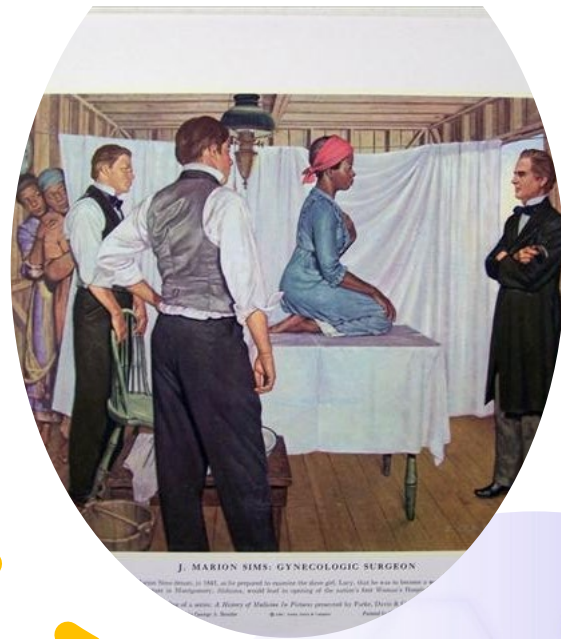


# The Historical & Ideological Origins of Race-based Algorithms



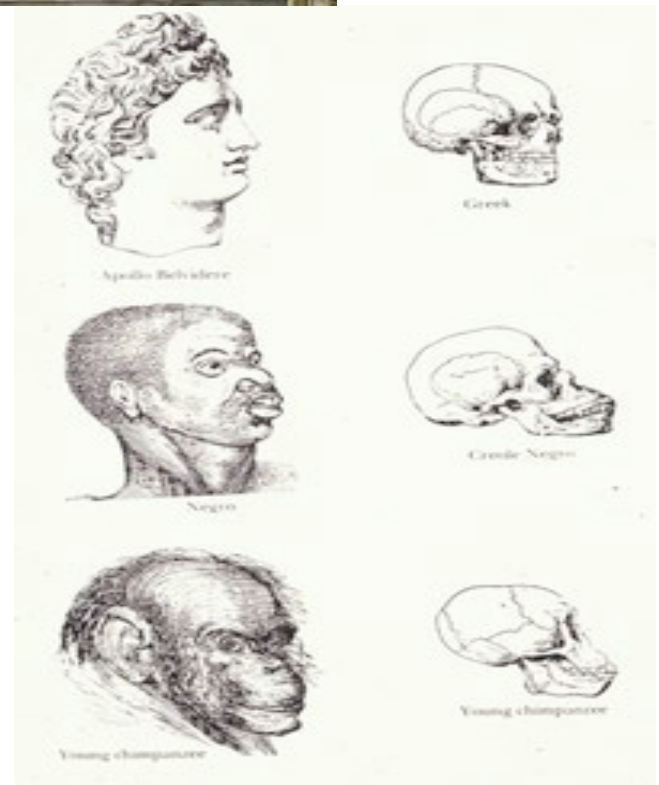
Dorothy Roberts, JD, FCPP

George A. Weiss University Professor of  
Law & Sociology

Director, Penn Program on Race, Science &  
Society

University of Pennsylvania

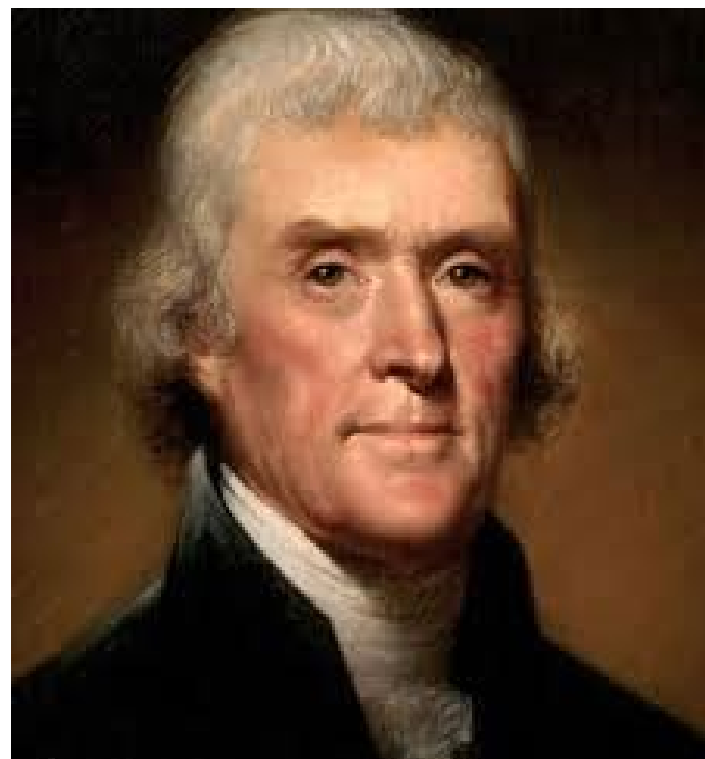
# The Scientific Invention of Race/ The Racial Invention of Science



## Thomas Jefferson, Racial Scientist

“The real  
distinctions  
nature has  
made” ...

“a powerful  
obstacle to the  
emancipation of  
these people.”



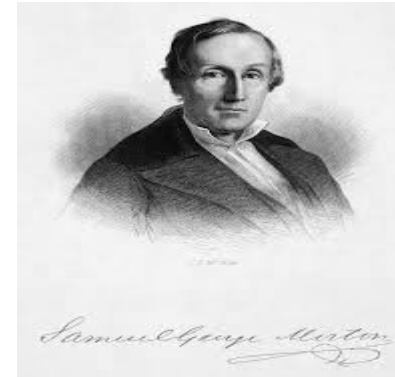
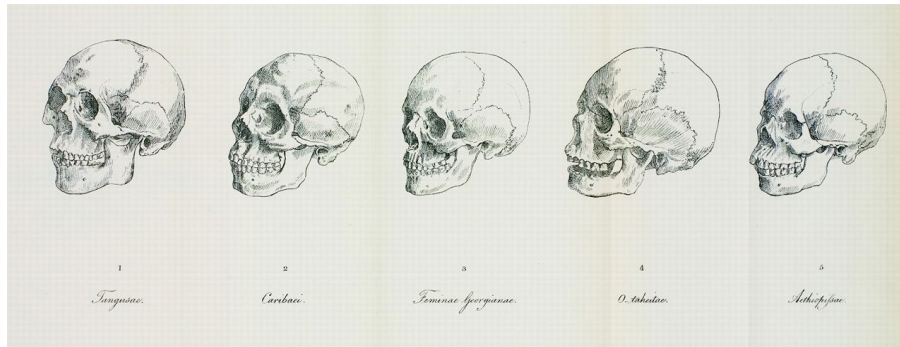
## Louis Agassiz' (1807-1873): Harvard Zoologist

- “There are upon earth different races of men, inhabiting different parts of its surface, which have different physical characteristics” ...
- So scientists have “the obligation to settle the relative rank among the races, the relative value of characters peculiar to each, in a scientific point of view” ...
- And concluded: “Social equality I deem at all times impracticable. It is a natural impossibility flowing from the very character of the negro race” – “indolent, playful, sensuous, imitative, subservient.”



