



Reproductive Scientist Development Program: Bridging the Gap to the Physician Scientist Career

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Abstract

Career development awards are a successful strategy to facilitate the advancement of physician-scientists trained in obstetrics and gynecology (OBGYN) toward a path of investigative independence. While these funding mechanisms can be effective approaches to developing the career of future OBGYN scientists, optimizing the probability of obtaining these awards requires determining the appropriate career development award for the applicant. There are many details and opportunities that need to be considered when deciding on the appropriate award. Some of the most sought-after awards are those that integrate career development and applied research, such as the K-series awards supported by the National Institutes of Health (NIH). A quintessential example of an NIH-funded mentor-based career development award to support the scientific training of an OBGYN physician-scientist is the Reproductive Scientist Development Program (RSDP). In this study, we provide data on the academic achievements of past and present RSDP scholars and discuss the structure, impact, and future of the RSDP, a federally funded K12 program dedicated to women's health for OBGYN scientific investigators. As healthcare is changing and physician-scientists comprise a unique and valuable part of the biomedical workforce, programs such as the RSDP are critical to maintaining a well-trained pipeline of OBGYN scientists to maintain and challenge the leading edge of medicine, science, and biology.

Keywords Physician scientist · Reproductive scientist development program · Clinician researcher · Career development award · K12

Introduction

Physician-scientists trained in OBGYN are poised to address gaps in knowledge about health, disease, and delivery of patient care through research to ultimately advance reproductive science and promote women's healthcare. As physicians, they have received medical and often subspecialty training in OBGYN, but most also receive formal and intensive scientific training to conduct independent investigation in the clinical and/or laboratory setting. This combination of expertise uniquely positions OBGYN physician-scientists to communicate knowledge across disciplines and to lead scientific teams or organizations to guide healthcare and important policy decisions. OBGYN scientists are typically academic medical faculty and often embody the missions of an academic medical center by performing research and providing clinical service. Traditionally, the OBGYN scientist has engaged in laboratory and clinical investigation, but to achieve a sustainable and diverse research infrastructure, this

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has since evolved to also include research on health services and implementation, population health, community engagement, and health equity.

To successfully embark on and transition to a physician-scientist career, early-stage investigators require funding to support their income while maximizing their time for research productivity, prolonged training to obtain competency in clinical and scientific research, balance of work/life demands, mentors that can support and guide a young physician-scientist, and skills to manage the time-consuming and demanding requirements to maintain their clinical credentials. With the present waning National Institutes of Health (NIH) funding landscape and career opportunities available to support physician-scientist trainees, the OBGYN-scientist workforce has continued to diminish. This is a concerning trend that parallels global underinvestment in women's health research and the progressively smaller pool of early-stage physician-scientists applying for NIH research support [1, 2]. OBGYN subspecialties that have traditionally attracted OBGYN scientists, including maternal–fetal medicine, reproductive endocrine infertility, and gynecology oncology, are also experiencing decreased interest from fellowship applicants to pursue an OBGYN scientist career [1, 3, 4]. A long-term consequence of this is a subsequent decline in OBGYN-scientist mentors that can train the next generation of physician-scientists in obstetrics and gynecology.

In response to this and to achieve their goal of improving the health of women, in 2019 the NIH Office of Research on Women's Health led the development of a “Trans-NIH Plan for Women's Health Research.” This plan is composed of five strategic goals, which include “advancing rigorous research that is relevant to the health of women” by “developing a well-trained diverse, and robust workforce.” Fostering the pipeline of OBGYN scientists promotes the engine of scientific progress and accelerates the transition of knowledge into improved healthcare for women. Thus, the development and effective implementation of innovative programs that attract, support, retain, and advance OBGYN physician-scientist careers will increase the diverse representation of women's reproductive health research. To address this need, federal and foundation-funded career-development programs were created to develop the next generation of OBGYN physician-researchers, to promote science focused on the reproductive health of women, and to revitalize and strengthen the scientific base of academic OBGYN departments. The NIH K-series career development awards underwent an expansion between 1990s and 2017 to promote the careers of early-stage biomedical academic researchers [5].

