The Struggle over Medical Bias in the United States

An STS Research Paper
presented to the faculty of the
School of Engineering and Applied Science
University of Virginia

by

Julia Joachim

March 21, 2023

On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

Signed: Julia Joachim

Approved: _____ Date _____
Peter Norton, Department of Engineering and Society

The Struggle Over Medical Bias in the United States

For decades, the U.S. healthcare sector has been under scrutiny for the biases that are embedded in medical treatments and devices Critics contend that biases harm specific groups. Patient advocates, healthcare providers, insurance companies, professional associations, and social justice advocacies generally agree that healthcare access and outcomes vary by race, gender, socioeconomic status, and other demographic factors.

This struggle over medical bias, actual and perceived, has led to a growing movement to include cultural competency training for healthcare providers, and to a growing advocacy for healthcare equity for marginalized communities. Racism embedded within the system is wide ranging. It encompasses disparities in patient access to better medical care, racially biased algorithms, and problems in the medical devices themselves. Responses to these inequities have been controversial. Some argue that efforts to address bias are unnecessary or even counterproductive.

Indeed, some companies in the health sector dispute claims that some of their devices embed legacies of systemic racism. While most participants agree that biases disadvantage some groups in the US healthcare system, mainstream responses to the problem typically favor incremental change, invoking scientific objectivity as the road to unbiased care. To social justice advocates and their allies, however, institutional science is in itself part of the problem.

Review of Research

In 1985, the Secretary's Task Force on Black and Minority Health published The Heckler Report. This was the first time the U.S. government had comprehensively examined health

1

disparities in racial and ethnic minorities. The report identified socioeconomic status and bias in healthcare delivery as two contributing factors. It recommended focusing on data collection saying "Data on the health status of minority populations must be collected, analyzed, and reported in a timely and accurate manner. This will require the development of standardized methods of data collection, greater attention to the quality of data, and more effective use of data by health policymakers" (Heckler, 1985). Since then the issues of bias in healthcare has gained more attention and scrutiny. There have been various factors contributing to the growing concern about biases in healthcare, including increased awareness of health disparities, greater recognition of the impact of social determinants of health, and advances in research on structural biases and their effects.

In a study researchers found that racial biases were partly driven by false beliefs about biological differences between Black people and white people (Hoffman et al., 2016). This study attributed the false beliefs to a systemic historic racism in medical science which dates to the 19th century and earlier. In the 19th century, physicians sought to find the "physical peculiarities" of Black people that could "serve to distinguish him from the white man" (Philadelphia Journal).

Another study proved it wasn't biological differences but instead inconsistent standards in the industry that created biases. A study done by Stat found that out of the 161 products approved by the FDA, 73 disclosed patient data used to validate performance of the device. Only seven of these products provided the racial demographic of the study populations and thirteen reported the gender makeup (Ross, 2021). These inconsistent standards lead to biases within devices. FDA needs to require transparency from companies while still protecting patient rights.

Evaluating systems on a diverse pool of applicants is necessary to combat implicit biases.

Implicit biases and assumptions consequently lead to structural biases in the healthcare system and vice versa. One criticism of the mainstream response to healthcare disparities is that it fails to address the root causes of these disparities. For example, critics argue that simply expanding insurance coverage is not enough to address healthcare disparities, as it does not address the broader social and economic factors that contribute to these disparities.

