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Minority populations disproportionately suffer from the effects of COVID-19, as evidenced by nearly three times the infection rate and one to two times the death rate among Black, Indigenous, and Latino people compared with White people.\(^1\) Although some assume that these disparities are rooted in genetic differences between racial or ethnic groups, they are more likely a result of structural inequalities. Minority groups tend to live in densely populated areas, have limited access to health care, and have higher rates of comorbidities, among other factors, that put them at greater risk for infection. While long-term effects of COVID-19 on lung function have yet to be investigated, we predict that racial disparities will emerge. Disparities in recovery are likely to be influenced by preconceived ideas regarding racial differences within American medicine.\(^1\) Specifically, we raise concern about racial biases built into the tools used to measure pulmonary dysfunction because they have the potential to exacerbate these disparities as minority patients recover from COVID-19.

Of utmost concern is the spirometer—a device used to measure the volume of air that can be exhaled after a deep breath. Spirometers are not commonly used when COVID-19 is most contagious, but are used to measure pulmonary function during recovery.\(^2\) Spirometers use a race-based correction or a so-called ethnic adjustment, which assumes a 10–15% smaller lung capacity for Black patients and 4–6% smaller lung capacity for Asian patients compared with their White counterparts.\(^4\) There is no routine adjustment for mixed-race patients. These corrections are automatically applied in the spirometry output (as percentage of predicted values), with many physicians unaware of the adjustment.

The notion that Black lungs are inherently inferior dates back to 1785, when the US President Thomas Jefferson described “a difference of structure in the pulmonary apparatus” between slaves and White Americans.\(^4\) A century later, the US physician and slaveholder, Samuel Cartwright, quantified a 20% difference in lung capacity between Black and White people, establishing race as an important factor influencing lung function. In the 1920s eugenics era, race differences were included in clinician handbooks, while occupational effects and other social conditions were ignored.\(^5\) In 1999, a study using the National Health and Nutrition Examination Survey established the modern race and ethnicity-specific standards on which correction factors are now based.\(^6\) They noted lung capacity differences between Mexican Americans, Blacks, and Whites potentially related to body build. Following this study, in addition to adjusting for age, sex, and height, race-adjustment was routinely built into the software of modern spirometers, under the assumption of innate biological differences.

During the COVID-19 pandemic, these race adjustments could potentially cause clinicians to miss important diagnoses. For example, restrictive ventilatory dysfunction is emerging as a problem in COVID-19 patients, evident for at least 2 weeks after hospital discharge.\(^7\) This defect is indicated by a spirometry measure of forced vital capacity—the total amount of air that can be expelled from total lung capacity—below the lower limits of normal for the appropriate reference population.\(^8\) Clinicians might miss this diagnosis if lower lung capacity measures are considered normal for minority populations. Additionally, spirometers are used in determining severity of ventilatory defects with the measure of forced expiratory volume—the amount of air expelled during the first 1 s of a forced exhalation. These measures can influence treatment plans—eg, for patients with pulmonary fibrosis caused by COVID-19 induced pneumonia, pulmonary rehabilitation might be needed, including breathing exercises and continual monitoring of pulmonary function. These treatments might not be undertaken if the racial adjustment leads to misdiagnosis. This notion is of particular concern considering Black patients are already less likely than White patients to be referred to pulmonary rehabilitation, despite more frequent pulmonary-related hospitalisations.\(^9\)

We urge health-care providers to be aware of the racial disparities that might be exacerbated by using race-corrections in spirometry, particularly during a pandemic that affects respiratory function. Currently, there is no known major genetic locus that varies by
race that can explain racial disparities in lung function; however, body proportions, socioeconomic status, and occupational hazards clearly influence capacity. These factors should be measured directly, rather than using race as a rough proxy. Race-based corrections are likely biasing clinical reports of COVID-19 recovery, severity of lung damage, and subsequent recovery treatment plans. Further, race corrections reinforce assumptions about innate biological differences between races, which is a pervasive problem across medical practice. Overall, we encourage further research into the specific factors that influence lung capacity and raise concerns over the routine use of race-based corrections in spirometry, especially in assessing COVID-19 recovery.

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Are women with asthma at increased risk for severe COVID-19?

Although adults with asthma appear to have a reduced risk of severe COVID-19 compared with younger populations, women with asthma might represent a somewhat susceptible subgroup for severe COVID-19 requiring hospitalisation. A study by Atkins and colleagues established female sex as an independent risk factor for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) hospitalisation among patients with asthma in the UK. This study and three additional studies from Paris, France, Illinois, USA, and New York, NY, USA, report that 37–53% of all individuals hospitalised with SARS-CoV-2 were women. However, 56–71% of patients with asthma hospitalised for COVID-19 were women in these studies. This increased proportion might be partially explained by the higher baseline prevalence of asthma in women than in men, because data from similar geographical areas suggest 51–65% of individuals with asthma are women. Several mechanisms might increase the risk of COVID-19-related hospitalisation in women with asthma. The recognition of these mechanisms might guide targeted management strategies.

First, women have a higher disease burden of asthma compared with men overall, with a significantly higher prevalence, rate of hospitalisation, health-care cost, mortality, and severity of disease. Additionally, structural differences such as a reduced airway calibre and increased tendency for bronchial hyper-responsiveness in women might contribute to the risk of hospitalisation with COVID-19. Second, asthma severity in men and women is modified by hormonal changes across the lifespan. Greater lifetime exposure to endogenous and exogenous oestrogen is associated with more severe asthma. Third, sex affects the prevalence of the two fundamental immunological asthma endotypes,