MODULE 14

MICRONUTRIENT INTERVENTIONS

Part 1: Fact sheet

Part 2: Technical notes

Part 3: Trainer's guide

Part 4: Training resource list

14

Harmonised Training Package (HTP):
Resource Material for Training on
Nutrition in Emergencies. Version 2, 2011

Acknowledgements

Numerous experts from many different organisations have been involved in writing the content of the HTP. Each module has been reviewed by a minimum of two reviewers from many of the academic institutions and operational agencies in the sector who have participated generously to ensure a high quality resource.

Module 14: Micronutrient interventions

Version 2 (Current):

Lead author:	Andrew Seal (UCL/CIHD)
Editorial oversight:	Carmel Dolan (NutritionWorks)
Reviewers:	Arnold Timmer (UNICEF)
Contributors:	Luz Maria de Regil (WHO)

Version 1:

Lead author:	Andrew Seal (UCL/CIHD)
Contributors:	Carmel Dolan (NutritionWorks)
Reviewers:	Saskia de Pee (WFP) Lisa Rodgers (WHO)

The HTP Version 2 (2011) was produced and published by the Emergency Nutrition Network (ENN)
32, Leopold Street, Oxford, OX4 1PX, UK. Tel: +44(0)1865 324996/324997, email: office@ennonline.net

The entire HTP is hosted on the UN Standing Committee on Nutrition (UNSCN) website
http://www.unscn.org/en/gnc_htp/

For further information on the HTP Version 2, please write to Carmel Dolan, NutritionWorks (www.nutritionworks.org.uk) at cmadolan@aol.com

Recommended citation: *The Harmonised Training Package (HTP): Resource Material for Training on Nutrition in Emergencies, Version 2 (2011). NutritionWorks, Emergency Nutrition Network, Global Nutrition Cluster.*

ISBN: 978-1-908182-00-5

The technical update of the HTP to produce Version 2 (2001) was made possible through the generous support of the American people through the Office for Disaster Assistance (OFDA) of the United States Agency for International Development (USAID) under the Agreement No. GHN-A-00-08 -00,001 to the Emergency Nutrition Network entitled Strengthening Capacity to Respond to Emergencies in the Food Security and Nutrition Sectors.
The content does not necessarily reflect the views of USAID or the United States.

The Harmonised Training Package (HTP): Resource Material for Training on Nutrition in Emergencies

What is the HTP?

The Harmonised Training Package: Resource Material for Training on Nutrition in Emergencies (the HTP) is a comprehensive documentation of the latest technical aspects of Nutrition in Emergencies (NiE). The word **Harmonised** reflects the pulling together of the latest technical policy and guidance, the word **Training** refers to its main application and the word **Package** refers to the bringing together of the subject matter into one place. It is organised as a set of modules by subject, each containing technical information, training exercises and a resource list for use in training course development.

The HTP is an initiative of the IASC Global Nutrition Cluster (GNC) and has been endorsed by the GNC and its member's agencies. In 2007, the IASC GNC commissioned the UK based partnership, NutritionWorks, to develop a training resource to facilitate capacity development in the NiE sector. HTP Version 1 was launched in 2008. HTP Version 2 update in 2010/11 was funded under an USAID OFDA grant to the UK based charity, the Emergency Nutrition Network (ENN). The update was undertaken in an ENN/NutritionWorks collaboration, with NutritionWorks responsible for overall coordination and editorial management, and editorial oversight and module production supported by the ENN.

What the HTP is not

The HTP is not a ready-to-use training course. It cannot be used as an 'off the shelf' package; rather, it should be used as a resource package during a process of course development by experienced trainers.

Who is the HTP for?

The HTP is a primarily a **resource for trainers** in the NiE sector and it can be used by individuals to increase their technical knowledge of the sector. It is designed to provide trainers from any implementing agency or academic institution with information from which to design and implement a training course according to the specific needs of the target audience, the length of time available for training and according to the training objectives. It is written in clear English and will be available in other languages in the future.

How is the HTP organised?

The HTP is organized into four sections containing a total of 21 modules which can be used as stand-alone modules or as combined modules depending on the training needs.

Section 1: Introduction and concepts

1. Introduction to nutrition in emergencies
2. The humanitarian system: Roles, responsibilities and coordination
3. Understanding malnutrition
4. Micronutrient malnutrition
5. Causes of malnutrition

Section 2: Nutrition needs assessment and analysis

6. Measuring malnutrition: Individual assessment
7. Measuring malnutrition: Population assessment
8. Health assessment and the link with nutrition
9. Food security assessment and the link with nutrition
10. Nutrition information and surveillance systems

Section 3: Interventions to prevent and treat malnutrition

11. General food distribution
12. Management of moderate acute malnutrition
13. Management of severe acute malnutrition
14. Micronutrient interventions
15. Health interventions
16. Livelihoods interventions
17. Infant and young child feeding
18. HIV/AIDS and nutrition
19. Working with communities in emergencies

Section 4: Monitoring, evaluation and accountability

20. Monitoring and evaluation
21. Standards and accountability in humanitarian response

Each module contains 4 parts which have a specific purpose as follows:

Part 1: The Fact Sheet – provides an overview of the module's topic and is designed for non-technical people to obtain a quick overview of the subject area.

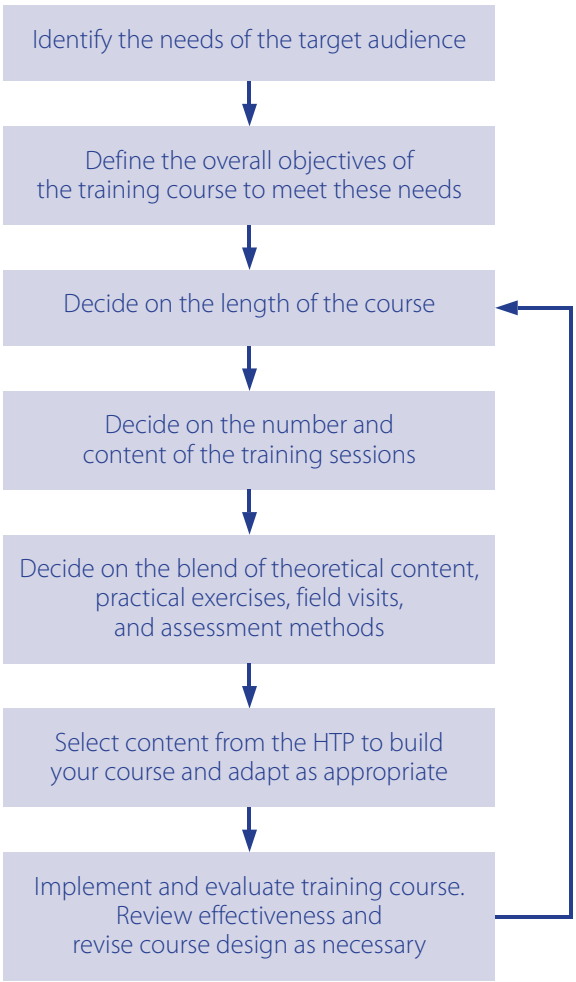
Part 2: The Technical Notes – for trainers and trainees, provides detailed technical guidance on current policies and practice.

Part 3: The Trainers' Guide – aims to help trainers develop a training course and provides tips and tools which can be adapted to the specific training context.

Part 4: Resources – lists of relevant available resources (including training materials) for the specific technical area.

How to use the HTP

The HTP should be used during a process of course development. The process of course development involves a number of steps and these are summarised in the diagram below.



MODULE 14

Micronutrient interventions

PART 1: FACT SHEET

The fact sheet is the first of four parts contained in this module. It provides an overview of key information on the prevention and treatment of micronutrient malnutrition. Detailed technical information is covered in Part 2. Words in *italics* are defined in the glossary.

Introduction

Micronutrient malnutrition is caused by an inadequate or excessive intake of one or more vitamins or minerals. Deficiency diseases that result include *scurvy, pellagra, beriberi, anaemia, iodine deficiency disorder, xerophthalmia* and *rickets*. All of these have occurred and reoccurred in emergency contexts within the last two decades.

As well as directly causing *morbidity* (illness) and *mortality* (death), micronutrient deficiencies also lead to growth retardation, impaired immunity and an increase in the severity of infectious disease. Infectious diseases can, in turn, worsen the problem of an inadequate diet and initiate a vicious cycle that connects infection and malnutrition.

Problems of inadequate intake combined with high rates of infections are commonly found in emergencies. For these reasons, it is essential that effective strategies to combat micronutrient malnutrition are developed and implemented in emergency situations.

Although the problem is much less common, excessive intakes of micronutrients can also be harmful. For example, in the case of iodine, *goitre* may develop in people who have either too little or too much iodine in their diet. Most micronutrients have a defined safe upper level of intake. Regular consumption above this level carries a health risk. For these reasons, it is important that strategies for reducing micronutrient malnutrition ensure that intakes remain within recommended levels.

Prevention

There is no one single approach to prevention that will be effective in all emergency contexts. However, it is possible to identify 11 approaches to prevention and to select from these a combination that will form an effective strategy. These approaches are:

1 Inclusion of nutrient-rich commodities in food aid rations

Food aid rations are often composed of only a few commodities and are therefore likely to be deficient in a number of micronutrients. Particular commodities can, however, be a good source of certain micronutrients. For example, ground nuts (peanuts) are a good source of *niacin* (vitamin B3). Including commodities that are available and a good source of micronutrients can be an effective, rapid, and cost-effective approach to improving food aid rations.

2 Provision of fresh food items that are complementary to a general ration

A basic food ration often contains a cereal, pulse, oil, salt and a blended food. This is often nutritionally deficient but the quality can be improved by the addition of complementary food items such as spices, and fresh vegetables and fruit. Refugee operations involving UNHCR and WFP are guided by a memorandum of understanding (MOU) between the two UN agencies. Under this MOU, complementary food items should be supplied by UNHCR when the need for them has been established by a joint assessment mission. However, the logistic, resource and management challenges involved in procuring and distributing complementary food commodities often means that provision is erratic.

3 Provision of micronutrient-fortified foods

The increasing introduction of micronutrient-*fortified foods* in food rations, and especially blended food, since the mid-1990s, has probably helped to prevent major micronutrient deficiency outbreaks. Cereal flours may be fortified with B vitamins, oil is usually fortified with vitamin A, salt should usually be fortified with iodine, and blended foods should include a broad range of added micronutrients.

4 Increasing the size of the general food ration to facilitate diet diversification by exchange or trade

Increasing the size of the general ration may provide beneficiaries with additional foodstuffs that can be bartered or traded in exchange for foods and result in a more diversified diet. This approach may be particularly useful when there are inadequate supplies of micronutrient-rich food aid commodities, and the beneficiaries have access to markets where micronutrient-rich foods are available.

5 Distribution of food supplementation products for home fortification

A relatively new approach involves supplying specialized *food supplementation products* to beneficiaries for them to add to a household or child's diet to improve the micronutrient content. These products include micronutrient powders (e.g. 'Sprinkles™') and *lipid nutrient supplements*. Operational experience with these approaches in emergencies is, so far, fairly limited and important questions remain over how recipients will use the products under these conditions.

6 Distribution of micronutrient supplements

The distribution of micronutrient supplements in the form of capsules and tablets is a key approach in combating micronutrient malnutrition. Vitamin A capsules for children and iron and folic acid tablets for pregnant women are well established routine components of most public health programmes. The use of multiple micronutrient tablets may gain in popularity but evidence of their benefits is currently inconclusive. Universal iron supplementation for children in *malaria* affected areas is not currently recommended. However, the treatment of children diagnosed with iron deficiency anaemia should continue, whether they reside in a malaria affected area or not.

7 Promotion of home gardening and agricultural development

The distribution of seeds, tools and other agricultural inputs may allow populations to grow vegetables and fruit or livestock for home consumption or for sale. However, access to land may be a major constraint, particularly in refugee camps or in areas which are insecure, e.g., due to land mines. Access to adequate water may also be a limiting factor.

8 Increasing income generation and improving access to markets

Increasing household income can help to improve the dietary intake of micronutrients by increasing diet diversity. Microcredit, enterprise development and improving market access may help in the process. However, it should be remembered that the most vulnerable households and individuals may be the ones least likely to benefit from these types of interventions.

9 Promotion of recommended infant and young child feeding practices

Promotion of *exclusive breastfeeding* and appropriate *complementary feeding* practices are critical public health interventions that also contribute to maintaining micro-nutrient status. Exclusive breastfeeding up to about six months of age, followed by the introduction of age-appropriate, nutritionally adequate and safe complementary foods with continued breastfeeding, are very important for the nutritional status and health of children. Complementary foods for infants should be rich in energy and micronutrients, as the growing child requires these for successful growth and development.

10 Ensuring adequate health care and a healthy environment

Good health is very important in maintaining good nutrition and micronutrient status. Examples of public health interventions that may contribute to preventing micronutrient deficiencies include measles vaccination, provision of good sanitation, hygiene promotion including hand washing, and programmes to control malaria.

