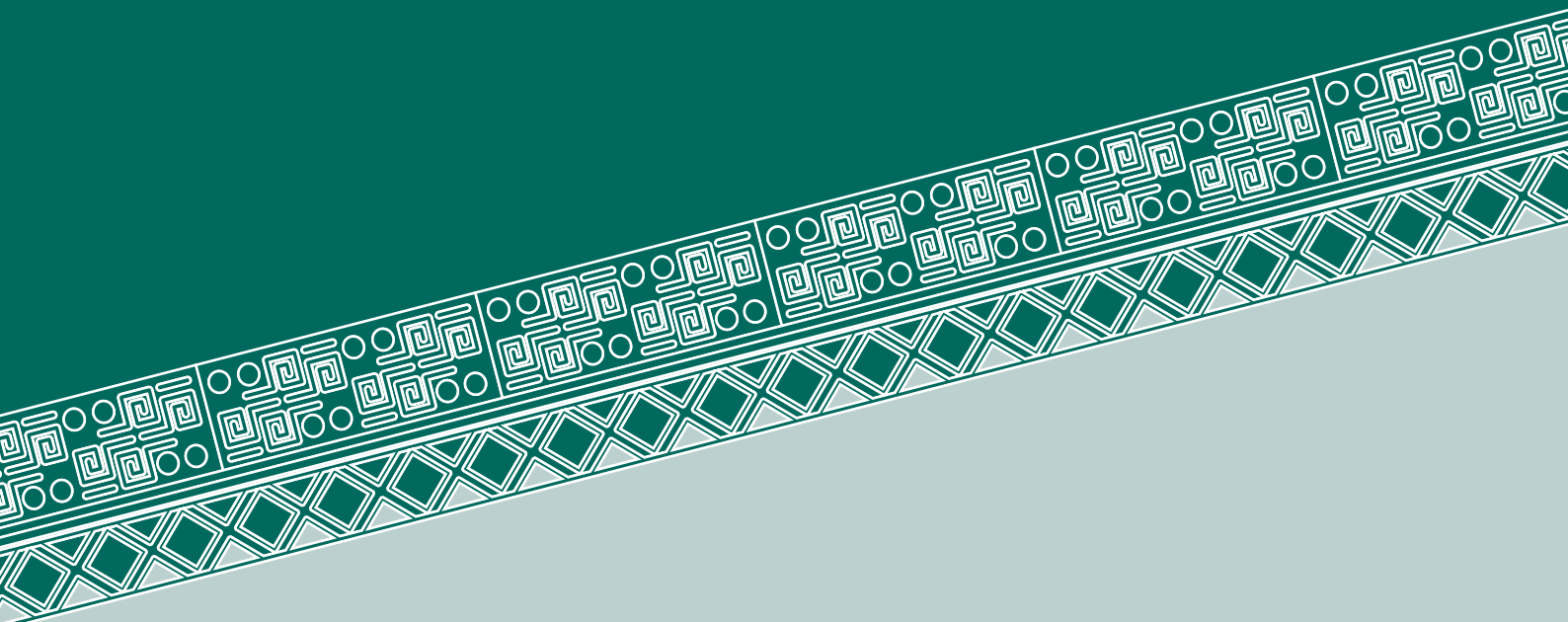


**GUIDELINES FOR THE
PREVENTION AND CONTROL
OF MICRONUTRIENT
DEFICIENCIES in Ethiopia**
Federal Ministry of Health



FOREWORD

This document is an implementation guide for the micronutrient component of the National Nutrition Program. It incorporates up to date information and adapts recommendations from the latest developments in science on micronutrient deficiencies and their management. Progressive implementation of different program interventions has made progress in maternal and child health in Ethiopia. An evidence based reduction in child mortality by providing Vitamin A Supplementation (VAS) based on national protocol, has averted and reduced child death that occur due to measles, diarrhea and overall by 50%, 40% and 24% respectively.

The government of Ethiopia has taken multiple strategies to tackle micronutrient deficiencies; these are supplementation, food diversification and food fortification. As one of the strategies vitamin A was supplemented twice a year for children 6-59 months of age since 2003. This guideline mainly focuses on micronutrients that are of public health significance in Ethiopia.. The prevention and control of Zinc deficiency has been added to reflect new evidence of its impact in reduction of stunting. In Ethiopia, the government has made a tremendous effort in implementing salt iodization to tackle iodine deficiency disorder of which the current iodized salt consumption has reached 96% of the households. .

Therefore the purpose of this guideline is to produce a reference guide for health and nutrition program managers and practitioners, as well as nutrition sensitive sectors, in the design, implementation and management of micronutrient deficiency programs and interventions.

I strongly believe that this guideline will contribute to the improvement of child survival interventions and maternal health through the active participation and involvement of the community in implementing the preventative activities. Let me take this opportunity to thank the invaluable contribution of all individuals and organizations who participated in the preparation of this document.



Kebede Worku (MD, MPH)

State Minister

Acknowledgment

The Micronutrient Guideline is the first standardized and comprehensive National Guideline prepared to provide full picture of micronutrient issues that are of public health significance in the country and provide guidance and direction to interventions that focus on micronutrient deficiency management and control in the country.

The Guideline elaborates the major micronutrient issues of the country , particularly Vitamin A, Iodine, Iron, Folic Acid, Zinc and emerging micronutrient deficiencies that need particular attention such as Calcium and Vitamin D. It also highlights on the importance of Breast Feeding, Food fortification, Social Mobilization, Program Management, Monitoring and Evaluation. It is our strong belief that this Guideline will contribute to the improvement of the prevention, management and control of micronutrient deficiencies through quality service delivery.

The Federal Democratic Republic of Ethiopia, Ministry of Health would therefore like to take this opportunity to acknowledge all partners and individuals who have technically and financially contributed to the development of the guideline. Special thanks would go to the technical working group which was organized to work on drafting the guideline, review and finalize it.



