Addressing Gaps in Pediatric Scientist Development: The Department Chair View of 2 AMSPDC-Sponsored Programs

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Pediatric physician-scientists (also known as pediatric scientists) are critical members of the biomedical workforce. These individuals hold medical degrees (MD, DO, or equivalent), are trained in pediatrics, and conduct basic, clinical, or translational research. Their unique clinical and research perspectives allow them to translate advances in scientific research, health informatics and engineering into the development of new patient treatment strategies, leading to improved health care for children.

Unfortunately, the pediatric-scientist workforce is waning.[1] Although the number of subspecialty-trained pediatricians has increased variably over the past 2 decades (modestly in some subspecialties, with recent declines in others), dedicated efforts at formal research training have remained relatively flat and inconsistent.[2-4] Subspecialties that traditionally attracted pediatric scientists have experienced stagnating fellowship applicant pools.[5] Furthermore, many potential pediatric scientists feel discouraged by a deteriorating pediatric funding landscape.[2,5-7] A consequence of this funding decline is a decreasing number of research-active mentors who can train the next generation of pediatric scientists.

Fostering the pipeline of pediatric researchers is important for improving care for children, particularly in fields in need of improved—or any—therapies. To do this, the AMSPDC-led FIS and the PSDP aimed to enhance the research training of pediatric trainees to develop a robust group of pediatric scientists who can stimulate new knowledge and vitalize areas of deficiency in the biomedical workforce. To assess FIS and PSDP program access, efficacy, and suggestions for improvement, we surveyed the current AMSPDC members on their interaction with and opinions of these programs. Here we describe the FIS and PSDP programs, report our survey results, and discuss implications for future directions of these programs.

AMSPDC	Association of Medical School Pediatric Department Chairs
FIS	Frontiers in Science
NICHD	*Eunice Kennedy Shriver* National Institute for Child Health and Development
PSDP	Pediatric Scientist Development Program
URiM	Underrepresented in medicine

Program Summaries

The AMSPDC's overall mission is to improve the health and well-being of children through the professional development of the chairs of academic pediatric departments and support of their clinical, research, education, and advocacy missions. The annual meeting accomplishes this by joining the FIS and PSDP programs from the US and Canada under one roof to maximize collaborations and advance pediatric research efforts. By doing so, the AMSPDC intends to motivate pediatric trainees to pursue their own research training pathways and build a pipeline of future pediatric scientists.

FIS

The FIS program was introduced in 1987 by Joseph B. Warshaw, MD, a leader dedicated to nurturing pediatric scientists. This was conceived as an approach to ensuring the continuing talent of pediatric physician-scientists. FIS, which is funded by an R13 grant from the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development (NICHD) and by an educational grant from Abbott Pharmaceuticals, promotes research and networking opportunities for pediatric trainees interested in investigative careers by facilitating interactions among pediatric residents, pediatric researchers, and department chairs. This day-long program is integrated into the AMSPDC's annual meeting and allows department chairs to invite academically-oriented pediatric residents to participate in the FIS symposium. The participating department chairs rotate such that approximately one-half of members are offered the opportunity to sponsor 1 resident each year, totaling approximately 40 residents per year. To promote diversity in attendance and perspectives, there is an emphasis on inclusion of residents underrepresented in medicine (URiM) for this opportunity. New in 2018, the FIS conducted a pilot experiment to engage

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URiM residents by issuing a special call for URiM applicants. This proved to be a success, with 65%-70% of the 2018 and 2019 FIS attendees identified as URiM (Table I).

During the FIS symposium, residents meet with their peers from other institutions, hear presentations from and interact with current PSDP fellows, and meet chairs and senior physician scientists from pediatrics departments across the United States and Canada. FIS participants from the 2019 meeting reported positive outcomes from their participation in the symposium, including the opportunity to network, establish future mentors, and gain invaluable information on various physician-scientist career paths. At the conclusion of the annual meeting, 27.5% of participating residents requested external mentorship from the PSDP alumni mentorship program, demonstrating that the physician-scientist pipeline is strengthened by the joint efforts of the 2 programs. Although historically few FIS participants have gone on to apply to PSDP (5%-7% overall), FIS is an important pipeline for the PSDP program, with 40% of PSDP awardees introduced to the PSDP through FIS.