Private Services

Problems in inequality begin with access to good medical care. Some private services exacerbate inequities by assisting wealthy clients to priority access to the best healthcare. Corporations are set up to expedite excellent concierge health services. Private Health Management (PHM) helps patients get appointments faster, find physicians, and organize medical records. Leslie Michelson, CEO of PHM, explains that clients "bring in a health advisor much like how they would for tax, legal, or estate planning issues." According to Michaelson, the healthcare system is "becoming more bureaucratic and difficult to access." PHM serves wealthy families seeking prestigious doctors (Milburn, 2015). Further benefiting wealthy clients, some hospitals collaborate with private patient services. PinnacleCare, for example, advised a patient to switch to NewYork-Presbyterian hospital, promising it had the "best colon cancer surgeon in the world" (Milburn, 2015). When NewYork-Presbyterian/Weill Cornell hospital was faulted for having a V.I.P. amenities floor that served only wealthy patients, it responded by asserting that it is "dedicated to providing a single standard of high-quality care to all

outpatients" (Bernstein, 2012). Wealth begets more medical choices, higher levels of care and excellence in specialists. Lower income people lack these options.

Insurance Companies

The use of artificial intelligence (AI) in insurance companies has become increasingly popular. However, the issue is the algorithms are normally insufficient at detecting biases in healthcare and can exacerbate ongoing issues. This is true for many health insurance companies that contribute to the disparity in racial healthcare. Companies do not consistently mitigate biases in their systems and processes. For example, UnitedHealth Group, the nation's largest healthcare insurer uses an algorithm from Optum that determines which patients require the most intensive medical needs. The algorithm assigns risk scores to patients based on their health conditions and medical history; the risk scores determine how much money UnitedHealth will pay healthcare providers for treatment. A study published shows that UnitedHealth's risk-scoring system unfairly underestimates the healthcare needs of Black patients. The system assigns Black patients to lower-tier healthcare providers and denies access to higher-quality care. The algorithm underestimates the needs of Black patients because the data informs the program that $1800 less is spent on Black patients' care a year than that of white patients. Consequently, the algorithm reinforces the existing data prejudice. Based on the data, the algorithm calculates that Black patients are less sick so allows less care (Obermeyer et al. 2019). New York state regulators called upon UnitedHealth Group to stop using the algorithm or prove that it isn't discriminatory (Reilly, 2019).

In response to this critical research, UnitedHealth Group said that it "appreciates the 'researchers' work" and claims that the algorithm proves that the cost model was highly predictive of cost (King, 2019). UnitedHealth Group defends its algorithm and continues to use it, arguing that it is "just one of many data elements intended to be used to select patients for clinical engagement programs, including most importantly, the doctor's expertise and knowledge of his or her patient's individual needs" (Rankin, 2016). UnitedHealth Group denied any wrongdoing while claiming a commitment to eliminating racial disparities in healthcare. The company also emphasized its efforts to increase access to quality healthcare for underserved communities, including investing in community health centers and partnering with community organizations to provide health education and support. Since much of a patients' healthcare is dependant on what services are covered, insurance companies' algorithms affect patient health.

In a similar suit in 2017, Anthem Blue Cross was sued for allegedly discriminating against African American and Hispanic patients by refusing to cover certain medical treatments. The lawsuit claimed that Anthem had used biased algorithms to deny coverage based on race (Castellucci, 2017). These lawsuits brought attention to healthcare disparities and showed how companies settled rather than admit wrongdoing. The settlement allowed the companies to continue discriminatory practices. Disparities in health insurance coverage often benefit wealthier white people at the expense of others.

Aetna has also faced accusations of socioeconomic bias, particularly in its coverage of mental health services. In 2018, the company settled a lawsuit that accused it of denying coverage for mental health and substance abuse treatment to individuals with certain mental health diagnoses. The lawsuit alleged that Aetna had implemented policies that made it more

difficult for individuals with conditions such as bipolar disorder and PTSD to access care, which resulted in worse health outcomes and increased costs (Landi, 2021).

The lawsuit claimed that Aetna used a flawed algorithm to approve or deny coverage for mental health and substance abuse treatment. The algorithm was biased with certain mental health diagnoses, causing denials in coverage for necessary medical treatment. According to the lawsuit, Aetna's policies resulted in worse health outcomes for individuals with mental health conditions, as they were forced to go without necessary treatment or pay for it out of pocket. The lawsuit also claimed that Aetna's policies increased costs for individuals and the healthcare system as a whole, as untreated mental health conditions can lead to more severe and costly health problems down the line.

