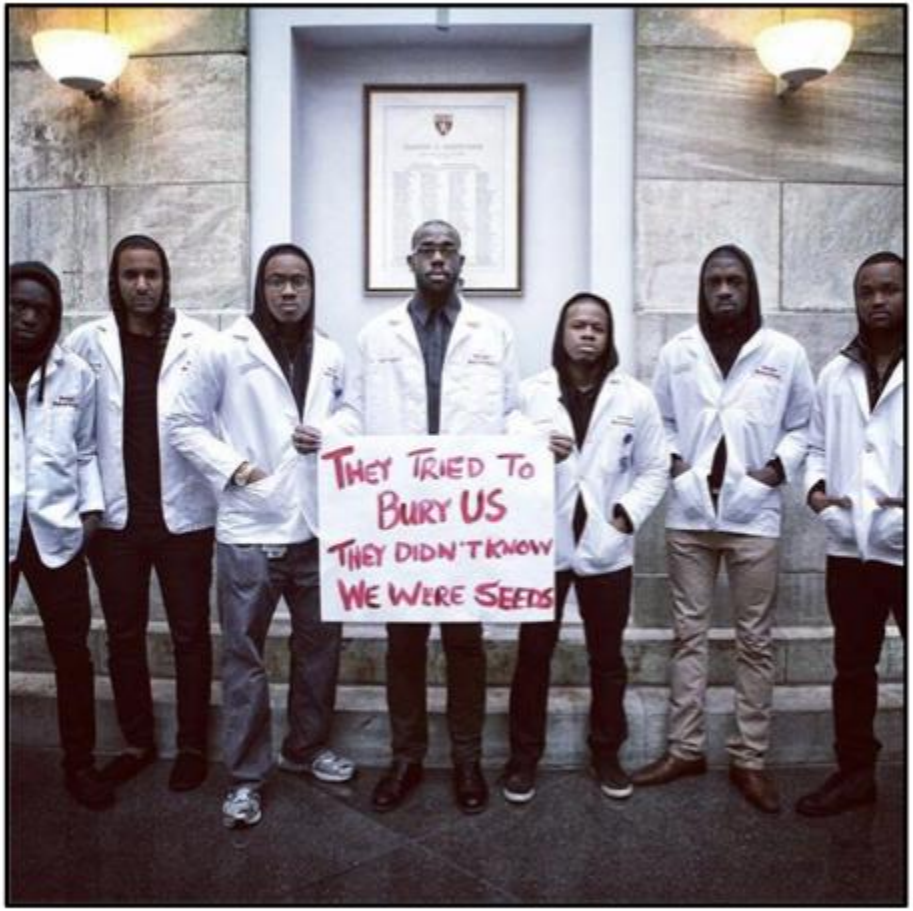
Race in Prediction Models: Reconsidering Race Correction

Presented by Darshali Vyas MD

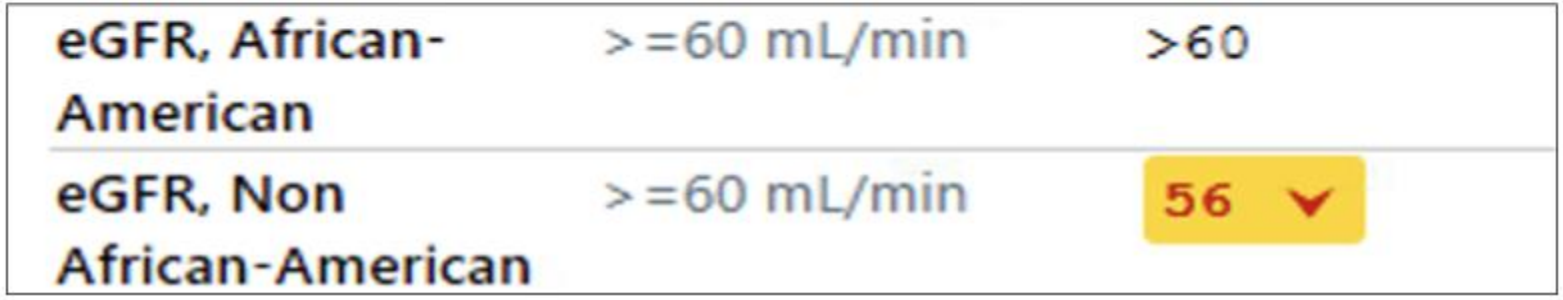
Background

- Black Lives Matter, 2013
- HMS Racial Justice Coalition, 2015
  - Medical school leadership
  - Recruitment
  - Curriculum
- ***Race: social construct, or proxy for genetic difference?***



