

Commentary

Revising the *a Priori* Hypothesis: Systemic Racism Has Penetrated Scientific Funding

Kafui Dzirasa^{1,2,3,*}¹Department of Neurobiology, Department of Psychiatry and Behavioral Sciences, Department of Neurosurgery, Duke University Medical Center, Durham, NC 27710, USA²Department of Biomedical Engineering, Duke University, Durham, NC 27708, USA³Twitter: @KafuiDzirasa*Correspondence: kafui.dzirasa@duke.edu<https://doi.org/10.1016/j.cell.2020.09.026>**SUMMARY**

To manifest our sincerest aspirations to “enhance health, lengthen life, and reduce illness and disability,” the US biomedical research enterprise must directly confront the reality of structural racism in scientific funding and the widespread denial of its existence. I believe that moment in American history has, at long last, arrived.

Black Americans have experienced disproportional morbidity and mortality from COVID19, exposing the tawdry underbelly of an American health enterprise that was reared to conceptualize blacks as 3/5ths of a person. Rather than extending Hippocrates' dearly held promise to first do no harm, our nation's medical system was seeded with this insidious notion of sub-humanity, facilitating the devaluation of black lives for the potential for scientific and clinical progress. Two centuries later, this persistent bias continues to infect our health care delivery systems. The heinous acts of Dr. J. Marion Sims, who performed gynecological surgical experiments on unanesthetized enslaved women to develop and perfect his clinical procedures, still echo in the unfounded belief that blacks have a higher pain tolerance and the striking incidence of maternal mortality in black women. The unethical Tuskegee study in which medical treatment was withheld from black men to evaluate the course of syphilis still echoes in the reflexive under participation of blacks in clinical trials for potential medical therapeutics.

Late in the 20th century, an earnest effort to address the US's historical health abuses was manifested in a thrust to increase the number of black doctors and biomedical scientists. This thrust galvanized the academic and biomedical research enterprises to invest in building and nurturing what would become known as the pipeline: a conceptual pathway that would seamlessly funnel black students

from earlier periods in their educational development to established careers in science and medicine. I entered one such pipeline program, the Meyerhoff Scholarship Program, in 1996. Thirteen years later, I completed my MD and PhD degrees.

With the benefit of another NIH pipeline support mechanism known as the “Research Supplements to Promote Diversity in Health-Related Research,” I quickly launched my independent research career. While my success served as an exemplar for our nation's investments in building the pipeline, my experiences at each step in my educational development revealed the fragility of the pipeline on which our nation had invested its hopes for equity. Indeed, many of my black colleagues were not provided sufficient support to navigate all the obstacles that were rooted in a US academic system whose DNA encoded the insidious notion of black inferiority. The pipeline was leaky, and many of the black colleagues I met throughout my training flowed from its bounds.

Tragically, for the small percentage of resilient black scientists and physicians who managed to navigate the minefield through which the American pipeline flowed, a far more perilous threat had been buried within the government institution that was nurturing the pipeline. A landmark study in 2011 showed that the National Institutes of Health (NIH) was less likely to award research project grants to blacks compared to their white

colleagues (Ginther et al., 2011). Strikingly, this discrepancy remained even after correcting for the training record, awards, and publications of black scientists. Our nation's preeminent taxpayer-funded biomedical science granting system seemed to itself be doing selective harm to black scientists.

I eagerly waited for a rapid set of policy changes from the NIH after the publication of this study. I was actively applying for NIH grants, and the idea that an evaluation system I thought rested on meritocracy may be biased against me felt unbearable. I could not image that a federal system guided by the Hippocratic oath would tolerate any potential harm to a vulnerable group of scientists, let alone a group that it had worked so earnestly to develop.

My first independent research grant was funded fifteen months later, but the rapid policy response that I was anticipating from the NIH to reimagine the grant review processes and eliminate any harm experienced by its black grant applicants never materialized. What I quickly discovered was my colleagues' unshakable and uncompromising belief that the evaluation of science was solely based on merit and logic, and not possibly secondary to global human factors such as bias. As stated in an 2014 editorial exploring bias as a potential root cause for the discrepancy in NIH funding for black scientists, “few academics consciously hold any such inclinations, and fewer still would deliberately allow them to affect their





Figure 1. Kafui Dzirasa joined the NIH Director, Commissioner of the Food and Drug Administration and Executive Director of the Cancer Moonshot Taskforce on December 15, 2016 to explore the nation's future in medical innovation, team science, and workforce development. Photo credit: <https://www.youtube.com/watch?v=IDR37vtByPg>.

grant evaluations. Some are likely to bristle at what might be seen as an accusation of racism..." (Editors, 2014). What ensued after that landmark report was aggressive action to buttress the current funding model and expand the pipeline further. Simply, the system advanced with the perspective that black scientists needed to be better prepared to compete within the current enterprise.

