ATS Statement on the Use of Race and Ethnicity in Pulmonary Function Test Interpretation

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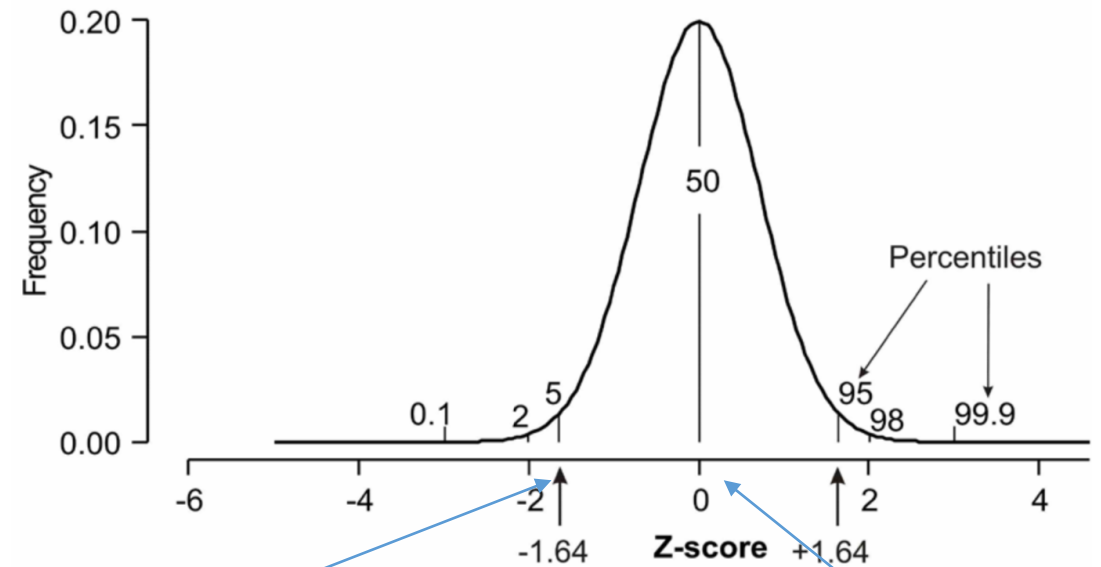
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Chief, Pediatric Pulmonary Division
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ATS 2023

47-year-old female
5'5" (165.1 cm)
Measured FEV$_1$ 2.0 L

GLI African-American Predicted FEV$_1$ 2.53 L
- 79% of predicted, z -1.46
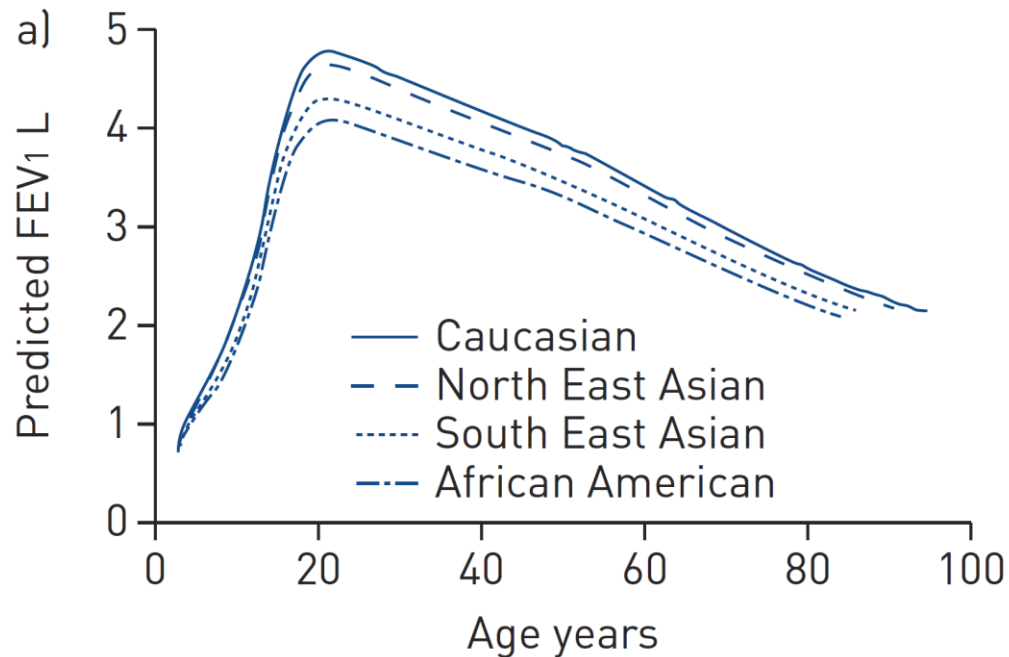- 2.0 > lower limit of 1.93 L

