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The Complexities of Race Adjustment in Health Algorithms

Marika M. Cusick, Glenn M. Chertow, Douglas K. Owens, Michelle Y. Williams, and Sherri Rose

CHRONIC KIDNEY DISEASE AFFECTS MORE THAN 1 IN 7 ADULTS—or about 37 million people—in the United States. For racial and ethnic minorities, the burden of kidney failure is higher: Black or African American and Hispanic patients are at least 3-fold and 1.5-fold more likely to progress to kidney failure in comparison to non-Hispanic white patients, in part due to delays in referrals and visits to nephrology. Despite recognition of these disparities in the 1980s, there has been little to no improvement since then.

There are debates about how to account for race in algorithms that are widely used to gauge the severity of kidney disease and inform related care decisions. For a long time, race was considered a factor when assessing kidney disease severity. Two of the most widely adopted kidney-disease-related equations incorporated a Black or non-Black race variable. Because the use of race variables in clinical algorithms propagates racial bias in decision-making, two professional organizations helped develop a different clinical algorithm that does not incorporate race in 2021.

Our paper, "Algorithmic Changes Are Not Enough: Evaluating the Removal of Race Adjustment from the eGFR Equation," is the first to assess the 2021 equation's effect on care decision-making for chronic kidney disease patients,

Key Takeaways

Chronic kidney disease affects more than 1 in 7 adults in the United States, with much higher rates of kidney failure among racial and ethnic minorities.

Drawing on Stanford Health Care data on more than half a million patients from 2019-23, we conducted the first assessment of how a new clinical algorithm for evaluating chronic kidney disease that no longer adjusts for race impacts clinical decision-making.

We find that the new algorithm lowered kidney health estimates for Black or African American patients, meaning they were classified into more severe stages of the disease. Despite these impacts, we observed no meaningful change to nephrology referrals and visits after the new algorithm was introduced.

Technical "fixes" alone are insufficient to address deep-seated health inequities. Policymakers should incentivize rigorous evaluations of new or modified clinical algorithms prior to deployment, where possible, and invest in tackling non-algorithmic, structural causes of health inequities in chronic kidney disease and other conditions.

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including its impact on care disparities for racial and ethnic minorities. Our study estimates the effects of implementing the kidney disease equation without race adjustment on nephrology referrals and visits for patients within the Stanford Health Care system.

While our study focuses on a single medical center and a single disease, the findings present important considerations for the healthcare field. As policymakers, healthcare practitioners, and technologists alike pursue the application of AI and machine learning (ML) algorithms in healthcare, our research underscores the need for health equity research and highlights the limitations of employing technical "fixes" to address deep-seated health inequities.

Introduction

Clinical algorithms are used in many healthcare contexts, and the treatment of chronic kidney disease is no exception. Primary care providers typically rely on an equation that estimates how well a kidney filters waste and toxins from the blood—also known as the estimated glomerular filtration rate (eGFR)—to gauge the severity of the disease. Patients with lower eGFR values are classified into more severe chronic kidney disease stages.

The two most widely adopted equations, the MDRD Study equation and the CKD-EPI 2009 equation, both incorporate data on serum creatinine (a key indicator of how well a kidney filters blood), age, sex, and Black versus non-Black race. The race variable leads to an increase in eGFR values for patients documented as Black or African American.

In 2021, amid growing concerns about racial bias in algorithms, health professionals developed CKD-EPI 2021, a new equation that no longer incorporated a patient's race among its variables. In validation, this new equation underpredicted true kidney filtration rates for Black patients and overpredicted those for non-Black patients. By lowering eGFR values for Black patients, CKD-EPI 2021 was thought to promote early detection and treatment of chronic kidney disease and ultimately reduce downstream disparities in kidney disease diagnosis and treatment.

CKD-EPI 2021 has been implemented and deployed in many healthcare systems without having been thoroughly evaluated for its impact on care decision-making and health outcomes. There is a strong need

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to ameliorate harm expeditiously where possible, but how to do this most effectively when the impact of new equations is unknown is a broader question for healthcare professionals, health systems, policymakers, advocates, and patients.

Our study assesses the effects of CKD-EPI 2021 on patient referrals and visits for nephrology care at Stanford Health Care, which began using the new equation without race adjustment for chemistry panels and point-of-care services on December 1, 2021. We analyzed electronic health record data from Stanford Health Care hospitals and clinics on 574,194 adult patients aged 21 and older who had at least one recorded serum creatinine value between January 1, 2019, and September 1, 2023. Among the patients we studied, 5 percent were documented as Black or African American, the overall mean age was 48 years, and 55 percent were female.

Our analysis compared differences in eGFR values and chronic kidney disease stages calculated by CKD-EPI 2009, the equation with race adjustment employed before December 2021, and the values calculated by CKD-EPI 2021, the equation without race adjustment implemented beginning in December 2021. To assess health outcomes, we compared quarterly rates of nephrology referrals, which are often prerequisites of nephrology visits, as well as the visits themselves. We defined quarters to align with the implementation of the new equation, starting in December 2021.

