Unit 3 – Micronutrient Deficiency Control Programmes

Introduction

Welcome to Unit 3, the final Unit of this module. In it, we introduce three key strategies for addressing micronutrient deficiencies at the Public Health level. These include micronutrient supplementation, food fortification and dietary diversification. These strategies can be combined with other Public Health measures such as parasite and diarrhoeal disease control. In the course of this Unit, you will investigate micronutrient deficiency control programming (or intervention) for each strategy.

It is sobering to think that one in every four people in the world suffers from micronutrient deficiencies. Thus, one quarter of the world does not receive adequate nutrition to grow up healthy and productive. To cite some examples, iodine deficiency is the most common cause of preventable mental retardation in the world today. Children born with iron deficiency have been estimated to lose the potential of at least 10 IQ points compared to those born without iron deficiencies. Globally, at least 40 million children are affected by vitamin A deficiency which poses a Public Health risk or crisis, because the extent and health consequences of this micronutrient deficiency.

Combating and preventing Public Health risk or crisis arising from micronutrient malnutrition is the focus of Unit 3. These key intervention strategies can be used to shift at-risk groups from a state of risk or crisis to a state of nutrient sufficiency and health.

Unit 3 contains four Study Sessions:

Study Session 1: What Makes Micronutrient Programmes Work?
Study Session 2: Micronutrient Supplementation Programmes.
Study Session 3: Food Fortification Programmes.
Study Session 4: Dietary Diversification.

In the first Study Session, we explore selected programme reviews to identify some of the factors that contribute to or hinder success in micronutrient interventions; in each of the following three sessions, we explore one of three key

micronutrient intervention strategies. The implications for programming are considered in relation to each strategy to address micronutrient deficiency.

By the end of Unit 3, you should be able to:

- Describe key components, processes and outcomes of successful micronutrient programming.
- Identify lessons behind successful nutrition programmes.
- Describe three key strategies for addressing micronutrient malnutrition.
- List the merits and shortfalls of each of these strategies.
- Describe key components of a micronutrient supplementation programme.
- Discuss trends in reducing micronutrient deficiencies through micronutrient intervention strategies.
- Describe micronutrient programme indicators.
- Summarise the impact on health, disease and development, of micronutrient deficiency control programmes.
- Discuss factors contributing to the need for food fortification programmes.
- Describe key components of a food fortification programme.
- Discuss factors contributing to the need for food diversification programmes.
- Describe key components of a food diversification programme.
- Summarise the impact of food diversification programmes on food security and development.
- Discuss role of food diversification in reducing micronutrient deficiencies.
- Describe food diversification programme indicators.
- Develop a micronutrient intervention programme.

We wish you well with this final Unit and hope that you will be able to relate these strategies to your work in the nutrition field. However, before you embark on the first Study Session, take a good look at Assignment 2. This will help you to study purposefully and to be ready to submit the assignment timeously.

Unit 3 - Session 1
What Makes Micronutrient Programmes Work?

Introduction

Welcome to the first session of Unit 3. This Session aims to present you with a series of lessons from successful and less successful micronutrient programmes. These have been documented in various reviews, illustrating how malnutrition, including micronutrient malnutrition, can be effectively addressed on a large scale, at a reasonable cost, through appropriate programmes and strategies backed by sustained political support at all levels.

We will also explore the various elements of nutrition programming, through reviewing selected case studies, using the Triple A Approach (Assessment, Analysis and Action) as the framework for analysing the interventions.

Successful nutrition programming at a Public Health level has, in part, to do with contextual factors that provide an enabling and supportive environment. In addition to making use of favourable contextual factors, certain programme factors contribute to successful programmes. These include the design, implementation, and management of the programme. Both the contextual and programme factors, and the way they interact, will be examined, in order to understand the dynamics behind their success and the potential impact of constraining factors.

Session Contents

Timing of this session

This session contains eight readings and four tasks. It should take you about five hours to complete.

1 LEARNING OUTCOMES OF THIS SESSION

By the end of this session, you should be able to:
▪ Describe key components, processes and outcomes of successful nutrition programming. ▪ Identify lessons behind successful nutrition programmes.

2 READINGS

You will be referred to the following readings in the course of this session. Use the author's initial to find the page numbers in the alphabetical index of the Reader.

Reading	Reference details
Deitchler, M., Mason, J., Mathys, E., Winichagoon, P. & Tuazon, M. A.	(2004a). Lessons from Successful Micronutrient Programs, Part I: Program Initiation. *Food and Nutrition Bulletin*, Special Edition, 25(1): 5 - 29.
Witten, C., Jooste, P., Sanders, D. & Chopra, M.	(2004). Micronutrient Programs in South Africa – South Africa Case Study. *Food and Nutrition Bulletin*, 25(1). 7 - 17. [Online], Available: //www.inffoundation.org/
Maberly, G. F., Trowbridge, F. L., Yip, R., Sullivan, K. M. & West, C. E.	(1994). Programs Against Micronutrient Malnutrition: Ending Hidden Hunger. Annual Review of Public Health, 15: 277 - 301.
Deitchler, M., Mason, J., Mathys, E., Winichagoon, P. & Tuazon, M. A.	(2004b). Lessons from Successful Micronutrient Programs, Part II: Program Implementation. *Food and Nutrition Bulletin*, Special Edition, 25(1): 30 - 52.
Laillou, A., Monvois, C. & Berger, J.	(2003). Bisavit-A: An Innovative Solution to Combat Micronutrient Deficiency in Vietnam. *Sight and Life Newsletter,* 3/2003: 3 - 7.
Schelling,E. & Zinsstag, J.	(2003). Livestock Milk as an Important Source of Vitamin A for Nomadic Pastoralists of Chad. *Sight & Life Newsletter,* 1/2003: 35 - 39.

Mason, J., Deitchler, M., Mathys, E., Winichagoon, P. & Tuazon, M. A.	(2004). Lessons from Successful Micronutrient Programs, Part III: Program Impact (Vitamin A). *Food and Nutrition Bulletin*, Special Edition, 25(1): 53 - 67.
Houston, R.	(2003). *Why They Work: An Analysis of Three Successful Public Health Interventions. Vitamin A Supplementation Programs in Ghana, Nepal and Zambia.* Arlington, VA: MOST Project, USAID. [Online], Available: //http/www.mostproject.org/ i - 41.

3 GETTING STARTED

The first step in initiating a micronutrient intervention is, as we have said, Assessment which is the initial stage of the Triple A strategy. This includes assessing the conditions that exist in the community. Applying the UNICEF Conceptual Framework is useful in unpacking the determinants of the malnutrition problem, however, broader programming issues also need to be assessed, such as the state of the policy environment. A conducive policy environment at all levels, from district to national level, and even internationally, is essential to successful nutrition programming (Maberly et al, 1994).

Other factors that that are crucial when initiating micronutrient deficiency programmes may vary from one micronutrient to another, although many are common. For example, in embarking on control programmes for vitamin A and iodine deficiency, Deitchler et al note the importance, of "… national workshops and advocacy meetings …" (2004a: 25), but do not identify this process for iron deficiency. Can you think why? Some of the other key processes that you will read about in Deitchler et al, 2004 article are: establishing technical and inter-sectoral committees and developing a plan of action at local and/or national level. By now, you will also probably be well aware of the importance of planning monitoring and evaluation strategies at the outset of the programme.

In order to gain a critical understanding of some of the programme initiation factors that seem to lead to successful micronutrient programming, you are encouraged to explore these two readings, bearing Task 1 in mind. Remember that engaging with these tasks is crucial to reading and learning actively.

READINGS

Deitchler, M., Mason, J., Mathys, E., Winichagoon, P. & Tuazon, M. A. (2004a). Lessons from Successful Micronutrient Programs, Part I: Program Initiation. *Food and Nutrition Bulletin*, Special Edition, 25(1): 5 - 29.

Witten, C., Jooste, P., Sanders, D. & Chopra, M. (2004). Micronutrient Programs in South Africa – South Africa Case Study. *Food and Nutrition Bulletin*, 25(1). 7 - 17. [Online], Available: //www.inffoundation.org/

TASK 1 – SUCCESS FACTORS OF MICRONUTRIENT PROGRAMMES

Use Deitchler et al (2004a) for this task. In order to identify factors which influence the success of micronutrient programmes:

a) Identify the key *programme initiation* processes which the authors recommend, and explain why they are important to the success of an intervention.

b) Take one micronutrient, e.g. vitamin A deficiency, as an example. Identify whether any of these steps have been followed in your own country. How possible would it be to initiate these steps in the present policy environment of your own country? Read the case study by Witten et al (2004) to get an insight into the process in South Africa.

FEEDBACK

We hope you found this task interesting.

a) Programme initiation processes

The comparison of the programme initiation process for different countries is summarised in Table 1 of Deitchler et al, (2004a) (page 6), and on page 25 of the article in the form of "Lessons learned …" Here are two examples: check your answers against them.

The authors identified that national surveys were carried out in all countries in relation to all the key micronutrients (constituting the essential Assessment step of the Triple A strategy). The rationale for such surveys is obvious, but an essential part of the surveys was comparing national data to international findings on the association of such micronutrient deficiencies with Public Health consequences. Look carefully at what indicators were used in these respective surveys.

National workshops were convened in the case of Vitamin A deficiency in some countries, the purpose of which was to build awareness amongst potential

collaborating organisations, government representatives and other interested parties. Did you note the variation of this process in relation to iodine deficiency control programmes?

You should have discussed at least four processes in relation to programme initiation.

b) Relating the programme initiation process to your own country context
In South Africa, substantial improvements have been achieved in Iodine Deficiency control since 1995. The programme was initiated in response to the challenge issued at the 1990 World Summit for Children, to eliminate Iodine Deficiency Disorder by 2000. A series of studies were conducted by the Medical Research Council, and a national survey was commissioned by the Department of Health (Witten et al, 2004). Sub-committees would have been established to oversee and monitor the process, and a plan of action was likely to have been drawn up for implementation, although this is not noted.

