Dissemination of WHO guidelines and recommendations on micronutrients: policy, practice and service delivery issues

Report of a regional meeting
Bangkok, 14-16 October 2014

World Health Organization
Regional Office for South-East Asia

SEA-NUT-195
Distribution: General

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Printed in India

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1. Introduction

A regional meeting on dissemination of WHO guidelines and recommendations on micronutrients: policy, practice and service delivery issues, was held from 14 – 16 October 2014 at Bangkok, Thailand. The meeting was organized by the World Health Organization's Regional Office for South-East Asia (WHO-SEARO) in collaboration with the Evidence and Programme Guidance Unit of the Department of Nutrition for Health & Development, WHO-headquarters, the Institute of Nutrition, Mahidol University, Thailand and the Micronutrient Initiative.

Representatives from nine Member States of WHO SEARO [Bangladesh, Bhutan, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand and Timor-Leste] attended the meeting. In addition, experts in public health, nutrition, maternal and child health served as resource persons. Senior representatives from the Food & Agriculture Organization of the United Nations – Asia & Pacific Region and the Global Alliance for Improved Nutrition (GAIN) also attended the meeting.

The overall objective of the meeting was to discuss the effective dissemination and incorporation of WHO guidelines and recommendations on micronutrients in national control and prevention programmes highlighting the following topics: (i) dissemination of current WHO guidelines and recommendations on micronutrients; (ii) overview of recent strategies and approaches for addressing anaemia in different population groups; (iii) review of national protocols for the control and prevention of micronutrients deficiencies, with particular focus on anaemia.

The meeting was inaugurated by Dr Yonas Tegegn, Representative of the World Health Organization in Thailand. Dr Tegegn welcomed the participants and wished them a fruitful meeting. Since Dr Poonam Khetrapal Singh, WHO Regional Director for South-East Asia was unable to be present at this meeting, Dr Tegegn delivered the message on her behalf.

In her message, Dr Poonam Khetrapal Singh expressed her deep appreciation to the Ministry of Public Health of the Royal Thai Government

for hosting this event and noted with pleasure the presence of national representatives from programmes dealing with child and adolescent health, maternal and reproductive health and nutrition and food safety from the Member States of the South-East Asia Region and several experts in nutrition, child health and public health.

The public health implications of micronutrient deficiencies are very important since they adversely affect fetal and child growth, cognitive development of infants, learning capacity in children and adolescents, and lower work capacity and resistance to infection in women of reproductive age and the elderly. Five main approaches in the area have been promoted for addressing micronutrient deficiencies: improving dietary intake through increased production, preservation and marketing of micronutrient-rich foods; nutrition education; food fortification; supplementation; global public health and disease control measures.

Dr Singh mentioned that of all the micronutrient deficiencies, anaemia is the most common in the Region. An estimated 55% of preschool children, 45% of pregnant women and 40% of women of child-bearing age are anaemic, although the range in each population category varies. Low intake of dietary iron and folate, parasitic infections and low bioavailability of iron from plant-based diets are considered to be the causative factors. She expressed satisfaction that all Member States in the South-East Asia Region have established micronutrient deficiency prevention and control programmes as part of overall nutrition policies/ plans of action.

In recent years, WHO has produced or updated several evidence-based guidelines and recommendations on a large number of nutrients of public health importance. These guidelines for nutrition action aim to assist the Member States to focus on key areas of intervention and develop a harmonized monitoring framework to assess the impact of interventions on the prevalence of micronutrient deficiencies. However, the dissemination and subsequent incorporation into effective national policies and programmes in Member States of the Region has been inadequate.

The objective of this meeting is to ensure effective dissemination of WHO guidelines and recommendations on micronutrients to the national control and prevention programmes. The meeting provided an opportunity

to examine the extent to which the existing national protocols for the control and prevention of micronutrient deficiencies are in alignment with the current WHO guidelines and recommendations, with particular emphasis on measures adopted for the control and prevention of anaemia in the Member States and how well these interventions are tuned to achieve the 50% reduction goal for anaemia in women of reproductive age by 2025, as endorsed by the World Health Assembly. The innovative techniques for micronutrient supplementation and food fortification, introduced in recent years, were also examined for their relevance to the Member States in the South-East Asia Region.

In his welcome remarks, Professor Visith Chavasit, Director, Institute of Nutrition, Mahidol University, Thailand mentioned micronutrient deficiencies as a major public health issue in the countries of the South-East Asia Region. He said that several Member States have introduced innovative measures for the control and prevention of micronutrient deficiencies and it would be worthwhile to adopt and adapt these interventions and best practices to appropriate country settings.

Professor Visith Chavasit and Dr Anil Samaranayake were nominated as the Chairperson and Co-Chairperson respectively while Dr Lena Davidsson was nominated as the Rapporteur for the meeting.

The agenda for the meeting is appended in Annex 1 and the list of participants is appended in Annex 2.

Objectives and mechanics of the meeting

Kunal Bagchi, WHO-SEARO

Micronutrient deficiencies contribute substantially to the global burden of disease with a wide geographic prevalence in both high-income and middle to low-income countries and are responsible for a wide range of non-specific physiological impairments, reduced resistance to infections, metabolic disorders, and delayed or impaired physical and psychomotor development.

WHO supports the need for coherent and harmonized nutrition interventions by using evidence-based standardized guidelines and tools to guide the implementation process and has been updating the existing nutrition guidelines and recommendations based on current technical evidence. These updates further serve as the basis for updating the national nutrition guidelines of Member States to align and fine-tune their nutrition programmes. However, the revision and updating of national nutrition guidelines to reflect new WHO guidelines and recommendations are not uniform in the Member States of the WHO South-East Asia Region.

Anaemia remains the most common nutritional deficiency in the Region. An appropriate integration of interventions will need to comprise dietary diversification, treatment of parasitic infections, supplementation of the vulnerable age groups with iron and folic acid and fortification of staple foods. Moreover, achieving the global anaemia target calls for a more concerted effort with a focus on adolescent and maternal nutrition, using the lifecycle approach. The "Comprehensive implementation plan on maternal, infant and young child nutrition is based on the rationale that nutrition challenges are multifaceted and while effective nutrition actions exist, these have not been expanded sufficiently. The Comprehensive implementation plan (CIP) has identified six global targets, one of which is 50% reduction of anaemia in women of reproductive age by 2050. The WHO-SEARO Regional Nutrition Strategy 2011-2015 has identified the effective control and prevention of micronutrient deficiencies as one of its strategic elements, which is in alignment with the CIP. The outcomes of this meeting are dissemination of current WHO guidelines and recommendations on micronutrients; a review of the national measures and protocols for the prevention and control of anaemia including supplementation and food fortification; and progressive alignment of national micronutrient deficiency control and prevention protocols with WHO guidelines.

Development process for nutrition guidelines and recommendations

Maria Nieves Garcia-Casal, WHO-HQ

A WHO guideline is any document, whatever its title, which contains WHO recommendations about health interventions; clinical, public health or policy interventions; a recommendation provides information about what policy-makers, health-care providers or patients should do. It implies a choice between different interventions that have an impact on health and that have ramifications for the use of resources. Several types of guidelines exist: (a) rapid advice, which provides response to an urgent, acute need; (b) standard/focused advice, which is limited to a particular topic area, based on evidence and requires between 9 and 12 months for formulation; (c) comprehensive advice or full guideline, which is a complete coverage of a health topic, is evidence-based and requires two to three years in its formulation; (d) compilations of guidelines, which contain recommendations from WHO and other sources. The evidence-informed guideline development process was adopted in 2009 and a 'Handbook for Guideline Development' was published by WHO providing guidance on the development of documents or publications containing WHO recommendations and the procedural steps to be followed. The second edition of the handbook was released in 2012.

The steps 1 – 3 of the guideline development process comprise the appointments of a 'Guideline Steering Committee, a "WHO Guideline Development Group" and an "External Review Group". Scoping the document is then introduced, which responds to the needs of Member States and interested stakeholders. A number of requests had been received to update or develop guidelines on a wide range of nutrition related issues such as indicators of vitamin and mineral status, food fortification, and supplementation in different schemes. At the fourth step of the process, questions are formulated for the review of evidence in the PICO format (Population, Intervention, Control and Outcome) and then calling for comments from all interested sources. Scoping the relevant questions and prioritizing the populations and outcomes are important as these are outcomes that are critical for decision-making and others that are important for research. For the step 5, related to evidence retrieval, three approaches

have been followed: (a) use of existing systematic reviews; (b) building on systematic reviews developed by other groups; and (c) commissioning of 'tailored' systematic reviews. The systematic review of evidence leads to the formulation of recommendation (step 6) which involves the GRADE approach: Grading of Recommendations, Assessment, Development and Evaluation. Individuals grading evidence should have access to systematic reviews of the evidence regarding the benefits and risks of the alternative management strategies under consideration. In this exercise, there is a clear separation of two issues: quality of the evidence (high, moderate, low and very low) and grades of recommendations (strong or conditional).

The quality of evidence or the extent to which one can be confident that an estimate of effect or association is correct is provided in the following matrix.

High	Further research **is very unlikely to change** our confidence in the estimate of effect	++++
Moderate	Further research **is likely** to have an important impact on our confidence in the estimate of effect and may change the estimate	+++
Low	Further research **is very likely** to have an important impact on our confidence in the estimate of effect and is likely to change the estimate	++
Very Low	Any estimate of the effect **is very uncertain**	+

Dissemination and implementation, including adaptation, are covered in Step 7. WHO guidelines have implications on patients, clinicians, policy-makers, quality monitors and funding agencies.

Implications of a ***strong*** recommendation:

- **Patients:** most people in their situation would desire the recommended course of action and only a small proportion would not.
- **Clinicians:** most patients should receive the recommended course of action, and adherence to this recommendation is a reasonable measure of good quality care.

- **Policy makers:** The recommendation can be adapted as a policy in most situations.
- **Quality monitors**: Adherence to this recommendation according to the guideline could be used as a quality criterion or performance indicator. If clinicians choose not to follow such a recommendation, they should document their rationale.
- **Funding agencies:** The intervention likely represents an appropriate allocation of resources (i.e. net benefits large relative to alternative allocation of resources).

Steps 8 & 9 relate to evaluation and plan for updating, which consist of emphasizing the need for high quality reviews on a timely manner and to find a more efficient way to collaborate with other partners.

The Evidence-informed Policy Network (EVIPNet) promotes systematic use of evidence in policy-making in low-and middle-income countries. Partnership at country level between policy-makers, researchers and civil society is promoted to facilitate the development of policy and its implementation through the use of best scientific evidence available. Several challenges are encountered in dissemination, adoption / adaptation, and implementation into policy and actions of WHO guidelines. Among the opportunities are the ability to improve the methods for summarizing and assessing programmatic experiences in the guideline development process; translating solutions or evidence into policy, practice and products to improve implementation; addressing values and preference to develop better strategies for communicating the guidelines to managers and policy-makers in order to scale-up operations.

WHO guidelines are built upon the following principles:

- Well-defined scope and target audience
- Broad and representative guideline development group
- *A priori* development of key questions for systematic reviews
- Systematic and comprehensive evidence retrieval, synthesis
- Quality assessment of the body of evidence for each question

- Formulation of recommendations based on the evidence and other explicit considerations
- Disclosure and management of all secondary interests (conflict of interest)
- Adherence to WHO reporting standards
- Usable document: relevant, applicable and user-friendly
- Include a plan for implementation and updating.

The following guidelines have been produced between 2010 and 2013:

(1) Guideline: Neonatal vitamin A supplementation

(2) Guideline: Vitamin A supplementation for infants 1–5 months of age

(3) Guideline: Vitamin A supplementation for infants and children 6-59 months of age

(4) Guideline: Vitamin A supplementation in pregnant women

(5) Guideline: Vitamin A supplementation in postpartum women

(6) Guideline: Vitamin A supplementation during pregnancy for reducing the risk of mother-to-child transmission of HIV

(7) Guideline: Intermittent iron supplementation in preschool and school-age children

(8) Guideline: Intermittent iron and folic acid supplementation in menstruating women

(9) Guideline: Daily iron and folic acid supplementation in pregnant women

(10) Guideline: Intermittent iron and folic acid supplementation in non-anaemic pregnant women (in press)

(11) Guideline: Calcium supplementation in pregnant women

(12) Guideline: Vitamin D supplementation in pregnant women

(13) Guideline: Use of multiple micronutrient powders for home fortification of foods consumed by infants and children 6–23 months of age

(14) Guideline: Use of multiple micronutrient powders for home fortification of foods consumed by pregnant women

(15) WHO recommendations for prevention and treatment of pre-eclampsia and eclampsia

(16) Guideline: Iron interventions in areas where malaria transmission occurs *(in press)*

Introducing WHO implementation tools to inform policy-making

Gerardo Zamora, WHO-HQ

The World Health Assembly endorsed the Comprehensive implementation plan on maternal, infant and young child nutrition [CIP] in 2012. The plan comprises six global nutrition targets to be attained; the targets are aligned along different development agendas that will run from 2012 to 2025. The action plan illustrates a series of priority actions that should be jointly implemented by Member States and international partners to achieve. Six policy briefs were developed with the purpose of consolidating the evidence around which interventions and areas of investment need to be scaled-up and guide decision-makers on what actions need to be taken. An online consultation with stakeholders was carried out to incorporate their comments into the policy briefs.