Conclude: Normal

GLI White Predicted FEV$_1$ 2.94 L
- 68% of predicted, z -2.43
- 2.0 < lower limit of 2.31 L

Conclude: Abnormal

Global Lung Function Initiative (GLI)

74,187 health, non-smokers

Ages 3-95 years

    3,545 Black (African American)

    4,992 North East Asian

    8,255 South East Asian

    57,395 White (Caucasian)

Race is a Social Construct

The Use of Race and Ethnicity in PFT

Perpetuates false ideas that race distinguishes people on the basis of innate and immutable features

Masks the effects of social and environmental factors that contribute to differences – lack of attention to modifiable risk factors

Assumes that the lower lung function found on average in Black populations is not clinically meaningful

Workshop Goals

1. Review the use of race and ethnicity in interpretation of PFTs

2. Evaluate clinical implications

3. Provide guidance so clinicians, investigators and patients can make informed decision

Lack of consensus,
concern for potential harm

Better lung function among Black vs. White individuals using race specific equations

Worse lung function among Black vs. White individuals using universal equations

Baugh et al. *Am J Resp Crit Care Med.* 2022
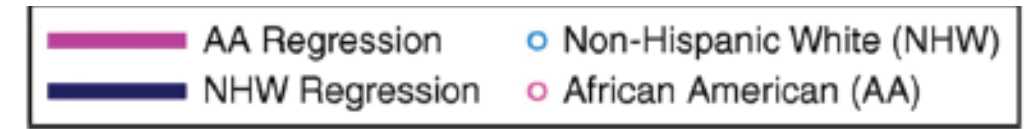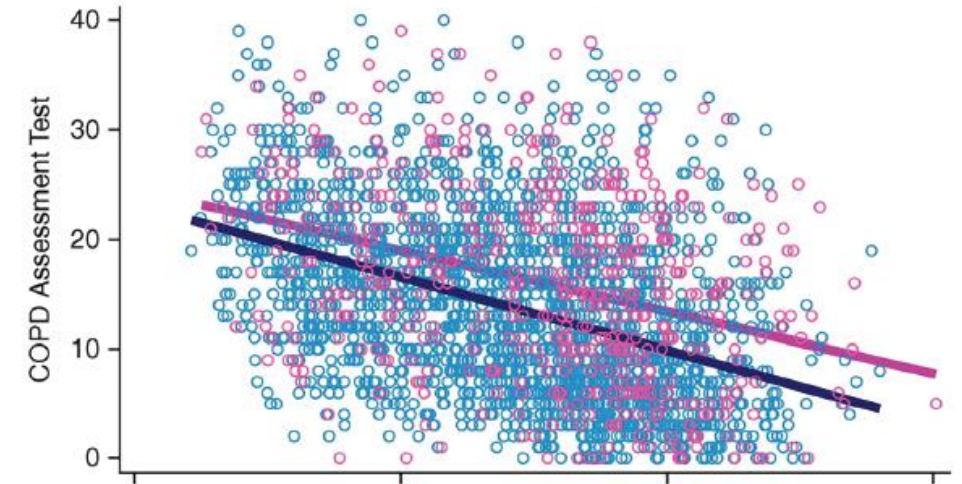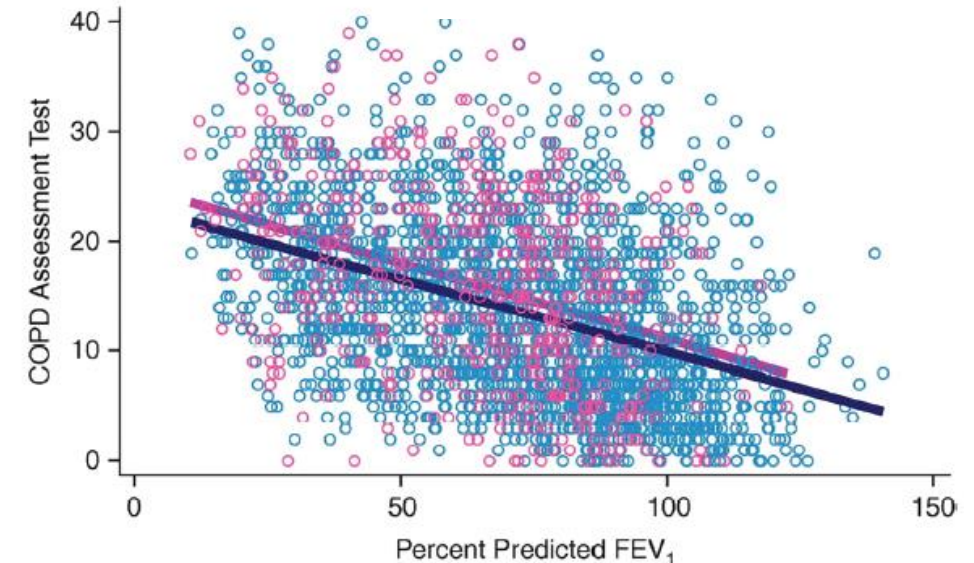
Race-based reference equations do not predict chronic lower respiratory disease better than race neutral equations