On the other hand, despite a survey conducted in 1994 of vitamin A deficiency, no supplementation programmes have been embarked upon on any significant scale (Witten et al, 2004). Food fortification was however successfully achieved in the wake of the national survey, and consultations undertaken by the Directorate of Nutrition of the Department of Health. A working relationship was established amongst nine universities who teach nutrition and dietetics in South Africa through their being jointly awarded the tender for the survey. A Food Fortification Task team was established by the Directorate of Nutrition, to manage programme design (Witten et al, 2004). In both programmes, there is clear evidence that monitoring was built in from the outset of the programmes. As Deitchler et al (2004a) outline, programme initiation processes are as important as implementation, and set up the context for successful intervention. Now that you have explored programme initiation, we will explore the processes of design and implementation of a programme.

4 PROGRAMME DESIGN AND IMPLEMENTATION

Although there is no blueprint for programme design, most reviews of micronutrient programmes note that success is not linked to any particular implementation framework but more to strategic approaches that are context specific, well targeted, and include a monitoring and evaluation component. Along with programme content and organisation, *coverage* and *intensity* are key considerations.

In order to design and develop effective programmes, the assessment process should also have taken account of available resources, the role and participation

of key stakeholders, community mobilisation and sustainability in terms of funding and time available (Maberly et al, 1994). Note that Maberly et al (1994) also introduce intervention strategies at the global and national levels, and suggest combined strategies for surveillance of different micronutrient programmes.

READING
Maberly, G. F., Trowbridge, F. L., Yip, R., Sullivan, K. M. & West, C. E. (1994). Programs Against Micronutrient Malnutrition: Ending Hidden Hunger. *Annual Review of Public Health*, 15: 277 - 301.

TASK 2 – KEY COMPONENTS OF MICRONUTRIENT PROGRAMME DESIGN

Use Maberly et al (1994) for this task.
a) Identify some of the global factors that have fed into eliminating micronutrient deficiencies.
b) List the key components cited by these authors in designing a micronutrient control programmes.

FEEDBACK

a) Factors that have supported programmes for eliminating micronutrient deficiencies

Maberly et al (1994) describe some of the global initiatives that have been so important in challenging heads of state, policy makers and the health sector to take action against micronutrient malnutrition. These global policies, plans and declarations are a key factor in motivating action at national level. As a Public Health professional in the field of nutrition, you should be familiar with all of them.

b) These authors identify the following components of programme design:

- communications and social marketing;
- advocacy, such as convening meetings of governmental, non-governmental and international partners, to discuss the implications of the problem and potential interventions;
- interventions: dietary diversification, fortification and enrichment; massive treatment; indirect methods, e.g. improving sanitation;
- monitoring, evaluation and surveillance in which they include identifying high-risk populations, monitoring programme implementation and combining surveillance strategies;
- developing a plan of action, at local and/or national level, which includes, for example, national legislation for salt iodisation and micronutrient fortification;
- establishing technical and inter-sectoral committees.

Within this framework, it is as important to note that the linkage between these components is as important as the components themselves. In addition, Maberly

et al (1994) place emphasis on the fact that interventions need to be appropriate, accessible and acceptable to the target group and that the target group should be able to afford the products of the intervention, in terms of money and time.

Beyond such design issues, lie critically important considerations of *how* these activities should be implemented, managed and monitored. Experience shows that success in micronutrient programming requires more than just the achievement of certain desirable outcomes, such as increased vitamin A uptake. It requires that these outcomes should be achieved by way of a good process. In other words, both the means and the ends are important, because outcomes achieved are unlikely to endure, without establishing an appropriate process (Allen & Gillespie, 2001).

In the task that follows, you will be asked to explore some of the factors that support or constrain the establishment and implementation of a micronutrient control programme.

READINGS

Deitchler, M., Mason, J., Mathys, E., Winichagoon, P. & Tuazon, M. A. (2004b). Lessons from Successful Micronutrient Programs, Part II: Program Implementation. *Food and Nutrition Bulletin*, Special Edition, 25(1): 30 - 52.

Laillou, A., Monvois, C. & Berger, J. (2003). Bisavit-A: An Innovative Solution to Combat Micronutrient Deficiency in Vietnam. *Sight and Life Newsletter,* 3/2003: 3 - 7.

Schelling, E. & Zinsstag, J. (2003). Livestock Milk as an Important Source of Vitamin A for Nomadic Pastoralists of Chad. *Sight & Life Newsletter,* 1/2003: 35 - 39.

TASK 3 – CONSTRAINTS AND RISKS IN DESIGNING MICRONUTRIENT PROGRAMMES

Using Deitchler et al (2004b), discuss the shortfalls of:
a) Inconsistent micronutrient assessment methodologies, e.g. surveys, screening systems.

b) A lack of research and reporting, i.e. a monitoring and evaluation system.

Using Laillou et al (2003) and Schelling et al (2003):
c) Discuss and compare the different programme designs used to achieve decreased vitamin A deficiency (VAD) with regard to target population, coverage and cultural habits.

FEEDBACK

a) The shortfalls of inconsistent micronutrient assessment methodologies, e.g. surveys, screening systems, can lead to incomplete estimates of the prevalence of a deficiency, which in turn leads to incorrect targeting and monitoring, and then incorrect measurement of impact.

b) A lack of research and reporting, i.e. a monitoring and evaluation system, can lead to inadequate (even incorrect) data to describe the programme's success regarding management, supply, targeting, uptake, impact and cost-effectiveness.

c) How these programme designs addressed targeting the population, coverage and cultural habits
Both programme interventions were based on food that was acceptable to the target group and that the target group usually consumed, therefore fitting in with cultural habits This factor would have enhanced coverage and success.

This task should have helped you build your understanding regarding some of the elements for success in programme design and implementation. While there are many operational demands for a successful programme, there is always the process that underpins that success. In short, *how* you implement the programme is just as important as *what* you do.

5 PROGRAMME SUSTAINABILITY

A programme may be deemed successful by virtue of its improved nutrition outcomes in the short term, but such effects may not endure, particularly if there are deficiencies in the process through which they were achieved. Process factors, as we have said, are critical for sustained success, and should also be evaluated to capture the totality of change.

Process includes capacity building, and relates most importantly to the way in which changes occur in peoples' capabilities and behaviours. These are likely to result in improved access and uptake of micronutrient programmes. Participation, ownership and empowerment are important aspects of such a process, and are critical to long-term sustainability. If real sustainability is to be achieved, then the process through which nutrition improves should be seen as part of the ultimate goal, not just the means. Consideration should be given to sustainability during the planning and implementation stages. In recent programme reviews, the following factors were found to be particularly important: human resources, financial viability and organisational sustainability (Jennings et al, 1991; Ndure et al, 1999; Sanders, 1991).

In order to learn more about micronutrient programme design in relation to sustainability, please use these readings to do Task 4.

READINGS

Mason, J., Deitchler, M., Mathys, E., Winichagoon, P. & Tuazon, M. A. (2004). Lessons from Successful Micronutrient Programs, Part III: Program Impact (Vitamin A). *Food and Nutrition Bulletin*, Special Edition, 25(1): 53 - 67.

Houston, R. (2003). *Why They Work: An Analysis of Three Successful Public Health Interventions. Vitamin A Supplementation Programs in Ghana, Nepal and Zambia.* Arlington, VA: MOST Project, USAID. [Online], Available: //http/www.mostproject.org/ i - 41.

TASK 4 – KEY PROGRAMME FACTORS FOR SUSTAINABILITY

Using the readings, discuss the lessons for strengthening sustainable and effective micronutrient control programmes in the context of vitamin A supplementation.

FEEDBACK

Sustainability can be evaluated at the technical, financial and organisational levels, all of which are very important. In designing programmes, it is important to recognise that dependence on external donors and partners should be reduced over time, while at the same time developing capacity within a country or community. This implies that part of programme design should entail empowering members to undertake key aspects of sustaining the programme such as operationalising the programme, managing it and organising programme inputs. In addition, programmes should seek to build academic capacity building within them, to ensure that the research aspect of Assessment, and monitoring and evaluation are effectively achieved. There should also be continued advocacy for programme support and participation of communities in the planning process, as well as building awareness and creating demand.

Continued monitoring is also important to ensure coverage and to improve programme efficiency as well as to demonstrate cost-effectiveness. Intervention strategies should also be linked to other preventative services, such as health promotion interventions for pregnant women, or worm control amongst children.

6 SESSION SUMMARY

This session should have helped you to identify a number of elements which feed into developing effective and sustainable programmes. These measures start with identifying the extent of a micronutrient problem, clarifying the operational and technical challenges, developing client-focused delivery mechanisms, creating demand and providing ongoing feedback to all stakeholders through monitoring and evaluation systems. In addition, it involves developing mechanisms for sustainability of a programme. In short, applying the Triple A programming framework is a dynamic process, involving ongoing assessment, analysis and action, with clear logical and defined components and processes.

7 REFERENCES AND FURTHER READING

- **A**llen, L.H. & Gillespie, S.R. (2001). *What Works? A Review of the Efficacy and Effectiveness of Nutrition Interventions.* ACC/SCN-Asian Development Bank (ADB) Nutrition Policy Discussion Paper. Geneva: ACC/SCN.

- **G**illespie, S.R. & Mason, J. B. (1991). *Nutrition Relevant Actions*. ACC/SCN State-of-the-Art Nutrition Policy Discussion Paper No 10. Geneva: ACC/SCN.

- **G**illespie, S.R., Mason, J. B. & Martorell, R. (1996). *How Nutrition Improves.* ACC/SCN State-of-the-Art Nutrition Policy Discussion Paper No 15. Geneva: ACC/SCN.

- **J**ennings, J., Scialfa, T., Gillespie, S.R., Lotfi, M. & Mason, J.B. (1991). *Managing Successful Nutrition Programmes.* ACC/SCN State-of-the-Art Nutrition Policy Discussion Paper No 8. Geneva: ACC/SCN.

- **H**elen Keller International (HKI) Cambodia. (2000). Routine Immunization Outreach is a Good Strategy for Delivering Vitamin A Capsules to Cambodian Children. *Nutrition Bulletin*, 2(3): 21 - 28.

