



# NUTRIENTS ESSENTIAL TO CHILD GROWTH AND DEVELOPMENT

# INSTITUTIONAL INTRODUCTIONS

This booklet is a collaboration between the following organisations, which share a commitment to improving global nutrition.

## **United Against Malnutrition & Hunger**

United Against Malnutrition & Hunger (UAMH) is an alliance for global action on malnutrition and hunger. UAMH brings together leaders from scientific, business, finance, military, diplomatic, faith, philanthropic, and civil society backgrounds who want to see a world in which everyone has access to the good nutrition they need to thrive and contribute to prosperous and stable communities. UAMH presses the UK government and politicians of all parties to restore the UK to the heart of global efforts to end malnutrition.

## **Agriculture, Nutrition and Health (ANH) Academy Science-Policy Platform**

ANH Academy Science-Policy Platform is a global evidence platform aiming to accelerate actions towards equitable and just food systems for nutrition and health, whilst confronting climate change and protecting nature, through interdisciplinary research, capability sharing and collaboration. The ANH Academy Network brings together a global community of interdisciplinary researchers, practitioners, and policymakers working on agriculture and food systems for improved nutrition and health, with over 13,000 members in 160+ countries, over 65% of whom are in Africa or Asia. Membership of the ANH Academy is free and open to all.

## **London School of Hygiene and Tropical Medicine (LSHTM)**

The London School of Hygiene & Tropical Medicine is one of the world's leading public health universities with a vision to help create a more healthy, sustainable and equitable world for everyone, because our shared future depends on our shared health. Founded 125 years ago in 1899, LSHTM is a unique network of specialist centres, units and partners around the world. Staff and students are working together towards improving health worldwide.

## **Rothamsted Research**

Founded in 1843, Rothamsted Research is one of the world's longest-established agricultural research institutions and a global leader in sustainable agriculture. Funded by the Biotechnology and Biological Sciences Research Council (BBSRC), part of UK Research and Innovation (UKRI), Rothamsted delivers cutting-edge science to improve food security, environmental sustainability, and climate resilience. Its distinctive strength lies in combining fundamental discovery with applied innovation — working closely with farmers, industry, policymakers and international partners to address global challenges in food production, land use and nutrition.

## **Tanzania Food and Nutrition Centre**

The Tanzania Food and Nutrition Centre works with the Tanzania Ministry of Health to shape the nutrition landscape, spearhead the national response to nutrition, and ensure a coordinated, effective, and efficient approach to tackling malnutrition. The Centre plans and initiates food and nutrition programmes and national development plans, carries out research and data analysis on food and nutrition, collaborates with food producers, manufacturers, and distributors to ensure proper nutritional value of food, and promotes community awareness of the importance of a balanced diet and the dangers of malnutrition. The Centre has worked with the ANH Academy and colleagues at the London School of Hygiene & Tropical Medicine and Rothamsted Research to analyse national dietary survey data to identify micronutrient deficiency risks and inform the development of large-scale food fortification policies.

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## FOREWORD

**DR GERMANA LEYNA**, DIRECTOR, TANZANIA FOOD AND NUTRITION CENTRE

**Malnutrition** remains a significant challenge in many low- and low-middle-income countries, including across sub-Saharan Africa. Micronutrient deficiencies among women and young children contribute to **stunting**, increased susceptibility to infection, poor pregnancy outcomes and reduced **cognitive development**.

The **first 1,000 days** of life provide an opportunity to break this cycle. Ensuring adequate intake of essential vitamins and minerals during pregnancy, infancy and early childhood is fundamental to building strong foundations for lifelong health and productivity.

This booklet focuses on vitamins and minerals most critical in the fight against hunger and **malnutrition**. It explains their importance and highlights practical policy approaches — including supplementation, food **fortification**, **biofortification** and efforts to improve **dietary diversity** and food system resilience.