In response, an Aetna spokesman said, "While we're not commenting on this pending litigation at this time, we take mental well-being very seriously. It is an enterprise priority that drives partnerships with organizations, providers, and employers to improve mental health care nationwide" (CNN, 2019). As part of the settlement, Aetna agreed to change its policies related to coverage of mental health and substance abuse treatment. The company also agreed to pay $17 million to members of the class-action lawsuit and to establish an independent review process for denied claims related to mental health and substance abuse treatment.

Overall, the accusations against Aetna highlight the ongoing issue of socioeconomic bias in healthcare, particularly in the coverage of mental health services. Advocates for mental health parity argue that insurance companies should not be able to discriminate against individuals with mental health conditions and that everyone should have access to medically necessary treatment, regardless of their diagnosis or socioeconomic status.

Nonprofits

Because it is difficult to find individual voices suing corporations or hospitals for racial bias, some nonprofits have begun to take action and recognize some of the longstanding racial disparities in American healthcare. The American Society of Nephrology (ASN) is a nonprofit and the world's largest medical organization dedicated to researching kidney disease. The physicians and scientists who compose ASN educate health professionals and promote research. To calculate the glomerular filtration rate, ASN used a model derived from white patients. The calculations consequently supported misdiagnoses of Black patients. In 2022, two years after the misdiagnoses were publicized, ASN updated its model (Chakraborty & Ye, 2021).

The National Patient Advocate Foundation (NPAF) is a nonprofit that promotes healthcare equity, patients' rights, rural health, and trust in providers. NPAF vice president Christine Wilson teaches patients to turn anecdotes into evidence to amplify their voices; guest speakers such as Olga Torres guide health professionals in avoiding healthcare bias. Torres cautions doctors that "when the patient and doctor do not speak the same language there is less opportunity to use small talk to develop a comprehensive patient history" (NPAF, 2021). However, in 2015 Patient Advocate Foundation received $15,000,000 from pharmaceutical companies. This may create bias within the advocacy (KHN, 2015).

Medical Devices

Critics of racial disparities in American healthcare warn that medical devices can embed biases and negatively affect patient medical care. A study by Emory University found that

temporal thermometers may miss fevers in patients with darker skin because skin emissivity has a different reflective measurement depending on the skin pigmentation (Bhavani et al., 2022). In 2020, a Michigan study published in the *New England Journal of Medicine* found that common pulse oximeters, which use light to measure oxygen levels in the blood, may be less accurate for people with dark skin due to differences in light absorption (Sjoding, 2020). Warning that pulse oximeter devices are ineffective for persons with darker skin hues, some doctors demand FDA testing and more publicity to support corrective action and to protect patients (Harlan, 2022).

Medical technology companies have contested these findings. Although the medical device company Masimo was accused of covering up the issue for years, Masimo challenged allegations of racism. Masimo CEO Joe Kiani speculated that if "sickle-cell patients were not excluded in the Michigan study, that alone could account for most of the difference between what we have seen and what Michigan reported" (Kiani, 2021). On an FAQ page on its website, Masimo explains "Are there any other resources that discuss the topic of skin pigmentation and racial biases in pulse oximetry?" To answer this question, they redirect you to the FDA website which discusses pulse oximeters but not Masimo specifically. The company affirmed that it tested the devices on patients with a large range of skin colors (Masimo, 2022). Masimo's studies contradict the Michigan study, therefore Masimo claims their pulse oximeters are unbiased.

