

Human Health



Stable Isotope Techniques Help to Address the Double Burden of Malnutrition

SUMMARY

- To be in good health, individuals require nutritious food, high-quality water, physical activity, adequate sleep, and a living environment devoid of germs and toxic contaminants.
- An imbalance in any of these factors may manifest in one or more forms of malnutrition including being undernourished or becoming overweight or obese.
- The term double burden of malnutrition (DBM) connotes a situation where at least two or more forms of malnutrition coexist at individual, household, or national levels and at different points in an individual's life.
- The IAEA supports countries in applying stable isotope techniques to assess key indicators associated with the DBM and to evaluate the impact of corrective actions to address it, thereby contributing to evidence-based policy formulation.

INTRODUCTION

Poor nutrition — whether visible or hidden — leads to millions of deaths annually. It adds to burdens on health care systems and hinders social and economic development. Over 800 million people throughout the world die annually of hunger or a hunger-related cause. Inadequate intake of nutritious food leads to undernutrition which is a contributing factor to at least 45% of the 5.4 million annual deaths among children under the age of five¹.

¹WORLD HEALTH ORGANIZATION, Fact sheet, Children: reducing mortality, WHO (2018). www.who.int/news-room/fact-sheets/detail/children-reducing-mortality



Balanced diet and appropriate physical activity contributes to people's well-being. Schoolchildren in Mauritius.

(Photo: N. Joonas/Mauritius)

Globally, about 38 million children under five were overweight in 2017² largely due to excess food intake and physical inactivity. Being overweight or obese leads to serious diet-related health problems including diabetes, heart diseases, cancers, disability, and death.

Inadequate consumption of fruits and vegetables and a lack of exposure to sunlight lead to deficiencies in essential vitamins and minerals for the body to function properly. These deficiencies are not readily visible and are mostly detected when it is too late. The co-occurrence of multiple forms of malnutrition (undernutrition, overweight and obesity, and invisible

²UNITED NATIONS CHILDREN'S FUND, WORLD HEALTH ORGANIZATION, WORLD BANK GROUP, Levels and trends in child malnutrition: key findings of the 2018 Edition of the Joint Child Malnutrition Estimates, WHO, Geneva (2018).

mineral and vitamin deficiencies) is what is now known as the DBM³.

The IAEA encourages the use of isotope techniques that enable indicators associated with the DBM to be measured accurately. Data derived from these techniques are used to develop nutritional interventions to improve children's nutrition and health, enhance policy formulation, and strengthen country capacity to meet the Sustainable Development Goals, and the UN Decade of Action on Nutrition 2016–2025, which was adopted by the UN General Assembly in 2016.

STABLE ISOTOPES HELP TO ASSESS THE DBM

Stable isotope techniques can be used in many ways for monitoring and evaluating actions targeting the DBM.

These techniques are used as reference methods to assess diet quality by measuring the availability of micronutrients from food and an individual's vitamin A status. Additionally, these techniques are used to assess breastfeeding practices and the quantity of breast milk infants consume.

Equally important is the ability to accurately measure body composition as fat and fat-free mass, and to link these to the risk of becoming overweight or obese. Furthermore, it is possible to determine physical activity levels from information obtained from measuring energy expenditure. This provides Member States with the necessary evidence to design or improve their national health and nutrition programmes, for example by increasing the intake of vitamins and minerals through food fortification or micronutrient supplementation, and to encourage healthy eating.

³WORLD HEALTH ORGANIZATION, The double burden of malnutrition, Policy brief, WHO, Geneva (2017).

Stable isotope techniques provide increased specificity and sensitivity compared to other nutritional assessment methods, and can be safely and non-invasively used for all age groups to determine nutritional status and measure the effectiveness of nutrition programmes. Deuterium is one of the isotopes of hydrogen which has a higher atomic mass due to an additional neutron in the nucleus. It is the most commonly used stable isotope in nutritional assessments.

Stable isotopes are not radioactive and occur naturally. They are used in low amounts, posing no health risks to people of all ages.

IAEA SUPPORT: THE CONTRIBUTION OF STABLE ISOTOPE TECHNIQUES TO TACKLE THE DBM

The IAEA supports Member States through national and regional technical cooperation and coordinated research projects to enhance research and development on isotope techniques, and to build capacity for the adoption and use of these techniques to design and evaluate interventions. The IAEA's support includes training, expert advice, provision of equipment, sample analysis, data management, and analysis to enable the results to be interpreted and used by nutritionists and health professionals.

Member States have benefitted from such support. For example, IAEA-supported studies provided important information that was used to design or improve national wheat flour fortification programmes in Haiti and Morocco. Both Governments requested help with the choice of the iron fortificant to add to wheat flour to effectively address the problems of anaemia and delayed growth in infants and children. Other IAEA-supported studies in Africa and Asia provided important information on excessive body fat among schoolchildren⁴.

⁴SLATER, C., et al., BMI and adiposity in children. A global perspective, *Sight and Life* Vol. 32 2 (2018) 58-61.

They concluded that the current Body Mass Index-for-age cut-off values for overweight and obesity likely underestimate the proportion of children with excessive body fat (Figure 1) and recommended assessing body composition to improve the targeting and impact assessment of interventions.