Addressing micronutrient deficiencies requires coordinated action across sectors. Health systems must deliver high-quality antenatal care and child nutrition services. Food systems must make nutrient-dense foods accessible and affordable. Social protection programmes must reach the most vulnerable households. Reliable monitoring systems are essential to guide policy and ensure accountability. Working to improve public health nutrition is my passion and the focus of my day-to-day work. My organisation strives to shape a healthier nutrition landscape in Tanzania and beyond, so that everyone can fulfil their potential.

By strengthening understanding among policymakers and partners, this booklet contributes to the broader goal of improving maternal and child nutrition and advancing sustainable development. I hope it supports renewed commitment to protecting the health and potential of the next generation.



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**Dr Germana Leyna**  
Director, Tanzania Food and Nutrition Centre

## PREFACE

**JONNY OATES**, CHIEF EXECUTIVE, UNITED AGAINST MALNUTRITION & HUNGER

Hunger and **malnutrition** remain among the greatest injustices of our time. While progress has been made in some areas, millions of women and children continue to suffer the consequences of inadequate diets, particularly deficiencies of essential vitamins and minerals.

The first **1,000 days** of life — from conception to a child's second birthday — represent a critical window. During this period, proper nutrition underpins healthy growth, cognitive development and immune function. Deficiencies in key **micronutrients** such as iron, iodine, folate, vitamin A and zinc can cause irreversible harm, limiting life chances and constraining national development.

This booklet provides a clear and accessible guide to those vitamins and minerals most central to global public health and to the fight against hunger and **malnutrition**. It is intended to support policymakers and parliamentarians in understanding not only the science, but also the policy levers available — from food **fortification** and supplementation to strengthening food systems and improving maternal and child health services.

Many of the solutions are well established and cost-effective. Universal salt iodisation, vitamin A supplementation, iron and folate **fortification**, and improved maternal nutrition services have demonstrated impact at scale. What is required is sustained political commitment and coordinated action.

Improving micronutrient status is not simply a health objective — it is an investment in human capital, resilience and economic growth. I hope this booklet contributes to renewed determination to address hunger and **malnutrition**, particularly for the youngest and most vulnerable.



A handwritten signature in black ink.

**Jonny Oates**  
Chief Executive, United Against Malnutrition & Hunger

# GLOSSARY

## Anaemia

A condition characterised by low **haemoglobin** in the blood, reducing the blood's ability to carry oxygen. Most commonly caused by iron deficiency, but can also result from deficiencies of folate or other nutrients.

## Biofortification

The process of increasing the vitamin or mineral content of crops through plant breeding or agronomic practices, such as fertiliser application.

## Cognitive development

The development of a child's ability to think, learn, remember and solve problems. Rapid cognitive development takes place during the **first 1,000 days** — from conception to a child's second birthday — when the brain is growing quickly and forming critical connections that influence learning, behaviour and health throughout life.

## Dietary diversity

The variety of foods consumed across and within food groups. Greater **dietary diversity** is associated with improved micronutrient adequacy.

## First 1,000 days

The period from conception to a child's second birthday. This is a critical window for physical growth, brain development and long-term health.

## Fortification

The addition of vitamins or minerals to commonly consumed foods during processing (for example addition of iodine to salt, or iron during milling of cereal flour) to prevent or correct population deficiencies.

## Haemoglobin

An iron-containing protein in red blood cells that transports oxygen around the body.

## Low birth weight

Birth weight less than 2,500 grams. Often associated with maternal **undernutrition** and micronutrient deficiencies.

## Malnutrition

An imbalance in essential nutrients leading to impaired nutritional status and health outcomes. Malnutrition includes **undernutrition** (such as stunting, wasting and **micronutrient** deficiencies) as well as overweight and obesity. In the **first 1,000 days**, **malnutrition** can have lasting effects on growth, brain development and lifelong health.

## Metabolism

All the chemical processes in the body that keep it alive and functioning. This includes breaking down food to release energy and using nutrients to build, grow and repair tissues.

## Micronutrients

Vitamins and minerals required in small amounts but essential for growth, immune function, cognitive development and overall health.