One of the K-series awards is the K12 RSDP, a federally funded program dedicated to promoting women's health through the development of independent OBGYN scientific investigators. To assess the academic achievements and

impact of the RSDP, we surveyed current and former RSDP scholars. Here we describe the history of the RSDP program, report our survey results, and discuss future steps needed to continue to strengthen the research training of OBGYN physicians in order to narrow the deficient gaps in the biomedical workforce.

Career-Development Awards

Career-development awards are largely comprised of NIH-funded K-awards, foundation awards, and project grants. The following is a list of career-development awards often pursued by OBGYN scientists.

NIH-Funded K-Awards

These are NIH grants awarded to the individual and consist of K08, K23, K99/R00, and the K12 RSDP (Table 1). The RSDP is unique among most K12 funding programs. It is a national K12 award, administered centrally through the principal investigator's home institution but granting individual awards to scholars throughout the USA and Canada.

NIH-Funded Institutional K-Programs

These K-type funding mechanisms differ from the RSDP in that they are not national but instead are institutional. The objective of these awards is to create a pool of junior physician investigators with expertise in women's health and reproductive biology research. For these mechanisms, institutions have their own institutional K programs that may include a KL2 Clinical and Translational Science Award (CTSA), a K12 Women's Reproductive Health Research (WRHR) award, and/or the K12 Building Interdisciplinary Research Career in Women's Health (BIRCWH) award.

Foundation Awards

These include funding opportunities from the Society for Maternal–Fetal Medicine (sMFM), American Association of Obstetricians and Gynecologists Foundation (AAOGF), American Board of Obstetricians and Gynecologists (ABOG), American College of Obstetricians and Gynecologists (ACOG), American Society of Reproductive Medicine (ASRM), Gynecologic Oncologic Group Foundation (GOG), Foundation for Women's Cancer, Mary Kay Foundation, Doris Duke Charitable Foundation, Foundation for Women's Cancer, March of Dimes, Burroughs Welcome Fund (BWF), and the American Heart Association (AHA). The design of these awards is to support future academic physician leaders who seek additional science training in reproductive biology and women's health.

Table 1 NIH grants awarded to the individual and consist of K08, K23, K99/R00, and the K12

Number	Support	Duration (years)	% Nonclinical
K12 (RSDP) Mentored Research Scientist Development Award	\$100,000–120,000 (salary) \$25,000 (supply)	4	100% (years 1–2)* 75% (years 3–4)
K12 (BIRCWH) Mentored Research Scientist Development Award	\$100,000 (salary) \$25,000–50,000 (supply)	5	75%
K12 (WRHR) Mentored Research Scientist Development Award	\$100,000 (salary) \$25,000 (supply)	5	75%
K99/R00 NIH Pathway to Independence Award	Up to \$100,000 (K99 salary) Up to \$249,000 (R00 salary) Up to \$30,000 (K99 supply)	5	75%
K08 Mentored Clinical Scientist Development Award	\$100,000 (salary) \$50,000 (supply)	3–5	75%
K23 Mentored Patient-Oriented Research Career Development Award	\$100,000 (salary) \$50,000 (supply)	3–5	75%

*Starting 2023 and on, phase I (years 1–2) and II (years 3–4) will be 75% nonclinical

Project Grants

Project grant opportunities are offered by the Preeclampsia Foundation, Thrasher Research Fund, Fetal Health Foundation, the Society of Reproductive Investigation (SRI), and the American Diabetic Association (ADA). These grants are often sums of money awarded to fund a specific project that contributes to an individual's career trajectory but does not provide longer-term protected research time for a physician scientist's career development.

Reproductive Scientist Development Program (RSDP)

Program Overview

The RSDP program was established in 1988 by Drs. Larry Longo and Robert Jaffe to train obstetrician-gynecologists committed to academic investigative careers in fundamental biomedical science [3]. It was managed initially through the University of California, San Francisco (1988–2012) until it moved to Washington University in St. Louis under the direction of Dr. Kelle Moley (2013–2018) and subsequently to the University of Missouri under the oversight of Dr. Danny Schust (2019–present). The program is also uniquely supported by an assigned Fertility and Infertility Branch program officer from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) of the National Institutes of Health (NIH); Dr. Lou DePaolo initially occupied this position until 2022, when Dr. Esther Eisenberg assumed this role.

