

Outcomes of a Junior Faculty Grant Award in Women's Health and Gender-Based Medicine

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This study describes publication and career outcomes associated with junior faculty receiving the FOCUS Junior Faculty Investigator (JFI) Grant Award in Women's Health and Gender-based Medicine. Our data suggest that the JFI Grant Award helped foster the careers of research-oriented junior faculty as measured by publications related to the grant, current position, amount of time devoted to research, and self-reported impact. Investments in junior faculty research grants are associated with down-stream faculty career outcomes and research publications that appear important in supporting the advancement of biomedical researchers and clinician-scientists and may influence interest in women's health and gender-based medicine.

Introduction

Women's health research has been transformed in recent decades due to initiatives, policies, and regulations aimed at ensuring that all biomedical research is informed by gender and sex. Historically, clinical research had been conducted primarily with male participants requiring clinicians to extrapolate medical implications for women. Currently, among notable accomplishments in women's health research is the achievement of gender parity in phase-3 clinical trials across most disciplines (Eshera et al., 2015). In 2016, the 21st Century Cures Act mandated that the National Institutes of Health (NIH) strategic plans incorporate women and strive to reduce disparities. The Cures Act underscores the importance of researchers evaluating and reporting findings incorporating a sex and gender lens. Socio-demographic and biological variation between men and women are associated with disease etiology for many medical conditions, and understanding these differences is essential to improve outcomes. Despite these efforts, many improvements are still needed in women's health research such as the inclusion of women with disabilities, the examination of biological sex in preclinical evaluations, and the reporting of variation by sex and gender across all clinical research phases and settings (Feuerstein et al., 2018). Research focused on women's health

is essential to address gaps in knowledge such as sex differences in disease treatment and response, particularly for conditions such as cardiovascular disease and certain cancers (Wizemann, 2012).

Although many programs support early career research activities (Cifra et al., 2017; Committee et al., 2016; Escobar-Alvarez & Myers, 2013; Mavis & Katz, 2003; McGovern et al., 2013; Mumma et al., 2017; Pion & Ionescu-Pioggia, 2003; Young et al., 2008), there is a lack of emphasis and availability of programs sponsoring junior investigators' research focused specifically on women's health and gender-based medicine (As-Sanie et al., 2019; Holdcroft, 2007). Supporting junior investigators in conducting women's health research is critical to the continued advancement of this research agenda. Enhancing the capacity of junior researchers to investigate gender-based differences, in addition to the traditional areas of research in women's health based on the female sex organs, reproductive health, and pregnancy, can shape the future of research for decades to come, yielding knowledge and implementation science with a gender-informed lens.

FOCUS on Health & Leadership for Women is a program at the Perelman School of Medicine at the University of Pennsylvania aimed at advancing the careers and leadership of women faculty. FOCUS also aims to promote education and research in women's health and gender-based medicine. One

of our flagship programs is the FOCUS Junior Faculty Investigator Grant Award (JFI Award) in women's health and gender-based medicine, which began in 1995. The JFI Award provides researchers (both men and women) with seed grants to support pilot research projects in topics relevant to women's health. The participants were also invited to participate in activities such as the FOCUS annual conference and lunchtime seminar series, especially seminars focused on faculty development topics. The JFI Awards have increased in amount from 1995 to 2020 from \$5,000 to \$20,000 each to conduct clinical, basic science, or public health research in women's health and/or gender-based medicine.

The goal of the JFI Award is to enable researchers to conduct pilot research in women's health, which can serve as a springboard for further research, publications, collaborations, and larger grant proposals. Specifically, we sought to support the advancement of biomedical researchers and clinician-scientists and influence interest in women's health and gender-based medicine. Awardees were encouraged to focus on intersectionality in women's health research and how interacting social factors affect women's health. Hence, many awardees focused on their research on underrepresented minorities, persons with disability and those who are economically disadvantaged. The objective of this report is to describe the impact that the JFI Award has had throughout its 25-year history (1995–2020) on the faculty who received this grant. We assessed whether the prior awardees 1) published one or more manuscripts including original research and scientific reviews specifically related to their research funded by the JFI Award and 2) were currently holding academic faculty positions. For the awardees who did not remain in an academic career which included working for a university or for the government in biomedical research, we examined how many of these awardees continued to focus their careers on women's health. Awardees were also asked to complete the Junior Faculty Investigator Grant Awardee Survey to assess the current proportion of time devoted to research and self-assessed impact of the JFI Award.

