

Folakemi T. Odedina¹✉ and Mariana C. Stern²

¹Division of Hematology/Oncology and Center for Health Equity and Community Engagement Research (CHCR), Mayo Clinic Florida, Jacksonville, FL, USA. ²Departments of Population and Public Health Sciences and Urology, Keck School of Medicine of USC, Norris Comprehensive Cancer Center, Los Angeles, CA, USA.

✉e-mail: Odedina.Folakemi@mayo.edu

Published online: 11 November 2021
<https://doi.org/10.1038/s41591-021-01555-8>

References

1. Addo, I. Y. *Soc. Sci. Humanit. Open* **2**, 100074 (2020).
2. Collins, F. S. et al. *Cell* **184**, 3075–3079 (2021).
3. Jeste, D., Twamley, E., Cardenas, V., Lebowitz, B. & Reynolds, C. III *Am. J. Public Health* **99**, S31–S37 (2009).
4. Shavers, V. et al. *J. Natl. Med. Assoc.* **97**, 1063–1077 (2005).
5. 21st Century Cures Act of 2016, Pub. L. 114-255. Approved 10 December 2016.
6. Nikaj, S., Roychowdhury, D., Lund, P. K., Matthews, M. & Pearson, K. *FASEB J.* **32**, 6410–6422 (2018).
7. Hofstra, B. et al. *Proc. Natl Acad. Sci. USA* **117**, 9284–9291 (2020).

8. Erosheva, E. A. et al. *Sci. Adv.* **6**, eaaz4868 (2020).
9. Ginther, D. K. et al. *Science* **333**, 1015–1019 (2011).
10. Bhattacharjee, Y. *Science* **336**, 969–970 (2012).
11. Kaatz, A. et al. *Acad. Med.* **91**, 1080–1088 (2016).
12. Hoppe, T. A. *Sci. Adv.* **5**, eaaw7238 (2019).
13. Trejo, J. *Mol. Biol. Cell* **31**, 2752–2754 (2020).
14. Kamerlin, S. C. L. *EMBO Rep.* **21**, e51994 (2020).

Author contributions

F.T.O. and M.C.S. both contributed to the writing of this Comment.

Competing interests

The authors declare no competing interests.



The US National Institutes of Health approach to inclusive excellence

The National Institutes of Health (NIH) is committed to increasing the participation of underrepresented groups in science and medicine, through changes in our funding and recruitment processes. These actions provide a blueprint for the global research community.

Marie A. Bernard, Alfred C. Johnson, Treava Hopkins-Laboy and Lawrence A. Tabak

Diversity of thought and approaches is essential for maintaining creativity and innovation in any field¹ and research shows that this is as applicable for science as it is for other fields^{2–6}. The biomedical research ecosystem needs to take advantage of all creative minds to address the immense challenge of optimizing the health of the population (Fig. 1).

Science and medicine still lack diversity

The US population is increasingly diverse⁷, but much of this population is untapped within the biomedical workforce. It is well known that some researchers are disadvantaged in receiving funding support through NIH R01 equivalent grants^{8,9}. Underrepresented groups (URGs), as defined by the National Science Foundation (NSF), are also underrepresented among program directors and principal investigators identified on NIH R01 equivalent grant applications and awards (Fig. 2).

The NIH has redoubled its efforts to enhance the participation of URGs in biomedical science, with an additional focus on those who may have experienced structural racism^{10–12}. In an open letter in February 2021, the NIH Director Francis Collins wrote, “To those individuals in the biomedical research enterprise who have endured disadvantages due to structural



Fig. 1 | The challenge of biomedical research is akin to the examination of an elephant while lacking sight. The more diverse the input from several vantage points, the more likely the problem will be fully examined, and appropriate solutions derived. Art by ICF using imagery from [Shuttlecock](#).

racism, I am truly sorry. NIH is committed to instituting new ways to support diversity, equity, and inclusion, and identifying and dismantling any policies and practices that may harm our workforce and our science¹³.

Here we describe the NIH’s efforts to foster equity in the biomedical research community, future funding implications and

lessons that could be applied elsewhere in the world.