Race "correction"

- Diagnostic algorithms
  - Individualize risk assessment
  - Guide clinical decisions
- Race embedded into decision-making tools
- Different treatment → inequitable outcomes?



Hidden in Plain Sight — Reconsidering the Use of Race Correction in Clinical Algorithms

Darshali A. Vyas, M.D., Leo G. Eisenstein, M.D., and David S. Jones, M.D., Ph.D.

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

Tool and Clinical Utility	Input Variables	Use of Race	Equity Concern
Cardiology			
The American Heart Association's Get with the Guidelines–Heart Failure[9] (https://www.mdcalc.com/gwtg-heart-failure-risk-score) *Predicts in-hospital mortality in patients with acute heart failure. Clinicians are advised to use this risk stratification to guide decisions regarding initiating medical therapy.*	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 to "increase the use of recommen medical therapy in high-risk pat reduce resource utilization in th risk."[9] The race correction regar patients as lower risk and may threshold for using clinical reso black patients.
Cardiac surgery			
The Society of Thoracic Surgeons Short Term Risk Calculator[10] (http://riskcalc.sts.org/stswebriskcalc/calculate) *Calculates a patient's risks of complications and death with the most common cardiac surgeries. Considers >60 variables, some of which are listed here.*	Operation type Age and sex Race: black/African American, Asian, American Indian/Alaskan Native, Native Hawaiian/Pacific 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. Identification as another nonwhite race or ethnicity does not increase the risk score for death, but it does change the risk score for major complications such as renal failure, stroke, and prolonged ventilation.	When used preoperatively to asses tient's risk, these calculations c minority patients, deemed high away from these procedures.
Nephrology			
Estimated glomerular filtration rate (eGFR) MDRD and CKD-EPI equations[11] (https://ukidney.com/nephrology-resources/egfr-calculator) *Estimates glomerular filtration rate on the basis of a measurement of serum creatinine.*	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 study population), proposes a more modest race correction (by a factor of 1.159) if the patient is identified as black. This correction is larger than the correction for sex (1.018 if female).	Both equations report higher eGFR (given the same creatinine mea for patients identified as black, better kidney function. These hi values may delay referral to spe or listing for kidney transplanta
Organ Procurement and Transplantation Network: Kidney Donor Risk Index (KDRI)[11] (https://optn.transplant.hrsa.gov/resources/allocation-calculators/kdpi-calculator/) *Estimates predicted risk of donor kidney graft failure, which is used to predict viability of potential kidney donor.†*	Age Hypertension, diabetes Serum creatinine level Cause of death (e.g., cerebrovascular accident) Donation after cardiac death Hepatitis C Height and weight HLA matching Cold ischemia En bloc transplantation Double kidney transplantation	Increases the predicted risk of kidney graft failure if the potential donor is identified as African American (coefficient, 0.179), a risk adjustment intermediate between those for hypertension (0.126) and diabetes (0.130) and that for elevated creatinine (0.209–0.220).	Use of this tool may reduce the poo African-American kidney donor United States. Since African-An patients are more likely to recei from African-American donors, ing the pool of available kidney could exacerbate this racial ine cess to kidneys for transplantat
Obstetrics			
Vaginal Birth after Cesarean (VBAC) Risk Calculator[12,13] (https://mfmunetwork.bsc.gwu.edu/PublicBSC/MFMU/VGBirthCalc/vagbirth.html) *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.*	Age BMI Prior vaginal delivery Prior VBAC Recurring indication for cesarean section 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 (0.671) or Hispanic (0.680) is almost as large as the benefit from prior 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.
Urology			
STONE Score[14,15] *Predicts the risk of a ureteral stone in patients who present with flank pain*	Sex Acute onset of pain Race: black or nonblack Nausea or vomiting Hematuria	Produces a score on a 13-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.	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.
Urinary tract infection (UTI) calculator[16] (https://uticalc.pitt.edu/) *Estimates the risk of UTI in children 2–23 mo of age to guide decisions about when to pursue urine testing for definitive diagnosis*	Age <12 months Maximum temperature >39°C Race: Describes self as black (fully or partially) Female or uncircumcised male Other fever source	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 children than for all nonblack children, this calculator may deter clinicians from pursuing definitive diagnostic testing for black children presenting with symptoms of UTI.
Oncology			
Rectal Cancer Survival Calculator[18] (http://www3.mdanderson.org/app/medcalc/index.cfm?pagename=rectumcancer) *Estimates conditional survival 1–5 yr after diagnosis with rectal cancer*	Age and sex Race: white, black, other Grade Stage Surgical history	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 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 rates.
National Cancer Institute Breast Cancer Risk Assessment Tool (https://bcrisktool.cancer.gov/calculator.html) *Estimates 5-yr and lifetime risk of developing breast cancer, for women without prior history of breast cancer, DCIS, or LCIS*	Current age, age at menarche, and age at first live birth First-degree relatives with breast cancer Prior benign biopsies, atypical hyperplasias Race/ethnicity: white, African American, Hispanic/Latina, Asian American, American Indian/Alaska Native, unknown	The calculator returns lower risk estimates for women who are African American, Hispanic/Latina, or Asian American (e.g., Chinese).	Though the model is intended to help conceptualize risk and guide screening decisions, it may inappropriately discourage more aggressive screening among some groups of nonwhite women.