11 Ensuring access to adequate non-food items

Household economic decisions are critical in determining the diet diversity and micronutrient status of all its members. If households are short of non-food items (e.g., cooking pots, soap or assets such as tools) then they may choose to use available food stocks or assets to buy these, rather than to improve the quantity or quality of their diet. Micronutrient deficiencies may result.

Treatment

Micronutrient deficiency diseases require urgent medical treatment. This will usually take the form of oral supplement tablets or capsules. A relatively new and effective approach involves using micronutrient powders (e.g. 'Sprinkles™' that can be added to normal food to increase micronutrient intake. The appropriate supplements should be made available as part of an essential drugs package.

Appropriate diagnosis and treatment of cases of micronutrient deficiency will significantly reduce the burden of morbidity and mortality. Effective treatment should always be accompanied by the development of a prevention strategy using the different approaches outlined above.

Key messages

1. Prevention of micronutrient malnutrition depends on achieving an adequate intake of the many micronutrients (vitamins and minerals) required by the human body.
2. Diseases can increase the requirements for micronutrients and can interact with malnutrition to cause morbidity and mortality.
3. Effective control of micronutrient malnutrition is likely to involve both curative and preventive approaches.
4. Options for the prevention of micronutrient malnutrition in emergencies can be classified into 11, often complementary, approaches:
   1) Inclusion of nutrient-rich commodities in food assistance rations
   2) Provision of fresh food items that are complementary to a general ration
   3) Provision of micronutrient-fortified foods
   4) Increasing the size of the general food ration to facilitate diet diversification by exchange or trade
   5) Distribution of food supplementation products for home fortification
   6) Distribution of micronutrient supplements
   7) Promotion of home gardening and agricultural development
   8) Increasing income generation and improving access to markets
   9) Promotion of recommended infant feeding practices
   10) Ensuring adequate health care and a healthy environment
   11) Ensuring access to adequate non-food items
5. An effective prevention strategy with long-term impact is likely to use a combination of these different approaches. Not all approaches can be used in all situations. For example, there may be no general food aid ration in some situations or there may be no spare land or water available for home gardening in others.
6. To treat a specific micronutrient deficiency disease high dose supplementation using a single or small range of micronutrients is usually required. This treatment should be accompanied by a good general diet and appropriate health care.
7. Micronutrient malnutrition can result from a deficiency or an excess of micronutrients. In designing any programme the possibility of excessive intakes of micronutrients needs to be considered.

PART 2: TECHNICAL NOTES

The technical notes are the second of four parts contained in this module. They provide an overview of how to prevent and treat micronutrient malnutrition in emergencies. The technical notes are intended for people involved in nutrition programme planning and implementation. They provide technical details, highlight challenging areas and provide clear guidance on accepted current practices. Words in italics are defined in the glossary.

Summary

This module provides an overview of approaches for the prevention and treatment of micronutrient malnutrition in emergencies. Prevention is considered in terms of ensuring a nutritionally adequate diet through dietary diversification, fortification of food aid commodities, micronutrient supplementation programmes, promotion of appropriate infant feeding, and income generation and market access. Clinical treatment of the common deficiency diseases is also reviewed.

Introduction

The recognition, diagnosis and assessment of *micronutrient malnutrition* is discussed in detail in Module 4. Here, approaches to the prevention and cure of this important and persistent public health problem are considered.

Micronutrient malnutrition is commonly caused by an inadequate intake of one or more vitamins or minerals. Micronutrient malnutrition leads to impaired immunity as well as an increased risk of *morbidity* (illness) and *mortality* (death). Infectious diseases can worsen the problem of an inadequate diet. In addition, there is a vicious cycle connecting infection and malnutrition. Problems of low diet quantity and quality combined with high rates of infections are commonly found in emergencies. For these reasons, it is essential that effective strategies to combat micronutrient malnutrition are developed and implemented in emergency situations.

Excessive intakes of micronutrients can also be harmful. For example, in the case of iodine, goitre may develop in people who have either too little or too much iodine in their diet, and very high levels of iron can be lethal. Most micronutrients have a defined safe upper level of intake. Regular consumption above this level carries a health risk. For these reasons, it is important that strategies for reducing micronutrient malnutrition ensure that intakes remain within recommended levels.

Case example 1: Excessive iodine intakes in long-term refugees

A series of nutrition surveys were conducted in long-term African refugee camps between 2001 and 2003. Urine samples were collected from adolescents and analysed for iodine concentration.

In five of the six camps that were surveyed, the median urinary iodine concentration indicated an excessive intake of iodine. The highest goitre prevalence was found in the camp with the highest iodine intakes.

The source of the excess iodine still remains unclear but caution is obviously needed when considering implementing programmes that may further increase iodine intakes in these and similar locations.

Source: Seal, A., et al., *'Excess dietary iodine intake in long-term African refugees'*, Public Health Nutrition, 22, 2006.

Key messages

1. Prevention of micronutrient malnutrition depends on achieving an adequate intake of the many micronutrients (vitamins and minerals) required by the human body.
2. Diseases can increase the requirements for micronutrients and can interact with malnutrition to cause morbidity and mortality.
3. Effective control of micronutrient malnutrition is likely to involve both curative and preventive approaches.
4. Options for the prevention of micronutrient malnutrition in emergencies can be classified into 11, often complementary, approaches:
   1) Inclusion of nutrient-rich commodities in food assistance rations
   2) Provision of fresh food items that are complementary to a general ration
   3) Provision of fortified foods
   4) Increasing the size of the general food ration to facilitate diet diversification by exchange or trade
   5) Distribution of food supplementation products for home fortification
   6) Distribution of micronutrient supplements
   7) Promotion of home gardening and agricultural development
   8) Increasing income generation and improving access to markets
   9) Promotion of recommended infant feeding practices
   10) Ensuring adequate health care and a healthy environment
   11) Ensuring access to adequate non-food items
5. An effective prevention strategy with long-term impact is likely to use a combination of these different approaches. Not all approaches can be used in all situations. For example, there may be no general food aid ration in some situations or there may be no spare land or water available for home gardening in others.
6. To treat a specific micronutrient deficiency disease high dose supplementation using a single or small range of micronutrients is usually required. This treatment should be accompanied by a good general diet and appropriate health care.
7. Micronutrient malnutrition can result from a deficiency or an excess of micronutrients. In designing any programme the possibility of excessive intakes of micronutrients needs to be considered.

Prevention is clearly better than a cure. Approaches to preventing micronutrient malnutrition are examined in addition to treatment.

Prevention

There is no one single approach to prevention that will be effective in all emergency contexts. However, as discussed below, it is possible to identify eleven approaches to prevention and to select from these a combination that will comprise an effective strategy.

1 Inclusion of nutrient-rich foods in food aid rations

As described in Module 4, *rations for general food distribution* are often composed of only a few commodities and are likely to be deficient in a number of micronutrients. However, particular commodities are good sources of certain micronutrients. For example, ground nuts (peanuts) are a good source of niacin (vitamin B3) and have been added to general rations with the aim of improving their niacin content in order to prevent *pellagra*. Identifying available commodities that are a good source of micronutrients and including them in food aid rations can be an effective, rapid, and cost-effective approach.

Information, *education* and *communication* with the recipient population about food processing and consumption may be very important in ensuring the best use of available food. People should understand the importance of different nutrients, which foods contain them, how to prepare the foods to preserve the nutritional value, as well as understanding what their food entitlements are.

Case example 2 looks at what happened in Malawi when there was an interruption in the supply of ground nuts for Mozambican refugees in 1989 and 1990.

These technical notes are based on the technical references given in the resource list for the module and the Sphere standards shown in the box below:

Sphere standard

Food Security, Food Transfers Standard 1: General nutrition requirements

Ensure the nutritional needs of the disaster-affected population including those most at risk are met. (For a list of key indicators see module 4)

Management of malnutrition standard 3: micronutrient deficiencies

Micronutrient interventions accompany public health and other nutrition interventions to reduce common diseases associated with emergencies and address micronutrient deficiencies

Key indicators

- Cases of micronutrient deficiencies are treated according to current best clinical practice
- Micronutrient interventions accompany public health interventions to reduce common diseases associated with emergencies such as measles (Vitamin A) and diarrhoea (zinc)

Source: The Sphere Project (2011). *Humanitarian Charter and Minimum Standards in Humanitarian Response*. Geneva: The Sphere Project.

Case example 2: Ground nuts improve the niacin content of general rations in Malawi: 1989-1990

Outbreaks of pellagra occurred among Mozambican refugees in Malawi in 1989 and 1990. The general ration planned for these refugees comprised maize flour (400 g), pulses (60 g), groundnuts (20 g), oil (40 g), salt and sugar, and was supplied by the World Food Programme (WFP) and the United Nations High Commissioner for Refugees (UNHCR). It contained about 1900 kcal and ground nuts provided the major source of niacin. Prior to both outbreaks of pellagra there was 5-6 months disruption in ground nut distribution.

Between February and October 1990, 18,276 cases of pellagra dermatitis (due to niacin deficiency) were reported among 285,942 refugees. Overall, 6.3 per cent of the refugee population developed pellagra. A matched-pair case-control study confirmed the protective role of the daily consumption of groundnuts, as well as the benefit of garden ownership, and home maize milling.

Several plans of action were considered at the time of the second outbreak in order to alleviate the shortage of groundnuts. While awaiting mobilization of international resources and identification of groundnut supplies, a screening and treatment programme for all cases of pellagra dermatitis was developed and distribution of tablets containing multivitamin B complex began in August 1990.

At the same time, food delivery started to improve. Groundnut supplies were identified in several countries and transportation organized and coordinated by the Malawian government, Médecins Sans Frontières (MSF), Save the Children Federation (SCF) and UNHCR. These combined efforts helped to control the epidemic.

Source: Malfait, P., et al., *'An outbreak of pellagra related to changes in dietary niacin among Mozambican refugees in Malawi'*, International Journal of Epidemiology, 22, 1993.

2 Provision of fresh food items that are complementary to a general ration

A basic food ration often contains a cereal, pulse (bean), oil, salt and a blended food. This is often nutritionally deficient but the quality can be improved by the addition of complementary food items such as fresh vegetables and fruit and spices.

In refugee operations, there has been a long standing memorandum of understanding (MOU) between UNHCR and WFP covering the responsibilities for delivering adequate food and nutrition services. One of the areas covered by the MOU is the supply of complementary food items. These complementary food commodities include local fresh foods, spices, tea and therapeutic milk (to be used in *selective feeding programmes*). Such items are required under the terms of the MOU to be supplied by UNHCR when the need for them has been established by a joint assessment mission. The full wording of the relevant section of the MOU is given in the **Box 1**.

Box 1: Responsibility for resource mobilization and milling in refugee operations

WFP is responsible for mobilizing the following commodities, whether for general or selective feeding programmes: cereals; edible oils and fats; pulses (or other sources of protein when appropriate and jointly agreed upon); blended foods; salt; sugar; and high-energy biscuits. Where beneficiaries are totally dependent on food aid, WFP will ensure the provision of blended foods or other fortified commodities in order to contribute to preventing or correcting micronutrient deficiencies.

UNHCR is responsible for mobilising complementary food commodities when recommended by joint assessment missions or on the basis of specific health/nutritional and/or social assessments, particularly when refugees have limited access to fresh food items. These complementary commodities include local fresh foods and therapeutic milk (to be used in selective feeding programmes). UNHCR may mobilize spices and tea when recommended.

Within its assistance activities, UNHCR is responsible for ensuring adequate supplies of non-food items and services, in particular those relevant to the safe and effective use of food aid, such as cooking utensils, fuel, water and sanitation, medicine, soap and shelter. UNHCR and WFP should promote nutritionally and environmentally sound practices along with cooking techniques and technologies for saving fuel.

Furthermore, UNHCR and WFP will facilitate the mobilization of seeds, tools and fertilizers, in cooperation with relevant government bodies and competent United Nations and development cooperation agencies.

Source: *Memorandum of understanding between the Office of the United Nations High Commissioner for Refugees and World Food Programme*, July 2002.

Despite this agreement there are substantial resources, logistic and management challenges involved in delivering fresh food items on a regular basis to refugee camps, especially when they are located in remote and arid areas. Experience indicates that the difficulties involved often result in erratic and unreliable supply. This in turn may mean that the micronutrient content of the full ration falls short of what was originally planned.

In non-refugee situations the MOU (1996) between WFP and UNICEF may be of relevance to identifying the party responsible for different interventions. The box below contains some of the key provisions of the MOU as it relates to micronutrient nutrition.

Box 2: Key provisions of the UNICEF/WFP Memorandum of Understanding

5.3.4 When general food distributions are implemented, food baskets will be designed by WFP, based on the indicative energy, protein and micronutrient requirements established by FAO and WHO, adjusted as necessary by the specific situation of the beneficiary population, demography, food habits, access to other food resources, workload of women and logistic/security constraints. Guidelines for the design of food baskets will be developed by WFP in consultation with UNICEF.