The e-Library of Evidence for Nutrition Actions (e-LENA) is an online library of evidence-informed guidance for nutrition interventions. It aims to help countries to successfully implement and scale-up nutrition interventions by informing as well as guiding policy development and programme design. Information is available in all six official languages of WHO at the website: *http://www.who.int/elena/en/*

The Global Database on the Implementation of Nutrition Action (GINA) was launched in 2012. It is a database of information on the implementation of nutrition policies and interventions and contains information collected from a variety of sources, where users can directly submit their data and share information on how programmes are implemented, including country adaptations and lessons learnt. All relevant information is available at the website: *http://www.who.int/nutrition/gina/en/*

The WHO Global Data Bank on Infant and Young Child Feeding started in 1991 as part of WHO monitoring and surveillance activities. It is maintained and managed to keep up with internationally accepted definitions and indicators and pools information mainly from national and regional surveys, and studies on the prevalence and duration of breastfeeding and complementary feeding. All relevant information is available at the website: *http://www.who.int/nutrition/databases/infantfeeding/en/*

Other nutrition-related databases and documentation are: (i) Vitamin and Mineral Nutrition Information System (VMNIS), which was established in 1991 as the Micronutrient Deficiency Information System (MDIS) to strengthen surveillance of micronutrient deficiencies at the global level; (ii) Nutrition Landscape Information System (NLiS), which contains data on nutrition and nutrition-related health and development in the form of automated country profiles and user-defined downloadable data.

The Alliance for Health Policy and Systems Research (AHPSR) is an international collaboration hosted by WHO since its inception in 1999. It aims to promote the generation and use of health policy and systems research as a means to improve the health systems of low- and middle-income countries. The strategic areas of work are (i) generation of knowledge; (ii) evidence-informed policy; (iii) capacity-development. All relevant information is available at the website: *http://www.who.int/alliance-hpsr/en/*

The Evidence-informed policy network (EVIPNet) promotes the systematic use of health research evidence in policy-making, focusing on low-and middle-income countries. Partnerships are established at the country level between policy-makers, researchers and civil society in order to facilitate policy development and policy implementation. At WHO headquarters, the Department of Nutrition for Health and Development (NHD) and its Evidence and Programme Guidance Unit (EPG) have closely worked with EVIPNet at country level and relevant information is available at the website: *http://global.evipnet.org*

ExpandNet is a global network of public health professionals and scientists seeking to advance the practice and science of scaling up successful health innovations tested in experimental, pilot and demonstration projects. It organizes technical meetings, workshops on

scaling up, develops guidance tools and networks partners and has produced a manual on "Nine Steps for Developing a Scaling-Up Strategy". There is an increasing demand for guidance on **how to** address implementation issues by WHO Member States and partners and in response WHO has put forward different tools to assist Member States and partners in policy making and implementation of interventions.

2. New Guidelines and Recommendations

Overview of micronutrient deficiencies in South-East Asia Region

Kunal Bagchi, WHO-SEARO

The public health implications of micronutrient deficiencies are potentially significant as micronutrient deficiencies affect fetal and child growth, cognitive development and immunity. The FAO/WHO organized International Conference on Nutrition (ICN) World Declaration on Nutrition stated that "overcoming micronutrient malnutrition is a precondition for ensuring rapid and appropriate national development". Subsequently, the World Health Report of 2000 identified iodine, iron, vitamin A and zinc deficiencies as among the world's most serious health risk factors.

Anaemia remains the most common nutritional deficiency in Member States of the WHO South-East Asia Region with high prevalence rates in preschool children and pregnant women. Several causes are postulated: dietary deficiencies of iron and folate; poor bioavailability of iron from plant-based diets rich in phytates; chronic blood loss due to malaria and parasitic infestations. Some of the functional changes associated with anaemia are: low attention span and inadequate cognitive function leading to poor performance in school children; reduction in work capacity in adults; increased susceptibility to infections. Scaling-up and continuation of proven interventions can result in successful reduction as demonstrated in Sri Lanka and Thailand, with several other Member States indicating similar trends.

An integrated approach towards effective anaemia control has the following components: (i) food-based approaches to increase micronutrient intake including dietary diversification and food fortification; (ii) micronutrient supplements to especially vulnerable segments of the population, particularly pregnant women; (iii) building strategies into the primary health care system and other health-related interventions; (iv) strategies would need to be evidence-based, tailored to local conditions, and consider the specific aetiology and prevalence of anaemia in a given setting and population group; (v) a surveillance system should be operational, affordable and easy to use; (vi) firm political commitment and strong partnerships involving all relevant sectors should be present.

With regard to vitamin A, the severe forms of vitamin A deficiency are no longer seen and there has been a steady decline in the prevalence of clinical forms of vitamin A deficiency in children below 5 years of age in most Member States of the Region. The recognition of the co-existence of vitamin A deficiency with other micronutrient deficiencies requires a broad-based approach comprising dietary diversification, nutrition education, increased coverage of measles vaccine and early diagnosis and prompt treatment of infections.

Table 2.1: *Prevalence of vitamin A deficiency disorders (VADD) in preschool children and vitamin A supplementation coverage in preschool children*

Country	Proportion of VADD in preschool children (< 70μg/L)	Vitamin A supplementation (%)
Bangladesh	21.7	94
Bhutan	22.0	No information
DPR Korea*	27.5	100
India	62.0	66
Indonesia	19.6	76
Maldives	9.4	52
Myanmar	36.7	96
Nepal	32.3	91
Sri Lanka	35.9	85
Thailand	15.7	No information
Timor-Leste	15.8	59

Sources: 1. Maternal & Newborn Health, WHO 2009; 2. State of the World's Children, UNICEF 2013; 3. World Bank Report 2010

**Democratic People's Republic of Korea*

Iodine Deficiency Disorders (IDD) have been recognized as a public health problem in the South-East Asia Region since the 1920s. IDD affect all socio-economic groups living in defined geographical areas and universal iodization of salt is considered the most appropriate intervention for the prevention and control of IDD. Consumption of 5 g of iodized salt daily is considered to meet a population's daily iodine requirement. Several Member States of the Region have achieved the desired rate of iodized salt distribution to their populations and Bhutan has eliminated IDD as a public health problem.

Table 2.2: *Proportion of population with satisfactory levels of iodine excretion and proportion of households using iodized salt*

Country	Proportion of population with UIE <100 µg/L (%)	Median urinary iodine excretion level (µg/L) [Target 100-199 µg/L]	Proportion of households using iodized salt (%)
Bangladesh	33.8	163	84.3
Bhutan	13.5	217	96.2
DPR Korea*	51.5	97	24.5
India	34.4	154	51.1
Indonesia	16.3	229	62.3
Maldives	43.1	115	44.0
Myanmar	34.3	124	92.9
Nepal	22.0	193	62.6
Sri Lanka	30.0	153	92.4
Thailand	34.8	144	47.2
Timor-Leste	No info	No info	59.9

Source: Global iodine nutrition Scorecard-ICCIDD 2012
**Democratic People's Republic of Korea*

Preventing micronutrient deficiencies in populations affected by humanitarian crises is an issue that requires urgent attention. Micronutrient deficiencies can readily occur during an emergency or be made worse if already present. Several events take place: livelihoods and food crops are

lost; food supplies are interrupted; diarrhoeal diseases resulting from compromised sanitation and hygiene are followed by malabsorption and nutrient losses; and infectious diseases suppress the appetite while increasing the need for micronutrients. It is essential to ensure that the micronutrient needs of people affected by a disaster are adequately met through nutritionally-balanced adequate food aid and/or rations.

All Member States have established micronutrient deficiency prevention and control programmes as part of overall nutrition policies/ plans of action and specific policies for vitamin A, Iron-Folic Acid (IFA), zinc and oral rehydration treatment of diarrhoea have been developed in Bangladesh, Nepal and India. National protocols for the prevention and control of micronutrient deficiencies are in alignment with WHO and other international guidelines and standards. Dietary diversification has been incorporated into micronutrient deficiency control programmes in some Member States although systematic implementation and monitoring are not undertaken uniformly. Supplementation with vitamin A and IFA to infants and young children is the usual practice in most Member States.

Table 2.3: *National micronutrient deficiencies control and prevention protocols and the status of their implementation with WHO guidance*

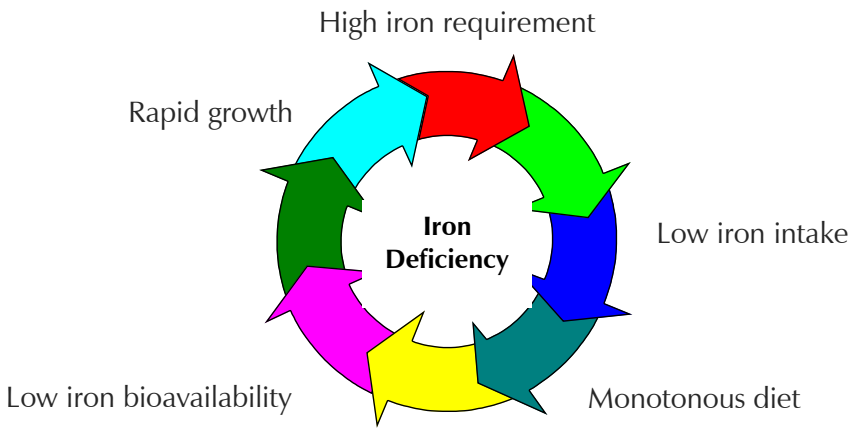
Bangladesh	• National protocols for iron-folic acid, vitamin A and zinc and aligned with WHO guidance. • National protocol for calcium
Bhutan	• National protocols for iron-folic acid, zinc and vitamin A aligned with WHO guidance • National protocol for calcium
India	National protocols for iron-folic acid, vitamin A and zinc - adapted and modified from WHO guidance
Indonesia	National protocol for post-partum vitamin A.
Maldives	National protocols for vitamin A, iron-folic acid, vitamin B1 and zinc in alignment with WHO guidance.

Myanmar	National protocols for vitamin A, iron-folic acid and zinc in alignment with WHO guidance.
Nepal	• National protocols for iron-folic acid, and zinc for diarrhoea in alignment with WHO guidance • Calcium supplementation pilot project
Sri Lanka	National protocol for calcium under formulation.
Thailand	National protocol for vitamin A for children < 3 years age in alignment with Thai RDA and WHO guidance
Timor-Leste	National protocol for iron-folic acid and zinc in alignment with WHO guidance

Iron

Lena Davidsson, WHO Temporary Adviser

Iron deficiency is the most prevalent micronutrient deficiency worldwide, particularly in infants, children and women of child-bearing age. Iron deficiency may be depicted through the following figure:



The bioavailability of iron depends on the proportion of the element that will be absorbed and utilized by the body, which in the case of iron may vary from <1% to 100%. Of the iron absorbed in the body from the total iron intake, ≈80-90% is incorporated into the red blood cells. Absorption and bioavailability studies are done through the use of ^{57}Fe and/or ^{58}Fe iron (stable isotopes) administration. On the first day of the study, a baseline blood sample is drawn followed by 1-4 days of labelled test meals intake and withdrawal of blood sample on the 18 day to assess for stable isotope concentrations. The enhancers of non-heme iron absorption are ascorbic acid and muscle tissue from foods of animal origin; the inhibitors of absorption are phytic acid and polyphenols. Iron absorption is also affected by the co-existence of *Helicobacter pylori* infection that leads to chronic gastritis and reduced gastric acid secretion.

Iron compounds commonly used to improve iron intake in the diet – ferrous sulphate, ferrous fumarate, ferric saccharate, ferric pyrophosphate, ferric orthophosphate and elemental iron powders– have different degrees of solubility in water and impact on iron status in the body. It is important to note that a state of anaemia [based on low haemoglobin concentration and low haematocrit] can result from deficiencies of other micronutrients such as vitamin A, folate and Vitamin B_{12} along with conditions like malaria, helminthic infestations, haemoglobinopathies, HIV-AIDS infection and inflammatory conditions of different origin. Studies on iron deficiency based on multi-criteria models have demonstrated that not more than 40% of total anaemia can be attributed to iron deficiency, which is determined based on indicators such as serum ferritin and circulating transferrin receptors while iron deficiency anaemia is based on the state of iron deficiency plus low haemoglobin.

An earlier joint statement on anaemia from WHO/UNICEF emphasized an integrated approach consisting of iron supplementation iron fortification of food, treatment of co-existing pathological conditions, dietary diversification and improved nutrition, improved sanitation, improved access to health care and nutritional education of consumers.

The current WHO guidelines on iron supplementation are as indicated below:

Use of multiple micronutrient powders for home fortification of foods consumed by infants and children 6–23 months of age (2011)

Home fortification of foods with micronutrient powders containing at least iron, vitamin A and zinc is recommended to improve iron status and reduce anaemia among infants and children 6–23 months of age (strong recommendation). Target groups are infants and children 6–23 months of age, with fortification starting at the same time as introduction of complementary foods.

Composition per sachet; Iron: 12.5 mg of elemental iron, preferably as encapsulated ferrous fumarate; Vitamin A: 300 μg of retinol; Zinc: 5 mg of elemental zinc, preferably as zinc gluconate. One sachet per day should be provided at minimum, for a period of two months, followed by a period of three-four months off supplementation. Use of the micronutrient powders is initiated every six months.

Interventions should be applicable in population settings where the prevalence of anaemia in children under two or five years of age is ≥20%. For malaria-endemic areas this is implemented in conjunction with measures to prevent, diagnose and treat malaria, as well as interventions for intestinal parasite/helminthic control. This intervention guideline is not applicable to children with HIV-AIDS and tuberculosis.

Intermittent iron supplementation in preschool and school-age children (2011)

Intermittent iron supplementation is recommended as a public health intervention in preschool and school-age children to improve iron status and reduce risk of anaemia (*strong recommendation).* Target groups are preschool-age children (24–59 months) and school-age children (5–12 years). The compositions of supplement are: 25 mg of elemental iron (24–59 months) (fumarate/sulfate/gluconate)/45 mg of elemental iron (5–12 years) (fumarate/sulfate/gluconate). The supplement is provided either as

drops/syrups (24–59 months) or tablets/capsules (5–12 years) with the frequency of one supplement per week (three months of supplementation followed by three months of no supplementation throughout the calendar or school year). Intervention is introduced in settings where the prevalence of anaemia in target groups is $\geq$ 20%.