Example 1: eGFR

Impacts:

- Referral to a nephrologist
- Placement on transplant waiting list
- Dosing of medications

Racial disparities:

- End-stage kidney disease
- Death due to kidney failure
- Longer wait times for kidney transplant


Black Kidney Function Matters
Use or Misuse of Race?

There will be continued tension about whether the use of race in medicine constitutes misuse.

“We need to slow down as a community of physicians to figure out how best to do this.”
NEIL POWE
Chief of medicine, Zuckerberg San Francisco General Hospital

Quantifying Harm

Examining the Potential Impact of Race Multiplier Utilization in Estimated Glomerular Filtration Rate Calculation on African-American Care Outcomes

Salman Ahmed, MD, MPH[1], Cameron T. Nutt, MD[2], Nwamaka D. Eneanya, MD, MPH[3], Peter P. Reese, MD, MSCE[3], Karthik Sivashanker, MD[4,5], Michelle Morse, MD, MPH[2,6,7], Thomas Sequist, MD, MPH[2,8], and Mallika L. Mendu, MD, MBA[1,5,9]

- Of 2225 African-American patients, **743 (33.4%)** would be reclassified to a more severe CKD stage
- 64 of 2069 patients (3.1%) would be reassigned from eGFR > 20 to eGFR ≤ 20, meeting criterion for accumulating kidney transplant priority

National Kidney Foundation®

ASN

VIEWPOINT

Reconsidering the Consequences of Using Race to Estimate Kidney Function

Nwamaka Denise Eneanya, MD, MPH

Clinicians estimate kidney function to guide important medical decisions across a wide range of settings, ... mutations like sickle cell trait or cysti... ever, eGFR equations are distinct beca...