## Neural tube defects (NTDs)

Serious birth defects of the brain and spine that develop very early during pregnancy. Maternal folate deficiency is a major risk factor for **neural tube defects**.

## Pre-eclampsia

A serious pregnancy complication marked by high blood pressure and organ dysfunction after 20 weeks of pregnancy. It can threaten the life of both mother and baby if not treated.

## Stunting

Impaired growth and development in children resulting from chronic **undernutrition**, measured as low height-for-age. **Stunting** is associated with poor cognitive development and also may pose problems for women in pregnancy, increasing risks of **low birth weight** and obstructed labour.

## Supplementation

The provision of vitamins or minerals in tablet, capsule, syrup or powder form to prevent or treat deficiencies.

## Undernutrition

A form of malnutrition that includes **stunting**, **wasting**, underweight and micronutrient deficiencies.

## Wasting

Low weight-for-height, usually resulting from acute undernutrition.

## INTRODUCTION

This booklet provides a concise and accessible overview of vitamins and minerals that are essential for human health and development, with a focus on the **first 1,000 days** — from conception to a child's second birthday. This period represents a critical window for physical growth, brain development, immune function and long-term health. Nutritional deficits during this time can have lifelong and irreversible consequences, affecting educational attainment, productivity and economic development.

The booklet is designed for a non-scientific audience — including policymakers, parliamentarians and development practitioners — who wish to understand why specific **micronutrients** matter, who is most at risk, and what policy responses are available.

The booklet does not attempt to provide comprehensive coverage of all **micronutrients**. Rather, it highlights those that are widely recognised as major contributors to **malnutrition**, and that are commonly the subject of public health nutrition policies and programmes, including **supplementation, fortification, biofortification** and dietary diversification strategies.

The framing throughout reflects the priorities of efforts to combat hunger and **malnutrition** in low- and low-middle income countries. In many such contexts, diets are dominated by staple grains or tubers and lack sufficient diversity to meet micronutrient requirements. Limited affordability of nutrient-dense foods, weak food systems, seasonal variability, conflict and climate shocks all shape access to essential vitamins and minerals. Women and young children are particularly vulnerable due to higher biological requirements and unequal access to nutritious foods and health services.

By presenting key information in a clear, policy-relevant format, this booklet aims to support informed decision-making and strengthen action to reduce micronutrient deficiencies, improve maternal and child nutrition, and advance equitable development outcomes.

## VITAMINS AND MINERALS

Vitamins and minerals (sometimes known as **micronutrients**) are required by the body in small amounts but are essential for growth, development and to maintain overall health. Unlike macronutrients (carbohydrates, protein and fat), they do not provide energy, but they enable the body to convert food into energy, build tissues, regulate immune function, support brain development, and maintain healthy bones and organ function.

Micronutrient deficiencies are among the most widespread forms of malnutrition globally. They often coexist with each other and alongside other forms of malnutrition, including underweight, overweight and obesity. Micronutrient deficiencies may not present with obvious early symptoms, yet they can impair **cognitive development**, reduce resistance to infection, increase maternal and child mortality, and constrain educational attainment and economic productivity.

Deficiencies are most common in settings where diets are monotonous and dominated by staple grains or tubers, where access to diverse foods is limited by affordability, geography or seasonality, and where health systems are weak. At the same time, some **micronutrients** can be harmful when consumed in excess, underscoring the importance of balanced, evidence-based policy approaches.

Addressing vitamin and mineral deficiencies requires coordinated action across food systems, health services, social protection, education and regulation. Interventions may include dietary diversification, **fortification** of staple foods, **supplementation** for high-risk groups, production of more nutritious staple crops, and strengthened monitoring and surveillance systems.

### CALCIUM AND VITAMIN D

#### What are calcium and vitamin D and why do they matter?

- Calcium is a mineral that is a major structural component of bones and teeth. Around 99% of the body's calcium is stored in the skeleton.
- Vitamin D enables the body to absorb and utilise calcium effectively. Without adequate vitamin D, much of the calcium consumed in the diet cannot be properly absorbed.

