
Building a Diverse Genomics Workforce Action Agenda: *Implementation Plan and Progress Report*

The **Forefront**
of **Genomics**



Letter from the Leadership of the National Human Genome Research Institute

Early in 2021, the National Human Genome Research Institute (NHGRI) made a renewed commitment to enhance the diversity of the genomics workforce by releasing “Building a Diverse Genomic Workforce: An NHGRI Action Agenda,” also known as the Action Agenda. Since then, our institute has worked hard to implement that agenda and is now proud to share this progress report that details our actions to date. NHGRI has developed new funding initiatives, expanded our engagement with communities and populations often underrepresented in outreach efforts, and set the stage for additional programmatic activities that will be forthcoming over the next several years. We will continue to advocate for cultural changes and make evidence-based decisions to improve the well-being of all. We recognize that the scientific ecosystem is rapidly changing, such that opportunities and challenges for careers in genomics are often in flux. Our Action Agenda and its implementation will thus need to remain dynamic and responsive to the needs of relevant scientific communities. What has remained constant is that genomics is a field in which basic, translational, clinical and bioethics research must come together to improve human health and reduce disease, and the long-term success of those efforts requires a more diverse genomics workforce. We are early in our efforts to implement the Action Agenda and we are already grateful to those who have embraced this cause and are helping us achieve our stated goals.



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Introduction

In January 2021, NHGRI released “Building a Diverse Genomic Workforce: An NHGRI Action Agenda”,¹ which accompanies and links to the 2020 NHGRI Strategic Vision.² Both documents express NHGRI’s commitment to enhancing the diversity of the genetics and genomics workforce. The 2020 NHGRI Strategic Vision outlines the institute’s priorities for human genomics research and identifies opportunities for the institute to advance human health through genomics research. Within the Strategic Vision is a set of guiding principles and values that undergirds the goals of the institute for the coming decade. Among these goals is the need to attract and retain a diverse genomics workforce. The Action Agenda builds on the Strategic Vision by more completely describing the goals and identifying strategies for meeting this need.

The Action Agenda aims to make progress towards building a genetics and genomics workforce that is more diverse and inclusive and informs communities about scientific opportunities available in the field. This aspiration cannot be realized without a concerted effort from NHGRI and many partners within the scientific and biomedical communities. All involved in the genetics and genomics workforce have a role in the dynamic process of understanding and improving this workforce ecosystem, including identifying gaps in the Action Agenda that are revealed during the implementation process. Although some of the Action Agenda’s programs and projects overlap in objectives, each offers the promise of an individual impact on enhancing the diversity of the genetics and genomics workforce, advancing the participation of underrepresented groups and/or increasing health equity within the genomics research enterprise.

This report is a way of monitoring progress towards actualizing the Action Agenda and describes newly developed NHGRI programs. The short- and long-term goals within the Action Agenda have implementation strategies and indicators of success. NHGRI recognizes the need for a responsible unit and has established the Training, Diversity, and Health Equity (TiDHE) Office within the institute’s Office of the Director in 2021. TiDHE’s mission is to serve as the hub for leading NHGRI’s training programs, work to build a more diverse genomics workforce and facilitate broader efforts to improve health equity research in genomics. TiDHE collaborates with NHGRI’s Extramural Research Program and Intramural Research Program (as well as other institute components) in all of its pursuits and consists of personnel who have expertise in extramural program development, portfolio analysis, genomics and health equity research, genomics education and training as well as community engagement. In short, TiDHE provides leadership for implementing NHGRI’s Action Agenda and helps to communicate the importance of the Action Agenda’s goals and objectives.



Community Engagement

Through implementing the Action Agenda, NHGRI is engaging communities while developing programs to diversify the genomics workforce. NHGRI has placed special emphasis on communicating the role of genomics in advancing human health to both the scientific community and the public as well as capturing the various perspectives about genomics research and its connection to clinical care. In its first year, TiDHE engaged an array of constituents, which includes administrators, faculty and students from Minority-Serving Institutions (MSIs); biomedical and pharmaceutical companies; genomics researchers, including early stage investigators and trainees; and genetics and genomics professional societies (Figure 1). NHGRI has engaged various members of the scientific community (Appendix A), such as leadership of Historically Black Medical Schools (HBMSs) and medical schools in Puerto Rico and has informed them of the Action Agenda and TiDHE’s goals, all of which has been instrumental in identifying gaps within NHGRI’s research portfolio.