- **M**aberly, G. F., Trowbridge, F. L., Yip, R., Sullivan, K. M. & West, C. E. (1994). Programs Against Micronutrient Malnutrition: Ending Hidden Hunger. *Annual Review of Public Health*, 15: 277 - 301.

- **N**dure, S. K, Sy, M. N; Nturi, M. & Diene, S. M. (1999). *Best Practices and Lessons Learnt for Sustainable Community Nutrition Programming.* Washington, DC: Sustainable Approaches to Nutrition in Africa (SANA), Office de Recherche en Alimentation et Nutrition Africaines (ORANA) and USAID.

- **S**anders, D. (1999). Success Factors in Community-based Nutrition Programmes. *Food and Nutrition Bulletin*, 20(3): 307 - 314.

- **W**itten, C., Jooste, P., Sanders, D. & Chopra, M. (2004). Micronutrient Programs in South Africa – South Africa Case Study. *Food and Nutrition Bulletin*, 25(1). 7 - 17. [Online], Available: //www.inffoundation.org/

Micronutrient Supplementation Programmes

Introduction

Welcome to Session 2 of Unit 3, which focuses on supplementation as an approach to addressing micronutrient deficiencies, one of a range of programmatic options to control and prevent micronutrient deficiency. The choice of strategy should be based on the prevalence and severity of deficiency, the government commitment to addressing the problem, the existing infrastructure and health resources, the cost-effectiveness of interventions and approaches, and the potential for multi-pronged interventions such as food fortification and/or dietary diversification.

Supplementation is the method of choice when *therapeutic treatment* is necessary - that is, to address *severe micronutrient deficiency*. Supplementation is also an appropriate tool for preventative programmes, as long as the distribution system can be maintained, and those receiving the supplements continue to consume them. Supplementation has been shown to be highly cost-effective in achieving its nutritional goals and health impact.
In this Study Session, we explore a range of issues relating to supplementation programmes, including the key components, indicators and potential impact of such interventions. The session also emphasises the importance of programme monitoring in supplementation interventions, in order to provide information for improving the efficiency of implementation and coverage in different settings. In summary, the session explores some of the measures to ensure effective supplementation programmes.

Session Contents

Timing of this session

This session contains seven readings and four tasks. It should take you about four hours to complete.

1 LEARNING OUTCOMES OF THIS SESSION

By the end of this session, you should be able to:
▪ Describe key components of a micronutrient supplementation programme. ▪ Summarise the impact of micronutrient supplementation programmes on health, disease and development. ▪ Discuss trends in reducing micronutrient deficiencies through micronutrient supplementation programmes. ▪ Describe micronutrient supplementation programme indicators.

2 READINGS

You will be referred to the following readings in the course of this session. Use the author's initial to find the page numbers in the alphabetical index of the Reader.

Reading	**Reference details**
Deitchler, M., Mason, J., Mathys, E., Winichagoon, P. & Tuazon, M. A.	(2004a). Lessons from Successful Micronutrient Programs, Part I: Program Initiation. *Food and Nutrition Bulletin*, Special Edition, 25(1): 5 - 29.
Deitchler, M., Mason, J., Mathys, E., Winichagoon, P. & Tuazon, M. A.	(2004b). Lessons from Successful Micronutrient Programs, Part II: Program Implementation. *Food and Nutrition Bulletin*, Special Edition, 25(1): 30 - 52.
Helen Keller International, Cambodia	(Jan 2000). Vitamin A capsule distribution after NIDS – Lessons Learned from Cambodia. *Cambodia Nutrition Bulletin*, 1(2): 9 - 11.
Helen Keller International,	(Dec 2000). Routine Immunization Outreach is a Good Strategy for Delivering Vitamin A Capsules to Cambodian Children. *Cambodia*

Cambodia.	*Nutrition Bulletin,* 2(3): 9 – 11.
Helen Keller International, Bangladesh	(June 2004). Vitamin A Capsule Distribution among 6-11 Month Old Infants: More than 25% Not Covered. *Nutritional Surveillance Project Bulletin,* 15: 4 pages.
Reis, T. K., Seidel, R. E., Sudaryono, S.& Palmer, A.	(1996). The Use of Integrated Media for Promotion of Vitamin A Capsule Consumption in Central Java, Indonesia. In R. E. Seidel (Ed). *Strategies for Promoting Vitamin A Production, Consumption and Supplementation: Four Case Studies.* Washington, DC: AED, USAID: 44 - 55.
Shaw, W. D. & Green, C.P.	(1996). Vitamin A Promotion in Indonesia: Scaling up and Targeting Special Needs. In R. E. Seidel (Ed). *Strategies for Promoting Vitamin A Production, Consumption and Supplementation: Four Case Studies.* Washington, DC: AED, USAID: 56 - 78.

3 THE COMPONENTS OF MICRONUTRIENT SUPPLEMENTATION PROGRAMMES

The 1990 World Summit for Children set the goal of eliminating vitamin A deficiency (VAD) and iron deficiency anaemia by the year 2000. While some progress has been made, there is irrefutable evidence that deficiency of vitamin A and iron is still widespread among children in the developing world. This is why a global commitment to achieving such goals is so important, as is setting benchmarks for countries unable to reach that goal.

The importance of multiple strategies to control vitamin A and iron deficiency is well recognised. However, policy makers and programme managers are encouraged to focus on supplementation, in view of its remarkable benefits. Vitamin A supplementation programmes are a proven, rapid and effective strategy to combat micronutrient deficiency and result in savings accruing from a reduced burden on health services associated with improved micronutrient status. In addition, vitamin A supplementation is a low-cost, sustainable strategy which has been in place and effective for decades in some developing countries. However, supplementation has not necessarily proven to be a short-term measure (Mason et al, 2004). As you start with the first task, remember that engaging with tasks is crucial in reading and learning actively.

READINGS

Deitchler, M., Mason, J., Mathys, E., Winichagoon, P. & Tuazon, M. A. (2004a). Lessons from Successful Micronutrient Programs, Part I: Program Initiation. *Food and Nutrition Bulletin*, Special Edition, 25(1): 5 - 29.

Deitchler, M., Mason, J., Mathys, E., Winichagoon, P. & Tuazon, M. A. (2004b). Lessons from Successful Micronutrient Programs, Part II: Program Implementation. *Food and Nutrition Bulletin*, Special Edition, 25(1): 30 - 52.

TASK 1 – COMPONENTS OF MICRONUTRIENT SUPPLEMENTATION PROGRAMMES

Using Deitchler *et al* (2004a) & Deitchler *et al* (2004b):
a) Summarise key components of a vitamin A supplementation programme.
b) Briefly discuss the role of international development agencies in initiating and supporting a countrywide micronutrient supplementation programme.

FEEDBACK

a) We hope you found this task stimulating. It should have helped you to identify the key components of micronutrient supplementation programmes, which include:

- A national or community survey on the prevalence of vitamin A deficiency;
- Workshops, national and/or local on vitamin A deficiencies;
- Establishing technical committees;
- Resource mobilisation and alliance building, nationally and also with international agencies for support of the programme;
- Implementation of the programme which includes putting the following into action: supplement supply, delivery mode, training and capacity development, advocacy and awareness creation;
- Monitoring and evaluation of both coverage and impact.

b) The role of international development agencies in supplementation programmes includes collaboration in the planning and implementation of the programme, provision of supplements and financial and technical support. In addition, logistical support is very important in the initiation phase of supplementation programmes.

From this discussion of supplementation programmes, you should have noted that most regions in the developing world have experienced shortfalls in reaching the goal of eliminating of vitamin A and iron deficiency through supplementation. More importantly, you may have recognised that supplementation is neither a short-term nor a quick fix intervention.

4 MODE OF DELIVERY

Some of the crucial considerations when choosing an intervention strategy are, as we have said:

- the prevalence and severity of deficiency;
- the government's commitment to addressing the problem;
- the existing infrastructure and health resources;
- the cost-effectiveness of interventions and approaches; and
- the potential for multi-pronged interventions such as food fortification and/or dietary diversification.

Supplements have the advantage that they can be administered quickly, at a reasonable cost; depending on existing delivery channels, capsule distribution can be implemented with relative ease. Critical to the success of preventative programmes is sustained periodic distribution and high coverage rates of the target population. Instrumental in coverage, is the mode of delivery of supplementation, meaning how you ensure that supplements reach members of the community regularly.

In Bangladesh, vitamin A capsule distribution reached only 55 percent of the children under five years old until it was incorporated into the 1995 NIDs campaign, whereafter capsule coverage increased to over 90 percent.

In December 1999, the WHO reported that more than 60 countries around the world distributed vitamin A capsules through national immunisation days for polio. In Africa alone, the number of countries increased from four in 1996 to 34 in 1999. However, polio campaigns are slowly being phased out. Vitamin A capsule distribution now needs a new vehicle, and the question is - can routine child health services such as the Expanded Programme on Immunisation (EPI) offer a new mode of delivery?

Use these case studies from Helen Keller International (HKI) (2000) on supplementation programmes in Cambodia, to identify challenges experienced in distribution of supplements in Task 2.

READINGS

Helen Keller International (HKI), Cambodia. (Jan 2000). Vitamin A Capsule Distribution after NIDS – Lessons Learned from Cambodia. *Cambodia Nutrition Bulletin*, 1(2): 9 - 11.

Helen Keller International (HKI), Cambodia. (Dec 2000). Routine Immunization Outreach is a Good Strategy for Delivering Vitamin A Capsules to Cambodian Children. *Cambodia Nutrition Bulletin,* 2(3): 9 - 11.

TASK 2 – MODE OF DELIVERY

a) Use the HKI case study from January 2000 for this question. Briefly discuss some of the most common challenges encountered in distributing vitamin A capsules through immunisation programmes.

b) Using both case studies, explain why distributing vitamin A capsules through routine immunisation has not being able to reach optimal coverage (80%) amongst children under 5 years.

