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A new spirometry reference equation for 3- to 12-year-old children in Brazil

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he importance of determining spirometric values is indisputable, not only for the individual and longitudinal monitoring of patients but also for the assessment of populations, which can even influence public and collective health care measures.[1] In addition, due to the enormous advances in medicine and the interaction among diverse pediatric subspecialties, the data obtained at pulmonary function laboratories—where spirometry is undoubtedly the most popular exam, because it is easily accessible and feasible for use in preschoolers and older chidren—can assist in the standard of care of these patients. Therefore, it is very important to have reference values for spirometry in a healthy population in order to allow the distinction between health and disease, measure the impact of diseases on lung function, diagnose pathologies correctly, maximize care for patients with chronic lung disease, and monitor the growth and the development of the lungs and airways in healthy children or in those with different pathologies.[2]

Pulmonary function laboratories must follow strict quality criteria to ensure that their pulmonary function results are accurate.[1] For this purpose, there is an indispensable tool that ensures whether the data obtained are considered normal or not: the reference values in use. Knowing the distribution of the normal curve is a concept that is deeply rooted in the routine and practice of pediatrics and childcare, and we know that the development of reference models or of parameters of normality requires herculean work, which involves the collection of data from a representative sample of the selected population that guarantees the lowest possible risk of selection bias, excluding individuals who may not be actually representative of the healthy population.

Because of the improvement in pediatric research on respiratory function, the use of spirometry, following internationally established criteria, has increased in preschoolers.[3] Therefore, reference equations that include 3- to 6-year-old children are necessary in Brazil. It is worth noting that the success rate of spirometry in 3- to 5-year-old preschoolers is higher than 70%-80% when spirometry is performed by qualified professionals following adequate acceptability criteria for this population.[4] This demonstrates the feasibility of spirometry and reinforces the importance of performing it more frequently; having specific prediction equations for this age group avoids biases, such as the simple extrapolation of reference values for older children to this age group.

In 2012, the multi-ethnic global equation by Quanjer et al.[5] for different age groups was published. Since then, those reference values have been used in the most diverse studies regarding pediatric subjects, because it covers a broad age group (from 3 to 95 years of age). However, depending on the characteristics of the pediatric population, those values proved to be adequate in some specific populations,[6,7] but not as effective in other populations in different regions.[8,9]

Ideally, each population should have their own local standards of normality, because there are various factors that might interfere with the determination of normality criteria, such as age, sex, ethnicity, and chest size, the latter not always being well represented by the height when it is used as a means of extrapolating the size of the rib cage because, depending on the various types of body build, the chest size/height ratio can considerably vary.[10,11]

The inherent characteristics of the Brazilian population with regard to the enormous plurality and miscegenation among the various ethnic groups make the challenge of creating a national prediction equation even more complex. According to data from the *Instituto Brasileiro de Geografia e Estatística* (Brazilian Institute of Geography and Statistics) in 2016,[12] about half of the Brazilian population is black or brown. In the present issue of the *Jornal Brasileiro de Pneumologia*, the study by Jones et al.[13] takes into account the ethnic characteristics of the vast majority of the Brazilian pediatric population between 3 and 12 years of age, because it covers the predicted values for individuals of white and black/brown ethnicity. Their large and representative sample totaled 1,990 subjects from different Brazilian regions; however, because there was a predominance of subjects from the southern and southeastern regions, there was a proportional inclusion of a greater number of white individuals. We know that the normal limits of pulmonary function variables show great variability among individuals, and the most modern equations can include lower limits of normality and results in Z scores, providing more robust data and facilitating longitudinal monitoring of the individual during diagnosis, treatment, and follow-up, as well as allowing the evaluation of larger groups, such as in population studies. In addition, the study by Jones et al.[13] had a strict quality control both in the compilation of the data and in the measurements performed. Moreover, all spirometric curves were reviewed by two researchers

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before their inclusion in the database. Furthermore, spirometric data that had more than four standard deviations were excluded. Finally, the study shows that the predicted values currently used for the Brazilian pediatric population,[1] similarly to those from the global equations,[5] underestimate the values of FVC and FEV_1, especially for the black population. This highlights the importance of using the new predicted values by Jones et al.[13] from now on; however, these equations should be revisited and updated periodically. We welcome the study by Jones et al.,[13] and we believe that these prediction equations for spirometry for 3- to 12-year-old children will be soon incorporated into the routine at pulmonary function laboratories in Brazil.

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