

## Use of Stable Isotope Techniques to Study Body Composition, Physical Activity and Cardiovascular Health of School Children in Mauritius

Harris Ramuth

The island of Mauritius has experienced sustained economic development since its independence 50 years ago, but also a surge in cardiovascular diseases, largely attributed to an epidemic of type-2 diabetes affecting almost equally its two main ethnic groups: *Indian* (South Asian ancestry) and *Creole* (Malagasy/African ancestry). As an excess of adiposity and a low physical activity contribute importantly to the pathogenesis of type 2 diabetes and cardiovascular diseases, it is important in the development of early preventive strategies to reliably assess body composition and free-living physical activity in children.

This thesis work applies stable isotope techniques to measure body composition and physical activity in Mauritian school children aged 7-13 years. Body composition was assessed by Deuterium dilution technique in 377 children to investigate the relationship between body mass index (BMI) and body fat% according to gender and ethnicity, as well as to investigate the impact of body composition on their cardiovascular health status, characterized by measurements of resting heart rate and blood pressure. In a subgroup of 53 children, the doubly-labeled water technique was used to evaluate total energy expenditure and physical activity level over a 2 week period under free-living conditions, and the effects of gender and ethnicity were explored.

The main results of this study are summarized as follows:

- I. Analysis of body composition reveals important ethnic differences in adiposity during childhood: for the same BMI, age and gender, Mauritian children have more body fat% than predicted for Caucasians, and among the Mauritian children, Indians have more body fat (and less lean mass) than Creoles.
- II. Analysis of cardiovascular functions indicates significant effects of gender on heart rate (Girls > Boys: + 4 beats/min) and ethnic differences in blood pressure, particularly among boys whereby Indians have higher systolic and diastolic blood pressure (+3 mm Hg) than Creoles. However, these gender or ethnic differences in cardiovascular functions are no longer observed once their differences in body weight or body composition are taken into account. In particular, the results point towards a contribution of excess body fat rather than higher lean mass in the association between excess weight and blood pressure.
- III. Analysis of free-living daily total energy expenditure indicates that it is lower than that predicted for children of the same age and body size, and also that it differs according to gender (lower in boys than in girls) and to ethnicity (lower in Indians than in Creoles) even after adjusting for differences in body weight and lean mass. These gender and ethnic differences in their total energy expenditure reside at least partly in their daily physical activity levels, with the majority of Creoles showing 'moderate' physical activity, contrasting with Indians where the majority shows 'low' or 'very low' physical activity.

This thesis work has established the foundations for future investigations into the use of stable isotope techniques for assessing body composition, free-living daily energy expenditure and physical activity levels in Mauritian children, with potentially major implications for ethnic-based population research towards improving the diagnosis of excess fatness and sedentary behaviour, and to better understand their underlying causes. It also has implications for monitoring the efficacy of intervention studies geared at developing better strategies to prevent or hinder the development of obesity and co-morbidities in this, as well as other, 'at risk' populations.

### Jury:

Prof. tit. Abdul G. Dulloo (thesis supervisor)  
Prof. Pascal Bovet (external co-examiner)  
Prof. Yves Schutz (external co-examiner)  
Prof. Zhihong Yang (internal co-examiner)  
Prof. Jean-Pierre Montani (internal co-examiner)  
Prof. Dr. Anna Lauber-Biason (president of the jury)