FEEDBACK

a) One of the challenges encountered by HKI in Cambodia was sustaining supplementation, once it became part of the routine Expanded Program for Immunization (EPI) after 1998. National Immunisation Days held during the pilot phase from 1996 - 7 showed far better coverage. Lower rates of coverage were also reported in remote areas away from cities. In addition, coverage decreased in relation to children 24 - 59 months old, who did not come to clinics specifically for immunisation. The coverage was also very low for pregnant women within eight weeks of delivery.

b) Vitamin A capsule distribution for children aged 6 -11 months is generally high, as this age group coincides with the target group for childhood immunisation programmes. However, reaching the targeted children becomes progressively more difficult with age. There are fewer opportunities to reach older children through health service contacts. As polio eradication is achieved in most countries, polio campaigns are no longer needed, and this channel for vitamin A capsule distribution is on the decline. Routine child health services, such as the Expanded Programme for Immunisation, are a feasible channel for supplementation. However, many countries miss the opportunity to use this channel, thus sacrificing coverage. Coverage rates can, however, also be affected by poor data capturing and reporting.

5 BEHAVIOUR CHANGE AND DEMAND CREATION

Despite the advances in our knowledge about the benefits of vitamin A, progress in eliminating its deficiency among affected populations has been disappointingly slow. As we have said, many contextual factors determine what strategy or combination of strategies is most appropriate for a particular country at a particular time. Programme reviews have illustrated that a comprehensive Information, Education and Communication (IEC) strategy is imperative in creating a demand and fostering community participation in the long term.

The principles of behavioural science and social marketing recognise that an individual's behaviour is directly influenced by their surrounding experiences, which involve social, economic, religious and cultural influences. Therefore market and social research for behaviour change and communication must focus in particular on the target community. In principle, research begins with the individual, and advances into the community. The demographics of the target population - economic and other factors - shape a society's basic values and should be investigated to develop an appropriate IEC strategy. In addition, the benefits of proposed preventative measures and the credibility and accessibility of potential prevention messages must be explored. From the information collected, strategies can be developed to encourage the target population to adopt the behaviour being promoted.

The next two case studies from Indonesia explore Information, Communication and Education (IEC) strategies in behaviour change and demand creation. These reviews describe how social marketing goes beyond communications activities into the design and implementation of all programme components, where communities are involved in decisions relating to design and implementation processes.

READINGS

Reis, T. K., Seidel, R. E., Sudaryono, S.& Palmer, A. (1996). The Use of Integrated Media for Promotion of Vitamin A Capsule Consumption in Central Java, Indonesia. In R. E. Seidel (Ed). *Strategies for Promoting Vitamin A Production, Consumption and Supplementation: Four Case Studies.* Washington, DC: AED, USAID: 44 - 55.

Shaw, W. D. & Green, C.P. (1996). Vitamin A Promotion in Indonesia: Scaling up and Targeting Special Needs. In R. E. Seidel (Ed). *Strategies for Promoting Vitamin A Production, Consumption and Supplementation: Four Case Studies.* Washington, DC: AED, USAID: 56 - 78.

TASK 3 – BEHAVIOUR CHANGE AND DEMAND CREATION

Using Reis et al (1996) and Shaw & Green (1996):
a) List the components of a comprehensive IEC strategy.
b) Discuss the role of an IEC campaign in improving coverage and sustainability.

FEEDBACK

a) You will find all the components of an IEC strategy in the reading, and we will therefore not reproduce this here.

b) In relation to improving sustainability, several successful programme examples demonstrated the key role that family behaviour plays in nutritional status, and how modifications in family practices can result in improved nutritional status. By putting a behaviour change focus into nutrition programme planning, social marketing assists in bringing programmes closer to community needs and thus enhances the potential for success.

6 MONITORING AND EVALUATING SUPPLEMENTATION PROGRAMMES

In the Triple A approach, monitoring fits into the cycle of assessment and analysis, second time around. We have already made the point that without good monitoring and evaluation, programme impact and success in terms of the programme goals cannot be determined. In supplementation programmes, monitoring is particularly important to ensure and sustain good coverage and effectiveness, and to enhance efficiency. Monitoring and evaluation also leads to better understanding of how deficiencies can be reduced in vulnerable groups.

A review of past programmes (Mason et al, 2004) revealed that in the supplementation interventions they studied, there was almost a total lack of attention to programme design and implementation, as well as poor programme monitoring.

For monitoring and evaluation of supplementation programmes, clear and precise indicators are necessary. Different indicators are also needed depending on whether you are engaged in monitoring or different forms of evaluation. Indicators are discussed in these readings, which you should use for Task 4.

READINGS

Deitchler, M., Mason, J., Mathys, E., Winichagoon, P. & Tuazon, M. A. (2004a). Lessons from Successful Micronutrient Programs, Part I: Program Initiation. *Food and Nutrition Bulletin*, Special Edition, 25(1): 5 - 29.

Deitchler, M., Mason, J., Mathys, E., Winichagoon, P. & Tuazon, M. A. (2004b). Lessons from Successful Micronutrient Programs, Part II: Program Implementation. *Food and Nutrition Bulletin*, Special Edition, 25(1): 30 - 52.

TASK 4 – SELECTING MONITORING AND EVALUATION INDICATORS

Using Deitchler, Mathys et al (2004a) and Deitchler, Mason, et al (2004b):

For vitamin A supplementation programmes, list possible indicators for:
a) Monitoring.
b) Impact evaluation.

FEEDBACK

a) For monitoring a vitamin A programme, the following indicators would be helpful:

Effectiveness and efficacy of the capsule.
Coverage rates.
Supplement uptake by health care centres or distribution points.
Knowledge of health workers.

b) For impact evaluation, the following indicators would be helpful:

Prevalence data on sub-clinical vitamin A deficiency: biochemical indicators of vitamin A deficiency, e.g. Serum retinol levels.
Clinical signs of vitamin A deficiency, i.e. Bitot's spots, night blindness.
Cost-effectiveness of the programme.

These are just a few indicators: there are different indicators that can be set for a programme, depending on the programme goals.

7 SESSION SUMMARY

Vitamin A and iron deficiency contribute significantly to premature death in young children, and successful supplementation programmes can lead to a significant reduction in the prevalence of these deficiencies. In this session you have investigated the key factors of successful supplementation programmes, and some of the challenges faced when delivering supplementation. You have, hopefully noted that good coverage is achievable with supplementation programmes. In addition, it has been emphasised that contextual factors must be taken into account in planning, that IEC strategies can be included to address behaviour change and create demand, and that monitoring is of key importance in addressing micronutrient deficiencies through supplementation programmes.

In the next session, we look at the second strategy for tackling micronutrient deficiencies at Public Health level: food fortification programming.

8 FURTHER READING

- **B**loem, M., Hye, A., Wijnrokos, M., Ralte, A., West, K.P., Sommer, A. (1995). The Role of Universal Distribution of Vitamin A Capsules in Combating Vitamin A Deficiency in Bangladesh. *American Journal of Epidemiology*, 142(8): 843 - 855.

- **A**khter, N., Strallkamp, G., de Pee, S., Panagides, D., Moench-Pfanner, R., Bloem, M. (2004). Vitamin A Capsule Distribution Among Infants in Rural Bangladesh aged 6 - 11 Months: More than 25% Not Covered. *Sight and Life Newsletter,* 3/2004: 26 - 27.

- **C**hilima, D.M., Kalimbira, A.A., Mtimuni, B.M., Mvula, N. (2004). Postpartum Vitamin A Supplementation in Malawi: Opportunities to Improve Coverage. *Sight and Life Newsletter,* 3/2004: 29 - 31.

- **P**an American Health Organization. (2001). *Integrated Vision for Vitamin A Supplementation in the Americas.* Regional Meeting Report HPP/HPN/MN/49 -17, 2 - 4 May 2001. Washington: PAHO.

- **G**riffiths, M. (2002). Communication Strategies to Optimize Commitments and Investments in Iron Programming. *Journal of Nutrition,* 132: 834S - 838S.

- **M**ason, J.B., Lotfi, M., Dalmiya, N., Sethuraman, K. & Deitchler, M. with Geibel, S., Gillenwater, K., Gilman, A., Mason, K. & Mock, N. (2001). *The*

Micronutrient Report: Current Progress in the Control of Vitamin A, Iodine, and Iron Deficiencies. Ottawa, Canada: Micronutrient Initiative/International Development Research Centre.

- **U**nited Nations Standing Committee on Nutrition. (1999). *Report of the Meeting of the Working Group on Vitamin A and Iron.* [Online], Available: www.unsystem.org/scn/Publications/ AnnualMeeting/SCN26/vitamina.html

- **U**NICEF. (18 -19 December 1997). *A Strategy for Acceleration of Progress in Combating Vitamin A Deficiency. Consensus of an Informal Technical Consultation Convened by the United Nations Children's Fund (UNICEF) in Association with The Micronutrient Initiative (MI), The World Health Organization (WHO), The Canadian International Development Agency (CIDA), The United States Agency for International Development (USAID).* New York.

Unit 3 - Session 3
Food Fortification Programmes

Introduction

Having explored micronutrient supplementation programmes in Session 2, we move on to the next broad strategy for addressing micronutrient deficiencies, namely food fortification. We focus on the process, advantages and disadvantages and the factors which have created an increased need for fortified foods, while at the same time creating opportunities for better fortification programmes. Before starting, can you think of one basic food in your own context which is fortified? With what nutrient is it fortified? Students from South Africa will probably think bread flour which has been fortified with vitamin A after 1994. So, what then do you understand by food fortification?

Food fortification is the process by which a nutrient is added to a commonly eaten food to improve the quality of a population's diet. It includes the addition of nutrients at levels higher than those found in the original or in comparable foods. The food that carries the nutrient is referred to as the *food vehicle,* and the nutrient added is the *fortificant*. Food fortification is usually undertaken when there is a widespread and consistent nutritional deficit in the population's diet, and has been commonly used as a method to control micronutrient deficiencies.

Session Contents

Timing of this session

This session contains three readings and six tasks. It should take you about five to six hours to complete.

1 LEARNING OUTCOMES OF THIS SESSION

By the end of this session, you should be able to:
▪ Discuss factors contributing to the need for food fortification programmes. ▪ Describe key components of a food fortification programme. ▪ Summarise the impact of food fortification programmes on health, disease and development. ▪ Discuss trends in reducing micronutrient deficiencies through food fortification programmes. ▪ Describe food fortification programme indicators.