Calcium is essential for:

- Skeletal development, strengthening of bones during growth and long-term bone health.
- Muscle contraction, blood clotting, and cell signalling.

Vitamin D is essential for:

- Helping the body absorb and retain calcium and phosphorus, thus contributing to bone health.
- Immune function and regulation of inflammation.

### Impacts of calcium and vitamin D deficiency

- Across much of Africa, South Asia, and Latin America, average dietary intakes of calcium are ~60% of recommended levels.
- Over 1 billion people are deficient in vitamin D worldwide, with greater prevalence in the Middle Eastern/North Africa region, parts of Asia, among people with darker skin, and among older people.
- Low calcium intake and vitamin D deficiency increase the risk of hypertension. During pregnancy, hypertension can lead to serious complications for both mother and baby — including **pre-eclampsia**, which can be life-threatening, as well as restricted foetal growth, preterm birth and stillbirth.
- Low calcium intake and vitamin D deficiency can result in low bone density, a cause of rickets in children and osteomalacia (soft bones), osteoporosis (brittle bones) and hip fractures in adults.
- Low calcium intake among adults is associated with increased risk of colorectal cancers.
- Vitamin D deficiency is associated with increased susceptibility to infections, including acute respiratory infections and tuberculosis.

### What causes calcium and vitamin D deficiency?

- Good dietary sources of calcium include: dairy products, small fish eaten with bones, leafy greens, certain millets, and fortified flours.
- The body can make vitamin D when skin is exposed to sunlight, and this is the main source for most people. However, diet can also contribute, and oily fish, eggs and fortified dairy/oils are all good sources of vitamin D.
- Foods that are good sources of calcium and vitamin D are often unavailable or unaffordable due to low production in local agriculture, poor cold chain infrastructure, weak market integration and limited affordability, particularly in rural areas.
- Fortified foods can be a good source of calcium and vitamin D, but **fortification** programmes are uncommon or fail to reach rural households in many low-income countries.
- As well as poor diet quality, vitamin D deficiency can result from little sunlight exposure, affecting populations in high latitudes, indoor workers, and those wearing concealing clothing that covers their skin when outdoors.

### Intervention options

- Support dairy production—for example through improved breeds or veterinary services—and fish production—for example through support for aquaculture or fisheries management.
- Provide dairy and fish products in school meal schemes.
- Antenatal calcium and vitamin D **supplementation**.
- Mandate **fortification** of staple foods. Implement strong quality control to monitor compliance.

## FOLATE

### What is folate and why does it matter?

- Folate is a vitamin that the body needs to make new cells. It plays a central role in growth and development because it helps the body copy and build DNA — the instructions inside our cells that guide how the body develops and functions.
- Folate is especially important during periods of rapid growth, including pregnancy and early childhood.

Folate is essential for:

- Making new cells and tissues.
- Healthy development of the baby's brain and spinal cord during early pregnancy.
- Producing healthy red blood cells.

### Impact of folate deficiency

- Folate deficiency often affects more than 20% among women of reproductive age in lower income countries.
- Maternal folate deficiency is the main cause of **neural tube defects (NTDs)**, a condition affecting ~260,000 births worldwide every year. An NTD occurs when the part of the embryo that becomes the brain and spinal cord does not form properly, normally resulting in stillbirth, early child death, or lifelong disability.
- Deficiency of folate can lead to a type of **anaemia** characterised by large, abnormal red blood cells, a condition that is much more common among women due to nutritional requirements associated with menstruation and pregnancy. Symptoms include fatigue, weakness and confusion.

