

3 The Costs of Vitamin and Mineral Deficiencies

THE FIRST 1,000 DAYS – from conception until the age of two – are the most critical for any child. After birth, if exclusive breastfeeding is not practised during the first six months of life or if the solid foods introduced after that period are nutrient-poor, young children are likely to suffer vitamin and mineral deficiencies.

Up to two billion people suffer the consequences of vitamin and mineral deficiencies.

Deficiencies lead to more frequent infections, reduce children’s ability to fight and survive disease, and impair mental capacity. These risks remain serious as children grow and develop. They cannot learn as well, and lose school days due to illness.

In adulthood, vitamin and mineral deficiencies negatively affect physical energy and, therefore, productivity. Deficiencies during pregnancy threaten the health and lives of women and impact their unborn children.

Chapter 3 explores the repercussions of vitamin and mineral deficiencies, from conception to adulthood, including:

- ✓ child and maternal deaths
- ✓ physical disabilities
- ✓ lowered intellects
- ✓ lost productivity
- ✓ burden on caregivers and health-care systems

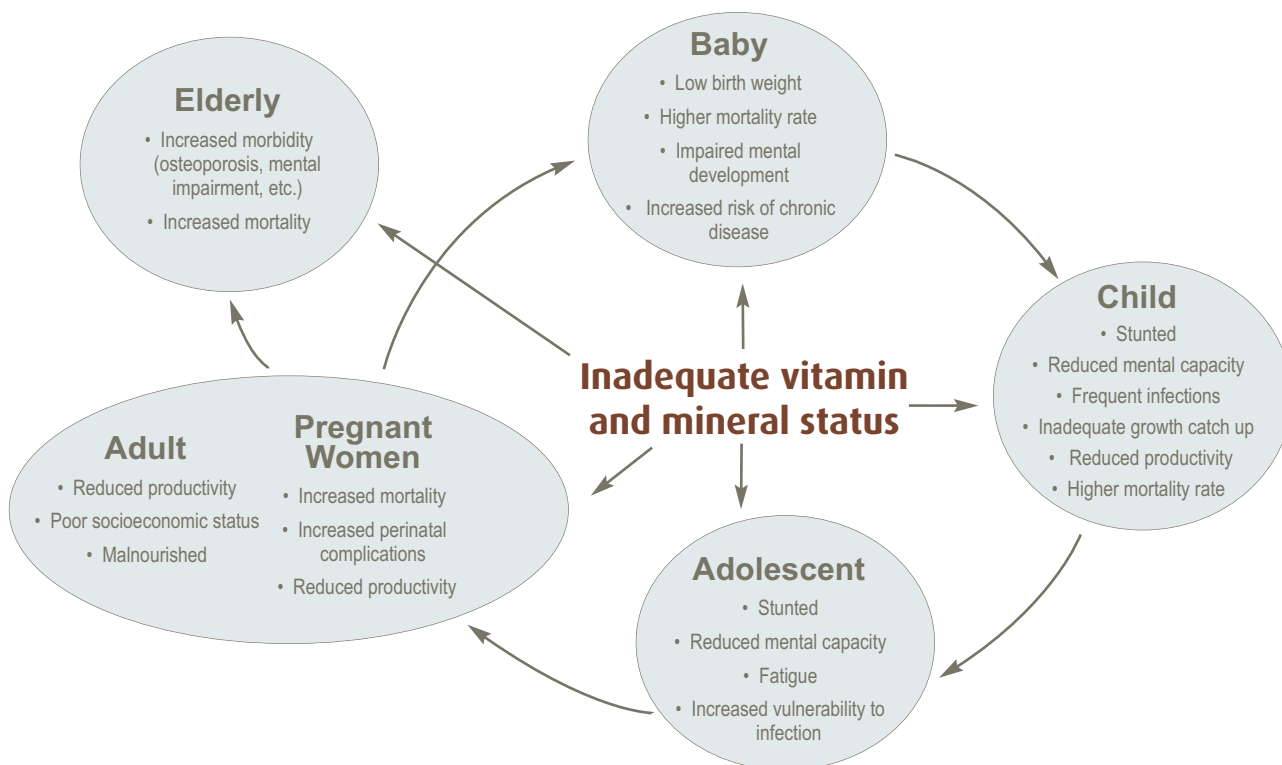
Lives Lost

The most unacceptable effects of vitamin and mineral deficiencies are unnecessary child and maternal deaths. For too many, death comes with pregnancy and birth, and for even more it comes after battles with disease.