2 READINGS

You will be referred to the following readings in the course of this session. Use the author's initial to find the page numbers in the alphabetical index of the Reader.

Reading	Reference details
FAO & ILSI	(1997). *Preventing Micronutrient Malnutrition: A Guide to Food-based Approaches. A Manual for Policy Makers and Programme Planners.* Washington, D.C: ILSI Press: 1 – 106. [Online], Available: // www.fao.org/
Deitchler, M., Mason, J., Mathys, E., Winichagoon, P. & Tuazon, M. A.	(2004a). Lessons from Successful Micronutrient Programs, Part I: Program Initiation. *Food and Nutrition Bulletin*, Special Edition, 25(1): 5 - 29.
Deitchler, M., Mason, J., Mathys, E., Winichagoon, P. & Tuazon, M. A.	(2004b). Lessons from Successful Micronutrient Programs, Part II: Program Implementation. *Food and Nutrition Bulletin*, Special Edition, 25(1): 30 - 52.

3 DEVELOPING EFFECTIVE FOOD FORTIFICATION PROGRAMMES

Food fortification is an opportunity to intervene in situations of micronutrient malnutrition and to invest in a human opportunity. Scientist have long known how to prevent anaemia from iron deficiency, night blindness from vitamin A deficiency disorder and, cretinism from iodine deficiency disorder. Unfortunately, however, most methods to control micronutrient deficiencies, such as dietary diversification and supplementation, are not within the reach of those who need it most. Clinics that supply supplements may not be accessible to those in rural villages. Foods such as meat, fish and poultry, which are good sources of bioavailable iron, are relatively expensive, and often not affordable to those at risk. Furthermore, such foods may also be culturally inappropriate in a country where most diets are vegetarian or plant based. These are all issues of equity and access. Food fortification resolves many issues of equity and access, because it is population-based: the fortification of staple foods reaches those most vulnerable to nutritional deficiencies.

Another benefit of food fortification is that it is preventative. To prevent a child from being born a cretin, a deaf-mute or handicapped, iodine needs to reach the brain of the child when it is still in the mother's womb. The window of opportunity to reverse disabilities resulting from micronutrient disabilities is very narrow, or not present at all. As health workers, we need to be proactive and look to preventative strategies: food fortification is one of them.

The globalisation of the food industry means that more and more of the foods eaten in the global community are processed outside of our own countries. This increased distance between the consumer and the processor might jeopardise fortification programmes, e.g. in countries where imported staple foods are cheaper than those produced locally. However, many countries have laws in place which mandate the fortification of certain foods for consumption *within their borders*.

With the urbanisation of the developing world and the gradual change from traditional diets toward more processed foods, it is now even more important and in some ways easier, to fortify foods. USAID reports that "... rapid urbanization rates are changing the composition of the types of nutrient sources for many people. Consumption of processed foods tends to increase with urbanization and increased income. For example, in Latin America, up to 33 percent of the average food budget is spent on foods prepared outside the home. In rural Guatemala, 25 percent of food money was spent on commercial foods and

beverages. Therefore, improving the nutrient quality and safety of available processed foods, benefits the population" (Nestel, 1993).

Do you know if there are any food fortification programmes in your country? Try to find out by contacting the government departments responsible for health or agriculture. You can also try to contact facilities or NGOs that are involved in nutrition programmes or nutrition research in your country.

The benefits of food fortification have been listed as follows:
- Fortification does not usually require change in the dietary habits of the population.
- Given the appropriate food industry infrastructure, fortification can be implemented relatively quickly and can be sustained over a long period.
- Food fortification is a population-based approach;
- Food fortification is preventative; and
- Food fortification is cost-effective.

Use the manual produced by the Food and Agricultural Organisation (FAO) on food fortification programmes to complete Tasks 1 and 2.

READINGS

FAO & ILSI. (1997). *Preventing Micronutrient Malnutrition: A Guide to Food-based Approaches. A Manual for Policy Makers and Programme Planners.* Washington, D.C: ILSI Press: 1 - 106. [Online], Available: //www.fao.org/

TASK 1 - KEY COMPONENTS OF EFFECTIVE FOOD FORTIFICATION PROGRAMMES

Using Section 2.5, Food Fortification of this reading, discuss the key components for developing and implementing an effective food fortification programme.

FEEDBACK

When planning a food fortification programme, one of the key components is *choosing an appropriate food vehicle*.

The following specific criteria should be met when choosing the appropriate food vehicle to introduce the fortificant:
- The food should be consumed by all population groups or by the majority of the target population that is at risk or vulnerable to nutritional deficiencies.
- The food should be used regularly and in consistent amounts.
- The taste, appearance and smell of the food should not change.
- The fortificant should remain stable under extreme conditions such as cooking, food processing, delivery and storage.

- The food should not be consumed in amounts that would present a risk of consumption at toxic levels of the fortificant.
- The food should not increase the market cost, in order to ensure affordability to the general population.

Other success factors for food fortification programmes are policy support, feasibility and safety, multiple sector support, economic and marketing incentives, an Information, Education and Communication (IEC) strategy, monitoring of micronutrient levels, strategies for sustainability and a food regulatory system.

TASK 2 – COMPONENTS OF LEGISLATION TO ENABLE FOOD FORTIFICATION

Using the same FAO & ILSI (1997) Manual as for Task 1, list and discuss the major components of legislation to enable food fortification programmes. In addition, list a set of regulatory measures to ensure quality assurance and control in an effective food fortification programme.

FEEDBACK

The components of legislation to enable effective food fortification programmes are as follows: Designation of a government agency (usually the minister of health) with the responsibility to issue and enforce enabling regulations for each fortification measure, and the authorisation to fortify foods.

For quality assurance and control, the following measures would be required:
- Regulations which would cover: foods for which fortification is mandatory; the type, quality and amount of fortificant to be added; the minimum levels required at production or port of import; distribution and consumption planning; labelling specifications and quality control and monitoring, with regular mandatory reporting.
- Enforcement of regulations and penalties for non-compliance.

Now that you have an overview of food fortification programmes, we will explore some examples of fortification programmes, and the lessons that they offer.

4 LESSONS FROM SUCCESSFUL FOOD FORTIFICATION PROGRAMMES

Many of us are not aware of the extent of food fortification in our own or other countries, and how long such strategies have been practised. Here is a little background information.

In industrialised countries, where processed foods are widely consumed and the industry is streamlined, food fortification has played a major role in improving the diet. On the other hand, for the rural poor where fortified foods are not part of their regular diet, and are not easily available nor accessible, the potential of programmes to succeed in addressing micronutrient deficiencies is considerably reduced.

Through fortification, a number of countries have eliminated nutritional deficiencies in the past. For example, in the early 1900s in Denmark, there was a high incidence of night blindness recorded resulting from vitamin A deficiency (VAD) in children. Decades later the problem disappeared after margarine was fortified with vitamin A. Vitamin D deficiency and rickets was also widespread throughout Europe and North America until milk was fortified with both vitamins A and D. In the United States, pellagra caused more than 3 000 deaths during the 1930s. Fortification of bread with niacin eliminated the problem.

In developing countries, food fortification has been rapid since the early 1990s, when the World Summit on Children and the International Conference for Nutrition focused the attention of the international community on the goal of reducing micronutrient nutritional deficiencies. For example, major progress has been made in reducing iodine deficiency through salt iodisation. Many countries have achieved the goal of Universal Salt Iodization, but progress has not been even across the regions. In Latin America, where 90 percent of all households have access to iodised salt, all nations have mandatory legislation to this effect. However, in South and South East Asia, iodised salt coverage ranges from 20-90 percent. In areas where households consume iodised salt, the total goitre rate in children has dropped dramatically.

Progress with other crucial micronutrients like iron and vitamin A has been modest. In some countries of Central America like Guatemala and Honduras, fortification of sugar with vitamin A demonstrated a significant improvement in vitamin A status of the population. In the past decade, universal fortification with multiple micronutrients of wheat and corn flour has been achieved in several Latin American countries. In Chile and Venezuela, iron fortification dramatically improved the iron status of the population and the rate of iron deficiency anaemia (IDA) is less than 1 percent.

Asian societies, on the other hand, are predominantly rice eating, and technologies to fortify rice are limited. In Thailand, however, other foods like noodles and fish sauce are fortified with micronutrients. As wheat flour consumption in Asia rises, many countries in the region such as India, Indonesia and the Philippines have initiated programmes for fortification of flour with iron, vitamin A, folic acid and other B vitamins. Thus there has been considerable progress in fortification technology. Yet vast populations in the region still remain affected by micronutrient nutritional deficiencies in spite of the fact that public and private producers could achieve elimination of these deficiencies through organised production, marketing and distribution of fortified foods (OMNI, 1994).

While fortified complementary infant foods are now widely used in industrialised countries, they are beyond the reach of the poor in developing countries. The challenge is to increase the density of complementary foods, with multiple fortifications of essential vitamins and minerals, at an affordable price. The industry has the opportunity to create such nutritious foods and improve the growth potential of poor children.

Success in food fortification, however, requires active collaboration between several sectors, including the scientific community, government agencies, private industry, consumer groups and international organisations. The potential of public-private partnerships in this regard is crucial. In the next task, you are asked to explore this issue, using Deitchler et al (2004).

READINGS

Deitchler, M., Mason, J., Mathys, E., Winichagoon, P. & Tuazon, M. A. (2004a). Lessons from Successful Micronutrient Programs, Part I: Program Initiation. *Food and Nutrition Bulletin*, Special Edition, 25(1): 5 - 29.

TASK 3 – THE ROLE OF PRIVATE-PUBLIC PARTNERSHIPS

a) Using Deitchler et al (2004a), what nutrition role can private-public partnerships play in food fortification programmes?
b) Who should carry the ultimate cost for accessing micronutrient-rich foods?

FEEDBACK

a) The scientific community has identified the problems of micronutrient malnutrition and possible solutions, including enrichment of foods. National governments play an equally important role in providing administrative support and prescribing the framework within which solutions can be implemented and regulated. Food fortification serves the needs of the public sector to reduce malnutrition and sustain economic growth.