Developing longstanding relationships with scientific communities can enhance NHGRI’s ability to identify the gaps related to strengthening the diversity of the genetics and genomics workforce and to implement changes that will have long-term positive effects on the field and its workforce. NHGRI and TiDHE hosted roundtable discussions with MSIs, biomedical and pharmaceutical industry representatives and academic partners (Figure 1). For example, during the 2022 American Society of Human Genetics (ASHG) Annual Meeting, NHGRI hosted an ancillary event entitled “NHGRI Building a Diverse Workforce: Listening to the Voices of Trainees and Early-Stage Investigators.” This ancillary session engaged trainees and early stage investigators in discussions about professional opportunities for genomics researchers from diverse backgrounds, including those from underrepresented groups, and strategies for strengthening genetics and genomics training opportunities. NHGRI in 2022 established a new award to recognize early-stage and established extramural investigators (Appendix B).



Figure 1: NHGRI Action Agenda Selected Activities



Overview

To be at the forefront of efforts of enhancing diversity of the genomics workforce, the “NHGRI Action Agenda for a Diverse Genomics Workforce” has the following four major goals.

GOAL 1:



Develop and support initiatives that provide early exposure and access to careers in genomics.

GOAL 2:



Develop and support training programs and networks that connect undergraduate and graduate education to careers in genomics.

GOAL 3:



Develop and support training, career development, and research transition programs that lead to independent research and clinical careers in genomics.

GOAL 4:



Evaluate progress towards achieving greater diversity in the genomics workforce.

NHGRI is committed to both short- and long-term strategies for implementing the goals of the “NHGRI Action Agenda for a Diverse Genomics Workforce,” which includes evaluating progress using defined metrics. The institute will use this agenda’s goals, objectives, and implementation strategies to develop appropriate programs that, if successful, will substantially enhance the diversity of the genomics workforce by the end of this decade.

GOAL 1:



Develop and support initiatives that provide early exposure and access to careers in genomics.

The first goal of the Action Agenda aims to promote the general public's awareness of career opportunities in genomics. Since the release of the Action Agenda, initiatives to increase exposure to careers in genomics are being developed and implemented. For example, NHGRI envisions that bringing awareness of genomics to those early in their education will aid in enhancing diversity in the genetics and genomics workforce. With heightened awareness of careers within the field, the public is in a better position to be a part of the next generation of genomic scientists. NHGRI plans to expand its engagement in STEM education by maximizing outreach to people who may not be familiar with the field. Exposing new generations of professionals to the fields of genetics and genomics and communicating how genetics and genomics impact health are important for implementing the Action Agenda and actualizing the long-term objectives associated with the first goal.

Objectives

1. Identify best practices in programming designed to provide early exposure to genomics, including barriers and recommendations to eliminate those barriers.
2. Support and participate in programs that are designed to encourage individuals of diverse backgrounds to pursue genomics careers, especially for persons who are historically underrepresented in science.



Initiatives:

Public Programs

National Museum of African American History and Culture (NMAAHC) Program Series — This collaborative four-part public program series involving NMAAHC, the Foundation of the National Institutes of Health (FNIH) and NHGRI highlights advances made by African American scientists in genetics and biomedical research. The series focuses on African American leaders in medicine and research, career highlights from senior biomedical researchers, careers of junior genomics researchers and opportunities to enhance diversity and equity in biomedical research.

Extramural Research Program

NIH Science Education Partnership Award (SEPA; R25) — NHGRI has signed on to this funding opportunity to support the development of informal educational activities in pre-kindergarten through grade 12 that: (1) complement and/ or enhance the training of a workforce to meet the nation's biomedical, behavioral and clinical research needs; (2) encourage individuals from diverse backgrounds to pursue further studies or careers in research; (3) help recruit individuals with specific specialty or disciplinary backgrounds to research careers in biomedical, behavioral and clinical sciences; and (4) foster a better understanding of biomedical, behavioral and clinical research and its implications ([PAR-20-153](#)).

