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REPORT
IN BRIEF

Understanding Interventions that Encourage Minorities to Pursue Research Careers

Summary of a Workshop



"We are faced with a really huge problem."
—Clifton A. Poodry,
Director, Division of
Minority Opportunities
in Research, National
Institutes of Health

Minority groups are severely underrepresented among the scientific workforce; this problem is amplified among biomedical and behavioral researchers in particular. Of the 4,396 doctorates awarded in the biological sciences in 2005, just 158 went to African Americans, 227 to Hispanics, and 12 to American Indians.

A variety of "intervention programs" encourage minorities to pursue careers in research. However, despite a belief that these programs often achieve their goals, there is relatively little understanding of the factors that contribute to that success. The Division of Minority Opportunities in Research (MORE) at the National Institute of General Medical Sciences (NIGMS) of the National Institutes of Health (NIH) has established a grant program to support research to better understand the efficacy of intervention programs and asked the National Academies to organize a workshop focusing attention on the issues addressed by the grant program. Although the focus of the workshop was on biomedical and behavioral sciences, much of the research presented is broadly applicable to other fields.

Research to understand the factors that contribute to the success of intervention programs is critical, said Anthony L. DePass of Long Island University–Brooklyn: "There are political and other pressures for us to really get it right, [to] create a body of scholarship that really demonstrates, based on empirical studies, what works, how to do it, and how not to do it."

Howard University's Orlando L. Taylor described the benefits of diversity among researchers: it demonstrates that the highest levels of achievement are accessible to the members of any group; furthermore, it enhances recognition of the full range of challenges affecting people in the United States. Elias A. Zerhouni, Director of NIH, emphasized the importance of diversity to NIH's future: "It is a strategic imperative that we succeed in making sure that we have the scientific body in 20 to 30 years that represents the vitality of our society."

Examples of Intervention Approaches

Nicholas Ingoglia of the University of Medicine and Dentistry of New Jersey (Newark) described how pre-college students from underprivileged backgrounds may not have the context for what scientific research even entails. "They don't even know what research is... They are bright kids, but they just don't have the information," he said. The challenge is to get these students to aim high: "Setting the goal to do well, go higher, is very often half the battle," he said.

Several workshop presenters described interventions designed to reach students at the undergraduate level, including a variety of programs that provide undergraduate research experiences, sometimes coupled with non-aca-

demographic support and community building. However, as Boston College's David R. Burgess pointed out, many of the most successful programs tend to be relatively small and expensive, partly because they are comprehensive and incorporate elements specific to a particular setting.

Other workshop participants described interventions that target graduate students or postdoctoral researchers, or that are designed to recruit and retain faculty. Several presenters addressed the question: How should "success" be defined for a graduate student? It is not possible, as DePass pointed out, for every graduate student to become a researcher. He identified a "need to look at exactly what we consider a successful research career. The numbers alone would dictate that we all cannot be at research I institutions. [Other] career tracks are research-related, and we need to consider those as we move on and decide what other measures of success are," he said.

Research Is Needed to Improve Intervention Programs

"Step one in making progress is realizing that we need, as a group, to come together with some testable pilots and identify the true drivers without being shy about what the issues are."

—Elias A. Zerhouni, Director, NIH

Workshop presenters identified a need to conduct rigorous research to identify the key elements that lead to successful intervention programs. NIGMS director Jeremy Berg outlined three fundamental questions that need to be answered:

- What are the probabilities that an individual with a given set of characteristics will make the transition

from one stage to another in a career in research?

- Why do people with different characteristics make the decisions that they do?
- How can these probabilities be changed?

Berg also described some of the challenges to answering these questions. Once an intervention program is implemented, he explained, it takes a long time to gauge the effects of that intervention in the scientific workforce: How should success be defined? How can one determine which elements of a program are working and which are not?

Examples of Previous Research

Speakers at the workshop offered examples of research from the contexts of several disciplines to explain the complex processes involved in making educational and career choices. What follows is a snapshot of some of the ideas discussed at the meeting.

