

## Introduction

Artificial intelligence (AI) is increasingly being integrated into healthcare for tasks ranging from automating administrative workflows to assisting in clinical decision-making. Hospitals and clinics are adopting AI tools to analyze medical images, predict patient outcomes, and personalize treatments. This trend is accelerating – nearly one-fifth of U.S. hospitals had implemented some form of AI by 2022. Enthusiasm for AI in medicine is high because of its potential to improve efficiency and accuracy in diagnosis and care. However, alongside these benefits, concerns have emerged about racial bias in AI systems. If not addressed, biased algorithms and devices can perpetuate or even worsen existing healthcare disparities. This report examines how racial bias manifests in AI-driven healthcare and the disproportionate impact on minority communities, with real-world case studies illustrating the human cost of these biases. Possible solutions to mitigate bias are also discussed.

## Racial Bias in AI

### How Bias Manifests

Racial bias in medical AI arises when algorithms perform unequally across different racial or ethnic groups. Often, this stems from biases in the data used to train AI models or biased assumptions built into clinical algorithms. For example, AI diagnostic tools for dermatology have shown reduced accuracy for patients with darker skin because training image datasets have been predominantly composed of lighter-skinned individuals. Such diagnostic bias means conditions in Black or Brown patients might go unrecognized or misdiagnosed by AI that wasn't designed with them in mind.

### Biased Algorithms

Racial bias also appears in treatment recommendation and risk stratification systems. A striking example was a widely used hospital algorithm designed to identify high-risk patients for care management. A 2019 study revealed this software routinely favored white patients over sicker Black patients, because it used healthcare spending as a proxy for health needs. Due to historical inequities (Black patients often had less access to care and thus incurred lower medical costs), the algorithm underestimated illness severity in Black patients. Similarly, until recently, an algorithm for assessing kidney disease included a race-based adjustment that made Black patients' kidney function appear better than it was. This built-in bias delayed many Black patients from reaching thresholds for specialty referral or transplant consideration. These examples show how structural racism encoded in data (e.g. unequal healthcare access or flawed race "corrections") can lead AI systems to propagate discriminatory outcomes.

### Biased Medical Devices

Racial bias is not limited to software – it can also affect AI-driven medical devices and sensors. For instance, pulse oximeters (devices that estimate blood oxygen levels using light) have been found to overestimate oxygen saturation in patients with darker skin. Studies during the COVID-19 pandemic confirmed that pulse oximeters were three times more likely to miss dangerously low oxygen levels in Black patients compared to white patients. This device bias is due to how light absorption varies with skin pigmentation. Another example is the blood-oxygen monitoring feature in smartwatches and fitness devices: such wearable pulse oximeters were reported to be

significantly less accurate for people with dark skin tones. In all these cases – diagnostic algorithms, risk prediction tools, and medical devices – racial bias in AI can lead to minority patients receiving incorrect assessments or suboptimal recommendations.

## **Impact on Minority Groups**

The consequences of biased AI in healthcare are borne disproportionately by minority communities, including Black, Hispanic, Indigenous, and other people of color. These groups have long faced systemic healthcare disparities and worse health outcomes due to factors like unequal access to care, underrepresentation in clinical research, and historical discrimination. AI systems that carry forward biases from historical data risk **exacerbating these inequities**. For example, the biased risk algorithm described above effectively meant that Black patients received less preventive care; researchers estimated that fixing the bias would more than double the number of Black patients flagged for high-risk care programs. In the context of kidney disease, the race-based adjustment in kidney function scores kept Black patients off transplant waitlists longer than comparable white patients. This contributed to Black patients waiting years for transplants even as Black Americans suffer end-stage kidney disease at three times the rate of whites.

During the COVID-19 crisis, the impact of device bias on minority patients became alarmingly clear. Inaccurate pulse oximeter readings in patients with dark skin led to delayed or missed treatment for severe COVID-19. One study found that such errors could have caused Black patients to experience a 4.5-hour delay in receiving COVID treatments on average. Because blood oxygen levels were a key metric for deciding hospitalization and therapy, overestimated readings meant some Black (and other non-white) patients weren't identified as needing life-saving oxygen or medications as promptly as they should have been. These delays and under-treatments likely contributed to higher COVID-19 mortality in those communities.

Beyond immediate clinical impacts, biased AI can erode trust in healthcare technology among minority populations. Given a historical context of medical racism – from the Tuskegee syphilis study to ongoing disparities – news of AI tools systematically underserving Black or Indigenous patients only deepens skepticism. For Indigenous peoples and other underrepresented groups, the concern is that algorithms trained on predominantly white or urban populations may not account for their unique health profiles, leading to misdiagnoses or neglect. In sum, racial bias in AI can amplify existing systemic disparities, resulting in minority patients receiving delayed care, improper diagnoses, or being overlooked for advanced treatments.