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Acronyms/Abbreviations

AIDS/HIV	Acquired Immune Deficiency Syndrome/ Human Immunodeficiency Virus
AMIYCN	Adolescent, Maternal Infant and Young Child Nutrition
ANC	Antenatal Care
ART/ARV	Antiretroviral Treatment/Antiretroviral Drug
BCC	Behaviour Change Communication
BFHI	Baby Friendly Hospital Initiative
BMS	Breast Milk Substitutes
CF	Complementary Food
CGP	Community Growth Promotion
COH	Cost of Hunger
CSS	Child Survival Strategy
DALYS	Disability-Adjusted Life Years
EBM	Expressed Breast Milk
EDHS	Ethiopian Demographic and Health Survey
ENA	Essential Nutrition Actions
ENAL	Essential Nutrition Actions Lens
EOS	Enhanced Outreach Strategy
FMHACA	Food Medicine Healthcare Administration and Control Authority
FMoH	Federal Ministry of Health
FSP	Food Security Program
GDP	Growth and Development Program
GMP	Growth Monitoring and Promotion
GSYCF	Global Strategy for Infant and Young Child Feeding
HAART	Highly Active Antiretroviral Treatment
HBC	Home Based Care
HDA	Health Development Army
HEP	Health Extension Program
HEW	Health Extension Worker
HSDP	Health Sector Development Program
HSDP-IV	Health Sector Development Plan IV
HTC	HIV Testing and Counselling
IBFAN	International Baby Food Action Network
ICMBS	International Code of Marketing of BreastMilk Substitutes
IEC	Information, Education and Communication
ILO	International Labour Organisation
ILOC	International Labour Organisation Convention
IMNCI	Integrated Management of Neonatal and Childhood Illnesses
IUGR	Intra-Uterine Growth Retardation
IYCF	Infant and Young Child Feeding
LNS	Lipid Based Nutrient Supplement
MDG	Millennium Development Goal
MNP	Micronutrient Powder

MPC	Maternity Protection Convention
MTCT	Mother-to-Child Transmission of HIV
MUAC	Mid Upper Arm Circumference
NGNH	National Guideline on Nutrition and HIV
NIYCFS	National Infant and Young Child Feeding Strategy
NNP	National Nutrition Program
NNS	National Nutrition Strategy
OTP	Outpatient Therapeutic Care
OVC	Orphans and Vulnerable Children
PLWHA	People Living with HIV and AIDS
PMTCT	Prevention of Mother-to-Child Transmission of HIV
RF	Replacement Feeding
SQUEAC	Semi-Quantitative Evaluation of Access and Coverage
TSF	Targeted Supplementary Feeding
UNGASS	United Nations General Assembly Special Session on Children
UNICEF	United Nations Children's Fund
VAD	Vitamin A Deficiency
WHA	World Health Assembly
WHO	World Health Organisation

CHAPTER 1

AN INTRODUCTION TO MICRONUTRIENT DEFICIENCY AND PREVENTION IN ETHIOPIA

1.1 Background

In 2008, a coherent national nutrition strategy (NNS) was instituted in Ethiopia. The goal of this strategy was to combat malnutrition by enabling all Ethiopians to attain an adequate intake of nutrients - prioritising the needs of children, and pregnant and lactating women - in order to acquire optimal nutritional status. The policy envisaged the supplementation and fortification of foods with micronutrients, and highlighted the necessity of promoting the consumption of diversified foods for sustained access to energy and micronutrient dense foods.

The NNS was followed by the adoption of the National Nutrition Program (NNP) in 2009. This saw the creation of an operational document through which to implement the NNS, with the prevention and control of micronutrient deficiencies at its core. The implementation of the NNP was scheduled across five-year phases, but this was later revised and the cut-off point for 'phase I' extended by two years to coincide with the MDG (Millennium Development Goal) assessment point in 2015.

The NNP sets firm targets for the prevention and control of micronutrient deficiencies in children under 5, as well as appropriate levels of Iron, vitamin A, iodine and Zinc in pregnant and lactating women. The NNP addresses nutrition as a multidimensional and multi-sectorial issue that goes beyond the health sector, strengthening linkages with other sectors; Ministries of Agriculture, Education, Industry, Finance and Economic Development, Trade, Social Affairs, Water, irrigation and electricity and Women, Child and Youth Affairs.

A number of micronutrient interventions have been scaled up since the development of the last National Guidelines for the Prevention and Control of Micronutrient Deficiencies. Millions of children in Ethiopia have been supplemented bi-annually with vitamin A; salt iodisation has been scaled up nationally; and pregnant women attending antenatal care and postnatal care have received Iron and Folic Acid supplementation. The present document

is an implementation guideline for the micronutrient component of the NNP. It incorporates up to date information and recommendations from the latest developments in science on micronutrient deficiencies and their management at the national level. The prevention and control of Zinc deficiency has been added to reflect new evidence of its impact on human health.

Although the micronutrients have been presented individually in this document, it should be noted that all are interrelated, and only comprehensive and integrated strategies have a lasting effect on health.

1.2 Micronutrient Deficiencies - Global and National Situation

Vitamins and minerals - called *micronutrients* because they are needed only in minuscule amounts - are substances that enable the body to produce enzymes, hormones and other substances essential for proper growth, health and development. As tiny as the amounts are, the consequences of their absence are severe.

Iodine, vitamin A, Zinc, folate and Iron - 'the big five' - are the most important in global public health terms, with deficiencies representing a major threat to the health and development of populations all over the world. It is estimated that at least 2 billion people live with micronutrient deficiencies globally. It is only relatively recently that the implications of Zinc deficiency on the health of children and the impact of Zinc in the treatment of diarrhoea received attention, highlighting its key role in child health throughout the developing world. Studies are also emerging to suggest that regular supplementation of calcium and vitamin D has a significant impact on health improvement in vulnerable populations, although further studies are required to determine their dose and delivery protocol.

Vitamin A deficiency (VAD) is the leading cause of preventable blindness in children, while also increasing the risk of disease and death from severe infections. VAD is a public health issue in more than half of all countries, hitting young children and pregnant women in low-income countries the hardest. One-third of children under the age of five in the developing world is Vitamin A deficient. In Ethiopia, 37.7% of children have deficient serum retinol levels, indicating a serious public health problem.

Iodine deficiency (IDD) is the world's most prevalent, yet easily preventable, cause of brain damage. Today, we are on the verge of eliminating it – an achievement that will be hailed as a major public health triumph. However, of far greater significance is IDD's less visible, yet more pervasive, mental impairment, which reduces intellectual capacity at home, in school and at work.

Iron deficiency is the most common and widespread nutritional disorder in the world. It affects a large number of children and women in developing countries, and is the only nutrient deficiency to be significantly prevalent in industrialised countries too. Over 30% of the world's population is anaemic, mainly as a result of iron deficiency. Iron deficiency and

anaemia reduce the work capacity of individuals and entire populations, bringing serious economic consequences and obstacles to national development. In Ethiopia, 44% of children aged 6-59 months and 17% of women aged 15-49 years are anaemic, indicating an important public health problem in the country.

Folate deficiency is widespread in Ethiopia and is related to inadequate dietary intake. This high prevalence emphasises the vital necessity for sustainable folate intake through dietary diversification and appropriate public health interventions, such as supplementation during the preconception period and efforts to promote greater utilisation of maternal health care services. In Ethiopia, the absence of food fortification with folate is also believed to have exacerbated the problem.