Table 3. Human toll of vitamin and mineral deficiencies

| TYPE OF REPERCUSSION | NUMBERS AFFECTED |
|-------------------------|---|
| LIVES LOST ANNUALLY | <ul style="list-style-type: none"> • 1.1 million children under five die due to vitamin A and zinc deficiencies • 136,000 women and children die because of iron-deficiency anaemia |
| LIVES IMPAIRED ANNUALLY | <ul style="list-style-type: none"> • 18 million babies are born mentally impaired because of maternal iodine deficiency • 150,000 babies are born with severe birth effects due to inadequate maternal folate intake • 350,000 children become blind due to vitamin A deficiency |
| LOST PRODUCTIVITY | <ul style="list-style-type: none"> • 1.6 billion people suffer reduced productive capacity due to anaemia |

Figure 1. Consequences of vitamin and mineral deficiencies during the life cycle



Adapted from the United Nations Administrative Committee on Coordination Sub-Committee on Nutrition (ACC/SCN), *Fourth Report on the World Nutrition Situation, 2000*, Geneva: ACC/SCN in collaboration with IFPRI.

1,000 days that can last a lifetime – if vitamin and mineral deficiencies are not corrected between conception and the age of two, it may be too late to correct them later.

Deficiencies in vitamin A and zinc are particularly dangerous for children who are fighting measles, diarrhoea and malaria. A full 20–24%²² of deaths from these three diseases are attributable to inadequate vitamin A or zinc. Vitamin A deficiency annually claims the lives of almost 670,000 children under five and zinc deficiency claims more than 450,000.²³ Approximately one third of the world’s children under the age of five have inadequate dietary intake of vitamin A and are, therefore, ill-equipped for survival.²⁴

Iron-deficiency anaemia during pregnancy is associated with 115,000 women’s deaths each year,²⁵ which account for one fifth of total maternal deaths.²⁶ This has the additional result

of leaving tens of thousands of children without the protective care of their mothers and at further risk of illness and death. Iron-deficiency anaemia is also estimated to cause almost 600,000 stillbirths or deaths of babies within their first week of life.²⁷

One fifth of all maternal deaths are associated with iron-deficiency anaemia during pregnancy.

Lives Impaired

While the number of children and women who die because of vitamin and mineral deficiencies is great, greater still is the number of people who live with these deficiencies and their consequences. The negative impact on their health and well-being is significant. More often than not, they suffer multiple deficiencies and, therefore, multiple impairments.

Lowered intellect

Reduced intellectual capacity undermines investments in



A young man shares a poster about the effects on the thyroid gland of iodine deficiency disorders (IDD) with a group of adolescents. They are part of a peer-to-peer education programme at a UNICEF-supported summer camp for vulnerable children in the village of Vasyshevo, Ukraine. © UNICEF/NYHQ2005-1809/Pirozzi

education and perpetuates cycles of poverty. It is a significant barrier to progress for any nation that hopes to achieve economic growth and improved standards of living. Maternal iodine deficiency is recognized as the greatest cause of preventable mental impairment in the world. In developing countries, 38 million newborns each year are at risk of iodine deficiency.²⁸

Intellectual ability is also affected by iron. The effects of iron-deficiency anaemia during infancy and the first years of life on cognitive performance are lasting. Globally, it is estimated that 47% of children under the age of five suffer from anaemia.²⁹ It is generally assumed that half of all anaemia cases are due to iron deficiency.³⁰

Disability

Disability can be a devastating burden for individuals and their families who lack resources. His or her options for learning and income earning are limited. In the case of severe disability, even significant resources may not be