Table I. Recent FIS participants (2016-2019)

Participants	2016	2017	2018	2019
Women, n (%)	22 (65)	22 (55)	29 (73)	30 (75)
Men, n (%)	12 (35)	18 (45)	11 (27)	10 (25)
URiM, n (%)*	N/A	N/A	28 (70)	26 (65)

*Information on URiM participants has been collected only since 2018. Information for previous years is unavailable.

PSDP

The PSDP was also founded in 1987 as a collaborative venture between the NICHD and AMSPDC[8] to address concerns about the declining number of trained pediatric physicians who go on to become independent scientists. Since the program's inception, PSDP has offered research support to MD, MD/PhD, DO, and DO/PhD pediatricians who aim to address central problems in child health. The program maintains its top-notch training and continues to produce a high proportion of independently funded physician-scientists due to continued support from the NICHD, the American Pediatric Society (APS), the American Academy of Pediatrics (AAP), March of Dimes, and the PSDP's parent organization, the AMSPDC.

The PSDP uniquely constitutes a national network of mentors and scholars who are selected based on the scientific merits of their research in basic, translational, or clinical investigation. Potential scholars are nominated by their department chair either during their final year in residency or during their first year of fellowship for subspecialties that have a >12-month clinical requirement. A selection committee composed of pediatric department chairs and other senior pediatric investigators reviews the applications and identifies the next cohort of PSDP scholars. The program selects pediatric trainees with promising research potential and established research mentors and then matches them with established external mentors on the PSDP Steering Committee who represent leaders in top-tier research environments. PSDP scholars receive up to 3 years of mentoring and career development opportunities that promote the successful transition to independent academic research careers. The scholars' first 2 years are funded by the NICHD and have traditionally been required to be free of clinical activities (ie, 100% research effort). During the second year of PSDP support, scholars have the option of applying for a third year of research support from their sponsoring departments, in which up to 15% of clinical time is permitted.

Trajectory of PSDP Scholars

The PSDP has trained some of the brightest physician scientists throughout North America. As of June 2019, 92% of the 211 PSDP graduates work in academic pediatrics, and many lead their divisions, departments, or institutions. Collectively, PSDP alumni have secured $533 million in NIH awards as principal or co-principal investigators, which represents an 8.8-fold return on the NICHD investment.[9] As of 2017, 49% of PSDP graduates have been NIH-funded principal investigators. A summary of recent award types is presented in Table II. Although data on other types of research funding are not yet available, the PSDP administration will launch an alumni survey aimed at capturing current NIH support, rank, and institutional and national leadership positions. as well as non-NIH support, such as foundation grants and other federal funding.

The FIS and PSDP program leadership team hopes to continue these successes. However, we recognize that these programs must adapt to meet stakeholders' needs and to diversify and expand the pipeline of pediatric researchers amid the changing funding and research landscapes. As an early step in this process, we set out to understand from pediatric department chairs how these programs currently serve

Table II. Summary of NIH successes among PSDP alumni

Award type	Number (%)
Total number of graduates as of 2019	211
NIH-funded principal investigators	109 (52)
K Award recipients	77 (37)
Active awards	13 (17)
Completed awards	64 (83)
K-to-R conversion rate*	40 (52)
K-to-R01 conversion rate*	30 (39)
Among scholars who entered the PSDP during or after 2008	
Total number of graduated scholars	62
DP2 NIH Director's New Innovator	1 (2)
K02 Independent Scientist	1 (2)
K08 Clinical Investigator	13 (21)
K23 Mentored Patient-Oriented Research	1 (2)
K99 NIH Pathway to Independence	1 (2)
R01 Research Project Grant Program	4 (6)
R03 Small Grant Program	1 (2)
R56 High Priority, Short-Term Project	1 (2)
% NIH-funded PSDP alumni	20 (32)

*Based on the number of completed K awards.

their trainees, and how we might improve access to and participation in FIS and PSDP.