5.3.5 To the extent possible, food commodities will be appropriately fortified. WFP and UNICEF will work together on advocacy with donor nations in favour of appropriately fortified foods. They will also work together to increase capacity for local milling and fortification of donated cereal products.

5.3.6 When the assessment indicates a significant risk of micronutrient deficiencies in a population, WFP will seek to address this through the inclusion of a fortified blended food or other fortified commodity in the general ration. UNICEF will be responsible for covering any unmet micronutrient needs through other measures (such as supplement distribution or provision of vitamin/mineral mixes).

Source: UNICEF/WFP *Memorandum of Understanding in emergency and rehabilitation interventions* (1998)

3 Provision of fortified foods

The increasing introduction of micronutrient-fortified foods in food rations since the mid-1990s, especially *blended food*, has probably helped to prevent major micronutrient outbreaks.

The vitamins and minerals added to fortified foods are known as *fortificants*.

- The *food vehicle* is the food to which fortificants are added.
- *Restoration* is when those micronutrients lost or removed during food processing are added back or restored in the final product.
- *Fortification* is the addition of micronutrients during or after processing a food, raising micronutrient levels above the amounts in the original food product. Fortification is sometimes also called *enrichment*.

Levels of fortification should be set so that the vitamin or mineral added will make a significant contribution to nutritional requirements, but not lead to a micronutrient intake above the safe upper limit. In addition, fortification must not alter the taste, smell, look, texture, physical structure or shelf-life of the food.

There are a number of types of food that may be fortified.

Cereals

Fortification of food aid staple commodities may be achieved at different stages of the logistic pathway. For example, in the case of donated maize grain this may occur in the donor country prior to international shipping, or it may occur in large mills at the national or regional level before shipping onwards to the site of the emergency. However, the great majority of food aid cereals are supplied unfortified. **Case example 2** looks at an example of where fortification at a large commercial mill was implemented in response to an outbreak of pellagra.

Not all commodities can be fortified. For example, rice is always distributed as grain rather than flour so it cannot usually be effectively fortified with a micronutrient premix powder.* While maize can be milled and fortified prior to distribution, the shelf life of the milled grain is much reduced, leading to additional logistic challenges. The majority of cereals supplied in food aid operations are still supplied as unfortified whole grains.

Overall, as outlined in **Case examples 3** and **4**, United Nations (UN) and non-governmental organization (NGO) experience of direct involvement in implementing emergency food aid fortification has had varied results. Procurement of commercially-fortified products and a move toward home fortification are currently being promoted. However, despite the current reluctance of the relief community to involve itself directly in food fortification activities, guidelines on fortification have been recently released by the World Health Organization (WHO) and initiatives to increase the fortification of foods within developing countries continue to expand.

Case example 3: Fortification of maize flour for refugee feeding in Malawi: 1991

In August 1990, in cooperation with WFP and UNHCR, Save the Children United Kingdom (SC-UK) arranged a consultancy mission to determine if it would be practical to fortify maize flour with nicotinamide, and possibly other micronutrients, for refugees in Malawi. The consultancy found that this was technically possible and full-scale fortification began in an existing commercial mill in Malawi by the end of 1991.

Although the fortification of maize flour required careful planning and the importation of equipment, the technical infrastructure of the mills in Malawi allowed for its successful implementation. The process essentially consisted of using a feeder to add known amounts of nicotinamide to maize flour that was continuously flowing through a screw conveyor. The volumetric feeder comprised a gearing system that allowed for accurate delivery of the vitamin premix into the maize flour. The premix contained niacin, riboflavin, and thiamine and was added to yield values of 45 mg niacin, 4 mg thiamine and 3 mg riboflavin per kg of maize flour.

Although causal analysis was not performed, the implementation of fortification was associated with the end of pellagra outbreaks in the refugee population.

Source: Henry, C. J. K. and J. Seaman, *'The micronutrient fortification of refugee rations to prevent nutritional deficiencies in refugee diets'*, Journal of Refugee Studies, 5, 1992.

* The use of technology for rice fortification (e.g. Ultra Rice® or NutriRice®) is under development but is still unproven in an emergency context.

Case example 4: Implementation of camp level cereal fortification in Zambia: 2003

To assess if milling and fortification of maize grain could be implemented at the level of the WFP extended delivery point, a pilot project was set up in a refugee camp in Zambia during 2003 using custom-designed milling and fortification technology.

Centralized milling and fortification of cereals on-site at a refugee camp was successfully implemented and was associated with a decrease in anaemia and stunting in 6- to 59-month-old children and in vitamin A deficiency in adolescents.

However, the management and logistic challenges presented by small and medium-scale fortification programmes have proven a barrier to the more widespread adoption by UN agencies or NGOs. Receiving donations or purchasing pre-fortified commodities from larger commercial providers is the currently favoured model for taking forward this particular approach to improving ration adequacy.

Source: World Food Programme, *Fortifying food in the field to boost nutrition: case studies from Afghanistan, Angola and Zambia*, Occasional Paper 16, WFP, Rome, 2006.

Blended foods

Blended foods typically consist of a milled and precooked mix of cereal and a pulse such as soya bean, to which oil and a mix of vitamins and minerals is added. Examples include corn soya blend (CSB), wheat soya blend (WSB), and corn soya milk (CSM). They are manufactured in many countries and regions where they are marketed under different brand names. These include Likuni Phala (Malawi), Famix (Ethiopia) and Unimix (East Africa).

Since the 1990s blended foods have been included in many food assistance operations where they are an important source of micronutrients in the diet. For some nutrients, such as vitamin C, blended foods may be the only source in the ration. There are various formulations of blended foods available and the specifications show a wide range of micronutrient content. Blended foods are produced in many countries and production within low-income, food-deficit countries has been supported by WFP.

Problems with the current formulations of blended foods include their high phytate content, which may prevent mineral absorption, and low energy densities.

Salt

Salt is routinely fortified with iodine in the form of potassium iodate or potassium iodide. The WHO recommends fortification of salt so as to achieve an iodine concentration of 20 to 40 mg/kg (20 to 40 ppm).

Oil

Oil is usually fortified with vitamin A. In recent years the policies of most major donors and WFP have required the provision of vegetable oil fortified with vitamin A. Current WFP specifications require vitamin A fortification of oil at 24,000-36,000 IU per kg and vitamin D at 2,400-3,600 IU per kg. Vitamin A is light sensitive so fortified oil should be stored in light-proof containers.

Special nutritional products for acute use in disasters

High energy biscuits (HEB) and BP-5 are examples of ready to use foods that are sometimes distributed in the acute phase of an emergency. They can be consumed without cooking and are usually fortified with a wide range of micronutrients.

4 Increasing the size of the general food ration to facilitate diet diversification by exchange or trade

One approach to enabling diet diversification is to increase the size of the general ration to facilitate trade and barter. This approach may be particularly useful when there are inadequate supplies of micronutrient-rich food aid commodities, and the beneficiaries have access to markets where micronutrient rich foods are available. Under these conditions, providing a larger ration of, for example, cereal grain, may allow recipients to exchange part of their ration for other preferred food items, thereby helping to ensure a more balanced diet. In **Case example 5** evidence is presented that highlights the importance of allowing exchange and trade, and that sales of food aid may represent distress rather than excess provision.

5 Distribution of food supplementation products for home-based fortification

Food supplementation products are intended to be used by recipients at home and added either to the household diet or that of its children. A variety of different products are now available. Effectiveness has not yet been proven in all cases and discussion of them in this training module is not an endorsement of any particular product. In considering what products may be suitable for a given setting the acceptability of products and approaches to the national and local authorities, such as the Ministry of Health, should be considered. Some products may not be usable in countries where product approval and licensing has not taken place.

Case example 5: Sale of food aid may help diet diversification in Zaire: 1996

In 1996 the sale and export of food aid from refugee camps near Uvira, Zaire, prompted a reduction in donated rations. However, research revealed that the sales did not reflect an excess of food in the camps. The sales were provoked by the absence of important components of the food basket, by cultural aversion to the staple (maize) and oil provided, by difficulties in food preparation, and by the refugees' limited ability to diversify their diet and cover pressing non-food needs.

Food sales improved the micronutrient content of diets but at the expense of energy lost from an already energy-deficient diet. At most, 23 per cent of the refugee households were eating adequate diets; the poorest one-fifth of households were twice as likely to sell or exchange food than other households and their diets were the worst.

Source: Reed, B. A. and J. P. Habicht, *'Sales of food aid as sign of distress, not excess'*, The Lancet, 351, 1998.

Food supplementation products

A number of types of food *supplementation* products are available.

Micronutrient powders (MNP) consist of micronutrients in a dry powdered or granulated form and are typically packaged in sachets that may contain the dose for a single individual for a single day or a household or institution for an extended period of time. They do not contain additional macronutrients and are intended for addition to the normal food of an individual or household. Their success has been documented mainly as a curative and preventative product for anaemia in children. Micronutrient powders are sometimes referred to as Sprinkles ™. Sprinkles™ is one of several brands of micronutrient powders that are currently available or under trial.

Lipid Nutrient Supplements (LNS) are high-viscosity (oily) fat-based products prepared by mixing dried powdered ingredients with a vegetable fat. Being a fat-based product, spreads tend to have a high energy density and to be resistant to microbiological contamination. They are designed to be added to household foods and increase the micronutrient and lipid (fat) content.

Products are aimed at infants and young children (e.g. Nutributter®) or at other population groups (e.g. QBmix®). They may be designed for preventing anaemia and stunting or for preventing micronutrient deficiency diseases such as Scurvy and Pellagra.

Home-based fortification

Home-based fortification, through the use of a MNP or LNS, takes place by pouring, squeezing or sprinkling the product onto food after cooking. It has been increasingly used to improve the micronutrient content of the diet of young children and to successfully treat anaemia. However, published evidence on its use in emergencies is still scant.

It is known that home-based fortification using a fortified sauce has proved acceptable in a small-scale pilot project in Angola, and distribution of a micronutrient powder was reported to be feasible and effective as a complement to a selective feeding programme in Haiti in 2005-2006. Large-scale distribution of a micronutrient powder to children aged 6 months to 12 years in families displaced by the Tsunami was also successfully implemented in Aceh and Nias provinces of Indonesia in 2005 and 2006. However, the impact of the distribution on nutritional status was not measured.

However, there have been few detailed studies on how beneficiaries use Food Supplementation Products under conditions in an emergency. More information is required before their use can be incorporated into routine programme planning.

Although the problem is very unusual, as mentioned above, micronutrients may at times be consumed in excess amounts and this may lead to associated clinical or sub-clinical conditions. There is a trend towards the increased use of fortified commodities and food supplementation products in emergencies. There are also persistent issues of quality control in food fortification. Taken together, these issues emphasise the need for greater attention to be given to the possibility of excessive intake of micronutrients. This potential problem deserves careful consideration in programme planning and evaluation.

6 Distribution of micronutrient supplements

The distribution of micronutrient supplements in the form of capsules and tablets is a critical approach in combating micronutrient malnutrition. Vitamin A capsules for children and iron and folic acid tablets for pregnant women are well established components of preventive public health programmes.

Vitamin A supplementation

Vitamin A deficiency is endemic in many parts of the world and has been long recognized as occurring under conditions of food shortage. Emergency-affected populations are often subject to pre-existing marginal vitamin A status and a high prevalence (rate) of *acute malnutrition* and infectious disease. *Xerophthalmia* (clinical signs of deficiency) was documented during the Irish potato famine of 1845-1850, and has subsequently been frequently reported during nutritional emergencies.

Following a large influx of refugees into eastern Sudan in 1984-1985, exceedingly high rates of xerophthalmia were observed. In recognition of the recurring and unnecessary morbidity associated with vitamin A deficiency, recommendations for a standard prophylactic supplementation regimen in emergencies were proposed in 1988. The dosages originally proposed have since been modified but the principle that supplementation should be an automatic part of the early-stage emergency response has remained. The importance of vitamin A supplementation has since been strengthened with the publication of a review in 1994 showing that supplementation reduces mortality among under-fives (6 to 59 months) by about 23 per cent in populations with clinical signs of vitamin A deficiency.

During a nutritional emergency, supplementation for children should normally be carried out as soon as possible and prior to a needs assessment. The recommended doses for preventive use are given in **Table 1**. However, if an emergency is occurring in a setting with low baseline child mortality and the diet is adequate, the need for blanket supplementation may be less compelling.

Table 1: Supplementation to prevent vitamin A deficiency

Population group	Oral dose	Frequency of dose
Infants 0-6 months	50,000 IU	Once
Infants 6-12 months	100,000 IU	Every 4-6 months
Children > 1 year	200,000 IU	Every 4-6 months[1]
Pregnant and other fertile women	Not more than 10,000 IU	Daily
Breastfeeding women	200,000 IU	Once during the first 8 weeks after delivery[2]

[1] Adequate protection can also be achieved with smaller, more frequent doses, e.g., 10,000 IU weekly or 50,000 IU monthly.