Micronutrient deficiencies contribute significantly to the burden of morbidity and mortality within the most vulnerable groups in our society, particularly children. Ethiopia has a very high child mortality rate, and diarrhoea, pneumonia and malaria are major contributors to child morbidity and mortality in the country. According to the EDHS 2011 and MINI EDHS 2014 shows child mortality is declining from 88 to 68 per 1000 live births respectively, though improvements have been recorded since 2000. Diarrheal diseases contribute to 20% of child deaths.

1.3 Goals and Objectives

1.3.1 Goal

The goal of this new version of the National Micronutrient Guidelines is to produce a reference guide for health and nutrition program managers and practitioners, as well as other practitioners working in nutrition sensitive sectors, in the design, implementation and management of micronutrient deficiency programs or interventions.

1.3.2 Specific Objectives:

- Serve as basic reference material to guide service providers in the day-to-day delivery/implementation of micronutrient deficiency and related services.
- Guide program managers in the planning, organisation, implementation, monitoring and supervision of service implementation focused on the prevention of micronutrient deficiency at their respective level.
- Facilitate the standardisation and harmonisation of the prevention of micronutrient deficiency program implementation and service provision at the community, facility, woreda, regional and national levels.
- Serve as milestone in the prevention of micronutrient deficiency and related service quality assessment and improvement.
- Serve different stakeholders as a reference material to guide the division of responsibility, coverage mapping, assess/plan integration and complementation, and appropriate resource allocation/utilisation.

1.4 Prevention of Micronutrient deficiencies in Ethiopia

The various strategies to be used nationally in the prevention and control of micronutrient deficiencies in Ethiopia are as follows:

- **Supplementation:** The process of providing micronutrients in the form of tablets, capsules, liquid or powder, in order to increase an individual's dietary intake of these micronutrients and improve their nutritional status.
- **Food Diversification:** The Process of increasing and diversifying the number of foods or groups of foods consumed over a given period of time, with the aim of providing adequate nutrients through complementarity.
- **Fortification:** The practice of deliberately increasing the content of an essential micronutrient, i.e. vitamins and minerals (including trace elements), in a food, so as to improve the nutritional quality of the food supply and provide a public health benefit with minimal risk to health.
- **Public Health Interventions** to address micronutrient deficiencies include:
 - Promotion of optimal breastfeeding, and
 - Infection prevention and control - particularly WASH interventions and parasitic infection control interventions.
- **Behavioural Change Communication:** In order for micronutrient interventions to achieve targeted results, emphasis must be given to social and behavioural change communication activities. In this way, a desired behaviour change will be solicited, in order to catalyse an increase in service-seeking practices.

CHAPTER 2

PREVENTION AND CONTROL OF VITAMIN A DEFICIENCY

2.1 Introduction

Vitamin A is a fat-soluble vitamin essential for proper functioning of the immune system. It comes in the form of retinol from animal sources or beta-carotene from plant sources. Vitamin A deficiency has long been known to manifest through ocular signs, such as night blindness, Bitot's spot and, in severe cases, total blindness. But more recently, studies have revealed that vitamin A deficiency is closely associated with increased mortality and morbidity among young children. Studies have also shown that vitamin A supplementation reduces overall child mortality caused by infectious diseases by 24% (WHO 2009).

Improving the vitamin A status of children increases their resistance to disease, and thus, in countries like Ethiopia, where diarrhoea, acute respiratory infection, and measles are among the major causes of child mortality, plays a critical role in reducing young child mortality.

2.2 Situation Analysis

UNICEF estimates that 100 to 140 million children in the world are vitamin A deficient, with the heaviest burden on South Asia and Sub-Saharan Africa (WHO 2001). Vitamin A deficiency (VAD) is a major public health problem in Ethiopia. It affects between 30% and 95% of children aged 6-59 months across the 11 regions of the country. VAD damages children's immune systems and lowers their resistance to common infections, leading to approximately 80,000 deaths a year (EHNRI, 2009/10). A national study conducted in 2008 indicated a prevalence rate of 1.7% for Bitot's spot and 0.8% for night-blindness among children, and 1.8% for night-blindness among mothers (Demissie et al., 2010). Nationally, 37.7% of children (95% Confidence Interval, 35.6% to 39.9%) had deficient serum retinol levels (Demissie et al. 2010).

In Ethiopia, there are wide variations in the consumption of vitamin A rich foods among regions, and between urban and rural settings. The proportion of children consuming vitamin A rich foods increases with age, from 16% at 6-8 months to 31 percent at 18-23

months. Urban children (38 %) are more likely than rural children (24%) to consume foods rich in vitamin A. With regards to regions, children living in Gambella are most likely to consume foods rich in Vitamin A (48 %), while those in the Afar region are least likely to do so (11 %) (EDHS, 2011). This, in part, explains the VAD disparities in the country.

2.3 Rationale For Intervention

VAD has profound negative consequences on health, the most notable being severe visual impairment and blindness. But other consequences are no less devastating for individuals and families suffering from them. These include:

- Impaired immunity, which makes individuals more susceptible to infections, such as malaria, measles, diarrhoea, TB, HIV and respiratory infections, and increases their chances of dying from these infections
- Iron deficiency anaemia
- Maternal mortality and poor pregnancy outcomes

Improving children's vitamin A status increases their chance of survival (Sommer and West 1996):

- Deaths from measles can be reduced by 50%
- Deaths from diarrhoea can be reduced by 40%
- Overall mortality can be reduced by 25%

Improving vitamin A status reduces the severity of childhood illnesses:

- Prevents xerophthalmia¹ and blindness
- Less strain on clinic outpatient services and reduced hospital admissions
- Contributes to the well-being of children and families

Improving vitamin A status also:

- May reduce birth defects
- May prevent epithelial and other types of cancer
- Prevents Anaemia

2.4 Population at Risk

- Children 6-59 months of age
- Pregnant and lactating women

2.5 Recommended Protocols and Activities

The main strategies that have been adopted globally in order to control and eliminate vitamin A deficiency are:

- Supplementation of Vitamin A capsules
- Promotion and support of optimal breastfeeding

¹ Although xerophthalmia literally means "dry eye", it denotes the entire spectrum of ocular abnormalities arising from vitamin A deficiency. These include night blindness, retinopathy, conjunctival and corneal xerosis, corneal ulceration and melting, and less obvious alterations in the epithelial structure of the eye and several other organs.