Methods

FIS and PSDP program leaders developed a 38-item survey to assess the perceptions of the FIS and PSDP programs and barriers to participation. The survey was created in SurveyMonkey (www.surveymonkey.com) and distributed via e-mail to all 168 AMSPDC members (12 members in Canada and 156 in the US). The survey link was sent 11 times via e-mail or e-newsletter between November 2018 and April 2019. Participation was voluntary, and respondents had the ability to skip questions and/or discontinue the survey at any time. Respondents had the option to submit their organization's name in a separate survey for tracking purposes. To ensure that each institution was represented only once, 6 responses were excluded from our analysis: 1 response was from a self-identified emeritus chair, and 5 responses were duplicates based on IP address and department characteristics. In the event of duplicates, the most recent response in each set was included in the analysis. Statistical analyses were completed in SAS version 9.4 (SAS Institute, Cary, North Carolina). Bivariate associations were tested using the Pearson χ^2 test. Results were considered significant at $P < .05$. Exact P values are presented because of small cell counts. This study was deemed exempt by the Duke University Health System's Institutional Review Board.

Results

The survey was emailed to 168 active AMSPDC members; 66 responded, for a response rate of 42%. The mean tenure of responding chairs was 6.2 years (SD, 5.0 years; range, 0.5-26.0 years), and the median duration of tenure was 4.2 years. A full summary of closed-ended responses is included in **Table III** and **Table IV** (available at www.jpeds.com). Responses were not reported if fewer than 20% of participants responded (**Table V**; available at www.jpeds.com). Sample characteristics are described in **Table VI**. More than one-half (65%) of responding department chairs identified as physician-scientists, and the remaining respondents (35%) identified as clinician-administrators or clinician-educators. The plurality of respondents chaired departments with large residency programs (39% had more than 25 new residents annually). Departments with larger faculty ($P = .01$), larger residency and fellowship programs ($P < .001$ for both), and more research dollars ($P = .02$) were more likely to be chaired by a self-described physician-scientist (**Table VII**; available at www.jpeds.com).

Chairs were asked about their general perceptions of the decline in physician-scientists among pediatricians. More than 90% of respondents reported that this decline was concerning (32%) or very concerning (59%). The most commonly reported challenges for physician-scientist development were clinical demands (74%), lack of trainee desire (67%), and lack of departmental or institutional research funding (53%). There were some differences by department characteristics (**Table VIII**). Lack of institutional infrastructure was less likely to be reported as a barrier by chairs who identified as physician-scientists and more likely to be reported as a barrier by chairs of departments with smaller faculty and fewer research dollars. A lack of mentorship was more likely to be reported by chairs of departments with smaller faculty size and fewer research dollars. A lack of ability to carve out research time during clinical training was more likely to be reported by chairs who identified as physician-scientists and those with <$100 million in research funding.

Chairs were also asked about their utilization and perceptions of the FIS program. Most responding chairs (77%) had nominated a resident to the FIS at least once. Nominations to the FIS were not associated with having a physician-scientist chair or with faculty size (**Table IX**). Although chairs of departments with larger residency programs and more

Table VI. Sample characteristics

Characteristics	Number (%)
Total number of responses	66
Department chair career path	
Physician-scientist (active)	22 (33.3)
Physician-scientist (former)	21 (31.8)
Clinician-administrator	11 (16.7)
Clinician-educator	12 (18.2)
Affiliation type	
Academic health center	47 (71.2)
Free-standing children's hospital	18 (27.3)
Number of full-time faculty	
<50	3 (4.5)
50-99	15 (22.7)
100-149	13 (19.7)
150-200	11 (16.7)
201-300	8 (12.1)
>300	16 (24.2)
Number of new residents annually	
<10	10 (15.2)
11-15	11 (16.7)
16-20	11 (16.7)
21-25	8 (12.1)
>25	26 (39.4)
Number of new fellows annually	
<10	29 (43.9)
11-15	10 (15.2)
16-20	3 (4.5)
21-25	6 (9.1)
>25	18 (27.3)
Total departmental research dollars	
<$1 million	9 (13.6)
$1-10 million	20 (30.3)
$11-50 million	24 (36.4)
$51-100 million	9 (13.6)
>$100 million	4 (6.1)
Departments with former PSDP fellows on faculty	
Former PSDP fellows	14 (21.2)
No former PSDP fellows	50 (75.8)
Roles of former PSDP fellows	
Active clinician	7 (10.6)
Active researcher	13 (19.7)
Division or section leadership	9 (13.6)
Department leadership	7 (10.6)
Organization leadership	3 (4.5)

