

A PERSPECTIVE ON PROMOTING DIVERSITY IN THE BIOMEDICAL RESEARCH WORKFORCE: THE NATIONAL HEART, LUNG, AND BLOOD INSTITUTE'S PRIDE PROGRAM

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Aspiring junior investigators from groups underrepresented in the biomedical sciences face various challenges as they pursue research independence. However, the biomedical research enterprise needs their participation to effectively address critical research issues such as health disparities and health inequities. In this article, we share a research education and mentoring initiative that seeks to address this challenge: Programs to Increase Diversity among Individuals Engaged in Health Related Research (PRIDE), funded by the National Heart, Lung, and Blood Institute (NHLBI). This longitudinal research-education and mentoring program occurs through summer institute programs located at US-based academic institutions. Recruited participants are exposed to didactic and lab-based research-skill enhancement experiences, with year-round mentoring over the course of two years. Mentor-mentee matching is based on shared research interests to promote congruence and to enhance skill acquisition.

Program descriptions and sample narratives of participants' perceptions of PRIDE's impact on their career progress are showcased. Additionally, we highlight the overall program design and structure of four of seven funded summer institutes that focus on cardiovascular disease, related conditions, and health disparities. Mentees' testimonials about the value of the PRIDE mentoring approach in facilitating career development are also noted.

Meeting the clinical and research needs of an increasingly diverse US population is an issue of national concern. The PRIDE initiative, which focuses on increasing research preparedness and professional development of groups underrepresented in the biomedical research workforce, with an emphasis on mentoring as the critical approach, provides a robust model that is impacting the careers of future investigators. *Ethn Dis.* 2016;26(3):379-386; doi:10.18865/ed.26.3.379

INTRODUCTION

The *Journal of Medical Biography* recently published an extraordinary story about a man named Vivien Theodore Thomas, an African American who overcame substantial odds to make medical history.¹ He lived in a time of complex social dynamics and encountered significant personal and professional challenges, which led to a career as a laboratory technician, instead of the doctor he had dreamed of becoming. That notwithstanding, he became a notable innovator in the field of cardiac surgery, and an effective mentor to many future leaders.¹

Similar to Mr. Thomas, today's aspiring investigators from racial and ethnic backgrounds underrepresented in the biomedical sciences, face daunting challenges in their pursuit of biomedical research careers. The lack of "cumulative advantage" gained across the span of the educational experience from kindergarten through graduate school, and "variability in access to mentoring and other resources" are two possible contributory factors.²

Since 2006, the National Heart, Lung, and Blood Institute (NHLBI), in recognition of these challenges, has funded a unique, early-career, faculty-targeted, research-skill enhancement,

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mentoring initiative called “The Programs to Increase Diversity among Individuals Engaged in Health-Related Research” or PRIDE.³ Previously called “Summer Institute Programs to Increase Diversity among Individuals Engaged in Health Related Research (SIPID),” PRIDE aims to increase the number of scientists and research-oriented faculty from backgrounds currently underrepresented in the biomedical sciences, to successfully compete for external research funding to support heart, lung, blood, and sleep (HLBS) disorders, as well as health disparities research. In this Perspectives piece we discuss the relevance of the PRIDE initiative in the current biomedical research context, and conclude by showcasing the design, structure and mentoring approaches of four currently funded PRIDE summer institutes, whose scientific focus is particularly related to cardiovascular disease and/or related conditions. The initiative contains seven funded summer institute programs overall, and all have a scientific or methodological focus that aligns with one or more of NHLBI’s heart, lung, blood, sleep or health disparities research portfolios. The cardiovascular disease portfolio for example, covers heart and vascular diseases, behavioral and clinical risk factors related to hypertension, and relevant target-organ conditions, to name a few.

Two commonly reported challenges for junior investigators as they build their academic research careers are: 1) insufficient time to focus on research; and 2) conflicting work expectations, including high teaching or clinical loads while pursuing research.⁴ A recent PRIDE program

participant framed these conflicts as follows: “[It’s] a lot of taking off and putting on hats, several changes of hats within the same week.... putting clinical responsibilities on one half of the week and research on the other... it gets difficult.” This difficulty is amplified by: 1) an overall low funding climate, which requires persistence, tenacity and refined grantsmanship

Currently, however, the health research enterprise is confronted by two inter-related but seemingly intractable issues: the underrepresentation of investigators from diverse racial and ethnic groups⁹ and the persistent problem of health disparities and health inequities.¹⁰

skills to succeed; and, 2) the absence of a sufficient number of experienced mentors to provide guidance.⁵

According to a 2010 report from the American Society for Biochemistry and Molecular Biology, although minority investigators accounted for approximately 29% of the US population, their representation as NIH R01 grantees was approximately 4%.⁶ Moreover, according to an NIH-sponsored report, for the period 2000-2006, non-Asian minority

grant applicants fared worse in the receipt of NIH R01 grant awards, compared with majority applicants.⁷