Annals of Internal Medicine

IDEAS AND OPINIONS

Race and the False Precision of Glomerular Filtration Rate Estimates

Ashwini R. Sehgal, MD

Quantifying glomerular filtration rate (GFR), a key measure of kidney function, is important for both the management and prognosis of kidney disease. Glomerular filtration rate is expressed in milliliters per minute normalized to body surface area, and values below ... sessed the body composition of a representative sample of 5462 adult Americans in 2015 to 2018. Muscle mass (as indicated by upper- and lower-extremity lean tissue, excluding bone mineral) was an average of 11% greater among Black than White participants, an amount

Establishing a Task Force to Reassess the Inclusion of Race in Diagnosing Kidney Diseases

A joint statement from the National Kidney Foundation and the American Society of Nephrology

July 2, 2020

May 29, 2020

UW Medicine to exclude race from calculation of eGFR (measure of kidney function)

STAT

CLINICAL

HEALTH

A yearslong push to remove racist bias from kidney testing gains new ground

By THERESA GAFFNEY / JULY 17, 2020

Reprints

Mass General Brigham

June 25, 2020

System News and Updates

Today's updates include:

- For Clinicians: Epic Upgrade Eliminates "Race Correction" for Kidney Disease Function
- LGBTQ+ Pride Virtual Event: Health Care and Policy in 2020
- Snapshots Recognizing the Brigham and Women's Faulkner Hospital Testing Tent Team
- For Clinicians: Latest Updates to COVID-19 Testing Criteria

For Clinicians: Epic Upgrade Eliminates "Race Correction" for Kidney Disease Function

Starting this week, we will no longer display a traditionally utilized "race multiplier" that adjusts the estimated kidney function value ("eGFR") for Black patients relative to other patients. Until now, Mass General Brigham has, consistent with other health systems nationally, displayed the multiplier in the Epic medical record noting the correction factor for Black patients.

We strongly encourage our clinical workforce to avoid use of such correction factors for several reasons:

American Society of Nephrology

The leaders of NKF and ASN agree that 1) race modifiers should not be included in equations to estimate kidney function and 2) current race-based equations should be replaced by a suitable approach that is accurate, inclusive, and standardized in every laboratory in the United States. Any such approach must not differentially introduce bias, inaccuracy, or inequalities.

The NEW ENGLAND JOURNAL of MEDICINE

March 5, 2021

ORIGINAL ARTICLE

New Creatinine- and Cystatin C–Based Equations to Estimate GFR without Race

L.A. Inker, N.D. Eneanya, J. Coresh, H. Tighiouart, D. Wang, Y. Sang, D.C. Crews, A. Doria, M.M. Estrella, M. Froissart, M.E. Grams, T. Greene, A. Grubb, V. Gudnason, O.M. Gutiérrez, R. Kalil, A.B. Karger, M. Mauer, G. Navis, R.G. Nelson, E.D. Poggio, R. Rodby, P. Rossing, A.D. Rule, E. Selvin, J.C. Seegmiller, M.G. Shlipak, V.E. Torres, W. Yang, S.H. Ballew, S.J. Couture, N.R. Powe, and A.S. Levey, for the Chronic Kidney Disease Epidemiology Collaboration*