Table VIII. Proportion of departments that have nominated residents to the FIS and PSDP

Parameter	Nominated to FIS n (%)	Nominated to FIS *P* value	Nominated to PSDP n (%)	Nominated to PSDP *P* value
Total responding department chairs (N = 66)				
Department chair career path		.14		<.0001
Physician-scientist (active or former) (N = 43)	38 (88.4)		21 (48.8)	
Clinician-administrator/educator (N = 23)	13 (56.5)		0 (0.0)	
Number of full-time faculty		.14		.004
<50	2 (66.7)		0 (0.0)	
50-99	9 (60.0)		0 (0.0)	
100-149	10 (76.9)		3 (23.1)	
150-200	9 (81.8)		4 (36.4)	
201-300	7 (87.5)		5 (62.5)	
>300	15 (93.7)		9 (56.2)	
Number of new residents annually		.04		.0007
<10	6 (60.0)		0 (0.0)	
11-15	6 (54.5)		1 (9.1)	
16-20	7 (63.6)		2 (18.2)	
21-25	7 (87.5)		2 (25.0)	
>25	25 (96.1)		16 (61.5)	
Number of new fellows annually		.19		<.0001
<10	17 (58.6)		0 (0.0)	
11-15	8 (80.0)		4 (40.0)	
16-20	3 (100.0)		1 (33.3)	
21-25	6 (100.0)		2 (33.3)	
>25	17 (94.4)		14 (77.8)	
Total departmental research dollars		.04		<.0001
<$1 million	3 (33.3)		0 (0.0)	
$1-10 million	13 (65.0)		2 (10.0)	
$11-50 million	22 (91.7)		9 (37.5)	
$51-100 million	9 (100.0)		6 (66.7)	
>$100 million	4 (100.0)		4 (100.0)	

research dollars were more likely to nominate residents to the FIS, a high proportion of chairs from nearly all subsets had nominated residents. The most commonly cited barriers to resident participation in the FIS were undefined physician-scientist career paths (47%) and lack of resident interest in research (32%). Several chairs also commented that the limited number of annual FIS slots (n = 40) is a barrier to nominations and participation. To encourage participation, most responding chairs felt that FIS should expand the scope of its content to include more clinical (65%), health services (71%), and translational (70%) research.

Historically, few FIS participants (5%-7%) have gone on to apply to the PSDP. Chairs' most commonly reported reasons for this low application rate from the FIS pool were uncertainty about the physician-scientist career path (71%) and the belief that the PSDP does not support the type of research residents wish to pursue (51%). Chairs were asked whether they believed that applications to the PSDP might increase if FIS participants received mentorship from PSDP alumni, and nearly 70% of responding chairs believed that alumni mentorship could increase applications.

When asked about PSDP applications more generally, nearly one-third (n = 21) of responding chairs have nominated trainees to the PSDP, and of those, more than one-half (n = 13) have had funded trainees. Chairs of departments with large residency and large fellowship programs were more likely to nominate trainees to the PSDP. However, nominees from departments with large residency and fellowship programs were not more likely to be funded ($P = .84$ and .17, respectively). When asked about barriers to nominations, a few responding chairs reported the perception that PSDP fellows tend to be selected repeatedly from the same programs. Although more than one-half (56%) of responding chairs felt that the PSDP's "no clinical time" requirement in the first 2 years of the program does not prohibit nominations, 43% of chairs did perceive this as a barrier, specifically because of the demands of clinical training (29%) and clinical coverage (29%), and because the requirement does not appeal to applicants (26%). Chairs identified neonatal-perinatal medicine (18%), critical care medicine (14%), and emergency medicine (11%) as the most commonly affected subspecialties. Furthermore, some chairs reported that access to their own institutional T32 and K12 programs preclude some PSDP nominations.