In an effort to address racial differences, some medical devices include a race-based correction, known as an ethnic adjustment. Ethnic adjustment stems from long standing inaccurate historical medical racism. Spirometers are one example of a medical device which contains an ethnic adjustment. Spirometers measure the function of the lungs. The patient

exhales in a tube and the machine measures the total volume of air exhaled after inspiration. The ethnic adjustment used in Spirometers assumes a smaller lung capacity for Black and Asian patients compared to their white counterparts (Smith & Spodak, 2021). There is no custom adjustment for multiracial patients. Spirometers incorporate an eGFR equation which uses race as a substitute for an unknown factor because it is assumed the factor is more common in minorities. When many physicians are unaware of the adjustment, these corrections are automatically applied to the spirometry output. The Spriometer assumes lung capacity in female patients than male patients and lower lung capacity in Black patients than white patients. Due to this assumption, percentage adjustments are automatically applied; racial bias is deliberately built into spirometers (Anderson, Malhotra, Non, 2021). Here, the racial issue isn't a biological factor, it is a social factor. Race correction in spirometers was based on questionable data carried from one era to another going back to the 18th century. (Braun, 2015). Spirometers were commonly used during the COVID-19 pandemic. The racial adjustment in Spirometers caused doctors to miss diagnoses such as restrictive ventilatory dysfunction as lower lung capacity was incorrectly assumed to be normal for minority populations.

Critics have been aware of the racial bias in the eGFR equation and the resulting medical dangers to patients. In 2020, the University of Washington and Mass General Bringham hospitals declared it was removing race correction from the eGFR equation (Smith & Spodak, 2021). The students at Mount Sinai hospital also started a petition asking the hospital to do the same. Students like Carina Seah went to Twitter tweeting "Our petition to remove "race correction" in eGFR calculations at Mount Sinai is almost at 400 signatures! If you're unfamiliar, I made some graphics to explain what eGFR is in the first place, and how it leads to discrepancies in treatment

and worse outcomes in Black patients" (Seah, 2020). The eGFR can negatively affect patients'

outcomes since it assumes Black patients have a lower lung capacity.

Likewise, racial biases impact other medical areas including Kidney Donors.

Similar to the eGFR, the national Kidney Allocation System implemented the Kidney Donor

Risk Index (KDRI) in 2014, which factors in race as a donor attribute, to anticipate the

probability of a kidney graft failing. According to an empirical finding that kidneys from Black

donors tend to underperform compared to non-Black donors, the KDRI adjusts for race,

irrespective of the recipient's race. The developers of the KDRI, however, do not offer any

plausible explanation for this discrepancy. If a potential donor is identified as Black, the KDRI

produces a higher probability of graft failure, implying that the candidate is a less suitable donor.

This then impacts organ allocation algorithms (Doshi et al. 2022). Black patients in the United

States typically wait longer for kidney transplants than non-Black patients. Given that Black

patients are more likely to obtain kidneys from Black donors, any reduction in the likelihood of

donation from Black individuals could exacerbate the wait-time inequality. Some experts,

mindful of this KDRI limitation, have proposed substituting "race" with a more precise,

ancestry-linked risk factor, such as APOL1 genotype that might actually contain a scientific

justification for donor decisions (Newell et al., 2017).

Astroturfing Groups

Astroturfing groups in healthcare can create bias in several ways, including misleading

the public. Astroturfing groups can create the impression of broad-based public support for a

particular position or product, even when such support does not exist. This can create a misleading perception of what the public actually thinks, leading to biased decision-making.

In 2009, it was revealed that the drug company Wyeth pharmaceuticals, owned by Pfizer had paid a medical commmunication company called DesignWrite to ghostwrite review articles for their drug Prempro. In May 2003, Elsevier's American Journal of Obstetrics and Gynecology" published an article to discredit a study that Prempro was found dangerous. In the Journal it was argued there was "no definitive evidence" that progestins cause breast cancer, and even said women who took the drugs would have a better chance at surviving cancer. This article was written by DesignWrite. The campaign was designed to downplay the risks of Prempro, which had been linked to an increased risk of breast cancer, and to discredit a study that had found the drug to be dangerous (Ostrzenski, & Ostrzenska, 2005). This creates unknowing bias for certain products within the healthcare community by influencing doctors. In response Charles Grassley a Iowa Republican senator said "Any attempt to manipulate the scientific literature, that can in turn mislead doctors to prescribe drugs that may not work and/or cause harm to their patients, is very troubling" (Wilson, 2008).