The IAEA's efforts in addressing the DBM complements the work of non-governmental organizations and other international organizations, such as the WHO, UNICEF, FAO, and the World Bank, to combat malnutrition in all its forms and to promote health. The IAEA's contribution includes:

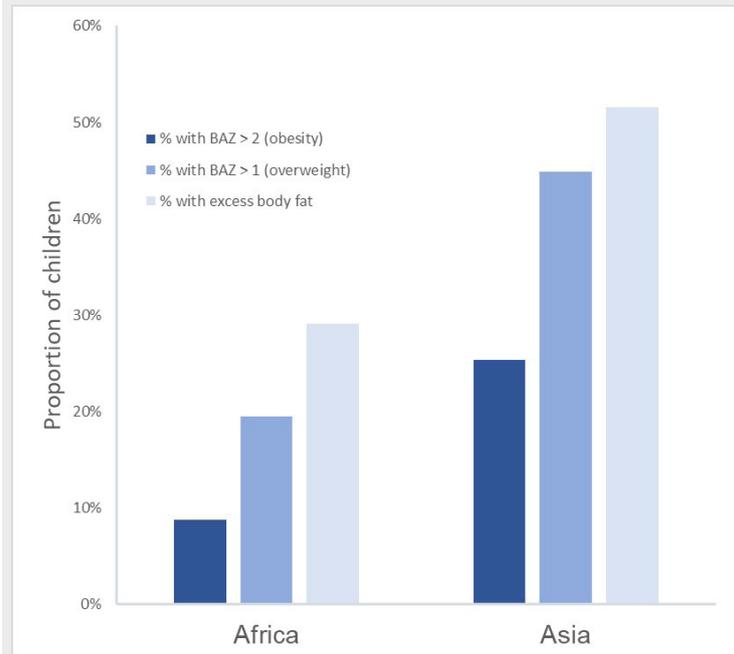
- Sharing the latest research findings and experiences with the implementation of relevant interventions, programmes and policies that help countries achieve their nutrition commitments;
- Identifying new assessment tools; and
- Providing stable isotope derived biomarkers for nutrition surveillance.

An example of tri-agency effort in tackling the DBM was the International Symposium on Understanding the Double Burden of Malnutrition for Effective Interventions, an initiative of the IAEA, WHO, and UNICEF in December 2018 that addressed biology, interventions, and policies to understand and tackle the DBM. It highlighted the IAEA's contribution in the use of stable isotopes in this area.

The IAEA also cooperates with the United Nations in the area of nutrition as a member of the United Nations System Standing Committee on Nutrition, which serves as a platform to discuss nutrition strategies and initiatives and to design joint global approaches. Support is also provided to thematic international initiatives in the areas of non-communicable diseases, nutrition and cancer, and environmental enteric dysfunction.

Interagency partnerships have a greater potential for promoting nutrition for better health and helping to minimize the many health problems associated with the DBM.

Figure 1: Two examples from Africa and Asia comparing currently recommended cut-off values for obesity and overweight by BMI-for-age z-score (BAZ) and excessive body fat percent assessed by deuterium dilution (excessive body fat defined as >25% in boys and >30% in girls).



(Source: IAEA)

EXAMPLES OF PUBLIC POLICIES ON NUTRITION

Due to the multiple faces of the DBM, interventions should be designed to simultaneously address several forms of malnutrition. Nutrition actions need to be appropriate to the individual setting and reflect the local context.

For example, an important phase is the first 1000 days of life spanning the nine months of pregnancy to the first two years of life in which adequate breastfeeding is not only important for ensuring healthy child growth with reduced risks of premature death, but is also a potent tool for reducing the risks of obesity and some non-communicable diseases later in life for both mother and child.

In addition, promoting nutritional awareness and providing a 'nutritious lunchbox' in schools can not only tackle food insecurity, but can also address the risk of overweight and obesity. Other interventions



A field worker discusses the benefits of good nutrition at an inner city primary school in Guatemala.

(Photo: F. Rojas and X. Elena/Guatemala)

include legislation to control the marketing of poor-quality food to children, taxation on sweetened beverages, food fortification, and investment in facilities and infrastructure that allow for increased physical activity.

Such interventions with a double-edged sword are now known as double-duty actions among nutrition professionals⁵. Accurate DBM monitoring and evaluation tools are needed to determine trends in DBM risk factors and to assess the effectiveness of interventions.

⁵WORLD HEALTH ORGANIZATION, Double-duty actions, Policy brief, WHO, Geneva (2017).

AREAS WHERE MEMBER STATES MAY BENEFIT FROM IAEA ASSISTANCE

- Having a better understanding of the role of isotope techniques in the field of nutrition;
- Assessing their national training needs in using these techniques to assess and improve national nutrition programmes; and
- Participating in the assessment of micronutrient status, breastfeeding practices, energy expenditure and body composition, and receiving hands-on laboratory training.

IAEA Briefs are produced by the Office of Public Information and Communication

Editor: Aabha Dixit • Design and Layout: Ritu Kenn

For more information on the IAEA and its work, visit www.iaea.org

or follow us on    

or read the IAEA's flagship publication, the IAEA Bulletin, at www.iaea.org/bulletin

IAEA, Vienna International Centre, PO Box 100, 1400 Vienna, Austria

Email: info@iaea.org • Telephone: +43 (1) 2600-0 • Facsimile +43 (1) 2600-7

