

# Understanding the Nutritional Challenges in Uganda: A Path to Healthier Futures

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## Abstract

Malnutrition, characterized by both undernutrition and emerging obesity-related metabolic disorders, remains a critical public health challenge in Uganda. This report examines the complex nutritional landscape in Uganda, where stunting, wasting, and micronutrient deficiencies coexist with rising obesity rates, particularly among children and adolescents. Despite national efforts, vulnerable populations, such as refugees and those in poverty-stricken regions, continue to experience alarmingly high rates of undernutrition. Concurrently, the prevalence of overweight and obesity has surged, indicating a shift towards non-communicable diseases like type 2 diabetes and non-alcoholic fatty liver disease. Anemia, particularly among women of reproductive age and children under five, persists as a significant health issue, with its prevalence rising sharply in recent years.

This report highlights the multifaceted nature of malnutrition in Uganda, drawing on data from various sources to underscore the need for integrated intervention strategies. Early-life nutritional interventions, informed by the Developmental Origins of Health and Disease (DOHaD) framework, are crucial for mitigating long-term health consequences. Additionally, agricultural diversification and culturally sensitive public health programs are essential for addressing both undernutrition and obesity. The report calls for a comprehensive approach that incorporates disaster preparedness, maternal health strategies, and community-based interventions to combat the dual burden of malnutrition and foster healthier futures for Uganda's children.

## **Summary for general public**

Malnutrition, a major health issue in Uganda, affects the health and development of many children. This problem is complex, as both undernutrition (such as stunting, wasting, and lack of essential nutrients) and rising issues like obesity are present at the same time. This situation highlights the need for comprehensive and effective solutions.

In Uganda, many children suffer from stunting and being underweight, especially in regions facing extreme poverty or refugee crises. For example, in areas like the West Nile region and refugee settlements like Nakivale, children struggle to get proper nutrition. This lack of adequate food and nutrients not only hampers growth but also makes children more vulnerable to diseases like pneumonia and conditions like nutritional rickets.

Anemia, which affects both women of reproductive age and young children, remains a widespread problem. This condition, often caused by a lack of iron, can lead to severe health issues, including increased risks during childbirth. Alarmingly, the number of women suffering from anemia in Uganda has been rising, which calls for better monitoring and intervention strategies.

While undernutrition is a critical issue, Uganda is also facing a rise in obesity, particularly among adults. This dual burden of malnutrition—where undernutrition and obesity exist side by side—complicates efforts to improve public health. The growing rates of obesity also increase the risk of chronic diseases like diabetes and non-alcoholic fatty liver disease, which are becoming more common in Uganda.

To address these challenges, a variety of strategies are needed. This includes better community-based programs to understand the local causes of child malnutrition, more effective disaster preparedness plans to protect children's nutrition during emergencies, and initiatives to improve early childhood nutrition. Additionally, agricultural practices that boost food production diversity can help provide more nutritious diets for children.

In conclusion, tackling malnutrition in Uganda requires a comprehensive approach that combines early-life nutritional interventions, agricultural improvements, and robust public health programs. By focusing on these areas, Uganda can better meet the nutritional needs of its children, ensuring they grow up healthier and more resilient.

## Introduction

Malnutrition remains a pervasive and multifaceted public health challenge in Uganda, impacting children's health and development. Despite significant efforts, both undernutrition and emerging issues of obesity and related metabolic disorders continue to coexist, reflecting a complex nutritional landscape.

Undernutrition, including acute malnutrition, stunting, and micronutrient deficiencies, is prevalent among children in Uganda (1). Studies have highlighted the critical state of nutritional health, particularly in vulnerable populations such as refugees and those living in poverty-stricken areas (2). For instance, children in the West Nile region, especially during refugee crises, face significant challenges in receiving adequate nutritional care at health centers (1). This scenario is mirrored in refugee settlements like Nakivale, where thinness and other forms of undernutrition are alarmingly high among children aged 5-17 years (2).

Severe acute malnutrition often complicates other health conditions, such as severe pneumonia, with instances of nutritional rickets observed among affected children at Mulago Hospital (3). Additionally, the transition from therapeutic foods such as F-75 to ready-to-use therapeutic foods remains a critical intervention for managing severe acute malnutrition in clinical settings in Uganda (4).