Coalition Against Socialized Medicine (CASM) is a group that presents itself as a patient advocacy group that advocates against Nancy Pelosi's drug pricing plan, which attempts to lower drug cost for American consumers. CASM is also anti Medicare for All claiming that it will harm seniors. CASM is a product who oppose Medicaire for All because it raises taxes on wealthy to provide healthcare for everyone. The Pharmaceutical Research and Manufacturers of America (PhRMA), the biggest drug industry trade group in the country contributed funding to

ACU. PhRMA, the Association for Accessible Medicines, and America's Health Insurance Plans

are members of the Partnership for America's Health Care Future, another front group that

produces anti-Medicare for All ad campaigns. The group has been accused of promoting policies

that benefit its funders rather than patients, creating a biased view of the issue of drug pricing.

The groups have used its financial resources to fund research and advocacy efforts that promote

its position on drug pricing while discrediting opposing viewpoints. For example, the group has

been accused of using its influence to prevent the appointment of individuals to key positions in

the Trump administration who were seen as being unfavorable to its position on drug pricing

(Kotch, 2019). By controlling the narrative in this way, Big Pharma, insurers, and hospitals

impact patients equality, they have been accused of influencing policymakers in ways that

benefit its funders rather than patients. Personal financial interest create bias within the

healthcare industry. The Medicare for All act would help minimize biases in the healthcare

industry by guaranteeing everyone affordable healthcare, creating less of a socioeconomic

barrier.

These examples demonstrate how pharmaceutical companies can use astroturfing tactics

to promote their products and influence public opinion. Such practices can erode trust in the

healthcare industry and compromise patient safety.

Conclusion

Ultimately, the goal of addressing bias and discrimination in the US healthcare system is

not simply to improve outcomes for marginalized communities, but to create a more just and

equitable society for all. Currently, as a minor step to alleviate bias, patients need to be aware

that they sould ask their doctor if the drug being prescribed is FDA approved for the specific

condition. This requires a fundamental and systemic change in the way we approach healthcare,

including a commitment to addressing the root causes of healthcare disparities and ensuring that

all individuals have access to high-quality healthcare regardless of their race, gender,

socioeconomic status, or other demographic factors. Tools used in healthcare can escape

regulation and need to be extensively researched and tested by the FDA. The lack of oversight

and accountability can lead to bias in algorithms and medical devices. Public reporting of

demographic information the tool is tested on should be reported. This needs to be overseen on a

bureaucratic level.

References

CNN. (2019, April 26). Aetna settles suit alleging claim-denying medical director never read patient's records. www.cnn.com/2019/04/26/health/aetna-settlement-california-investigation/index.html

Anderson, M. A., Malhotra, A., & Non, A. L. (2021). Could routine race-adjustment of spirometers exacerbate racial disparities in COVID-19 recovery? The Lancet Respiratory Medicine, 9(2), 124–125. doi.org/10.1016/S2213-2600(20)30571-3

Bernstein, N. (2012, January 22). Chefs, Butlers, Marble Baths: Hospitals Vie for the Affluent. *The New York Times*. www.nytimes.com/2012/01/22/nyregion/chefs-butlers-and-marble-baths-not-your-average-hospital-room.html

Bhavani, S. V., Wiley, Z., Verhoef, P. A., Coopersmith, C. M., & Ofotokun, I. (2022). Racial Differences in Detection of Fever Using Temporal vs Oral Temperature Measurements in Hospitalized Patients. *JAMA*, *328*(9), 885–886. doi.org/10.1001/jama.2022.12290

Braun, L. (2015). Race, ethnicity and lung function: A brief history. Canadian Journal of Respiratory Therapy: CJRT = Revue Canadienne de La Thérapie Respiratoire : RCTR, 51(4), 99–101.