Intermittent iron and folic acid supplementation in menstruating women (2011)

Intermittent iron and folic acid supplementation is recommended as a public health intervention in menstruating women where anaemia is highly prevalent, to improve their haemoglobin concentrations and iron status and reduce the risk of anaemia (*strong recommendation).* The target groups are all menstruating adolescent girls and adult women, who are administered one supplement per week for three months followed by three months of no supplementation throughout the year/school year. The supplement consists of iron: 60 mg of elemental iron (sulfate/fumarate/gluconate) and folic acid: 2800 µg (2.8 mg). Intervention is introduced in settings where the prevalence of anaemia is ≥ 20 % or higher among non-pregnant women.

Other related considerations: if recipients are diagnosed with anaemia, they should be treated with daily iron and folic acid (120 mg plus 400 ug); in malaria-endemic areas, supplements should be implemented in conjunction with malaria prevention/diagnosis/treatment measures; supplement can be part of integrated programmes for adolescents and reproductive health; on confirmation of pregnancy, women should receive standard antenatal care including daily or intermittent supplements depending on their anaemia status; implementation of a behaviour change communication strategy; and quality control of supplement.

Daily iron and folic acid supplementation in pregnant women (2012)

Daily oral iron and folic acid supplementation is recommended as part of antenatal care to reduce the risk of low-birth weight, maternal anaemia and iron deficiency (strong recommendation). The target group is all pregnant adolescent and adult women who receive a daily supplement of Iron: 30–60 mg of elemental iron (sulfate/fumarate/gluconate) and folic acid: 400 µg (0.4 mg) for the entire duration of pregnancy, supplementation starting at

the earliest stage when pregnancy is confirmed, as part of an integrated antenatal care and in all population settings.

Other considerations: if anaemia is ≥40%, then 60 mg iron per day should be used; if diagnosed with anaemia then concurrent treatment with 120 mg Fe plus 0.4 mg folic acid/day would be initiated and if folic acid is not available then iron would need to be provided; other micronutrients, depending on availability, may be also provided; in malaria-endemic areas, supplements should be implemented in conjunction with malaria prevention/diagnosis/treatment measures; implementation of a behaviour change communication strategy; and quality control of supplement.

Intermittent iron and folic acid supplementation in non-anaemic pregnant women (2012)

Intermittent use of iron and folic acid supplements by non-anaemic pregnant women is recommended to prevent anaemia and improve gestational outcomes (*strong recommendation)*. The target group consists of all non-anaemic pregnant adolescent girls and adult women who receive a weekly supplement of 120 mg of elemental iron (sulfate/fumarate/ gluconate) and 2800 μg (2.8 mg) of folic acid as part of a programme for integrated antenatal care, for the entire duration of pregnancy in all geographical settings were the prevalence of anaemia is < 20% among pregnant women.

Other considerations: if anaemia is diagnosed, then treatment with daily iron and folic acid (120 mg plus 400 μg) should be initiated; implementation of this recommendation will require a strong health system for the delivery of services; in malaria-endemic areas, supplements should be implemented in conjunction with malaria prevention/diagnosis/ treatment measures; implementation of a behaviour change communication strategy; and quality control of supplement.

Use of multiple micronutrient powders in pregnant women

As there is currently no available evidence to directly assess the potential benefits or harm of the use of multiple micronutrient powders in pregnant women for improving maternal and infant health outcomes, routine use of

this intervention during gestation is not recommended as an alternative to iron and folic acid supplementation (*strong recommendation)*.

Vitamin A

Umesh Kapil, WHO Temporary Adviser

- **Neonatal vitamin A supplementation (first 28 days after birth) [2011]**

  Presently, neonatal vitamin A supplementation (supplementation within the first 28 days after birth) is not recommended as a public health intervention to reduce infant morbidity and mortality (*strong recommendation*).

- **Vitamin A supplementation in infants 1-5 months of age [2011]**

  Vitamin A supplementation in infants 1-5 months of age is not recommended as a public health intervention for the reduction of morbidity and mortality (strong recommendation).

- **Vitamin A supplementation in postpartum women [2011]**

  Vitamin A supplementation in postpartum women is not recommended for the prevention of morbidity and mortality (strong recommendation).

- **Vitamin A supplementation in pregnant women [2011]**

  Vitamin A supplementation is not recommended during pregnancy as part of routine antenatal care for the prevention of maternal and infant morbidity and mortality (strong recommendation).

- **Vitamin A supplementation in infants and children 6 – 59 months of age [2011]**

  High-dose vitamin A supplementation is recommended in infants and children 6 – 59 months of age in settings where vitamin A deficiency is a public health problem to reduce child morbidity and mortality (strong recommendation).

Recent scientific evidence in vitamin A supplementation in infants and children 6 – 59 months of age has come from many sources. The "Deworming and enhanced vitamin A" (DEVTA) study undertaken in India was a large-scale trial to assess the role of massive-dose vitamin A administration in reduction of childhood mortality, where one million children were followed and mortality rates in children 1-6 years of age were recorded. The study demonstrated that vitamin A administration had no impact on under-five mortality.

In India, before 1970s, clinical vitamin A deficiency and nutritional blindness from vitamin A deficiency were a major public health issue. High prevalence of vitamin A was often found to co-exist with high prevalence of severe acute malnutrition and vitamin A deficiency in children. Effect of a single massive dose of vitamin A on serum and liver levels of the vitamin in India, along with similar studies undertaken in other parts of the world, demonstrated that vitamin A supplement given to a vitamin A-deficient population may decrease mortality by approximately 34%. It was later realized that reduction in under-five mortality was mainly due to reduction in deaths due to measles and diarrhoea, while no significant beneficial effect was observed on respiratory tract infections or malaria. However, vitamin A supplementation for the reduction of under-five mortality began to gather more importance and with advocacy from international organizations, health planners and administrators all over the world adopted vitamin A supplementation as a strategy for the reduction of under-five mortality. Subsequent studies including some from India reported that vitamin A supplementation had no effect on morbidity status and further suggested that vitamin A supplementation alone could not reduce child mortality.

In recent times, nutritional blindness is no longer a public health issue and although Bitot's Spot prevalence is low in several parts of India, it is also often found to be non-responsive to vitamin A supplementation. The health situation in India has also changed over time: there has been improvements in health infrastructure and services with better access to health care facilities, use of antibiotics and improved immunization. These have led to reduction in the number of episodes and duration of morbidity in infants and young children, reduction in severe childhood malnutrition, overall improved dietary intake, less episodes of acute respiratory

infections, measles, and less diarrhoeal episodes due to better hygiene and sanitation. Deaths from diarrhoea in children below five years declined from 13.6 per 1000 in 1982 to 4.6 per 1000 in 2008; coverage with measles vaccine has increased over the years; and severe childhood malnutrition has also declined between 1975–79 and 2011–2012. It is to be noted that only 18% - 30% of children between the ages of 6–59 months received vitamin A supplementation during the previous six months.

The table below indicates the reduction in under-five mortality in India

Table 2.4: *Under-five mortality in India*

Year	U-5 yr. / 1000
1970	191
1990	116
2000	94
2008	69
2011	53

Source: NFHS 3 – 2005-6

Between 2010 and 2011, the differences between Infant mortality rate and U-5 mortality rate in several states of India have been decreasing, a trend similar to that witnessed in several Member States of the South-East Asia Region. Even when examining the U-5 mortality rates in several countries where very high coverage of vitamin A has been achieved, the reduction in U-5 mortality has been 1-2 points per year like any other country and there was no 30% reduction in the U-5 mortality. This brings into question the possible impact of vitamin A on mortality of infants and young children. In recent years, with the vitamin A administration being listed along with the immunization schedule on several growth monitoring and health cards, vitamin A is often mistakenly regarded as a vaccine. This myth has to be rectified. Wide coverage of measles immunization and providing appropriate oral rehydration treatment to address diarrhoeal problems are important in reducing deaths from measles.

Iodine [iodization of salt and seasoning sauce]

Visith Chavasit, WHO Temporary Adviser

Compared to other micronutrients, information on iodine should be better established in terms of requirement and upper limit for daily intake. Recommendations given by the Institute of Medicine, National Academies of Sciences (IOM) and the World Health Organization are slightly different, though that of WHO is globally recognized. Iodized salt is also recommended and recognized worldwide as the main source of iodine. Consequently, international guidelines for controlling iodine deficiency disorder should emphasize quality control of iodine content in salt, corresponding to the requirement and upper limit of the WHO recommendation. However, information on the amount of salt consumed, other salty seasonings used, and amount of iodine available in those vehicles within a country also must be available in order to establish a fortification standard with both lower and upper limits appropriate for a population.

The salt iodization technique is well-known. However, it must be designed to fit with a country's situation, especially in terms of salt producers' knowledge, investment fund, and salt quality. Greater understanding about variation in salt quality, production capacity, producer capability, etc. will lead to an appropriate design for the iodization machine and method. When salt is not used for salty seasoning in some populations, the availability of iodine in alternative salty seasonings must be considered, since iodized salt is used as the raw material for their production. In Thailand, for example, some population groups use only fish sauce and soy sauce instead of salt to get a salty taste into their foods. Both sauces are produced by using low quality salt that is quite hygroscopic. Technically, it is not feasible to iodize hygroscopic salt since the applied iodine solution is normally leached out from the wet salt surface during storage and within a short period of time. These sauces do not contain adequate iodine and cannot be the iodine source as expected. Under this limitation, the Thai government allows the iodine compound to be directly fortified into the final products of these sauces, which makes it both technically and economically feasible.

Quality monitoring of salt is also an important issue for preventing iodine deficiency disorder. The classic titration method is well-recognized for its reliability and practicality. However, this method requires chemicals, scientific glassware, and a background in laboratory techniques that normally are not accessible to small and medium-scale salt producers in developing countries. Although it may be unacceptable to law enforcers, test kits from either India or Thailand are yet the selected choice for quality control of salt in most developing countries. There are several weaknesses in the test-kit technique, such as a small amount of sample not representing the product, variable amount of sample, reading bias from the guided colour and value on the test kit box, etc. Modification of the sampling and reading techniques for the test kit could significantly increase reliability of the method. The correlation between the test kit and titrated values are found to improve from 0.08 to 0.61 for an untrained salt producer, and 0.81 for the trained ones.

Zinc

Tahmeed Ahmed, WHO Temporary Adviser

More than 300 enzymes require zinc for their catalytic activities and these enzymes are found in all six enzyme classes: oxidoreductase, transferase, hydrolase, lysase, isomerase and ligase. Zinc deficiency is caused by lack of zinc in the diet, frequent episodes of diarrhoea and low zinc levels in the food chain. For example, several of the common complementary foods used in rural Bangladesh provide only 45% of the Recommended Nutrient Intake (RNI) of zinc. Vitamin A and zinc deficiencies are responsible for 0.6 million and 0.4 million deaths and 9% of global childhood DALYS.

Improvement in zinc status may be achieved through: supplementation with zinc; fortification of food including home fortification with micronutrient powders; dietary diversification; bio-fortification; appropriate infant and young child feeding; improving overall food security; and a nutrition-friendly agriculture sector including fisheries, livestock and use of fertilizer fortified with zinc. Several studies have been conducted on preventive supplementation with zinc and diarrhoea and impact on height and weight gain. No overall adverse effects of zinc supplementation on haemoglobin, serum ferritin and serum copper have been reported. Also,

no interaction was found between zinc and other micronutrients when administered in isomolar amounts or with food.

Fortification of food with zinc as part of programmes for the control and prevention of micronutrient deficiencies has been undertaken, using 12.5 mg iron, 0.16 mg of folic acid, 0.3 mg vitamin A, 30 mg of vitamin C and 5 mg of zinc. Addition of zinc imparts no colour, odor or change in overall taste. Bio-fortification of rice with zinc (IR 68144) has been undertaken in recent years. Preventive zinc supplementation in at risk children aged 12-59 months has been recommended as part of the package of nutrition interventions from the Lancet Series on Maternal and Child Nutrition (2013). As early as 2004, a joint WHO/UNICEF statement on the clinical management of acute diarrhoea reported that more than 1.5 million children under the age of five years continue to die each year as a result of acute diarrhoea. This number can be dramatically reduced through critical therapies such as prevention and treatment of dehydration with ORS and fluids available in the home, breastfeeding, continued feeding, selective use of antibiotics and zinc supplementation for 10-14 days.

In the management of diarrhoea, 20 mg of zinc is administered daily for 10-14 days to children and a reduced dose of 10 mg for 10-14 days to infants under the age of six months, to curtail severity and duration of the episode and prevent further episodes in the next 2-3 months [Pocket Book of Hospital Care for children, 2nd edition, WHO, 2013]. WHO's recommendations on the management of diarrhoea and pneumonia in HIV-infected infants and children states that elemental zinc supplementation is recommended for 10-14 days, with increased fluids and continued feeding, for all HIV-infected and exposed children with diarrhoea (10 mg/day for infants under six months, 20 mg per day for infants and children over six months).

The World Health Organization's guideline on the use of multiple micronutrient powders for home fortification of foods consumed by infants and children 6-23 months of age issued in 2011, states that one sachet containing iron, vitamin A and zinc (5 mg of elemental zinc preferably as zinc gluconate) could be used for home fortification for a minimum period of two months, followed by a period of three-four months of supplementation, so that the micronutrient powder is administered every

six months. The target group would be infants and young children aged 6-23 months, starting at the same time complementary feeding is introduced. Use is recommended in settings where the prevalence of anaemia in children under two and under five years is 20% or higher. However, as there is currently no available evidence to directly assess the potential benefits or harm of the use of multiple micronutrient powders in pregnant women for improving maternal and infant health outcomes, routine use of this intervention during gestation is not recommended as an alternative to iron and folic acid supplementation (strong recommendation).