Overall, the RSDP comprised 8–12 present scholars overseen by executive, selection, and evaluation committee members. There are now over 100 past and present RSDP

scholars that form a growing network of physician-scientists with shared experiences and broad interests. The RSDP provides career development support for obstetricians and gynecologists who are committed to a basic science career in academic medicine and research. The areas of interest covered by the program are broadly defined, with emphasis in cell and molecular biology as applied to problems in reproductive endocrinology, genetics, maternal–fetal medicine, oncology, immunology, infectious disease, or other aspects of reproduction.

The RSDP program serves as a proven stepping stone for a successful career as a physician-scientist. It provides salary and research supply support, protected research time, a network of accomplished researchers in biomedical research, the opportunity for collaboration on future projects, and continuous scientific and career support to the RSDP scholar.

Funding Support

The program is supported by the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) of the NIH in collaboration with private agencies, professional societies, foundations, and private industry.

Program Structure

Initially, the RSDP was a 5-year program, but was redesigned as a 4-year program in 2018 with the intent to encourage physician-scientist scholars to achieve scientific independence earlier. The program consists of two phases, each with its own separate application process. Applications for phase 1 are similar to most career-development awards but include an initial letter of intent. If invited for full application, the submission process would include a career statement from the applicant, research plan, budget, letters of

support, and resume. Phase I is a 2-year award presently requiring 100% protected time, during which the physician-scientist scholars pursue intensive basic research in the laboratory of a nationally recognized scientific leader, including those of Nobel laureates and members of the National Academy of Science. Note that in the most recent Request for Competitive Renewal Applications (RFA) for the RSDP, the time commitment for phase I of the RSDP is being changed to 75% protected time to align it with other K-type training mechanisms. Upon successful completion of a second competitive application submitted in year 2 of phase I, phase II scholars receive 2 years of additional support at 75% protected time for laboratory-based research. Moving forward, both phases will also include local institutional department sponsorship for additional teaching and/or clinical services, to which the scholars are able to devote up to 25% effort. By the completion of phase II, the goal is for the RSDP scholar to be competitive and, ideally, successful in securing funding from the NIH or other private and public foundations to continue their research program. With nearly 35 years of data available, we here assessed RSDP outcomes via a scholar survey.

Methods

To assess the academic achievements and impact of RSDP, the RSDP program leaders developed an electronic 30-item survey to assess the demographics and career details of all current and former RSDP scholars.

Survey Details

The survey was created in Google Documents (www.docs.google.com) and distributed via email to all 114 RSDP members from 1988 to 2021. The survey link was sent 5 times via email or e-newsletter between May 5, 2021, and February 28, 2022. Participation was voluntary, and respondents were given the option to skip questions and/or end the survey at any time. There were no duplicate survey submissions.

Statistical Analysis

This study was deemed exempt by the University of Missouri's Institutional Review Board. Characteristics (gender, specialty, field, geographic region where program was completed and of current position, whether a MD/PhD degree was held, current position, and current scholar status) of all RSDP scholars ($n = 114$) were assessed overall and by 5-year cohorts. Characteristics of survey respondents were compared to nonrespondents using Pearson's chi-squared or Fisher's exact test. Descriptive statistics of the survey

respondents ($n = 53$) were determined using means and standard deviations for age upon entering the program (years) and length of RSDP support (years), medians and interquartile ranges for number of publications overall and directly resulting from the program, and proportions for current research areas. The number and proportion of successful NIH and Department of Defense (DOD) awards were calculated among RSDP alumni ($n = 103$) and all scholars ($n = 114$, including current scholars), as were the conversion time (years) from a K grant to any NIH grant and from a K grant to an R01 grant. The number and proportion of successful foundation grants were calculated among the survey respondents ($n = 53$). Differences in any NIH funding, R01 funding, leadership position (defined as academic or medical director or a chair or dean at any level), and dean or chair position were assessed by scholar gender, subspecialty, and PhD attainment using Pearson's chi-squared or Fisher's exact test. All analyses were conducted in Stata 17.0 (StataCorp, College Station, TX).