# Samuel Morton (1799-1851); Penn Medical School

## *Crania Americana* (1839)



- Europeans: “highest intellectual endowments”
- Mongolians: “ingenious, imitative, highly susceptible of cultivation”
- Native Americans: “averse to cultivation; restless, revengeful, fond of war”
- Ethiopians: “joyous, flexible, indolent, lowest grade of humanity”



# Racial Concept of Disease

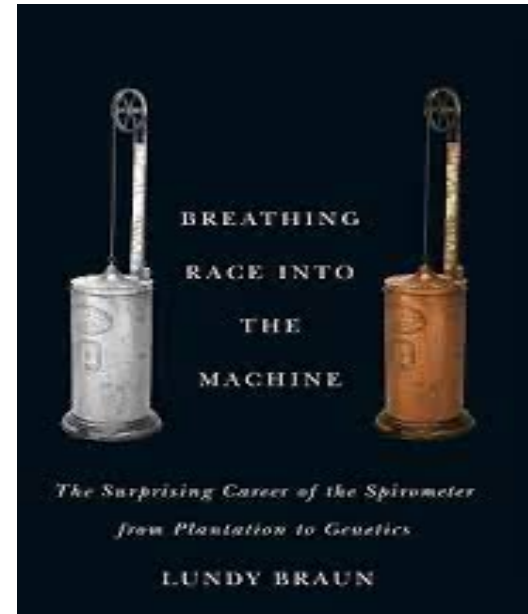
Dr. Samuel Cartwright, *The Report on the Diseases and Peculiarities of the Negro Race* (1851).

- *Drapetomania* (“the disease that causes Negroes to run away”)
- *Dysaesthesia Aethiopis* or “Rascality”
- *Negro Consumption*
- *Frambaesia* or “Yaws”
- *Pulmonary Congestion*
- *Scrofula*
- *Bilious and Adynamic Fevers*



# Race embedded in medical technology

Spirometer  
(invented 1846):  
“correction” for  
presumed racial  
differences in  
lung capacity





The NEW ENGLAND  
JOURNAL of MEDICINE



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MEDICINE AND SOCIETY

Race Correction and the X-  
Ray Machine — The  
Controversy over Increased  
Radiation Doses for Black  
Americans in 1968

Itai Bavli, Ph.D., and David S. Jones, M.D., Ph.D.

“The belief that Black people have denser bones, more muscle, or thicker skin led radiologists and technicians to use higher radiation exposure during x-ray procedures.”



# Vyas, D. A., Eisenstein, L. G., & Jones, D. S., "Hidden in plain sight—reconsidering the use of race correction in clinical algorithms," *New England Journal of Medicine* (2020)

