

How a failure to understand race leads to flawed health tech

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A new study focused on wearable health monitors underscores an entrenched problem in the development of new health technologies—namely, that a failure to understand race means the way

these devices are developed and tested can exacerbate existing racial health inequities.

"This is a [case study](#) that focuses on one specific [health](#) monitoring technology, but it really highlights the fact that racial bias is baked into the design of many of these technologies," says Vanessa Volpe, co-author of the study and an associate professor of psychology at North Carolina State University.

"The way that we understand race and the way that we put that understanding into action when developing and using health technologies is deeply flawed," says Beza Merid, corresponding author of the study and an assistant professor of science, technology, innovation, and racial justice at Arizona State University.

"Basically, the design of health technologies that purport to provide equitable solutions to racial health disparities often define race as a biological trait when it's actually a social construct," Merid says. "And the end result of this misunderstanding is that we have health technologies that contribute to health inequities rather than reducing them."

To explore issues related to the way the development and testing of health tech can reinforce racism, the researchers focused specifically on photoplethysmographic (PPG) sensors, which are widely used in consumer devices such as Fitbits and Apple watches. PPG sensors are used in wearable technologies to measure biological signals, such as [heart rate](#), by sending a signal of light through the skin and collecting data from the way in which the light is reflected back to the device.

For the study, the researchers drew on data from clinical validation studies for a wearable health monitoring device that relied on PPG sensors. The researchers also used data from studies that investigated the

ways in which [skin tone](#) affects the accuracy of PPG "green light" sensors in the context of health monitoring. Lastly, the researchers looked at wearable device specifications and user manuals and data from a lawsuit filed against a health technology manufacturer related to the accuracy of technologies that relied on PPG sensors.

"Essentially, we synthesized and interpreted data from each of these sources to take a critical look at [racial bias](#) in the development and testing of PPG sensors and their outputs to see if they matched guidelines for responsible innovation," Volpe says.

"These studies identified challenges with PPG sensors for people with darker skin tones," says Merid. "We drew on scholarship exploring how [innovative technologies](#) can reproduce racial health inequities to dig more deeply into how and why these challenges exist. Our own expertise in responsible innovation and structural racism in technology guided our approach. If people are developing technologies with the goal of reducing harm to people's health, how and why do these technologies end up with flaws that can exacerbate that harm?"

The findings suggest there are significant challenges when it comes to "race correction" in health technologies.

"Race correction" is a broad term that applies not only to technologies but also involves correcting or adjusting health risk scores used to make decisions about the relative risk of disease and the allocation of health care resources.

"Race correction assumes that we can develop technologies or health risk scoring algorithms to first quantify and then 'remove' the effect of biological race from the equation," says Merid. "But doing so assumes race is a biological difference that needs to be corrected to achieve equitable health for all. This prevents us from treating the real thing that

needs to be corrected—the system of racism itself (e.g., differential treatment and access to health care, systematic socioeconomic disenfranchisement)."

"For example, many—if not most—health technologies that use PPG sensors claim to be designed for use by everyone," Volpe says. "But in reality, those technologies are less accurate for people with darker skin tones.

We argue that the systematic exclusion and erasure of those with darker skin tones in the development and testing of wearable technologies that are supposed to democratize and improve health for all can be a less visible form of race correction. In other words, the development process itself reflects the system of racism. The end result is a technological 'solution' that fails to deliver equity and is instead characteristic of the very system that created the problem.

"Race corrections assume that we have to make adjustments based on race as a biological construct," Volpe says. "But we should be adjusting racism as a system so that the technologies developed work and are responsible and equitable for everyone—in both their development and their consequences."

"Innovation can introduce unintended consequences," Merid says. "Rather than coming up with a solution, you can potentially just introduce a new suite of problems. This is a longstanding challenge for trying to develop technological solutions to social problems.

"Hopefully, this work contributes to our understanding of the ways that race correction is problematic," says Merid. "We also hope that this work advances the idea that assumptions about [race](#) in the health field are deeply problematic, whether we're talking about health technology, diagnoses or access to care. Lastly, we need to be mindful about the

ways in which emerging health technologies can be harmful."

A paper on the study, "[Race Correction and Algorithmic Bias in Atrial Fibrillation Wearable Technologies](#)," is published open access in the journal *Health Equity*.

More information: Beza Merid et al, Race Correction and Algorithmic Bias in Atrial Fibrillation Wearable Technologies, *Health Equity* (2023). [DOI: 10.1089/heq.2023.0034](https://doi.org/10.1089/heq.2023.0034)

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