Elmaleh-Sachs et al. *Am J Resp Crit Care Med* 2022
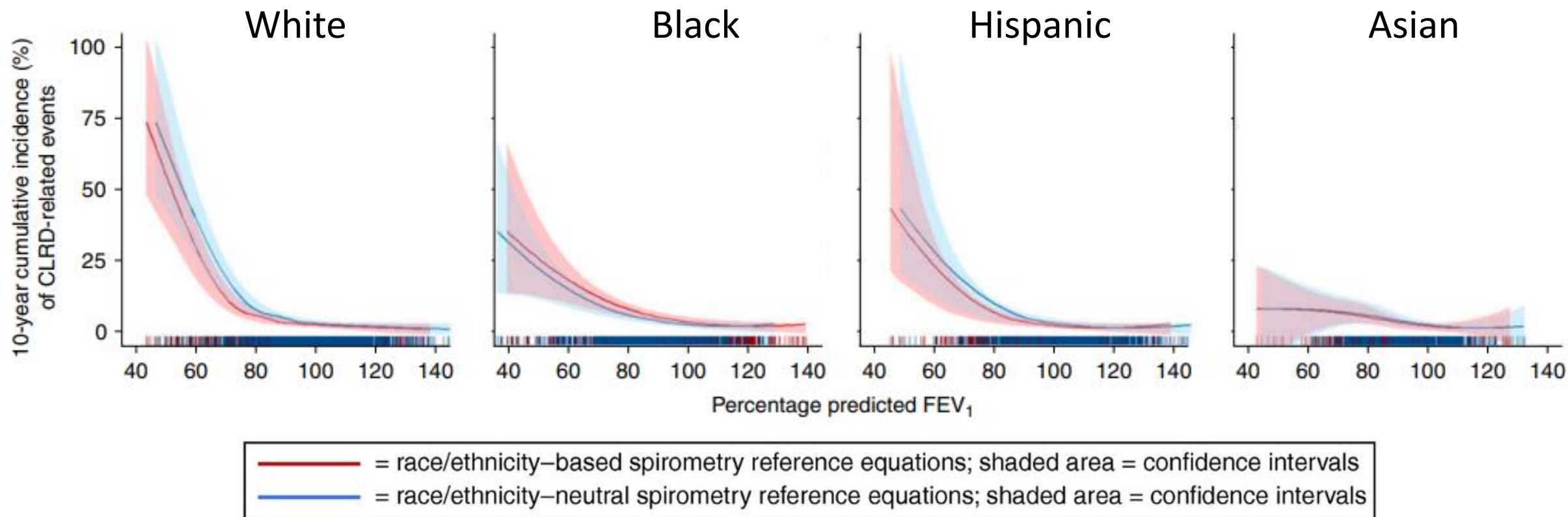
Lower predicted survival for Black individuals when race-specific equations used