The NIH UNITE initiative

On 26 February 2021, the NIH publicly unveiled the UNITE initiative to address structural racism and the systemic barriers to the representation of URGs

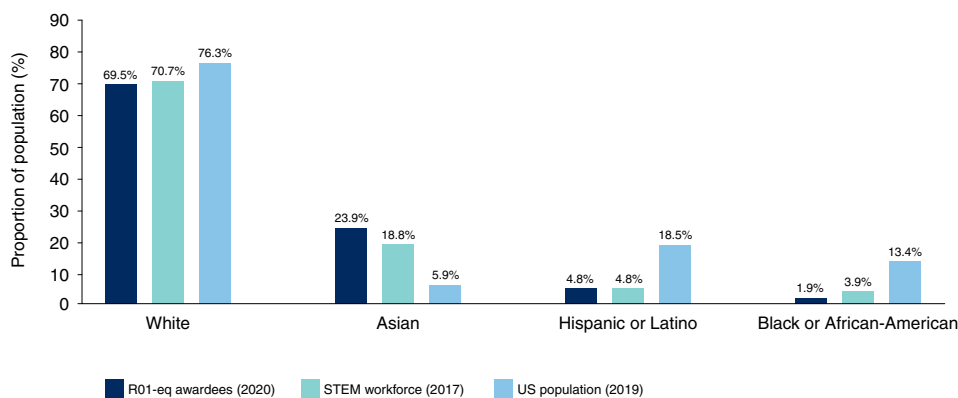


Fig. 2 | Racial and ethnic representation among NIH R01-eq grantees, STEM doctoral workforce, and US population (2017, 2019 and 2020). Sources: NIH, Chief Officer for Scientific Workforce Diversity, 2021 *Progress Infographic*, accessed August 2021; NSF, National Center for Science and Engineering Statistics, *Survey of Doctorate Recipients, 2017*; US Census, *Quick Facts, 2019 Population Estimates*, accessed August 2021.

in biomedicine¹⁴. UNITE builds on the foundational efforts of the NIH Chief Officer for Scientific Workforce Diversity (COSWD), the Diversity Program Consortium, the Office of Equity, Diversity, and Inclusion, and several other initiatives across the NIH.

Guided by five interacting committees, UNITE looks internally at the NIH scientific and non-scientific workforce; at the external biomedical workforce funded by NIH grants; and at the research that addresses health disparities, minority health and health equity. The goal of UNITE is to address barriers to full representation in each sphere to improve science and scientific outcomes. Crucially, for the first time, UNITE brings together representatives from all 27 separate NIH institutes and centers to work collaboratively to address this critical area (Fig. 3).

Funding

Funding is a major priority. Two NIH Common Fund funding opportunity announcements commit up to US\$24 million in the first three years and \$60 million in total for research into transformative health disparities and both have experienced a robust response. A third funding opportunity provides up to \$30.8 million from 25 NIH institutes, centers and offices to support agency-wide observational and intervention research that addresses the effect of structural racism and discrimination on minority health and health disparities.

Career opportunities for URGs will also be increased, starting with increasing participation of institutes and centers in the NIH Science Education Partnership Award, which targets science, technology,

engineering and mathematics (STEM) education for children aged 4 to 18. The NIH will expand its interactions with, and support of, Historically Black Colleges and Universities, Tribal Colleges and Universities, Hispanic-Serving Institutions, and other minority serving institutions.

There are also proposed funding increases for four NIH institutes: the National Institute on Minority Health and Health Disparities; the National Institute of Nursing Research; the National Heart, Lung, and Blood Institute; and the Fogarty International Center. These institutes and centers receive disproportionate numbers of applications that would support researchers from underrepresented racial and ethnic groups who research topics related to health disparities.

We are also encouraging the development of funding opportunities on specific disease and topic areas related to health disparities.

Workforce diversity

There are new efforts to facilitate a more diverse scientific workforce and greater diversity among grant recipients, including from the NIH's National Institute of General Medical Sciences to investigate the effect of structural racism and discrimination on the biomedical workforce, and the NIH-wide Brain Research through Advancing Innovative Neurotechnologies initiative. The latter was the first funding opportunity announcement to require applicants to submit, as part of the overall scoring criteria, a plan to enhance diverse perspectives—that is, a summary of strategies to advance the scientific and technical merit of the proposed project through expanded inclusivity.