Discussion

Today's emerging physician-scientists must overcome multiple compounding hurdles to be successful. These issues are well recognized by trainees and represent barriers for career selection. Trainees are competing for limited resources with PhD colleagues who frequently have 6-8 years of professional research training, while they are closing their own research training gap after residency. A significant majority of MD-only trainees have at least some debt and often as much as a house mortgage. Family and caregiving obligations can interrupt research and career development for many physician-scientists, and women are disproportionately affected. Finally, although not restricted to physician-scientists, nearly all pediatric subspecialty trainees experience significantly lower salaries than general pediatricians, and the extended timeline of physician-scientist training and generally lower pay as assistant professors further accentuate this challenge. The survey findings here provided many valuable insights and actionable suggestions. The decline in pediatric physician-scientists is a common concern, and understanding the institutional and individual barriers to this career pathway is critical for reversing the trend. Although most responding chairs have nominated residents to the FIS, there is a desire for expansion of the number of available slots and the scope of research represented. Similarly, the perception that the PSDP supports primarily basic science research is another important barrier to address and may be mitigated by instituting PSDP alumni mentorship. Finally, there may be

Table IX. Departments that have nominated residents to the FIS and PSDP

Parameters	Total number	Nominated to FIS		Nominated to PSDP	
		n (%)	*P* value	n (%)	*P* value
Total number of responses	66				
Department chair career path			.14		<.0001
Physician-scientist (active or former)	43	38 (88.4)		21 (48.8)	
Clinician-administrator/educator	23	13 (56.5)		0 (0.0)	
Number of full-time faculty			.14		.004
<50	3	2 (66.7)		0 (0.0)	
50-99	15	9 (60.0)		0 (0.0)	
100-149	13	10 (76.9)		3 (23.1)	
150-200	11	9 (81.8)		4 (36.4)	
201-300	8	7 (87.5)		5 (62.5)	
>300	16	15 (93.7)		9 (56.2)	
Number of new residents annually			.04		.0007
<10	10	6 (60.0)		0 (0.0)	
11-15	11	6 (54.5)		1 (9.1)	
16-20	11	7 (63.6)		2 (18.2)	
21-25	8	7 (87.5)		2 (25.0)	
>25	26	25 (96.1)		16 (61.5)	
Number of new fellows annually			.19		<.0001
<10	29	17 (58.6)		0 (0.0)	
11-15	10	8 (80.0)		4 (40.0)	
16-20	3	3 (100.0)		1 (33.3)	
21-25	6	6 (100.0)		2 (33.3)	
>25	18	17 (94.4)		14 (77.8)	
Total departmental research dollars			.04		<.0001
<$1 million	9	3 (33.3)		0 (0.0)	
$1-10 million	20	13 (65.0)		2 (10.0)	
$11-50 million	24	22 (91.7)		9 (37.5)	
$51-100 million	9	9 (100.0)		6 (66.7)	
>$100 million	4	4 (100.0)		4 (100.0)	

additional opportunities for the Steering Committee to address other programmatic and institutional barriers to PSDP nominations.

The majority of responding chairs expressed concern in the decline in pediatric physician-scientists. Although clinical demands present a major challenge to physician-scientist development, this is a complex problem that requires collaboration across research, clinical, and administrative leadership to design and implement creative solutions.[10] Interestingly, although the size of the academic department was not associated with ability to carve out time during training, departments with research-intensive programs (>$100 million in total research funding) appeared better poised to meet this challenge. Our programming seeks to address the next common challenge—lack of trainee desire—through the FIS program by engaging academically-oriented trainees with peer and senior pediatrician-scientists and encouraging them to pursue research careers. Through our programming, we strive to engage trainees in addressing commonly expressed concerns about training duration, educational debt, strategies to choose strong laboratories and mentors, and subsequently securing funding in the face of an increasingly competitive NIH landscape.[11,12]

We address the third major challenge—funding—through the PSDP by providing salary support during fellows' first 2 research years. AMSPDC member institutions provide funding to third-year PSDP fellows in the critical fellow-to-faculty transition year, and the PSDP continues to seek funding from partner organizations to support departments that may otherwise find it difficult to fund this important transition year. Finally, lack of mentorship was reported as a significant barrier by chairs of departments with smaller faculty and fewer research dollars. Both the FIS and PSDP facilitate opportunities for trainees to connect with physician-scientists across North America to ensure that trainees have access to leaders in their chosen field of research. Furthermore, the PSDP can facilitate research training at an institution outside the home institution, which could broaden the research base of pediatric departments nationally.