**Table 1. Examples of Race Correction in Clinical Medicine.\***

Tool and Clinical Utility	Input Variables	Use of Race	Equity Concern
<b>Cardiology</b> The American Heart Association's Got with the Guidelines—Heart Failure* ( <a href="https://www.ahajournals.org/gwtg/heart-failure-risk-score">https://www.ahajournals.org/gwtg/heart-failure-risk-score</a> ) <i>Predicts in-hospital mortality in patients with acute heart failure. Clinicians are advised to use this risk stratification to guide decisions regarding medical therapy.</i>	Systolic blood pressure Blood urea nitrogen Sodium Age Heart rate History of COPD Race: black or nonblack	Adds 3 points to the risk score if the patient is identified as nonblack. This addition increases the estimated probability of death (higher scores predict higher mortality).	The original study envisioned using this score to "increase the use of recommended medical therapy in high-risk patients and reduce resource utilization in those at low risk." The race correction regards black patients as lower risk and may raise the threshold for using clinical resources for black patients.
<b>Cardiac surgery</b> The Society of Thoracic Surgeons Short Term Risk Calculator ( <a href="http://riskcalc.sts.org/stswebriskcalc/calculate">http://riskcalc.sts.org/stswebriskcalc/calculate</a> ) <i>Calculates a patient's risk of complications and death with the most common cardiac surgeries. Considers &lt;60 variables, some of which are listed here.</i>	Operation type Age and sex Race: black/African American, Asian, American Indian/Alaskan Native, or Native Hawaiian/Islander, or "Hispanic, Latino or Spanish ethnicity," white race is the default setting. BMI	The risk score for operative mortality and major complications increases in some cases, by 20% if a patient is identified as black, identified as another nonwhite race, or if ethnicity does not increase the risk score for death, but it does change the risk score for other complications such as renal failure, stroke, and prolonged ventilation.	When used preoperatively to assess a patient's risk, these calculations could steer minority patients, deemed higher risk, away from these procedures.
<b>Nephrology</b> Estimated glomerular filtration rate (eGFR) MDRD and CKD-EPI equations** ( <a href="https://www.kidney.com/nephrology-resources/egfr-calculator">https://www.kidney.com/nephrology-resources/egfr-calculator</a> ) <i>Estimates glomerular filtration rate on the basis of a measurement of serum creatinine.</i>	Serum creatinine Age and sex Race: black vs. white or other	The MDRD equation reports a higher eGFR (by a factor of 1.210) if the patient is identified as black. This adjustment is similar in magnitude to the correction for sex (0.742 if female). The CKD-EPI equation (which included a larger number of black patients in the original study) reports a slightly more modest race correction (by a factor of 1.155) if the patient is identified as black. This correction is larger than the correction for sex (0.618 if female).	Both equations report higher eGFR values (given the same creatinine measurement) for patients identified as black, suggesting better kidney function. These higher eGFR values may delay referral to a specialist care or listing for kidney transplantation.
<b>Organ Procurement and Transplantation Network:</b> Kidney Donor Risk Index (KDRI)** ( <a href="https://optn.transplant.hrsa.gov/resources/allocation-calculators/kdri-calculator/">https://optn.transplant.hrsa.gov/resources/allocation-calculators/kdri-calculator/</a> ) <i>Estimates predicted risk of donor kidney graft failure, which is used to predict viability of potential kidney donor.†</i>	Age Hypertension, diabetes Serum creatinine level Cause of death (e.g., cerebrovascular accident) Donation after cardiac death Height and weight HLA matching Cold ischemia En bloc transplant Double kidney transplantation Race: African American	Increases the predicted risk of kidney graft failure if the potential donor is identified as African American (coefficient, 0.129). A risk adjustment intermediate between those for hypertension (0.126) and diabetes (0.130) and that for elevated creatinine (0.209–0.230).	Use of this tool may reduce the pool of African-American kidney donors in the United States. Since African-American patients are more likely to receive kidneys from African-American donors, by reducing the pool of available kidneys, the KDRI could exacerbate health equity in access to kidneys for transplantation.