- Food Diversification or modification (bio-fortification) for Vitamin A
- Food fortification with vitamin A
- Infection control

2.5.1 Promotion and Support of Optimal Breastfeeding

In the first six months of life, breast milk protects the baby against infectious diseases that can deplete vitamin A stores and interfere with vitamin A absorption. Colostrum is the first essential food produced for new-borns and is three times richer in vitamin A than mature milk. As a result of this, alongside the presence of antibodies and other protective factors, it is often considered to be the baby's first immunisation (UNICEF 1997).

The vitamin A intake of a breastfed child depends upon the vitamin A status of the mother, the stage of lactation and the quantity of breast milk consumed. From birth to six months of life, exclusive and frequent breastfeeding can provide the infant with all the vitamin A required for optimal health, growth and development. The consumption of other foods decreases the amount of breast milk consumed and may disrupt the infant's absorption of vitamins and minerals that come from it. Optimal breastfeeding practices are, therefore, crucial in helping to meet the child's vitamin A needs for the first year and beyond. (Linkages project, Breastmilk: A Critical Source of Vitamin A for Infants and Young Children , Facts for feeding, 2001)

2.5.2 Supplementation

Universal supplementation with vitamin A capsules is a low cost, highly effective strategy for improving the vitamin A status of children from 6 to 59 months of age.

Doses and Schedules for Vitamin A Supplements

Table 1: Schedules of Vitamin A supplementation for prevention:

Age	Dose	Frequency
Children 6-11 months	100,000 IU (1 capsule of 100,000 IU)	Once
Children 12-59 months	200,000 IU (2 capsules of 100,000 IU)	Once every 6 months

Table 2: Vitamin A therapeutic supplementation: for children with Severe Acute Malnutrition

Age	Dose	Frequency
Children 6-11 months	100,000 IU (1 capsule of 100,000 IU)	One dose at first contact with the health unit and then as stipulated in the management of severe acute malnutrition guideline*
Children 12-59 months	200,000 IU (2 capsules of 100,000 IU)	One dose at first contact with health unit and then as stipulated in the management of severe acute malnutrition guideline*

*Do not give VAS if the child has been supplemented through EOS/CHD/HEP within one month and has bilateral pitting edema.

Table 3: Vitamin A therapeutic supplementation: For children with Xerophthalmia or Measles

Schedule	Doses for the Age Groups		
	Infants < 6 months of age	Children 6 months to one year of age	Children >1 year of age
Immediately on diagnosis	50,000 IU, (a drop from 100,000 IU capsule)*	100,000 IU (1 capsule of 100, 100 IU)	200,000 IU (2 capsules of 100, 000 IU)
Next day	50,000 IU, (a drop from 100,000 IU capsule)	100,000 IU (1 capsule of 100, 100 IU)	200,000 IU (of 100, 000 IU)
15 days later	50,000 IU, (a drop from 100,000 IU capsule)	100,000 IU (1 capsule of 100, 100 IU)	200,000 IU (of 100, 000 IU)

*A drop is equivalent to 50,000 IU

The new WHO guideline (2011) states that vitamin A supplementation in postpartum women is not recommended as a public health intervention for the prevention of maternal and infant morbidity and mortality (strong recommendation). The quality of the available evidence for maternal mortality, maternal morbidity and adverse effects was graded as low or very low (WHO 2011).

Note: * Mega dose Vitamin A supplementation is teratology and should not be given to pregnant women. Key steps for the administration of vitamin A capsules:

- Check the expiry date of the capsule and the date the tin was opened for the first time (don't administer capsules from a tin opened over a year ago, even if it is within its life period).
- Check the age of the child.
- Ask the caretaker if the child has received a vitamin A capsule in the last one month. If the answer is yes, confirm and do not administer.
- If the answer is no, ask the caretaker to hold the child firmly, make sure the child is calm, give the appropriate dose of vitamin A to the child:
 - 100,000 IU to child 6-11 months
 - 200,000 IU to child 12-59 months
- Cut the nipple of the capsule in the middle (not at the tip or bottom) with scissors and immediately squeeze the drops of liquid into the child's mouth.
- Check if the child is comfortable after swallowing the drops.
- Put all capsules that have been used into a plastic bag.
- Wipe your hands to clean off the oil.
- Record the dose on the tally sheet.

Vitamin A supplementation is currently being delivered through three mechanisms:

- **Enhanced Outreach Strategy (EOS) Campaign:** EOS is a vertical campaign-based VAS delivery mechanism conducted bi-annually. The supplementation is conducted with children aged 6-59 months and integrated with other interventions, like De-Worming and nutritional screening.
- **Community Health Days (CHD):** The CHDs are quarterly events organised locally at the kebele level by health extension workers (HEW). In CHDs, VAS and De-Worming are conducted every six months, while nutritional screening of children aged 6-59 months, and pregnant and lactating women, is conducted every three months.
- **Routine Delivery Through HEP:** The routine VAS delivery through the HEP modality is a daily service, which is predominantly a mix of facility-based, outreach and house-to-house delivery. Routine service delivery of VAS is the complete integration into the existing routine health system (HEP).

2.5.3 Food Diversification

Food diversification is an important longterm, sustainable strategy for the prevention of vitamin A deficiency. Populations should be encouraged to grow and consume vitamin A rich foods throughout the country at all times. This requires input from a variety of entities, such as the Ministries of Health, Agriculture, Education, and Information and Communication; the Regional States; donors and NGOs. Relevant regional bureaus must initiate and coordinate the establishment of horticultural demonstration gardens in health facilities and schools, as well as agricultural extension demonstration plots in farming areas. These horticultural gardens act as demonstrations, while also disseminating information about the use of fruits and vegetables, and the distribution of seedlings that could be grown around rural homes. Extension agents should play a significant role in promoting the introduction of vitamin A rich foods, and improving the consumption and storage of such foods (FMOH 2004).

Animal Source Foods of Vitamin A

The best food sources of pre-formed active retinol, which is most effectively used by the body, are animal foods. These include breast milk, egg yolks and organ meats - such as liver, whole milk and milk products, fish, cod liver oil, butter and ghee. The best source of vitamin A for infants is breast milk. The mother's secretion of vitamin A into breast milk is related to her own vitamin A status.

Plant Source Foods of Vitamin A

Plants contain beta-carotene, which needs to be converted into retinol by the body. The best plant sources of vitamin A are dark orange or dark yellow fruits and vegetables, such as papayas, mangos, pumpkins, carrots and yellow or orange sweet potatoes, as well as dark green leafy vegetables, such as spinach, kale and Swiss chard. Gommen is an example of a traditional plant rich in vitamin A and commonly included in the Ethiopian diet. The amaranth plant grows wild in Ethiopia and is another good source of beta-carotene.