Diversity cannot be improved without data. The NIH has therefore published data

about the demographics of NIH-funded researchers and NIH employees^{15,16}.

Many researchers from underrepresented backgrounds may not have access to networks that facilitate NIH funding. We therefore commit to listening and learning from a wide variety of stakeholders, including those we have not frequently engaged.

Additional programs will be developed to help ensure that academic and research institutions recruit more diverse cohorts and assure open and welcoming institutional cultures. For example, the Faculty Institutional Recruitment for Sustainable Transformation funding opportunity will support ten or more academic institutions in recruiting diverse faculty cohorts who have demonstrated a strong commitment to promoting diversity and inclusive excellence, focusing on their advancement and improving the institutional culture to help ensure that researchers from all backgrounds can thrive. This builds on existing programs such as the Distinguished Scholars Program (DSP) and the Institutional Research and Academic Career Development Awards Program.

Intramural tenure-track investigators from URGs have increased since NIH established the DSP¹⁷. The NIH plans to expand DSP to include senior investigators, further enhancing the diversity of the intramural research program.

Personal relationships and staff interactions can be pivotal in a scientist's entrance into the NIH funding system, often to the detriment of URGs. The NIH will therefore be reviewing the interactions of NIH staff, such as Program Officers and Scientific Review Officers, with researchers seeking funding support to address possible bias or inequities that may affect funding opportunities. The NIH also recognizes that it is crucial to signal the importance of diverse role models in science^{18,19}, and thus will change the NIH's physical and virtual representations to reflect the diversity of our society and workforce more accurately.

Measuring success

Success must be measured, and the NIH is committed to evaluating interventions and being informed by the evidence on how best to promote inclusive excellence.

Research suggests that assigning responsibility for diversity among institutional leaders can increase diversity at other levels of an organization²⁰. As such, starting in fiscal year 2022, the NIH will add a component to the annual evaluation of all directors of institutes and centers, with measurable outcomes, requiring them to be accountable for diversity, equity and inclusion.

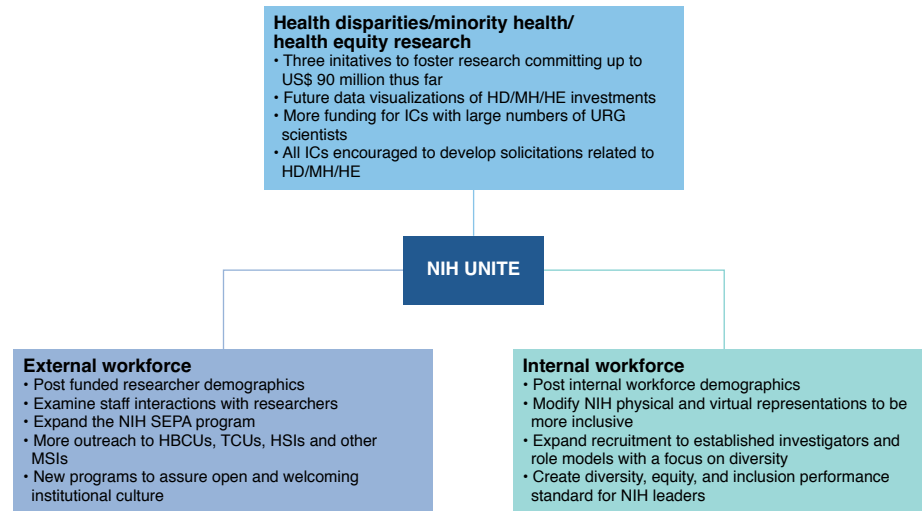


Fig. 3 | The NIH UNITE initiative is committed to identifying and implementing targeted actions that address structural racism in the NIH scientific and non-scientific workforce; in the external biomedical workforce funded by NIH grants; and in the research that addresses health disparities, minority health and health equity. HBCUs, Historically Black Colleges and Universities; HD/MH/HE, health disparities/minority health/health equity research; ICs, institutes and centers; HSIs, Hispanic-Serving Institutions; MSIs, Minority Serving Institutions; TCUs, Tribal Colleges and Universities.

