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ST. AUGUSTINE CAMPUS
FACULTY OF SCIENCE & TECHNOLOGY

DEPARTMENT OF PHYSICS

SEMINAR SERIES: 2024/2025

Evaluating the Relationship Between Measures of Body Composition in School-Aged Children

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Date: Monday 30th June 2025

Time: 11:00 a.m.

Venue: FST 414- 3rd Floor Natural Sciences Building

Title: Evaluating the Relationship Between Measures of Body Composition in School-Aged Children

ABSTRACT

The double burden of malnutrition (DBM) has emerged as a critical public health challenge in low and middle-income countries. Characterised by rapidly rising rates of overnutrition in the form of overweight and obesity and modestly declining rates of undernutrition, the phenomenon is prevalent across all age groups, including children and adolescents 5 – 19 years, a group not typically covered by the 2025 Global Nutrition targets. Traditionally, anthropometric measurements have been used to assess nutrition status and subsequently identify the DBM. However, bioelectrical impedance analysis (BIA) is increasingly applied, though it remains unvalidated against a reference method, such as the nuclear technique of deuterium dilution, for this population. Population-specific validation for BIA is recommended as factors such as age, sex and the hydration factor used to estimate fat free mass (FFM) can affect the accuracy of results.

This study, which is a subset of the IAEA RLA6087 Project (Building Capacity in the Use of Stable Isotope Techniques to Address Childhood Obesity in English-Speaking Member States), therefore seeks to assess the DBM among school-aged children using anthropometry, BIA, and the deuterium dilution technique. Anthropometric data and BIA measurements will be collected and used to develop population-specific BIA prediction equations for total body water (TBW) and FFM using stepwise multiple linear regression.

These equations will subsequently be validated against values obtained from the deuterium dilution technique which involves the analysis of saliva samples collected from participants post-ingestion of a known dose of deuterium oxide, via Fourier Transform Infrared (FTIR) spectrometry. By integrating stable-isotope hydrometry, this study aims to compare three methods of body composition assessment and to develop prediction equations tailored to the target population. This study also aims to provide crucial data on the nutritional status of school-age children which can subsequently be used the implementation of interventions to counter potential long- and short-term consequences of the DBM in the study population and wider society.