[2] If the mother is not breastfeeding, the supplement should be given within 6 weeks of delivery to prevent any risk of teratogenicity (malformation of the baby) in a subsequent pregnancy.

Source: World Health Organization (2000) *The Management of Nutrition in Major Emergencies*. WHO: Geneva.

Iron and folate supplementation for pregnant women

Many women entering pregnancy have low iron stores and, as the demand for iron during pregnancy is high, the situation tends to worsen with time. This problem occurs widely both in emergency and non-emergency situations. Iron and folate supplementation remains one of the corner stones of micronutrient deficiency prevention. All women should receive both iron and folate supplementation for at least six months of pregnancy. Where the prevalence of anaemia in pregnant women is 40 per cent or higher this supplementation should continue for three months after birth.

Despite the importance of this intervention adherence to iron and folate supplements is often poor due to lack of appreciation of their benefits and side effects such as nausea (sickness) and constipation. Research has shown beneficial effects of weekly as well as daily supplementation, but daily supplementation remains the intervention recommended by WHO.

Multiple micronutrient supplementation tablets during pregnancy

Recently, there has been a move towards using a multiple micronutrient tablet as a replacement for iron and folate supplementation programmes. It has been considered that in populations where multiple micronutrient deficiencies may exist, it is more appropriate to provide a supplement containing a wider range of essential micronutrients. Several trials have been carried out on the use of a tablet formulated by UN agencies that uses 15 different micronutrients. Evidence strongly suggests that the use of these tablets is associated with an increase in birth weight in malnourished populations. However, there is currently no consensus on whether this results in a decrease in adverse outcomes or the cost-effectiveness of the intervention.

Table 2: Iron and folate supplementation for pregnant women

Prevalence of anaemia in pregnant women	Daily oral dose		Duration of supplementation
	Iron	Folic acid	
< 40%	60mg	400µg	6 months of pregnancy
≥ 40%	60mg	400µg	6 months of pregnancy, continuing to 3 months post-partum

Source: World Health Organisation, *The Management of Nutrition in Major Emergencies*, WHO, Geneva, (2000).

Challenge 1: Iron supplementation of children in Zanzibar: 2002-2003

Until recently WHO recommended iron supplementation for all children in populations where the diet supplied inadequate quantities of iron and iron-fortified foods were not available.

However, a study carried out in Zanzibar between 2002 and 2003 found that there may be adverse health consequences if iron supplements were given to children who were not iron deficient and were living in areas where malaria or other infectious disease transmission was high. Following a meeting in 2004, WHO issued the following statement:

> *"The findings of the trial in Zanzibar suggest that caution should be exercised in settings where the prevalence of malaria and other infectious diseases is high. Until the WHO recommendations are revised it is advised that iron and folic acid supplementation be targeted to those who are anaemic and at risk of iron deficiency. They should receive concurrent protection from malaria and other infectious diseases through prevention and effective case management…*
>
> *These conclusions should not be extrapolated to fortification or food-based approaches for delivering iron, where the patterns of iron absorption and metabolism may be substantially different…*
>
> *It is necessary to take the health environment into account when designing iron supplementation programmes as public health measures so that the benefits can be optimized without incurring significant risk."*

More research is required to fully understand the best ways of safely delivering preventive iron supplementation in areas where malaria and other infectious diseases are prevalent.

Untargeted blanket supplementation of children with iron supplements should be avoided in areas where malaria is prevalent. In the absence of specific guidance, iron supplements should be assumed to include Micronutrient Powders. The treatment of diagnosed iron deficiency anaemia should continue using the established supplementation regimens along with prevention and control programmes for malaria and helminth infections.

Source: From *'Iron supplementation of young children in regions where malaria transmission is intense and infectious disease highly prevalent'*, Joint Statement, World Health Organization and the United Nations Children's Fund, 2006; and

Sazawal, S., et al., *'Effects of routine prophylactic supplementation with iron and folic acid on admission to hospital and mortality in preschool children in a high malaria transmission setting: community-based, randomised, placebo-controlled trial'*, The Lancet, 367, 2006.

Use of supplements to prevent epidemics of other micronutrient diseases

Supplementation can be used in non-routine programmes to prevent epidemics of micronutrient deficiency diseases in high-risk populations. Examples include the use of vitamin C tablets to prevent scurvy in Afghanistan and the use of niacin tablets to prevent pellagra in Angola.

In these cases, where supplements must be delivered to the entire population or high-risk group, programmes cannot use the distribution mechanisms used for routine supplementation. In general, these types of supplement distributions present challenging logistic issues which may make them difficult to sustain over a prolonged period. In addition, the acceptability of regular supplement consumption may be called into question by the target population, resulting in poor adherence and programme coverage.

Distribution of micronutrient supplements has proven to be effective, at least in the short term, for preventing epidemics. They are a valuable approach to consider using in situations where a rapid, short term solution is needed to a serious and urgent problem.

Case example 6: Using vitamin C supplementation to prevent a scurvy epidemic in Afghanistan: 2002

In March 2002, there were reports of a hemorrhagic fever outbreak in western Afghanistan. It was later confirmed that the hemorrhagic symptoms and increased mortality were actually due to scurvy. A rapid assessment confirmed the cases clinically, estimated a prevalence rate of 6.3 per cent (a severe public health problem), and determined that the attack rates peaked each year in January and February (the end of the winter).

Many Afghans had limited dietary diversity due to isolated locations, lengthy winters, continuing drought, asset depletion and loss of *livelihoods* (means of making a living). After numerous food and fortification options to prevent future outbreaks had been considered, vitamin C tablet supplementation was selected because of the relatively rapid response time compared with other prevention methods. A three-month course of vitamin C tablets was distributed to 827 villages in at-risk areas.

The tablets were acceptable to the population and compliance was good. No cases of scurvy were reported for the winter of 2002-2003. The case example from Afghanistan demonstrates that scurvy can occur in non-refugee or non-displaced populations, that vitamin C supplementation can be an effective prevention strategy and that the humanitarian community should address prevention of scurvy in outbreak-prone areas.

Source: Cheung, E., et al., *'An epidemic of scurvy in Afghanistan: assessment and response'*, Food and Nutrition Bulletin, 24, 2003.

Case example 7: Difficulties in using supplement tablets to prevent pellagra in Angola: 1999

In the late 1990s, during the Angolan civil war, MSF began to diagnose cases of pellagra in Kuito, in central Angola. This marked the beginning of a large and persistent outbreak of pellagra. Analysis of the food aid ration at that time showed that it did not provide enough niacin. As other food commodities such as corn soya blend (CSB) were not yet available a distribution of vitamin B complex tablets to all women aged 15 and over was organized as an emergency response in December 1999. The target group was chosen as they were suffering the highest attack rate, and because of a lack of resources to distribute to the entire population. Thirty tablets, to last one month, were distributed to each woman. A nutritional survey conducted in December 1999 assessed compliance with the prescribed vitamin B complex tablets by counting the number of tablets left in the distribution bag after a set number of days. The survey found low compliance.

It was concluded that a vitamin B tablet distribution campaign did not seem to be the most effective solution to control this pellagra outbreak. Furthermore, targeting women with tablets was an emergency measure, but not a satisfactory option, as all strata of the population were probably deficient in niacin.

At a multi-agency meeting held in January 2000 it was agreed that the general ration should be supplemented with CSB (rather than groundnuts as the latter lacks riboflavin and pyridoxine, both of which are necessary for the conversion of tryptophan into niacin) and that the priority group for receiving the expanded ration should be the displaced.

Source: Baquet, S. and M. van Herp, *'A Pellagra epidemic in Kuito, Angola'*, Field Exchange, 10, 2000.

7 Promotion of home gardening and agricultural development

The distribution of seeds, tools and other agricultural inputs may allow populations to grow vegetables and fruit or livestock for home consumption or for sale. However, access to land may be a major constraint, particularly in refugee camps or in areas which are insecure, e.g., due to land mines. Water availability may also be a limiting factor.

One approach to try to maximize use of available land and water resources involves so called multi-story gardening. This has been piloted in refugee camps in Kenya and more recently in Ethiopia. It involves the use of old food aid sacks which are then filled with earth and used to grow crops. The crops can be watered using household waste water. While this is an innovative idea that has great potential to improve diet diversity, evidence is currently lacking about the yield that can be obtained with these gardens and whether it would contribute significantly to household nutrient intake.

8 Increasing income and improving access to markets

Increases in income can help to improve the intake of micronutrients through increasing the purchasing power of beneficiaries and therefore their dietary diversity. Vouchers for food or cash may be used to increase purchasing power while micro-credit and enterprise development may promote sustainable development. In all cases adequate market access is essential.

Challenge 2: Use of multiple micronutrient supplements in emergencies

UNICEF and WHO have recently developed two formulations for a daily multiple micronutrient supplement for pregnant women and children. In 2006, together with WFP, they issued recommendations for their use in emergencies.

These recommendations state that:

> *"Pregnant and lactating women should be given this supplement providing one RNI of micronutrients daily, whether they receive fortified rations or not. Iron and folic acid supplements, when already provided, should be continued. When fortified rations are not being given, children aged 6 to 59 months should be given one dose each day of the micronutrient supplement shown in Table 1; when fortified rations are being given, children aged 6 to 59 months should be given two doses each week of the micronutrient supplement…*
>
> *Furthermore, vitamin A supplements should continue to be given to young children and mothers post-partum according to existing recommendations. Breastfeeding and appropriate complementary feeding should also continue to be promoted actively…*
>
> *Moreover the continued need for supplements and fortified foods should be assessed periodically during and after the emergency. As the crisis wanes, the general distribution of the supplement is likely to be reduced and then increasingly targeted to specific groups."*

In practice, most programmes trying to deliver these multiple micronutrient supplements have used micronutrient powders as the delivery mechanism. The majority of programmes have targeted children. However, while there is a lot of current research in this area, published evidence and operational experience in emergencies remains limited. There is also a lack of established protocols and experience for implementing the recommendation of a phased reduction in distributions as the emergency improves.

While there has been an increase in the use of micronutrient powders to deliver supplements in emergency affected populations, experience with this approach remains limited and their use in any given context requires careful planning and monitoring.

Source: From 'Preventing and controlling micronutrient deficiencies in populations affected by an emergency. Multiple vitamin and mineral supplements for pregnant and lactating women and for children aged 6 to 59 months', Joint Statement, World Health Organization, the World Food Programme and the United Nations Children's Fund, 2006.

However, sometimes the most vulnerable households and individuals may be the ones least likely to benefit from these types of interventions.

9 Promotion of recommended infant feeding practices

Promotion of *exclusive breastfeeding* and appropriate *complementary feeding* practices are critical public health interventions that also contribute to maintaining micronutrient status. Exclusive breastfeeding up to six months of age, followed by the introduction of complementary foods with continued breastfeeding for two years or longer are very important for the nutritional status and health of children. Complementary foods for infants should be rich in energy and nutrients, as the growing child requires these for optimal growth and development.

It may be extremely difficult for carers to obtain access to adequate complementary infant foods during emergencies.

10 Ensuring adequate health care and a healthy environment

Good health is very important in maintaining good nutrition and micronutrient status. Below are some examples of public health interventions that may contribute to preventing micronutrient deficiencies:

- Vaccination against measles, which is important in the control of xerophthalmia
- Water, sanitation and hygiene promotion to control diarrhoea
- De-worming to control anaemia due to intestinal parasites such as hookworm or schistosomiasis
- Malaria control (e.g., insecticide-treated mosquito nets, vector control, etc.) to combat anaemia
- Health and nutrition promotion activities, e.g., an appropriate sun exposure as protective factor against rickets

11 Ensuring access to adequate non-food items

Household economic decisions are critical in determining the diet diversity and micronutrient status of all its members. In situations of scarce resources, food may not be, or may not be perceived to be, the top priority. If households are short of non-food items (e.g., cooking pots, soap or assets such as tools) then they may choose to use their available food stocks or other assets to procure these, rather than to improve the quantity or quality of their diet. This implies that nutritional assessments should take into account the availability of non-food items and consider taking measures to ensure their availability as part of a nutrition strategy. As seen in **Case example 5** (above), the sale of food aid may be a sign of distress and a shortage of non-food items, rather than excess provision of food aid.

Treatment

Micronutrient deficiency diseases require urgent medical treatment. This will usually take the form of oral supplement tablets or capsules. A relatively new approach involves using micronutrient powders that can be added to the normal food to increase micronutrient intake. These have been shown to be effective for the treatment of iron deficiency anaemia.

In some situations the prevalence of a micronutrient deficiency disease may be so high that blanket treatment of a population is justified. However, if this is done the possibility of excessive intake for those who are not suffering from deficiency must be taken into account.

Treatment doses for micronutrient deficiencies are given in many standard medical textbooks and field manuals. There is some variation in the doses recommended by different sources. **Table 3** shows a summary of some recommended treatments for selected micronutrient deficiency diseases.