McCormack et al. *Am J Resp Crit Care Med* 2022
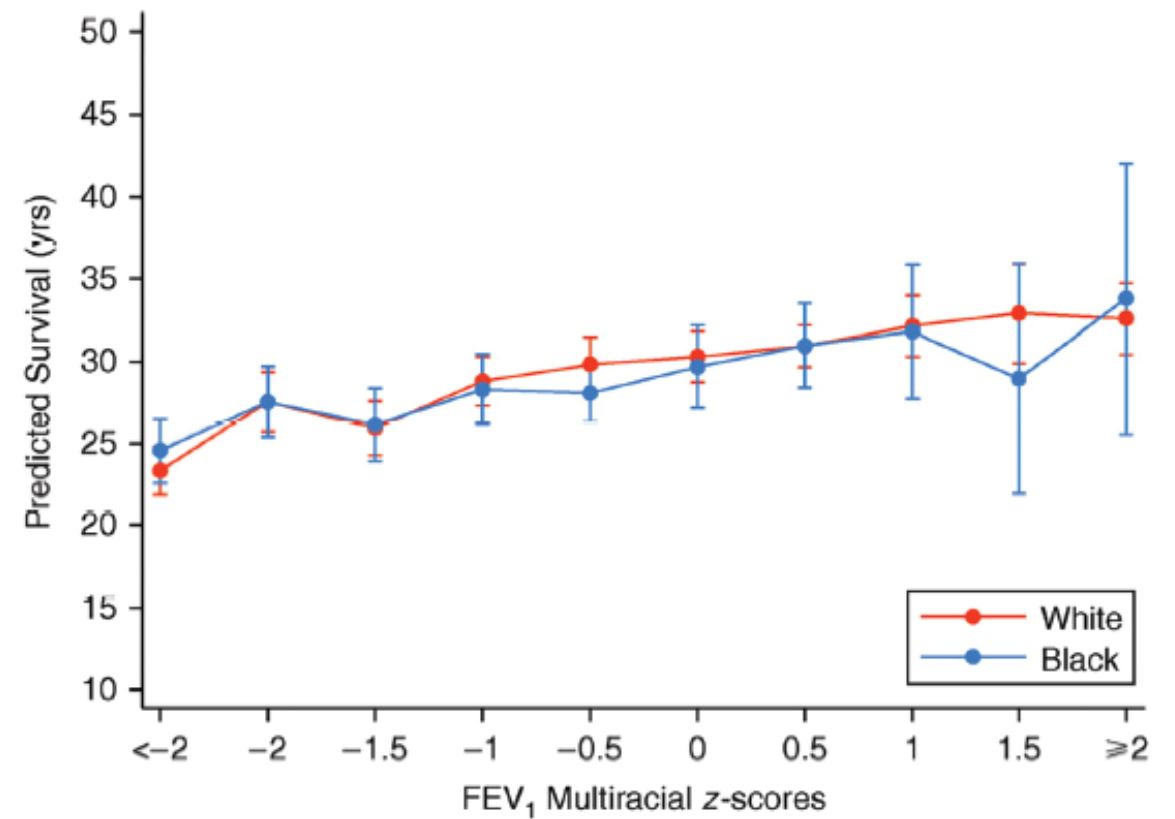