Social Cognitive Career Theory

Social cognitive career theory explores the psychological and social factors that influence choices related to education and careers. As Robert W. Lent of the University of Maryland, College Park, put it, the fundamental question is "Can I do this thing? Can I do well in a science or engineering-related major in college?" One way to improve intervention programs, according to Lent, is by "getting people to rethink areas they might be able to do well at but have prematurely foreclosed upon because they don't believe they have the ability to do well or don't know enough about the field to want to pursue it." Other options he identified include clarifying and supporting career goals, instilling realistic outcome expectations, and helping people to manage environmental barriers and build support systems.

The workshop "*Understanding Interventions that Encourage Minorities to Pursue Research Careers: Major Questions and Appropriate Methods*" was held on May 3-4, 2007 in Washington, D.C. Additional information about the workshop, including speaker presentations, is available at <http://www.nationalacademies.org/moreworkshop>.

Workshop Speakers and Panelists: **Jeremy M. Berg**, National Institutes of Health; **Carol J. Burger**, Virginia Polytechnic Institute and State University; **David R. Burgess**, Boston College; **Martin M. Chemers**, University of California, Santa Cruz; **Yolanda S. George**, American Association for the Advancement of Science; **Larry V. Hedges**, Northwestern University; **Tuajuanda Jordan**, Howard Hughes Medical Institute; **Barry R. Komisaruk**, Rutgers, The State University of New Jersey; **Robert W. Lent**, University of Maryland, College Park; **Kenneth I. Maton**, University of Maryland, Baltimore County; **LaRuth C. McAfee**, Case Western Reserve University; **Michael T. Nettles**, Educational Testing Service; **Clifton A. Poodry**, National Institutes of Health; **Anne Preston**, Haverford College; **Shiva P. Singh**, National Institutes of Health; **Claude Steele**, Stanford University and Center for Advanced Study in the Behavioral Sciences; **Orlando L. Taylor**, Howard University; **Wanda E. Ward**, National Science Foundation; **Elias A. Zerhouni**, National Institutes of Health.

Human Capital Theory

Anne Preston of Haverford College described how human capital theory, rooted in economics, offers another perspective to understand how interventions might influence individuals' decisions. For example, she explained that mentoring programs can increase knowledge and change expectations; better job placement programs might lead to better returns on an investment in human capital; and fellowships, research and teaching assistantships, and other forms of financial support can reduce the costs of the investment.

Social Identity and Stereotype Threat

"It is one thing to integrate a school setting or work place. It is another thing to make that setting a place where everybody seems to flourish—where they feel like they belong."—Claude Steele, Stanford University

Steele described how social identity and stereotype threat can provide insights to the context of diversity issues in the scientific workforce. The social identities held by individuals (based on age, sex, race, religion, ethnicity, and so on)—and the stereotypes associated with those identities—can influence educational performance, he explained.

According to Steele, cues in the environment can accentuate or lessen the effects of a stereotype threat. For example, he said that when women are greatly outnumbered by men in taking a math test, they tend to perform worse than if men are absent. Individuals are always looking around and counting how many other people share their social identities in a particular setting, Steele explained: "People do respond to numbers." He described particular interventions that can dramatically shape how students respond to such cues.

Survey Research

Michael T. Nettles of Educational Testing Service described a survey that studied factors influencing students' graduate school experiences. The survey results Nettles described showed that these students' experiences are affected by the type of financial support they have. For example, in sciences, mathematics, and engineering, African American students were less likely than white students to be supported by research assistantships, even when background characteristics and student experiences are taken into account. Yet being a research assistant can have a profound effect on a student's graduate school experience by providing "an increase in students' social interactions with peers, their academic interactions with faculty...and their overall research productivity," Nettles said.

The Elements of Effective Research

Shiva P. Singh of the MORE Division gave an overview of the Division's Efficacy of Interventions grant program, which supports research proposals to inform the development of interventions that encourage minorities to pursue research careers. Barry R. Komisaruk of Rutgers University, who helped to develop the grant program, detailed some of the questions posed by reviewers of those research proposals, including the following:

- Is the proposed program research—or is it an assessment or description of a program?
- What is the likelihood that the proposed intervention will have a measurable effect?
- Is the research sensitive to the unique social, cultural, economic, and other issues of the groups being studied?
- Is the design of the questionnaires and interviews appropriate? Are the statistical analyses and other analytic techniques appropriate?
- Does the research team have the necessary expertise?