Methods

Description of the FOCUS Junior Faculty Investigator Grant Award (JFI Award) Sample

Since the inception of the JFI Award in 1995, FOCUS has secured funds to support a total of 50 junior faculty members (39 women, 11 men) at the University of Pennsylvania Perelman School of Medicine. Study approval was obtained by the Institutional Review Board of the University of Pennsylvania. One faculty member passed away leaving 49 awardees for our analysis. JFI awardees included men and women who were assistant professors in any of the four full-time faculty tracks (Tenure, Clinician-Educator, Research and Academic Clinician), or instructors (excluding instructors who were currently fellows) at the University of Pennsylvania Perelman School of Medicine. The awardees had been chosen by a small application review committee based on the following criteria: (1) importance and relevance of the research topic to women's health; (2) study design, methodology, and data collection; (3) logistics and feasibility; and, (4) potential for impact on investigator's career including publication and subsequent grant funding. The JFI Awards were given to both men and women as evidence suggests that the inclusion of both genders in teaching and research may be most effective in promoting a gender perspective in medicine (Risberg et al., 2003). One of the authors, Hillary Bogner, is the Director of the program.

Awardees were contacted via email in September 2019 with a request for their current curriculum vitae (CV) and to complete the Junior Faculty Investigator Grant Awardee Survey. Repeat emails were sent and if no response was obtained after the second e-mail, we attempted to contact awardees by telephone. In addition, we conducted PubMed searches of all award recipients. For awardees who submitted their CV, we reviewed the titles of their publications as a preliminary assessment of a link to the JFI Award. If a preliminary link was determined, an internet search was then employed to review the paper to confirm the link of the publication to the JFI Award. Data for awardees who we were unable to contact were gleaned from publicly available websites. These data include current employment and publications. We carefully reviewed websites

to confirm that the person on the website had been employed by the Perelman School of Medicine and that the years of employment matched the year of the JFI Award. The University of Pennsylvania's Perelman School of Medicine online directory helped to verify our search results and the current employment and location of prior JFI awardees.

Junior Faculty Investigator Grant Awardee Survey

The Junior Faculty Investigator Grant Awardee Survey was adapted from a Burroughs Wellcome Fund survey (Pion & Ionescu-Pioggia, 2003). Gender and self-identified ethnicity were assessed using standard questions. If awardees did not submit their CV, they were asked to provide the following information: 1) degree(s) (M.D., Ph.D., Masters, and other); 2) current job title; 3) current employment setting (academic institution, research institution, private industry, government, and medical practice); and 4) academic rank/title (Professor Emeritus, Professor, Associate Professor, Assistant Professor, Adjunct Professor, Instructor, Other, or no academic appointment). All awardees were asked "Please provide the approximate percentage of time that you spend on the following activities (research, patient care, teaching, administration, and other) in your current position." Awardees were also asked to rate their "perceived influence of the JFI Award" on their career in terms of "obtaining a promotion and/or faculty position," "establishing an independent research program," "obtaining additional external research support," "ability to pursue risky research," and "interest in women's health research." A limitation of this study was selection bias, as participants were not randomly assigned to participation. We also did not have a comparison group to contrast effectiveness. In addition, data was compiled from awardees at different career stages.

Outcomes of the JFI Award

Descriptive statistics were used to examine the characteristics of prior JFI awardees within the whole sample. The main outcomes of our study were as follows: 1) one or more published peer-reviewed research paper(s) or scientific review(s) that directly resulted from the research done in the JFI Award (full descriptions of each JFI research study were on file in FOCUS records so linking of award study to publication was easily done) and 2)

retention in academic careers. Through the Junior Faculty Investigator Grant Awardee Survey, we also assessed the current proportion of time devoted to research and the self-reported impact of the award. We considered an academic career to include working for a university or for the government in biomedical research. For the awardees no longer working in academic careers, we assessed how many continued to be focused on women's health. Analyses were conducted using STATA (College Station, TX version 14).