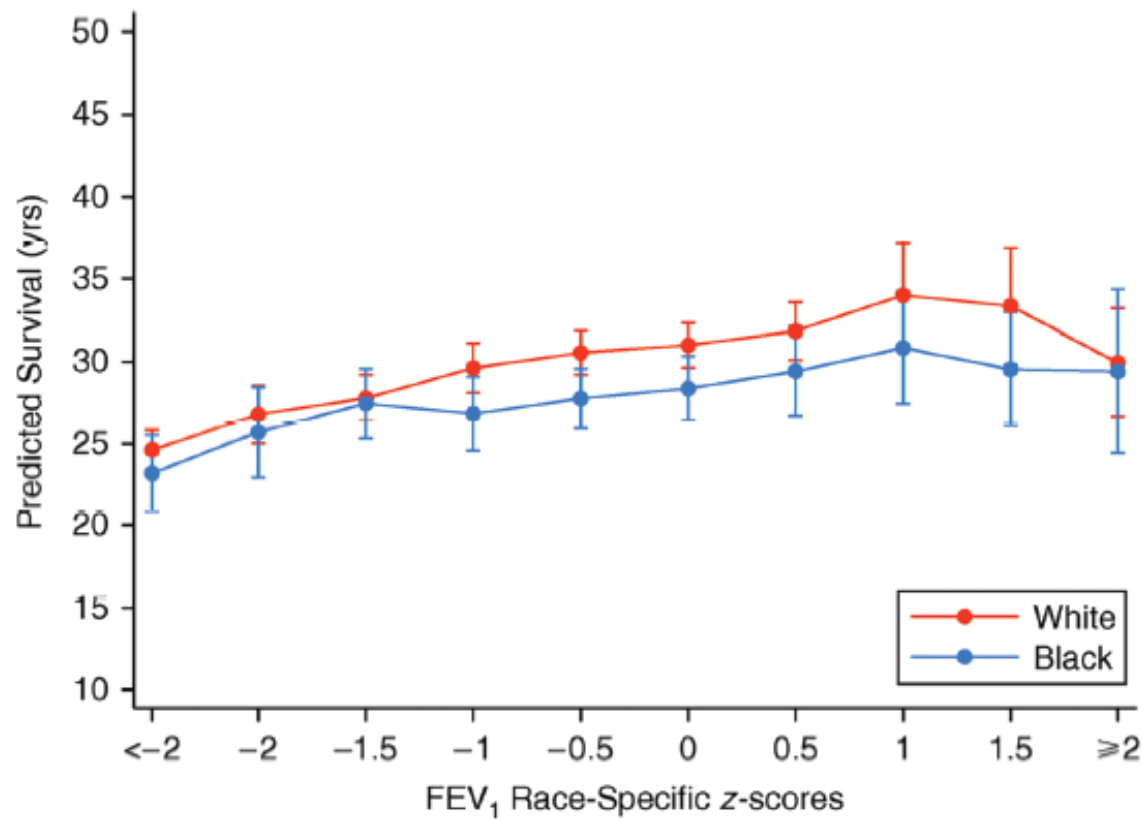
Determinants of pulmonary function