As zinc affects the health and growth of children, what is the way forward to increase its availability? One would be the use of zinc in oral rehydration salt during the management of diarrhoea. Utilization of zinc during diarrhoea has been high in Bangladesh (34%) and low in India (1.3%). However, there are several constraints to the increase of zinc coverage:

- Absence of clear national policy on zinc or no clear strategy for scaling-up zinc consumption
- Non-availability of zinc
- Presence of patents and licenses
- Lack of endorsement by paediatricians
- Poor awareness among health workers, people
- Poor compliance to home-based treatment

Most Asian countries have a policy/plan of action for the use of zinc supplementation, either as part of diarrhoea treatment or general consumption through home fortification. Several other broader interventions can be used to overcome zinc deficiency in Asian countries – zinc–enriched fertilizers, consumption of fish powder and eggs, accessible health systems and ensuring overall food security.

Calcium & Vitamin D

Tahmeed Ahmed, WHO Temporary Adviser

Calcium

Hypertension complicates 5% of all pregnancies and accounts for ≈ 40000 maternal deaths annually. Maternal calcium supplementation is a key intervention to improve maternal and birth outcomes, particularly in countries with high burden of undernutrition.

Poor calcium intake results in reduced level of calcium in the blood which leads to increased secretion of Parathormone and Renin, causing a rise in the vascular intracellular calcium in smooth muscles resulting in increased vascular resistance and vasoconstriction. Calcium supplementation reduces smooth muscle contractility and prevents pre-term labour and delivery. A recent study on pre-eclampsia has shown this condition to affect 7-10% of pregnancies, possibly as a result of malnutrition and poor dietary intake. High diastolic blood pressure, edema and moderate to severe proteinuria are reported.

Table 2.5: *Serum calcium in pre-eclampsia in India*

Variable	Control N=50	Mild PE n=25	Severe PE n=25
Serum calcium (mmo1/L)	2.45±0.18	2.12±0.15*	1.94±0.09*,**
Serum magnesium (mmo1/L)	0.79±0.13	0.67±0.14*	0.62±0.11*
Serum zinc (μmo1/L)	15.64±2.4	12.72±1.7*	12.04±1.4*

Values are expressed as mean ±SD
Mild PE mild pre-eclamptic group, Severe PE severe pre-eclamptic group
**p<0.05 when compared o control group; **p<0.05 when compared to mild pre-eclamptic group*
[Source: Jain, S. et al. Biol. Trace Elem. Res. 2010]

Consumption of milk and milk products, traditionally good sources of calcium, and mean intake of calcium per day in a few countries show variable patterns, as indicated below.

Country	Consumption of milk products [Kg/Capita/Year]	Calcium intake [mean intake in mg / day]
United States of America	254.0	962
China	28.7	400
India	68.7	211
Bangladesh	16.0	200

A study from Bangladesh on the very low adequacy of micronutrient intakes by young children and women in rural Bangladesh is primarily explained by low food intake and limited food diversity, where overall prevalence of adequacy is reported around 23%. For calcium, while the requirement is 800 mg of calcium per day, women consume only around 164 mg of calcium per day. In the Bangladeshi National Micronutrient Survey conducted in 2011–2012, calcium deficiency was reported at 24.4% in children of pre-school age, 17.6% in children 6–14 years and 26.3% in women of childbearing age (15–49 years). Bioavailability of calcium from different foods is another important factor. For example, an estimated 16 servings of spinach will equal the calcium intake from 1 cup of milk.

Summary of calcium and its impact on maternal mortality and morbidity:

- Dietary intakes of calcium is poor in developing countries
- Calcium deficiency is associated with pre-eclampsia and hypertension
- Calcium supplementation reduces risks of maternal morbidity and mortality

Table 2.6: *WHO recommendation for calcium supplementation during pregnancy*

Dosage	**1.5 – 2.0 g elemental calcium / day** [(a)]
Frequency	Daily, with the total daily dosage divided into three doses (preferably taken at mealtimes)
Duration	From 20 weeks' gestation until the end of pregnancy
Target group	All pregnant women, particularly those at higher risk of gestational hypertension [(b)]
Settings	Areas with low calcium intake

(a) 1 g of elemental calcium equals 2.5 g of calcium carbonate or 4 g of calcium citrate

(b) Women are regarded as being at high risk of developing hypertension and pre-eclampsis if they have one or more of the following risk factors: obesity, previous pre-eclampsia, chronic hypertension, renal disease, autoimmune disease, nulliparity, advanced maternal age, adolescent pregnancy and conditions leading to hyperplacentation and large placentas (e.g. twin pregnancy). This list can be adapted/complemented based on the local epidemiology of pre-eclampsia.

Vitamin D

Vitamin D deficiency causes growth retardation and rickets in children and osteomalacia, osteopenia, osteoporosis and bone fracture in adults. In pregnancy adverse effects on fetal growth, bone ossification, tooth enamel formation, and neonatal calcium homeostasis can occur. The national prevalence of rickets in Bangladesh among children aged 1-15 years was reported at 1% in the National Rickets Survey of Bangladesh (2008). Vitamin D is also linked with stunting.

Fish, fish products, meat, liver, milk and fortified foods are major sources of vitamin D and consumption of these foods is insufficient in Bangladesh with no availability of vitamin D fortified food. Lack of direct exposure to sunlight among women may contribute to vitamin D deficiency. Prevalence of vitamin D deficiency is defined as 25-hydrozyvitamin D (25[OH]D) level below 50 nmol /L.

Table 2.7: *Vitamin D status of children and women in Bangladesh*

N=1649	Vitamin D deficiency, %					
	Pre-school		School-age		Women of Childbearing Age	
	% <25 nmol/L	% <50 nmol/L	% <25 nmol/L	% <50 nmol/L	% <25 nmol/L	% <50 nmol/L
National	7.5	39.6	6.5	45.5	21.0	71.5
Rural	7.0	38.0	4.3	41.2	17.1	70.6
Urban	8.9	44.6	11.5	54.2	35.6	72.4
Slum	10.1	47.9	14.7	66.5	31.9	83.1

Source: Bangladesh National Micronutrient Survey 2011-2012

The World Health Organization's guideline on vitamin D supplementation in pregnant women: Vitamin D deficiency is thought to be common among pregnant women, particularly during the winter months, and has been found to be associated with an increased risk of pre-eclampsia, gestational diabetes mellitus and pre term birth. However, based on the grading of the quality of evidence (GRADE), vitamin D supplementation is not recommended during and in pregnancy, to prevent the development of pre-eclampsia and its complications (strong recommendation). In addition, due to the limited evidence currently available to directly assess the benefits and harm of the use of vitamin D supplementation alone in pregnancy for improving maternal and infant health outcomes, the use of this intervention during pregnancy as part of routine antenatal care is also not recommended, (conditional recommendation).

3. Strategies for the prevention and control of anaemia in infants, young children, adolescents, pregnant and lactating women

Comprehensive Implementation plan to improve maternal, infant and young child nutrition: policy brief for global target 2 on anaemia reduction

Gerardo Zamora, WHO-HQ

The Comprehensive Implementation Plan (CIP) to improve maternal, infant and young child nutrition was endorsed by the World Health Assembly in 2012. CIP addresses the double burden of malnutrition: undernutrition and overweight. The action plan illustrates a series of priority actions that should be jointly implemented by Member States and international partners. There are six global targets to be attained and are aligned with different development agendas that will run from 2012 to 2025 and progress will be monitored using information available in 2012 as the baseline. The six targets are interlinked, voluntary in nature and guide the priority and goal-setting processes in Member States.

The global targets for 2025 in the CIP are:

(1) Reduce by 40% the number of children under 5 who are stunted

(2) Achieve a 50% reduction in the rate of anaemia in women of reproductive age

(3) Achieve a 30% reduction in the rate of infants born with low birth weight

(4) Ensure that there is no increase in the rate of children who are overweight

(5) Increase to at least 50% the rate of exclusive breastfeeding in the first six months

(6) Reduce and maintain childhood wasting to less than 5%

For the purpose of monitoring and tracking, a matrix as indicated below, will be used.

Table 3.1: *Tracking matrix*

	Targets	Baseline 2012	Target 2025
1	Reduce by 40% the number of children under 5 who are stunted	162 million	≈ 100 million
2	Achieve a 50% reduction in the rate of anaemia in women of reproductive age	29%	15%
3	Achieve a 30% reduction in the rate of infants born with low birth weight	15%	10%
4	Ensure that there is no increase in the rate of children who are overweight	7%	7%
5	Increase to at least 50% the rate of exclusive breastfeeding in the first six months	38%	50%
6	Reduce and maintain childhood wasting to less than 5%	8%	≤ 5%

A policy brief on each target has been prepared. The policy briefs seek to consolidate the evidence around which interventions and areas of investment need to be scaled up. The policy briefs also emphasize the importance of context and settings that are characteristics for policy-making and implementation. The policy briefs seek to guide decision-makers on what actions need to be taken in order to achieve real progress towards the achievement of targets. The six policy briefs will be followed by similar briefs on implementation and equity considerations aimed at programme managers and project implementers.

The policy briefs included an online global consultation with all stakeholders. All six policy briefs are structured around three segments: (i) what is at stake, including short definitions of the condition and related micronutrient deficiencies, (ii) the causes, global prevalence and policy issues in Member States; and (iii) a framework for action that includes recommended interventions by WHO, successful experiences and lessons learnt; actions to drive progress in achieving targets and thus reducing or tackling the micronutrient deficiencies at stake and, considerations for

implementation and suggested implementation strategies. All policy briefs include successful country experiences for Member States and their policy makers to draw upon when designing their national policies and programmes.

4. Micronutrient Fortification

Control of iron deficiency and anaemia through fortification of staple foods

Maria Nieves Garcia-Casal, WHO-HQ

Food fortification is an economical and convenient approach to deliver micronutrients to reduce deficiencies. It is a cost-effective and sustainable public health intervention that could be targeted or universal and, although desirable, does not require that individuals change food habits. Any food fortification intervention needs to undertake a preliminary assessment of micronutrient deficiencies; development of fortification standards and legislation; acquisition of equipment by the appropriate industries; establishing communication strategies and social marketing activities; ensuring quality assurance and control systems; and assessing health impact. Additional specific issues are: to define the nutritional status and fortification needs of the population; selection of adequate micronutrient mixes; selection of food vehicle; acceptability in appearance, taste and shelf life of the fortified food and meals containing it; bioavailability of micronutrients from fortified food and meals; field studies; monitoring of the programme and evaluation.

Each component requires input and consensus from a number of essential organizations, such as government ministries, nutrition and health institutes, research and academic institutions, standards bureaus, industry partners, civil society and international agencies. The potential sources of data that may be utilized in the development and introduction of any fortification programme are: national food consumption data; household income and expenditure surveys (HIES); panel survey; fortification rapid assessment tool (FRAT); FAO food balance sheets; demographic health

surveys; industry information. Additional information may be available in national health policy documents, reports of different stakeholders, or other large-scale health surveys.

Fortification of any food item, whether mandatory or voluntary, will depend on the extent of the public health magnitude of the problem; the size and scale of the food industry to be able to undertake the fortification process; population awareness about the nutritional impact of the particular food fortification and population food consumption patterns; and overall political environment. The food vehicle selected should reach the entire population and desirably deliver most of the calories of the diet. It has to be consumed daily but at the same time with no risk of excessive consumption and the fortified food should preferably be centrally produced (easier for quality control measures, monitoring and evaluation).

The selection of fortificants will be based on the number and amount of micronutrients needed, cost, bioavailability and safety. Fortification with iron requires additional considerations regarding technical difficulties related with the reactivity of iron and the generation of undesirable organoleptic changes, the amount to be added, segregation during mixing and storage, food matrix or diet composition. For vitamin A, while fortification is technically feasible, the processing losses are estimated at around 30%. For folic acid, stability, storage and cooking conditions and amount to be added are critical issues.

For most food vehicles, the recommended iron fortificants include ferrous sulfate, ferrous fumarate, ferrous bisglycinate, encapsulated ferrous sulfate or fumarate, electrolytic iron (at twice the amount), and ferric pyrophosphate (at twice the amount). Co-addition of ascorbic acid in a 2: 1 molar ratio is recommended for infant foods; in the case of high phytic acid foods, the molar ratio could be 4:1. Sodium-iron-EDTA has been used for the mass fortification of high-phytates cereal flours and for sauces with high peptide content (e.g. fish sauce, soy sauce). For liquid milk and dairy products, ferrous bisglycinate, micronized ferric pyrophosphate and ferric ammonium citrate are also suitable fortificants. Cereals constitute the main source of calories and nutrients in countries where micronutrient deficiencies are prevalent. As such, major points for consideration in fortifying cereals with iron are the low iron absorption from cereal-based foods as well as the extended use of elemental iron as a fortificant.

In order to measure the impact on health, data on the prevalence of particular micronutrient deficiency should be obtained and appropriate indicators identified to evaluate impact: haemoglobin for iron status; annual productivity losses (for iron); physical and cognitive function information (for iron); mortality <5 years (for vitamin A); neural tube defects for folic acid. The existence of programmes and measures that favour the control of micronutrient deficiencies could also be consulted: malaria control; helminthic and other parasitic infestations; delivery and post-partum services; nutrition education, advocacy and awareness measures. Social determinant issues would also need to be recognized: how to reach population with limited access to fortified food; barriers preventing equal access to fortified products among the vulnerable; and social protection initiatives to provide fortified products. Lessons learnt from similar intervention in countries should be considered when implementing a food fortification programme.

Control of diseases, improvement of sanitation and quality of life, supplementation, food fortification, change of food habits, improvement of micronutrient content of staple crops through biofortification, genetically modified food, nanotechnologies and nutritional education are all complementary strategies, each with its own relative importance depending on the local conditions and needs. National fortification projects take time to establish and the long-term success of fortification projects requires active and continuous improvements and a rapid capacity for response and change, based on data from constant monitoring and evaluation in order to remain effective and relevant.