Research Outcomes

In the two years following the implementation of the new eGFR equation without race adjustment within the Stanford Health Care system, eGFR values were consistently lower for Black or African American patients. Compared to the 2009 algorithm, CKD-EPI 2021 decreased their eGFR scores by 10 percent, on average. As a result, a higher proportion of Black or African American patients were classified into more severe stages of chronic kidney disease: The new algorithm assigned 18 percent of measurements for those patients to more severe chronic kidney disease stages, which warrants earlier and more urgent treatment. By contrast, for those not documented as Black or African American, eGFR scores increased 5 percent on average, and 12 percent were assigned to less severe chronic kidney disease stages. Most of the changes in chronic kidney disease stages, for all patients, were between the least two severe stages of the disease.

However, despite these differences, we observed no significant changes to nephrology referrals and visits after the new equation was implemented. For example, the estimated quarterly *referral* rate for nephrology

was 34 per 10,000 patients documented as Black or African American after implementation of CKD-EPI 2021. Had the algorithm not been implemented—that is, had the previous, race-adjusted algorithm been used—the estimated patient referral rate would have been 38 per 10,000 Black or African American patients. At 189 and 188 per 10,000 patients, the quarterly nephrology *visit* rate for Black or African American patients was nearly identical with or without the race-adjusted version of the algorithm. Similarly, there were no meaningful changes to the nephrology referral and visit rates for patients documented as not Black or African American with and without implementing the new algorithm.

There are a number of possible reasons for why we did not observe changes in patient referrals and visits after implementing the new eGFR equation. First, a myriad of other factors contribute to decisions regarding patient referrals, such as the presence of other conditions (e.g., diabetes, hypertension). Second, our observed changes to eGFR values may not have been large enough to meaningfully influence referrals and visits, especially since the majority of these changes occurred in patients at the earliest stages of the disease. Third, since only 5 percent of our study population was documented as Black or African American, our results may be limited by this small sample size. Evaluating a health system with a larger proportion of identified Black or African American patients could yield different results. Lastly, structural factors beyond the algorithm contribute substantially to health inequities, which we expand on in our discussion.

Both policymakers and health practitioners should exercise caution when presented with the option to deploy clinical algorithms that claim to mitigate health disparities yet lack adequate evidence to support this claim.

Policy Discussion

Despite focusing on clinical algorithms used specifically to evaluate chronic kidney disease, our study speaks to broader healthcare and policy debates about deploying AI and ML in healthcare settings and their impact on health equity.

The inclusion of race in clinical algorithms can propagate racial bias in decision-making. Both policymakers and health practitioners should exercise caution when presented with the option to deploy new clinical algorithms that claim to mitigate health disparities yet lack adequate evidence to support this claim. Where possible, policymakers should explore ways to incentivize and guide rigorous evaluations of new or modified clinical algorithms prior to deployment. Such evaluations could minimize the risk of potential harm by measuring algorithms' actual

impacts on clinical decision-making, health outcomes for patients, and health equity in society.

Policymakers should also take away from our findings that algorithmic changes alone are insufficient for addressing the social and structural factors contributing to health disparities. There has been much debate and research on technical adjustments to address or mitigate unfairness in algorithms. Nonetheless, our study shows that merely modifying the eGFR equation does not move the needle on health inequities in chronic kidney disease. After two years of implementation in a single health system, the newer algorithm, which removed race adjustment, did not produce changes in referrals or visits for Black or African American kidney disease patients.

Rather than focus on algorithmic modifications, policymakers should invest additional resources in tackling the non-algorithmic, often structural causes of racial and ethnic disparities in chronic kidney disease, including limited access to insurance coverage and medical care, poorer environmental and neighborhood conditions, and increased stress from racial discrimination. The vast promise of AI and ML to transform healthcare delivery should not divert resources from these critical areas impacting health equity. As we recommend here, policymakers should remember that structural problem-solving and robust algorithmic assessments are not mutually exclusive.

Chronic kidney disease impacts millions of people in the United States, and it is but one area where new clinical algorithms are being deployed in clinical healthcare settings without thorough prior evaluation. What is needed is a more rigorous assessment of the potential impact of healthcare algorithms and AI models on clinical decision-making, health outcomes, and health inequities. Healthcare providers and policymakers must not put their full faith in technical "fixes" and ignore the necessity of structural investments in health equity change.

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Reference: The original article is accessible at Marika M. Cusick et al., "**Algorithmic Changes Are Not Enough: Evaluating the Removal of Race Adjustment from the eGFR Equation,**" *Proceedings of Machine Learning Research*, 248 (June 2024): 619-643 https://proceedings.mlr.press/v248/cusick24a.html.

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Marika M. Cusick is a PhD student in health policy at the Stanford University School of Medicine.

Glenn M. Chertow is the Norman S. Coplon/Satellite Healthcare Professor of Medicine at the Stanford University School of Medicine.

Douglas K. Owens is the Henry J. Kaiser, Jr. Professor and chair of the department of health policy at the Stanford University School of Medicine.

Michelle Y. Williams is a clinical assistant professor of medicine at the Stanford University School of Medicine.

Sherri Rose is a professor of health policy at the Stanford University School of Medicine and a faculty affiliate at the Stanford Institute for Human-Centered Artificial Intelligence.

Stanford University
Human-Centered
Artificial Intelligence

Stanford HAI: 353 Jane Stanford Way, Stanford CA 94305-5008

T 650.725.4537 **F** 650.123.4567 **E** HAI-Policy@stanford.edu **hai.stanford.edu**