The importance of appropriate treatment is illustrated in **Case examples 8** and **9**. Recognition and treatment of these diseases has the potential to greatly reduce the burden of morbidity and mortality in a population. However, prevention is, almost always, better than a cure. Appropriate diagnosis and treatment of cases should always be accompanied by the development of a prevention strategy using the different approaches outlined earlier in the module.

Methods to effectively tackle micronutrient malnutrition are necessarily diverse. Significant challenges remain at both the technical and policy levels, and continued efforts are required if we are reduce and eventually eliminate this serious public health problem during emergencies.

Case example 8: Reducing infant mortality by treatment of beriberi in Thailand: 1999

During a research study on malaria an extremely high infant mortality was observed in a refugee population on the north-western border of Thailand. Between 1987 and 1990 the infant mortality rate was 16 per cent and about 7 per cent of all infants were dying from this unrecognized micronutrient deficiency disease. After identification of infantile beriberi as the major cause of mortality standardized treatment was introduced. This involved: intra muscular injection of thiamine (50 mg) in infants suffering from the syndrome; supplementation of mothers who showed symptoms with 100 mg thiamine hydrochloride per day during pregnancy and 10 mg per week during lactation until 9 months post-partum; and a supplementary food ration for all pregnant women of 500 g soybeans and 4 eggs per week.

In response to these measures the case fatality rate for infantile beriberi fell from almost 100 per cent to 7 per cent and the overall infant mortality decreased from 183 to 78 deaths per 1000 live births.

Source: Luxemburger, C., et al. (2003) *'Beri-beri: the major cause of infant mortality in Karen refugees'*, Transactions of the Royal Society of Tropical Medicine and Hygiene, 97(2).

Case example 9: Treating scurvy in prison populations in East Africa: 2005

While visiting prisoners in East Africa, health delegates of the International Committee of the Red Cross (ICRC) encountered prisoners suffering from a hitherto undiagnosed 'mysterious' illness, consisting mainly of swollen and hard legs. Patients had not improved after various treatments given by the local health centre or hospital. The ICRC set out to investigate the nature of this disease in 10 prisons and examined 133 prisoners with the suspected clinical symptoms described as 'wooden leg' syndrome. Serum ascorbic acid levels were measured and a food basket analysis done. The diagnosis of scurvy was confirmed. The clinical presentation of scurvy in these East African prisons seems to be somewhat different from the classic descriptions, but is in line with historic records of the disease.

All patients responded to standard treatment with oral ascorbic acid. Treatment was easy and inexpensive, and the response to treatment was quick. They concluded that scurvy remains a problem in prisons in Africa and clinicians working in prisons need to be aware of its presence and its presentations.

Source: Bennett, M. and R. Coninx, *'The mystery of the wooden leg: vitamin C deficiency in East African prisons'*, Tropical Doctor, 35(2), 2005.

Table 3: Recommended treatments for some important micronutrient deficiency diseases

Disease	Recommended treatment	References
Anaemia	*Remember to also look for and treat non-nutritional causes of anaemia such as sickle cell, hookworm, schistosomiasis and malaria.*	
Severe iron deficiency anaemia	Children < 2 years 25mg iron and 100-400µg folic acid per day for 3 months Children 2-12 years 120mg iron and 400µg folic acid per day for 3 months Adolescents and adults (including pregnant women) 600mg iron and 400µg folic acid per day for 3 months	1
Moderate iron deficiency anaemia	See the section on prevention of anaemia	
Xerophthalmia (vitamin A deficiency)	– Give 3 doses of oral vitamin A at day 1, day 2 and in week 3. Curative doses of vitamin A 0-6 months 50,000 IU 6-12 months 100,000 IU > 1 yr (including adults) 200,000 IU – With the first dose, give topical antibiotic eye ointment (e.g., tetracycline 1% or chloramphenicol 1%) for 10 days. – If the cornea is involved, close the eye and gently cover with an eye pad. Refer the patient to a specialist. – NB: High dose vitamin A supplementation of pregnant women risks teratogenic effects (birth defects) in their unborn children. However, if there are severe signs of active xerophthalmia it becomes essential to weigh this risk against the possible serious consequences of vitamin A deficiency for both mother and foetus. In these circumstances the high dose treatment schedule given above may be followed for pregnant women.	1, 2
Rickets (vitamin D deficiency)	Oral administration of 5000 IU of vitamin D daily for 4-6 weeks followed by 1000IU daily for 6 months The supplements are usually given in capsules and are commonly derived from fish liver oils.	1

IU – International Unit

1 World Health Organization, *Management of Nutrition in Major Emergencies*, WHO, Geneva, 2000.

2 *Oxford Handbook of Tropical Medicine*, 3rd Edition, Oxford University Press, Oxford, 2008

Table 3: Recommended treatments for some important micronutrient deficiency diseases (continued)

Disease	Recommended treatment	References
Beriberi		
Adult	Critically ill adults should be given 50-100mg thiamine very slowly intravenously followed by 3-5mg per day orally for at least 6 weeks.	1
Infantile	In the case of severe heart failure, convulsions or coma, 25-50mg thiamine should be given very slowly intravenously, followed by a daily intramuscular dose of 10mg per day for about 1 week. In less severe cases give 10 mg thiamine per day orally or intramuscularly for 1 week followed by 3-5mg per day orally for at least 6 weeks.	1
Lactating women	Symptomatic women with mild beriberi should receive 10mg thiamine per day orally for 1 week, followed by 3-5mg per day orally for at least 6 weeks to prevent the development of acute beriberi in their infants.	1
Ariboflavinosis	Give 2-5mg of riboflavin orally per day until symptoms resolve.	2
Pellagra	Give a daily dose of 300mg nicotinamide orally for 2-4 weeks. NB: Try to avoid using nicotinic acid as this may cause flushing of the skin, nausea, vomiting, tingling and numbness.	1
Scurvy	Give ascorbic acid divided in 3 oral doses for 2 weeks: infants 50mg/day; children 150mg/day; adults 500mg/day. This is followed by preventive treatment: children and adults: 50-100mg/day. A larger dose of 1 gram per day ascorbic acid for 2-3 weeks is also recommended by WHO but may not be appropriate in children.	1, 2

IU – International Unit

1 World Health Organization, *Management of Nutrition in Major Emergencies*, WHO, Geneva, 2000.

2 *Oxford Handbook of Tropical Medicine*, 3rd Edition, Oxford University Press, Oxford, 2008

PART 3: TRAINER'S GUIDE

The trainer's guide is the third of four parts contained in this module. It is NOT a training course. This guide provides guidance on how to design a training course by giving tips and examples of tools that the trainer can use and adapt to meet training needs. The trainer's guide should only be used by experienced trainers to help develop a training course that meets the needs of a specific audience. The trainer's guide is linked to the technical information found in Part 2 of the module.

Module 14 is about the prevention and treatment of micronutrient malnutrition. It aims to help participants learn about a range of approaches that can be used for tackling these important public health problems.

Participants need to have an understanding of micronutrient malnutrition and have completed Module 4 before beginning this module.

Navigating your way around the guide

The trainer's guide is divided into six sections.

1. **Tips for trainers** provide pointers on how to prepare for and organize a training course.
2. **Learning objectives** set out examples of learning objectives for this module that can be adapted for a particular participant group.
3. **Testing knowledge** contains an example of a questionnaire that can be used to test participants' knowledge either at the start or at the end of a training course.
4. **Classroom exercises** provide examples of practical exercises that can be done in a classroom context by participants individually or in groups.
5. **Case studies** contain examples of case studies that can be used to get participants to think by using real-life scenarios.
6. **Field-based exercises** outline ideas for field visits that may be conducted during a longer training course.

CONTENTS

1. Tips for trainers

2. Learning objectives

3. Testing knowledge

Exercise 1: What do you know about the prevention and cure of micronutrient malnutrition?

Handout 1a: What do you know about the prevention and cure of micronutrient malnutrition? Questionnaire

Handout 1b: What do you know about the prevention and cure of micronutrient malnutrition? Questionnaire answers

4. Classroom exercises

Exercise 2: Planning an adequate general ration

Handout 2a: Planning an adequate general ration: Scenario

Handout 2b: Food composition table

Handout 2c: Planning an adequate general ration: Model answer

Exercise 3: Advocating for an adequate ration

Handout 3a: Advocating for an adequate ration: Scenario

5. Case studies

Exercise 4: Case Study: Bhutanese refugees in Nepal 1990-1993

Handout 4a: Case Study: Bhutanese refugees in Nepal 1990-1993

Handout 4b: Case study I: Bhutanese refugees in Nepal 1990-1993: Model answers

6. Field-based exercises

Exercise 5: Visit to a blended-food factory or mill producing fortified flour

Exercise 6: Field study

1. Tips for trainers

Step 1: Do the reading!

- Read Parts 1 and 2 of this module.
- Familiarize yourself with the technical terms from the glossary.
- Read through key documents (see full references of key documents and how to access them in Part 4 of this module).

Step 2: Know your audience!

- Find out about your participants in advance of the training:
  - How many participants will there be?
  - Do any of the participants already have experience in micronutrient malnutrition?
  - Could participants with micronutrient malnutrition experience be involved in the sessions by preparing a case study or contribute through describing their practical experience?

Step 3: Design the training!

- Decide how long the training will be and what activities can be covered within the available time. In general, the following guide can be used:
  - A **90-minute** classroom-based training can provide a basic overview.
  - A **half-day** classroom-based training can provide an overview of micronutrient malnutrition and include some practical exercises.
  - A **one-day** classroom-based training can provide a more in-depth understanding of micronutrient malnutrition and include a number of practical exercises and/or one case study.
  - A **three to eight-day** classroom plus field-based training can provide full training in order to carry out an actual assessment suitable for a particular context. This would include case studies and practical field exercises.
- Identify appropriate learning objectives. This will depend on your participants, their level of understanding and experience, and the aim and length of the training.
- Decide exactly which technical points to cover based on the learning objectives that you have identified.
- Divide the training into manageable sections. One session should generally not last longer than an hour.
- Ensure the training is a good combination of activities, e.g., mix PowerPoint presentations in plenary with more active participation through classroom-based exercises, mix individual work with group work.

Step 4: Get prepared!

- Prepare PowerPoint presentations with notes (if they are going to be used) in advance and do a trial run. Time yourself!
- Prepare exercises and case studies. These can be based on the examples given in this trainer's guide but should be adapted to be suitable for the particular training context.
- Prepare appropriate equipment for the session, such as calculators.
- Prepare a 'kit' of materials for each participant. These should be given out at the start of the training and should include:
  - Timetable showing break times (coffee and lunch) and individual sessions
  - Parts 1 and 2 of this module
  - Pens and paper

REMEMBER

People remember 20 per cent of what they are told, 40 per cent of what they are told and read, and 80 per cent of what they find out for themselves.

People learn differently. They learn from what they read, what they hear, what they see, what they discuss with others and what they explain to others. A good training is therefore one that offers a variety of learning methods which suit the variety of individuals in any group. Such variety will also help reinforce messages and ideas so that they are more likely to be learned.

2. Learning objectives

Below are examples of learning objectives for a session on micronutrient malnutrition. Trainers may wish to develop alternative learning objectives that are appropriate to their particular participant group. The number of learning objectives should be limited; up to five per day of training is appropriate. Each exercise should be related to at least one of the learning objectives.

Examples of learning objectives

At the end of the training participants will:

- Be able to describe the approaches available for the prevention and cure of micronutrient malnutrition.
- Be aware of the importance of supplementation in the treatment of micronutrient deficiency disease.
- Be aware of the importance of treating infections associated with micronutrient deficiency disease.
- Be aware of medical conditions that can give rise to micronutrient malnutrition.
- Know how to plan adequate general food rations.
- Know how to use NutVal software to assist in the planning of adequate general food rations.
- Be aware of the importance of advocating for rations that meet international standards in terms of micronutrient content.
- Understand the potential importance of complementary food rations in ensuring micronutrient adequacy
- Understand the importance of other public health approaches such as vaccination and good water and sanitation in reducing the risk of micronutrient malnutrition.
- Understand the importance of market access and viable livelihoods in ensuring the availability of, and access to, micronutrient rich foods.

3. Testing knowledge

This section contains one exercise which is an example of a questionnaire that can be used to test participants' knowledge on the cure and prevention of micronutrient malnutrition either at the start or at the end of a training session. The questionnaire can be adapted by the trainer to include questions relevant to the specific participant group.

Exercise 1: What do you know about the prevention and cure of micronutrient malnutrition?

What is the learning objective?

- To test participants' knowledge about the prevention and cure of micronutrient malnutrition

When should this exercise be done?

- *Either* at the start of a training session to establish the knowledge level of participants
- *Or* at the end of a training session to check how much participants have learned
  It is possible to use the first six questions at the start and the last six at the end.

How long should the exercise take?

- 20 minutes

What materials are needed?

- **Handout 1a:** What do you know about the prevention and cure of micronutrient malnutrition? Questionnaire
- **Handout 1b:** What do you know about the prevention and cure of micronutrient malnutrition? Questionnaire answers

What does the trainer need to prepare?