2.5.4 Food Fortification of Vitamin A

Fortification involves adding one or more vitamins and minerals to commonly consumed foods. In Ethiopia, vegetable oil and wheat flour have been selected as vehicles to fortify vitamin A. With growing industrialisation in Ethiopia at a much greater rate than most African countries, refined oil consumption has increased over the past ten years. This trend is expected to continue in the years to come; hence the need for centrally processed foods, such as refined vegetable oil, wheat flour, sugar and others. Vitamin A fortification of edible oil is considered one of the most cost-effective strategies to address vitamin A deficiency. The fortification of wheat flour with vitamin A is also considered, mainly in order to improve Iron absorption in the flour. (For detailed information, refer to chapter 7).

2.5.5 Infection Control

Infections increase the excretion of vitamin A from the body and cause depletion. Thus, measures to reduce the excretion of vitamin A will help to prevent deficiency. Infection control through the provision of safe drinking water and sanitation, early diagnosis and treatment, immunisations and health education will all reduce the excretion of vitamin A and prevent deficiency.

2.6 Program Management

2.6.1 Planning

The annual planning process (at different levels) will be used as the main vehicle for preparing the integration process (EOS/CHD/HEP) - there will not be separate planning processes for CHDs/HEP. In this regard, the CHDs/HEP should be part of the Annual National and Regional Health Plans, as well as woreda, kebele and HEW based health plans. The amount of Vitamin A supplement required will be estimated as part of this planning process.

2.6.2 Social Mobilisation

Social mobilisation is a critical component of the CHD. It is crucial that clear messages are communicated to communities regarding the available services, who the beneficiaries of the services are, and when and where the service will be conducted. At the same time, this opportunity can be used to increase community awareness of the benefits of components of CHD (VAS) and also to increase demand for health services, particularly routine VAS. The Health Development Army (also called the Women's Development Army) plays a critical role in social mobilisation. Health Extension Workers (HEWs) can also disseminate this information through the kebele administration leaders and village elders.

2.6.3 Training

An integrated community Maternal, New-born and Child Health training scheme

has already been developed and is currently being rolled out to the HEWs. Nutrition related skills, including VAS-targeted services, are part and parcel of this skills upgrading program. Similarly, the Blended Integrated Nutrition Learning, targeting service providers and program managers, addresses operational and technical issues pertaining to the VAS program. These two in-service training schemes improve the service provision at the health facility level and can act to ensure sustained high coverage rates of VAS services. Newly recruited HEWs will be involved in the Integrated Refresher Training (IRT).

2.6.4 Supply/Logistics Management

The integration of vitamin A supplementation into the HEP also requires a transition in the procurement and distribution of vitamin A capsules from supporting partners to the existing government system through the PFSA. Supply management should be an integral part of the woreda planning for the procurement and distribution of supplies through the health system.

Vitamin A capsules must be handled carefully to ensure their effectiveness. Some precautions include:

- Store at room temperature in a cool dry place
- Protect capsules from direct sunlight
- Do not freeze capsules - they should not be stored in the cold chain or transported in vaccine carriers

2.7 Monitoring and Evaluation

Strategies for monitoring and evaluating the impact of any kind of vitamin A activity should be planned and built into programs at the design and implementation stage. Ideally, the impact of vitamin A activities, especially supplementation, on infant and child mortality should be evaluated, though this requires more rigorous monitoring systems than those currently in place. As VAS coverage is an internationally recognised indicator in tracking progress towards the 4th Millennium Development Goal (MDG) of reducing child mortality, reliable coverage data from the district level is important:

- To determine whether the program is going according to plan, and whether objectives and targets are being met - monitoring and evaluation has to be part of the VAS delivery mechanism.
- To improve program performance, effectiveness and efficiency, and to reduce costs, monitoring can identify low performing health centres and areas within a district. It can then provide feedback to those involved in implementing the program to let them know how well they are doing.

Review meetings on the vitamin A program at the national, regional and woreda levels have to be conducted annually or Bi-annually to ensure that 2 doses of VAS coverage is maintained at or above 90%. Periodic reports have to be compiled and analysed at all levels, including the national level, for feedback, follow up and fine-tuning of program implementation.

2.7.1 Monitoring Surveys

Vitamin A coverage surveys must be carried out at the national/regional levels, in order to evaluate progress, using indicators such as:

- Percentage of children aged 6- 59 months who have received vitamin A within the past six months.
- Percentage of children consuming foods rich in vitamin A.

2.7.2 Periodic Surveys

The impact of vitamin A interventions, especially supplementation, on infant and child mortality must be evaluated, though this requires more effective and rigorous surveys. Periodic food consumption surveys, and the assessment of retinol levels and other clinical signs in target groups will be used to estimate prevalence, and to monitor and measure program impact.

Three methods used to assess vitamin A status in the community are:

- Dietary assessment to evaluate the intake of vitamin A rich foods, and the consumption of fats and oils that aid in the absorption of Vitamin A; assessment of breastfeeding frequency.
- Clinical assessment: Medical history and presence of infections, such as measles, diarrhoea, undernutrition, signs of visual impairment (night blindness, Bitot's spot, conjunctival Xerosis, corneal Xerosis and corneal ulcers).
- Biochemical assessment: Serum retinol concentration (below 20microgram/dl indicates VAD)

Table 4: Cut-off values for public health significance of VAD

Indicator	Prevalence Cut-Off Values for Public Health Significance
Serum or plasma retinol < 0.70 µmol/l in preschool-aged children	≤ 1.9: No public health problem
	≥ 2% to < 10%: Mild
	≥ 10% to < 20%: Moderate
	≥ 20%: Severe
Night blindness (XN) in pregnant women	≥ 5%: Moderate
Night blindness (XN) in children (2- 5 years)	≥ 5%: Moderate

Monitoring, evaluation and research should prove that VAD prevention and control strategies are complimentary to each other and don't put the community at danger from an unnecessarily high intake of vitamin A.

2.8 Responsibilities at Each Level

National

- Formulate implementation direction and strategies; monitor the execution of all activities according to the plans and provide feedback.

- Allocate resources and ensure their timely distribution to the regions.
- Provide overall coordination and policy direction for the EOS transition.
- Facilitate the coverage validation study.
- Provide technical assistance in planning, training and coordinating routine service delivery, through the identification of gaps and deployment of regional advisors when necessary.

Regional

- Coordinate overall activities at the regional and zonal levels, and follow up initial preparations, implementation and monitoring of the processes.
- Ensure that partners are actively engaged and involved in supporting the EOS transition process.
- Compile and summarise zonal annual logistical plans and send to FMOH on time.
- Provide resources to the zones and ensure the implementation according to the plan; provide regular feedback to zones on the performance of planned activities.

