

Comparison of lung function in Congolese vs African American children

Michele Arigliani¹, Mario C. Canciani¹, Leon Thsilolo², Robert Kitenge², Tontonp Mfuanani³, Paola Cogo¹, Philip H. Quanjer⁴ ¹Department of Clinical and Experimental Medical Sciences, Unit of Paediatrics, University Hospitalier Monkole and Centre de Formation et d'Appui Sanitaire (CEFA) Kinshasa, DR Congo; ³Université technologique Bel Campus, Kinshasa, Dr Congo; ⁴Department of Pulmonary Diseases and Dept of Paediatrics, Division of Respiratory Medicine, Erasmus University Medical Centre – Sophia Children's Hospital, Rotterdam, Netherlands.

Background

Lung function in African and African American children is expected to be comparable because of the shared genetic background. Yet there are relevant differences between these groups in terms of genetic mixing and environment (*e.g.* average level of affluence and nutritional status, healthcare access, exposure to air pollutants) that could determine differences in spirometry outcomes. In 2012 the Global Lung Function Initiative (GLI-2012) produced a prediction equation model for spirometry that fits four ethnic groups, including African Americans. It is unknown whether this model is applicable to sub-Saharan African people. Aims: To investigate whether the "GLI-2012 black" equations fit children from The Democratic Republic of Congo (DR Congo) and to compare lung function in these children and their African American peers from the third National Health and Nutrition Examination Survey (NHANES III).

Methods

Anthropometry and spirometry were obtained in children aged 6-12 years from public and private schools in Kinshasa, D.R. Congo. Exclusion criteria were: respiratory symptoms (i.e. cough, coryza) or fever on the test day, current asthma (defined as the occurrence of at least one episode of wheezing or whistling in the chest in the last 12 months), known chronic conditions likely to influence lung function or spirometry performance (e.g. congenital heart disease, mental retardation, previous tuberculosis), non-repeatable spirometry test or abnormally shaped flow-volume curves. A portable spirometer (Pony FX©, Cosmed, IT) was used. Children performed two up to seven forced expiratory manoeuvres standing upright with nose clip in situ. Z-scores of anthropometric and spirometric data were derived from CDC2000 and "GLI-2012 black" equations, respectively. Results were compared to those of African American children (6-13 years) from NHANES III. Group differences were assessed by t-tests.



N(% Age Heig FEV FVC **FEV**

GLI-2012 equations for African Americans fit children from DR Congo despite large differences in environmental conditions. The smaller scatter (*i.e.* SD) in Congolese children may be a chance finding due to limited sample size and needs confirmation in larger studies.

Results

In DR Congo 459 children were initially enrolled. After exclusions, data from 377 children (mean \pm SD age of 9.5 ± 1.6 ; boys 55%) were analyzed and compared with those of 833 African American peers (mean \pm SD age of 10.4 \pm 1.3; boys 51%) from NHANES III (Table 1).

GLI-2012 provided a good fit for Congolese children with mean (SD) z-scores of -0.16 (0.79) for FEV₁, -0.09 (0.83) for FVC, -0.17 (0.71) for FEV₁/FVC. Between-person variability (*i.e.* SD) was smaller than expected. Congolese children were smaller than African American ones (Table 1) and had slightly smaller FEV₁ and FVC, but not FEV₁/FVC (Table 1). School type, a proxy for affluence, was unrelated to respiratory outcomes (Table 2).

Table 1. Spirometric (GLI-2012) and anthropometric (CDC 2000) indices in Congolese schoolchildren and their African American peers

| | DR Congo | African Americans NHANESIII | Mean Diff (DR Congo - USA) (95% CI) |
|-------------|--------------|--------------------------------|--|
| ooys) | 377 (55%) | 833 (51%) | |
| years) | 9.5 (1.6) | 10.4 (1.3) | 0.72;1.09 |
| t z-score | 0.32 (1.30) | 0.71 (1.50) | 0.23;0.56 |
| and height | 0.501 (0.02) | 0.504 (0.01) | 0.001;0.006 |
| z-score | -0.16 (0.79) | 0.05 (1.06) | 0.10;0.31 |
| -score | -0.09 (0.83) | 0.09 (1.05) | 0.08;0.31 |
| FVC z-score | -0.17 (0.71) | -0.07 (1.12) | -0.00;0.21 |

Table 2. Spirometric indices in relation to school type in children from DR. Congo

| School type | Ν | FEV ₁ z-score | FVC z-score | FEV ₁ /FVC z-score |
|----------------------|-----|--------------------------|--------------|-------------------------------|
| Public | 190 | -0.10 (0.84) | -0.06 (0.89) | -0.10 (0.71) |
| Private | 187 | -0.22 (0.72) | -0.13 (0.76) | -0.24 (0.70) |
| 95% CI of difference | | -0.04;0.28 | -0.10;0.23 | -0.00;0.29 |

Conclusions

michelearigliani@gmail.com