

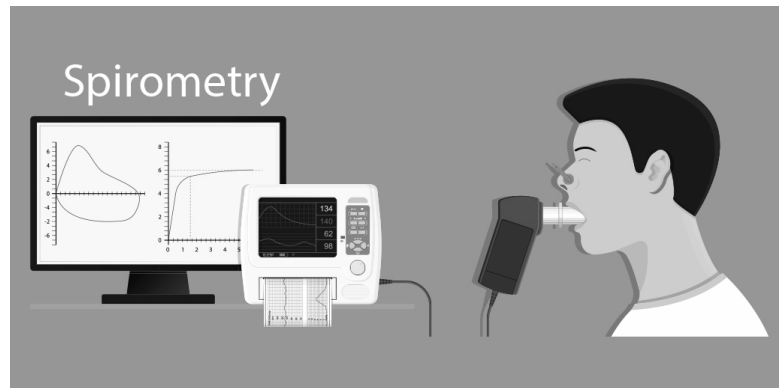


Race Correction in Lung Testing

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Though the notion of racial difference in pulmonary function has existed since the 18th century, differences may be due to other factors such as socioeconomic status or environmental causes. Furthermore, assuming racial differences can lead to greater health disparities.

Pulmonary function can be measured using a spirometer, a handheld device that the patient breathes into, in order to measure lung volumes. There are two main values: vital capacity (FVC), the largest breath a person can forcefully exhale, and forced expiratory volume (FEV), how much air a person can force from the lungs in one second. These values and the ratios between them are used to diagnose a variety of pulmonary diseases, such as chronic obstructive pulmonary disease (COPD) and asthma.¹ Both chronic bronchitis (a condition of COPD) and asthma are characterized by the constriction of airways in the lung. Emphysema, another condition of COPD, reduces the lung surface area used to exchange oxygen through alveoli damage.

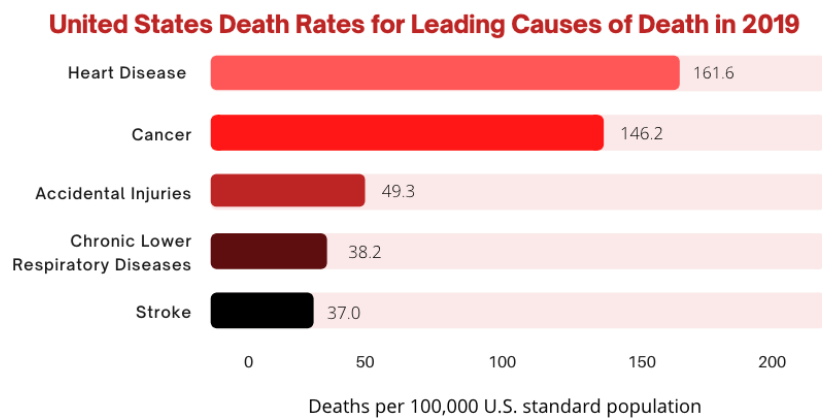


According to the Centers of Disease Control and Prevention (CDC), chronic respiratory disease was the fourth leading cause of death in the United States in 2019. However, COPD is likely to be underdiagnosed due to a lack of lung function testing. A 2007 review found that out of 5000 patients newly diagnosed with COPD, only 32% had previously undergone a lung function test.² Likewise, asthma is the most common chronic condition in children, however,



population-based studies suggest that, due to underreporting of respiratory symptoms and low socioeconomic status, 20-70% of people with asthma remain undiagnosed.³

Metrics to diagnose these conditions sometimes change based on the patient’s race. For example, most spirometers require race as an input to the machine’s algorithm. The patient’s score is corrected by 10-15% if the device receives an input of “Black,” and 4-6% if “Asian” is input. However, the practice of race correction does not have a scientific basis. Stereotypes of fitness varying by race in America trace back to Thomas Jefferson’s *Notes on the State of Virginia*, wherein he attempts to justify the conditions of slavery, writing that Blacks have “a



difference of structure in the pulmonary apparatus.”⁴ Jefferson was not a physician and his writings were not subjected to the rigorous peer-review that are expected of medical science. Race correction in spirometry has been accepted as a concept without rigorous examination.