Zonal/Sub-City

- Coordinate overall operations for the EOS transition - required finance, logistics and transportation to the woreda level.
- Ensure that the supervision and monitoring of processes is implemented to track performance.
- Give regular feedback on the performance of planned activities to the woreda.

Woreda

- Organise, lead, direct and monitor VAS activities in the woreda.
- Ensure that the local administration at the kebele level are adequately informed and mobilised to support EOS integration.
- Coordinate the operations of the EOS component service integration at the health post level.
- Ensure the timely distribution of vitamin A, Albendazole and other necessary supplies to health posts.
- Prepare a backup plan in case of a coverage drop. In areas where vitamin A is a public health problem, supplementation is recommended in infants and children aged 6–59 months, as a public health intervention to reduce child morbidity and mortality. However, the VA supplementation coverage of six months has to be maintained above 80%, in order to reduce the risk of child morbidity and mortality. If the coverage is below 80%, it is low coverage, and a mop-up has to be conducted so as to reach all target children and prevent vitamin A deficiency.
- Review VAS performance during the current round, in order to identify problems, constraints, strengths and action points, in order to ensure improved performance in next round.
- Conduct supportive supervision and assist the HEWs in covering all target children with VAS.

Kebele/Health Post

- Ensure the availability of vitamin A capsules and other necessary supplies at the health post.
- Mobilise the kebeleleaders and HDAs in supporting VAS activities.
- Create awareness on the benefits of Vitamin A among the community.
- Ensure service integration of VAS at the health post (provide routine VAS at the facility, house-to-house and outreach sites).
- Compile and report the kebele's VAS coverage results using the established reporting formats.

Monitoring of VAS performance coverage by using monitoring chart accordingly

CHAPTER 3

PREVENTION AND CONTROL OF IODINE DEFICIENCY DISORDERS (IDD)

3.1 Introduction

Iodine is a mineral necessary for the regulation of physical growth and neural development. It is an essential component of the thyroid hormones, thyroxin (T4) and triiodothyroxine (T3). An insufficient iodine level in the blood leads to the poor production of these hormones. This, in turn, affects the development and functioning of the brain, muscles, heart, liver and kidneys, and results in a range of poor health conditions - collectively referred to as Iodine Deficiency Disorders (Hetzel and Pandav, 1996).

The most visible effect of IDD is the appearance of goiters, which are caused by the enlargement of the thyroid gland situated in the neck. When iodine intake is low, the production of thyroid hormones decreases. To compensate for this decrease, the pituitary gland at the base of the brain secretes a greater volume of thyroid-stimulating hormone (TSH). This results in increased gland activity, causing it to enlarge and display a visible goiter. Less visible effects, such as mental retardation, are however even more dramatic and IDD is the main cause of preventable brain damage in the world.

Iodine is naturally found in soil and water, but it is distributed unevenly throughout the earth's crust. Mountainous regions and areas with frequent flooding have lower iodine levels because of leaching and washing away by rainwater. Ethiopia is particularly vulnerable to iodine deficiency for four possible reasons:

1. The country is largely composed of highland areas.
2. The iodine content of the soil is decreasing over time, as the result of soil bleaching by floods caused by high rainfall in certain areas.
3. Goitrogenic foods are cheaply available in the community and may contribute to the development of goiters.
4. Access to adequately iodised salt is limited and the quality of salt distributed to the community is not well inspected to ascertain whether it contains adequate amounts of iodine (Mezgebu et al. 2012).

3.2 SITUATION ANALYSIS

A total goiter rate (TGR) of 5% or more is recommended as the cut-off point in indicating a public health problem, as per the decision made by key international concerned bodies – WHO, UNICEF and the ICCIDD (Aziziet al., 2001). Globally, approximately 30% of the world's populations, and more than 150,000 million people in Africa, are affected by IDD (The Lancet 2008). In Ethiopia, IDD is a major public health problem. At the time of the most recent study (Abuyeet al., 2007), the prevalence of goiters in children aged 6 -12 years was 40%. Almost 46 per cent of these children had median urinary iodine excretion levels below 20 µg/l, indicating moderate to severe IDD. Marked variations are seen among the regions with regards to the prevalence of IDD, although all regions are affected. Compared to the previous national survey, the prevalence of goiters (TGR) has markedly increased – in 1991 the TGR was just 26%. The increase in the prevalence of IDD is very alarming, affecting millions of the nation's young children by impairing their optimal growth and development permanently. According to UNICEF (2006), Ethiopia ranks 6th among the 13 'make or break countries', extensively contributing to the global high burden of IDD. According to the global iodine nutrition scorecard for 2012, in Ethiopia an estimated 66 million people (75%) and 2.5 million infants (80%) are iodine deficient.

The 2012 Profiles Analysis [Ethiopia Profiles Analysis 2012] estimated that if current levels of iodine deficiency in pregnant Ethiopian women remain unchanged, over 12.7 million children will suffer some form of intellectual disability during the subsequent years, up to 2025. It is also estimated that a GDP loss of more than 5.3 million USD will result from IDD over the same period due to reduced productivity.

Recognising the extent of iodine deficiency in the country and the disorders that could emanate from it, the FMoH has engaged itself in the overall coordination of the production and distribution of iodised salt in the interim period. There is a misreading that responsibility for salt iodisation solely lies with the Ministry of Health. It is obvious that the health sector plays a pivotal role, but several other sectors, including the private sector, can significantly contribute to the success of the USI program.

A mandatory salt regulation was enacted by the Council of Ministers in March 2011 (Council of Ministers Regulation No. 204/2011). This regulation makes it mandatory that all salt for human consumption is iodised, according to the country's specifications prescribed by the appropriate authority. The Ethiopian Food, Medicine and Health Care Administration and Control Authority (FMHACA), established by Regulation No. 189/2010, is the main regulatory agency.

3.3 Rationale for Intervention

Iodine is necessary for normal foetal brain development. Pregnant women living in iodine-deficient regions are more likely to give birth to mentally retarded children. In communities affected by iodine deficiency, the average intelligence quotient (IQ) of children on a scale of 100 points is 13.5 IQ points lower than that of children living in communities without iodine deficiency (Hetzel 1989). Iodine deficiency is the single greatest cause of preventable

mental retardation. Hence countries with IDD are encouraged to prevent and control the problem without delay.

