 years. The actuarial rate of R01 award attainment at 5 years was 22.7% overall and at 10 years was 42.5% overall. In the fully adjusted Cox proportional hazards model, female K award recipients remained less likely than male K award recipients to receive an R01 award (hazard ratio, 0.79 [95% CI, 0.68–0.92]; $P = 0.002$).

Conclusion. Rates of R01 funding were low for both male and female K award recipients, with fewer than one-quarter of all K awardees attaining an R01 award within 5 years and fewer than half within 10 years. Women were significantly less likely to receive an R01 award than men.

Commentary

In the last 50 years, women have made tremendous gains in the medical profession: in 1960, only 5% of medical students in the United States were women; today, men and women enter medical school in approximately equal numbers [1]. Despite parity in the number of women and men entering the "pipeline" of medical training, disparities between the sexes persist in academic medicine. For example, in 2007 only 33% of faculty, 17% of full professors, and 12% of department chairs at U.S. medical schools were women [2]. A similar gender gap has been observed for authorship of peer-reviewed original research and guest editorials in the academic medical literature: the proportion of female authors has increased significantly over the past 4 decades, but women still comprise fewer than 30% of first authors, fewer than 20% of senior authors, and fewer than 20% of guest editorialists in prominent medical journals [3].

Some have argued that such gender differences may reflect a "slow pipeline"—meaning it will take still more time for women to reach the upper echelons of academic medicine in equal numbers as men. Others point out that such differences may simply reflect the choice of women physicians not to enter the academic pipeline in the first place; for example, more women than men may prefer clinical or teaching activities over research [4]. The authors of the current study propose a third hypothesis—the "leaky pipeline"—meaning that women with an early commitment to academic research careers may not "succeed" at the same rates as their male colleagues. By restricting their analysis to recipients of a K08 or K23 award, both highly selective grants from the NIH intended to launch the independent research careers of promising junior clinical-scientists, they seek to exclude women who have already made different career choices (ie, clinical, administrative, or teaching). Their finding that women who have already secured K award funding do not go on to get R01 grants at the same rates as men, after controlling for type of K award, year of K award, academic institution, NIH funding institute, and medical specialty, raises significant concerns that women are receiving less support than men to progress toward independent research careers.

It should be noted that overall rates of R01 funding were low for both men and women in this analysis. Launching an independent research career has become increasingly challenging in an era of decreasing federal funding [5]. More K award recipients may be turning to alternate funding sources (ie, private foundation grants) or choosing alternate careers (ie, academic leadership, clinical care or teaching). It is possible that women are making these choices in greater numbers than men, thereby explaining the observed disparities.

An alternate explanation for these findings also deserves consideration: women may receive less support from their institutions than men to launch successful careers in academic research. The authors note several ways in which this may be the case. Women may have less protected time for research and grant-writing activities, given that the dollar amounts of their K awards were on average less than those of their male peers. They may feel more pressured to take on additional clinical responsibilities. They may not have the flexibility they need to juggle the competing demands of work and family, and may be less successful in negotiations with their department chairs. And finally, they may not receive the same caliber of mentorship as men, or may not have mentors that are prepared to deal with the unique challenges faced by women in academic medicine [6].

Several limitations should be considered in the interpretation of these results. First, receipt of an R01 award is only one measure of success for clinician-scientists. This study was limited by the data available in CRISP and unable to examine or compare other types of funding or markers of academic progress between men and women. Second, while the authors conducted a rigorous search to identify the sex of each recipient and verify whether each woman had changed her name, it is possible that misclassification errors occurred. Finally, the follow-up period for this study may have been too short. It is possible that women have more time between receipt of a K award and receipt of an R01 given the demands of childbearing and raising a family.

Applications for Clinical Practice

This study provides evidence that only a minority of K08 and K23 award recipients go on to receive R01 funding within 5 to 10 years, and that a significant sex disparity exists in R01 funding among previous K awardees. These concerning findings demand urgent attention to whether the "pipeline" in academic medicine is functioning properly. In particular, examination of ways to improve support for female clinician-scientists who have demonstrated aptitude and a strong interest in research careers is needed.

—Review by Yael Schenker, MD

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