Results

Current and Former RSDP Scholar Characteristics

The survey was emailed to 114 current and former RSDP scholars; 53 responded, for a response rate of 46%. Survey respondents were more likely to work in academia in the Northeast or Midwest USA, be a current RSDP scholar, and have a role as assistant professor or director (Supplemental Table 1). At present, there are 11 active RSDP scholars. The characteristics of current and former RSDP scholars are described in Table 2. From 1988 to 1997, the program was comprised of a similar number of male (47%) and female (53%) scholars, but since 1998, the program has predominately been comprised of female scholars; in total, there have been 63% female and 37% male scholars. Two-thirds of RSDP recipients were doctors of medicine (MD) and a third of scholars held both MD and doctors of philosophy (PhD) degrees. With the recent redesign of the RSDP program from 5 to 4 years in length, there has been a proportionate decline in the number of RSDP scholars, which occurred equally in both males and females (Table 2).

Scholar Characteristics While Supported by the RSDP

RSDP scholars who responded to the survey started their award at an average age of 34.7 ($SD \pm 2.8$) years old (Table 3) and were supported by the RSDP mechanism for an average of 3.8 years ($SD \pm 1.5$). On average, each scholar generated a median of 8 (IQR: 3–12) publications directly from their RSDP work.

Table 2 RSDP scholar characteristics; data are *n* (%)

Characteristic	1988–1992	1993–1997	1998–2002	2003–2007	2008–2012	2013–2017	2018–2022	Overall
<i>n</i>	15	18	17	18	20	15	11	114
Gender								
Female	8 (53)	9 (50)	10 (59)	11 (61)	15 (75)	10 (67)	9 (82)	72 (63)
Male	7 (47)	9 (50)	7 (41)	7 (39)	5 (25)	5 (33)	2 (18)	42 (37)
Specialty								
Family Planning	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (9)	1 (1)
Generalist	0 (0)	2 (11)	0 (0)	3 (17)	1 (5)	1 (7)	0 (0)	7 (6)
Genetics	1 (7)	2 (11)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3 (3)
Gyn-Onc	3 (20)	1 (6)	5 (29)	7 (39)	3 (15)	2 (13)	3 (27)	24 (21)
MFM	5 (33)	5 (28)	6 (35)	4 (22)	9 (45)	7 (47)	6 (55)	42 (37)
REI	6 (40)	8 (44)	6 (35)	3 (17)	7 (35)	5 (33)	1 (9)	36 (32)
Urogynecology	0 (0)	0 (0)	0 (0)	1 (6)	0 (0)	0 (0)	0 (0)	1 (1)
Career ^a								
Academic	9 (60)	8 (44)	11 (65)	15 (83)	16 (80)	10 (67)	11 (100)	80 (70)
Private practice	4 (27)	7 (39)	5 (29)	2 (11)	3 (15)	4 (27)	0 (0)	25 (22)
Industry	2 (13)	3 (17)	1 (6)	0 (0)	0 (0)	1 (7)	0 (0)	7 (6)
Other	0 (0)	0 (0)	0 (0)	1 (6)	1 (5)	0 (0)	0 (0)	2 (2)
Region, completed RSDP								
Northeast	5 (33)	5 (28)	4 (24)	6 (33)	10 (50)	7 (47)	4 (36)	41 (36)
Midwest	2 (13)	3 (17)	1 (6)	2 (11)	4 (20)	2 (13)	3 (27)	17 (15)
South	3 (20)	4 (22)	6 (35)	5 (28)	1 (5)	2 (13)	0 (0)	21 (18)
West	5 (33)	6 (33)	6 (35)	5 (28)	5 (25)	4 (27)	4 (36)	35 (31)
Region, current position ^a								
Northeast	3 (20)	2 (11)	3 (18)	5 (28)	7 (35)	6 (40)	4 (36)	30 (26)
Midwest	5 (33)	4 (22)	2 (12)	2 (11)	5 (25)	2 (13)	3 (27)	22 (19)
South	2 (13)	2 (11)	3 (18)	5 (28)	1 (5)	2 (13)	0 (0)	15 (13)
West	4 (27)	7 (39)	9 (53)	6 (33)	5 (25)	4 (27)	4 (36)	39 (34)
International	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (7)	0 (0)	1 (1)
Missing	1 (7)	3 (17)	0 (0)	0 (0)	2 (10)	0 (0)	0 (0)	7 (6)
MD/PhD Degree	3 (20)	3 (17)	6 (35)	7 (39)	7 (35)	5 (33)	3 (27)	34 (30)
Current Position ^a								
Professor	8 (53)	7 (39)	7 (41)	5 (28)	2 (10)	0 (0)	0 (0)	29 (25)
Associate professor	1 (7)	1 (6)	4 (24)	10 (56)	6 (30)	1 (7)	1 (9)	24 (21)
Assistant professor	0 (0)	0 (0)	0 (0)	0 (0)	6 (30)	8 (53)	8 (73)	22 (19)
Instructor	0 (0)	0 (0)	0 (0)	0 (0)	1 (5)	1 (7)	2 (18)	4 (4)
Director	4 (27)	5 (28)	7 (41)	9 (50)	6 (30)	4 (27)	2 (18)	37 (32)
Medical director	5 (33)	4 (22)	1 (6)	0 (0)	1 (5)	0 (0)	0 (0)	11 (10)
Chair/Vice chair	2 (13)	6 (33)	6 (35)	3 (17)	0 (0)	0 (0)	0 (0)	17 (15)
Dean/Associate dean/vice dean	2 (13)	0 (0)	0 (0)	0 (0)	1 (5)	0 (0)	0 (0)	3 (3)
Current scholar	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	11 (100)	11 (10)