Early-life

Prematurity

Infections

Nutrition: over and under

Second-hand smoke

Indoor/outdoor pollution

Discrimination, stress

Genetics

    Genetic ancestry vs SNPs
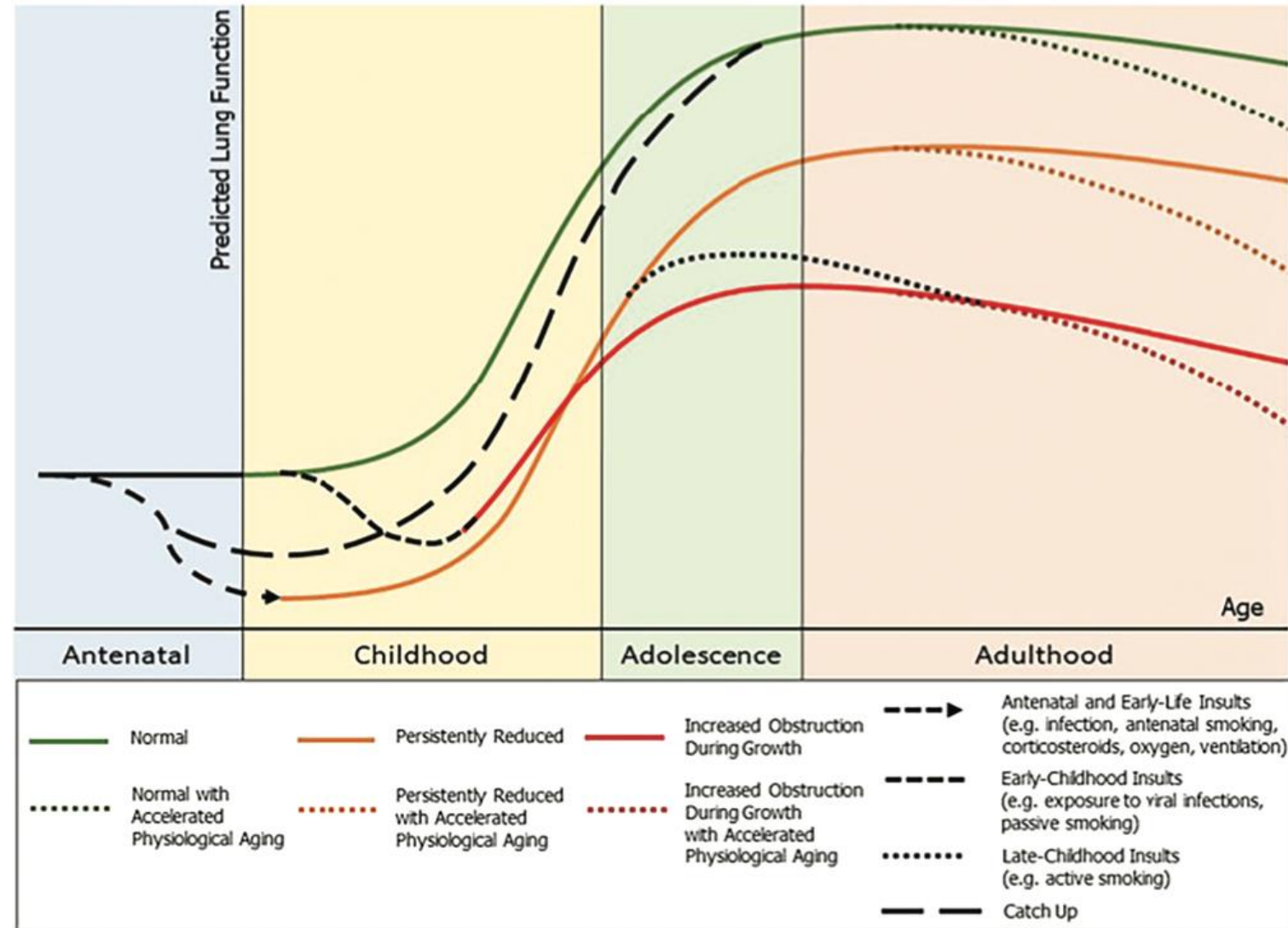
Gibbons et al. *Front Pediatr* 2020

Race and Ethnicity in Pulmonary Function Test Interpretation
An Official American Thoracic Society Statement