<b>Obstetrics</b> Vaginal Birth after Cesarean (VBAC) Risk Calculator*** ( <a href="https://infonetwork.bsc.gwu.edu/Public/vbacriskcalc/vbacriskcalc.html">https://infonetwork.bsc.gwu.edu/Public/vbacriskcalc/vbacriskcalc.html</a> ) <i>Estimates the probability of successful vaginal birth after prior cesarean section. Clinicians can use this estimate to counsel people who have to decide whether to attempt a trial of labor rather than undergo a repeat cesarean section.</i>	Age BMI Prior vaginal delivery Prior VBAC Recurrent indication for cesarean sec. African-American race Hispanic ethnicity	The African-American and Hispanic correction factors subtract from the estimated success rate for any person identified as black or Hispanic. The decrement for black (0.621) or Hispanic (0.680) is for black (0.621) or Hispanic (0.680) is for vaginal delivery (0.888) or prior VBAC (1.003).	The VBAC score predicts a lower chance of success if the person is identified as black or Hispanic. These lower estimates may dissuade clinicians from offering trials of labor to people of color.
<b>Urology</b> STONE Score***,12 <i>Predicts the risk of a ureteral stone in patients who present with flank pain</i> Urinary tract infection (UTI) calculator** ( <a href="https://uiscalc.pitt.edu/">https://uiscalc.pitt.edu/</a> ) <i>Estimates the risk of UTI in children 2–23 mo of age to guide decisions about when to pursue urine testing for definitive diagnosis</i>	Sex Acute onset of pain Race: black or nonblack Nausea or vomiting Hematuria Age <12 months Maximum temperature >39°C Race: Describes self as black (fully or partially) Female or uncircumcised male Other fever source	Produces a score on a 33-point scale, with a higher score indicating a higher risk of a ureteral stone. 3 points are added for nonblack race. This adjustment is the same magnitude as for hematuria. Assigns a lower likelihood of UTI if the child is black (i.e., reports a roughly 2.5-times increased risk in patients who do not describe themselves as black)	By systematically reporting lower risk for black patients than for all nonblack patients, this calculator may steer clinicians away from aggressive evaluations of black patients. By systematically reporting lower risk for black children than for all nonblack children, this calculator may deter clinicians from pursuing definitive diagnostic testing for black children presenting with symptoms of UTI.
<b>Oncology</b> Rectal Cancer Survival Calculator** ( <a href="http://www3.mdanderson.org/app/medcalc/index.cfm?pagename=rectalcancer">http://www3.mdanderson.org/app/medcalc/index.cfm?pagename=rectalcancer</a> ) <i>Estimates conditional survival 1–5 yr after diagnosis with rectal cancer.</i> National Cancer Institute Breast Cancer Risk Calculator*** ( <a href="http://bcrisktool.cancer.gov/calculator.html">http://bcrisktool.cancer.gov/calculator.html</a> ) <i>Estimates 5-yr and lifetime risk of developing breast cancer for women without prior history of breast cancer, DCIS, or LCIS.</i>	Age and sex Race: white, black, other Stage Surgical history Current age, age at menarche, and age at first pregnancy First-degree relatives with breast cancer Prior benign biopsies, atypical biopsies Race/ethnicity: white, African American, Hispanic/Latino, or Asian American, American Indian/Alaska Native, unknown	White patients are assigned a regression coefficient of 1, with higher coefficients (depending on stage) assigned to black patients (1.18–1.72). The calculator returns lower risk estimates for patients of Chinese descent (e.g., Chinese), Hispanic/Latino, or Asian American (e.g., Chinese).	The calculator predicts that black patients will have shorter cancer-specific survival from rectal cancer than white patients. Clinicians might be more or less likely to offer interventions to patients with lower predicted survival. Though the model is intended to help conceptualize breast cancer risk, it may inappropriately discourage more aggressive screening among some groups of nonwhite women.