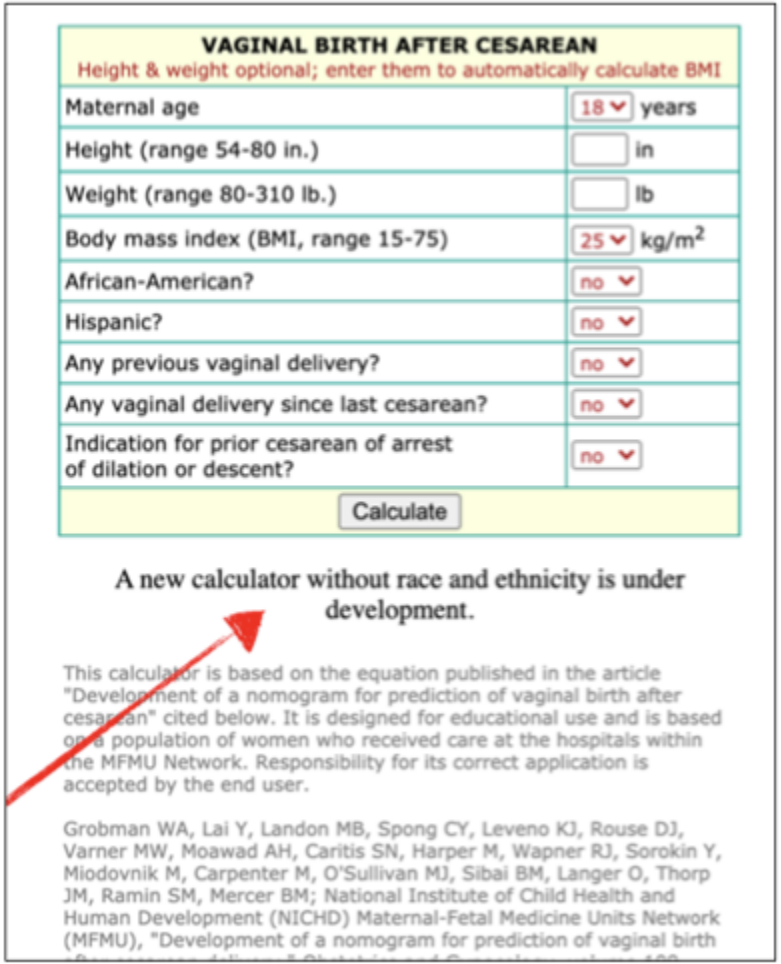
Example 2: VBAC

Impacts:

- Benefits of VBAC > C-section
  - Surgical complications
  - Recovery time
  - Subsequent pregnancy complications
- Marital status and insurance type

Racial disparities:

- C-section rates
- Maternal mortality rates



VAGINAL BIRTH AFTER CESAREAN

Height & weight optional; enter them to automatically calculate BMI

Maternal age	18 years
Height (range 54-80 in.)	in
Weight (range 80-310 lb.)	lb
Body mass index (BMI, range 15-75)	25 kg/m^2
African-American?	no
Hispanic?	no
Any previous vaginal delivery?	no
Any vaginal delivery since last cesarean?	no
Indication for prior cesarean of arrest of dilation or descent?	no

Calculate

A new calculator without race and ethnicity is under development.

This calculator is based on the equation published in the article "Development of a nomogram for prediction of vaginal birth after cesarean" cited below. It is designed for educational use and is based on a population of women who received care at the hospitals within the MFMU Network. Responsibility for its correct application is accepted by the end user.

Grobman WA, Lai Y, Landon MB, Spong CY, Leveno KJ, Rouse DJ, Varner MW, Moawad AH, Caritis SN, Harper M, Wapner RJ, Sorokin Y, Miodovnik M, Carpenter M, O'Sullivan MJ, Sibai BM, Langer O, Thorp JM, Ramin SM, Mercer BM; National Institute of Child Health and Human Development (NICHD) Maternal-Fetal Medicine Units Network (MFMU), "Development of a nomogram for prediction of vaginal birth

The VBAC Calculator

Logistic Regression Equation for Prediction of Achieving VBAC After a Trial of Labor

Predicted probability of successful VBAC=exp(w)/[1+exp(w)], where w=3.766−0.039(age)−0.060 (prepregnancy body mass index)−0.671 (African-American race)−0.680 (Hispanic race)+0.888 (any prior vaginal delivery)+1.003 (vaginal delivery after prior cesarean)−0.632 (recurring indication for cesarean)

VAGINAL BIRTH AFTER CESAREAN

Height & weight optional; enter them to automatically calculate BMI

Maternal age	35 years
Height (range 54-80 in.)	in
Weight (range 80-310 lb.)	lb
Body mass index (BMI, range 15-75)	30 kg/m^2
African-American?	no
Hispanic?	no
Any previous vaginal delivery?	no
Any vaginal delivery since last cesarean?	no
Indication for prior cesarean of arrest of dilation or descent?	no

Calculate

VAGINAL BIRTH AFTER CESAREAN

Predicted chance of vaginal birth after cesarean: **64.4%**

95% confidence interval: [**61.7%, 66.9%**]