Through the FIS program, we aim to expand the physician-scientist pipeline by generating interest in research careers. Although the program is widely used by the responding chairs, we still have an opportunity to bolster the physician-scientist pipeline across programs of varying size. As several chairs suggested, one way to do this would be to expand the FIS so that more residents can participate, ideally 1 candidate annually for each residency program. Furthermore, we are working to address the perception that the scope of research should be broadened by diversifying the topics that pediatrician researchers will present. Moving forward, we will continue to invite speakers who engage in multidisciplinary research areas, including implementation sciences, and who represent a diverse array of physician-scientist career paths, as well as those who are typically underrepresented in research.

By engaging residents who are interested in research careers and connecting them with successful pediatric scientists through the FIS program, we aim to increase the proportion of FIS residents who apply to the PSDP. As with the FIS, there is a perception among department chairs that the PSDP favors basic science research. Because the PSDP is an NIH K12 award that fosters all types of research, we are aligning the FIS and PSDP goals to include broad basic, clinical, and implementation science across both platforms. Toward this end, we are actively engaging PSDP alumni to serve as external mentors for FIS resident attendees. We are currently connecting interested FIS participants with PSDP alumni mentors, and we will endeavor to pair residents with mentors who are interested in similar research domains. More than one-half (9 of 16) of committed alumni mentors are women, and we are hopeful that this will continue to expand the pipeline of women physician scientists by connecting female residents with accomplished women who can help them navigate their research careers during major life transitions. Moreover, 10 of 18 senior pediatric researchers and department chairs on the PSDP Steering Committee who serve as external mentors for PSDP fellows are women. Through PSDP alumni and external mentorship, we also aim to rectify disparities in nominations to the PSDP by program size. We hope that connecting interested residents with PSDP alumni will encourage more PSDP nominations from departments with smaller programs, especially given that programs of all sizes experience successful PSDP funding outcomes.

Two additional barriers to nominations were reported in this survey. Responding chairs were divided over concerns about whether the "no clinical time" requirement is a barrier to applications and nominations. This requirement was originally stipulated by the NICHD, yet the current NICHD program description allows for future opportunities to permit a small amount of clinical effort in the early years of the K12 fellowship. The PSDP Steering Committee will continue to discuss the merits and challenges of this requirement both internally and with the NICHD program staff. Finally, institutional K12 and T32 awards alleviate some of the financial burden of supporting fellows and preclude some chairs from nominating trainees to the PSDP. Although subsequent NIH funding is higher among NICHD-funded K12 awardees, especially compared with T32 MD-only appointees,[13] T32 awards can provide important and consistent subsidization of costs related to subspecialty fellows.[14] Furthermore, the perceived benefits and prestige of a K12 vs a T32 training grant are debated; and the function of the current K12 award is one the Steering Committee will continue to assess prospectively.

There are some limitations to interpreting these survey results. The results do not necessarily reflect the experiences or opinions of the majority of AMSPDC members, given the 42% response rate. Furthermore, there is the possibility of selection bias toward chairs from research-heavy institutions. Because the survey was anonymous, we were unable to compare the characteristics between responding and nonresponding department chairs. Nonetheless, we are encouraged by the diversity of responses to this initial survey. We also are conducting annual follow-up surveys of FIS trainees and are longitudinally tracking their subsequent professional development to assess their enrollment into the PSDP or other research-focused fellowships and their professional pursuits as junior faculty. Furthermore, we are augmenting our tracking of PSDP alumni outcomes. We hope that by focusing on increasing diversity in the FIS and linking participants with strong PSDP alumni mentors, we will increase the pipeline of women and URiM physician-scientists into the PSDP and subsequently the pediatric workforce. These metrics and participant trajectories will be tracked using the updated FIS and PSDP alumni surveys. Using data from these surveys, we will continue to work with the Steering Committee to engage AMSPDC members as we plan for the future of these 2 programs.