<b>Breast Cancer Surveillance Consortium Risk Calculator**</b> ( <a href="https://tools.bscsc.org/BC5yrRisk/calculator.htm">https://tools.bscsc.org/BC5yrRisk/calculator.htm</a> ) <i>Estimates 5- and 10-yr risk of developing breast cancer in women with no previous diagnosis of breast cancer, DCIS, prior breast augmentation, or prior mastectomy</i>	Age Race/ethnicity: white, black, Asian, American Indian, other/multiple Race†, unknown BRCA1/2 mutation score First-degree relative with breast cancer Pathology results from prior biopsies	The coefficients rank the race/ethnicity categories in the following descending order of risk: white, American Indian, black, Hispanic, Asian.	Returns lower risk estimates for all nonwhite race/ethnicity categories, potentially reducing the likelihood of close surveillance in these patients.
<b>Endocrinology</b> Osteoporosis Risk SCORE (Simple Calculated Osteoporosis Risk Estimator) ( <a href="http://www.mdapp.co/osteoporosis-risk-score-calculator-336/">http://www.mdapp.co/osteoporosis-risk-score-calculator-336/</a> ) <i>Determines whether a woman is at low, moderate, or high risk for low bone density in order to guide decisions about screening with DXA scans</i> Fracture Risk Assessment Tool (FRAX)** ( <a href="https://www.sheffield.ac.uk/FRAX/tool.aspx">https://www.sheffield.ac.uk/FRAX/tool.aspx</a> ) <i>Estimates 10-yr risk of a hip fracture or other major osteoporotic fracture on the basis of patient demographics and risk factor profile. Calculators are country-specific.‡</i>	Rheumatoid arthritis History of fracture Age Sex Etirogen use Weight Race: black or not black Age and sex Weight and height Parent who had a hip fracture Prior fracture of hip, spine, or forearm Glucocorticoid use Rheumatoid arthritis Secondary osteoporosis Alcohol use, >3 drinks per day Femoral neck bone mineral density	Assigns 5 additional points (maximum 10 points) to the risk score if the patient is identified as nonblack. The U.S. calculator returns a lower fracture risk if a female patient is identified as white (0.001), black (0.002), or Hispanic (0.003). Estimates are not provided for nonwhite American patients or for multiracial patients.	By systematically lowering the estimated risk for nonblack patients, the SCORE may discourage clinicians from pursuing further evaluation (e.g., DXA scan) in black patients, potentially delaying diagnosis and intervention. The calculator reports 10-yr risk of major osteoporotic fracture for black women as less than for white women, even when all other risk factors for Asian and Hispanic women are increased 5-fold, compared with that for white women. This lower risk reported for nonwhite women may delay intervention with osteoporosis therapy.
<b>Pulmonology</b> Pulmonary-function tests** <i>Uses spirometry to measure lung volume and the rate of airflow through airways in order to diagnose and monitor pulmonary disease</i> BRADS denotes Breast Imaging Reporting and Data System, BMI body-mass index (the weight in kilograms divided by the square of the height in meters), COPD chronic obstructive pulmonary disease, DCIS ductal carcinoma in situ, DXA dual-energy x-ray absorptiometry, LCIS lobular carcinoma in situ, and MDRD Modification of Diet in Renal Disease.	Age and sex Race/ethnicity	In the U.S., spirometers use correction factors for persons labeled as black (10–15%) or Asian (4–6%).	Inaccurate estimates of lung function may result in the misclassification of disease severity and impairment for racial/ethnic minorities (e.g., in asthma and COPD).