^a Includes last position for one deceased scholar

Location and Subspecialty Training

Institutions that scholars resided in during their RSDP training were largely located in the Northeast (36%) or West (31%) (Table 2). Similarly, post-training scholars are currently in the West (34%), Northeast (26%), Midwest (19%), and South (13%). Since the program's inception,

the highest proportion of RSDP scholars are subspecialists in maternal–fetal medicine (37%), reproductive endocrine infertility (32%), and gynecology oncology (21%). Other RSDP scholar subspecialties include genetics (3%), family planning (1%), and urogynecology (1%), with 6% of scholars practicing general OBGYN.

Table 3 Survey sample characteristics among 53 survey respondents; data are *n* (%) unless otherwise specified

Characteristic	
Age at entering RSDP (years) ^a	34.7 ± 2.8
Length of RSDP support (years) ^a	3.8 ± 1.5
Number of publications ^b	45 [26–76]
Number of publications resulting from RSDP ^b	8 [3–12]
Current research area ^c	
Basic Science	12 (23)
Translational	34 (64)
Patient-oriented	6 (11)
Health Services	2 (4)
Other	2 (4)
No current research	3 (6)

^a Data are mean ± standard deviation^b Data are median [interquartile range]^c Respondents could select all applicable current research areas

Career Practice Pattern and Leadership Positions

A large portion of RSDP scholars pursued an academic career (70%), with others in private practice (22%) and industry (6%) (Table 2). Current and former RSDP scholars span from instructor (4%), assistant professor (19%), associate professor (21%), to full professor (25%). Many are in leadership roles, including academic director (32%), medical director (10%), department chair or vice chair (15%), and dean or associate dean or vice dean (3%) (Table 2).