The NIH built and broadly promoted an early career review program to give all young scientists hands-on training on the grant review process. In response to recommendations from its committee for workforce diversity (Working Group on Diversity in the Biomedical Research Workforce, 2012), the NIH hired a Chief Diversity Officer and launched innovative programs such as the Building Infrastructure Leading to Diversity Initiative and the National Research Mentoring Network (Vishwanatha et al., 2016; Kaiser, 2012). Importantly, the NIH also took bold steps to acquire direct scientific data to explore whether the current peer review system was indeed consciously or unconsciously biased against blacks. The *a priori* hypothesis of this comprehensive approach was clearly that the evaluation of science was rooted in meritocracy, and overwhelming scientific evidence would be needed to reject it. Certainly, while these were perfectly appropriate scientific approaches to navigate the identified issue

of potential bias, each of these strategies overlooked the first tenet to medicine. Above all else, do no harm. If indeed systematic bias was knit into the peer review system, our nation's preeminent taxpayer funded biomedical research institution had opted for an approach that would allow continued harm to an entire generation of young black scientists rather than risk potential scientific and clinical progress.

Years later, I successfully positioned myself to weigh in on this important national discussion (Figure 1). In 2016, the 21st Century Cures Act mandated a study through the National Academies of Science, Engineering, and Medicine to provide clear recommendations to the US Congress on how to best support our nation's young scientists. I was one of the seventeen scientists appointed to this study committee. Since the American Innovation and Competitiveness Act of 2017, sponsored by Senator Corey Gardner (R-Colorado), raised the importance of enhancing workforce diversity in maintaining America's competitiveness in the global area, I hoped that the timing was right to make my own bold recommendations to directly address the potential systematic bias raised by Dr. Ginther and her colleagues.

First, I confirmed that the funding gap for black scientists persisted using five additional years of data provided by the

Office of the NIH Director. I also confirmed that 35%–40% of NIH grant funding was indeed awarded to the top 10% of the investigator workforce (Lauer and Lorsch, 2016, 113th Meeting of the NIH Advisory Committee to the Director). Coincidentally, several prominent scientific leaders had recently implicated hyper-competition for the remaining funds as a major threat to US biomedical research system (Alberts et al., 2014), and a plan to redistribute the NIH grant portfolio toward supporting more young investigators was being broadly considered (Collins, 2017). I imagined that such a strategy could also be used to increase funding for young black scientists in a manner that eradicated the funding disparity. NIH leadership took up this issue head on based on data that suggested NIH had diminishing returns for each additional dollar invested in its highest funded scientists (Collins, 2017). As a result of this analysis, they proposed a 'Grant Support Index' which would in effect cap the number of grants that could be awarded to each scientist. Though this proposed cap threatened to reduce my own NIH grant support, I believed that additional support for younger scientists was in the best interest in the long-term survival of the US biomedical research enterprise. Nevertheless, the negative reactions from many of my academic colleagues was swift, and the proposal evaporated

(Kaiser, 2017). This led me to conclude that if the scientific community rejected the NIH leadership's empirical evidence on this issue, my small voice was unlikely to have any measurable impact.

After failing to gain support for another idea in which the top 25%–30% pool of scored grants would be randomly funded through a lottery system (Fang and Casadevall, 2016), I quickly shifted to exploring a strategy implemented by basic scientists and engineers, including myself, in their daily work. This strategy was based on standardization. Here, an expected outcome is specified, and the measuring tools are adjusted to achieve it. The basic assumption in this approach is that the measuring tools are imprecise. This approach is used for calibrating everything from our pipettes to our lasers. My *a priori* hypothesis was that scientific talent was distributed irrespective of race, and I reasoned that NIH's troves of empirical data could be used to determine the impact of race on the final score a grant received from peer reviewers. This discrepancy could then just be calibrated out of the peer review system by simply increasing (decreasing by NIH metrics) the scores for black scientists by the measured gap. By continuously updating the adjustment scale based on real time funding outcomes, any differences in the funding gap and thus the adjustment score would ultimately be calibrated out of the system. As I discussed this approach with several colleagues, it became clear that the broader scientific community would likely perceive such an attempt to remove any advantage from those that benefited from an unfair system as inherently unfair. Many colleagues asked, why should we change a system that works well for 99% of scientists? Ultimately, I conceded the point. Only 1%–2% of NIH applicants were black.