Results

The majority of the 50 junior faculty JFI Award recipients were women (78%) and white (62%) with 22% of awardees identifying as Asian and 14% of awardees identifying as underrepresented in medicine (URiM) and/or of multiple ethnicities. At the time of the grant award, the most common specialties were Internal Medicine (28%), Pediatrics (14%), Emergency Medicine (10%) and Obstetrics and Gynecology (10%) with the remainder reporting a diverse range of specialties. Table A1 contains descriptive statistics for all awardees. Forty-two awardees (84%) published at least one peer-reviewed research paper or scientific review related to their research project. One faculty member passed away leaving 49 awardees for the remaining analysis; of this group, 42 (85.7%) have remained in academic careers. Four awardees (8.2%) are in clinical medical practice; 2 (4.1%) are in private industry; and one (2%) is leading a non-profit organization. Of the 7 awardees who did not remain in academic careers, 2 of them continued to focus on clinical women's health.

Thirty-eight of the 49 awardees (77.5%) completed the Junior Faculty Investigator Grant Awardee Survey. Awardees who completed the survey did not differ from those who did not complete the survey in terms of gender, self-identification as underrepresented in medicine (URiM) and/or of multiple ethnicities, or current position (all p -values < 0.05). Survey findings show that past awardees spend an average of 37.7% (standard deviation (SD) = 26.9) of their time on research activities, 35.8% (SD = 25.1) on patient care, 12.2% (SD = 8.9) on teaching, 11.6% on administration (SD = 16.8), and 5.3% on other (SD = 11.4). When asked if the JFI Award influenced their obtaining additional

external research support, 12 awardees (31.6%) responded that it had a great deal of influence and 14 awardees (36.8%) responded that it influenced future funding somewhat. In addition, 11 awardees (28.9%) responded that the JFI Award influenced their interest in women's health research a great deal and 19 awardees (50%) responded the JFI Award influenced their interest in women's health somewhat (Table A2).

Discussion

Our principal findings suggest that the JFI Award helped foster the careers of research-oriented junior faculty as measured by publications related to the research project, current position, proportion of time currently devoted to research, and self-reported impact. The data obtained for the 1995–2020 JFI grant awardees demonstrate that 84% of awardees published at least one peer-reviewed research paper or scientific review related to their research project and 85% of awardees have chosen to remain in academic medicine. Furthermore, a high percentage of awardees responded that the JFI Award influenced their interest in women's health. The findings support that the JFI Award may promote scholarly productivity and career development and validate the criteria and process used to select successful applicants. In addition, two of the faculty who did not remain in academic careers continued to focus on women's health. Investments in junior faculty research grants are important in supporting the success and advancement of biomedical researchers and clinician-scientists and may influence and promote interest in women's health and gender-based medicine.

We acknowledge that perhaps the most important limitation is selection bias. The most talented, hardworking, and accomplished individuals may have been selected for the JFI Award and would have been successful in academic medicine with or without the grant award. We do not have a control group for comparison. Many different research grant awards support junior researchers at key times during their careers (e.g. Escobar-Alvarez & Myers, 2013; Mavis & Katz, 2003; McGovern et al., 2013). Research on many of these awards has attempted to determine the impact of each award on awardees' success. However, because junior researchers who are not funded through one mech-

anism go on to apply for another, determining the impact of a specific award is difficult (Jacob & Lefgren, 2011). Even if JFI grant awardees may have had the same amount of success in their research careers without the award, the JFI Award may be particularly beneficial in funding the exploration of women's health research and the development of a gender-informed lens.

