

Addressing the Workforce Crisis in Uronephrology: Design and Initial Observations of the Duke Paired Undergraduate Mentorship Program

Loryn W. Dass ¹, Anna Williams ¹, Jennifer D. Varner ¹, Terri Taylor ², Holly Hough ², Jessica Sperling ³, Matthew A. Sparks ⁴, Allison McElvaine ² and Rasheed Gbadegesin ^{1,2}

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Introduction

There is an impending biomedical workforce crisis in the United States with fewer individuals pursuing clinical nephrology practice and research careers in nephrology and urology.^{1,2} There is attrition in the biomedical career pathway, particularly among students from underrepresented minority (URM) backgrounds and women.^{3,4} The current workforce lacks sufficient diversity, and the dearth of senior URM faculty who can serve as mentors further illustrates the necessity for early mentor training for trainee and junior faculty (URM and non-URM). While feelings of self-efficacy are important for motivating students toward scientific careers, personal identity as a scientist is more predictive of long-term behaviors that indicate integration into scientific research.^{5,6} Summer programs attempt to spark interest and address attrition and the lack of diversity in science, technology, engineering, and mathematics (STEM) fields. Well-planned programs can help students integrate their beliefs and expectations with the research experience.⁷

The aim of the Duke Paired Undergraduate Mentoring Program (PUMP) in uronephrology is to develop interest in uronephrology clinical and research careers among a diverse cohort of undergraduates through a mentored summer research enrichment program. PUMP started in the summer of 2023 and is funded by the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK). In this article, we report the rationale, study design, and initial short-term outcomes from PUMP.

Methods

We recruited rising sophomores, juniors, and seniors from undergraduate universities across the country. We achieved our programmatic goal of admitting >50% URM and/or women by using a coalition between Duke and

Historically Black Colleges and Universities. Prior research experience was not required for program acceptance, and participants received a stipend.

Paired Undergraduate Mentorship Program (PUMP) is an 8-week program consisting of structured weekly research skills workshops and hands-on research. Workshop sessions focus on topics to break down barriers to continued pursuit of a career in scientific research and cover topics such as equity and inclusion in STEM, how to read a scientific paper, research project development, research ethics, and scientific communication including guidance on platform and poster presentations (Figure 1A). PUMP scholars are paired with a junior and senior mentor to complete basic, translational, or clinical research projects developed by the junior and senior mentors. Virtual sessions are also conducted throughout the academic year on topics such as applying to graduate or medical school, career pathways in clinical and/or laboratory-based research, and the pros and cons of taking a gap year, among others. Students are encouraged to apply to return the following summer for project continuation.

We designed pre- and postprogram surveys to evaluate participant self-assessment of knowledge and skills, scientific self-efficacy, scientific identity, and scientific values and assessment of mentors and benefits gained. Participants were invited to complete structured interviews at the end of the summer program and were compensated for their time completing the surveys and interview.

Results

For cohort 1, we received 11 applications and invited four applicants for four available program slots. For cohort 2, we increased program visibility across multiple platforms and received 44 applications, inviting four new

¹Division of Nephrology, Department of Pediatrics, Duke University School of Medicine, Durham, North Carolina

²Office of Physician-Scientist Development, Duke University School of Medicine, Durham, North Carolina

³Office of Evaluation and Applied Research Partnership, Duke University School of Medicine, Durham, North Carolina

⁴Division of Nephrology, Department of Medicine, Duke University School of Medicine, Durham, North Carolina

Correspondence: Dr. Rasheed Gbadegesin, email: rasheed.gbadegesin@duke.edu

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A

<p>Orientation and Meeting Co-Mentors</p> <ul style="list-style-type: none"> Develop effective interpersonal communication skills Explore the research environment at Duke Cultivate identity as a researcher 	<p>Research Project Development</p> <ul style="list-style-type: none"> Enhance disciplinary knowledge Apply logical/critical thinking skills Enhance ability to conduct a research project Recognize and apply responsible and ethical research practices Cultivate identity as a researcher 	<p>How to Read a Scientific Paper</p> <ul style="list-style-type: none"> Develop effective interpersonal and scientific communication skills Enhance disciplinary knowledge Recognize and apply responsible and ethical research practices Enhance ability to conduct a research project Cultivate identity as a researcher Document training path in pursuing a research career 	<p>Making Your Research Visible: Scientific Communication</p> <ul style="list-style-type: none"> Develop effective scientific communication skills Apply logical/critical thinking skills Cultivate identity as a researcher 	<p>Ethics in Research</p> <ul style="list-style-type: none"> Develop effective scientific communication skills Explore the research environment Recognize and apply responsible and ethical research practices Cultivate identity as a researcher 	<p>Equity and Inclusion in STEM</p> <ul style="list-style-type: none"> Develop confidence as a researcher Explore personal differences in the research environment Document milestones and available paths in pursuing a research career 	<p>Scientific Presentation</p> <ul style="list-style-type: none"> Enhance disciplinary knowledge Develop effective scientific communication skills Apply logical/critical thinking skills Develop confidence as a researcher Explore research career options 	<p>Final Presentations</p> <ul style="list-style-type: none"> Develop effective scientific communication skills Enhance disciplinary knowledge Enhance logical/critical thinking skills Cultivate identity as a researcher Develop confidence as a researcher
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B