Nutritional deficiencies also extend to cultural practices that adversely affect children's health. Cultural practices such as canine bud extraction have been linked to significant health problems among young children in urban slums (5). Furthermore, the longstanding issue of anemia, particularly kwashiorkor, has historical roots and continues to impact Ugandan children's health (6). According to a pooled analysis of population-representative data, anemia prevalence and severity in women and children from 2000 to 2019 show significant regional and global variations, with persistent high levels of severe anemia (7). This analysis underscores the need for continued surveillance and improved strategies to address anemia globally.

Additionally, the WOMAN-2 trial has provided important new evidence on the association between maternal anemia and postpartum hemorrhage. The cohort analysis from this trial indicates that maternal anemia significantly increases the risk of postpartum hemorrhage, emphasizing the critical role of effective anemia management during pregnancy (8). These findings are crucial for refining clinical guidelines and interventions aimed at reducing postpartum hemorrhage and improving maternal outcomes.

Further historical data analysis also highlights enduring trends in anemia prevalence. A systematic review of data from 1995 to 2011 shows both global and regional trends in hemoglobin concentration and anemia prevalence among children and women, including pregnant and non-pregnant women (9). This analysis provides a long-term perspective on anemia trends, which is essential for understanding the effectiveness of past interventions and guiding future strategies.

Research underscores the importance of early-life nutritional interventions to mitigate long-term health consequences. The Developmental Origins of Health and Disease (DOHaD) framework emphasizes how early nutritional environments can influence lifelong health trajectories, underscoring the need for robust early childhood nutritional programs in Africa (10).

Concurrently, there is an evolving recognition of the dual burden of malnutrition, where undernutrition and obesity coexist. In certain communities, rising obesity rates among children and adolescents are juxtaposed with persistent undernutrition, complicating public health responses (11). This dual burden is evident in changing population BMI distributions, contributing to shifts in obesity and underweight prevalence (11). Studies have also linked increased farm-level production diversity to better nutritional outcomes among children, suggesting agricultural interventions as potential strategies to address malnutrition (12).

The intersection of malnutrition with metabolic diseases, such as diabetes, is particularly concerning. The growing prevalence of type 2 diabetes among young populations in sub-Saharan Africa, including Uganda, poses new challenges for health systems traditionally focused on infectious diseases (13, 14). This epidemiological shift is compounded by socio-economic determinants and lifestyle changes contributing to non-alcoholic fatty liver disease (NAFLD) and other metabolic disorders (15, 16).

Effective intervention strategies are crucial for addressing these multifaceted nutritional challenges. Community-based approaches, such as confidential enquiries into child deaths in Uganda, provide valuable insights into the local circumstances surrounding child mortality and highlight areas for targeted nutritional interventions (17). Programs like the REACH trial, which evaluated hydroxyurea for managing sickle cell anemia, demonstrate the potential of integrated approaches to improving child health outcomes in the region (18).

Moreover, situational analyses of disaster hazards reveal the compounded risks that affect children's nutritional status during emergencies, necessitating comprehensive disaster preparedness and response plans (19). The impact of staple food consumption on undernourishment further illustrates the complex interplay between diet, economic factors, and nutritional health (20).

In conclusion, addressing malnutrition in Uganda requires a multifaceted approach that considers the diverse and evolving nutritional needs of children. Integrating early-life nutritional interventions, agricultural strategies, and comprehensive public health programs can potentially mitigate the dual burden of malnutrition and associated metabolic disorders, fostering healthier futures for Uganda's children.

### **Data analyses and source data verification**

Data presented was provided by the Official Statistics Provider for Uganda (Uganda Bureau of Statistics, UBO; Office of the Prime Minister, 'Uganda Nutrition Action Plan 2020-2025: leaving no one behind in scaling up Nutrition Actions', Kampala, Uganda, 2020) and the Uganda Demographic and Health Survey (UDHS) 2022. Data is of public consumption and is stored in The PLATFORM for the NEEDY and the research team analyzing the data of the current report.

Data collation was performed using GraphPad Prism 5.0. The steps of the outbreak investigation followed the previously described guidelines (22,23). For correlation analyses, data was analyzed by generalized linear modeling, as previously described (24), which is equivalent to analysis of covariance (ANCOVA). Data are presented as Mean of prevalence of different parameters.