- Familiarize yourself with the questionnaire and answers.
- Add your own questions and answers based on your knowledge of the participants and their knowledge base.

Instructions

Step 1: Give each participant a copy of Handout 1a.

Step 2: Give participants 15 minutes to complete the whole questionnaire or 10 minutes for half of it.

Step 3: Give each participant a copy of Handout 1b or read out the answers.

Step 4: Give participants five minutes to mark their own questionnaires and clarify the answers where necessary.

Handout 1a: What do you know about the prevention and cure of micronutrient malnutrition? Questionnaire

Time for completion: 15 minutes

Answer all the questions. Choose ONE ANSWER ONLY for each question.

1. What is the most important advantage of calculating the micronutrient content of a food aid ration when you are planning a programme? *Circle the correct answer.*
   a) Allows the nutritionist to minimise the weight of the ration
   b) Helps to check that people will get adequate nutrients to avoid disease
   c) Minimises the cost of the ration
   d) Ensures the selected foods are culturally appropriate

2. Which of these programmes should be routinely done in emergency nutrition and health programmes? *Circle the correct answer.*
   a) Iron and folate tablet distribution to pregnant women
   b) Supply of iodized salt in the general ration
   c) Vitamin A capsule distribution to pre-school children in areas with high child mortality
   d) All of the above

3. Which of the following statements about micronutrient malnutrition is true? *Circle the correct answer.*
   a) Micronutrient malnutrition only occurs if micronutrient intakes are too low
   b) Micronutrient malnutrition only occurs if micronutrient intakes are too high
   c) People can suffer harmful affects if their micronutrient intakes are either too low or too high
   d) Food aid rations are always designed to ensure the micronutrient content is adequate

4. Which intervention is most likely to increase the micronutrient intake of the whole population? *Circle the correct answer.*
   a) A standard iron and folate supplementation programme
   b) A standard vitamin A supplementation programme
   c) Promoting recommended infant and young child feeding practices
   d) Improving the micronutrient content of the general food ration0

5. Which of the following statements about micronutrient malnutrition is true? *Circle the correct answer.*
   a) Women and children are the only people at risk of micronutrient deficiencies in emergencies.
   b) Adolescents are not at risk of micronutrient malnutrition.
   c) Adult males never suffer from micronutrient malnutrition.
   d) Some micronutrient deficiency diseases affect adults more than children.

6. Which complementary public health intervention may help to reduce anaemia? *Circle the correct answer.*
   a) Insecticide treated bed nets
   b) De-worming medication in school children
   c) Improved sanitation
   d) All of the above

7. Which statement is **NOT** true? *Circle the correct answer.*
   a) High dose vitamin A supplementation for children should be given as soon as possible in an emergency
   b) High dose vitamin A supplementation can be integrated with vaccination campaigns
   c) High dose vitamin A supplementation should be targeted at all pregnant women
   d) High dose vitamin A supplementation has been shown to reduce mortality in children by 23 per cent in populations where there are clinical signs of deficiency

8. Tablets for routine prevention of anaemia in pregnant women should contain how much iron and folate? *Circle the correct answer.*
   a) 60mg of iron and 400mg of folate
   b) 160mg of iron and 400µg of folate
   c) 60mg of iron and 400µg of folate
   d) 1000mg of iron and 1000µg of folate

9. Which food aid commodity is routinely fortified with micronutrients? *Circle the correct answer.*
   a) Wheat grain
   b) Beans
   c) Rice
   d) Blended foods

10. Salt is routinely fortified with which fortificant? *Circle the correct answer.*
   a) Potassium iodate
   b) Thiamine hydrochloride
   c) Nicotinamide
   d) Potassium chloride

11. Pellagra should be treated with which supplements? *Circle the correct answer.*
   a) Iron and vitamin A
   b) Nicotinamide and B complex
   c) Ascorbic acid
   d) Selenium and zinc

12. Improving livelihoods and market access may reduce micronutrient deficiencies by? *Circle the correct answer.*
   a) Increasing the number of hours worked by parents.
   b) Encouraging sale of livestock
   c) Improving purchasing power and access to a more diverse range of foods
   d) Decreasing the use of traditional foods

Handout 1b: What do you know about the prevention and cure of micronutrient malnutrition? Questionnaire answers

1. **(b)**
2. **(d)**
3. **(c)**
4. **(d)**
5. **(d)**
6. **(d)**
7. **(c)**
8. **(c)**
9. **(d)**
10. **(a)**
11. **(b)**
12. **(c)**

4. Classroom exercises

This section provides examples of practical exercises that can be carried out in a classroom context by participants individually or in groups. Practical exercises are useful between plenary sessions, where the trainer has done most of the talking, as they provide an opportunity for participants to engage actively in the session. The choice of classroom exercises will depend upon the learning objectives and the time available. Trainers should adapt the exercises presented in this section to make them appropriate to the particular participant group. Ideally, trainers should use case examples with which they are familiar.

Exercise 2: Planning an adequate general ration

What is the learning objective?

- To know how to plan adequate general food rations
- To know how to use NutVal software to assist in the planning of adequate general food rations

When should this exercise be done?

- After the main concepts about micronutrients have been introduced

How long should the exercise take?

- 1 hour and 15 minutes

What materials are needed?

- **Handout 2a:** Planiing an adequate general ration
- **Handout 2b:** Food composition table
- **Handout 2c:** Planning an adequate general ration: model answers

What does the trainer need to prepare?

- Familiarize yourself with the calculations and results before the session and ensure handouts are available and the participants will have calculators ready.

Instructions

Step 1: Give each participant a copy of Handout 3a, explain the exercise, and let them work through it for 60 minutes. Provide support, if necessary.

Step 2: Hold a discussion for 15 minutes in plenary to address any important questions and confirm that participants understood the exercise and results.

Handout 2a: Planning an adequate general ration: Scenario

Time for completion: 30 to 60 minutes

Read the following scenario and attempt the calculation.

You are a nutritionist who has been reviewing the food assistance provided to a resident population in a famine-affected area. You have been asked to plan two rations based on different intervention strategies.

(a) A complementary food aid ration that is designed to complement the food that is still accessible to the famine-affected population and fill the energy and nutrient gap

(b) A general ration that is designed to provide a nutritionally balanced ration and deliver 2,100 kcal per person per day

The current ration being distributed to the famine affected population is given in the table below in grams/person/day.

Ration (grams/person/day)	
Maize grain	350
Beans	50
Oil	20

A survey has indicated that the non-aid foods being frequently consumed by the population include very few fruits and vegetables and no obvious sources of iodine.

The commodities that are immediately available to be added to the ration are CSB and salt, both conforming to WFP specifications.

1. Initially you decide to focus on the probable deficiencies in iodine and vitamin C by providing a complementary food ration that will deliver the population requirement for these particular nutrients.

   Calculate the minimum quantities of CSB and salt you would need to add to the ration to ensure it provides an adequate amount of vitamin C and iodine. Use the nutrient values given in the composition table (Handout 2b) to calculate this by hand or use NutVal software. Give your answer to the nearest whole gram.

   Note that in a population with an average energy requirement of 2100 kcal the minimum amount of iodine required is 150 µg and the minimum amount of vitamin C required is 28 mg.

   Only complete the remaining questions if using NutVal software.[1]
   There are many calculations involved!
2. After you have done this calculation, the new ration containing the CSB and salt should contain 1798 kcal. Now you decide to design a general ration that will meet the complete food needs of the population. As a first step, increase the amount of oil until the requirement for 500 µg RE has been satisfied. What is the oil content of the ration now?
3. Due to the presence of large stocks of maize in the warehouse you have been told by the programme manager that the maize ration will need to be increased to 400 g/person/day. After you have done that, also increase the quantity of beans until the energy and riboflavin requirements have been satisfied. What is the amount of beans in the ration now?
4. To address the deficiency in calcium, increase the amount of beans in the ration to 100 grams and then find out how much CSB would need to be added to fulfil the calcium requirements. What is the CSB content of the ration now?
5. Finally, to reduce the excessive energy content of the ration, reduce the maize content to 312g. Write down the final ration you have designed.
6. Comment on the ration design and how it compares with the general food ration often used in actual food aid operations.

[1] NutVal is a spreadsheet application. The current version is designed to work with Excel 2003 and is available to download from: http://www.nutval.net/

Handout 2b: Food composition table

Nutrient content per 100 grams of raw uncooked food*

Commodity	Energy Kcal	Protein (g)	Fat (g)	Calcium (mg)	Iron (mg)	Iodine µg	Vitamin A µg RE	Vitamin B1 (Thia-mine) (mg)	Vitamin B2 (Ribo-flavin) (mg)	Vitamin B3 (Niacin) (mg)	Vitamin C (mg)
Maize	350	10.0	4.0	7	2.7	0	0	0.39	0.20	2.2	0
Beans (dried)	335	20.0	1.2	143	8.2	0	0	0.50	0.22	6.2	0
Oil^	885	0.0	100.0	0	0.0	0	900	0.00	0.00	0.0	0
CSB§	400	18.0	6.0	181	12.8	2	501	0.44	0.70	10.0	50
Salt~	0	0	0	0	0	6,000	0	0.00	0.00	00.0	0

* Nutritional values are taken from the spreadsheet application NutVal 2006.

^ Vitamin A-fortified according to WFP specifications

§ Formulated according to WFP specifications

~ Iodized according to WFP specifications (specifications define a range of 4450-7500µg iodine/100 g salt)

Handout 2c: Planning an adequate general ration: Model answers

1. **Calculate the minimum quantities of CSB and salt you would need to add to the ration to ensure it provided an adequate amount of vitamin C and iodine. Use the nutrient values given in the composition table (Handout 2b) to calculate this by hand or use NutVal software. Give your answer to the nearest whole gram.**
   You would need to add 3 grams of salt and 57 grams of CSB to ensure the ration provided the minimum required amounts of iodine (150µg) and vitamin C (28mg) in a 2,100 kcal general ration. After the addition of 3 grams of salt and 57 grams of CSB the ration contains 181µg of iodine and 28 mg of vitamin C.

2. **After you have done this calculation, the new ration containing the CSB and salt should contain 1798 kcal. Now you decide to design a general ration that will meet the complete food needs of the population. As a first step, increase the amount of oil until the requirement for 500 µg RE has been satisfied. What is the oil content of the ration now?**
   24 ml of oil.

3. **Due to the presence of large stocks of maize in the warehouse you have been told by the programme manager that the maize ration will need to be increased to 400 g/person/day. After you have done that, also increase the quantity of beans until the energy and riboflavin requirements have been satisfied. What is the amount of beans in the ration now?**

   91 grams of beans.

4. **To address the deficiency in calcium, increase the amount of beans in the ration to 100 grams and then find out how much CSB would need to be added to fulfil the calcium requirements. What is the CSB content of the ration now?**
   158 grams of CSB.

5. **Finally, to reduce the excessive energy content of the ration, reduce the maize content to 312g. Write down the final ration you have designed.**
   The final ration composition should contain:

Maize grain (white)	312g
Beans, dried	100g
Oil, vegetable (WFP specifications)	24g
Salt (WFP specifications)	3g
CSB	158g

6. **Comment on the ration design and how it compares with the general food ration often used in actual food aid operations.**
   The ration design contains less salt than is often provided and a lot more CSB. A typical CSB provision may be as little as 50 g per person per day. The cereal component of most rations also tends to be higher. However, as we saw in Module 4, the more conventional ration designs also tend to have poor micronutrient adequacy.

Exercise 3: Advocating for an adequate ration

What is the learning objective?

- To be aware of the importance of advocating for rations that meet international standards in terms of micronutrient content

When should this exercise be done?

- After the main concepts have been introduced and exercises 1 and 2 have been completed

How long should the exercise take?

- 60 minutes

What materials are needed?

- **Handout 3a:** Advocating for an adequate ration: Scenario

What does the trainer need to prepare?

- Read and familiarise yourself with the scenario and descriptions. This is a fairly unstructured exercise that can go in several directions. While the role of political and organizational environment is something that participants should fully explore, try and ensure there is a reasonable amount of time spent on discussion of the technical issues. Obviously, the aim is to arrive at a point in the role play when the stakeholders start to agree that action to tackle the problem of Ariboflavinosis is required. How you get there and how long it takes will depend on the individual participants!

Instructions

Step 1: Introduce the exercise to the course participants.

Step 2: Allocate roles to different participants.

Step 3: Give the groups 10 minutes to familiarize themselves with their roles and briefs.

Step 4: Conduct the role play by chairing the meeting.

Step 5: Discuss the results.

Discussion points for feedback in plenary

➡ Every organization has its own perspective and interests.

➡ Different organizational priorities do not mean that organizations or individuals do not care about the health and welfare of refugees.

➡ How important is technical knowledge in the debate?

Handout 3a: Advocating for an adequate ration: Scenario

Time for completion: 40 minutes

The aim of this exercise is to encourage you to think around the complex issues that surround making decisions on the content of emergency food aid. This scenario focuses on a long-term refugee situation.