Conclusion

We thank the AMSPDC members who took the time to respond to this survey. We appreciate their concrete suggestions for improving the FIS and PSDP. Moving forward, we will continue to explore options such as increasing access to the FIS, promoting the PSDP alumni mentorship program, and actively expanding the scope of research supported by the FIS and PSDP. Furthermore, we will continue to discuss and survey PSDP fellows on the pros and cons of the "no clinical time" requirement of the PSDP and the merits of a K12 vs a T32 training program with the Steering Committee. We will continue to assess FIS and PSDP access and outcomes in service of increasing and diversifying the pediatric physician-scientist workforce. ■

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Table III. Responses to FIS survey questions

Survey question	n (%)
Have you ever selected a resident to attend the AMSPDC/PSDP FIS annual meeting?	
Yes	51 (77.3)
No	8 (12.1)
How many times have you nominated a resident to participate?	
Once	8 (12.1)
2-3 times	21 (31.8)
4-5 times	16 (24.2)
More than 5 times	7 (10.6)
What do you see as potential barriers to sending residents from your institution to participate in the FIS annual meeting?	
Lack of resident interest in research	21 (31.8)
Undefined career paths	31 (47.0)
Given other responsibilities, the chair doesn't know residents well enough to nominate	4 (6.1)
Limited resources for travel	15 (22.7)
Would it help your institution nominate more FIS resident candidates if we also contacted your residency director to ask for nominations?	
Yes	32 (48.5)
No	28 (42.4)
Should the scope of science presented at the FIS be broadened to include more:	
Basic	21 (31.8)
Clinical	43 (65.2)
Health services	47 (71.2)
Translational	46 (69.7)
Only 2-3 out of 40 FIS resident attendees apply for the PSDP per year. Why do you think this proportion is not larger?	
Difficulty identifying a mentor	15 (22.7)
Lack of interest in research	23 (34.8)
Uncertainty of career path	47 (71.2)
Belief that type of research is not funded by the PSDP	34 (51.5)
Debt	26 (39.4)
Limited feasibility (clinical requirements)	27 (40.9)
Would PSDP alumni mentorship for FIS residents increase the proportion who apply for the PSDP? This could be supported by a cross-institutional alumni network.	
Yes	32 (48.5)
Maybe	14 (21.2)
No	14 (21.2)