Area of Research and External Research Funding

At present, most scholars who responded to the survey engage in translational research (64%), with others conducting basic science (23%), patient-oriented (11%), or health services (4%) research. Some responding former scholars (6%) are not involved in research currently (Table 3). Amongst former RSDP scholars, many have secured NIH (46%) (Table 4) funding, and of the 53 survey respondents, half had achieved foundation (53%) funding (Table 5). In addition to their RSDP K12 award, some scholars were also supported by other K12 mechanisms prior to or after their RSDP training, including the BIRCSWH (5%) and WRHR (18%), as well as K08s (15%) (Table 4). RSDP alumni have also successfully obtained funding through other federal mechanisms, including NIH R01 (29%), R21 (14%), U54 (9%), U01 (6%), P01 (3%), and P50 (3%), as well as DOD grant awards (3%). The scholar transition time from K-funding to an R01 mechanism is a median of 8 years (IQR: 6–12). The most common foundation funding achieved by RSDP scholars who responded to the survey was from the March of Dimes

Table 4 Summary of successful NIH and DOD grants among RSDP scholars; data are *n* (%)

Award type ^a	RSDP alumni	All RSDP scholars
Total number of RSDP scholars	103	114
BIRCSWH	5 (5)	5 (4)
WRHR	19 (18)	19 (17)
NIH funded investigators ^b	47 (46)	48 (42)
K08	15 (15)	15 (13)
R01 ^c	30 (29)	31 (27)
R21	14 (14)	14 (12)
P01	3 (3)	3 (3)
P50	3 (3)	3 (3)
U01	6 (6)	6 (5)
U54	9 (9)	9 (8)
Other NIH ^d	3 (3)	3 (3)
Department of defense	3 (3)	3 (3)

^a Scholars could report more than one successful grant^b K to any NIH grant conversion among all RSDP scholars: median time=6 years, 48% converted within 5 years, and 90% converted within 10 years^c K to R01 conversion among all RSDP scholars: median time=8 years, 19% converted within 5 years, and 68% converted within 10 years^d R29 (*n* = 1), R03 (*n* = 1), and UG1 (*n* = 1)

(17%), the American Society of Reproductive Medicine (11%), the Burroughs Wellcome Fund (9%), the Gates Foundation (6%), and the Gynecologic Oncology Group (4%) (Table 5). There was no significant difference in NIH funding success rates by gender, OBGYN subspecialty, or educational degree. However, there was a trend of greater NIH funding success, including R01 funding, for RSDP scholars specializing in reproductive endocrine infertility (50%), gynecology oncology (46%), and maternal–fetal medicine (36%). At this time, 33 RSDP scholars are currently NIH funded as principal investigators.

Table 5 Summary of successful foundation grants among survey respondents (*n* = 53)

Award type ^a	<i>n</i> (%)
Foundation funded investigators	28 (53)
Burroughs Wellcome Fund	5 (9)
Gates	3 (6)
March of Dimes	9 (17)
American Association of Obstetricians & Gynecologists	1 (2)
American Society of Reproductive Medicine	6 (11)
Gynecologic Oncology Group	2 (4)
Investigators funded by other foundations	19 (36)

^a Scholars could report more than one successful grant

Discussion

OBGYN physician-scientists are uniquely positioned to play a critical role in advancing biomedical research in the reproductive sciences. The background of an OBGYN physician-scientist facilitates the recognition of clinically relevant and novel research ideas and the ability to translate results from the bench to bedside. However, the physician-scientist workforce is diminishing as a result of challenges in achieving adequate funding, clinical demands, paucity of available mentorship, lack of institutional support, educational debt, lower wages compared to fully clinical colleagues, and difficulties with work-life balance [1]. As physician-scientists are becoming endangered at the national level, more comprehensive and supportive research experiences need to be available to OBGYN residents, fellows, and junior faculty so that they can develop an interest in a research-focused career early [1].

In our study of a 33-year-old NIH national K12 program for physician-scientists in OBGYN, gender, OBGYN subspecialty training, and educational degree did not impact an RSDP scholar's ability to obtain NIH funding or leadership positions. Prior studies of other medical specialties noted gender disparities among early-career K-award-funded physician-scientists [6–8]. RSDP scholars are mostly women, which likely reflects the recent demographics of the OBGYN field [9]. Similar to a prior study by Okeigwe et al. [10], we also found having a PhD degree was not a prerequisite to achieving successful independent funding. However, prior NIH reports of K-award recipients have shown that those with an MD/PhD had higher rates of achieving R01 funding compared to those with an MD alone [8].