The private food industry, however, has equally compelling reasons for the production of fortified foods. Raising product quality through fortification is likely to stimulate demand for regional products, and intensify competition and trade. In the light of their potential role, it is important to include the food industry in one's micronutrient advocacy strategies.

Since food fortification is one of the major strategies to reduce micronutrient malnutrition in developing countries, it offers a unique opportunity for the industry to simultaneously expand its market and profitability, while playing a key role in improving health and the nutritional status of the population. The bigger manufacturers are also seldom reluctant to engage in these strategies, although smaller companies might find the process too costly.

In order to have an effective and sustainable fortification programme, it is vital that the public and private sectors work in close collaboration, understanding and recognising each other's interests and concerns. The industry could be involved in developing technology for food fortification and quality control. In addition, international agencies have a role to play in this process, by providing initial advocacy and technical or funding support for development of intervention strategies. Simultaneously, the consumer must be educated regarding the benefits of food fortification, in order to create a demand to which industry would have to respond, as well as future markets for fortified products.
Creating demand for fortified foods is the topic of the next section.

5 BEHAVIOUR CHANGE AND DEMAND CREATION IN FOOD FORTIFICATION PROGRAMMES

In the field of food fortification, there are a number of challenges. Although synthetic vitamins are available in the developed world, for supplements, food products and animal feed, the market for nutrient additives has been limited. In developing countries, the need to fortify staple foods, such as rice, wheat and sugar, is much more pressing, but has only been initiated recently. Why do you think this is so?

One of the challenging issues is the choice of food vehicle. We have already noted that flour fortification was not the most suitable choice for Asian countries where rice is the staple food. Another factor which may constrain private investment in the fortified food market is the relatively high development and start-up costs of technologies for fortification. In Indonesia, rice has been fortified with vitamin A and/or iron, but further work is needed to develop other suitable products. In some sectors, the private sector's high investment in development may need to be complemented by public measures for distribution and marketing.

Another issue for developing country contexts is that distribution strategies may not be developed and regulatory systems are often not in place to ensure that food fortification programmes succeed. For example, the technology for double fortification of salt with iron and iodine was developed in India in the early 1990s, but it is yet to find large-scale application.

Key to the success of food fortification programmes is demand creation and behaviour change amongst consumers. Lack of public awareness of micronutrient malnutrition and low consumer demand for fortified products is perhaps the most important factor. For private investors, lack of consumer awareness and demand means a relatively slow return (Nestel, 1993).

Now return to the FAO & ILSI (1997) manual and do Task 4.

READINGS

FAO & ILSI. (1997). *Preventing Micronutrient Malnutrition: A Guide to Food-based Approaches. A Manual for Policy Makers and Programme Planners.* Washington, D.C: ILSI Press: 1 – 106. [Online], Available: /www.fao.org/

TASK 4 - KEY DECISIONS IN DEVELOPING A PROMOTION STRATEGY

Referring to Section 2.5, Food Fortification of this manual, outline the key decisions in developing a promotion strategy to change food behaviour in a food fortification programme.

FEEDBACK

Your outline of decisions for a promotions strategy should include components such as:

- What food or dietary changes should be promoted?
- Who should the message reach?
- How should the message be presented?
- What communication channels should be used for maximum impact?
- What resources are needed for implementation?
- How will the programme be monitored?

Apart from legislative and regulatory measures, as well as public-private investment in the process, food fortification programmes cannot be effectively implemented without a fully developed promotions strategy aimed at creating demand and changing consumer behaviour. Ensuring that programming is taking place according to planned objectives is the topic of the next section.

6 MONITORING AND EVALUATING FOOD FORTIFICATION PROGRAMMES

While an intervention is ongoing, it is necessary to assess programme coverage and progress towards achieving programme goals. Monitoring and evaluation is also important in improving programme effectiveness and efficiency.

Monitoring food fortification programmes differs from monitoring other micronutrient deficiency control interventions, because it is concerned with the quality and availability of the product of a food-processing company as it moves from factory to consumer: this involves monitoring the interaction between public regulatory agencies, private industry, trade and public health services (Deitchler et al, 2004b). To some extent, it is the effort that is being put into achieving the goals of food fortification that must be monitored in relation to this process. Before reading Deitchler et al, Part II (2004b), try Task 5.

TASK 5 – DEVELOPING A MONITORING AND EVALUATION FRAMEWORK FOR FOOD FORTIFICATION PROGRAMMES

Brainstorm a set of indicators for monitoring and evaluating the impact of a programme involving the fortification of salt with iodine.

READINGS

Deitchler, M., Mason, J., Mathys, E., Winichagoon, P. & Tuazon, M. A. (2004b). Lessons from Successful Micronutrient Programs, Part II: Program Implementation. *Food and Nutrition Bulletin*, Special Edition, 25(1): 30 - 52.

FEEDBACK

Now use Deitchler et al, Part II (2004) to check your answer. All micronutrient deficiency control programmes need a monitoring and evaluation framework with clear and precise indicators.

Indicators for Iodine Fortification of Salt

Monitoring indicators	Impact indicators (sub-clinical and clinical deficiency indicators)
a) Quality assurance of the iodine content of salt on a regular basis, which includes expected iodine content of salt at different points during production and/or import process. This includes production levels, levels after packaging, levels after storage, levels after transportation and levels at wholesale and retail points, if sold. If not sold, levels must be tested at the centres for distribution, e.g. schools, NGOs, health centres or any other distribution centres.	In order to evaluate impact, the following indicators could be used: - urinary iodine; - thyroid size; - levels of Neonatal Thyroid Stimulating Hormone. Comparing these findings with the original assessment, i.e. a survey of the prevalence of iodine deficiency disease IDD), will give an indication of the success of the programme. You would use the *Definition of Iodine Status of a Population Based on Median Urinary Iodine Concentration* (in Unit 1 Session 2) to assess change.
b) Availability, accessibility and consumption of iodised salt, i.e. coverage.	
c) Awareness creation and social marketing efforts.	
d) The target group's knowledge about the benefits of the micronutrient.	

Hopefully you have grasped the importance of monitoring and evaluation when it comes to micronutrient fortification. More importantly, however, you need a good grasp of the nature, stakeholders and strategy of each intervention approach in order to refine the indicators which will elucidate the efficiency and potential for success of a programme such as food fortification.

7 COMPARING TWO MICRONUTRIENT DEFICIENCY INTERVENTION APPROACHES

Before we conclude the session, think back to Unit 3 Session 2, in which you explored micronutrient supplementation as a strategy. By way of revision, complete Task 6.

TASK 6 – COMPARE TWO MICRONUTRIENT DEFICIENCY PROGRAMME APPROACHES

Compare supplementation and food fortification strategies using the following table.

Question	Micronutrient supplementation	Food fortification
Benefits		
Who benefits?		
Time frame for programme		
Vehicles for distribution		
Costs		
Key factors for success		
Monitoring indicators		
Stakeholders		
Need for social marketing/demand creation		
Sustainability		
Challenges		

FEEDBACK

The answers to this task are in your study sessions, so we will not give a full answer. However, it is important to note that short term strategies such as nutrient supplementation have been effective in providing immediate relief in several countries, but there is concern that this approach is not sustainable in the long term. Food fortification is a more cost-effective and sustainable solution than food supplementation. This is because it plays a major role in improving the diet and meeting the micronutrient needs of the population. This can be viewed as part of an integrated food-based strategy; others include dietary diversification, homestead production and improved food processing and storage.

8 SESSION SUMMARY

In this session, we have explored another nutrition intervention strategy, aimed at preventing micronutrient nutritional deficiencies and their consequences at population level. We have considered the process and components of food fortification, the regulatory requirements, and the importance of building relationships between public and private players. We have also explored some of the challenges faced when developing food fortification interventions in developing countries, and the importance of building awareness of the importance of micronutrients to health as well as a demand for fortified foods, if such programmes are to succeed. Finally, we have explored the specifics of monitoring evaluating the impact of food fortification programmes.

In the final session of this module, we move on to a third strategy that can be used to combat micronutrient deficiency, namely food diversification.

9 REFERENCES AND FURTHER READING

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- **U**NICEF/WHO. (1995). *Report of the UNICEF/ WHO Joint Committee on Health Policy, 13th session, January 30 - 31. JCHP 30/95.7.* Geneva: WHO: 12 - 13.

- **W**HO. (1992). *National Strategies For Overcoming Micronutrient Malnutrition EB 89/27. 45th World Health Assembly Provisional Agenda Item 21.* WHO/A45/17. Geneva: WHO.

- **W**HO/UNICEF. (1995). *Global Prevalence of Vitamin A Deficiency.* WHO, Micronutrient Deficiency Information System (MDIS) Working Paper No 2. WHO/UNICEF Doc. WHO/NUT/95.3. Geneva: WHO.

- **W**HO/UNICEF. (1994). Indicators for Assessing Vitamin A Deficiency and Their Application in Monitoring and Evaluating Intervention Programmes. Geneva: WHO.

- **W**HO/UNICEF/ICCIDD. (1994). *Indicators for Assessing Iodine Deficiency Disorders and Their Control through Salt Iodization.* WHO/ NUT/94.6. Geneva: WHO.

- **W**orld Bank. (1994). *Enriching Lives: Overcoming Vitamin and Mineral Malnutrition in Developing Countries: Development in Practice.* Washington, DC: World Bank.

- **Y**ip, R.A. (2002). Prevention and Control of Iron Deficiency: Policy and Strategy Issues. *Journal of Nutrition,* 132: 802S - 805S.

Unit 3 - Session 4
Dietary Diversification

Introduction

Combating hunger rather than *hidden hunger* was the major item on the nutrition agenda in earlier years. In recent years, however, micronutrients have moved to centre stage. The current emphasis on micronutrients is likely to draw attention to the need for *nutritive quality* in the diet, and not just their energy and protein content. To this extent, the recent interest in micronutrients is welcome.