Genomic Data Science Community Network (GDSCN) — NHGRI's Office of Genomic Data Science (OGDS) and TIDHE are supporting the expansion of GDSCN to enable a broader and more diverse spectrum of undergraduate educational institutions, including minority-serving institutions and community colleges, to have access to genomic data science opportunities. This effort leverages the Genomic Data Science Analysis, Visualization and Informatics Lab-space (AnVIL), a scalable and interoperable cloud-based resource for the genomics community.

GOAL 2:



Develop and support training programs and networks that connect undergraduate and graduate education to careers in genomics.

The second goal of the Action Agenda focuses on individuals training at the undergraduate and graduate levels with a developing interest in genetics and genomics. NHGRI plans to advance training programs and develop novel opportunities to prepare students for careers in genomics. Implementing this goal entails building sustainable relationships with colleges, universities and genetics and genomics professional societies. As undergraduate and graduate education programs expand to reach a more diverse workforce, these trainees will be better prepared for future career opportunities in genetics and genomics, thus increasing the retention of individuals from diverse backgrounds within the field. Maintaining communication with these groups will also aid NHGRI in attracting and sustaining a diverse scientific workforce to the field, which is currently lacking in the biological sciences more broadly.

Objectives

1. Create a systematic network of support for students from diverse backgrounds, including those from underrepresented groups, as they enter and move through graduate training programs in genomics.
2. Ensure that undergraduate minority-serving institutions and community colleges are aware of and are tightly connected to this network.
3. Encourage inclusive climates at all leading graduate-level genomics training programs to mentor and promote cohorts of individuals from diverse backgrounds, including underrepresented groups.



Initiatives:

Public Programs

ASHG Human Genetics Scholars Initiative (HGSi) Program — NHGRI and ASHG have continued their partnership through this longstanding program. This program aims to advance diversity and inclusion in the genomics workforce by: (1) identifying, mentoring and preparing a select group of high-potential, early career individuals from diverse backgrounds for professional success; and (2) developing and sustaining a community of researchers across generations who are committed to workforce diversity and inclusion and who will foster sustained attention to these issues at their institutions.

Intramural Research Program

Immersive Summer Program for Research in Genomics (iSPRiNG) — This summer program, coordinated by NHGRI's Intramural Training Program with support from TiDHE, aims to build a skilled and diverse workforce of genomics scientists in basic, behavioral, clinical and social science research. This program introduces highly motivated students to the field of genomics through summer experiences in genomics research at NHGRI. Students work alongside leaders in the field, receive individualized research mentoring, learn about careers in genomics and have access to a network of early career genomics professionals ([iSPRiNG Program](#)).

Extramural Research Program

NHGRI Predoctoral to Postdoctoral Transition Award for a Diverse Genomics Workforce (F99/K00) — This funding opportunity provides career continuity between the predoctoral and postdoctoral stages of an individual's research training. Graduate students from diverse backgrounds will receive scientific and career development opportunities to prepare them to become independent genomics researchers ([PAR-21-143](#)).

Diversity Genome Research Centers — This new initiative supports the development of innovative genomics research projects through infrastructure building and the formation of interdisciplinary research teams at research institutions that have a historical mission of serving underrepresented populations. This program will improve genomics research capacity at these institutions, enhance the diversity of the genomics research workforce, amplify innovation and creativity and increase the participation of underrepresented populations in genomics research (Figure 1) ([RFA-22-026](#), [RFA-22-027](#)).

Educational Hub for Enhancing Diversity in Computational Genomics and Data Science — OGDS and the Training Program are co-funding a grant that uses the NHGRI-funded AnVIL and other NIH cloud-based platforms to enhance access to educational and research opportunities in computational genomics and data science among individuals from diverse backgrounds, including those from underrepresented groups. This initiative will focus on opportunities for those seeking undergraduate and master's degrees ([RFA-HG-22-002](#)).

Genome Research Experiences to Attract Talented Undergraduates into the Genomics Field to Enhance Diversity (GREAT) Program — Through collaborative institutional partnerships, this program supports educational activities that encourage undergraduates from diverse backgrounds to pursue further training and careers in the scientific, medical, ethical, social and/or legal areas of genomics research (Figure 1) ([RFA-HG-22-004](#)).