Castellucci, M. (2017, March 29). Anthem faces lawsuit alleging race-based coverage discrimination. Modern Healthcare. www.modernhealthcare.com/article/20170329/NEWS/170329888/anthem-faces-lawsuitalleging-race-based-coverage-discrimination

Chakraborty, R., & Ye, J. (2021, November 18). Bioethics in the Age of COVID-19: Laundering bias and saving lives through AI – *Yale Scientific Magazine.* www.yalescientific.org/2021/11/bioethics-in-the-age-of-covid-19-laundering-bias-and-saving-lives-through-ai

CNN. (2019, April 26). Aetna to pay $935,000 after revealing HIV meds on envelopes. www.cnn.com/2019/04/26/health/aetna-settlement-california-investigation/index

Doshi, M. D., Schaubel, D. E., Xu, Y., Rao, P. S., & Sung, R. S. (2022). Clinical Utility in Adopting Race-free Kidney Donor Risk Index. Transplantation Direct, 8(7), e1343. doi.org/10.1097/TXD.0000000000001343

Gelles, D. (2008, December 12). Wyeth Settles Overcharging Case for $30 Million. New York Times. www.nytimes.com/2008/12/13/business/13wyeth

Harlan, E. (2022, August 4). Addressing racial bias in pulse oximetry / *CHEST Physician*.

www.mdedge.com/chestphysician/article/256831/diversity-medicine/addressing-racial-bi as-pulse-oximetry

Heckler, Margaret M. U.S. Department of Health and Human Services (1985) Report of the Secretary's Task Force Report on Black and Minority Health Volume I: Executive Summary. Other. Gvernment Printing Office, Washington, D.C..

Hoffman, K., Trawalter, S., Axt, J., and Oliver, N., (2016, April 4). Racial bias in pain assessment and treatment recommendations, and false beliefs about biological differences between blacks and whites | PNAS. www.pnas.org/doi/abs/10.1073/pnas.1516047113

Huang C, Wang Y, Li X, et al. Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. The Lancet Respiratory Medicine. 2020;8(2):e26-e27. doi.org/10.1016/S2213-2600(20)30571-3

Kaiser Health News (KHN). (2018, April 6). Pre$cription For Power: The Patient Advocacy Database. khn.org/patient-advocacy

Katz, J. T., & Sinha, M. S. (2021). Letter to the Editor: Adverse Drug Reactions and Medication Errors During the COVID-19 Pandemic. JAMA, 325(15), 1527-1528. doi:10.1001/jama.2021.2173

Kiani, J. (2021, February 15). Pulse Oximeters Are Not Racist. *Orange County Business Journal*. www.ocbj.com/healthcare/pulse-oximeters-not-racist

King, R. (2019, October 28). New York insurance regulator to probe Optum algorithm for racial bias | *Fierce Healthcare*. www.fiercehealthcare.com/payer/new-york-to-probe-algorithm-used-by-optum-for-racial -bias

Kotch, A. (2019, October 10). This Pharma-Backed Astroturf Group Wants to Keep Your Drug Prices High – Sludge. readsludge.com/2019/10/10/coalition-against-socialized- medicine

Kubo, M., & Harada, K. (2005). Oxidative stress suppresses cellular immunity in vitro. Atherosclerosis, 179(2), 225-232. doi.org/10.1016/j.atherosclerosis.2004.10.016

LaMotte, S. (2021, April 25). How race correction in medical algorithms leads to worse care for Black patients. CNN. www.cnn.com/2021/04/25/health/race-correction-in-medicine-history-refocused/index.ht ml