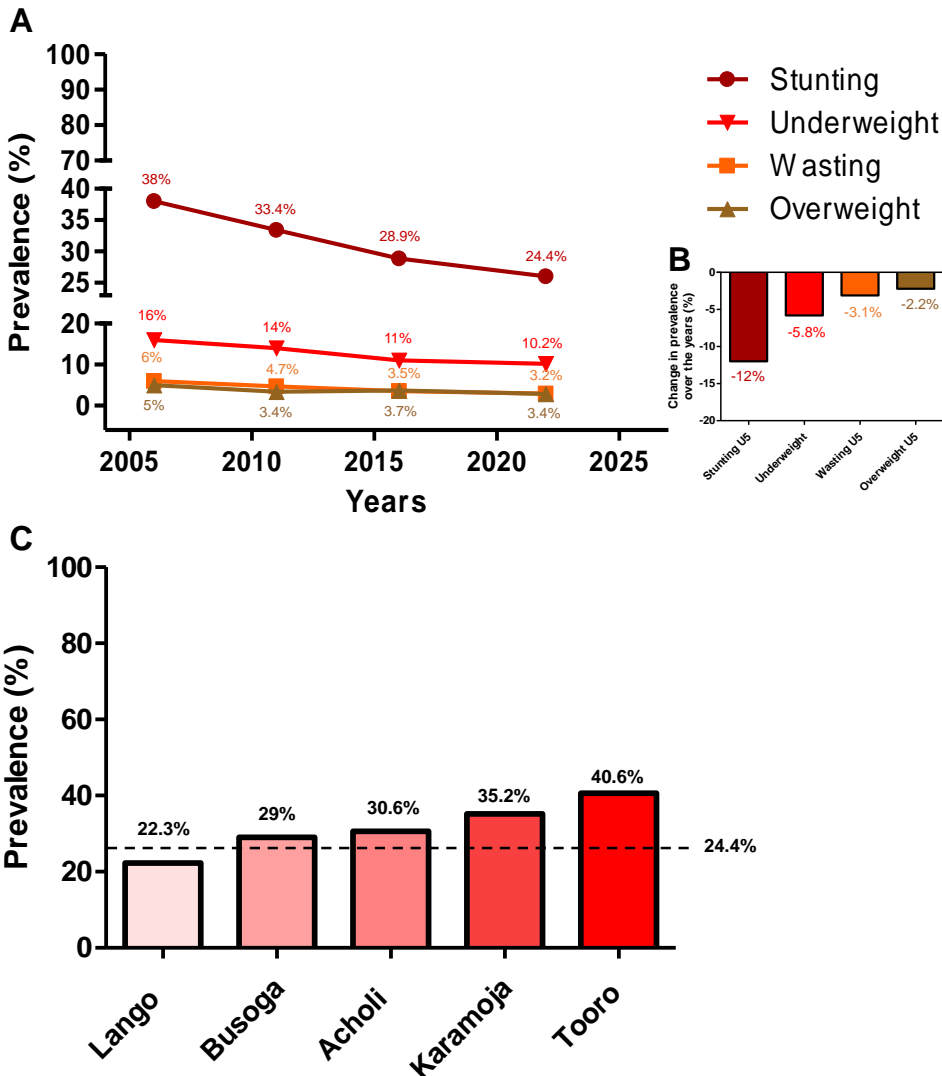
**Results**

**Malnutrition situation at national level in Uganda**

The prevalence of stunting and underweight in children under 6 – 59 months in Uganda are alarmingly high (Figure 1 A). The latest data show that the prevalence of stunting in 2022 was 24.4% and 10.2% for underweight (Figure 1 A).

Data on prevalence of stunting and underweight were higher over the years as compared to wasting and overweight (Figure 1 A).