There have been many scientific studies reporting that racial and ethnic groups have lower lung capacity compared to whites.⁵ However, many of these studies were performed by physicians aiming to validate Jefferson’s writing and fail to acknowledge that race is a social construct rather than a biological category. Race has social implications impacting health that can explain differences in lung function among races. For example, individuals experience high- or low-quality medical care due to racial bias and discrimination, which results in varying outcomes.

Socioeconomic status (SES) is another factor that can impact lung function and explain variance in lung function across races. In the US, nearly two-thirds of COPD patients are people with low SES.⁶ Individuals with low SES are more likely to encounter environmental risk factors such as secondhand smoke, air pollution, and exposure to industrial fumes.⁶ These exposures can start before a child is born; for example, in the United Kingdom, smoking rates in low SES

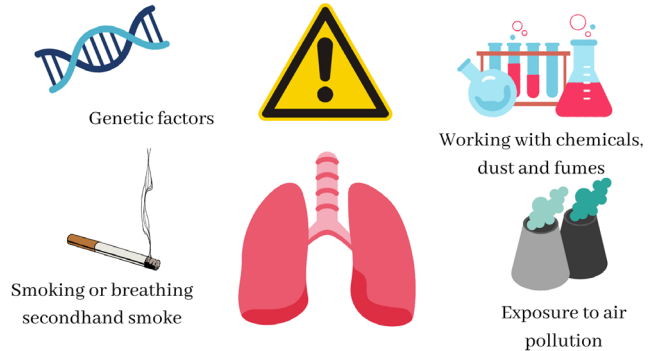
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pregnant women are triple that of pregnant women with high SES.⁶ Low SES individuals may also have difficulty forming healthy behaviors due to limited access to healthy foods or options for outdoor fitness and recreation.

Many studies have explored which socioeconomic factors are associated with respiratory conditions like asthma and COPD. A study conducted in the Netherlands suggested that having an ethnic minority background and low family SES are closely associated with asthma and lung function.⁷ The prevalence of poor lung function in low SES families may be due to a lack of access to primary care and health insurance. If families do not have health insurance, they may be unwilling to go to the doctor for minor health concerns, which may lead to respiratory issues that go undiagnosed until they become severe enough to warrant an emergency department visit.

Factors Contributing to Lung Disease



Transportation can also be a barrier to regular healthcare access. Not all hospitals have the necessary tests (e.g. plethysmography, a pulmonary function testing requiring patients to sit in an airtight box), meaning that patients may need to go to larger hospitals further away. Many low SES patients have difficulty finding someone to take them to the hospital or taking time off from demanding jobs. Transportation issues are exacerbated for older patients who often have multiple medical conditions to monitor and for which to schedule regular appointments.

Race correction can have negative effects on patients, including the underdiagnosis or misdiagnosis of pulmonary disease. Further, race correction masks the impact that the social and environmental factors listed above have on lung function. A 2020 article in *The Lancet* states that since most spirometers assume Black patients have a 10-15% smaller lung capacity than White patients, low spirometry measurements for Black patients may be dismissed, allowing lower lung function to be undiagnosed.⁸ This is especially dangerous in the wake of COVID-19; some patients reported restrictive ventilatory dysfunction, a defect that lowers FVC, up to two weeks after discharge. Thus, assuming lower lung function in certain races can cause these defects to be overlooked, and the severity of diagnoses can be underestimated as well.

Unfortunately, because race correction is a well-established standard for pulmonary function testing, it may be difficult to shift away from this practice. More data is likely needed to convince manufacturers to change spirometer algorithms. However, Dr. Peter H. Sporn, a



pulmonologist from Northwestern, noted that this type of research is unlikely to be funded by the National Institutes of Health (NIH) and the issue of race correction in spirometry has garnered limited attention in the scientific community. However, interest in race correction and its effects is growing; researchers like Dr. Lundy Braun, Professor of Pathology and Laboratory Medicine and Africana Studies at Brown University and author of *Breathing Race into the Machine: The Surprising Career of the Spirometer from Plantation to Genetics*, have been laying much of the groundwork with bringing attention to this topic. There are also broader movements like White Coats for Black Lives, a medical student-run organization founded in 2014 that aims to fight racism in medicine and health care. Efforts by clinicians, researchers, and patients will be needed to clearly elucidate the impacts and advocate for change in terms of pulmonary function tests. Ultimately, race correction does not have a clear scientific basis and should be phased out of spirometers. In tandem with this change more research is needed into the impacts of socioeconomic status on lung function.



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