NHGRI Diversity Supplement Program — TiDHE plans to increase awareness among the current grantee community about the availability of supplemental funds through the Diversity Supplement Program. This program provides additional support to existing NHGRI grants for research experiences for individuals from diverse backgrounds including those at high school to the faculty level ([PA-21-071](#)).

Chief Officer for Scientific Workforce Diversity (COSWD) Administrative Supplement Program to Recognize Excellence in Diversity, Equity, Inclusion, and Accessibility (DEIA) Mentorship — In partnership with the NIH COSWD Office, NHGRI reviewed and co-funded supplement requests for grantees to expand their mentoring contributions to enhancing diversity, equity, inclusion and accessibility in genomics research ([NOT-23-002](#)).



GOAL 3:



Develop and support training, career development, and research transition programs that lead to independent research and clinical careers in genomics.

The third goal of the Action Agenda focuses on training the next generation of genomics scientists and healthcare professionals from diverse backgrounds, including those from underrepresented groups. In addition to a lack of diversity among genomics researchers, there is a notable lack of genomics expertise among practicing healthcare professionals, which adds to barriers in genomic clinical care and can expand health disparities.³ Diversifying the genomics workforce must include a direct focus on transforming current research and clinical training opportunities among those interested in the fields of genetics and genomics, and it is within the mission of NHGRI to develop programs and projects to enhance diversity among research and clinical professionals involved in genomics. In enacting the third goal of the Action Agenda, NHGRI believes that energizing and expanding training, career development and research and clinical transition programs will build a more diverse network of researchers and healthcare professionals who will become leaders in genomics and genomic medicine

Objectives

1. Identify and reduce barriers for individuals from diverse backgrounds who want to enter research and clinical careers in genomics.
2. Facilitate the inclusion and retention of individuals from diverse backgrounds in research and clinical careers in genomics.

Initiatives:

Intramural Research Program

Postdoctoral Fellowship Program in Genomic Science and Health Equity (NHGRI/FDA Fellowship) — This interagency postdoctoral fellowship program is co-sponsored by NHGRI and the U.S. Food and Drug Administration (FDA) Office of Minority Health and Health Equity (OMHHE). The three-year fellowship program provides training in genetic, genomic and pharmacogenomic approaches to advance minority health and health equity. Fellows are mentored by research investigators at NHGRI and OMHHE and trained in research methodology and medical product development.

Future Leaders Advancing Genomic Sciences in Health Innovation Postdoctoral (FLAGSHIP) Program — This program aims to train early-career postdoctoral scientists from diverse backgrounds to become future leaders in genomics research. The program's purpose is to build diverse teams and apply advanced genetic and genomic approaches to benefit people of all ancestries.

Extramural Research Program

New Investigators to Promote Workforce Diversity in Genomics, Bioinformatics, or Bioengineering and Biomedical Imaging Research (R01) — This funding opportunity promotes diversity in the genomics, bioinformatics, bioengineering and biomedical imaging research workforces by supporting independent research from early stage investigators from diverse backgrounds, including investigators from underrepresented groups. The goals are to: (1) diversify the workforce and recruit the most talented researchers from diverse backgrounds to conduct independent research relevant to NHGRI's mission; (2) improve the quality of the educational and training environment; (3) balance and broaden perspectives in setting research priorities; (4) improve the ability to recruit subjects from minority and other health disparity populations into clinical research protocols; (5) and improve the research and clinical capacity to address and eliminate health disparities ([RFA-HG-21-041](#)).

Investigator-initiated Research in Genomics and Health Equity (R01 and R21) — NHGRI's National Advisory Council for Human Genome Research recently approved a concept for a program to support early stage investigators from diverse backgrounds, including investigators from underrepresented groups in order to enhance the diversity of independent research in genomics and health equity. The institute plans to release a funding opportunity announcement for this area in the coming months.

GOAL 4:



Evaluate progress towards achieving greater diversity in the genomics workforce.

The fourth goal represents NHGRI's commitment to effectively evaluating the Action Agenda's programs and initiatives through metrics. Evaluation of the programs and initiatives are important for assessing use of resources and impact. Determination of the strengths and weakness of the NHGRI programs will be used to evaluate the long-term goals of the Action Agenda.