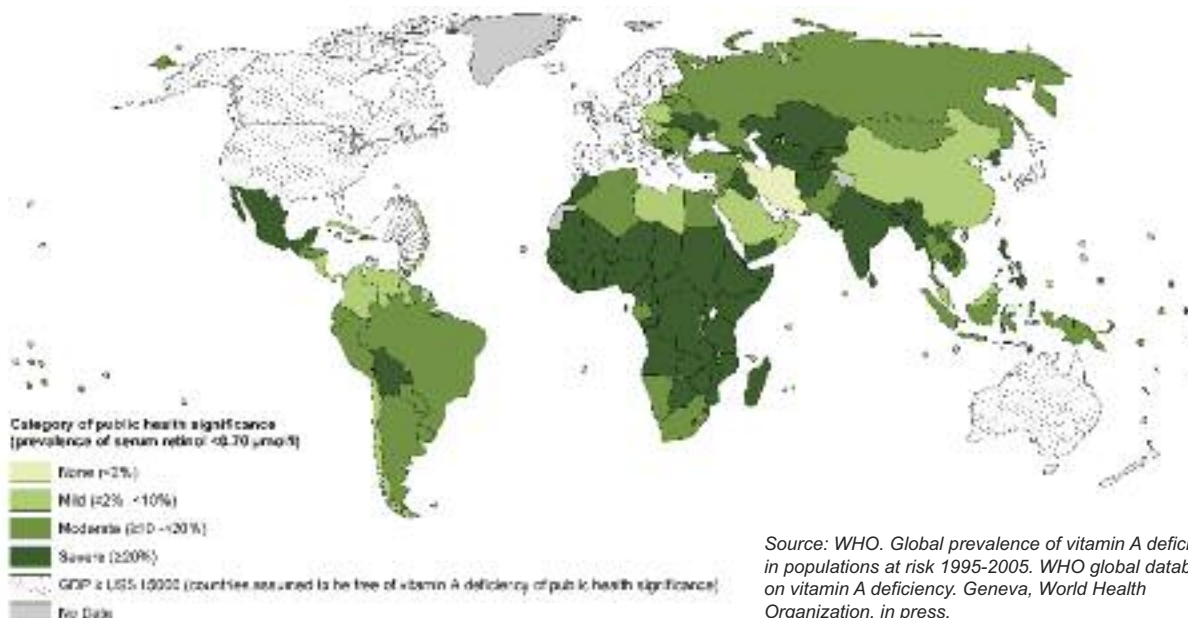
enough to enable economically productive lives. A disabled individual in a household with few resources usually experiences a greatly diminished quality of life.

Each year, spina bifida and anencephaly – the two most common types of neural tube defects – affect an estimated 300,000 newborns worldwide.³¹ Severe cases of spina bifida require treatment by surgery, and even with this intervention, most affected children live with some paralysis of the legs and bowel control problems.³² Most babies with anencephaly do not survive birth. At least half of these cases could be prevented if the mother consumes enough folic acid before and during the early stages of pregnancy.³³

Without benefit of folic acid fortification or supplementation programmes, 150,000 babies are born every year with severe defects that are otherwise preventable.