### What causes folate deficiency?

- Good dietary sources of folate include leafy green vegetables, beans, lentils and some animal-source foods. However, access to fresh vegetables is limited by seasonality and affordability. Also, folate can be destroyed by prolonged cooking.
- Fortified foods can be a good source of folate, but **fortification** programmes are either lacking entirely or fail to reach rural households in many low-income countries.
- Women's folate needs increase substantially in early pregnancy when it is difficult to get the necessary amount of folate from diet alone. Successive and closely-spaced pregnancies increase maternal folate deficiency risk.
- Use of folate supplements in the months before conception is highly effective at improving maternal folate status in early pregnancy and averting NTDs. However, use of supplements is uncommon in many countries, especially where community health programmes and reproductive health services are lacking.

### Intervention options

- Strengthen horticulture production—for example, through provision of irrigation equipment—improve market access and infrastructure, and promote cooking techniques that minimise loss of folate.
- Increase access and adherence to folate or multiple micronutrient supplements (MMS) before and during pregnancy, including through outreach and engagement with at-risk groups.
- Increase access to reproductive health services to provide supplements and encourage use, and to support wider birth spacing.
- Mandate **fortification** of staple flour or salt. Implement strong quality control to monitor compliance.

## IODINE

### What is iodine and why does it matter?

Iodine is a mineral required in tiny amounts for the production of thyroid hormones, which regulate growth, **metabolism** and brain development.

Iodine is essential for:

- Foetal and early childhood brain development.
- Regulation of **metabolism**.
- Normal growth.

### Impact of iodine deficiency

- Iodine deficiency affects over 2 billion people worldwide, with high prevalence in many low-income settings. Most cases of deficiency are mild-to-moderate, although severe deficiency occurs in remote, fragile and conflict-affected settings.
- Mild iodine deficiency in mothers during pregnancy and in early childhood can impair **cognitive development** of the child.
- Moderate iodine deficiency causes low thyroid activity and may result in swelling of the thyroid gland in the neck (known as goitre). This may cause a range of problems including fatigue, weakness and cognitive issues.
- Severe iodine deficiency in pregnancy and infancy increases risk of miscarriage, still birth, brain damage, deafness and stunted growth.

### What causes iodine deficiency?

- Most foods are low in iodine. Good sources are iodised salt (including table salt and foods made with iodised salt), marine-source fish and fish from some large freshwater lakes. Dairy products can be a good source of iodine, although this depends on the iodine content of livestock feed. Leafy vegetables may contain iodine, but only when grown in iodine-rich soils; crops grown in inland or mountainous areas are often low in iodine.
- Around 90% of people live in countries with salt iodisation programmes, which have proven highly cost-effective in preventing iodine deficiency.

- Iodine deficiency remains more common in remote and conflict-affected areas where iodised salt is less accessible, and where unfortified artisanal salt is used.
- Some foods including cassava contain substances called goitrogens, that inhibit iodine **metabolism** and disrupt the production of thyroid hormones.

### Intervention options

- Strengthen iodised salt legislation, enforcement, and monitoring.
- Ensure iodised salt availability in informal markets.
- Strengthen monitoring of iodine status in school-age children and pregnant women.

## IRON

### What is iron and why does it matter?

Iron is an essential component of **haemoglobin**, the protein in red blood cells that transports oxygen from the lungs to the rest of the body.

Iron is essential for:

- Oxygen transport.
- Brain development.
- Immune function.
- Energy **metabolism**.

Requirements are high in infancy and among adolescent girls and women, particularly during pregnancy.

### Impacts of iron deficiency

- Iron deficiency **anaemia** causes fatigue, weakness and reduced immunity, and affects approximately 1 billion people worldwide, including one-in-three women of reproductive age and two-in-five young children.
- In pregnancy, iron deficiency increases risk of maternal mortality, **low birth weight** and preterm birth.
- In infancy and early childhood, iron deficiency impairs **cognitive development** and learning capacity.

### What causes iron deficiency?

- Animal-source foods (such as meat, fish, poultry and eggs) contain iron that is readily absorbed by the body. However, these foods are often unaffordable or difficult to access, particularly in rural or conflict-affected areas. Adolescent girls and women — despite having higher iron requirements — frequently have less access to iron-rich foods, including meat.
- Fortified foods can be a good source of iron, but **fortification** programmes are either lacking entirely or fail to reach rural households in many low-income countries.
- Iron from cereals and legumes is less well absorbed by the body because the grains contain naturally occurring compounds that inhibit iron absorption.