Outreach for vacancies can be better targeted once the NIH is aware of the composition of its workforce, trends in hires and departures, and other benchmarks. UNITE works closely with NIH's Office of Human Resources and Office of Equity, Diversity, and Inclusion to look at the overall diversity of the internal workforce, using several evaluation techniques such as listening sessions, workgroups and workforce demographic analyses. UNITE will use these data to identify internal policies, procedures and structural norms that may be barriers to full equity for all staff, which can then be reduced with further assessments and corrective actions.

Appropriate metrics provide a broader grasp of a problem. Institutions must build qualitative and quantitative measures into every program and a process to identify and remove disparities from the funding ecosystem. The NIH evaluates its actions, in part, by looking for increases in grant applications that support scientists from URGs, success of proposals and increases in funded health disparities, minority health and health equity research.

Action for others

Assuring full inclusion of the variety of individuals who can contribute to scientific excellence, including those systematically disadvantaged based on race and ethnicity, involves implementing comprehensive, institutional-level strategies and approaches

informed by research. This is the approach the NIH is taking with the UNITE initiative and an exemplar of steps that others in biomedical research can and should take. Progress is made when academic and research institutions, and scientific and medical publishers, objectively assess each foundational system and process in their organization.

There are three components that academic institutions and publishers may wish to replicate immediately. First, organizations should be clear that diversity, equity and inclusion are part of their core values. As such, the NIH publicly declared that it values diversity and acknowledged and committed to ending structural racism.

Second, organizations must be transparent about who moves their work forward. For academic and research institutions, this requires transparency about faculty demographics, while funders and publishers should share workforce and reviewer demographics, as the NIH has done with the recent posting of internal demographics, and the work of the NIH Center for Scientific Review, which regularly updates its reviewer demographic data.

Third, organizations should hold all decision makers accountable for diversity, equity and inclusion by making these expectations part of the performance metrics for institutional leaders, as the NIH is initiating for fiscal year 2022. Hiring managers should also commit to

considering a broad range of people and perspectives when recruiting and avoid reliance on a mental rolodex for potential candidates. The NIH COSWD has developed a tool that can be adopted widely to identify a broad range of candidates for all scientific searches²¹.

Scientific discovery and innovation depend on highly talented scientists with diverse backgrounds and perspectives. The NIH is committed to fostering diversity in the biomedical research workforce by implementing evidence-backed strategies and policies that address long-standing inequalities in research funding.

Identifying and dismantling harmful policies and practices requires the full participation of the biomedical research community. Led by the NIH, we in the United States are working together to eliminate structural racism in science and enable talented scientists from all backgrounds to use their creativity and innovation to advance biomedical research. The principles that guide our efforts are potentially applicable across the globe. □

Marie A. Bernard¹✉, Alfred C. Johnson², Treava Hopkins-Laboy³ and Lawrence A. Tabak⁴

¹Office of the Chief Officer for Scientific Workforce Diversity, Office of the Director, National Institutes of Health, Bethesda, MD, USA. ²Office of Management, Office of the Director, National Institutes of Health, Bethesda, MD, USA. ³Office of Equity, Diversity, and Inclusion, Office of the Director, National Institutes of Health, Bethesda, MD, USA. ⁴Office of the Director, National Institutes of Health, Bethesda, MD, USA.

✉e-mail: marie.bernard@nih.gov

Published online: 11 November 2021
<https://doi.org/10.1038/s41591-021-01532-1>

References

- Herring, C. *Am. Sociol. Rev.* **74**, 208–224 (2009).
- AlShebli, B. K., Rahwan, T. & Woon, W. L. *Nat. Commun.* **9**, 5163 (2018).
- Campbell, L. G., Mehtani, S., Dozier, M. E. & Rinehart, J. *PLoS One* **8**, e79147 (2013).
- Freeman, R. B. & Huang, W. J. *Labor Econ.* **33**, S289–S318 (2015).
- Gomez, L. E. & Bernet, P. J. *Natl. Med. Assoc.* **111**, 383–392 (2019).
- Smith-Doerr, L., Alegria, S. N. & Sacco, T. *Technol. Soc.* **3**, 139 (2017).
- United States Census Bureau. <https://www.census.gov/library/publications/2020/demo/p25-1144.html> (accessed 31 August 2021).
- Hoppe, T. A. et al. *Sci. Adv.* **5**, eaaw7238 (2019).
- Lauer, M. S., Doyle, J., Wang, J. & Roychowdhury, D. *eLife* **10**, e67173 (2021).
- Bennett, C. L., Salinas, R. Y., Locascio, J. J. & Boyer, E. W. *PLoS One* **15**, e0235190 (2020).
- Hrabowski, F. A. III, Tracy, J. K. & Henderson, P. H. *Proc. Natl. Acad. Sci. USA* **117**, 18137–18141 (2020).
- Wingfield, A. H. *Science* **369**, 351 (2020).
- National Institutes of Health. <https://www.nih.gov/ending-structural-racism> (accessed 31 August 2021).
- Collins, F. S. et al. *Cell* **184**, 3075–3079 (2021).
- National Institutes of Health. https://report.nih.gov/sites/report/files/docs/NIH_Principal_Investigators_by_Gender_Race_Ethnicity_and_Disability_2016-2020_02_23_2021_PDF.pdf (accessed 31 August 2021).