VAGINAL BIRTH AFTER CESAREAN

Height & weight optional; enter them to automatically calculate BMI

Maternal age	35 years
Height (range 54-80 in.)	in
Weight (range 80-310 lb.)	lb
Body mass index (BMI, range 15-75)	30 kg/m^2
African-American?	yes
Hispanic?	no
Any previous vaginal delivery?	no
Any vaginal delivery since last cesarean?	no
Indication for prior cesarean of arrest of dilation or descent?	no

Calculate

VAGINAL BIRTH AFTER CESAREAN

Predicted chance of vaginal birth after cesarean: **48.0%**

95% confidence interval: [**44.1%, 51.9%**]

Women's Health Issues 29-3 (2019) 201–204

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WOMEN'S HEALTH ISSUES

www.whijournal.com

Commentary

Challenging the Use of Race in the Vaginal Birth after Cesarean Section Calculator

Darshali A. Vyas, BA [a,*], David S. Jones, MD, PhD [a], Audra R. Meadows, MD, MPH [a,b], Khady Diouf, MD [a,b], Nawal M. Nour, MD, MPH [a,b], Julianna Schantz-Dunn, MD, MPH [a,b]

[a] *Harvard Medical School, Boston, Massachusetts*
[b] *Department of Obstetrics and Gynecology, Brigham and Women's Hospital, Boston, Massachusetts*

Article history: Received 18 February 2019; Received in revised form 7 April 2019; Accepted 12 April 2019

Table 2
Variables Included in Validated Models for VBAC Risk Stratification*

United States (Grobman et al., 2007)	Canada (Chaillet et al., 2013)	Sweden (Fagerberg et al., 2015)
Maternal age	Maternal age	Maternal age
BMI	BMI	BMI
Prior vaginal delivery	Prior vaginal delivery	Prior vaginal delivery
Prior VBAC	Prior VBAC	Prior VBAC
Prior indication for cesarean	Prior indication for cesarean	Prior indication for cesarean
Maternal race		Maternal height
		Delivery unit's rate of ERCS
		Delivery unit's rate of unplanned cesarean section

Abbreviations: BMI, body mass index; ERCS, elective repeat cesarean section; VBAC, vaginal birth after cesarean delivery.

* Only the U.S. version includes maternal race as a risk factor.

Logistic Regression Equation for Prediction of Achieving VBAC After a Trial of Labor

Predicted probability of successful VBAC=exp(w)/[1+exp(w)], where w=3.766−0.039(age)−0.060 (prepregnancy body mass index)−0.671 (African-American race)−0.680 (Hispanic race)+0.888 (any prior vaginal delivery)+1.003 (vaginal delivery after prior cesarean)−0.632 (recurring indication for cesarean)

Race and the notion of “essential difference”

The anthropoid pelvis was first described as a “degraded or animalized arrangement seen in the lower races”

“The narrow pelvis is so distinctively a Negro character and our average is so much less than those of other American Negro samples that it may well serve as an indication of relatively pure Negro material.”

(Turner, 1886 in Caldwell & Moloy, 1933:498)

Average Capacity of Lungs.

	In usual Vigor		Not in usual Vigor		Total	
	No. Men	Cubic Inches	No. Men	Cubic Inches	No. Men	Cubic Inches
White Soldiers, Earlier Series	4 837	175.655	1 915	155.699	6 752	169.995
White Soldiers, Later Series	8 895	187.868	1 541	166.321	10 436	184.686
Sailors	1 104	179.217	–	–	1 104	179.217
Students	288	204.382	–	–	288	204.382
Full Blacks	1 631	165.319	221	149.697	1 852	163.455
Mulattoes	671	161.635	138	145.428	809	158.870
Indians	504	185.058	7	179.286	511	184.978

Summary of lung capacity measurements by race.

(Gould, 1979 in Braun, 2005 “Spirometry, Measurement and Race in the Nineteenth Century”)

Quantifying Harm

May 23, 2020

Reproducing racism

▶ LISTEN Co-produced with PRX

Christine Smith:	I think he asked the race question for last. He asked what race I was, and I said I'm Hispanic. He then asked me, "Well, how Hispanic are you?" I said, "I'm 100% Hispanic."
Al Letson:	The calculator gives a lower score if you identify as Hispanic or African-American.
Christine Smith:	Then he said, "Okay, that lowers your chance even more." Then he gave me my score and said they wouldn't be able to offer me a trial of labor.