Read the following scenario and familiarize yourself with the role allocated to you by the trainer. Try to empathize with the role you have been assigned and to prepare to engage in the debate in a polite but enthusiastic way.

This scenario is set in a hypothetical country in Asia.[2]

A refugee population has been accommodated in the country for about five years in three different camps. There is widespread concern over the nutritional status of the refugees and nutritional surveys have reported a consistently high prevalence of angular stomatitis, a sign of vitamin B2 (riboflavin) deficiency. This has been a continuing problem since the start of the refugee operation. Analysis of the food aid ration confirms that it is a rice-based ration, heavily deficient in riboflavin.

A meeting has been called by UNHCR to discuss the results of the latest nutrition survey with the various stakeholders. The meeting will be chaired by the course trainer, who will take the role of UNHCR's Country Representative but will act impartially in the discussion. The first speaker invited to address the meeting will be the individual from the health and nutrition NGO, who will present the case for tackling the inadequate general ration. Once this person has spoken, others will be invited by the chair to share their perspectives.

Organizations represented

Ministry of Home Affairs of the host country – primarily concerned about internal security, social welfare, and law and order. Has responsibility for overseeing the refugee camps and is mandated by the government to bring about repatriation of the refugee to their country of origin at the earliest opportunity. However, the ministry is also concerned to uphold the host country's international reputation for observing international standards and human rights.

Your role: a senior civil servant of the ministry

UNHCR – responsible for overall coordination of the camps, registration of refugees, social and legal protection, and liaison with the national government, international donors and the embassies of donor governments in country. Under pressure from the host government to bring about repatriation of the refugees as soon as possible. Under pressure from some international donors to protect the rights of the refugees to remain in the host country and mindful of its own mandate to protect refugees. While responsible for carrying out the annual nutrition survey, the organization currently has no nutrition or health personnel employed on its staff and hires external consultants to conduct surveys and write reports.

Your role: a protection officer working in the camps. You are aware of the reports of riboflavin deficiency and have seen cases of angular stomatitis in refugee children. However, there are many difficult social protection issues to deal with and you are not convinced that riboflavin deficiency is a real priority.

WFP – responsible for providing the basic food commodities in the general ration. They also supply fortified biscuits for school feeding. Concerned by the continued reports of inadequate rations and riboflavin deficiency, WFP launched a programme to supply fortified biscuits for school feeding. Resources and technical solutions to improve the adequacy of the general ration seem difficult to obtain.

Your role: a programme officer. You have a background in management and logistics with no academic training in health or nutrition. However, you have attended a short course on nutrition and are aware of the issues. You have just been informed by your country office that resources are not available.

[2] Any similarity to a real country or situation is coincidental.

An international NGO responsible for camp management – The organization has a respected reputation in international emergency relief work and development projects. It has extensive experience of camp management but has no specialists in health and nutrition.

Your role: a programme manager. Having little knowledge of health or nutrition you are unconvinced of the seriousness of the problem and, frankly, wonder what all the fuss is about. Angular stomatitis is, after all, frequently seen in many children in the country, not just among refugees living in camps.

The national Red Cross/Red Crescent Society responsible for food distribution – As the national society, the organization has many volunteers and a well-established reputation, although it is not without critics. Within the camp it has responsibility for food storage and distribution.

Your role: a senior official in the organization in the society who has been involved with food distribution for several years. You are concerned that the operation is successful and that the refugees are seen to be doing well.

An international health and nutrition NGO running health services in the camps – The organization has a long and respected reputation in international emergency relief work. However, from the outside some perceive it as being a little arrogant and not very good at longer-term work and development activities. It identifies strongly with the refugee population and sees its role as ensuring they receive full rights and protection under international law. It undertakes onsite distribution monitoring (known locally as food basket monitoring) and has repeatedly advocated for beneficiaries to receive the full ration to which they are entitled. The distribution still, however, fails to achieve an average of 100 per cent of the planned ration.

Your role: a nutritionist! You are the only nutritionist at the meeting. You have also just collaborated on the most recent nutritional survey and worked closely with the UNHCR consultant in analysing data and writing the report. You are devastated that the internationally-funded relief effort has failed to provide adequate rations for so many years and has allowed the epidemic of ariboflavinosis to persist in pre-school children for so long. The latest survey shows a prevalence of 14 per cent (95% CI 12-16 per cent). This compares with 16 per cent last year and 13 per cent the year before. You are determined that at this meeting you will convince your colleagues in the other organisations that effective action is necessary.

A local human rights NGO

The organisation is concerned about the situation of the refugees but is only too aware that problems of poverty and poor nutrition affect large parts of the host country, including the communities that live adjacent to the refugee camps.

Your role: a human rights researcher. You are alarmed at the amount of resources being spent on the refugees when so many problems in your population go unaddressed. You want to see the refugees receive an adequate diet but want to also advocate for more resources to be made available for the people living in communities near to the refugee camps.

Exercise 4: Case Study: Bhutanese refugees in Nepal 1990-1993

What is the learning objective?

- To be able to describe the approaches available for the prevention and cure of micronutrient malnutrition

When should this exercise be done?

- After completion of the theory component of the module

How long should the exercise take?

- 60 minutes

What materials are needed?

- **Handout 4a:** Case study I: Bhutanese refugees in Nepal 1990-1993
- **Handout 4b:** Case study I: Bhutanese refugees in Nepal 1990-1993: Model answers

What does the trainer need to prepare?

- Read and familiarize yourself with the scenario and answers. Consider how best to divide the course into working groups. It is usually most useful to try and create groups of mixed abilities and varying backgrounds. If you have been using NutVal software in your training, try and make it available for all the groups to use in their analysis.

Instructions

Step 1: Introduce the exercise and some of the background information to the course participants. Try to let the students read most the background information themselves.

Step 2: Divide students into groups and provide each group with copies of Handout 4a.

Step 3: Give the groups 30 minutes to work through the background information and discuss the question and their answers.

Step 4: Ask each group to briefly present their recommendations (five minutes maximum for each group).

Step 5: Provide a summary of the answers and discuss the results.

Discussion points for feedback in plenary

➡ Were there any other interventions that could have been considered?

➡ How easy is it to try and change people's food preparation and dietary habits?

➡ When and how will people change them?

(Generally, it is extremely difficult due to the many complex and powerful reasons that make people choose their diets. However, experience has shown that people will change their behaviour in response to effective marketing campaigns and some other factors.)

Handout 4a: Case Study: Bhutanese refugees in Nepal 1990-1993

The population

The first refugees began arriving in southeast Nepal from southern Bhutan after October 1990. The journey was a few days for the majority who arrived in lorries and buses. Camps began to develop in 1991, but the peak influx was during May 1992. By July 1992 there were over 50,000 refugees registered. The 'emergency phase' led into the 'care and maintenance phase' in late 1992. By January 1997 there were 91,801 registered refugees in seven camps, with several thousand unregistered who were living and working in Nepal. One fifth of the population is below 18 years of age, and 13 percent are less than five years of age.

The local environment

The narrow strip of land, which adjoins India along Nepal's southern border, is known as the Terai. It is only a few hundred feet above sea level, and until the 1950s and 1960s was jungle and sparsely inhabited due to rampant cases of malaria. The Jhapa district, where the camps are located, was cleared and is now one of the most densely populated areas in eastern Nepal and has the highest proportion of area under cultivation.

Other sources of food and income

The Terai is well served with buses and cycle rickshaws. Access to towns and markets is easy in terms of distance. There are ample seasonal opportunities for casual daily work. However, there is a numerically and politically significant number of landless Nepali citizens in the Terai who depend on casual daily work for subsistence. The refugees are willing to work for less pay, as they receive a full ration back at the camp. This has led to a policy of trying to limit numbers of refugees moving in and out of the camps. In this sense they are officially 'closed camps' but there are no physical barriers. The opportunity to work, albeit on a casual basis, is certainly a factor that directly influences food availability and the possibility of diet diversification among the refugee population.

Leadership structures

Each camp is divided into sectors and sub-sectors, with an average of 80 houses in each sector. Each sector has a sector head, and each sub-sector a male and female head. The functions of this camp management structure are distribution, administration, and peace and security. The structure resembles the administrative block system, which the refugees had in Bhutan. The Bhutanese are used to leaders having a strong influence over their daily life.

Malnutrition and micronutrient deficiencies

During the emergency phase, the main nutritional concern was acute malnutrition, iron deficiency anaemia and vitamin A deficiency, but not vitamin B and C deficiencies. By late 1992 malnutrition and mortality rates were considered to be at 'acceptable' levels.

An outbreak of suspected beriberi became apparent in September 1993, when an increasing number of patients with neurological symptoms were presenting at the health centres. From October, weekly surveillance figures were kept. Numbers of cases varied significantly from camp to camp. The time the cases had spent as refugees in the camp was reported as follows:

Time in camp (months)	% cases
< 6	5.4
6-11	18.5
12-17	41.5
18-23	23.1
24-29	3.1
30+	8.5

The general ration was set as follows:

	Grams per person per day
Polished rice	430.0
Pulses	60.0
Vegetable oil	25.0
Sugar	20.0
Salt	7.5
Vegetables	100-150

The actual average amounts received were calculated as follows:

	Grams per person per day
Polished rice	401.0
Pulses	57.0
Vegetable oil	25.0
Sugar	19.0
Salt	4.5
Vegetables	96-125

Refugees preferred polished rice to any other cereal, and many would wash their rice more than once before cooking, sometimes throwing this water away. Refugees traded or exchanged some of the pulses in their ration for other foods and non-food items.

Fortified blended food was only being used for supplementary feeding for malnourished children (less than 80 per cent WFH) and pregnant and lactating women.

Answer the questions.

You are a nutritionist on the UNHCR/WFP food assessment mission in early 1994.

1. What were the likely contributing factors of the outbreak of beriberi?
2. What are your recommendations for addressing this outbreak of beriberi? Justify your recommendations.

Handout 4b: Bhutanese refugees in Nepal 1990-1993: Model answers

1. What were the likely contributing factors of the outbreak of beriberi?

These include:

- The received ration looks, on first site, to be deficient in thiamine. Calculating the nutrient values using NutVal 2006 (assuming the vegetable content was actually 100g of dark green leafy vegetables) confirms this. The ration contains only 83 per cent (0.74mg) of the thiamine (and 25 per cent (0.35mg) of the riboflavin!) required in a general ration of 2100 kcal.
- Cooking practices that involve boiling and washing food several times are likely to reduce the B vitamin content of the ration still further.
- Pulses are the only thiamine rich food item in the ration. Unfortunately, they also tend to be traded or exchanged for other foods, which may not be a good source of thiamine, and non-food items.
- While work opportunities exist, the policy of trying to limit numbers moving in and out of the camps is presumably reducing the household income and the opportunities for diet diversification through purchase and trade.

2. What are your recommendations for addressing this outbreak of beriberi? Justify your recommendations.

Intervention options

a) Provision of parboiled rice

Parboiling of rice, rather than polishing, helps to retain the vitamin B content and makes rice easier to process by hand. The practice of parboiling rice is more than two thousand years old, and may have started in the Persian Gulf. Today, it is the preferred rice of many in the southern parts of the Indian subcontinent.
During processing, the rice is briefly boiled before being dried and stored. Parboiling rice drives nutrients, especially thiamine, from the bran into the grain, so that parboiled white rice is nutritionally similar to brown rice.

Advantages and disadvantages

In this population there is a strong cultural preference for polished rice (which has a low thiamine content). Introducing parboiled rice or other cereals with a better thiamine content may prove challenging. However, the strong role of the sector leaders in the camp may help encourage change, assuming they could be convinced of the benefits.

b) Inclusion of blended food in the ration

This would help to improve the micronutrient profile of the ration. Inclusion of 36 gram/person/day of WFP specification CSB or 30 gram/person/day of CSB of the United States specification would meet the general ration thiamine requirement.

Advantages and disadvantages

Blended food would improve the overall micronutrient profile of the ration, not just increase thiamine content. If adequate supplies can be obtained this would be a very useful addition to the ration.

There is no information on the cultural acceptability of the blended food, but it is likely to be preferentially consumed by children. Ideally, more information would be collected on the age profile of the patients being admitted for treatment for beriberi and about how the blended food would be used in the population. A programme of information, education and communication activities would be required before introducing this new food or if trying to change food preparation practices, as noted above in option a).

c) Improving access to employment opportunities

Removing restrictions on entering and leaving the camps might help to increase household income, reduce the sale of food aid pulses and improve dietary diversity.

Advantages and disadvantages

Increasing the self-sufficiency of refugees and stimulating the local economy could be two positive side effects of this option.