Accelerated reduction effort on anaemia (AREA) is an intensified approach to improve health and nutrition by sustainably addressing the anaemia burden, which works with adolescent girls and women of reproductive age (WRA), and going beyond the emphasis on the 1000 days window-period of maternal and women's health. AREA is a country-owned and country-led initiative to commit to anaemia reduction and achieve the Global Targets 2025 and the initiative is to break isolated operations in the field by bringing actors together and build into the national scaling-up nutrition efforts to ensure sustainable long-term nutritional improvement. AREA could accelerate anaemia reduction using a multifactorial and multisectoral approach, tailored to local conditions and taking into account

anaemia's specific aetiology and the population groups affected. WHO's support to the implementation of a comprehensive package of public health measures would help to address all aspects of iron deficiency and anaemia in women of reproductive age: Iron and folic acid supplementation; Iron and folic acid fortification of wheat and maize flours (and other staples); dietary interventions; control of infections; birth spacing.

Equity and implementation considerations for nutrition interventions: conceptual framework and examples on food fortification

Gerardo Zamora, WHO-HQ

Micronutrient deficiencies affect all population groups but those with less economic resources, power and opportunities are more vulnerable and endure greater consequences. Fortification as a public health intervention seeks to affect all groups, but especially the ones that most need the intervention. When implemented, interventions are influenced by contextual and structural factors, but they also influence the context and, hopefully, the conditions people live in. Policies and interventions can have unexpected effects, positive and negative, affecting access to interventions. Thus, contextual and structural factors are related to social determinants of health, which in turn shapes the context where implementation is carried out. Access to interventions is conceived as an implementation outcome.

Health equity refers to the absence of systematic differences in health *(between and within countries, and between population groups)*. Such differences are considered unfair and avoidable by reasonable action. The factors that sustain and explain these differences are the social determinants of health (SDH), or the conditions in which people are born, grow, live, work and age. WHO's has put forward severeal framework to analyze public health programmes with an equity and SDH approach, which have been used to analyze several public health pogrammes programmes.

Implementation in public health is the translation into practice of evidence-informed policies and recommendations, which have been elaborated to address public health challenges. Implementation science and

research is the scientific study of methods to promote the systematic uptake of research findings into routine practice to improve the quality and effectiveness of health services and care.

Table 4.1: *Implementation Research – variable outcome*

Outcome	Working definition
Acceptability	The perception among stakeholders (e.g. consumers, providers, managers, policy-makers) that an intervention is agreeable.
Adoption	The intention, initial decision, or action to try to employ a new intervention.
Appropriateness	The perceived fit or relevance of the intervention in a particular setting or for a particular target audience (e.g. provider or consumer) or issue.
Feasibility	The extent to which an intervention can be carried out in a particular setting or organization.
Fidelity	The degree to which an intervention was implemented as it was designed in an original protocol, plan, or policy.
Implementation cost	The incremental cost of the delivery strategy (e.g. how the services are delivered in a particular setting). The total cost of implementation would also include the cost of the intervention itself.
Coverage	The degree to which the population that is eligible to benefit from an intervention actually receives it.
Sustainability	The extent to which an intervention is maintained or institutionalized in a given setting.
Equity in access	The absence of systematic differences between population groups in access to intervention
Based upon: Peters DH, Tran NT, Adam T. ***Implementation Research in Health: A Practical Guide***. Geneva: World Health Organization; 2013.	

Equity in access to interventions is an implementation outcome and is explained through the social determinants of health where the proposed analytical framework seeks to identify entry points to overcome barriers in

access and difficulties in implementation, and be useful for implementation and programme managers – dialogue with other actors (policy makers, academic researchers).

Example 1: Fortification of maize flour and corn meals

Over 200 million people rely on maize, in any of its forms, as a staple food (especially in Sub-Saharan Africa, South-East Asia, and Latin America) and maize provides approximately 20% of the calories consumed in the world. In countries where maize is a staple, corn flour or maize meal tends to be consumed by population groups across the social gradient (but heavy reliance as a dietary staple by individuals/households in lower socioeconomic positions). By 2013, 12 countries had a policy to fortify maize flour with at least one micronutrient: five countries in Africa (Kenya, Nigeria, South Africa, Tanzania, and Uganda); and seven in the Americas (Brazil, Costa Rica, El Salvador, Guatemala, Mexico, United States of America, and Venezuela). However, fortified foods do not always reach the population groups most in need of this intervention.

Table 4.2: *Socio-economic context and position*

Key determinants	Key aspects
Income, cost of food, and purchasing power of families	• Low-income associated with higher prevalence • Rural households-cost-purchasing power • Voluntary-local mills
Education level, attitudes, knowledge, and misconceptions	• Consumers' preferences modified by educational level (basic knowledge) • Family size/sexuality
Cultural norms, gender roles, values, and intra-household distribution of food	• Valuation of household members' influence, food intake (women, older people, children) • Mostly for foods perceived as luxury
Support from local leaders	• Local leaders (including religious ones) had helped break misconception • Social marketing

Key determinants	Key aspects
Policies and regulatory frameworks	• Politics of food (worldwide and locally) • Legislation necessary to establish fortification infrastructure/sanctions • Resistance/concerns from stakeholders
International trade policies	• International and regional trade obligations • Evidence-informed–standards compliance

Differential exposure refers to individuals and populations groups with higher risk of micronutrient malnutrition (MNM) who are usually also at higher risk of many other social and health problems.

Table 4.3: *Differential exposure*

Key determinants	Key aspects
Distance and hard-to-reach fortification mills	• Travel and distance may be major barriers to adhere to the intervention • Time-consuming activities linked to interventions (training and talks) • Freight cost of premix to mills
Food availability, changes in consumption patterns, and rural/urban differences	• Changes in food availability impacts consumption of maize flour and corn meal (v.s. greater availability of wheat flour) • Children in rural areas eat more corn meals vs. more bread in urban areas • (Data needed!!)
Displaced populations and long-lasting deprivation	• Physical conditions might impede access to micronutrients and minerals (no market, poor livelihoods) • Local involvement

Differential vulnerability refers to the clustering of risk factors or their cumulative effects throughout the life-course, which makes unprivileged

populations more vulnerable to facing barriers to access fortification of maize flour and corn meal.

Table 4.6: *Differential vulnerability*

Key determinants	Key aspects
Cultural values, body image, and family planning	➢ Mandatory food fortification, no change in individual behaviour, but changes in regular diet may be affected by several factors: age and gender ➢ Beauty expectations in women (unhealthy dieting) ➢ Stigmatized pregnancy (adolescents and non-married women)
Clustering of risk factors	➢ Combination of limited opportunities for education, jobs, and income generation ➢ Conditional transfer programmes vs. food assistance schemes ➢ Functioning markets vs. less functional/ accessible markets

Differential health outcomes refers to, for example, how health systems work to level up unjust differences.

Table 4.4: *Differential health outcomes*

Health systems	➢ **Despite fortification of foods being a market-based intervention, it may benefit from a strong health system, which is a powerful determinant for health** ➢ **Evidence limited on the role of each one of the seven building blocks in relation to access to fortified maize flour and corn meal; no impact assessments found** ➢ **Social participation approaches in community health** ➢ **Quality of workforce knowledge (training)**

Differential consequences – unexpected difficulties are likely to have unequal consequences for individuals and their families (different

associated baseline conditions). Those facing poor living conditions frequently have fewer resources to surmount unforeseen adversities.

Table 4.5: *Differential consequences*

Increasing cost of energy	➢ Local mills to transform maize into masa or flour. ➢ Mills are fuel-or electrically-operated ➢ Local mills more vulnerable to changes in cost of energy, translate costs to consumers ➢ Consumers might forego the cost of fortification (linked to socioeconomic conditions) ➢ Pricing strategies ➢ Limited evidence on the role of social protection schemes

Fortification of maize flour and corn meal requires intersectoral action for policymaking, deploying interventions, and monitoring of its impact and all efforts need to be aligned especially with poverty reduction programmes and other social intervention policies and social protection schemes. Sustainability of fortification programmes is usually ensured by consumers willing to pay the extra price (if any), but extremely difficult in contexts of extreme and extended poverty and lack of opportunities. Health systems are challenged in the collection and use of key information required to assess and address health inequities in access to these interventions.

Example 2: Fortification of condiments and seasonings

In situations where they are consumed, condiments and seasonings (e.g., fish and soy sauces) are usually used by all population groups according to income. Many factors can affect fortification of condiments and seasonings. For instance, a recent analysis of population data from Vietnam suggests that consumption of flavouring powders and sauces tends to slightly increase with socioeconomic status, particularly in urban areas and there might be a risk of greater benefit for those with less need. Moreover, a

national plan to launch iron-fortified fish sauce to prevent iron deficiency was elaborated in VietNam with the support of GAIN, given that fish sauce industry was state-run. The privatization of the state-run industry greatly affected the project implementation and participating manufacturers declined from 30 to 10.

Another example is that of sodium intake as exposure to high intakes of certain minerals is usually not equally distributed across population groups. Studies from Brazil found that at population level, ≈75% of Na comes from table salt or salt-based condiments. This proportion increased as income decreased: the lower the income the more contribution of salt and condiments to sodium intake. There is risk of increasing exposure to unhealthy diets in low-income countries where health systems are not well prepared for chronic care of noncommunicable diseases. In many parts of the world, diets increasingly incorporate significant amounts of "processed foods", which could be an opportunity for introducing healthy processed foods, but usually they are not. Making "healthy" food choices requires knowledge and abilities usually filtered by education level and income and marketing is not likely to reach all groups equally.

It is well known that Iodized salt has indisputable benefits for the health of populations and in parts of the world (e.g., South-East Asia) food systems are rapidly transforming in line with economic growth, urbanization, increased trade and more retail markets are becoming available. However, regulatory frameworks are sometimes very weak, so it is unclear as to what extent salt used by the food manufacturing sector is fortified and this situation is likely to affect the fortification of condiments and seasonings.

Differential health outcomes are affected by health systems' capacity to generate data because appropriate interventions to level-up health inequities require reliable information on the population. Studies have found that some food consumption surveys do target low-income households, but fail in collecting data from these households. As such, fortification of condiments and seasonings is affected by this un collected data; data may sometimes be in the hands of the industry but not in the health systems. This should be considered when interventions are designed so baselines are less biased.

With regard to the implications for implementation of fortification of condiments and seasonings, more research is needed to understand whether fortification of condiments and seasonings is safe at the population level; and how different population groups actually access this intervention. It is to be noted that as health inequities operate through the social determinants of health (SDH), an SDH-based approach in health interventions can contribute to increase and ensure equitable access to interventions such as food fortification as many determinants of health operate in the manner population groups access and use interventions. Thus, fortification of condiments and seasonings cannot be a stand-alone strategy, but in alignment with other fortification strategies (e.g., social policies, agriculture and economy policies) and other sectors. More research is needed on implementation of fortification of condiments and seasonings for WHO to provide guidance on scaling up of strategies.

Fortification of salt and sugar

D. Chaudhary, Micronutrients Initiative (Asia)

Prevalence of anaemia among pregnant women in Member States of the WHO South-East Asia Region is indicated in the table below.

Table 4.6: *Anaemia and Vitamin A deficiency – SEA Region*

Country	Anaemia -Prevalence (%) *			Vitamin A-Prevalence (%) #
	Pregnant Women	Non-pregnant Women	Pre-school Children	Preschool Children (Serum retinol <0.70 μmol/L)
Bangladesh	47	33	47	22
Bhutan	50	55	81	22
DPR Korea**	35	35	32	28
India	59	55	70	62

Country	Anaemia -Prevalence (%) *			Vitamin A-Prevalence (%) #
	Pregnant Women	Non-pregnant Women	Pre-school Children	Preschool Children (Serum retinol <0.70 μmol/L)
Indonesia	44	33	45	20
Maldives	55	50	82	9
Myanmar	50	45	63	37
Nepal	48	35	46	32
Sri Lanka	29	32	30	35
Thailand	22	18	25	16
Timor-Leste	23	32	32	46

[Sources: * -WHO-Worldwide prevalence of anaemia 1993-2008; WHO Global Database on Anaemia 2008; NFHS 2005-2006; Nepal DHS 2011][# - Worldwide prevalence of Vitamin A deficiency in populations at risk 1995-2005 (2008)]
**Democratic People's Republic of Korea

Why fortification should be considered:

- Diets are inadequate in poor contexts: provides critical nutrients e.g. iron, folic acid.
- Appropriate foods can deliver nutrients: e.g. salt, wheat flour that are consumed on a population –wide basis
- Does not require significant change in dietary habits
- It complements other approaches such as food supplementation and dietary diversification.

Double fortification of salt (DFS) is based on several considerations: salt is an appropriate vehicle for fortifications of iodine and salt iodization programmes have successfully delivered iodine to populations; salt fortified with iodine and iron can provide 100% of iodine requirements, about 30% of iron requirements and 10 mg of salt consumption will provide 3 mg of iron; double fortification of salt is a complementary strategy to improve iron nutrition of populations. A "double fortified salt intervention" trial in India among female Indian tea-pickers demonstrated significant improvements in all measures of iron status. However, there was no improvement in the

prevalence of anaemia suggesting the present of other micronutrient deficiencies and possible haemoglobinopathies. Median urinary iodine excretion was appropriate. Several types of 'DFS' exist, varying in the iodine and iron contents and compositions and additives used. In general, all are efficacious and stable for long duration. Double-fortified salt has been found to be acceptable to population but has limited demand due to limited availability; the cost benefit ratio is 2.4:1. In India, the Tamil Nadu Salt Corporation manufactures DFS and distributes to the State-run school lunch programme, covering around three million children every day. In India and Bangladesh, private salt producers have commenced the production and marketing of DFS, while other countries like Sri Lanka, Nepal, Kenya and Nigeria have shown interest.

However, several programmatic issues related to DFS need to be resolved: adding iron to iodized salt causes colour changes and iodine loss and ferrous iron is less stable than ferric iron. Several other options have been identified: micro-encapsulation of ferrous fumarate (1 mg/g salt) - with edible polymers such as partially hydrogenated vegetable oil; micronized ferrous pyrophosphate (3 mg/g salt) with the mean particle size $\approx$ 2.5μm obtained by grinding; use of stabilizer sodium hexametaphosphate (SHMP); new complexes under development such as magnesium-iron and hydroxide-carbonate-iodate-hydrate complex. Also, evidence for effectiveness is not available.