- Heavy menstrual bleeding increases iron requirements and risk of deficiency among some adolescent girls and women.
- Inflammation and infection reduce iron absorption, while some infections such as malaria and hookworms increase iron loss through destruction of red blood cells or bleeding.
- Supplementation programmes for young children and pregnant women often fail to reach people outside schools or those with little access to antenatal care.

### Intervention options

- Support livestock production—for example through provision of improved breeds or veterinary services.
- Promote food processing techniques (including soaking and fermenting grains) that make iron easier for the body to absorb.
- Develop high-iron varieties of staple crops through crop breeding, a process known as ‘**biofortification**’.
- Fortify cereal flours during milling and condiments during manufacturing with absorbable forms of iron. Implement strong quality control to monitor compliance.
- Provide iron or multiple micronutrient **supplementation** (MMS) to high-risk groups. However, note that adherence to these interventions is typically low, due mainly to side effects of iron **supplementation** (gastric discomfort).
- Control malaria through provision of insecticide treated bed nets, and conduct deworming programmes in schools.

## SELENIUM

### What is selenium and why does it matter?

Selenium is a mineral required in tiny amounts for thyroid function, antioxidant defence and immune function.

Selenium is essential for:

- Production and regulation of thyroid hormones.
- Protecting the body’s cells from damage and the development of cancer.
- Immune system function.

### Impacts of selenium deficiency

- Globally, 0.5–1 billion people have inadequate selenium intake, and recent studies conducted in sub-Saharan Africa have found 35–65% of adults are deficient.
- Moderate deficiency may increase susceptibility to infections and possibly certain cancers.
- Low selenium may impair maternal thyroid function, which can affect foetal development, particularly brain development.
- Some studies suggest selenium deficiency may cause **pre-eclampsia** and higher risk of miscarriage.
- Severe deficiency can cause heart disease and thyroid dysfunction.

### What causes selenium deficiency?

- The selenium content of foods – including crop and livestock products – depends largely on the amount of selenium in the soil where they are produced.
- Populations relying on crops grown in selenium-poor soils — common in many tropical regions — are at greater risk of deficiency, particularly rural households that depend heavily on locally produced foods.

### Intervention options

- Agronomic **biofortification** of crops and livestock feed using selenium-enriched fertilisers.
- Diversify diets within affordability constraints, and diversify value chains e.g. to blend cereals from high- and low-selenium soils in the production of flour.
- Include selenium in multiple micronutrient supplements.

## VITAMIN A

### What is vitamin A and why does it matter?

Vitamin A is important for maintaining healthy skin and mucous membranes (nose, lungs, gut), immune system function, and vision.

Vitamin A is essential for:

- Normal vision, particularly in low light.
- Immune defence.
- Growth and development.
- Integrity of skin and mucous membranes.

### Impacts of vitamin A deficiency

- Vitamin A deficiency affects around 20% of children globally, and around 30% of young children in Africa.
- Prevalence of deficiency has declined substantially in recent decades following roll-out of vitamin A supplements, but still remains a high public health priority.
- Vitamin A deficiency is strongly associated with an increased risk of mortality, particularly in children under 5 years of age.
- Deficiency can lead to growth failure and impaired resistance to infectious disease.
- Deficiency increases the severity of infectious diseases including measles.

### What causes vitamin A deficiency?

- Good sources of vitamin A include liver, eggs, dairy products and orange or dark green fruits and vegetables. However, diets may lack animal-source foods due to affordability constraints, while seasonal variation limits availability of fruits and vegetables.
- Fortified foods—particularly cooking oils—can be a good source of vitamin A, but **fortification** programmes are either lacking entirely or fail to reach rural households in many low-income countries.