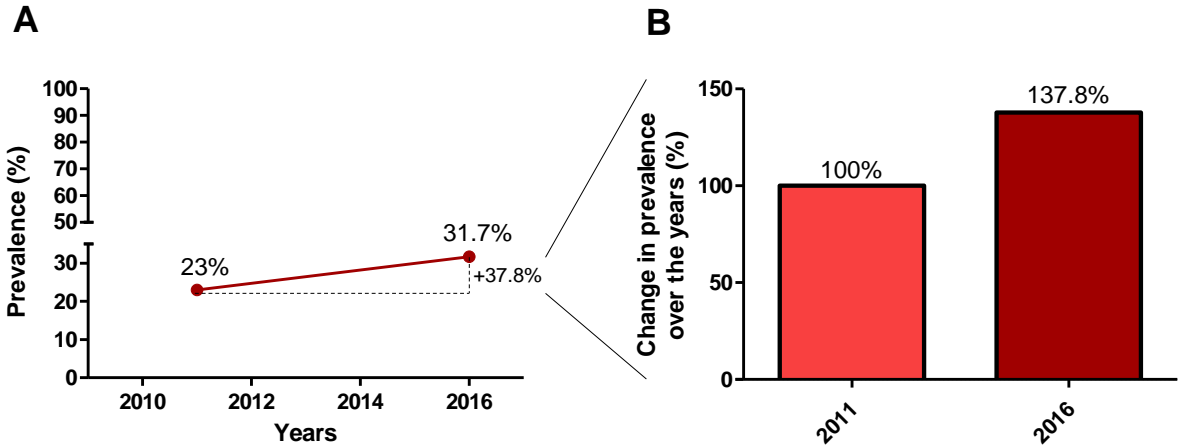
Although all these parameters show a trend towards decreasing with time at national level (Figure 1 A,B), the nutrition status in selected target areas show that only Lango Sub-region had a prevalence of stunting (22.3%) below the national values (24.4%) (Figure 1 C).



**Figure 1. Malnutrition in Uganda.** (A) Prevalence of stunting, underweight, wasting and overweight in children under 6-59 months. (B) Change in prevalence of stunting, underweight, wasting and overweight between 2006 and 2022. (C) Prevalence of stunting in target study areas in Uganda (2016).

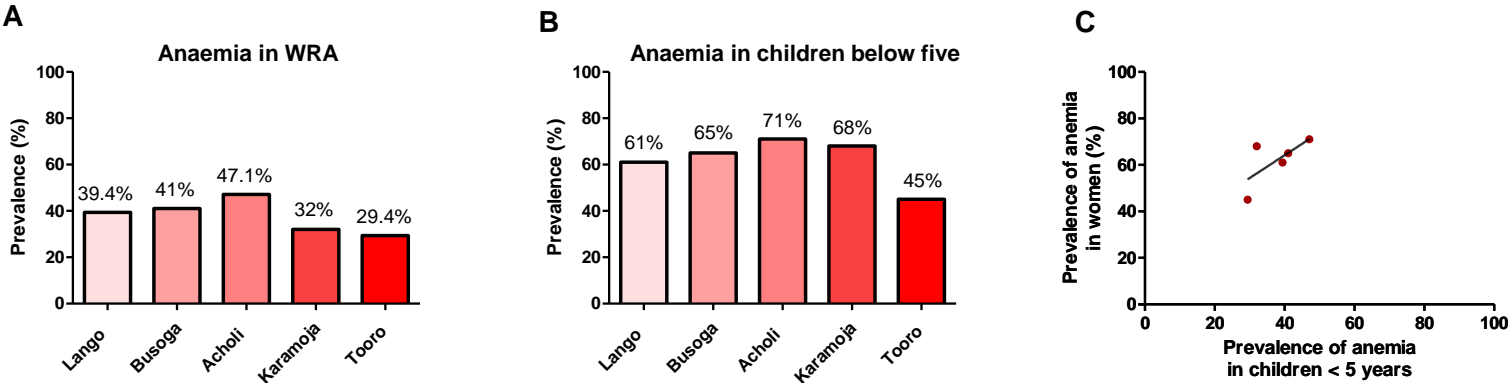
**Anaemia in women of reproductive age (WRA) and in children below five years**

Anaemia have long-term consequences on individuals and societies, including poor cognition and educational performance, low adult wages, lost productivity and, when accompanied by excessive weight gain later in childhood, an increased risk of nutrition-related chronic diseases in adult life (21). Collected and collated data showed that the prevalence of anaemia in Uganda at national level in WRA increased 37.8% within five years’ time-frame (2011 – 2016) (Figure 2A,B).



**Figure 2. Anaemia in WRA at national level in Uganda.** (A) Prevalence of anaemia in Ugandan WRA. (B) Change in the prevalence of anaemia in Ugandan WRA taking as baseline (100%) the prevalence of anaemia in 2011 (23%).