Fortification of sugar with vitamin A is based on the consideration that 70% of the population consumes of about 60 g of sugar per day and can be fortified with vitamin A at 12 mg/day. Other micronutrients have been added to vitamin A fortified sugar with mixed results: addition of folic acid accelerates the degradation of vitamin A while addition of NaFeEDTA was found to be stable and efficacious. Several counties in South America have vitamin A fortification of sugar with strong support from the sugar industry. Studies in Guatemala showed that vitamin A fortified sugar was an effective strategy for improving the vitamin A status, providing children with about a third of their recommended intake of vitamin A and increase in the amount of vitamin A in the breast milk of lactating women. A similar finding was reported from a study in Zambia.

Both DFS and sugar enriched with vitamin A can be acceptable if marketed appropriately although some discolouration and floating due to encapsulation may be encountered with DFS. Both interventions are technically feasible, have been scaled to some degree and can be cost-effective under right conditions.

5. Conclusions & Recommendations

Conclusions

(1) Participants agreed on the importance of this meeting and the relevance of effective dissemination of WHO guidelines and recommendations on micronutrients. However, as most guidelines and recommendations are relatively new, adequate and appropriate dissemination has not been achieved in most Member States.

(2) Evidence-based data on the prevalence of micronutrient deficiencies, trends over time and impact and coverage of interventions are lacking in most Member States. Increased coordination and cooperation at the national and regional level is encouraged to improve the quality of data. Technical and financial resources could be sought from partner organizations and interested bilateral partners.

(3) As there are several interventions for the control and prevention of micronutrient deficiencies underway in Member States, the meeting provided a good opportunity to review the new information and refine the national strategies and interventions in alignment with WHO guidelines and recommendations.

(4) The meeting was an opportunity to compile information on ongoing interventions to address micronutrient deficiencies in different age groups in Member States.

(5) Concern was expressed about the aetiology of anaemia in all age groups including young infants that requires more collaboration between obstetricians/ gynaecologists, public health nutritionists, child health specialists and neonatologists for a comprehensive approach.

(6) Availability of pharmaceutical preparations and fortification mixtures with appropriate combinations and dosages of micronutrients remains a constraint in most Member States. Increased collaboration between public and private sectors is needed to resolve this issue.

(7) Most Member States lack a coordinated approach to the control and prevention of micronutrient deficiencies. For example, Member States need to explore inclusion of food fortification programmes, food diversification as well as supplementation interventions and other public health interventions in their strategies to combat micronutrient deficiencies.

Recommendations

(1) Participants agreed that adoption/adaptation and subsequent implementation of the WHO guidelines and recommendations should be undertaken in the Member States.

(2) The aetiology and causation of anaemia extends beyond the health sector. Efforts should be made through coordinated and multisectoral research to understand anaemia in different geographical and population settings.

(3) Member States are encouraged to review the dosage of folic acid being used either in routine health practice or mass-scale public health interventions and to adhere to doses recommended in WHO guidelines.

(4) Monitoring and evaluation of different interventions for the control and prevention of micronutrient deficiencies have to be improved to generate efficacy and effectiveness data required for informed policy-making and planning.

(5) Member States, in collaboration with partner organizations, would need to create a critical mass for conducting research on micronutrients at the national and regional levels, using appropriate methodologies. New techniques to assess micronutrient status and/or bioavailability should be introduced to generate good quality data.

Annex 1

Agenda

(1) Inaugural session

(2) Objectives and mechanics of the meeting

(3) Development process for nutrition guidelines and recommendations

(4) Introduction to EVIPNet

(5) New guidelines and recommendations

(6) Anaemia in infants and young children

(7) Prevention and control of anaemia in Infants and young children - best practices

(8) Country experiences in the prevention and control of anaemia in infants and young children

(9) Prevention and control of anaemia in adolescents - best practices

(10) Country experiences in the prevention and control of anaemia in adolescents

(11) Prevention and control of anaemia in women: adults, pregnant and lactating - best practices

(12) Country experiences in the prevention and control of anaemia in women: adults, pregnant and lactating - best practices

(13) Fortification

(14) Micronutrient deficiencies in humanitarian crises

(15) Group Activity: Aligning national micronutrient deficiencies prevention and control protocols

(16) Conclusions and recommendations

Annex 2

Country Reports

Prevention and control of anaemia in infants and young children in Bangladesh

Shimul Koli Hossain, Ministry of Health & Family Welfare

Current Data: In the National Micronutrient Survey conducted between 2011 and 2012, anaemia in pre-school age children shows the prevalence pattern as indicated in the following table.

Table 3.2*: Prevalence of anaemia among pre-school children in Bangladesh*

Geographical distribution	Anaemia	Iron-deficiency anaemia
National	33.1%	7.2%
Urban	22.8%	10.1%
Slum	22.0%	13.9%
Rural	36.6%	6.1%

Source: National Micronutrient Survey 2011-2012

Structures:

The nodal organizations for the prevention and control of anaemia in Bangladesh are:

- Government
  - Ministry of Health & Family Welfare – National Nutrition Services (NNS), Directorate General of Health Services
  - Ministry of Food & Disaster Management
  - Ministry of Social Welfare
  - Ministry of Women and Children Affairs

- NGOs and United Nations / international organizations

  - The Ministry of Health and Family Welfare supervises the activities of the Directorate General of Health Services and the Directorate General of Family Planning. The Institute of Public Health Nutrition and the National Nutrition Services are supervised by the Directorate General of Health Services at the national level. At the district level, the civil surgeon; at the sub-district level, the Upazilla officer and the family planning officer supported by medical officers; and paramedics and field workers at the community; are responsible for the _____.

Strategies and interventions:

The national strategy for the prevention and control of anaemia was formulated in 2007 and comprises the following:

Priority strategies: targeted at high-risk groups [low birth-weight infants aged 2-5 months; all children aged 6-23 months; pregnant women and breastfeeding women up to three months postpartum; adolescent girls and newly married women]

- Strategy 1: Micronutrient supplementation
- Strategy 2: Dietary improvement
- Strategy 3: Parasitic disease control
- Strategy 4: Family planning and safe motherhood

Population-based strategies:

- Strategy 5: Food fortification
- Strategy 6: Production of micronutrient-rich foods through household food production, crop diversification, biotechnology and bio-fortification.

A new national strategy on prevention and control of micronutrient deficiencies for the period 2014-2023 has been formulated with several strategic areas: policy, guidelines and legislation; intervention programmes; partnership and coordination; capacity-building; advocacy and

communication; monitoring, evaluation and research. Monitoring of the micronutrient intervention programmes is undertaken through the regular management information system, periodic surveys and supportive supervision. Feedback is provided from changes in policies, strategy development and plans of action.

Interventions:

Implementation of national micronutrient deficiency control and prevention interventions.

- Promotion and distribution of iron and folic acid tablets among pregnant and lactating women;
- Promotion of early initiation and exclusive breastfeeding;
- Promotion and counselling on complementary feeding;
- De-worming of children;
- Vitamin A supplementation among 6-59 months old children
- Training and counselling of caregivers on hand washing & personal hygiene
- Food fortification
- Infant and young child feeding (including distribution of micronutrient sachets among 6-23 months old children)
- Treatment of children with anaemia and malnutrition
- Awareness building among mothers /caregivers and communities

Stakeholders:

There are large number of stakeholders and partnerships engaged in the control and prevention of micronutrient deficiencies in Bangladesh:

- Ministries of Health & Family Welfare, Agriculture, Women & Child Affairs, Social Welfare, Food & Disaster Management, Fisheries & Livestock

- WHO, UNICEF, FAO, WFP, UNHCR, REACH
- National and international NGOs, professional associations
- Academia and research Institutions

Bhutan

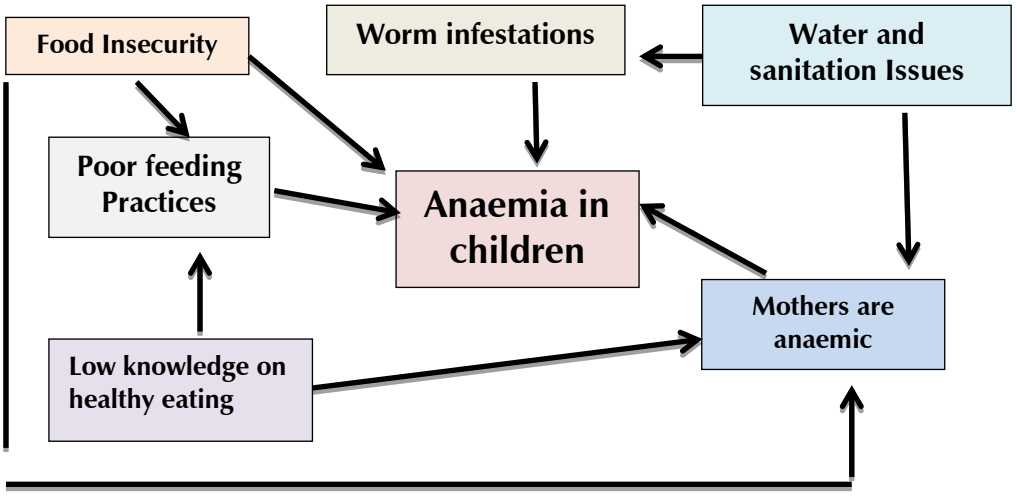
Pemba Yangchen, Ministry of Health

Current Data:

Table 3.3: *Anaemia in Bhutan*

Target Group	Criteria	1986	2001-2002
Women	< 12 mg/dl	60%	55% (non-pregnant)
Pre-school children	<11mg/dl	58%	81%
School children	<11 mg/dl	36%	
Men (adult)	<13 mg/dl		28%

***Figure 3.1**: Web of causation for anaemia in Bhutan*



Structures:

In Bhutan, three agencies are responsible for the prevention and control of anaemia:

- Ministry of Health for screening and treatment
- Ministry of Education for information
- Ministry of Agriculture for food security

Strategies and Interventions

Several interventions are in place for the control and prevention of anaemia in mothers: haemoglobin assessment during pregnancy; iron-folic acid supplementation for pregnant and lactating mothers; health education on maternal nutrition -MCH handbook; counselling on infant and young child feeding practices. The key intervention for infants less than six months is exclusive breastfeeding for the first six months of life. For children between six months and five years, deworming in children is started at the age of 15 months and continued every six months till the age of 57 months;

counselling on infant and young child feeding; introduction of nutritionally adequate complementary food starting at six months of age. For school-age children: deworming; iron-folic acid supplementation on every Thursday of the week (60 mg iron and 400 μg folic acid); health education emphasizing the importance of iron and hand-washing; education and treatment for malaria.

Stakeholders:

Table 3.4: *Levels of responsibilities as per the health facility*

Facility	Responsibilities
Community level	• Line listing of pregnant mothers by Volunteer Health Workers (VHWs) • Promotion of kitchen gardening, sanitation and hygiene
District level	• Home Workers screen and treat anaemia • Ensure that pregnant and lactating women receive iron folic acid • Diagnose and treat all cases of parasitic infections
National level	• Evidence-based policies and interventions • Screen and treat anaemia • Diagnose and treat parasitic infection • Iron folic acid supplementation for all pregnant women • Training of the school health coordinators/health workers/monastic bodies • Health education on healthy diet • Ensure efficient flow of supplies • Monitoring and evaluation

Among the internal partners are the various national programmes – reproductive health, school health, diarrhoeal diseases control, medical

services, drugs and vaccine department, and health promotion. The key stakeholders are the Ministries of agriculture and education, UNICEF and WHO. The Ministry of Health is currently preparing for the National anaemia survey in 2015.

Nepal

Giri Raj Subedi Ministry of Health and Population

Current data

Nepal is a small and diverse country with a population of 27.31 million, and an under-five population of 2.81 million. There are 75 administrative districts, 16 of which are in mountainous areas, 39 districts in hilly areas and 20 districts in the "Terai". The country is divided into far-western, mid-western, western, central and eastern regions.

Substantial improvements in stunting and underweight have occurred over the last 15 years, but they yet remain high; wasting has remained almost unchanged.

Table 3.5: *Nutrition profile of children in Nepal*

	Stunting	Underweight	Wasting
NDHS 2001	57	43	11
NDHS 2006	49	39	13
NDHS 2011	41	29	11
MDG Target 2015	28	27	5

Table 3.6: *Prevalence of anaemia in 6-59 months old children, women of child-bearing age and pregnant women (1998-2011)*

Years	Prevalence (%)		
	6–59 months	Pregnant Women	Women of reproductive age
NMSS 1998	75	75	73
NDHS 2006	48	42	36
NDHS 2011	46	48	35

Structures:

The nodal agency responsible for the control and prevention of anaemia in infants and young children is the nutrition section of the Child Health Division, Ministry of Health and Population. All activities are implemented through the district health offices and district public health offices throughout the country. At community level, activities are through the primary health care outreach clinic and subsequently through the community female health volunteers and mothers groups.

Strategies and interventions:

Several interventions for the control and prevention of anaemia in infants and young children exist:

(1) Infant and Young Child Feeding (IYCF)

(2) Micronutrient powder (MNP) distribution linked with IYCF

(3) Iron supplementation among pregnant and postpartum mothers

(4) Growth monitoring and counselling

(5) Control of parasitic Infestation by deworming bi-annually

(6) Vitamin A supplementation bi-annually.

In 2005, the National Nutrition Strategy and Anaemia Action Plan endorsed micronutrient powder (MNP) as a key intervention to address anaemia in young children and was piloted in two districts in 2008. The programme has since then expanded to several additional districts. Currently the MNP initiative addresses children less than two years and is distributed free. MNP is also used in emergencies, food insecure areas and refugee camps as part of food ration or food-for-work initiatives. Collaboration is maintained with international partner organizations in the procurement and distribution of MNP.