Since the era of John Snow, the father of public health and epidemiology,⁸ society has looked to the research enterprise to prevent and resolve health care problems. Vaccination initiatives, food and water fortification efforts, and the antibiotic revolution are all research-driven efforts that have led to substantial population-level health gains. Currently, however, the health research enterprise is confronted by two inter-related but seemingly intractable issues: the underrepresentation of investigators from diverse racial and ethnic groups⁹ and the persistent problem of health disparities and health inequities.¹⁰ Health disparities are defined as “differences in the health status of different groups of people”¹¹ and health inequities as the “avoidable inequalities in health between groups of people.”¹²

These issues are seemingly intractable because, as early as 1985, the Surgeon General’s report titled “Report of the Secretary’s Task Force on Black & Minority Health” identified both health disparities and health care inequities as major public health concerns.¹³ Yet, 30 years later, these problems persist. With respect to underrepresentation, the Surgeon General’s Report noted that “Minorities are [also] underrepresented in research and teaching positions in health sciences,” and that “An insufficient number of role models and teachers who are sensitive to the training needs of minorities has a negative effect upon the training of future minority health

professionals.” Others have echoed similar sentiments, particularly noting that health disparities and health inequities research is more likely to be undertaken by individuals from backgrounds underrepresented in the biomedical sciences, and thus there is a need to better prepare this cadre of investigators.¹⁴⁻¹⁶

On the health disparities front, as recently as the turn of the century, the problem was considered by some to be nothing more than perceptual^{17,18} and was not the focus of substantive research until the mid-to-late 80s and early 90s.¹³ Again, the 1985 Surgeon General’s report recognized that health disparities were prevalent and endemic in the United States, and specifically showed that, for many of the health indicators examined, significantly large disparities existed between certain minority populations (African Americans, Hispanics and Native Americans/Alaska Natives) and their White counterparts.¹³ Carefully executed studies in the 1990s provided further evidence of unequivocal group-specific differences and disparities and noted, for example, that compared with Caucasians, Hispanics were less likely to receive cardiac medications,¹⁹ and African Americans less likely to have coronary artery bypass surgery.²⁰ Moreover, African Americans were also less likely to receive kidney transplants,²¹ and more likely to receive lower-than-required doses of dialysis.²² Incidentally, in both of these sequelae, target end-organ conditions result, in part, from uncontrolled hypertension,²³ a condition that garners significant NHLBI investments. The impressions left by the

early studies led to the first Congress-directed Institute of Medicine study in 2003,²⁴ which sought to determine the extent and cause of racial/ethnic differences in health care. The ensuing watershed report marked many “firsts,” including for the first time, that disparities and inequities were carefully defined, with racial and ethnic minority inequity defined as ‘receiving a lower quality of health care than non-minorities, “even when access to socioeconomic factors was controlled.” The report was also among the first to conclude that the majority of observed health-related differences by race/ethnicity were associated with socioeconomic factors; once these factors and other measures of health care access were controlled, such disparities diminished.

HOW FAR HAVE WE PROGRESSED?

While much research has underscored the relationship between economic status and health-related disparities,²⁵ major underlying determinants remain poorly defined, especially since what constitutes disparities has been continuously refined.²⁶ Reports examining progress between 1990-2005 on several health indicators of long-standing disparity, suggest that progress has been quite slow.²⁵ For example, with respect to cardiovascular disease (CVD), which is the leading cause of death in the United States,²⁷ African Americans have the highest overall mortality rate, particularly out-of-hospital deaths, and especially at younger ages.²⁸⁻³⁰ Currently identified reasons

for these poorer outcomes include high prevalence of risk factors, patient delays in seeking medical care, and disparities in health care.^{31,32}

Moreover, effective preventive or disease management outcomes are reportedly not being realized among minority populations because of barriers they encounter.³³ The annual Agency for Healthcare Research and Quality (AHRQ), National Health Disparities Report (NHDR) records, “that racial and ethnic minorities often receive poorer quality of care and face more barriers in seeking care including preventive care, acute treatment, or chronic disease management, than do non-Hispanic White patients.” Minorities also report “experiencing poorer quality patient-provider interactions.”³³

The persistence of these disparities in health care experiences and outcomes of racial and ethnic minorities indicate an urgent need for new ways to think about strategies to reduce or prevent health care-related disparities. To move the field forward, we need more investigations that provide knowledge about the biological and other determinants of health disparities, including social determinants within and between groups. Moreover, knowledge regarding how to efficiently apply new clinical and social strategies to overcome health disparities is sparse and also critically needed. These knowledge deficits, as well as the current state of health disparities and inequities in the United States, provide a compelling rationale for transformative research-training programs designed to foster the career development of underrepresented investigators in the biomedical sciences.