Increasing access to work might be politically difficult and might also risk resentment from the local host community if the price of labour was reduced by the additional supply of workers. More information on the availability of thiamine rich foods in local markets and would be useful in evaluating this option.

d) Provision of treatment for infantile beriberi

Infant mortality rates are not included in the briefing. These should be looked into urgently as infantile beriberi may be an important cause of mortality in this thiamine-deficient population. In the meantime, medical staff should be made aware of the possible occurrence of infantile beriberi, a case definition agreed upon and medical supplies for treatment (thiamine injections and oral supplements) procured.

Advantages and disadvantages

This is an important approach to control possible excess mortality, but it should be accompanied by preventative approaches. Care should be taken that concern over infantile beriberi does not undermine the promotion of exclusive breastfeeding.

e) Supplementary feeding and/or supplementation of pregnant women

Due to the risk of infantile beriberi, a supplementary feeding programme and/or supplementation programme should be started for pregnant women.

Advantages and disadvantages

This is an important preventative strategy, but will not deal with the problem for the whole population.

6. Field based exercises

The section outlines ideas for exercises that can be carried out as part of a field visit. Field visits require a lot of preparation. An organization that is actively involved in programming or nutrition surveillance has to be identified to 'host' the visit. This could be a government agency, an international NGO or a United Nations agency. The agency needs to identify an area that can be easily and safely visited by participants. Permission has to be sought from all the relevant authorities and care taken not to disrupt or take time away from programming activities. Despite these caveats, field based learning is probably the best way of providing information that participants will remember.

Exercise 5: Visit to a blended-food factory or mill producing fortified flour

What is the learning objective?

- To allow participants to observe food fortification in an established commercial factory and gain awareness of the processes involved. The factory should preferably be engaged in the manufacture of food aid products, e.g., blended foods, fortified maize, etc.

When should this exercise be done?

- During or after completion of the module

How long should the exercise take?

- 1 day to organize
- Half day to 1 day to undertake

What materials are needed?

- Agreement with the company running the factory
- Permission from the training institution for the visit to go ahead
- If necessary, risk assessment forms to be prepared and completed by the trainer prior to the field trip

What does the trainer need to prepare?

- An itinerary for the factory visit
- A plan for transportation, accommodation and meals for participants
- A briefing sheet for the participants on the local situation including safety and security procedures
- To ensure that participants are suitably dressed and equipped for the visit, and have note pads and pens
- Prior to the visit, work in a group with the participants to construct an observation checklist of things to look out for, e.g. how is the food processed prior to fortification; what fortificants are used; how is the addition of fortificants monitored; how are the end products packaged and labelled; what quality control checks are made (See list below).

Exercise 5: Visit to a blended-food factory or mill producing fortified flour (continued)

Discussion points for feedback in plenary

- ➡ General impressions of the factory and fortification process
- ➡ Relevance of the manufactured products for food aid operations
- ➡ Are the micronutrient fortification levels of the product appropriate for what is needed in the field?
- ➡ Why the date of manufacture is important in finding out if a fortified food is still fit for consumption and fortified at the stated levels.
- ➡ Why the batch number may be important in tracing the source of faulty food products. Quality problems in the past have included infestation, coarsely milled products and flavour taints.

The following is a suggested activity that should be adapted to fit the local context.

Arrange a visit to a blended-food factory or flour mill producing fortified flour products used in food aid programmes. Allow students to observe the food processing and fortification process.

- For all fieldwork and visits, a risk assessment must be undertaken to look at the risks involved to the course participants, local staff and beneficiaries.
- Every effort must be taken to minimize disruption to the ongoing work of the programme.
- Trainers and students must act with tact and discretion and avoid open criticism of any activities they see. Observations should be discussed with trainers at the end of the field visit.

Key observation points for participants

(To be adapted according to the local situation)

1. What is in the product being manufactured?
2. What are the ingredients and where have they been procured?
3. How are the ingredients processed and mixed?
4. What quality control checks are carried out on the ingredients?
5. Which fortificants are added to the product?
6. Where are the fortificants manufactured?
7. How are the fortificants measured and mixed with the food product?
8. How is the end product packaged and labelled?
9. Is there a manufacturing batch number?
10. Is a 'use by', 'manufactured on', or 'best before' date included on the packaging
11. What quality control checks are performed on the finished product?
12. Which agencies and food aid operations are the products used in?

Exercise 6: Field study

The section outlines ideas for exercises that can be carried out as part of a field visit. Field visits require a lot of preparation. An organization that is actively involved in programming or nutrition surveillance has to be identified to 'host' the visit. This could be a government agency, an international NGO or a United Nations agency. The agency needs to identify an area that can be easily and safely visited by participants. Permission has to be sought from all the relevant authorities and care taken not to disrupt or take time away from programming activities. Despite these caveats, field based learning is probably the best way of providing information that participants will remember.

What is the learning objective?

- To allow participants to observe micronutrient malnutrition prevention and curative activities in an established refugee camp

When should this exercise be done?

- After completion of the module material including the previous exercises

How long should the exercise take?

- 1 day to organize, and 1 to 2 days, or as dictated by local circumstances

What materials are needed?

- Letters of agreement with the NGO or United Nations agency hosting the visit
- Permission from the training institution for the visit
- Risk assessment forms to be prepared and completed by the trainer prior to the field trip

What does the trainer need to prepare?

- A full itinerary for the field visit
- A plan for transportation, accommodation, meals and refreshments for participants
- A briefing sheet for the participants on the local situation including safety and security procedures
- To ensure that participants are suitably dressed and equipped for the field visit, and have note pads and pens
- Prior to the visit work in a group with the participants, to construct an observation checklist of things to look for, e.g., number of refugee households with access to home gardens, provision of micronutrient supplements at health facilities, etc.

Discussion points for feedback in plenary

➡ General impressions of the field site visited

➡ Detailed observations on the micronutrient malnutrition programmes in the site visited

➡ Ideas for improving the technical content and management of the programme

The following is a suggested activity that should be adapted to fit the local context. It would be preferable to combine this field activity with that described in Module 4 as there are many areas of overlap.

Arrange a visit to a refugee camp to observe general ration distribution, onsite distribution monitoring, post distribution monitoring, and how data is collected for the health information system. If possible, data should be collected and analysed for micronutrient content and energy and macronutrient sufficiency.

- For all fieldwork and visits, a risk assessment must be undertaken to look at the risks involved to the course participants, local staff and beneficiaries.
- Every effort must be taken to minimize disruption to the ongoing work of the programme.
- Trainers and students must act with tact and discretion and avoid open criticism of any program activities they see. Observations should be discussed with trainers at the end of the field visit.

Key observation points for participant (To be adapted according to the local situation)

In addition to the observation points listed for the field exercise in Module 4, the following should be included:

1. Is there an iron/folate supplementation programme running for pregnant women? If yes,
   a. What is the composition of the supplements and where are they procured from?
   b. How are the iron/folate supplements distributed?
   c. Is there any data on adherence?
2. Is there a vitamin A capsule distribution programme? If yes,
   a. What is the composition of the supplements and where are they procured from?
   b. How and how often are they distributed?
   c. Which population group/s receive the supplements?
   d. Is there any data on coverage?
3. What fortified foods are supplied in the general ration?
4. What are the ingredients and composition of those foods? (This may be difficult or impossible to find out in some cases.)
5. What are the 'date of manufacture'; 'best before' or 'use by' dates for the products (Some products may not have these!)
6. Where were they manufactured and by which company? (This may be difficult or impossible to find out in some cases.)
7. What are the manufacturing batch numbers of the food products?
8. Is there any information on which groups of the population consume the fortified products, how, and in what amounts?
9. Have health staff diagnosed any cases of micronutrient deficiencies? If yes, how did they treat these?
10. Which micronutrient supplements are available for use in the medical stores?

PART 4: TRAINING RESOURCE LIST

The training resource list is the fourth of four parts contained in this module. It provides a comprehensive list of reference material relevant to this module including guidelines, training courses and reference manuals. Part 4 provides background documents for trainers who are preparing training material.

What can you expect to find here?

1. An inventory of existing guidelines and manuals listed alphabetically by agency name with details about their availability.
2. A list of known training resources listed alphabetically by agency name with details about:
   - Overall content
   - Intended use
   - Target audience
   - Length of time the course session has been designed for

Guidelines and manuals

Many nutrition manuals and guidelines contain sections on interventions for the prevention and treatment of micronutrient malnutrition. The list presented here contains selected documents which are dedicated to or have sections with particular relevance to the contents of this module. Useful reference information on diagnosis and treatment is also available in many standard medical textbooks. Please also see the additional resources included in the list from module 4.

1. **WHO (2000) *The Management of Nutrition in Major Emergencies* Geneva: WHO.**
   Availability: downloadable pdf format in English
   Contact: http://www.who.int/nutrition/publications/emergencies/en/index.html

   MANUAL
   Chapter 1: Meeting nutritional requirements
   Chapter 2: Major nutritional deficiencies in emergencies
   Chapter 3: Assessment and surveillance of nutritional status
   Chapter 4: Nutritional relief: General feeding programmes
   Chapter 5: Nutritional relief: Selective feeding programmes
   Chapter 6: Prevention and control of communicable diseases
   Chapter 7: The context: emergency and preparedness and response programmes

2. **WHO&FAO (2006) *Guidelines on Food Fortification with Micronutrients*. Geneva: WHO.**
   Availability: downloadable pdf format in English
   Contact: http://www.who.int/nutrition/publications/micronutrients/en/index.html

   Guidelines to assist countries design and implement appropriate food fortification programmes, intended as a resource for governments and agencies implementing programmes and for scientists doing research. They are written form a nutrition and public health perspective and provide practical guidance set out in four parts.
   Part 1. The role of food fortification in the control of micronutrient malnutrition
   Part 2. Evaluating the public health significance of micronutrient malnutrition
   Part 3. Fortificants: Physical characteristics, selection and use with certain vehicles
   Part 4. Implementing effective and sustainable food fortification programmes

3. **WHO, WFP&UNICEF (2006).** ***Preventing and controlling micronutrient deficiencies in populations affected by an emergency. Joint statement of the World Health Organization, the World Food Programme and the United Nations Children's Fund, 2006*****. Geneva: WHO.**
   Availability: downloadable pdf format in English
   Contact: http://www.who.int/nutrition/publications/micronutrients/en/index.html
   Provides guidance on the composition of multiple micronutrient supplements for women and children.

4. **WHO&UNICEF (2006)** ***Iron supplementation of young children in regions where malaria transmission is intense and infectious disease highly prevalent***
   Availability: downloadable pdf format in English
   Contact: http://www.who.int/nutrition/publications/micronutrients/en/index.html
   Results from a large scale iron and folic acid supplementation trial were published in 2006 and indicated negative affects when children without iron deficiency were supplemented in a malaria endemic area. This statement was issued by WHO in response to these results and recommends that iron and folic acid supplements are only targeted to those with anaemia in areas where the prevalence of malaria or other infectious diseases is high.

5. **WHO&UNICEF (2004)** ***Focusing on anaemia: Towards an integrated approach for effective anaemia control***
   Availability: downloadable pdf format in English
   Contact: http://www.who.int/nutrition/publications/micronutrients/anaemia_iron_deficiency/en/index.html

6. **WHO, UNICEF&IVACG Task Force (1997)** ***Vitamin A supplements: a guide to their use in the treatment and prevention of vitamin A deficiency and xerophthalmia***
   Availability: downloadable pdf format in English
   Contact: http://www.who.int/nutrition/publications/micronutrients/vitamin_a_deficieny/en/index.html

7. **WHO (2003)** ***Nutrient requirements for people living with HIV/AIDS: Report of a technical consultation*****. World Health Organization, Geneva, 13-15 May 2003**
   Availability: downloadable pdf format in English
   Contact: http://www.who.int/nutrition/publications/hivaids/en/index.html
   GUIDELINES that contain the current consensus view on the nutritional requirements of people living with HIV/AIDS. Please note that knowledge in this area is evolving and these recommendations may well be subject to change in the near future.

Training courses

8. **FSAU and FAO (2000).** ***Micronutrient Flip Chart*****.**
   Availability: downloadable pdf format in English
   Contact: http://www.fsnau.org/products/manuals-guides
   FLIP CHARTS on micronutrients designed for training for mid-level management of health workers with a health background. A facilitator's script with questions is included. This was designed for use in Somalia but can be applied elsewhere.

9. **UNHCR and UCL-CIHD (2003)** ***Micronutrient Malnutrition – Detection, Measurement and Intervention: A Training Pack for Field Staff*****.**
   Availability: downloadable PowerPoint files in English
   Contact: www.ucl.ac.uk/cihd/research/nutrition/tools
   A TRAINING COURSE on micronutrient malnutrition made up of POWER POINT presentations, Handouts and Photo cards aimed at raising awareness of micronutrient deficiencies among health and nutrition field staff. Material from this course has been used extensively in the design of this module.
   Session 1: Important Nutrition Concepts
   Session 2: Micronutrient Deficiency Diseases
   Session 3: Detection and Prevention

ISBN: 978-1-908182-00-5

Produced by the Emergency Nutrition Network (ENN)
32, Leopold Street, Oxford, OX4 1PX, UK.
www.ennonline.net