\*BRADS denotes Breast Imaging Reporting and Data System, BMI body-mass index (the weight in kilograms divided by the square of the height in meters), COPD chronic obstructive pulmonary disease, DCIS ductal carcinoma in situ, DXA dual-energy x-ray absorptiometry, LCIS lobular carcinoma in situ, and MDRD Modification of Diet in Renal Disease.  
†The current calculator uses Ethnicity/Race, with the following options: American Indian or Alaska Native, Asian, Black or African American, Hispanic/Latino, Native Hawaiian or Other Pacific Islander, White, and Multiracial.  
‡The calculator also allows patients to be further subcategorized by race, ethnicity, or location: China (Mainland China, Hong Kong), Singapore (Chinese, Malay, Indian), and the United States (Caucasian, black, Hispanic, Asian).

# Are oximeters racially biased? White as the standard



The NEW ENGLAND  
JOURNAL of MEDICINE



## CORRESPONDENCE

### Racial Bias in Pulse Oximetry Measurement

December 17, 2020

N Engl J Med 2020; 383:2477-2478

DOI: 10.1056/NEJMc2029240

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#### TO THE EDITOR:

Oxygen is among the most frequently administered medical therapies, with a level that is commonly adjusted according to the reading on a pulse oximeter that measures patients' oxygen saturation. Questions about pulse oximeter technology have been raised, given its original development in populations that were not racially diverse.<sup>1,2</sup> The clinical significance of potential racial bias in pulse oximetry measurement is unknown.