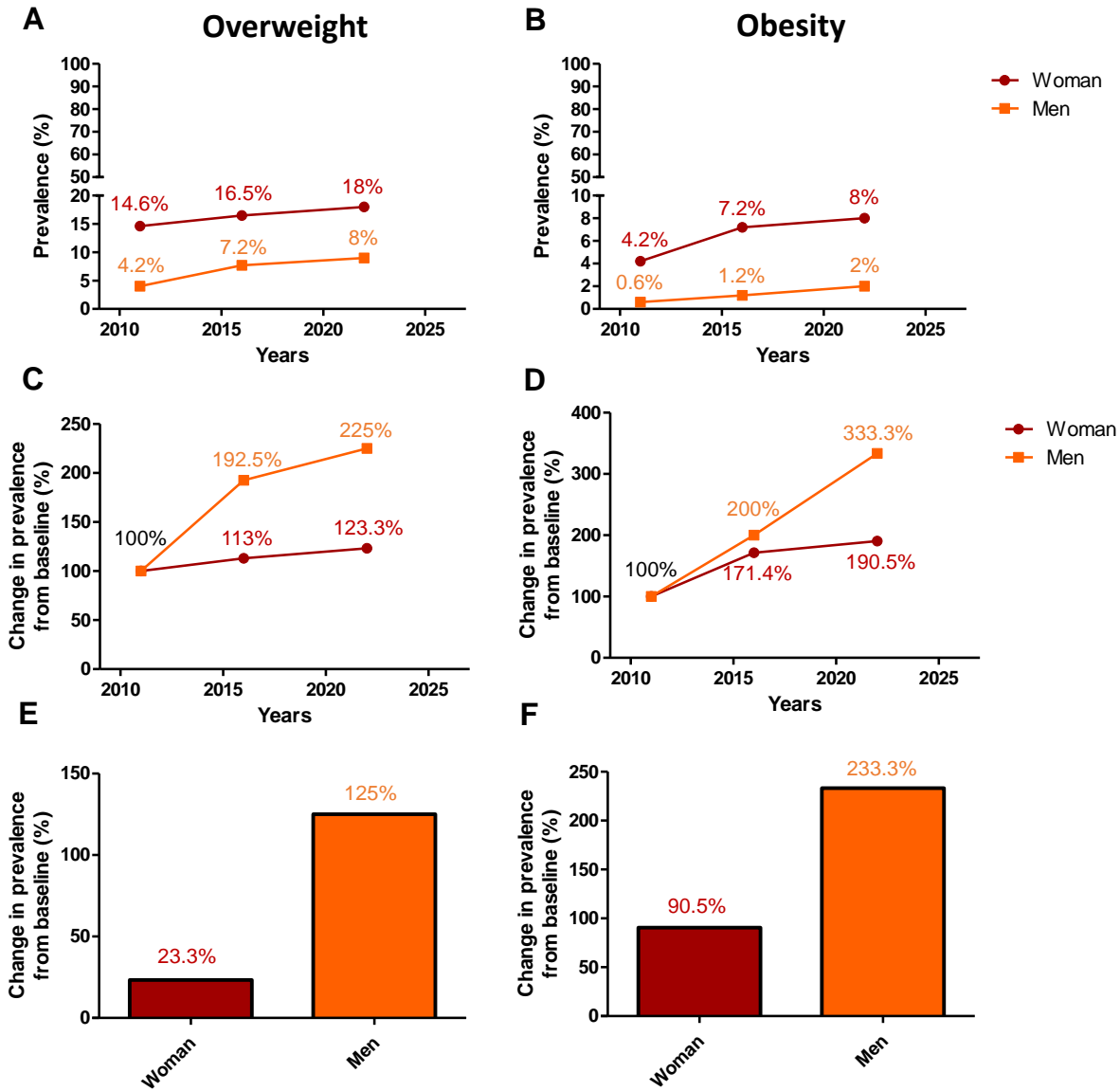
In the selected target areas for this study, it was shown that the prevalence of anaemia in WRA, ranging from 29.4 to 47.1% (Figure 3A), was lower than in children below five, where the prevalence of anemia ranged from 45 to 71% (Figure 3B). Interestingly, a positive, yet not statistically significant, correlation was found when the prevalence of anaemia was compared between WRA and children below five (Figure 3C).



**Figure 3. Anaemia in WRA and in children below five years in Ugandan selected target study areas.** (A) Prevalence of anaemia in Ugandan WRA. (B) Prevalence of anaemia in children below five. (C) Correlation analysis between the prevalence of anaemia in Ugandan WRA and children below five.