## **Case Studies / Examples**

### Anthony Randall and Kidney Transplant Algorithm Bias

Anthony Randall, a Black man in Los Angeles, had been on dialysis and waiting over five years for a kidney transplant. Unknown to him, an algorithm used by the transplant system included a race-based “modifier” that made Black patients’ kidney function scores appear higher (healthier) than they truly were. This meant Randall’s level of kidney disease was underestimated, delaying the point at which he was placed on the national transplant waiting list. In mid-2023, Randall filed a lawsuit against his hospital (Cedars-Sinai Medical Center) and the United Network for

Organ Sharing, alleging that this racially biased formula robbed him of a fair chance at a transplant. The bias in the algorithm was not a secret – the transplant system’s board had determined that using a race modifier was causing widespread underestimation of Black patients’ illness severity. By early 2023, hospitals were instructed to stop using the race adjustment and to retroactively adjust Black patients’ waiting times to account for the delay. Randall argues that had these changes come earlier, he might have already received the kidney he urgently needs. His case highlights how a well-intentioned clinical algorithm, embedded with a racial factor, ended up denying timely care to Black patients.

#### Dr. Noha Aboelata and Pulse Oximeter Bias During COVID-19

Dr. Noha Aboelata, a family physician and CEO of Roots Community Health Center in Oakland, encountered racial bias in medical technology firsthand during the COVID-19 pandemic. In late 2020, one of her patients – an older African American man with chronic lung disease – had an oxygen saturation reading on a fingertip pulse oximeter that appeared safely above the danger threshold. Despite the device showing a relatively normal oxygen level, Dr. Aboelata’s clinical intuition suggested that the patient was in distress. She ordered an arterial blood gas test, which confirmed that the patient’s blood oxygen was dangerously low, meaning he did need supplemental oxygen. Shortly thereafter, she read a study in the New England Journal of Medicine that validated her experience: pulse oximeters were failing to detect low oxygen in patients with dark skin at much higher rates than in white patients. Dr. Aboelata and her colleagues felt betrayed by a device that was systematically less accurate for the Black community they serve. In response, her clinic joined others in suing manufacturers and retailers of pulse oximeters, demanding clearer warnings and improvements. She also supported national calls for the FDA to address racial bias in pulse oximetry. This case study demonstrates how biases in medical devices can directly put minority patients at risk, with potentially fatal outcomes.

#### Alex Morales and Smartwatch Blood-Oxygen Reading Bias

Alex Morales, a resident of New York, brought attention to racial bias in a consumer health device – the Apple Watch. Morales, who has a darker skin tone, purchased an Apple Watch expecting its blood oxygen sensor to reliably track his oxygen levels for fitness and health monitoring. However, he later discovered that the watch’s oximeter could be less accurate for people with darker skin. In late 2022, Morales filed a class-action lawsuit against Apple, claiming that the blood oxygen app was racially biased and did not work as advertised for non-white users. His complaint cited studies reporting that pulse oximetry devices are “significantly less accurate” on individuals with darker skin. Morales argued that Apple had a responsibility to disclose this limitation, as many consumers paid a premium for the device under the assumption it would perform equitably for everyone. Although a judge ultimately dismissed the lawsuit in 2023, the case drew public attention to an important point: biases in medical-grade equipment also exist in popular health tech gadgets. Alex Morales’s experience underscores that racial bias in AI-driven healthcare tools isn’t confined to hospitals – it can affect everyday consumers and highlights the need for greater accountability among tech companies.

## **Conclusion**

AI technologies hold great promise in healthcare, but the examples above illustrate how racial bias can be embedded in AI-driven tools, leading to unequal care. Minority patients – including Black, Hispanic, and Indigenous communities – often bear the brunt of these biases, which compound longstanding health disparities. Addressing this problem is crucial to ensuring that AI improves healthcare for everyone, rather than reinforcing existing inequities.

Mitigating racial bias in AI-driven healthcare will require efforts on multiple fronts:

- **Diverse Data and Development:** Building AI models with training data that fully represents minority populations.
- **Race-Aware Algorithm Design:** Adopting approaches that recognize the influence of social determinants without perpetuating stereotypes.
- **Bias Auditing and Testing:** Routinely evaluating AI systems for disparate impacts by race or ethnicity.
- **Regulation and Transparency:** Strengthening oversight and requiring manufacturers to report demographic performance data for AI tools.
- **Healthcare Workforce Education:** Ensuring clinicians and developers are aware of AI biases and the historical context of healthcare disparities.

By implementing these measures, stakeholders can help ensure that AI truly benefits all patients, reducing rather than exacerbating healthcare disparities.

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