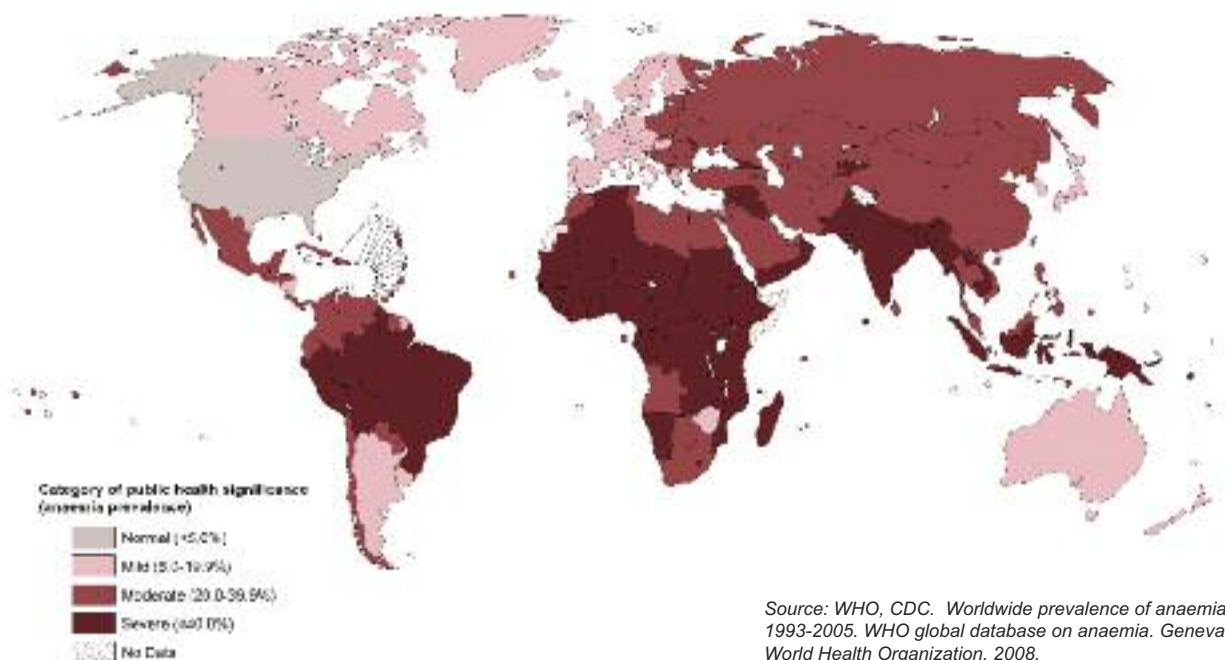
Global Impact of Vitamin and Mineral Deficiencies^a

Map 1. Prevalence of vitamin A deficiency among preschool-aged children by country



As Map 1 indicates, vitamin A deficiency is a significant public health problem in more than half of all countries. Regions where vitamin A is deficient in the diet include South Asia, most of sub-Saharan Africa, some countries in Latin America, and parts of China.

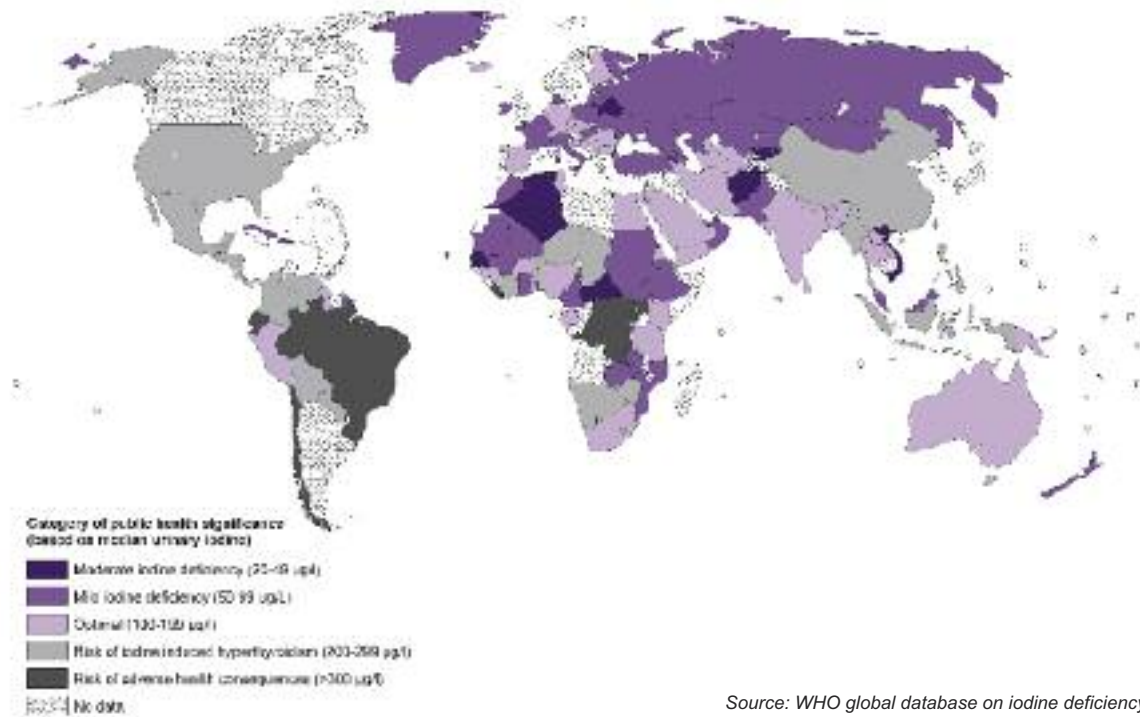
Map 2. Anaemia as a public health problem by country: Preschool-aged children



Map 2 indicates that, like vitamin A deficiency, anaemia prevalence is concentrated in sub-Saharan African, South Asia and parts of Latin America.