ORIGINAL RESEARCH: OBSTETRICS | ARTICLES IN PRESS

Prediction of vaginal birth after cesarean in term gestations: A calculator without race and ethnicity

William A. Grobman, M.D., M.B.A. • Grecio Sandoval, M.A • Madeline Murguia Rice, PhD • ... Monica Longo, MD • Mark B. Landon, MD •

for the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development Maternal-Fetal Medicine Units (MFMU) Network •

Show all authors

Published: May 23, 2021 • DOI: https://doi.org/10.1016/j.ajog.2021.05.021

Taking Race Out of an Equation for Childbirth

Until last week, a calculator widely used by OB-GYNs pushed more Black and Hispanic women toward second C-sections

By Kaveh Waddell

May 27, 2021

"At the end of the day, if the calculator ends up solidifying a concept of race as biology or determinative of outcome, that's a fundamental bad"

-- William Grobman MD

- Defensible empiric logic
- Regression analyses of large data sets
- Race/ethnicity correlates with an outcome of interest

But if race does appear to correlate with clinical outcomes, does that justify its inclusion in diagnostic or predictive tools?

Medical Algorithms Have a Race Problem

Certain lab tests provide one result if a patient is Black, another if they're white. But debate over 'race adjustments' is heating up.

By Kaveh Waddell
Last updated: September 18, 2020

CR Consumer Reports

"No one is saying to throw away science. We just want to make sure that we are not causing harm to our patients."

NWAMAKA ENEANYA

Nephrologist and assistant professor at the University of Pennsylvania

Problems of race-correction

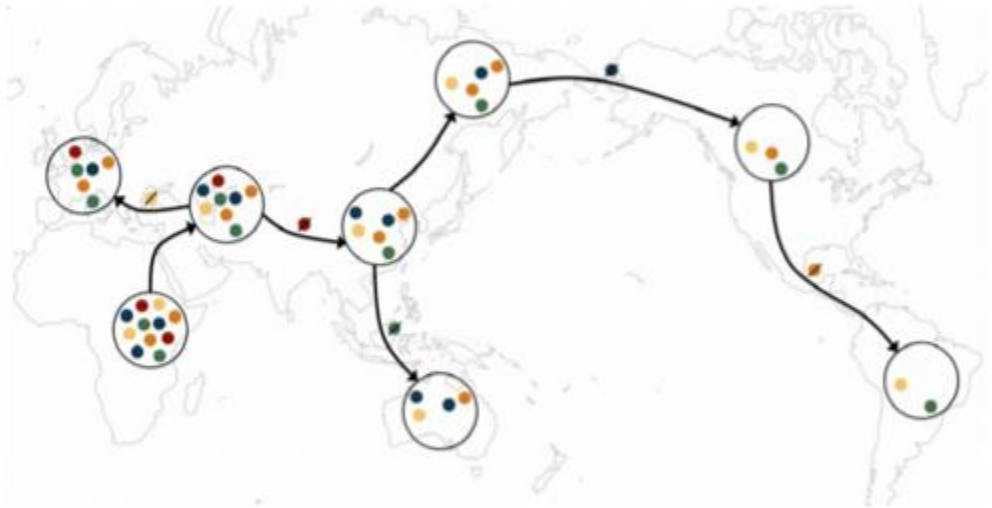
- Exceedingly unlikely to reflect genetic difference
- **More likely reflects effects of racism rather than race**
- How to operationalize?

Re-evaluating race correction

1) Is the need for race correction based on **robust evidence and statistical analyses** (e.g., with consideration of internal and external validity, potential confounders, and bias)?
2) Is there a **plausible causal mechanism** for the racial difference that justifies the race correction?
3) And would implementing this race correction **relieve or exacerbate health inequities**?