#### TO THE EDITOR

Throughout 2020, the global movement for racial equality has led many to reflect on their own biases. While combating racism is vital in every setting, we must also preserve nomenclature in science so that it remains a tool to be wielded in the discovery of truth. Phrases such as “racial bias” and “structural racism” are commonplace in the social sciences literature, but they should be used with caution in scientific study. If the findings of the study by Sjoding et al.<sup>1</sup> are correct, they establish a diagnostic inaccuracy, owing to darker skin color, not a racial bias. The term “racial bias” always refers to decisions that are influenced by a person's race. Medical devices such as pulse oximeters are blind to color and cannot exhibit such a bias. It is worrisome that the study findings have been disseminated across social media as proof of “structural racism in health care.”<sup>2</sup> Imprudent use of such terms will inevitably further erode the trust of some Black patients and will contribute to, rather than help to remedy, concerns regarding racism in Western medicine.

Thomas Whitehead-Clarke, M.B., B.S.

# “But we aren’t racist”

*New York Times*, Oct. 18-19, 2018

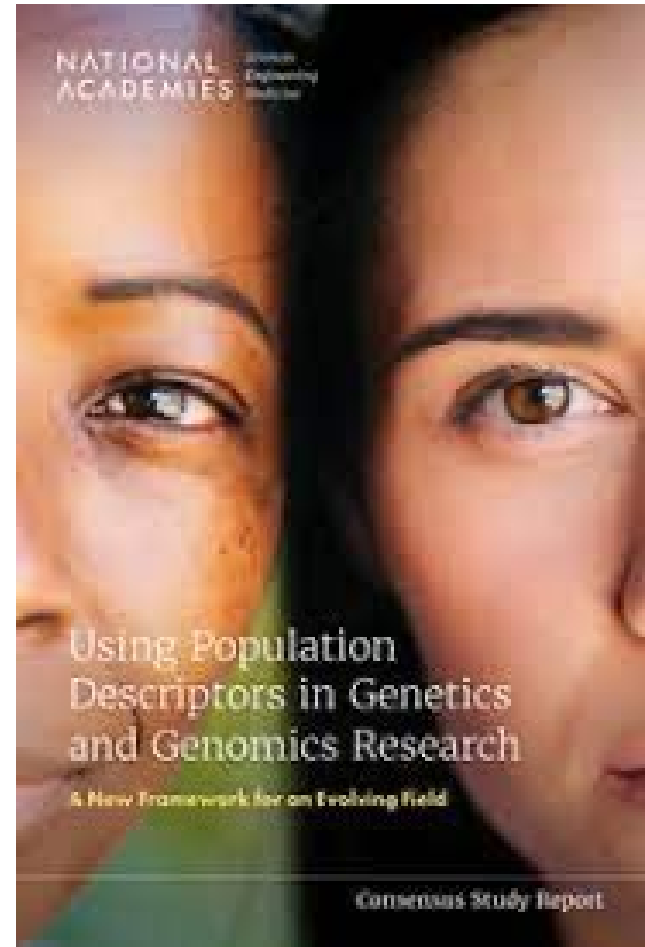
*Geneticists Criticize Use of Science by  
White Nationalists to Justify ‘Racial Purity’*



As shown from a video showing the ongoing rally, white nationalists are using genetic research — like the study published Tuesday — to justify their claims of racial purity.

Racism produces race  
(not the other way  
around)

- Conclusion 4-1: Race is neither useful nor scientifically valid as a measure of the structure of human genetic variation.
- Recommendation 1: Researchers should not use race as a proxy for human genetic variation.