^a The boundaries and names shown and the designations used on these maps do not imply the expression of any opinion whatsoever on the part of the World Health Organization, the United Nations or any other agency concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

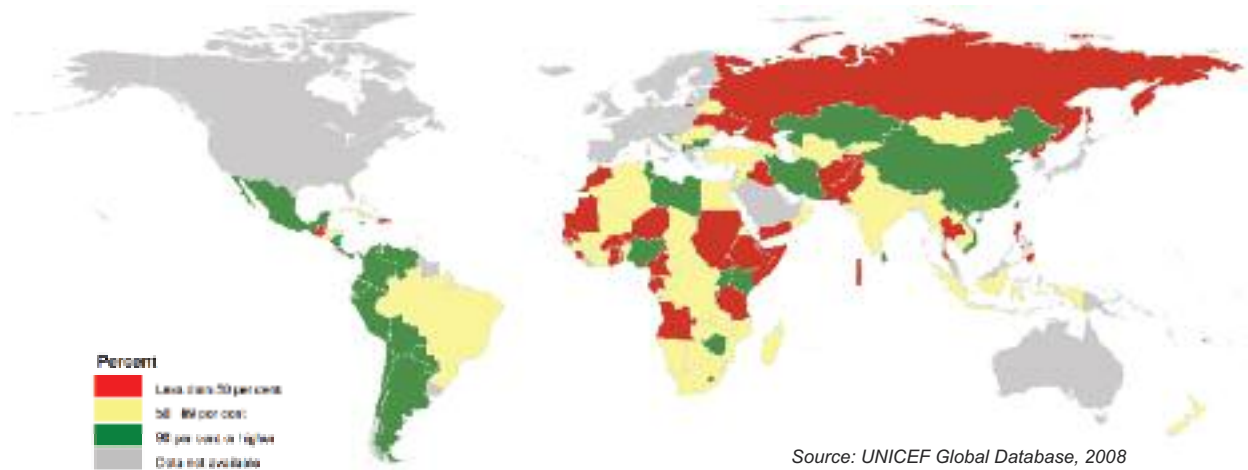
Map 3. Iodine status of school-aged children by country, based on the median urinary iodine concentration^b



Source: WHO global database on iodine deficiency, 2007.

As Map 3 indicates, iodine deficiency remains a public health problem in approximately 45 countries. Unlike vitamin A deficiency, which is concentrated in the developing world, iodine deficiency is a problem in both developed and developing countries. In fact, Europe has the highest estimated prevalence of insufficient iodine intakes at 52%.³⁹

Map 4. Percentage of households consuming adequately iodized salt (2000–2007)



Source: UNICEF Global Database, 2008

As Map 4 illustrates, 34 developing countries have achieved the universal salt iodization goal, and an additional 38 countries are considered 'on track' for elimination of iodine deficiency disorders. These are countries that have either shown increases in coverage of at least 20% over the previous decade or that have reached between 80% and 89% coverage with no indication of possible decline. Further information on progress-to-date and continuing challenges is included in Chapter 4.

^b In generating Map 3, nationally representative data was used in the majority of cases. However, in 36 cases, sub-national data was used due to the lack of nationally representative data. For example, the estimate for India is based on data from 20 state and district surveys, representing 15 unique states.

It is estimated that 5 million children are affected by night blindness linked to vitamin A deficiency.³⁴ Every year, 350,000 children become blind because of this deficiency,³⁵ representing 70% of all new cases of childhood blindness annually.³⁶ These children face daunting physical, social and ultimately economic challenges.