16. National Institutes of Health. <https://www.edi.nih.gov/people/resources/advancing-racial-equity/nih-workforce-profile-fy21q02> (accessed 31 August 2021).
17. Bernard, M. A. <https://diversity.nih.gov/blog/2021-05-25-closer-look-nih-distinguished-scholars-program-dr-carl-hashimoto> (accessed 31 August 2021).
18. Beech, B. M. et al. *Acad. Med.* **88**, 541–549 (2013).
19. Campbell, A. G. et al. *CBE Life Sci. Educ.* **12**, 394–402 (2014).
20. Kalev, A., Dobbin, F. & Kelly, E. *Am. Sociol. Rev.* **71**, 589–617 (2006).

21. National Institutes of Health. <https://diversity.nih.gov/programs-partnerships/recruitment-search-protocol> (accessed 31 August 2021).

Acknowledgements

We are grateful for the assistance provided by ICF Next in producing this manuscript, and to V. Rucker, the UNITE program manager, for her careful review and input regarding the final version of the manuscript.

Author contributions

Lead author duties were performed by M.A.B., with all authors contributing equally to the review and finalization of the manuscript.

Competing interests

The authors declare no competing interests.



Promoting diversity and inclusion in STEMM starts at the top

STEMM organizations must be proactive in advancing diversity, equity and inclusion.

Marcia McNutt and Laura Castillo-Page

The COVID-19 pandemic offers stark evidence that without greater diversity, equity and inclusion (DEI), science is prevented from fulfilling its fundamental obligations to society. In the United States, Black/African Americans, Hispanic/Latino/Latina/Latinx Americans, and American Indians are dying from COVID-19 at higher rates than those of other groups¹. In addition, populations under-represented in science are less likely to trust in any of the several vaccines against COVID-19 that are protecting hundreds of millions of people worldwide². The COVID-19 pandemic has also negatively impacted the careers of white women and women of color in academic science, technology, engineering, mathematics and medicine (STEMM) fields as the disruptions from the pandemic disproportionately affected their ‘engagement, experience and retention’³. The pandemic has thus underscored the urgency of efforts to advance DEI in science.

A more diverse, inclusive scientific workforce and culture, together with a more inclusive approach to how research is conducted, would result in more attention on addressing poorer health outcomes for racial and ethnic minority populations and other underserved communities⁴, more confidence within these communities that proven solutions are indeed in the best interests of all populations⁵, and greater overall creativity, innovation and excellence in research⁶.

The National Academy of Sciences (NAS) has recognized its own obligation in this effort. The NAS identifies and elevates



Marcia McNutt (left), credit: Chris Michel. Laura Castillo-Page (right), credit: Richard Greenhouse.

the best science in the United States and the world by electing to membership the most impactful and creative scientists. In turn, the National Academies of Sciences, Engineering, and Medicine (NASEM) calls on members from all three academies and other volunteer experts to serve on study committees that offer their best advice in addressing pressing scientific issues such as the COVID-19 pandemic and climate change. For too many decades, however,

the class of NAS members elected annually and the advisory committees on which they served consisted mostly of white men, although progress has been made in recent years, especially in the number of women being elected and serving on committees.

The NAS is committed to advancing diversity both in the scientific enterprise at large and within in its own ranks. To this end, in recent years, the academy has made several reforms to the membership