Objectives

1. Establish a relevant set of metrics for evaluating NHGRI diversity training and career development programs.
2. Use these metrics to develop tracking protocols for all individuals supported by these training programs.
3. Assess all NHGRI training and career development programs, including diversity-targeted programs with periodic reports to leadership.



Initiatives:

Public Programs

Human Genetics & Genomics Workforce Survey — NHGRI, the ASHG, the American College of Medical Genetics and Genomics (ACMG) and the National Society of Genetic Counselors (NSGC) funded the development of a report that provides baseline data that describe the demographic composition of the human genetics and genomics workforce (Figure 1).

Intramural and Extramural Research Program

Toolkit of Best Practices in Tracking Trainee Outcomes — NHGRI has initiated the development of a summary report and accompanying toolkit that will identify available best practices for defining and tracking trainee outcomes in biomedical and genomics research.

Conclusion

As NHGRI continues to work towards achieving a genetics and genomics workforce that is diverse and inclusive and accomplishes the goals and objectives outlined in the Action Agenda, improvements must be continuously made. Meanwhile, the institute can anticipate that new challenges will emerge, and new gaps will be identified while implementing the Action Agenda.

NHGRI and TiDHE regard newly identified challenges as opportunities to enhance the diversity of the workforce and improve the breadth of research and innovations in genomics. Already known challenges include constructing tangible improvements and identifying metrics for retaining a diverse workforce; recruiting more individuals from diverse backgrounds into the field; formulating impactful initiatives and training programs that lead to independent research and clinical careers; and making substantial and sustained improvements in the workforce. This requires long-term institutional commitment to tackling these issues, leading to innovative genomic science, medicine, and bioethics research questions. NHGRI endeavors to react quickly to newly identified gaps and to devise strategies to address them. In the two years since the release of the Action Agenda, NHGRI and TiDHE have developed and expanded programs and projects across multiple educational, training and career stages to enhance the diversity of the genetics and genomics workforce.

NHGRI cannot, however, achieve the goals of the Action Agenda alone. Through new and continued engagement with various communities, NHGRI hopes to support a workforce that reflects the needs of science. Articulating the important contributions of genetics and genomics and how this scientific discipline strengthens research and clinical care will lead to improved public outreach and engagement. Supporting genomics training programs will build interest in pursuing a career in the field and attract individuals from diverse backgrounds to genomics-oriented research and clinical careers. Implementation of the Action Agenda will become a cyclical process, in which each of the goals feeds into the institute's long-term strategic plan to diversify the genetics and genomics workforce.



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- Scientific community and representatives from different institutions
- Genomic Workforce Diversity Working Group
- Extramural Research Program staff
- Intramural Research Program staff
- Office of Communications staff
- Policy and Program Analysis Branch staff
- Education and Community Involvement Branch staff

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Community Engagement

Appendix A

Date(s)	Community Engagement Activity	Target Audience
Varied	Historically Black Medical Schools Engagement	Faculty and Administrators
July, Sept. 2021	Industry Roundtable	Leading Biotech Industry Representatives
May 2022	Geneticists Roundtable	U.S. Underrepresented Minorities (URM) Geneticists
Sept. 2022	Historically Black Colleges and Universities Roundtable	Historically Black Colleges and Universities Faculty and Staff
Sept. 2022	Hispanic Serving Institutions Roundtable	Hispanic Serving Institutions Faculty and Staff
Oct.-Dec. 2022	Smithsonian National Museum of African American History and Culture Speaking Program Series	Public
Oct. 2022	ASHG Ancillary Event	Trainees and Early-stage Investigators

Appendix B

Outstanding Award for Enhancing Diversity, Equity, Inclusion, and Accessibility (DEIA) in the Genomics Workforce
 Outstanding Award for Enhancing Diversity, Equity, Inclusion, and Accessibility (DEIA) in the Genomics Workforce NHGRI developed a new award to recognize NHGRI early-stage and established extramural investigators who are making a sustained and substantial contribution to enhancing diversity, equity, inclusion and accessibility in the genomics workforce. The solicitation of nominations has been published ([NOT-HG-22-014](#)).

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