Loss of Productivity

Every day, national economies suffer significant yet unnecessary losses in productivity due to vitamin and mineral deficiencies. In countries with the highest numbers of people living with physical and intellectual impairments, the lost potential for economic growth is staggering. Mothers tending to sick or disabled children lose days of work. Adults living with reduced energy and intelligence are unable to fully contribute to society.

As the most common and widespread nutritional disorder in the world, iron-deficiency anaemia undermines global productivity by compromising both physical and intellectual capacity. In 2006, approximately 1.62 billion people had anaemia.³⁷

In China, vitamin and mineral deficiencies represent an annual GDP loss of US\$ 2.5-5 billion.³⁸ In India, they may be costing the country US\$ 2.5 billion annually – equivalent to approximately 0.4% of GDP.

Burden on Caregivers and Health Systems

Professional care for disabled children is too costly for most families, so family members dedicate themselves to this care instead of attending school or generating household income. Childhood illness – particularly when bouts are frequent and long – can lead to unaffordable costs for many families, both in terms of drug treatment and productive time lost in caring for the ill. The time and resources of health-care providers spent in the diagnosis and treatment of children who were unable to avoid disease because of vitamin and mineral deficiencies is also significant.

The Causes of Vitamin and Mineral Deficiencies

As with malnutrition in general, the causes of vitamin and mineral deficiencies are multiple and interconnected.

Poor diet

The most immediate cause is poor nutrient intake through

inadequate diets. Vitamins and minerals occur naturally in food. A varied diet of meat, eggs, fish, milk, legumes, fruits and vegetables is the best basis for obtaining adequate vitamin and mineral nutrition.

While of fundamental importance, improving the diets of the world's poor is a complex and long-term undertaking that depends largely on rising incomes. In the short term, lives can be saved and improved through a range of cost-effective interventions, including supplementation and fortification.

Illness

Illness impedes the body's ability to absorb and retain vitamins and minerals. It can even lead to actual losses of them, as in the case of zinc loss during diarrhoeal illness. Vitamin and mineral nutrition is severely compromised by



A mother in Tanzania breastfeeds her two children. If exclusive breastfeeding is not practised during the first six months of life or if the solid foods introduced after that period are nutrient-poor, young children are also likely to suffer vitamin and mineral deficiencies.

parasitic infections such as hookworm. A vicious cycle ensues when the deficiencies caused by disease leave the individual more vulnerable to further illness, and less able to combat it when it strikes.

Underlying causes

Underlying poor nutrient intake and disease are issues of insufficient access to food, inadequate health care, and poor caring practices that inhibit growth and health.