Landi, H. (2021, September 24). Aetna hit with class-action lawsuit alleging discriminatory policies for mental health treatment. Fierce Healthcare. www.fiercehealthcare.com/payer/aetna-hit-class-action-lawsuit-alleging-discriminatory-p olicies-for-mental-health-treatment

Lupkin, S. (2021, February 3). FDA clears first artificial intelligence tool for triaging eye
   problems. Stat News. www.statnews.com/2021/02/03/fda-clearances-artificial-
   intelligence-data

Masimo—A Message from our Founder/CEO on Racial Bias and Pulse Oximetry. (n.d.).
   www.masimo.com/company/news/pulse-oximetry-racial-bias

Milburn, R. (2015, June 12). Wealthy Increasingly Hire Pricey Health-Care Consultants.
   Barrons. blogs.barrons.com/penta/2015/06/12/wealthy-increasingly-hire-pricey-health-
   care-consul tants

Newell, K. A., Formica, R. N., Gill, J. S., Schold, J. D., Allan, J. S., Covington, S. H.,
   Wiseman, A. C., & Chandraker, A. (2017). Integrating APOL1 Gene Variants Into Renal
   Transplantation: Considerations Arising From the American Society of Transplantation
   Expert Conference. *American Journal of Transplantation*, *17*(4), 901–911.
   doi.org/10.1111/ajt.14173

Obermeyer, Z., Powers, B., Vogeli, C., & Mullainathan, S. (2019). Dissecting racial bias in an

   algorithm used to manage the health of populations. Science, 366(6464), 447–453.
   doi.org/10.1126/science.aax2342

Ostrzenski, A., & Ostrzenska, K. M. (2005). WHI clinical trial revisit: Imprecise scientific
   methodology disqualifies the study's outcomes. American Journal of Obstetrics and
   Gynecology, 193(5), 1599–1604. doi.org/10.1016/j.ajog.2005.07.085

Philadelphia Journal of the Medical and Physical Sciences (1820-1827) Philadelphia:
   American Periodicals Series II
   1820 (Vol. 1, no. 1) - Nov 1826-Feb 1827 (Vol. 4, no. 7)

Rankin, K. (2016, October 26). Study of widely used medical software says Black patients don't
   need same level of care as white. Colorlines.
   www.colorlines.com/articles/study-widely-used-medical-software-says-black-patients-do
   nt-need-same-level-care-white

Reilly, M. (2019, October 29). UnitedHealth algorithm accused of racial bias gets the OK from
   federal judge. Minneapolis/St. Paul Business Journal.
   www.bizjournals.com/twincities/news/2019/10/29/unitedhealth-algorithm-accused-of-rac
   ial-bias-gets.html

Ross, C. (2021, February 3). As the FDA clears a flood of AI tools, missing data raise troubling
   questions on safety and fairness. *STAT*.
   www.statnews.com/2021/02/03/fda-clearances-artificial-intelligence-data

Seah, C. [@CarinaSeah]. (2020, July 10). *Our petition to remove "race correction" in eGFR calculations at Mount Sinai is almost at 400 signatures! If you're unfamiliar,* [Tweet]. Twitter. twitter.com/CarinaSeah/status/1281759931377635328

Smith, J., Spodak, C., (2021, June 7). Race correction in medicine: A fight brewing in America's hospitals | CNN www.cnn.com/2021/04/25/health/race-correction-in-medicine-history-refocused/index.ht ml

Sjoding, M. W., Dickson, R. P., Iwashyna, T. J., Gay, S. E., Valley, T. S., & Bienvenu, O. J. (2020). Assessment of Racial Disparities in a Handheld Pulse Oximeter During the COVID-19 Pandemic. New England Journal of Medicine, 383(24), 2477-2478. doi: 10.1056/NEJMc2029240.

Wilson, D., (2008, December 13). New York Times. Wyeth to Pay $30 Million in Drug Discount Case. www.nytimes.com/2008/12/13/business/13wyeth.html