I then turned my analysis more broadly. I quickly discovered that the US government sets annual goals for the awarding of its contracting service. These award targets, including funding Small Businesses, Women-owned small businesses, Small Disadvantaged Businesses, Service Disabled Veteran Owned Small Business, and Historically Underutilized Business Zone Businesses are

established and tracked by the Small Business Administration for many government entities including the Department of Health and Human Services, which oversees the NIH. I wondered whether this type of governmental “scorecard” model could be used to address the funding disparity for black scientists. In the end, I quickly abandoned this idea as well after several of my colleagues shared their contempt for such a system. This sentiment was echoed in an editorial which expressed concern that “policies such as grant-allocation quotas could come at the expense of other researchers” (Editors, 2014). Yet again, another strategy that would remove an advantage from those that may benefit from an unfair system would be perceived as inherently unfair.

Finally, I wondered whether the NIH could simply hyper-prioritize topic areas, such as social determinants of health, for which I had always been informed were more greatly pursued by black scientists. As a basic bench scientist, I quickly concluded that this approach may ultimately incentive other young black scientist to only pursue a selective area of inquiry. With all of my potential strategies exhausted, I took a step back from staring at an endless string of tables describing funding outcomes for NIH grant applicants. Then suddenly, the answer was staring right at me. The NIH had funded an average of 4162 New R01-equivalent grants annually from 2002–2016. Strikingly, the R01 funding disparity for black scientists could be virtually eliminated if each of NIH's 24 Institutes and Centers funded approximately 1 additional grant each year. The same was true to close the gap in funding rates for new non-R01 equivalent project grants.

The NIH had invested tax-payer dollars in organizing workgroups and workshops for workforce diversity, pipeline support, young faculty training and mentoring, studying its peer review system, and training grant reviewers in implicit bias. Without dismissing my colleague's concerns about the perceived unfairness of selectively advantaging a miniscule group of disadvantaged investigators, I concluded that the optimal stewardship of tax-payer dollars warranted full consideration of a strategy in which each NIH

Institute simply funded 2 additional grants. Such an approach was aligned with ensuring the maximum return on investment for NIH's efforts to build and nurture cohorts of black scientists, and it was aligned with the national priorities outlined in the 21st Century Cures and American Innovation and Competitive-ness Acts. In the absence of such an intervention, black scientists will continue to be harmed.

Systemic racism was woven into an American tapestry which declared black people sub-human at its birth. The callous acts of violence perpetrated against George Floyd, Breonna Taylor, Elijah McClain, Rayshard Brooks, and Jacob Blake have awakened the consciousness of the nation to the impact of structural racism, and the disproportionate loss of black lives from COVID-19 has clearly revealed that this cancer persists within our nation's biomedical research enterprise as well. Given that the discrepancy in funding for black applicants persists after nearly 10 years of focused effort on the part of NIH, the *a priori* hypothesis that structural racism has somehow failed to penetrate our peer review systems is no longer tenable.

Our beloved America desperately cries for equity. She has called on the biomedical community to follow as her black scientists engage in a march toward a more perfect union: a march to promote the general Welfare and to secure the Blessings of Liberty. How long must black lives be devalued as they are disproportionately impacted by disease? How long must the science exposing racism as a determinant of health lie dormant in a second tier of our nation's consciousness? How long should the young black scientists that have been suffocated by disparities in federal funding support continue to wait? How long must black lives perish from health inequities, while the biomedical community denies the impact of systemic racism in the practice and funding of science? “However difficult the moment, however frustrating the hour, it [must] not be long.” (MLK Jr.).

The moment has arrived to fulfill the promise of America's past, to manifest the iridescent hopes of her future, and to meet her highest calling to enhance health, lengthen life, and reduce illness and disability. Though my black scientific

colleagues and I have been met with denial, we have not been crushed. We remain anchored by our early indoctrination that addressing racial inequities in health and medicine will require researchers emanating from the groups that have been historically encumbered by system racism. We continue to press toward the goal to win the prize to which our nation has ascribed: life, Liberty, and the pursuit of Happiness. We endure.

“How long? Not long.”

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