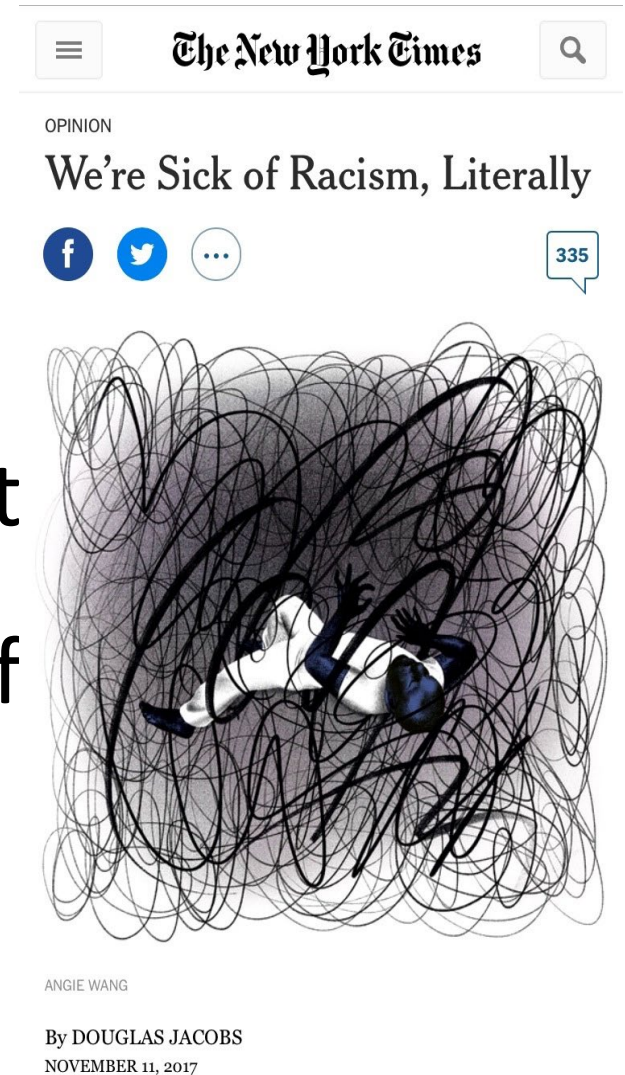


# Embodying *Racism*

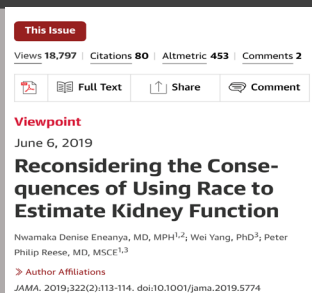
“Race is not a biological category that naturally produces health disparities because of genetic differences. Race is a political category that has staggering biological consequences because of the impact of social inequality on people’s health”

Fatal Invention, 129

D. Roberts, UPenn







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HEALTH

# Changing the equation: Researchers remove race from a calculator for childbirth

 By **Katie Palmer**  June 3, 2021



NEWS RELEASE 18-JUL-2022

# Race-based spirometry equations may miss emphysema

Embargoed News from Annals of Internal Medicine

Peer-Reviewed Publication  
AMERICAN COLLEGE OF PHYSICIANS

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## 1. Race-based spirometry equations may miss emphysema

*Findings suggest race-specific interpretations of spirometry may be normalizing structural racial inequities in respiratory health*

Race-based  
diagnostics harm  
patients

c. Dorothy Roberts

# Racial discrimination

## ***Black Former N.F.L. Players Say Racial Bias Skews Concussion Payouts***

The players say doctors use two scales — one for Black athletes, one for white — to determine eligibility for dementia claims.



Najeh Davenport's 2019 neurocognitive exam found that his executive functioning was diminished enough to qualify for compensation. The N.F.L. appealed the award and said that when his scores were recalculated accounting for race, he was ineligible for a payout. Jeffery Salter for The New York

c. Dorothy Roberts



**The New York Times**

**2021 N.F.L. Season >**

**Week 6 Takeaways**

**No Gruden, No Prob**

## ***Plan Filed to Scrap Race as Factor in N.F.L. Concussion Settlement***

The revised agreement eliminates race as a consideration in evaluating dementia claims by former players.



**By Ken Belson**

Oct. 20, 2021



- Race correction shows a failure to recognize race-based medicine's harms.... I marvel that doctors aren't worried that race correction might contribute to African Americans' higher rate of end-stage kidney disease.
- Race correction shows a failure to understand the meaning of race and its connection to racism historically and today.
- The persistence of race correction shows an unwillingness from some in medicine to change.