Nirav R. Bhakta, Christian Bime, David A. Kaminsky, Meredith C. McCormack, Neeta Thakur, Sanja Stanojevic, Aaron D. Baugh, Lundy Braun, Stephanie Lovinsky-Desir, Rosemary Adamson, Jonathan Witonsky, Robert A. Wise, Sean D. Levy, Robert Brown, Erick Forno, Robyn T. Cohen, Meshell Johnson, John Balmes, Yolanda Mageto, Cathryn T. Lee, Refiloe Masekela, Daniel J. Weiner, Charlie G. Irvin, Erik R. Swenson, Margaret Rosenfeld, Richard M. Schwartzstein, Anurag Agrawal, Enid Neptune, Juan P. Wisnivesky, Victor E. Ortega, and Peter Burney; on behalf of the American Thoracic Society Committees on Pulmonary Function Testing and on Health Equity and Diversity

Key conclusions/ recommendations

- PFT labs should adopt a race-neutral approach to PFT interpretation – use average reference equations

- Global Lung Function Initiative (GLI) average equation (GLI-global)
  - Weighted average of data included in the original GLI ethnicity-specific equations
  - Many of the world's population still not included
  - Race composite, not race agnostic

Examples of results close to thresholds for which decision change depending on reference equations

	Black Reference Equation		White Reference Equation		"Other" Average Reference Equation	
	FEV_1	FVC	FEV_1	FVC	FEV_1	FVC
Life insurance evaluation (female: age, 54 yr; height, 166 cm; FEV1 = 1.44 L)	60%		52%		56%	

Bhakta et al. *Am J Resp Crit Care Med* 2023

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Evaluation for interstitial disease (male: age, 54 yr; height, 190 cm; FVC = 3.90 L)		81%		68%		74%

Bhakta et al. *Am J Resp Crit Care Med* 2023

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Determining need for noninvasive ventilatory support for neuromuscular weakness (male: age, 60 yr; height, 176 cm; FVC= 2.2 L)		57%		49%		53%

Bhakta et al. *Am J Resp Crit Care Med* 2023

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Threshold for lung transplantation evaluation for ILD (male: age, 60 yr; height, 176 cm; FVC = 1.6 L)		42%		35%		38%

Bhakta et al. *Am J Resp Crit Care Med* 2023

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Fitness for surgical lung cancer resection (male: age, 60 yr; height, 176 cm; FEV1 = 1.1 L; planned RUL)	31%		26%		28%	

Bhakta et al. *Am J Resp Crit Care Med* 2023

What happens next?

What is the ideal population composition contributing to reference equations?

Threshold-based decisions should be backed by evidence of benefit

How much of variation in lung function results from social and environmental effects? How can they be incorporated in PFT interpretation without norming?

Move beyond a statistical description of an individual's lung function to the relationship with meaningful health outcomes

Increase diversity of people and diseases in studies on pulmonary function

Role of race and ethnicity in improving lung health and function?

Role of local reference equations meeting rigorous quality standards and that represent an average inclusive of the diversity of that population?

Exploration of alternative approaches, such as FEV1Q

Exploration of alternatives to height such as chest dimensions

Acknowledgments

ATS Executive Committee

Kevin Wilson
Chief of Documents and Medical Affairs for the American Thoracic Society

Peer reviewers

GLI Global

Based on archived data that led to the the GLI 2012 equations

Construction
- Weighted average of data into a single model across age, height and sexes
- Weights applied based on proportions in categories based on country/region of origin:
  - Caucasian
  - African-American
  - Northeast Asian
  - Southeast Asian

Advantages
- Large populations
- High-quality data
- Modeling technique that provides continuous predictions across a full age range

Limitations
- Uses race/ethnicity categories
- Categories influenced by country of origin and assignments do not have a scientific basis

Many of the world's populations are still not included
Data left out of GLI 2012 were not available
Race/ethnicity/country available, other measures by which to judge diversity of the data not available

Race-neutral in application, not in construction. In construction, it is multi-racial, race-aggregate, or race-composite

Predicted value nearly identical to GLI Other. Distribution wider.

- Not yet available for D_{LCO} or lung volumes
- Older devices will need updates or replacement

Bowerman et al. AJRCCM 2023.