Iron supplementation of pregnant and postpartum women:

- Distribution of iron folic acid tablets to pregnant women (180 tabs) and lactating mothers (45 days) through hospitals and health facilities
- Intensification programme of maternal iron supplementation through female community health volunteers (FCHVs)
- De-worming of pregnant women during second trimester of pregnancy.

Other large-scale nutrition interventions are: flour fortification; distribution of fortified blended flour; infection-reduction interventions such as deworming, promotion of hygiene and sanitation, malaria prevention and promotion of school health and nutrition programme.

Monitoring activities: monthly departmental meetings, routine monthly data collection, analyses, interpretation and feedback to all health facilities, annual performance review (district-centre level). Evaluation is undertaken through: baseline, midline and end-line survey; Nepal Demographic and Health Survey (NDHS) undertaken every five years; national micronutrient status survey (proposed).

Stakeholders:

All interventions are delivered as part of the national nutrition policy and strategy and a multisectoral nutrition plan. The co-ordinating body is the National Planning Commission and the implementing agency is the

Nutrition Section of the Ministry of Health and Population. The relevant partners are WHO and UNICEF.

Prevention and control of anaemia in adolescents Indonesia

E. Juneaedi, K. Anwar, T. Suryanto, M. Adil, R. Effendi, D.P.Aprianto, Ministry of Health

Current data:

As reported in the national census of 2010, the infant, under-five and adolescent populations of Indonesia are enumerated at 4.5 million, 22.6 million and 43.4 million, respectively. The prevalence of anaemia in children has been declining, as determined from different surveys conducted over the years (1995 – 2011)

1995 National Household Survey (SKRT)	2001 (SKRT)	2004 (SKRT)	2006 (SR GZ MIKRO)	2011 (SEANUTS)
51.5%	58.0%	40.2%	25%	17.6%

Prevalence of anaemia in adolescents has also shown a decline between 2004 and 2013.

2004 National Household Survey (SKRT)	2005 East Jakarta Survey	2006 National Micronutrient Survey	2007 (Semarang Survey)	2013 (Basic Health Survey)
57.1%	44.4%	28%	25.5%	26.4%

Structures

At the level of the Ministry of Health, control and prevention of anaemia in adolescents is provided in collaboration with the ministries of education and religious affairs; nongovernmental organizations and international agencies.

Strategies and interventions

Since 1998, a new initiative has been implemented to provide iron supplementation in junior high schools and high schools. Interventions for control and prevention of anaemia in adolescent girls are carried out only in a few areas, where iron supplementation is administered to school children (subject to availability of iron supplements and supportive local policy). The central and local government programmes focus on reducing the maternal anaemia status and nutritional status of children less than two years. Prevention and control of anaemia in adolescents is provided by the central government through national policies (norms, standards, procedures and criteria) and the local government which implements national policies adjusted to specific local policies.

Two types of interventions exist for the control and prevention of anaemia in adolescents.

Preventive and promotive: Services are delivered through the "adolescent-friendly health services (AFHS)" in primary health centrrs and school health programmes. As part of this intervention, training and coaching is provided to "adolescent health care" staff and "peer counsellors". One tablet each of iron + folic acid per week is provided to each adolescent girl that is increased to one tablet per day for the duration of her menstruation. 'Rapor Kesehatanku' [My Health Report Book] is a new initiative that collates all relevant information on the health status of all school-age children and adolescents [7 – 19 years].

Students from the 1st, 7th and 10th grade undergo health screening including haemoglobin estimation for students from the 7th and 10th grades. Each student is administered one tablet of iron + folic acid per day. Recently a "draft Algorithm for Adolescent Health" has been adopted from a WHO manual and will be used through the primary health services for implementing adolescent friendly health services.

Information on key health issues is directly made available to young women. Indirect sources of information communication and education are (i) teachers/educators/school; (ii) youth organizations; (iii) health workers. There is no structured monitoring and evaluation system targeted at the adolescent population. Evaluation depends on periodic surveys and may

include the following: quick survey of nutrition disorders; basic health research; household health survey; Indonesian Demographic and Health Survey.

Stakeholders:

The relevant stakeholders are the ministries of education, health, religious affairs and home affairs with the involvement of nutrition, maternal and child health, and essential medicines. Assistance is also obtained from international agencies.

Maldives

Maimoona Aboobakuru, Fathimath Thohira, Nazeera Najeeb, Ministry of Health

Current status

Maldives is situated in the Indian Ocean and consists of approximately 1190 small low-lying coral islands. Only 194 islands are inhabited. The total population is around 317000 and are primarily young adults. The infant mortality rate is 9, the under-five mortality rate is 11 and the neonatal mortality rate is 6.

As per the National Micronutrient Survey undertaken in 2007, the prevalence of micronutrient deficiencies is indicated in the table below.

Table 3.7: *Micronutrient deficiencies in the Maldives*

Deficiency	Women	Children
Anaemia	15.4%	26.3%
Iron (Ferritin <20 ng/ml)	38.4%	57.3%
Iodine (<100μg/L)	26.8%	18.8%
Vitamin A (Retinol <40μg/dL)	44%	55.2%
Zinc (<60 μg/dL)	26.8%	16%

The prevalence of anaemia among women of child-bearing age (15-49 years) is indicated below.

Table 3.8: *Prevalence of anaemia in women of child-bearing age*

Anaemia	Multiple Indicator Cluster Survey (MICS 2001)	National Micronutrient Survey (2007)
Mild (Haemoglobin 10.00-10.9 g/dL)	40%	NIA
Moderate (Haemoglobin <7 – 10 g/dL)	10%	15.1%
Severe (Haemoglobin < 7 g/dL)	1%	0.3%

The National Micronutrient Survey (2007) reported that iron deficiency anaemia was most prominent among mothers who were taking coffee/tea. 92% of the population consume tea/coffee, of whom 60% consume tea/coffee immediately after meals. Similarly, dietary practices of adolescents remain sub-optimal. Because of its geographical location, the diet of the population is largely dependent on fish and meat. An estimated 22.7% of the students ate a fruit twice or more per day while 10.1% of the students' ate a vegetable three or more times a day, as determined by the 'Global School Health Survey of 2009'.

Structures:

The Ministry of Health (Health Protection Agency) is the nodal agency for all national public health programmes and works under the principle of universal health coverage. All relevant interventions are integrated with relevant public health programmes.

Central	***Tertiary hospitals***	
Atoll	***Secondary hospitals***	Public health unit
Island	***Health centres***	Public health unit
Island	***Health posts***	Public health unit

Strategies and interventions:

The policy, plan and strategies addressing adolescent health are:

- Health Master Plan
- Public Health Act
- Integrated national nutrition strategic plan 2013 – 2017
- Draft Micronutrient Policy
- National reproductive health strategy 2014 - 2018
- National Youth Health Strategy
- Adolescent health standards and service package
- Action plan for prevention of NCDs
- Work initiated to develop food-based dietary guideline.

- **Adolescent health programme:** Advocacy and awareness**,** media, IEC materials, events; preparatory work is ongoing to initiate adolescent- friendly health services.
- **School health programme:** health and nutrition programme in schools led by school health; life-skills programme; training teachers on adolescent health, awareness programmes for students in collaboration with the Ministry of Education and the Health Protection Agency (HPA)
- **Pre-conception care:** Plan to initiate folic acid and iron supplementation programme in 2015; plan to develop strategies for 'Birth defects Prevention and Control' interventions.

Activity	Target population
Vitamin A	From 9 months to 13 years
Deworming	2-13 years
Folic acid and Calcium supplementation	During pregnancy
Screening for Thalassemia	➢ Mandatory before marriage ➢ Iron deficiency anaemia will be ruled out and advice and/or referral provided

Monitoring and evaluation are undertaken through routine monitoring of public health, reproductive, maternal and nutrition programmes supplemented with periodical surveys and program assessments.

Stakeholders

All health facilities, the ministries of education, youth, sports and human resources, gender, international partner agencies and nongovernmental organizations.

Sri Lanka

S. Gunawardana, A. Samaranayake, N. Hemachandra, C. Vithana, C. Hettiarachchi,

A. Jayathilaka, Ministry of Health & WHO Sri Lanka

Current data:

Socio-demographic indicators of Sri Lanka:

- Total population: 20.3 M (2012)
- Surface area: 65,610km^2
- Population density: 323 per km^2 (2012)
- Population growth rate: 0.7%
- Crude birth rate (CBR): 17.6/1000 population (2010)
- Crude death rate (CDR): 6.2/1000 population (2010)
- Life expectancy: total 74.9yrs (2011)

  Male 70.3yrs

  Female 77.9yrs
- Literacy rate: total 91.9% /M 93.2% / F 90.8%
- Per capita income: US$ 2804 (2011)
- Free education and free health for all

There are 4 million adolescents in the country, comprising 19.7% of the population. The national primary school enrolment is 99% while secondary school enrolment is 94.5%. Teenage pregnancy, which is estimated at 6.3%, is addressed by the maternal care programme.

There are no national-level data on the prevalence of anaemia among adolescents but various regional and local estimates exist based on which, national prevalence of anaemia in adolescents is estimated at 40%.

Structures:

The Ministry of Health is the nodal agency with support received from the Ministry of Education and various other ministries. Overall advocacy, policy direction and coordination is provided through the National Nutrition Council chaired by His Excellency the President of Sri Lanka; 17 other ministries are also included in the council, emphasizing a multisectoral approach. The Ministry of Health acts through the existing health services such the 'National School Health Programme' together with the Ministry of Education. All issues related to the national nutrition policy, national education policy and adolescent health strategy are addressed.

Health care for adolescents and schoolchildren is provided by the Area Medical Officer of Health in collaboration with the Ministry of Education. There are 9862 schools throughout the country that receive such health care. Public health inspectors (1/10000) supervise public health activities at the school level while a Public Health Midwife (1/3000 population) provides care to out-of-school adolescents.

Strategies and interventions:

Weekly iron + folic acid tablet is administered to the entire school population from the first year of schooling to the last year (13^{th} year) including both boys and girls along with a yearly deworming exercise. Nutrition education is included in the school curricula along with life-skills development in several school settings. Mid-day meals are provided in many schools and 'health promoting schools' include canteen policy. Non-health interventions include school and home-gardening programmes to induce food diversity.

The weekly iron + folic acid supplementation was pilot-tested in 2007 among girls from grade 7 to 10 and subsequently, a policy decision was taken to implement this intervention nationally. In 2013, it was decided to administer supplementation to the entire school population and the programme was initiated in 2014. The Ministry of Health procures and supplies the iron, folic acid, vitamin C and anti-helminthic tablets and utilizes the Ministry of Health's logistical channels up to the division level, where supplies are distributed to individual schools. Class-teachers are expected to administer the tablets, directly observe intakes by the students and maintain records. The Area Public Health Inspector assists in the logistics, supervises and monitors the programme. The total cost of the initiative (fully funded by the Government) is Sri Lanka Rupees 92.7 million per year. Iron used is 60 mg elemental iron as ferrous sulphate and 2 mg of folic acid. The challenges are: how to address the needs of out-of-school adolescents; influence of mass media advertisements; and easy access to unhealthy fast foods.

Monitoring of the programme is through routine school-level reports, monthly nutrition activities and special surveys undertaken from time to time.

Stakeholders:

The various stakeholders are the international agencies, nongovernmental organizations, community-based organizations and other government sectors such as agriculture, livestock, economic development and media.

Prevention and control of anaemia in pregnant and lactating women
Democratic Peoples' Republic of Korea

Shushil Dev Pant, WCO Democratic People's Republic of Korea

Current data

The Democratic Peoples' Republic of Korea consists of nine Provinces and three special cities covering a population of 24.3 million. As part of overall

health care, there is a medical doctor providing free health care to 130 families. The antenatal coverage is over 97% while ensuring a minimum of four visits per year and 100% of births are attended by skilled birth attendants. 84% of pregnant women and 71% of women of reproductive age group receive iron supplementation and 74% of pregnant women receive micronutrient supplementations. As per the Multi-Indicator Cluster Survey (MICS) conducted in 1998, 35% of pregnant women are anaemic. 31.2% of women in the reproductive age group were found to be anaemic in the national nutrition survey conducted in 2012. In 2012, 23% of women in the reproductive age group were reported to be malnourished.

Structures:

Administrative mechanisms for interventions:

- 'Ri' (village) hospital/clinic-centered health services with a primary health care- based approach that manages anaemia and lactation-specific interventions through 'Ri' clinics. A "Household (Ri) Doctors Manual" serves as the standard reference.
- The county/provincial hospitals address complicated cases of pregnancy and deliveries that are referred.

Strategies and interventions:

The antenatal interventions for anaemia are indicated in the table below:

Table 3.9: *Antenatal care [ANC] Interventions*

First ANC visit
• **Laboratory examinations for haemoglobin, liver and renal functions, malaria parasite, blood sugar and stool examination**
• **Iron-folic acid or multi-nutrient tablets**
• **Iodine supplementation in endemic provinces**

28-32 weeks & 36 weeks • **60 mg of iron + 400 μg folic acid during pregnancy and over the first quarter of postpartum** • **Haemoglobin should be re-assessed if < 10 g/dl at first visit and the woman appears pale**
After delivery • **Vitamin A supplementation and multi-nutrient tablets**
One tablet per day of micronutrient tablet to be administered for the first six months during pregnancy and the first three months of lactation

Regarding nutrition and de-worming, all pregnant women are advised to consume an additional 200 calories per day and eat a balanced diet rich in protein, vitamin A and iron along with one course of Mebendazole (anti-helminthic) between 20-40 weeks of pregnancy. All lactating women are advised to consume an additional 650 calories/day through a balanced diet rich in protein, vitamin A and iron and take a course of anti-helminthic within six months of delivery.