WHAT HAS BEEN DONE SO FAR?

While there have been other meritorious programs focused on this issue, in this article, we showcase only the NHLBI PRIDE programs,³⁴ where program participants receive hands-on and face-to-face research education and skills training during two summer institute sessions (each 2-3 weeks in duration), with individual mentoring occurring throughout the 2-year training period. Matching mentees with experienced research faculty mentors from the mentee's institution (when possible) or from the summer institute and/or nationally recognized leaders elsewhere, is a vital component of this program's design. The efficacy of this approach is currently being evaluated in terms of mentees' achievements with respect to grant receipt, number of publications, and career progression. A more comprehensive description of the program's successes, including objective data, is currently under review elsewhere.³⁵ Here, we offer a few examples of mentee's perceptions on the value of PRIDE training in moving them toward productive academic research careers:

"...with PRIDE ... mentors are someone like you, who went through what you went through, so they understand what you are going through. If they can make it, I can make it also..." (Mentee A)

"Tremendous. The mentoring from the PRIDE Program has surpassed the mentoring I have received from my home institution. It is nice to have a place to discuss the nuances of be-

ing a minority researcher, while not lowering expectations or considering such concerns as trivial." (Mentee B)

Although congruence in mentee-mentor matching is emphasized, PRIDE programs endeavor to engage proven strategies that support successful outcomes. How both of these are integrated into active programs is highlighted below in four of the seven currently funded summer institute programs. These four have a focus on cardiovascular disease and/or related conditions and concomitant health-related disparities.

The Cardiovascular Health Related Research Program

Under the umbrella of the Brooklyn Health Disparities Center, The Cardiovascular Health Related Research (PRIDE-CVD) at the State University of New York Downstate Medical Center engages fundamental training by interdisciplinary faculty in the areas of health disparities. Key program elements include: partnerships between mentors and mentees based on the mutual CVD disparities research interests; capacity building by training and coaching mentees in grant writing; and close partnership with community-based organizations to support the training of program participants in cardiovascular health disparities research careers. This comprehensive training and mentoring platform allows mentees to gain career-development and research-relevant tools with which to build robust funding portfolios and gain deeper knowledge about cardiovascular health disparities. To date, 52 program participants have completed a

full grant application to support their research projects, all have formed networks inclusive of colleagues and faculty, often from other underrepresented populations, and have been inspired to fully pursue a research career knowing that dedicated mentors are available to provide guidance.³⁶ One recent graduate summed it as follows:

"I came to PRIDE-CVD at the mid-career stage in the first cohort of PRIDE-CVD, scared to write grants because of how competitive it was and because I didn't know how to write grants while also continuing to publish and fulfill my teaching and service obligations. I had written grants before (K01 applications), which were scored but not funded. It wasn't until I became a PRIDE-CVD scholar that I realized that my mentors were supposed to read my application. Of course, the grant instructions indicate that the mentors should be involved in developing the K application. However, this was not my experience. As a result, I never realized the true meaning of 'team science' until I got to PRIDE-CVD."

The PRIDE-Cardiovascular Genetic Epidemiology Program

The PRIDE-Cardiovascular Genetic Epidemiology (CGE) program located at Washington University in St. Louis, MO, focuses on research experiences in genetic epidemiology and bioinformatics in cardiovascular diseases and related conditions including hypertension. Training includes instruction on basic concepts and methods in genetic epidemiology, with an emphasis on genetic association studies and instruction in

bioinformatics. In addition, a series of special lectures and workshops are offered on a variety of topics related to cardiovascular diseases and genetic epidemiology to underscore recent developments in genomics that clearly show how genes contribute to individual variation in health and disease.³⁷ Advances in genetic and statistical methods are combined to demonstrate how to measure genetic ancestry and describe the architecture of genome variation across individuals and populations. These emerging methods are critical for admixed populations such as Latinos and African Americans, where most individuals are unaware of their precise ancestry and report ancestry based on the national origin of their family and/or their physical appearance. The PRIDE-CGE program's training includes how to incorporate measures of environmental variables, genetic ancestry, and physiologic mediators of the causal nexus in sophisticated statistical models to identify risk factors for heart, lung, sleep and blood diseases. As a result, this program is developing a cadre of individuals who will be able to help decipher the role of biological and other determinants of health disparities within and between groups, bridging a major research gap.