3.4 Recommended Protocols and Activities to Implement the Protocols

Two key strategies are used to combat IDD in Ethiopia:

- Universal salt iodisation for human and animal consumption.
- Supplementation of iodine capsules to populations in highly endemic areas under special circumstances.
- Nutrition education (For detailed information refer chapter 9)

3.4.1 Universal Salt Iodisation

WHO/UNICEF/ICCIDD recommends that 90% of households should receive iodised salt of at least 15 ppm for the successful management of IDDs in a population (Azizi et al. 2001). According to Ethiopian national nutrition phase I end line survey the national household iodized salt coverage was 84.5%. More than 15% of the total household consumed non iodized salt and 33 % had more than 15 ppm (EPHI, 2015).

IDD can be eliminated with the routine daily consumption of adequately iodised salt. All people, independent of age, socio-economic status, culture and religion, use salt throughout the year. Iodised salt is the most effective, lowcost, long-term solution to such a major public health problem. Less than 0.05 US cents (1.00 Br) per person/year and a tablespoon of iodine for a lifetime is a small price to pay for protection against the devastating effects of IDD.

For a national population of more than 98million, approximately more than 400,000 metric tonnes (MT) of iodised salt will be required for human consumption annually. This figure is based on the 2014 National iodized salt coverage survey finding, which shows that on average a person consumes 8 ± 5 grams of salt/day. The awareness, commitment and coordinated efforts of several stakeholders, including the government, public/private salt industry and donors/partners, is required to carry out the sustainable iodisation of salt in order to achieve the goal of USI in Ethiopia.

Type and Level of Iodine in Salt

The iodine content in salt is expressed as either ppm or mg/kg of iodine or potassium iodate (KIO₃). Usually, in Ethiopia, potassium iodate (KIO₃) is used for salt iodisation because of its relative stability over potassium iodide (KI) under unfavourable conditions.

The Standard for salt iodisation in Ethiopia is 34-66 PPM in the form of potassium iodate (KIO₃) or 20-40 PPM as Iodine.

The KIO₃ content in salt is the same as the iodine content times 1.68 or $KIO_3 = I \times 1.68$ (WHO 2001). In Ethiopia, an iodine content of 34-66 ppm is required as KIO₃ at the port of entry or at the packaging factory.

Handling of Iodised Salt

In any salt iodisation program, it is important to ensure that salt contains the specified amount of iodine at the time of consumption. The retention of iodine in salt is dependent upon the iodine compound used, the type of packaging, the exposure of the package to prevailing climatic conditions and the period of time between iodisation and consumption. The required amount of iodine in iodised salt is maintained only when the following conditions are met:

Salt is sprinkled on food at the end of cooking.

Salt is not washed before use.

The storage, selling and use of salt after its expiry date is avoided.

3.4.2 Supplementation of Iodine Capsules

As a short-term strategy in highly endemic areas, Lipiodol (iodized oil capsules) should be distributed to targeted high-risk groups once annually. This will protect the recipients for one to two years until salt iodisation is in place. Iodine capsule supplementation is costly, not universally accessible and consequently not a sustainable intervention (Zimmermann et al., 2000).

WHO and UNICEF recommend iodine supplementation for pregnant and lactating women in countries where less than 20% of households have access to iodized salt, until the salt iodization program is scaled up. According to WHO (2013) countries with a household access to iodized salt between 20% and 90% should make efforts to accelerate salt iodization or assess the feasibility of increasing iodine intake in the form of a supplement or iodine fortified foods by the most susceptible groups (Table 5). The salt iodization coverage in Ethiopia (85%) (EPHI, 2015) also lies within the above range of WHO standard and hence supplementation has to be considered in endemic areas.

Table 5: WHO-recommended dosages of daily and annual iodine supplementation

Population Group	Daily dose of iodine supplement ($\mu\text{g}/\text{day}$)	Single annual dose of iodized oil supplement (mg/year)
Pregnant women	250	400
Lactating women	250	400
Women of reproductive age (15–49 years)	150	400
Children \leq 2 years	90	200

Note: ^aFor children 0-6 months of age, iodine supplementation should be given through breast milk. This implies that the child is exclusively breastfed and that the lactating mother received iodine supplementation as indicated above. ^bThese figures for iodine supplements are given in situations where complementary food fortified with iodine is not available, in which case iodine supplementation is required for children of 7-24 months of age.

However, achieving sufficient iodine nutrition in the population through USI and other dietary means, such as the avoidance of foods with high amounts of goitrogenic compounds, would eliminate the need for specific iodine supplementation during pregnancy and lactation. Alternative interventions are needed only when USI is impractical or delayed (WHO, 2013).

Actions to promote optimal iodine nutrition in young children (WHO/UNICEF, 2007)

According to WHO, in a country where salt iodization is not in a full scale, the country need to assess the feasibility of increasing iodine intake in the form of a supplement or iodine-fortified foods by the most susceptible groups, as described in the following programmatic steps.

- Assess population iodine nutrition status, household iodized salt coverage (preferably disaggregated) and salt iodization programs in order to identify a national or sub-national problem.
- Develop new plans to strengthen salt iodization that include increasing political commitment, advocacy, capacity-building of the salt industry for production and quality assurance, adoption and enforcement of appropriate regulations/legislation, and an effective iodized salt monitoring system at production (or importation), retail and community levels.
- If a country does not succeed in scaling-up its salt iodization program within two years, the feasibility of increasing the iodine intake of susceptible groups by means of supplements or iodine-fortified foods will need to be explored as a temporary measure while strengthening the salt iodization program in areas of moderate and severe iodine deficiency.
- Assessing the feasibility of providing additional iodine should include:
 - costing of supplementation,
 - existing channels for distribution to reach the target groups,
 - likely duration of supplementation, and
 - Potential compliance.

3.5 Program Management

3.5.1 Training and Capacity Building

Train health workers, laboratory personnel, HEWs, program managers and other partners at all levels; provide training or orientation for salt producers, wholesalers and retailers on quality assurance and the proper handling of iodised salt.

Train the Health Development Army to educate the community on the proper handling and utilisation of salt.

3.5.2 Program Communications (advocacy, social mobilisation)

- Conduct advocacy in order to enhance political and administrative support at all levels.
- Develop messages based on formative assessments.
- Distribute communication materials to create demand for the universal consumption of iodised salt.
- Promote safe food preparation and storage methods:
 - Safe cooking methods with iodised salt.
 - Keep iodised salt in a cool and dry place, away from heat and direct sunlight.
 - Educate the public on effective cassava processing methods, like soaking the root in water and fermenting the grated pulp of the root, in areas where cassava is eaten as a staple crop.

3.5.3 Supply of Potassium Iodate (KIO₃)

The salt industry should own the USI program and ensure its own supply of KIO₃. The FMHACA will regularly monitor the quality and safety of potassium iodate (KIO₃) during importation and at production sites.