Table IV. Responses to PSDP survey questions

Survey question	n (%)
Do you find the decline in the number of physician-scientist trainees in pediatrics, particularly MD-only physician-scientist trainees:	
Not a major problem facing department chairs	4 (6.1)
Concerning, requiring department chair vigilance	21 (31.8)
Very concerning, requiring department chair-level interventions	39 (59.1)
What do you see as the major current challenges for physician-scientist development at your institution?	
Lack of institutional infrastructure for research	25 (37.9)
Lack of departmental or institutional funding for research	35 (53.0)
Clinical demands of the department	49 (74.2)
Lack of available mentors	31 (47.0)
Lack of desire among trainees	44 (66.7)
Changes to the makeup of clinical care providers interacting with trainees (eg, increase in hospitalists)	11 (16.7)
Lack of ability to carve out adequate research time during residency or fellowship	28 (42.4)
Lack of ability for fellows to obtain a faculty job with protected time	30 (45.5)
Have you nominated at least 1 PSDP fellow during your chairmanship?	
Yes	21 (31.8)
No	13 (19.7)
Have you had a PSDP fellow funded within your department during your chairmanship?	
Yes	13 (19.7)
No	8 (12.1)
How effective is the PSDP in overcoming barriers in physician-scientist development, such as those identified above?	
Very effective	1 (1.5)
Moderately effective	4 (6.1)
Slightly effective	8 (12.1)
Does the PSDP equally support all types of pediatric research (basic, clinical, health services, translational)?	
Yes	3 (4.5)
No	10 (15.2)
Which areas of [pediatric research] support should be expanded?	
Basic	1 (1.5)
Clinical	5 (7.6)
Health services	5 (7.6)
Translational	8 (12.1)
What is the ideal composition of a PSDP fellow mentorship team to ensure success?	
Research mentor	12 (18.2)
Research co-mentor	7 (10.6)
Intrainstitutional career mentor	11 (16.7)
PSDP Steering Committee career mentor	12 (18.2)
What are the important components of successful PSDP fellow-to-faculty-transition training?	
Unconscious bias	6 (9.1)
Grant writing	11 (16.7)
Negotiating the first faculty position	7 (10.6)
Time management	11 (16.7)
Economics of a research career (eg, multiple funding sources, budget)	11 (16.7)
Does the "no clinical time" requirement during the first 2 PSDP fellowship years prohibit nomination of potential PSDP fellows from your institution?	
Yes	31 (43.1)
No	40 (55.6)
What are some of the reasons the "no clinical time" requirement of the first 2 years of the PSDP fellowship is a barrier to nomination?	
Applicant training desires	17 (25.8)
Demands of the subspecialty clinical training	19 (28.8)
Demands of clinical coverage of the subspecialty unit	19 (28.8)
Not acceptable to division chiefs	12 (18.2)
Are there specific subspecialties that are inhibited from nominating PSDP fellows by the "no clinical time" requirement of the first 2 years of the PSDP fellowship?	
Yes	19 (28.8)
No	9 (13.6)
Which subspecialties are affected by this requirement?	
Adolescent medicine	5 (7.6)
Allergy-immunology	3 (4.5)
Cardiology	6 (9.1)
Child abuse	2 (3.0)
Critical care medicine	9 (13.6)
Developmental-behavioral medicine	3 (4.5)
Emergency medicine	7 (10.6)
Endocrinology	6 (9.1)
Gastroenterology	6 (9.1)
Hematology-oncology	6 (9.1)
Hospital medicine	4 (6.1)
Infectious diseases	3 (4.5)
Neonatal-perinatal medicine	12 (18.2)
Nephrology	3 (4.5)
Pulmonology	3 (4.5)
Rheumatology	3 (4.5)
Would you be interested in cross-institutional partnerships for PSDP training in which departments from 2 institutions jointly provide clinical and research training for a PSDP fellow? (eg, a PSDP fellow completes clinical training at one institution and research training at a partner institution)	
Yes	50 (75.8)
No	47 (71.2)
Should the PSDP play a role in facilitating these partnerships?	
Yes	47 (71.2)
No	2 (3.0)

Table V. Questions not reported due to low response rates

What are the major barriers to nominations to the PSDP from your institution?
Does the optional institutional commitment to support the salary of a third year of a PSDP fellow prohibit nominations of potential PSDP fellows who would be supported at your institution?
What level of commitment would be less prohibitive?

Table VII. Department characteristics by chair career path

Characteristics	Total number	Physician-scientist chair, n (%)	Clinician-administrator/educator chair, n (%)	*P* value
Total number of responses	66			
Number of full-time faculty				.01
<50	3	1 (33.3)	2 (66.7)	
50-99	15	7 (46.7)	8 (53.3)	
100-149	13	6 (46.1)	7 (53.8)	
150-200	11	7 (63.4)	4 (36.4)	
201-300	8	8 (100.0)	0 (0.0)	
>300	16	14 (87.5)	2 (12.5)	
Number of new residents annually				<.001
<10	10	2 (20.0)	8 (80.0)	
11-15	11	7 (63.6)	4 (36.4)	
16-20	11	6 (54.5)	5 (45.4)	
21-25	8	4 (50.0)	4 (50.0)	
>25	26	24 (92.1)	2 (7.7)	
Number of new fellows annually				<.001
<10	29	10 (34.5)	19 (65.5)	
11-15	10	7 (70.0)	3 (30.0)	
16-20	3	2 (66.7)	1 (33.3)	
21-25	6	6 (100.0)	0 (0.0)	
More than 25	18	18 (100.0)	0 (0.0)	
Total departmental research dollars				.002
<$1 million	9	2 (22.2)	7 (77.8)	
$1-10 million	20	10 (50.0)	10 (50.0)	
$11-50 million	24	19 (79.2)	5 (20.8)	
$51-100 million	9	8 (88.9)	1 (11.1)	
>$100 million	4	4 (100.0)	0 (0.0)	