We must however not lose sight of the fact that micronutrient deficiencies in many parts of the world are often a part of general under-nutrition, including energy-protein under-nutrition. It is rare, for example, that one comes across a child with Bitot's spots or angular stomatitis in the absence of growth retardation. It is indeed even possible that
micronutrient deficiencies are the result of insufficient habitual food in the household, rather than poor *quality* of such foods. It will be unfortunate if the current euphoria over micronutrients leads us to the mistaken approach of trying to solve isolated micronutrient deficiencies with single (or even multiple) supplements, ignoring the basic necessity of overall improvement of household diets with respect to quality and quantity.

This food based, rather than drug-based, approach is termed *dietary diversification*. Dietary diversification represents a combination of actions. One action is the identification of food items (wild and cultivated), with high micronutrient content and bioavailability, and to promote their consumption. When the supply of these foods is low, interventions may aim to increase their availability by promoting cultivation of specific crops, or keeping livestock, assuming that this produce will be locally consumed. Another strategy is *in-home fortification* with the addition of *sprinkles* to home-prepared weaning foods. Sprinkles are an odourless colourless granular, multi vitamin or mineral, or single micronutrient powder, packed in single portion sachets. Additional strategies include promotion of income-generating activities, which improve purchasing power and allow people to buy specific nutritious food items, e.g. meat. This is an indirect way of improving supply and access to food.

Simultaneously the public should be made aware of the nutritious quality of the foods available to them, so as to enable informed choices. Behaviour change communication, rather than technological development, is an important tool in these strategies, which are often associated with more social objectives such as

empowering women or poor people in general, which in turn reinforces the dietary diversification strategy.

Session Contents

Timing of this session

This session contains five readings and four tasks. It should take you about five hours to complete. A logical break is at the end of Section 3.

1 LEARNING OUTCOMES OF THIS SESSION

By the end of this session, you should\ be able to:
▪ Discuss factors contributing to the need for food diversification programmes. ▪ Describe key components of a food diversification programme. ▪ Summarise the impact of food diversification programmes on food security and development. ▪ Discuss role of food diversification in reducing micronutrient deficiencies. ▪ Describe food diversification programme indicators.

2 READINGS

You will be referred to the following readings in the course of this session. Use the author's initial to find the page numbers in the alphabetical index of the Reader.

Author	Reference details
Helen Keller International, Bangladesh	(Sept 2003). HKI's Homestead Food Production Program Sustainably Improves Livelihoods of Households in Rural Bangladesh. *Homestead Food Production* Bulletin, 1. Dhaka: HKI. [Online], Available: //http/www.hkiasiapacific.org: 4 pages.
Helen Keller International, Bangladesh	(Nov 2004). Homestead Food Production Improves Household Food and Nutrition Security. *Homestead Food Production Bulletin,* 2. Dhaka: HKI. [Online], Available://http/www.hkiasiapacific.org: 4 pages.
Helen Keller International, Bangladesh.	(April 2002). Eggs are Rarely Eaten in Rural Bangladesh: Why and How to Improve their Availability. *Nutritional Surveillance Project Bulletin*, 11. Dhaka: HKI. [Online], Available: //http/www.hkiasiapacific.org: 4 pages.
FAO & ILSI	(1997). *Preventing Micronutrient Malnutrition: A Guide to Food-based Approaches. A Manual for Policy Makers and Programme Planners.* Washington, D.C: ILSI Press: 1 – 106. [Online], Available: // www.fao.org/
Solon, F., Briones, H., Hernanadez, J. R. & Shafritz, L. B.	(1996). Moving to Long-term Strategy: Vegetable Gardening and Consumption in the Philippines. In R. E. Seidel (Ed). *Strategies for Promoting Vitamin A Production, Consumption and Supplementation: Four Case Studies.* AED, USAID: Washington, DC: 27 - 42.

3 DEVELOPING AN EFFECTIVE FOOD DIVERSIFICATION PROGRAMME

Food-based approaches for improving nutritional status have generally started from a *vegetable paradigm*. This is true for biofortification (enriching staple crops), dietary diversification (yellow or orange fruits and vegetables or dark-green leafy vegetables), as well as post-harvest processing (processing of vegetable foods or vegetables as vehicles for fortification). Nevertheless, it is well known that animal foods contain more bio-efficacious micronutrients than vegetable foods. However, economic factors are believed to hamper increased animal food consumption by vulnerable groups in the short term. Solutions are therefore generally sought from vegetable foods (Ruel, 2003).

Recent research shows that micronutrient bio-efficacy in vegetable foods is even lower than had been previously assumed. Refer to Unit 1 Session 2 to refresh

your memory on these micronutrient levels. For example, 300 gram of spinach contains 2 600 µg of β-carotene, which converts to only 100 µg of serum retinol. This is a quantity that can also be obtained by consuming a mere 0.83 gram of chicken liver. This suggests that animal foods may be more promising micronutrient sources than plant foods. Furthermore, impact studies show that even modest consumption of animal foods by pregnant and lactating women, or children, significantly improves their health and the growth and cognitive development of the latter. These findings give reason for questioning the premise of prioritising existing approaches. Animal foods have strong advantages, which cannot be easily matched by a vegetable diet.

Our biological evolution has given us humans a natural craving for animal foods. People more readily accept animal foods than some vegetable foods propagated by existing approaches (Semba & Bloem, 2001), and animal food consumption rises spontaneously when incomes rise. These observations indicate, on the one hand, that we should adopt a broad developmental view of nutrition, i.e. one which is embedded in a socio-economic context. On the other hand, it remains a tough battle for physicians and nutritionists to reduce malnutrition as long as economic growth falters (Semba & Bloem, 2001).

In the first task of this session, you are asked to refer to the same FAO & ILSI (1997) manual that you used in the last session, and to explore some questions around food diversification programmes.

READINGS

FAO & ILSI. (1997). *Preventing Micronutrient Malnutrition: A Guide to Food-based Approaches. A Manual for Policy Makers and Programme Planners.* Washington, D.C: ILSI Press: 1 - 106. [Online], Available: /www.fao.org/

TASK 1 - BENEFITS OF FOOD DIVERSIFICATION PROGRAMMES

a) Describe the type of food based strategies that can form part of dietary diversification programmes.
b) Summarise the key benefits of food diversification programmes.

FEEDBACK

a) Here are some food based strategies that could form part of a dietary diversification programme:

- Small scale production (home gardens) of micronutrient rich foods, e.g. fruit and vegetables
- Community vegetable and fruit gardens

- School and health centre based gardens
- Small animal, fish and poultry production
- Supplementation programmes linked to other interventions

Note that all the above must be culturally acceptable to the community and target groups.

b) Some of the benefits of food diversification programmes:
- They are preventative and sustainable.
- They can be adapted to cultural needs and dietary traditions, and are locally feasible strategies; thus they are available, accessible and appropriate.
- They can address multiple micronutrient deficiencies simultaneously.
- The risk of toxicity is minimised.
- They can be done in conjunction with other interventions.
- They are long-term interventions.

Having covered some of the basics of food diversification programmes, the next section covers some of the factors for success of such programmes.

4 LESSONS LEARNT FROM SUCCESSFUL FOOD DIVERSIFICATION PROGRAMMES

To meet the challenges of micronutrient malnutrition in the developing world, increasing dietary diversification is the most important factor, because this strategy could provide a wide range of micronutrients. To achieve this objective in a developing country context requires adequate supply, access and consumption of a variety of foods. Diets in developing countries generally lack many nutrients, including energy (from inadequate amounts of food). Strategies therefore need to emphasise an increase in total food intake, in addition to a greater variety of foods. Agricultural and food policies tend to be oriented to primary agricultural production, but they could also be formulated to promote and support home gardens and small livestock keeping, for the explicit purpose of increasing the household consumption of micronutrient-rich foods (Allen & Gillespie, 2001).

The adoption of *desirable* dietary patterns for nutrition improvement, e.g. appropriately formulated to meet micronutrient needs, could be used in the formulation of agricultural policies and programmes. This process could be achieved through support for integrated farming systems, oriented to assuring household food security, but also based on a variety of foods that will meet total dietary (including micronutrient) needs. Thus, availability of energy-rich staples, animal and/or fish as major sources of protein, and vitamin-, mineral- and

phytonutrient-rich fruit and vegetables, could constitute the types of production envisaged.

The cultivation of edible indigenous plants as additional sources of micronutrients could also be added. The low bioavailability of some key micronutrients from foods, such as iron, are substantially enhanced with the right food combinations, and with appropriate food processing and preparation techniques. Simple appropriate technology for the preservation of micronutrient-rich foods would need further development and promotion for their year-round availability. Linking community development policies to national programmes for the alleviation of hunger and malnutrition, with an emphasis on increasing the variety of foods consumed, is probably the best strategy for improving micronutrient malnutrition (Allen, 2003; Semba & Bloem, 2001). For Task 2, you are asked to refer to the following two readings from Helen Keller International, Bangladesh (2003 & 2004).

READINGS

Helen Keller International, Bangladesh. (Sept 2003). HKI's Homestead Food Production Program Sustainably Improves Livelihoods of Households in Rural Bangladesh. *Homestead Food Production* Bulletin, 1. Dhaka: HKI. [Online], Available: //http/www.hkiasiapacific.org: 4 pages.

Helen Keller International, Bangladesh. (Nov 2004). Homestead Food Production Improves Household Food and Nutrition Security. *Homestead Food Production Bulletin,* 2. Dhaka: HKI. [Online], Available://http/www.hkiasiapacific.org: 4 pages.

TASK 2 – IDENTIFICATION OF KEY SUCCESS FACTORS OF FOOD DIVERSIFICATION PROGRAMMES

Using the readings from Helen Keller International/ Bangladesh (2004) and (2003), identify and discuss success factors of the Bangladesh food diversification programme.

FEEDBACK

The success factors for this food diversification programme were:

- Community participation.
- Collaboration, technical assistance and support of the local NGOs, which increased the success of implementation and sustainability.
- Integration of the programme into other community-based health and development activities.
- Training and education in home gardening techniques and nutrition.
- Diversification of varieties of vegetables.

- Provision of a reliable source of seeds, seedlings and saplings at subsidised prices.
- Development of community nurseries to supply seed and to serve as training and
  demonstration sites.
- Cost sharing between all partners.
- Introduction of animal husbandry which provides foods from animal sources. Such foods were also necessarily acceptable to the community and thereby increased the bioavailablity of certain micronutrients and created funds for other household needs.
- Monitoring and evaluation of the programme and subsequent adjustments.

