



Guidance to the applicability of the Global Lung Initiative spirometry reference equations for South African populations

To the Editor: The lack of appropriate reference data for assessment of respiratory function in African populations and its implications for correct diagnosis and management of respiratory disease are longstanding concerns. The Global Lung Initiative 2012 (GLI₂₀₁₂) has the largest data set that provides guidance for spirometry reference equations across all ages for diverse populations across the world.^[1] Until recently, the major limitation to its use in Africa was the lack of data from black African populations. A similar limitation applies to other currently used equations, and it is the reason for current recommendations for ethnic corrections, although the latter are not broadly validated, particularly in paediatric and adolescent populations. The only contribution of African population data to the GLI data set is from North Africa, where the ethnic background of the population was categorised as 'Caucasian' in the data set. The limitations of the recommendation from the North African population were also noted as being inappropriate compared with local previously derived Tunisian reference equations.^[2] The challenges associated with lack of data from healthy populations in Africa are linked to multiple factors, some of which are lack of access to resources, technical expertise and equipment to collect large data sets of healthy African populations.^[3]

The South African Thoracic Society adult spirometry guidelines published in 2013 recommend that a correction factor of 0.9 for black and Asian individuals and 0.95 for individuals of mixed ethnicity

be employed when European-based equations (e.g. European Coal and Steel Community predictions) are used.^[4] These recommendations were based on lack of local data at the time and the perceived inappropriateness of the GLI equations for adult black Africans.^[5]

A previous systematic review of retrospective evidence from African populations had recommended the use of the GLI-African American equation in adults and children in sub-Saharan Africa, although data from West African populations showed a poor fit to all the reference equations.^[6] Prospective data on children in four other sub-Saharan countries have recommended the use of the GLI-African American equation for paediatric populations.^[7,8]

Based on the findings of the retrospective African data set, a prospective study in >3 000 South African (SA) adults and children of various ethnicities was performed to assess the appropriate GLI references that should be utilised in the SA context.^[9] Based on the results of this study, we would strongly recommend that for SA black African and mixed-ethnicity populations the GLI-'Other' reference equation should be utilised when performing spirometry. The GLI-White equation should be utilised for white South Africans, and the GLI-SE Asian equation for Indians. A critical finding of this study, which has been replicated in multiple studies, is that the forced expiratory volume in 1 second (FEV₁)/forced vital capacity (FVC) ratio is stable and is independent of the reference utilised, and can be relied on to diagnose airway obstruction in a good-quality test and using age-adjusted cut-offs for disease (Table 1).

While we are aware of the limitations of the recent SA study, which mainly included black Africans of Zulu and Xhosa descent, it represents a major step towards appropriate

prediction values for the vast majority of South Africans, and an evidence-based implementation of the GLI reference values in southern Africa.

The change in the reference values suggested in this letter is endorsed by the South African Thoracic Society.

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Table 1. Reference equations and fit for South African populations

	FEV ₁ z-score,* mean (SD)	FVC z-score, mean (SD)	FEV ₁ /FVC z-score, mean (SD)
Black African (GLI-'Other')	0.13 (1.28)	0.13 (1.32)	-0.01 (0.87)
Mixed ethnicity (GLI-'Other')	0.22 (1.44)	0.24 (1.56)	-0.02 (0.85)
Indian (GLI-SE Asian)	0.18 (1.03)	-0.13 (1.09)	-0.1 (0.93)
White (GLI-White)	0.21 (1.22)	0.19 (1.24)	0.02 (0.91)

GLI = Global Lung Initiative; FEV₁ = forced expiratory volume in 1 second; FVC = forced vital capacity; SD = standard deviation.
*A z-score of 0.0 would denote a perfect fit.

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