Myanmar

Thet Wah, Tun Min, Hnin Aye Kyu, Department of Health

Current data

According to the survey done by the Department of Medical Research in 1994, 58% of pregnant women and 30% of children were found to be anaemic. Subsequently, haemoglobin surveys have been undertaken by the National Nutrition Centre in various regions of the country - hilly, plain, coastal and delta - in 2001, 2002 & 2003 where the target population groups were non-pregnant women, adolescent schoolgirls, pregnant women, children less than five years. Highest prevalence of anaemia is found in the delta and coastal regions and lowest in the hilly region. Overall prevalence of anaemia in different population groups are as indicated below:

Children less than 5 years	**75%**
Pregnant women	**71%**
Non-pregnant women	**45%**
Adolescent schoolgirls	**26%**

In 2003, a Nutrition Anaemia Initiative Project was implemented in two targeted townships and the prevalence of anaemia in women was assessed in 2005. In the Kyungyangon township, prevalence of anaemia was 60.8% in 2003 and declined to 42.1% in 2005; in Kayan township, prevalence was 50.1% in 2003 declining to 48% in 2005. Another small-scale survey was undertaken in Lewe township in 2012, where 150 pregnant women were studied. 75.7% were found to be anaemic with 61.7% suffering from iron deficiency. 18% of the subjects had helminthic infestations.

Structures

The nodal agency for the delivery of nutrition services is the National Nutrition Centre, Department of Health of the Ministry of Health. Services are rendered through the primary health care approach and jointly with the maternal and child health care services.

The administrative mechanism for intervention is as follows:

Frontline implementers	• **Midwives** • **Lady health visitors** • **health assistants**
Local & Regional Supervisors (mid-level manager)	• Township health nurse • Township medical officer/district medical officer • Nutrition team in state and region under the guidance of state & region health director
Central Supervisor/ Programmer	• National Nutrition Centre, Ministry of Health

Most anaemia cases are assumed to be due to iron deficiency and intervention covers all townships.

Strategies and interventions

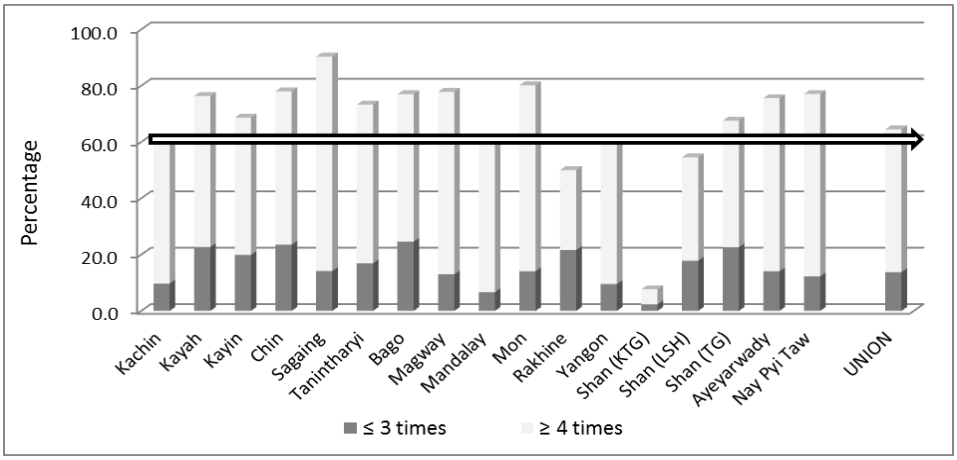
The strategies comprise of: iron supplementation; nutrition education on iron-rich foods, enhancers/inhibitors, food habit; deworming; food fortification; public health measures such as birth-spacing, sanitation, latrine and hand-washing, immunization and personal hygiene.

- Iron supplementations to pregnant women: Iron and folic acid tabs (60mg ferrous sulphate and 400µg folic acid). Supplementation is started as early as possible and continued till the 7th month of pregnancy with one tablet per day, there after increasing to one tablet two times a day, completing the course of 180 tablets. Recently, multi-micronutrient tablets are being issued.
- For therapeutic purposes, one tablet is administered two times/day for three months at any stage of pregnancy and continued until anaemia has been corrected.

Before 2012, the main supplier of iron tablets for preventive purposes was UNICEF and the Department of Health for tablets used for therapeutic reasons. Since 2012, the Department of Health provides all supplies for both preventive and therapeutic purposes while the local health department and UNICEF provide supplies as per local need.

Monthly reporting has been integrated with the national HMIS reporting with regular monthly supervision by local supervisors and the nutrition team. Supervision from the central level is occasional and evaluation is done annually together with the primary health care evaluation while nutrition review is carried out every two years with all state and regional nutrition teams.

Figure 3.2: ***Coverage of pregnant women receiving iron tablets in Myanmar, 2014***



The main stakeholders are the department of health, local health departments and basic health staff. Partnership is maintained with various related departments (nutrition-sensitive sectors), international partner agencies, nongovernmental organizations and the private sector.

Iron supplementation for adolescent school girls:

- Supervised supplementation was started in 2002 (four townships) and subsequently expanded yearly to include 20_townships so far. Iron + folic acid tablets (60 mg ferrous sulphate and 400 μg folic acid) are administered at the rate of one tablet two times a week for the whole school term with each girl receiving a total of about 70 tablets. Regular monitoring and supervision consists of three monthly reports from schools and supervisory tours.

Iron supplementation for infants and children six months to three years old:

- Administration of iron syrup was started in 2001 and maintained till 2012. 0.5 ml (1 ml = 25 mg of iron) of iron syrup is administered to children during the growth monitoring and promotion sessions.

- Provision of "Micronutrient Sprinkles" was initiated in 2012 and currently distributed in selected 'risk' areas where all infants and children between six months to three years are provided with one sachet of 'sprinkle' per day for 2 months with a four-month interval.

Thailand

Suntaree Ratanachu-ek, Kitti Larpsombatsiri, Dr Saipin Chotivichien, Orawan Eamopas, Patcharin Kasibut, Ministry of Public Health

Current data

Prevalence of anaemia among the Thai population aged ≥ 15 years was 11.4% in males and 22.2% in females in 2002 and in 2009, 15.8% of Thai males were anemic and 29.8% of women were anaemic (4th National Health Examination Survey, 2008-2009). A more detailed breakdown of the prevalence of anaemia in different age categories of adult males, females and combined, is provided in the following table.

Table 3.10: Prevalence of anaemia by gender and age group (2008-2009)

	15-29 years	30-44 years	45-59 years	60-69 years	70-79 years	≥80 years	Total
Male	8.1%	10.6%	16.9%	29.5%	46.1%	59.9%	15.8%
Female	25.3%	24.5%	30.2%	38.5%	50.2%	61.2%	29.8%
Combined	16.2%	17.8%	23.7%	34.5%	48.4%	60.7%	23%

[Source: 4th National Health Examination Survey, 2008-2009]

The Bureau of Health Promotion, Department of Health, Ministry of Public Health reported persistent increase in the prevalence of anaemia among pregnant women between 2001 and 2011. The information is provided in the table below.

Table 3.11: *Prevalence of anaemia in pregnant women (2001-2011)*

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Prevalence (%)	**13.34**	**12.02**	**12.4**	**12.3**	**13.3**	**15.7**	**17.1**	**18.2**	**18.6**	**18.4**	**20.6**

[Source: Bureau of Health Promotion, DOH, MoPH, 2014]

Improvements in maternal and child nutrition in Thailand are depicted in the table below.

Table 3.12: *Maternal and child Nutrition – Thailand*

	1980	1990	2006
Antenatal Coverage (%)	35	75	95
Anaemia in pregnancy (%)	50-75	18.8	10
Low-birth weight (%)	16	10	<10
Underweight in children (%)	51	20	<10

[Sources: NHES 2; Holistic Development of Thai Children; NFNS 5; NHES 4]

Trend in the nutritional status of children less than 5 years

	1995	2001	2008-9
Stunting	9.7%	8.3%	6.3%
Underweight	12.9%	6.9%	4.8%
Overweight & Obesity	5.8%	7.9%	8.5%

[Sources: NHES 2; Holistic Development of Thai Children; NFNS 5; NHES 4]

Table 3.13: *Iron (+ Folic Acid) Supplementation schedule in Thailand is indicated below:*

Group	Suggested Scheme
Pregnant Women	Iron 60 mg + Folic acid 400 μg daily
Lactating women	Iron 60 mg daily for 3 months + weekly dose for 3 months
Low Birth Weight (< 2500 g)	Iron 12.5 mg weekly dose

Group	Suggested Scheme
6 months – 24 months	Iron 12.5 mg weekly dose
5 – 12 years old	Iron 60 mg weekly dose
Women of childbearing age	Iron 60 mg + Folic acid 2800 μg weekly dose
Thalassemia	Folic acid 5 mg adult

Strategies and interventions

The Thailand Food Committee Act of 2008 relates to the 11th National Economic and Social Development Plan [NESDP] of Thailand which had led to the formulation of the national health development plan. There are three components: (i) Thailand Healthy Lifestyle Strategic Plan (2011-2020); (ii) the Strategic Framework of National Nutrition Plan in Thailand (2014-2015) that includes the IDD control and prevention programme, obesity prevention (Thai people, flat belly), and the Optimum Growth Development of Thai Children; Comprehensive Implementation Plan (2014-2025) – food and nutrition for improving maternal, infant and child nutrition. The monitoring and evaluation system includes: i) nutrition integration programme – obesity control and obesity prevention among Thai school children, healthy menu, promotion of food and nutrients for health project, IDD surveillance project.

Current nutrition intervention in Thailand comprises:

- Iodine, folic acid and iron [Triferidine tablet] supplementation for women on a daily basis and as part of antenatal care
- Pre-school and school-age children are provided weekly iron supplementation
- Iron + folic acid supplementation for reproductive age women – weekly dose through the 'Youth-friendly Health Services'.

Timor-Leste

Triana Corte-Real de Oliveira, Joao Bosco da Costa, Fatima Isable Gusmao, Ministry of Health

Current data

As per the different Demographic Health Surveys conducted in 2003 and 2010 and the Timor-Leste Food and Nutrition Survey of 2013, nutrition information on non-pregnant/pregnant women is provided below.

Table 3.14: *Nutrition status of pregnant / non-pregnant women*

	DHS 2003	DHS 2010	TLNFS 2013
Anaemia – pregnant/ non-pregnant	32.1	21.3	38.9
Overweight	3.1	5.1	10.2
Thinness	37.7	27.2	24.8

Structures

The nodal agency responsible for implementing the different interventions is the Ministry of Health. Several departments coordinate their efforts: Maternal & Child Health, Nutrition, Health Promotion and Environmental Health. A national-level multisectoral collaboration – COSANTIL which is the national committee for food security and nutrition in Timor-Leste has the ministries of health, agriculture, education, commerce, finance and justice as members, as well as the state secretaries of water & sanitation, gender equity; and various donor and implementing partners (national and international).

Strategies and interventions

The national policy and strategy to implement interventions to improve nutritional status of the country. Services are delivered through different

facilities established at different levels of the government, as indicated below.

Table 3.15: *Administrative structure and interventions in Timor-Leste*

Location	Services	Interventions
Referral hospital and district health centre	Both inpatient and out-patient services	Pregnancy: • Food supplementation – distribution of corn oat on ANC visit • Iron and folic acid • Albendazole during antenatal care (one dose at second trimester) • Lactating: Iron and folic acid during postnatal visit
Sub-district health centre	Outpatient management (treatment) and food supplementation programme	
Community level	Health post, SISCA (Integrated Community Health Services), home visit	• Identify malnourished women, treatment and food supplementation • Food fortification and supplementation programme • Food practice: SISCA

The "nutrition-specific" interventions are delivered by the Ministry of Health [MCH, Nutrition, health promotion and environment] and comprise: (i) policy, guidelines and legislation; (ii) intervention programmes (food supplement - Timor Vita, iron and folic acid); (iii) partnership coordination; (iv) capacity building for care providers; (v) advocacies and communication; (vi) monitoring and evaluation and research. "Nutrition-sensitive" interventions are delivered through the ministries of agriculture, commerce, industry, environment, education, social solidarity (money-cash transfer), infrastructure, state administration, water & sanitation, and gender equity.

Monitoring and evaluation:

- Supportive supervision quarterly in the health facilities
- Regular monitoring and evaluation from national level to district
- Data: iron folic acid supplement for pregnant women
- Periodic surveys, 1–3 years (nationwide Nutrition Survey - 2013)
- Developing report form, specific for anaemia in pregnant and lactating women.

Annex 3
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The public health implications of micronutrient deficiencies are very important since these deficiencies adversely affect fetal and child growth, cognitive development of infants, children and adolescents, women of reproductive age and the elderly, and lower their resistance to infection. Of all the micronutrient deficiencies, anaemia is the most common in the South-East Asia Region and an estimated 55% of preschool children, 45% of pregnant women and 40% of women of child-bearing age are anaemic. Low intake of iron and other important nutrients in the diet, parasitic infections and low bioavailability of iron from plant-based diets are considered to be the causative factors. In recent years, WHO has produced or updated several evidence-based guidelines and recommendations on a large number of nutrients of public health importance. These evidence-based guidelines for nutrition action will assist the Member States to focus on key areas of intervention and develop a harmonized monitoring framework to assess the impact of such interventions on the prevalence of micronutrient deficiencies.

A regional meeting on dissemination of WHO guidelines and recommendations on micronutrients: policy, practice and service delivery issues, was organized by the World Health Organization's Regional Office for South-East Asia in collaboration with the Department of Nutrition for Health & Development, WHO Headquarters, the Institute of Nutrition, Mahidol University, Thailand and the Micronutrient Initiative, in Bangkok, Thailand from 14-16 October 2014. The overall objective of the meeting was to discuss the effective dissemination and incorporation of WHO guidelines and recommendations on micronutrients in national control and prevention programmes highlighting the following topics: (i) dissemination of current WHO guidelines and recommendations on micronutrients; (ii) overview of recent strategies and approaches for addressing anaemia in different population groups; and (iii) review of national protocols for the control and prevention of micronutrient deficiencies, with particular focus on anaemia.

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