### Overweight and obesity in Uganda

Overweight among adult’s population in Uganda has increased for the period 2011 – 2022 (Figure 4 A,C,E). Although the prevalence of overweight was higher in women than in men within this time-frame (Figure 4A), when taking the prevalence data of overweight in 2011 for each gender as a baseline, it is shown that the percentage of change in the prevalence of overweight in men over the years was much pronounced than in women (Figure 4C). And indeed, while women showed a 23.3% increase in the prevalence of overweight from 2011 to 2022, men showed a 125% increase in this parameter (Figure 4E).



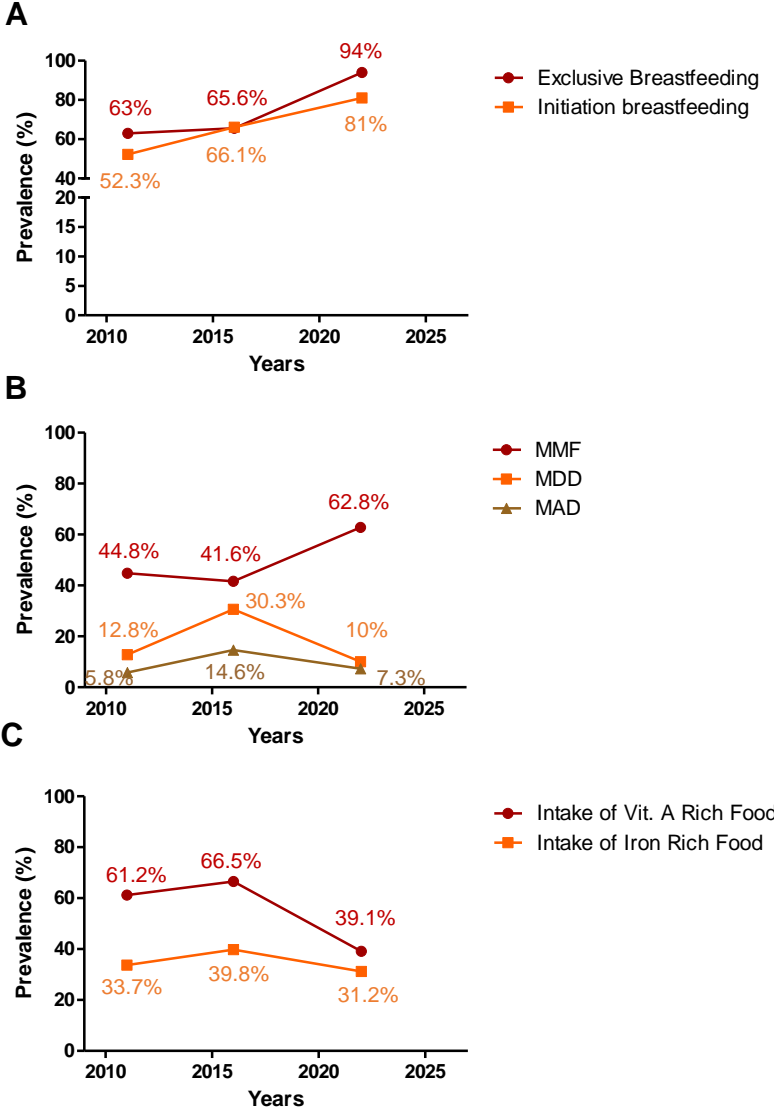
**Figure 4. Overweight and obesity among women and men.** Prevalence of (A) overweight and (B) obesity in women and men. Change in the prevalence of (C) overweight and (D) obesity over the years taking the data from 2011 as baseline. Fold change in the prevalence of (E) overweight and (F) obesity among women and men from 2011 to 2022.

A similar scenario was observed when data of obesity among adult’s population in Uganda (2011 – 2022) was analyzed (Figure 4B,D,F). Although the raw prevalence of obesity seems

to be higher in women than men (**Figure 4B**), the normalized data to the baseline in 2011 shows that the change in the prevalence of obesity in man was more pronounced than in women (**Figure 4D**), with a 233% increase from 2011 to 2022 versus a 90.5% in women (**Figure 4F**).