Race vs Ancestry

- What is the distribution of human genetic diversity?
- More genetic variation *within* racial groups than *between* them



Health

Coronavirus kills far more Hispanic and Black children than White youths, CDC study finds

More than 75 percent of children dying from covid-19 are minorities, a finding that echoes disproportionate death rates among adults

Students in the Los Angeles Unified School District stand socially distant in a hallway during a lunch break. (Jae C. Hong/AP)

- **Not a call for race-blind medicine**
- **Race/ethnicity can be valuable analytic categories**
- **Caution with using them in predictive analytics**

Conclusions

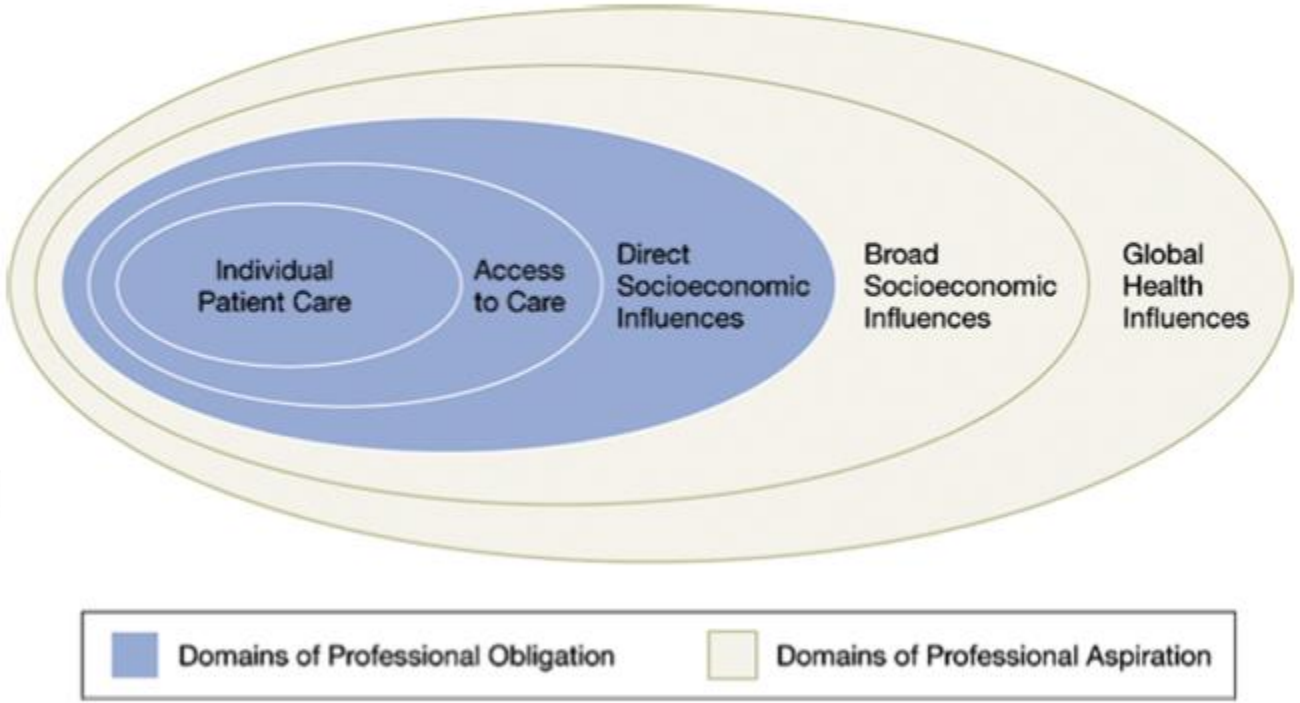
- Existing race correction should be re-evaluated on a case-by-case basis
- Professional societies should review tools & create guidelines
- Recognize race as a social construct, not biological
- Distinguish race from ancestry
- Policy change underway

Limitations / Next Steps

Technological quick-fixes = low-hanging fruit?

VS

Slow, structural change



Gruen et al: Physician-Citizens—Public Roles and Professional Obligations (JAMA 2004)

What is our first principle when it comes to race?