Demographic Parameter	n = 8
Sex	
Male	2
Female	6
Race	
African Ancestry/Black	5
Asian	2
White	1
Undergraduate Institution	
HBCU	3
Non-HBCU	5
College classification at time of application	
Rising Sophomore	1
Rising Junior	3
Rising Senior	3
Senior**	1

C

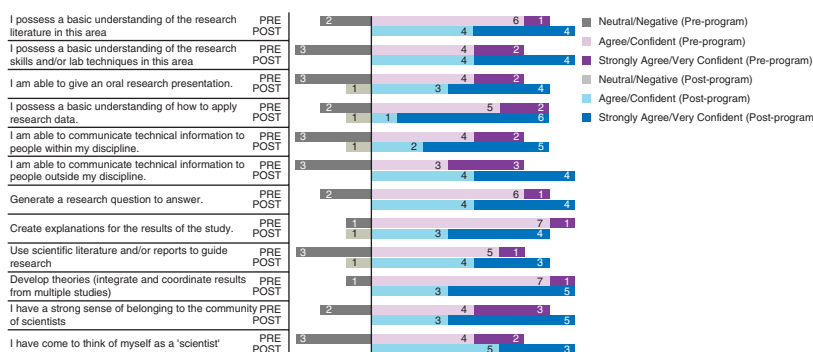


Figure 1. Description and early outcome of the Duke PUMP. (A) Summer undergraduate research skills workshop curriculum. (B) Cohort 1 and 2 participant demographics. (C) Comparison of pre- and postprogram surveys. *One participant returned for second summer with the program; their data are included for only the first summer. **The sole senior participant had a late graduation date. HBCU, Historically Black College or University; PUMP, Paired Undergraduate Mentorship Program.

applicants and one returning scholar to participate. Of the eight total participants in the two combined cohorts, six participants were female, five identified as URM, and three attend a Historically Black College and University (Figure 1B). On average, 90% of the participants attended the summer professional development workshops, and three of four participants in cohort 1 participated in each between-summer virtual session. One of two eligible participants returned for a second summer session.

All eight participants completed the preprogram survey, and seven completed the postprogram survey. Surveys indicated that scholars' sense of belonging and identification as a scientist was higher after the program (Figure 1C). They also noted gains in technical skills, and they rated their experience with their mentors positively. In interviews, participants liked the hands-on, immersive aspect of the summer experience and reported feeling more confident at the end of the program.

Discussion

During the first two summer sessions of the Duke PUMP, we have showed the feasibility of running the program, and we achieved our goal of recruiting a diverse cohort of >50% URM and/or women. We increased the number of applicants to the program by 400% by using multiple dissemination platforms. This astronomical increase in the number of applicants is a clear indication of the need for

this and similar programs to address the workforce crisis in urology.

Demonstrating the effect of an undergraduate summer program on the clinical and workforce takes time because of the years needed to progress from undergraduate training to independent practice. Yet studies demonstrate student identification as a scientist is predictive of long-term behavior and persistence in STEM.^{5,6} Short-term outcomes from PUMP show student feelings of identification as scientists were higher because of program participation. One participant highlighted how the generous stipend reduced barriers to participation and having her own cubicle made her feel like she was wanted and accepted. This highlights how seemingly small programmatic elements can have a substantial effect on a student's feeling of belonging.

Future plans include gathering medium- and long-term data as students return for a subsequent summer and the cohort size increases. Overall, PUMP is a generalizable framework for creating a summer program for cultivating early interest, quality mentorship, and sustained engagement, which has the potential to bolster and diversify the urology clinical and research workforce.

Disclosures

Disclosure forms, as provided by each author, are available with the online version of the article at <http://links.lww.com/CJN/C127>.

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Author Contributions

Conceptualization: Rasheed Gbadegesin, Allison McElvaine, Matthew A. Sparks.

Data curation: Loryn W. Dass, Rasheed Gbadegesin, Holly Hough, Allison McElvaine, Matthew A. Sparks, Jessica Sperling, Terri Taylor, Jennifer D. Varner, Anna Williams.

Formal analysis: Loryn W. Dass, Rasheed Gbadegesin, Jennifer D. Varner, Anna Williams.

Funding acquisition: Rasheed Gbadegesin.

Investigation: Loryn W. Dass, Rasheed Gbadegesin, Allison McElvaine, Matthew A. Sparks, Jessica Sperling, Jennifer D. Varner, Anna Williams.

Methodology: Loryn W. Dass, Rasheed Gbadegesin, Allison McElvaine, Matthew A. Sparks, Jessica Sperling, Jennifer D. Varner, Anna Williams.

Project administration: Rasheed Gbadegesin, Holly Hough, Matthew A. Sparks, Terri Taylor.

Supervision: Rasheed Gbadegesin, Matthew A. Sparks, Jessica Sperling.

Writing – original draft: Loryn W. Dass, Rasheed Gbadegesin, Allison McElvaine, Matthew A. Sparks.

Writing – review & editing: Loryn W. Dass, Rasheed Gbadegesin, Holly Hough, Allison McElvaine, Matthew A. Sparks, Jessica Sperling, Terri Taylor.

Data Sharing Statement

All data are included in the manuscript and/or supporting information.

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