**Feeding practices of children**

The trends in infant breastfeeding practices show are increasing over the years (**Figure 5A**), however, the prevalence of minimum dietary diversity (MDD) and minimum acceptable diet (MAD) in children aged 6 – 59 months remain alarmingly low (**Figure 5B**). Despite of the increase in the minimum meal frequency (MMF) from 2011 (prevalence of 44.8%) to 2022 (prevalence of 62.8%), more efforts need to be put to amend the unmet need to reach numbers near to 100% for the MMF and to significantly improve the low prevalence of MDD and MAD (**Figure 5B**).



**Figure 5. Dietary feeding practices of children in Uganda.** (A) Infant breastfeeding practices. (B) Dietary feeding Practices of children aged 6-59 months (C) Intake of Vitamin A & Iron Rich Foods in children aged 6-23 months.

Another important aspect to improve in the feeding practices in children aged 6 – 23 months is the intake of vitamin A and iron-rich foods. Although the prevalence of vitamin A intake ranged between 61.2 to 66.5% in 2011 and 2016, respectively, it drastically reduced to 39.1% by 2022 (**Figure 5C**). Even lower prevalence was shown for the iron-rich food consumption in children aged 6 – 23 months (**Figure 5C**). Here, departing from a prevalence of 33.7% in 2011 and slightly increasing towards a 39.8% in 2016, it decreased again by 2022 to a 31.2% (**Figure 5C**).

## Discussion

Malnutrition remains a significant public health challenge in Uganda, reflecting a complex interplay of undernutrition and emerging issues such as obesity and related metabolic disorders. This discussion aims to address the multifaceted nature of malnutrition in Uganda, drawing on the findings of various studies and highlighting the critical need for comprehensive intervention strategies.

The prevalence of undernutrition, including stunting, wasting, and micronutrient deficiencies, among children in Uganda is alarmingly high. As of 2022, stunting affected 26% of children under five, while 10.2% were underweight. This high prevalence of undernutrition is indicative of the broader nutritional challenges faced by vulnerable populations, particularly in regions experiencing refugee crises. For instance, the West Nile region and Nakivale refugee settlement have reported significant challenges in providing adequate nutritional care, with high rates of thinness among children aged 5-17 years (1, 2).

Severe acute malnutrition often exacerbates other health conditions, such as severe pneumonia, and can lead to complications like nutritional rickets (3). In clinical settings, the transition from therapeutic foods such as F-75 to ready-to-use therapeutic foods (RUTF) is a critical intervention for managing severe acute malnutrition (4). Additionally, cultural practices, such as canine bud extraction, have been linked to significant health problems among young children in urban slums, highlighting the need for culturally sensitive health interventions (5).

Anemia remains a pervasive issue, particularly affecting women of reproductive age (WRA) and children under five. The prevalence of anemia in WRA increased by 37.8% from 2011 to 2016, with children under five exhibiting even higher rates (6, 7). The persistent high levels of anemia underscore the need for continued surveillance and improved strategies to address this condition globally. Notably, maternal anemia significantly increases the risk of postpartum hemorrhage, as evidenced by the WOMAN-2 trial, emphasizing the critical role of effective anemia management during pregnancy (8).

The coexistence of undernutrition and rising obesity rates among children and adolescents complicates public health responses. The dual burden of malnutrition is evident in changing population BMI distributions, contributing to shifts in obesity and underweight prevalence (11). This phenomenon is particularly concerning as it indicates a transition towards non-communicable diseases, such as type 2 diabetes and non-alcoholic fatty liver disease (NAFLD), which pose new challenges for health systems traditionally focused on infectious diseases (13-16).

Effective intervention strategies are crucial for addressing these multifaceted nutritional challenges. Community-based approaches, such as confidential enquiries into child deaths in Uganda, provide valuable insights into the local circumstances surrounding child mortality and highlight areas for targeted nutritional interventions (17). Programs like the REACH trial, which evaluated hydroxyurea for managing sickle cell anemia, demonstrate the potential of integrated approaches to improving child health outcomes in the region (18).

Additionally, situational analyses of disaster hazards reveal the compounded risks that affect children's nutritional status during emergencies, necessitating comprehensive disaster preparedness and response plans (19). The impact of staple food consumption on

undernourishment further illustrates the complex interplay between diet, economic factors, and nutritional health (20). Early-life nutritional interventions, guided by the Developmental Origins of Health and Disease (DOHaD) framework, are essential for mitigating long-term health consequences and fostering healthier futures for Uganda's children (10).

