Strategies to Classify Lung Function: It's Not Black and White

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From labeling a desire for freedom from slavery as "drapetomania" (1) to justifying housing segregation a public health measure against tuberculosis (2), past medical standards have stoked public racism. Because race has been used as a social identity to justify exploitation, attempts at race-based medicine are especially susceptible to this dynamic. Characterizing race as a determinant of lung function has been discussed as another example of racism (3). But as millions have found resilience and meaning in racial identity, we believe that discussing racial differences in lung function is not inherently racist but can advance both science and equity. For example, a comparative study of the pre–European contact Congolese traditions that suffuse the Missa Luba and the distinctly European ones that inform the Sanctus in J.S. Bach's B-minor Mass (https://www.youtube.com/watch?v=9NbtQP7F_G8) enriches both our knowledge of music theory and our appreciation of Catholic ritual.

The American Thoracic Society's (ATS) recent position paper on the use of race in spirometry puts two major views into sharp relief. The ATS statement suggests that normal ranges for lung function should be "race neutral" (4). On the other hand, other experts prefer the prior, "race-specific" approaches as being more precise (5). For example, in a recent analysis of clinical data, race-neutral prediction equations reclassified 7.5% of White people who were "abnormal" under a race-specific approach as "normal" (6, see pp. 83–90 of this issue).

Reconciling these disparate views depends on the question being addressed. If trying to identify individuals with additional impairment in a population in which pollution exposure drives whole-population reductions in lung function, comparison of the individual's data with those local population normal range may be appropriate. However, if the aim is to estimate the risk of adverse outcomes, inclusive of the effects of pollution, then a different comparator (such as the ATS's race-neutral recommendation [7] or the National Health and Nutrition Examination Survey White equations [8]) may be reasonable. One might similarly elect between the two options by weighing concern about the detection of early disease versus avoiding the potential negative impacts of diagnostic labels (9).

Lung function is determined by both genetic and environmental influences, but quantifying the role of each in population-level racial differences is difficult. Environmental influences, especially in early life, can influence gene expression in both individuals and their unexposed descendants (10, 11). This suggests that even when differences appear biologically rooted, they may be the consequence of other factors. Environmental influences are not race neutral, and it is essential that we do not attribute lung function decrements caused by poverty, discrimination, and their sequelae (malnutrition, environmental exposures, crowding, early-life infections, other complex exposures) to innate or benign mechanisms (12). Considering genetics, some alleles have been identified in association with lung function, and it is possible that they appear with different frequencies across racial groups. Finally, about 30% of an individual's lung function is heritable (13), so a child's lung function may be impaired because of parental influences rather than the child's own exposures. In summary, although many factors contribute to determining lung function, we do not foresee an imminent end to this debate on the basis of clear differentiation of genetic and environmental contributions; the two are so intermingled that they may be impossible to disentangle.

Alternatively, we might consider the question "Does this person's lung function put them at risk of adverse outcomes, given the work or treatment contemplated?" This question may be difficult to answer, particularly among those close to the current borderline of "abnormal lung function," because of the uniqueness of genes, body morphometry, exposomes, and their interactions uniting in each individual. This shortcoming may relate not to race but to an approach rooted in reference equations. A compromise must be reached.

Like the religious music referenced earlier, race is also the product of a particular ideology. Going further, we should acknowledge how pulmonary function testing and interpretation, because of factors such as patient effort, subtlety of disease

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presentation, lack of prior testing in most individuals, and other factors, are also an art, with the inherent uncertainties that implies. The fundamental truth in which we are most interested (does this person have disease) is not likely directly measurable. Although any proposal is a compromise, there are better and worse approximations. We should encourage more work on lung function determinants, with special attention to the potential detrimental exposures experienced by all marginalized groups, whether racially classified or not. We also recommend investigation of new physical variables as a potential adjustment to standing height so that differences in thoracic cavity size and/or leg length are addressed and self-identified race is no longer relevant. In choosing reference values, we should be critical about their correlation to outcomes in the specific clinical question being asked. These undergird broader questions:

1. How do new interpretation approaches affect impairment status and percentage of predicted values when applied to real-world situations and datasets?
2. What study designs would separate normal variance in thoracic cavity size from potential pathology caused by poor living conditions?
3. Which interpretation approaches best correspond to each of the broad range of clinical, occupational, and administrative functions we ask of spirometry?
4. What specific mechanisms make spirometry a beneficial tool for risk assessment, and how can this benefit be maximized?
5. What harms are we potentially doing by using reference equations that we know overestimate lung function in certain populations and underestimate it in others?

As racial determination is no longer Black or White, the optimal approach to spirometric interpretation may also be in shades of gray. Whether one decides to use a race-neutral or a race-specific reference population, reported as percentage predicted or as a *z*-score, acknowledging the uncertainty in this estimate by including the confidence intervals around the actual point estimate may be the best current way to capture this uncertainty. ■

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