The PRIDE-Functional and Translational Genomics of Blood Disorders Summer Institute Program

As one of the original three summer institute programs funded by NHLBI in 2006, The PRIDE-Functional and Translational Genomics of Blood Disorders (PRIDE-FTG) Summer Institute program focuses on functional and

translational genomic approaches that can be used to investigate mechanisms of blood and cardiovascular diseases to discover the genetic basis of clinical phenotypes. This program leverages its pool of nationally recognized mentors toward equipping its participants from underrepresented groups to achieve extramural funding success that, in turn, can increase retention and promotion to higher academic ranks. Matriculates are supported with in-class sessions as well as hands-on laboratory experiences to help them hone their research skills related to blood diseases in general, with a focus on sickle cell disease in particular, which is the most common genetic disease in people of African descent. Noting marginal progress toward developing effective therapies for this high-mortality condition, mentees are supported to visit the laboratories of their nationally renowned mentors during the course of their training year where they gain direct mentorship and enhance research skills. The value of this combined didactic and laboratory approach in helping participants establish productive research careers has been described by one mentee as follows:

"I have gained invaluable mentoring guidance and grant writing skills here at PRIDE. I believe that PRIDE has given me the foundation to have a GREAT funded proposal and research career."

The Program to Increase Diversity in Behavioral Medicine and Sleep Disorders Research Training Institute

The NHLBI-funded PRIDE summer institute programs have had far-reaching effects in other arenas as

well, as evidenced by the NYU program. The Program to Increase Diversity in Behavioral Medicine and Sleep Disorders Research Training Institute at NYU School of Medicine is built on the belief that increasing the recruitment and retention of faculty from underrepresented backgrounds is achievable through a sustained effort to maximize exposure to career-development opportunities and through focused interactions with seasoned mentors and peer mentors in an autonomy-supportive academic network. Congruent mentoring is used to expose trainees to learning opportunities intended to inspire them to conduct research in sleep health disparities while employing innovative translational behavioral medicine models. This approach uses a mentorship model that considers how ethnic and cultural differences between mentors and mentees might adversely impact the academic achievement of the mentee.³⁸ As evidence suggests, this program creates a 'safe place' for mentees from underrepresented backgrounds to explore and grow.³⁹ Accordingly, mentors and mentees are matched based on similarities in: a) academic interests; b) background; and/or c) personal interests.³⁸

Similar to other PRIDE programs described above, the NYU Behavioral Medicine and Sleep Disorders PRIDE program exposes participants to an initial two-week summer session providing didactic training, followed by a mid-year progress report, ending with a one-week summer session focused on participation in an NIH mock grant review. Key elements engaged to ensure academic success among the mentees include:

academic leadership training; provision of peer- and faculty-networking opportunities; monthly webinars featuring scholar presentations with mentor feedback; academic social networking and career-development information sharing; and congruent peer mentorship³⁹ to support frank discussions of academic challenges.

Besides its direct impact on those who participate in the NHLBI PRIDE Program (both faculty and mentees),

Here, we have briefly described the rationale and design of an on-going NHLBI-funded initiative called the PRIDE Program, which aims to increase diversity in the biomedical research workforce...

this program's training model has also become the foundation for several NIH-funded programs such as the Cardiovascular Research Training (CaRT) Institute in Ghana and Nigeria funded by the NIH/Fogarty International Center;⁴⁰ the Training Core of the NYU Center for Stroke Disparities Research;⁴¹ and the Post-doctoral Training Program in Behavioral Neuroscience, recently funded by the National Institute for Neurological Disorders and Sciences.⁴²

CONCLUSION

The United States is becoming an increasingly diverse nation and the persistence of both health disparities and health inequities suggests that the clinical and research needs of diverse populations will continue to be a major public health concern. To maintain current health gains, skilled researchers from all segments of society need to be engaged in the biomedical research enterprise. One means toward this end is to use targeted mentoring and specialized biomedical research training programs to increase the number of scientists from underrepresented backgrounds to conduct research. Here, we have briefly described the rationale and design of an on-going NHLBI-funded initiative called the PRIDE Program, which aims to increase diversity in the biomedical research workforce, and to specifically expand the ethnic/racial representation of individuals who pursue research in NHLBI mission-relevant, scientific areas. To date, more than 275 early career investigators have benefited from the PRIDE Program at geographically diverse sites, under the leadership of many diverse principal investigators from both majority and minority backgrounds who themselves are committed to advancing the career development of early-career investigators who focus on varied scientific and methodological interests. Through these mentoring and training programs, progress is being made in equipping scientists from underrepresented groups to become contributors to the scientific enterprise within the biomedical sciences.

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DISCLOSURE OF POTENTIAL CONFLICTS OF INTEREST

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RESEARCH INVOLVING HUMAN PARTICIPANTS AND INFORMED CONSENT

Informed consent or exemption was obtained from each mentee, as approved by each institution's institutional review board.

DISCLAIMER

The views expressed in this article are those of the authors and do not necessarily represent the views of the National Heart, Lung, and Blood Institute, National Institutes of Health, or Department of Health and Human Services.

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