- Children from poorer households often consume less vitamin A in their diets and are also less likely to receive vitamin A supplements through national programmes.
- Infections increase requirements.
- Breastfeeding mothers have increased vitamin A needs to ensure sufficient vitamin A is transferred through breast milk.

### Intervention options

- Support livestock production—for example through provision of improved breeds or veterinary services.
- Strengthen horticulture production—for example, through provision of irrigation equipment—and improve market access and infrastructure.
- Develop high-vitamin A staple crops including orange maize and orange-fleshed sweet potato, a process known as ‘**biofortification**’.
- **Supplementation** among young children. Note, high-dose vitamin A supplement programmes often run alongside polio and measles vaccination campaigns. As polio campaigns wind down and development funding declines, coverage of vitamin A **supplementation** is falling and requires renewed support.
- Mandate **fortification** of edible oils and flours. Implement strong quality control to monitor compliance.

## ZINC

### What is zinc and why does it matter?

Zinc is a mineral involved in numerous metabolic processes and is essential for growth, immune function and tissue repair.

Zinc is essential for:

- Linear growth.
- Immune defence.
- Wound healing.
- Reproductive health.

Zinc deficiency leads to multiple, non-specific changes including reduced growth and weak immune function. There are no specific clinical signs of zinc deficiency, and it remains largely untreated among children with lifelong implications for health and productivity.

### Impacts of zinc deficiency

- Nearly 2 billion people are zinc deficient worldwide.
- The greatest prevalence of zinc deficiency occurs in Africa, Asia and Central America, among low-income populations whose diets lack diversity.

- Zinc deficiency is one of the key underlying causes of **stunting** (too short for age), which affects about 150 million children (~23% prevalence) globally, primarily in low- and lower-middle income countries. **Stunting** increases risks of child mortality and later life occurrence of non-communicable disease, such as cardiovascular disease and diabetes.
- Zinc deficiency increases the risk and severity of diarrhoea and pneumonia.

### How common is zinc deficiency and what causes it?

- Animal-source foods (meat, fish, poultry, eggs) provide zinc that is absorbed well by the body, but are often unaffordable and inaccessible particularly in rural or conflict-affected areas.
- Zinc from cereals and legumes is less well absorbed by the body because the grains contain naturally occurring compounds that inhibit zinc absorption.
- Crops grown on weathered, tropical soils can be particularly low in zinc.

### Intervention options

- Support livestock production—for example through provision of improved breeds or veterinary services.
- Promote food processing techniques (including soaking and fermenting grains) that make zinc easier for the body to absorb.
- Develop high-zinc varieties of staple crops through crop breeding, a process known as ‘**biofortification**’. In many areas, this should be complemented by application of zinc via fertilisers, which can increase yields and boost grain zinc content.
- Provide zinc **supplementation** in diarrhoea management and preventive programmes in high-risk settings.
- Mandate zinc **fortification** of staple foods or condiments. Implement strong quality control to monitor compliance.

# Nutrients Essential to Child Growth and Development in the First 1,000 Days

Nutritional deficits during this critical window can have lifelong and irreversible consequences for health, development and productivity

## FOLATE



*Helps the body copy and build DNA, make new cells and tissues*

Maternal folate deficiency causes neural tube defects (NTDs) affecting foetal brain and spinal cord development.

**NTD affects ~260,000 births worldwide every year**

## IODINE



*Supports production of thyroid hormones, which regulate growth, metabolism and brain development*

Maternal iodine deficiency impairs cognitive development of the child

**Iodine deficiency affects over 2 billion people worldwide**

## IRON



*Enables haemoglobin to transport oxygen from the lungs to the rest of the body*

Deficiency impairs cognitive development and learning capacity in children

**Iron deficiency anaemia affects roughly 1 billion people worldwide**

## SELENIUM



*Supports thyroid function, antioxidant defence and immune function*

Low selenium impairs maternal thyroid function and affects foetal brain development

**0.5–1 billion people have inadequate selenium intake worldwide**

## VITAMIN A



*Supports vision, immune system function, and healthy skin and mucous membranes*

Deficiency causes growth failure and increases risk of mortality in children under 5