In conclusion, addressing malnutrition in Uganda requires a multifaceted approach that integrates early-life nutritional interventions, agricultural strategies, and comprehensive public health programs. By acknowledging the diverse and evolving nutritional needs of children, policymakers and health practitioners can develop targeted interventions to mitigate the dual burden of malnutrition and associated metabolic disorders, thereby fostering healthier futures for Uganda's children.

## Clinical recommendations

### 1. Strengthen Early-Life Nutritional Interventions

- **Promote Exclusive Breastfeeding:** Encourage exclusive breastfeeding for the first six months of life and continued breastfeeding up to two years or beyond, complemented with appropriate solid foods.
- **Enhance Maternal Nutrition:** Provide nutritional support and counseling to pregnant and lactating women to ensure they receive adequate micronutrients and macronutrients, reducing the risk of low birth weight and stunting.
- **Supplementation Programs:** Implement routine vitamin A and iron supplementation for children under five and pregnant women to prevent deficiencies.

### 2. Improve Dietary Diversity and Feeding Practices

- **Minimum Dietary Diversity (MDD) and Minimum Acceptable Diet (MAD):** Educate caregivers on the importance of a diverse diet that includes fruits, vegetables, grains, and proteins to improve MDD and MAD.
- **Increase Iron-Rich Food Intake:** Promote the consumption of iron-rich foods and iron-fortified products among children aged 6-23 months and women of reproductive age to combat anemia.
- **Vitamin A Supplementation:** Restore and enhance programs for vitamin A supplementation to increase intake among young children.

### 3. Address Cultural Practices

- **Cultural Sensitivity:** Develop culturally sensitive educational programs to address harmful traditional practices such as canine bud extraction, which can lead to severe health issues.
- **Community Engagement:** Engage community leaders and influencers in awareness campaigns to shift harmful practices and promote positive health behaviors.

### 4. Manage Severe Acute Malnutrition (SAM)

- **Therapeutic Feeding Programs:** Ensure the availability and proper transition from F-75 therapeutic foods to ready-to-use therapeutic foods (RUTF) in health centers.
- **Capacity Building:** Train healthcare workers in the management of SAM, including the use of therapeutic foods and the identification of complications.

### 5. Combat Anemia

- **Screening and Supplementation:** Implement regular screening programs for anemia in women of reproductive age and children under five. Provide iron and folic acid supplements as necessary.
- **Education on Anemia Prevention:** Educate communities about the causes and prevention of anemia, emphasizing the importance of a balanced diet rich in iron and other essential nutrients.

## 6. Tackle the Dual Burden of Malnutrition

- **Obesity Prevention Programs:** Develop and promote programs aimed at preventing obesity through healthy eating and physical activity, targeting both children and adolescents.
- **Monitor BMI:** Regularly monitor the BMI of children and adolescents to identify and address undernutrition and overweight issues early.
- **Healthy School Meals:** Implement school feeding programs that provide balanced meals, incorporating both micronutrient-rich and macronutrient-rich foods.

## 7. Integrated Approaches to Non-Communicable Diseases (NCDs)

- **NCD Awareness:** Increase awareness about the risk factors and prevention of non-communicable diseases such as diabetes and NAFLD.
- **Lifestyle Interventions:** Promote lifestyle interventions, including healthy eating and regular physical activity, to prevent the onset of NCDs.

## 8. Community-Based Approaches and Surveillance

- **Child Death Enquiries:** Conduct confidential enquiries into child deaths to understand local causes and circumstances, providing insights for targeted interventions.
- **Surveillance Systems:** Strengthen surveillance systems to monitor nutritional status and health outcomes, allowing for timely interventions.

## 9. Emergency Preparedness

- **Disaster Response Plans:** Develop and implement comprehensive disaster preparedness and response plans that address the nutritional needs of children during emergencies.
- **Food Security Programs:** Enhance food security programs to ensure consistent access to nutritious food during crises.

## 10. Agricultural Interventions

- **Diversify Food Production:** Encourage farm-level production diversity to improve household food security and children's nutritional outcomes.
- **Nutrition-Sensitive Agriculture:** Integrate nutrition objectives into agricultural policies and programs to enhance the availability and accessibility of diverse and nutritious foods.

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