This programme provides a sense of the potential of food diversification as a strategy, but as with the other two approaches, food fortification and supplementation, the strategy needs to be combined with demand creation and advocacy towards behaviour change.

5 BEHAVIOUR CHANGE AND DEMAND CREATION IN FOOD DIVERSIFICATION PROGRAMMES

Dietary changes are most effective when programmes are targeted at well defined geographical areas. Selecting the right foods to be promoted needs careful market and audience research to ensure acceptability. Issues such as market, economic viability, social acceptability, nutritional value and seasonality must also be addressed during formative research, to ensure that behavioural change can be brought about and that demand can be created (Seidel, 1996).

Food diversification may involve changes in ingrained family and cultural habits and norms. Sustainability of food diversification programmes also requires consistent monitoring and impact evaluation, to ensure long term changes of behaviour. There are a number of steps that can be undertaken to create demand in a dietary diversification programme. Explore these readings to identify these steps for Task 3.

READINGS

Solon, F., Briones, H., Hernanadez, J. R. & Shafritz, L. B. (1996). Moving to Long-term Strategy: Vegetable Gardening and Consumption in the Philippines. In R. E. Seidel (Ed). *Strategies for Promoting Vitamin A Production, Consumption and Supplementation: Four Case Studies.* AED, USAID: Washington, DC: 27 - 42.

FAO & ILSI. (1997). *Preventing Micronutrient Malnutrition: A Guide to Food-based Approaches. A Manual for Policy Makers and Programme Planners.* Washington, D.C: ILSI Press: 1 - 106. [Online], Available: /www.fao.org/

TASK 3 - IDENTIFY KEY STEPS IN MARKETING FOOD BASED PROGRAMMES

Using Solon et al (1996) and the FAO & ILSI manual (1997), identify key steps in communicating your message in marketing a programme to increase gardening and consumption of vitamin A rich foods.

FEEDBACK

Take note of the lessons learned in the programme undertaken by Solon et al (1996).
Some of the key steps in marketing food based programmes are:

- Audience research.
- A strategic design process that includes:
  - defining the *product* and setting objectives;
  - Audience segmentation;
  - Designing and testing messages;
  - Selecting a media mix and promotional plans;
- Training for community outreach.
- Implementation, which includes activities in schools, health centres, with farmers groups and day-care centres, involving the broadcast media as well as designing and dissemination of print materials.
- Monitoring the programme.

As with any intervention strategy, monitoring and evaluation is critical to the continual improvement and success of the strategy.

6 MONITORING & EVALUATION OF FOOD DIVERSIFICATION PROGRAMMES

Food diversification programmes are usually a complex series of activities, and some of them cannot be planned in advance. Monitoring is therefore very important, to ensure that problems can be addressed as they arise. It is also very important that the targeted communities are involved in the monitoring process.

Programme monitoring will also ensure accountability, which will enhance sustainability; evaluation will in turn determine if programme goals were met; both process and impact evaluation needs to be done.

As with any intervention, it is important that food diversification programmes are culturally acceptable, that they are accessible to the target groups, and that the type of programme is appropriate (Gillespie and Mason, 1994). The final task

requires you to identify indicators for food diversification programmes, and we recommend that you use FAO & ILSI manual (1997) to guide you.

READINGS

FAO & ILSI. (1997). *Preventing Micronutrient Malnutrition: A Guide to Food-based Approaches. A Manual for Policy Makers and Programme Planners.* Washington, D.C: ILSI Press: 1 - 106. [Online], Available: /www.fao.org/

TASK 4 - INDICATORS FOR MONITORING AND EVALUATING FOOD DIVERSIFICATION PROGRAMMES

Using the FAO & ILSI manual (1997), make a list of possible indicators for monitoring and evaluating the outcomes of food diversification programmes.

FEEDBACK

Monitoring Indicators for Food Diversification Programmes	Outcomes Indicators for Evaluating Food Diversification Programmes
Target group consumption of the animal food/vegetable/fruit	Nutritional status indicators: weight, height, biochemical indicators of deficiency
Breastfeeding practices	Community members' knowledge about micronutrient foods and deficiencies
Cost effectiveness	Cost effectiveness of the programme
Availability of seeds and seedlings	Prevalence of deficiency diseases
Production of the food i.e. number of gardens, harvest yields, number of animals.	Household food security
	Household income.

7 SESSION SUMMARY

That concludes this session on food diversification programmes and the whole module. Hopefully you are now in a position to develop a micronutrient intervention or programme as required by Assignment 2.

We also hope that you feel confident about taking up the issue of micronutrient deficiency interventions within the course of your work in Public Health and that you are convinced that integrated food based strategies play a major role in improving the diet and meeting the micronutrient needs of a population.

It is, however, often a mix of strategies that will best enhance the success of food diversification programmes, depending on the availability of foods, the status of the food industry and the patterns of consumption by those at highest risk of deficiencies. Above all programmers need to recognise that sustainable food based strategies are fundamental to long term prevention of micronutrient deficiencies.

It is now your task to complete your second assignment and hopefully you are better equipped to do so. Be in touch with your lecturer if you have any difficulties, and please remember to complete the Module Evaluation Form which you will find on the last page.
Well done, and good luck with the assignment!

8 FURTHER READING

- **A**CC/SCN (1991). United Nations Administrative Committee on Coordination/Sub Committee on Nutrition. *Controlling Iron Deficiency.* Geneva: ACC/SCN.
- **A**llen, L.H. (2003). Interventions for Micronutrient Deficiency Control in Developing Countries: Past, Present and Future. *Journal of Nutrition,* 133: 3875S - 3878S.
- **A**llen, L.H. & Gillespie, S.R. (2001). *What Works? A Review of the Efficacy and Effectiveness of Nutrition Interventions.* ACC/SCN-Asian Development Bank (ADB) Nutrition Policy Discussion Paper. Geneva: ACC/SCN.
- **F**AO and WHO (1992). *International Conference on Nutrition, World Declaration and Plan of Action.* Rome: Food and Agriculture Organization.
- **F**AO & WHO (1992). *International Conference on Nutrition: Major Issues for Nutrition Strategies.* Rome: Food and Agriculture Organization.
- **G**illespie, S. & Mason, J. (1994). *Controlling Vitamin A Deficiency.* State-of-the-Art Series Nutrition Policy Discussion Paper No 14. Geneva: ACC/SCN.

- **G**opalan C. (1994). Micronutrient Deficiencies: Public Health Implications. *NFI Bulletin*, 15(3):1 - 6.
- **G**reiner, T. & Mitra, S.N. (1995). Evaluation of a Food-based Approach to Solving Vitamin A Deficiency in Bangladesh. *Food and Nutrition Bulletin*, 16:193 - 205.
- **I**VACG (International Vitamin A Consultative Group) (1992*). Nutrition Communications in Vitamin A Programmes: A Resource Book.* Washington, DC: Nutrition Foundation.
- **M**ansour, M., Muderhwa, R., Adamou, D. & Mamman, M,L. (1994). Piloting Diet Diversification through Home Gardens: The Niger Experience [abstract]. In *Toward Comprehensive Programmes to Reduce Vitamin A Deficiency.* A Report of the XV IVACG Meeting. Washington, DC: IVACG: 76.
- **P**arlato, M., Green, C. & Fishman, C. (1992). *ICN Case Study: Communicating to Improve Nutrition Behavior - The Challenge of Motivating the Audience to Act.* International Conference on Nutrition, December. Rome: FAO.
- **P**arlato, M. (1992). *Vitamin A Social Marketing: A Program Guide.* Washington, DC: Academy for Educational Development.
- **R**uel, M.T. (2003). Operationalizing Dietary Diversity: A Review of Measurement Issues and Research Priorities. *Journal of Nutrition,* 133: 3911S - 3926S.
- **S**eidel, R.E. (1996). *Strategies for Promoting Vitamin A-Production, Consumption and Supplementation: Four Case Studies.* Washington, D.C: USAID.
- **S**emba, R.D. & Bloem, M.W. (eds). (2001). *Nutrition and Health in Developing Countries.* Totowa, New Jersey, USA: Humana Press.
- **T**alukder, A., Islam, N., Klemm, R. & Bloem, M. (1993). *Home Gardening in South Asia, the Complete Handbook.* Bangladesh: HKI, Dhaka: 109.
- **U**NICEF/WHO. (1995). *Report of the UNICEF/ WHO Joint Committee on Health Policy, 13th Session, January 30-31.* JCHP 30/95.7. Geneva: WHO: 12 - 13.
- **O'**Brien-Place, P.M. (1987). *Evaluating Home Garden Projects.* Washington, DC: USDA/USAID.
- **W**HO. (1992). *National Strategies for Overcoming Micronutrient Malnutrition EB 89/27.* 45th World Health Assembly Provisional Agenda Item 21 (WHO/A45/17). Geneva: WHO.
- **W**orld Bank. (1994). *Enriching Lives: Overcoming Vitamin and Mineral Malnutrition in Developing Countries: Development in Practice*. Washington: DC World Bank.
- **W**orld Bank. (1993). *Investing in Health.* World Development Report. New York: Oxford University Press.

MODULE EVALUATION FORM FOR *MICRONUTRIENT MALNUTRITION*

Please would you be so kind as to fill in the form below giving us your comments on the module. Please send it back to The Student Administrator with your assignment. Thank you.

1. In general, how do you feel about the module?

2. What aspects of the module challenged you to think more deeply about micronutrient malnutrition?

3. Were there any sessions or readings which you found difficult?

4. Are there any sections of the module which could be better explained? Be as specific as possible.

5. Was the timing suggested useful or accurate?

6. Could the structure of the sessions or the reader be changed in any way to make them more user friendly?

7. Do you think the module will have relevance in your workplace? Please explain how.

8. Are there any improvements you could suggest to the assignments?

9a. Had you taken SOPH's *Public Health Nutrition: Policy and Programming previously?*

9b. What proportion of the module content was new to you?

Thank you very much.