**Affects around 20% of children globally**

## CALCIUM & VITAMIN D



*Supports skeletal development, strengthening of bones during growth*

Deficiency causes low bone density, a cause of rickets in children

**Over 1 billion people deficient in vitamin D worldwide**

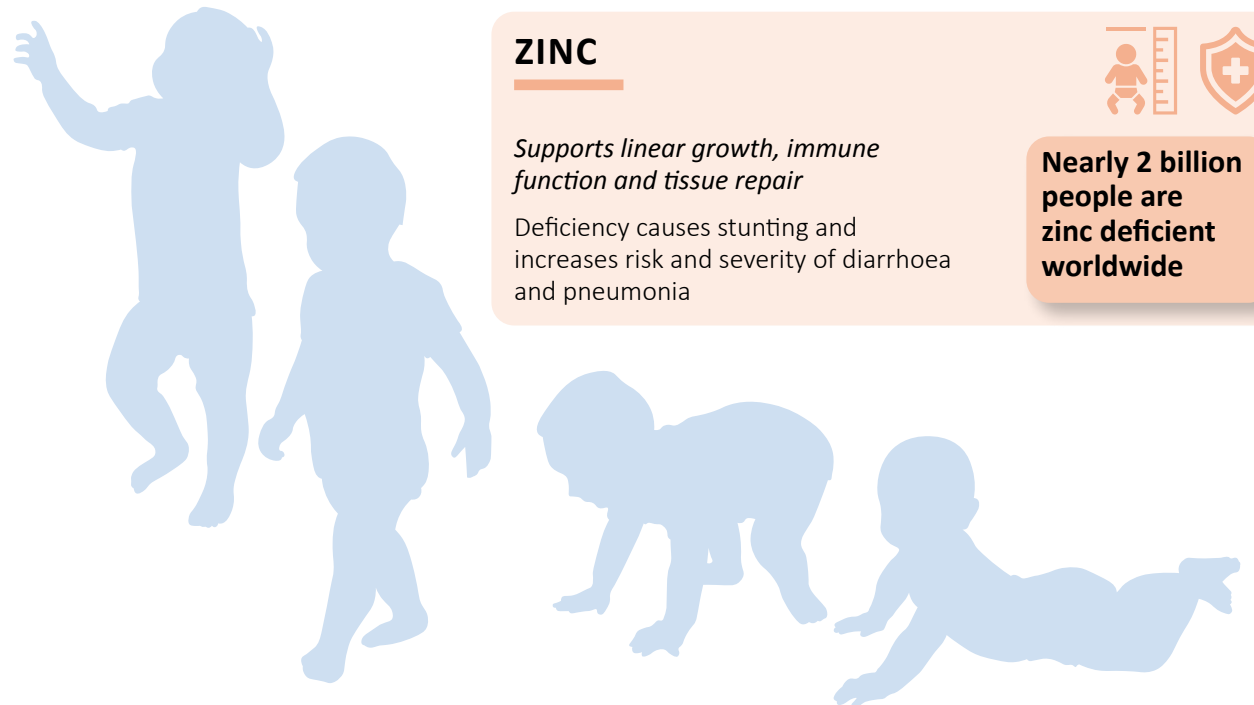
## ZINC



*Supports linear growth, immune function and tissue repair*

Deficiency causes stunting and increases risk and severity of diarrhoea and pneumonia

**Nearly 2 billion people are zinc deficient worldwide**





## AUTHORS

Edward Joy, London School of Hygiene & Tropical Medicine and Rothamsted Research  
Emma Fabian, United Against Malnutrition & Hunger  
Fanny Sandalinas, London School of Hygiene & Tropical Medicine and Kings College London  
Suzanne Filteau, London School of Hygiene & Tropical Medicine  
Aishwarya Nangia, London School of Hygiene & Tropical Medicine

## REFERENCES

Scan the code to view references from the booklet on the UAMH website.



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