Other limitations are worth noting. We evaluated a single program developed within a specific institutional environment in the United States limiting generalizability to other faculty populations. However, our findings may be relevant to other institutions that have similar faculty populations, research missions, and resources. Second, some of our data were self-reported, and there is the potential for all the sources of error associated with retrospective interview data including imperfect recall and response bias (e.g., socially desirable responding). Third, participation in the JFI Award was not randomly assigned, and selection bias may influence the characteristics of the sample. Thus, the implications drawn from these findings may only be applicable to faculty members or instructors with characteristics associated with the selection process. Furthermore, our study is a snapshot of our awardees who are at different stages of their careers with various amounts of time that have passed since the grant was awarded.

In all, 84% of the JFI grant awardees published one or more peer-reviewed research papers or scientific reviews related to their research project. When the impact of research investment on scientific productivity has been examined, awardees of a new investigator grant were three times more likely to publish the proposed research compared to non-awardees (Farrokhyar et al., 2016). Other investigators have found that junior investigators appear to benefit from early career research funding even if the grants do not cover the recipients' salary but provide technical help and support for supplies (Mavis & Katz, 2003; Tesauro et al., 2014). These results suggest that although many of the unsuccessful applicants for the JFI Award may have received subsequent funding through other mechanisms, the JFI Award may be successful in our goal of promoting careers in women's health research and gender-based medicine and advancing the academic careers of junior faculty in general.

In the future we hope to strengthen the JFI Award with additional program components. For example, we would like to offer the following options that awardees may select to participate in based on time or needs: structured writing group workshops, brown bag lunches to facilitate cohort-building, near-peer mentoring and symposiums that will highlight faculty research successes. Our findings demonstrate that the investigations that directly resulted from the JFI Awards have contributed to the published body of research in women's health and gender-based medicine and have advanced this area of scholarship. The JFI Award is associated with faculty who are successful in sustaining their academic careers. Junior faculty research training in women's health and gender-based medicine may be an important approach for attracting and developing future researchers in these areas. During a time when new initiatives, policies, and regulations are aimed at increasing foundational scientific knowledge related to women's health and gender-based medicine, our investments and dedication to cultivating researchers equipped to generate and translate that knowledge into patient care, health care delivery, and health policy is important. The FOCUS JFI Grant Award may be effective as part of an ongoing effort to develop the pipeline of women's health and gender-based medicine researchers.

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APPENDIX A

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Table A1. *Characteristics of FOCUS Junior Faculty Investigator (JFI) Award recipients (N = 50)*

Gender	N (%)
Male	11 (22)
Female	39 (78)
Race/Ethnicity	
Asian	11 (22)
Black/African American	2 (4)
Hispanic/Latinx	1 (2)
Multiple	4 (8)
White	31 (62)
Unknown	1 (2)
Specialty at time of award	
Anesthesiology and Critical Care	2 (4)
Emergency Medicine	5 (10)
Epidemiology and Informatics	1 (2)
Family Medicine & Community Health	3 (6)
Internal Medicine	14 (28)
Neurology	1 (2)
Nursing	2 (4)
Obstetrics and Gynecology	5 (10)
Orthopaedic Surgery	1 (2)
Pediatrics	7 (14)
Psychiatry	2 (4)
Radiation Oncology	1 (2)
Radiology	1 (2)
Surgery	4 (8)
Systems Pharmacology and Translational Therapeutics	1 (2)
Publications	
1 or more peer-reviewed publications related to the JFI award	42 (84)

Table A2. *JFI Awardee Survey Questions on Influence of JFI Award (n = 38)*

Survey questions	A great deal N (%)	Somewhat N (%)	Only a little N (%)	Not at all N (%)
Has the JFI award influenced your obtaining a promotion and/or faculty position?	8 (21.1)	19 (50)	5 (13.2)	6 (15.8)
Has the JFI award influenced your establishing an independent research program?	11 (28.9)	14 (36.8)	11 (28.9)	2 (5.3)
Has the JFI award influenced your obtaining additional external research support?	12 (31.6)	14 (36.8)	5 (13.2)	7 (18.4)
Has the JFI award influenced your ability to pursue "risky" research?	7 (18.4)	14 (36.8)	7 (18.4)	10 (26.3)
Has the JFI award influenced your interest in women's health research?	11 (28.9)	19 (50)	5 (13.2)	3 (7.9)

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