Martin M. Chemers of the University of California, Santa Cruz, identified three key factors in formulating a research question: focus, theories, and competencies. He explained that in choosing how to focus a study, researchers almost inevitably peer through the lens of their own expertise to select research questions. Chemers described how developing a theoretical framework describing the central features of an intervention program is important to put it into the context of what is known. He also emphasized the importance of interdisciplinary collaboration.

Workshop speakers and participants acknowledged that there are many relevant and important research questions. A handful of the many potential research questions offered at the workshop include the following:

- Are there specific forms of teaching or mentoring that lead students to pursue research careers?
- Can the influence of mentors or other role models be measured, linked to outcomes, and modified?
- Do research experiences positively affect career choices, and what are the principal components of these experiences and effects?
- Among recent undergraduates, which factors and experiences affected their decision to enter or avoid a biomedical career?
- Among graduate students in the biomedical and behavioral sciences, what were the optimal times of their entry into a research laboratory experience, and what are the characteristics of these students and

their experiences that may have contributed to their pursuit of graduate study?

Larry V. Hedges of Northwestern University described three fundamental principles to which a research design should adhere:

1. Variation is essential in order to obtain empirical evidence that relations exist; if researchers study only effective programs, they cannot be sure which features of effective programs do not also exist in ineffective programs.
2. Not all relations are equally sized, and the size of an effect needs to be compared to other effects or measures to gauge its importance.
3. When studying developmental processes, longitudinal studies are almost always more revealing than cross-sectional studies.

Kenneth I. Maton of the University of Maryland, Baltimore County identified the need for statistical methods to be built into a research project from the beginning: “The techniques that you apply to analyze your data should be those that are appropriate to answer the questions you are asking.” He described various cases in which different statistical methods, including factor analysis, analysis of variance, analysis of covariance, and predictors of outcome, would be most appropriate.

Building the Research Community

One objective of the workshop was to foster the development of a community of scholars interested in pursuing research related to the participation of minorities in biomedical and behavioral

research. Workshop participants discussed ways to extend that support beyond the meeting itself. One important emphasis was the dissemination of information on funding opportunities, ongoing projects, and research results. Carol J. Burger of Virginia Tech mentioned the need for journals to serve as avenues for sharing the results—including negative results—of relevant studies in this area. Other workshop participants described how conferences, electronic mailing lists of past and current awardees from programs that support research into educational interventions, and a website on the topic would also be effective ways to foster a community of researchers in this area.

Workshop participants outlined how federal agencies, nonprofit organizations, professional societies, and other funders of research can contribute to an understanding of educational interventions, by conducting research or supporting others to do research, for example. Reporting on a breakout discussion, Alyson Reed of the National Postdoctoral Association described how funders can examine intervention programs that they have funded, and can collaborate with each other to establish a coordinated research agenda and common tools.

As the workshop drew to a close, participants acknowledged that it had been a valuable first step; as Howard H. Garrison of the Office of Public Affairs at the Federation of American Societies for Experimental Biology put it, the workshop began “establishing a community that can help carry this work forward.”

Planning Committee for the Workshop on Understanding Interventions that Encourage Minorities to Pursue Research Careers: Anthony L. DePass (*Co-Chair*), Long Island University; Larry V. Hedges (*Co-Chair*), Northwestern University; Daryl E. Chubin, American Association for the Advancement of Science; Howard H. Garrison, Federation of American Societies for Experimental Biology; Carol B. Muller, MentorNet; Karen Kashmanian Oates, Harrisburg University of Science and Technology; Adam P. Fagen (*Study Director*), National Research Council.

This report brief was prepared by the National Research Council based on the workshop summary *Understanding Interventions that Encourage Minorities to Pursue Research Careers*. For more information, contact the Board on Life Sciences at (202) 334-2187 or visit <http://nationalacademies.org/bls>. Additional information about the workshop, “*Understanding Interventions that Encourage Minorities to Pursue Research Careers: Major Questions and Appropriate Methods*,” is available at <http://www.nationalacademies.org/moreworkshop>. Copies of *Understanding Interventions that Encourage Minorities to Pursue Research Careers* are available from the National Academies Press, 500 Fifth Street, NW, Washington, D.C. 20001; (800) 624-6242; www.nap.edu.

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