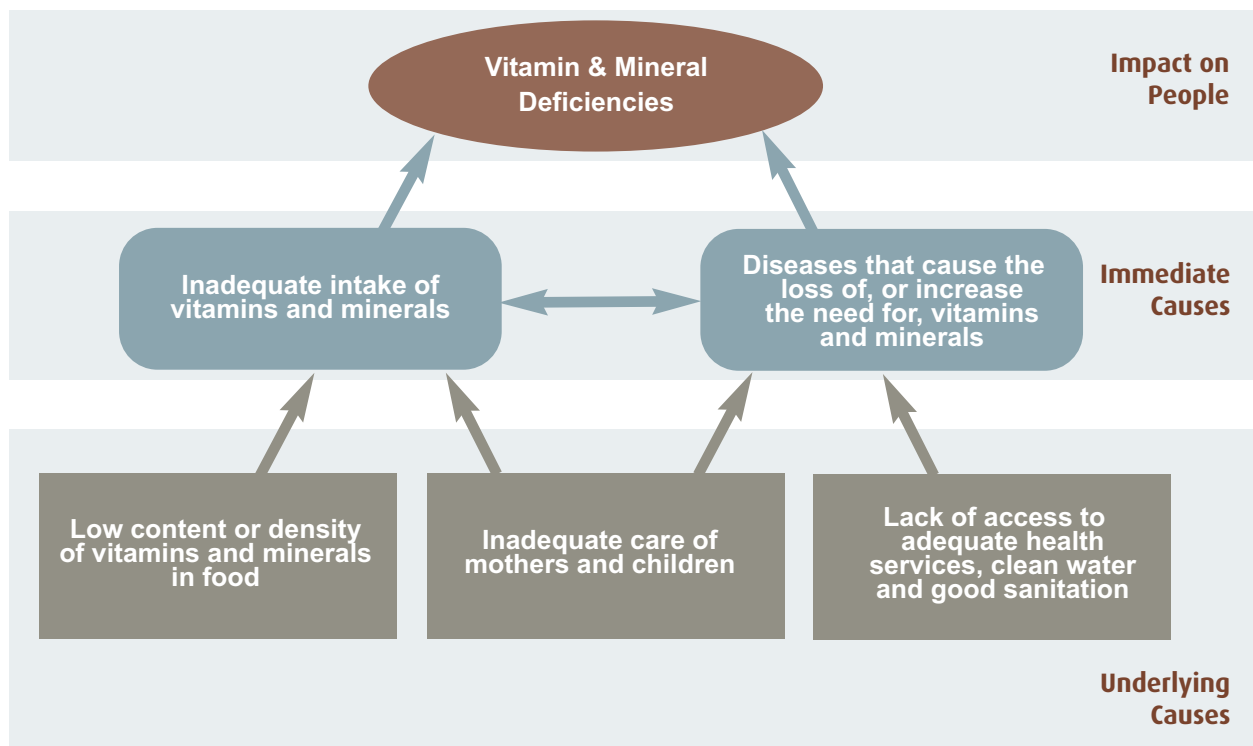
The provision of nutrition and child-care education, particularly to women, is also essential. Among the practices that would pay great dividends for children’s nutritional health are:

- ensuring early and exclusive breastfeeding for the first six months of life
- providing nutrient-rich foods, in sufficient quantity and quality once complementary feeding begins
- stimulating infants and young children to encourage physical and cognitive development, and
- timely visits to health service providers for micronutrient supplementation and immunization.

Unfortunately, support for household nutrition and child-care remains out of reach for those who have limited access to health services. Despite the many causes of vitamin and mineral deficiencies and the great challenge posed by the sheer numbers of people affected by them, highly cost-effective solutions exist.

In 2003 it was estimated that without appropriate interventions, India’s productivity losses due to undernutrition, iron deficiency anaemia, and iodine deficiency disorders could equal US\$ 114 billion between 2003 and 2012.

Figure 2. The main causes of vitamin and mineral deficiencies



Source: Adapted from *Determinants of Malnutrition: The State of the World’s Children*, UNICEF, 1998

Refugees and those affected by emergencies are especially vulnerable to vitamin and mineral deficiencies



A Sudanese refugee seeks shelter from a sandstorm near Tine, Chad. Vitamin and mineral deficiencies can easily develop during an emergency (such as war or a natural disaster). © UNHCR/H.Caux

Vitamin and mineral deficiencies can easily develop during an emergency – or worsen if they are already present.

In times of war or natural disaster, livelihoods and food crops are lost, food supplies are interrupted, diarrhoeal diseases break out, and infectious diseases suppress the appetite while increasing the need for micronutrients to help fight illness.

Vitamin and mineral deficiencies have been reported for years in emergency settings, especially in refugee camps. For instance, a 2003 study among Burmese refugees in Thailand found that 65% of children suffered iron-deficiency anaemia.

Due to a variety of factors, the delivery of essential micronutrient interventions is especially challenging in emergency settings. Although vitamin A supplements are already routinely included as part of an emergency response, other deficiencies are too often neglected.

However, during the past decade, multiple micronutrient fortification has been used increasingly in these situations. In 2003, mobile milling and fortification equipment was used at the Nangweshi refugee camp in Zambia to fortify maize meal with a number of micronutrients, including vitamin A, folic acid, iron and zinc. A 2007 study found that the introduction of fortified maize meal led to a decrease in anaemia in children and a decrease in vitamin A deficiency in adolescents.

The UN Standing Committee on Nutrition has suggested that a combination of interventions may be appropriate, including increased access to fresh food, improved livelihoods and access to markets, enhanced fortification of food aid, distribution of supplements, and in-home fortification with multiple micronutrient powders or fortified condiments.⁴¹