Compared to K08 (32%) and K23 (18%) recipients from other medical specialties as well as OBGYN K08 (32%) and K23 (17%) recipients, RSDP scholars had comparable R01 success rates (29%) [10]. In addition, the conversion time from RSDP K12 to an R01 (8 years) was comparable to published rates of conversion for K08 (6 years) and K23 (7 years) recipients [10]. Among grant recipients, similar to the sMFM AAOGF award (53) [11], a 3-year program designed to support the training of OBGYN MD physician-scientists, the RSDP scholars had similar NIH-grant funding success rates (46%). This suggests that early career development programs like the RSDP benefit aspiring OBGYN physician-scientists.

Older studies, published mostly 1 to 2 decades ago, also examined the early career outcomes of RSDP scholars and AAOGF fellows [3, 12–15], especially in regards to the receipt of a faculty position and external research support, as these are two traditional indicators of a successful academic medicine career. In the prior cohorts examined, timing of data collection and variables of interest differed

amongst studies, but the overall results of these studies were similar. Approximately 90–95% of former fellows were reported to be in faculty positions, and between 58 and 80% had successfully obtained external research support during their careers [3, 13–15]. A more recent study in 2005 by Pion et al. reported that amongst AAOGF fellows, 88% had active academic medicine careers and 22% had been awarded at least one R01 grant, but only 29% were currently NIH funded, likely reflecting the increasing challenges of maintaining a continuous NIH-funded research program [12]. Our current study of RSDP alumni career outcomes aligns with the results of earlier evaluations, with the overwhelming majority (80%) having active academic medicine careers and 29% having achieved R01 funding.

The RSDP is successful largely because the program encompasses many predictive factors of a successful transition to research independence by trainees on career development awards [16]. These include fostering a unique and extensive collaborative network, providing rigorous local and national mentorship, and requiring strong institutional support and resources [16]. The RSDP is a scientific community of current and former RSDP scholars who actively collaborate on multi-center studies, grants, and manuscripts as well as share biospecimens, samples, cell lines, data, and ideas. RSDP alumni are also dedicated to mentoring and training future generations of RSDP scholars and continue to play a dynamic role in the program after completing their K12 training. In addition, unlike many other physician-scientist training programs [17], it provides funding and a large amount of protected research time.

Our study is not without limitations; we had a 46% response rate largely because the survey was conducted during the COVID-19 pandemic, when many of the institutions and hospitals employing current and former RSDP scholars were facing acute workforce challenges. Given the degree of continued participation of RSDP scholars and alumni at annual meetings and RSDP-sponsored activities and mentorship from RSDP alumni to current scholars, this lower response rate is unlikely a reflection of the personal connection felt towards the program. Additionally, most survey nonrespondents were older RSDP alumni who had information on file that was not current, and updated information was difficult to obtain. As older RSDP alumni are more likely to have successfully achieved research funding and academic leadership positions secondary to greater time in rank, lack of data on these past scholars most likely negatively biased our results on the RSDP's success and impact.

The declining numbers of physician-scientists, persistent underfunding of reproductive health research, and historic lack of prioritization of women's health issues by the NIH have impeded the advancement of clinical OBGYN care. These are well-known concerns. To reverse this trend, it is important to assess and understand both the institutional and individual

barriers and mechanisms of success to this career pathway. In addition, a greater focus on recruiting and retaining the next generation of OBGYN researchers is crucial. As such, it is critical to continue to recognize and invest in the success of national NIH K programs, such as the RSDP, to perpetuate the pipeline of OBGYN physician-scientists committed to women's health research. Ours is the most current study to analyze the structure and impact of the RSDP. Prior studies focused on this subject were largely published over 1 to 2 decades ago [3, 10, 12–15].

In summary, mentored early career development awards, like the RSDP, better position OBGYN physician-scientists to achieve independent research careers. This study demonstrates that the RSDP program has added to the research capability of academic OBGYN departments across the nation with its strong track record of former scholars attaining independent federal funding, pursuing academic careers, and achieving leadership positions. Our study validates that support for programs like the RSDP is critical to continue to improve the long-term recruitment and mentorship of OBGYN physician-scientists and to advance clinical care in OBGYN to better the health of women and their offspring.

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Declarations

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