3.6 Monitoring and Evaluation

3.6.1 Monitoring the Quality of Iodised Salt

The IDD control program based on salt iodisation clearly cannot succeed unless all salt for human consumption is being adequately iodised. Therefore, the monitoring of salt iodine content is key and must be conducted at the production and importation sites, wholesale retailers and in households. If all salt leaving production facilities and all imported salt is properly iodised, packaged and labelled, the population are likely to have their iodine requirements met.

Monitoring Salt Iodine at the Production Site and Port of Entry (customs check points)

This will provide an answer to the question: Is the salt adequately iodised, according to the level required by the law of the country? This is the appropriate place where law enforcement can take place. Salt monitoring at the site of production is the responsibility of both the salt producer (internal monitoring) and governmental food inspectors (external monitoring).

Monitoring Salt at the Wholesale and Retail Levels

Monitoring the iodine in salt at the retailer level provides an answer to the question: is the salt iodized or Not?. Monitoring at this level yields a quick and easy indication of whether or not iodised salt is available in the marketplace and the degree to which non-iodised salt is competing for household use.

Monitoring Salt at the Household Level

Monitoring the iodine in salt at the household level answers the question: What percentages of households use iodised salt at any iodine concentration and what percentage use salt that is within an acceptable range of iodine concentration? This information indicates what is actually being used in households at a national level and provides important information about the successful delivery of iodised salt to the consumer. It also highlights the use of non-iodised salt obtained from unconventional marketing sources. Coverage, and the methods used to determine it, is critical for program monitoring.

3.6.2 Coverage and Impact Evaluation:

Monitoring the iodine status of a population answers the questions: “Is the salt iodisation program (or other interventions) improving iodine intake? Has iodine deficiency been eliminated in the population?” Iodine status is the most immediate measure to assess whether the thyroid gland has adequate iodine to function normally and protect the individual from the manifestations of iodine deficiency. The median urinary iodine concentration reflects the population status and is the indicator most commonly assessed. Salt coverage surveys may be conducted more frequently and are more easily ‘attached’ to other national surveys.

The assessment of the household use of iodised salt is predominantly conducted through school or household surveys. These may be carried out by district health staff or as part of periodic national surveys. In our national context, the HEP provides a special opportunity that needs to be fully utilised in this regard.

3.7 Indicators for the Various Levels of USI Implementation

Process Indicators:

- Adequacy of iodised salt production and distribution.
- Level of iodine in salt.

Outcome Indicators:

- Percentage of households adequately utilising iodated salt (>15ppm)

Impact Indicators:

- Percentage of children with clinical and sub-clinical IDD
- UIE level of >100 µg/l in the target population (SAC 6-12yrs)

3.8 Responsibilities at Each Level

National Level

Provide overall program coordination and leadership.

- Develop national iodisation standards and guidelines.
- Develop goals/targets and national action plans.
- Mobilise necessary resources (internal external).

- Enact and enforce salt regulation.
- Develop a strategy for IDD communications and celebrate “IDD day”.
- Disseminate the distribution of communication materials.
- Conduct periodic review meetings.
- Organise and support necessary trainings.
- Monitor and Evaluate - (coverage/access, quality, utilisation and impact).
- Strengthen and support consumer protection associations (independent customer union)

Regional Level

- Provide regional level coordination and leadership.
- Harmonise regional/national plans.
- Implement national iodisation standards and guidelines.
- Enforce salt regulation.
- Mobilise resources (internal/external).
- Develop strategy for IDD communications.
- Produce materials as necessary.
- Conduct periodic review meetings.
- Monitor access, coverage and quality at the regional level.

Zonal Level

- Provide zonal-level coordination and leadership.
- Harmonise zonal/regional plans.
- Enforce salt regulation.
- Produce materials as necessary.
- Conduct periodic review meetings.
- Monitor access, coverage and quality at the zonal level

Woreda Level

- Provide woreda-level coordination and leadership.
- Harmonise woreda/zonal/regional plans.
- Enforce salt regulation as appropriate.
- Monitor access, coverage and quality at the woreda level.

Kebele Level

- Provide kebele level coordination and leadership.
- Harmonise kebele/woreda/zonal plans.
- Enforce salt regulation as appropriate.
- Conduct periodic review meetings.
- Monitor access, coverage and quality at the kebele level.

Facility Level

- Provide technical support and supervision.
- Coordinate and support necessary training activities.

Household Level

- Monitor/ensure access to adequately iodated salt for the family.
- Practice safe cooking and storage methods.

CHAPTER 4

PREVENTION AND CONTROL OF IRON DEFICIENCY ANAEMIA

4.1 Introduction

Iron is a necessary part of haemoglobin in the red blood cells that transport oxygen and carbon dioxide in the body. Deficient levels of Iron leads to anaemia, which is defined as a low level of haemoglobin in the blood as evidenced by the reduced quality and quantity of red blood cells. Anaemia is one of the most prevalent nutritional disorders worldwide, affecting populations in both industrialised and less developed countries. The global prevalence of anaemia is estimated to be 43% (273 million) in children, 38% (32 million) in pregnant women and 29% (496 million) in non-pregnant women. Africa has the highest prevalence (68% in preschool children; 57% in pregnant women and 48% in non-pregnant women) (WHO 2012).

Low haemoglobin concentrations and anaemia are important risk factors for the health and development of women and children. Moderate and severe maternal anaemia may lead to an increased risk of maternal haemorrhage; premature delivery; low birth weight; associated maternal and child mortality; impaired physical and cognitive development; and reduced educational attainment and lowered future work productivity. Maternal short stature and Iron deficient anaemia, which can increase the risk of maternal death at delivery, contribute to at least 20% of maternal deaths (WHO 2010). Furthermore, the effect of reduced productivity due to anaemia can have a significant impact on the economic growth and overall development of a country.

4.2 Situation Analysis

According to the demographic and health survey conducted in Ethiopia in 2011, the prevalence of anaemia is estimated to be 44% in children aged 5-59 months, 22% in pregnant women and 15% in non-pregnant women of reproductive age (EDHS 2011). The same survey found that the prevalence of anaemia in men above 15 years of age was 11%. This illustrated that there is a decreasing trend when compared to the previous survey

conducted in 2005. At that time, the prevalence was 52% and 27% among children and WRA, respectively. However, the prevalence of anaemia is still high amongst some risk groups.

Anaemia is defined as a haemoglobin concentration below a set cut-off point based on individual and environmental factors (i.e. age, sex, physiological status, smoking or non-smoking and altitude). The WHO defines anaemia as a haemoglobin concentration less than 110 g/l at sea level in children under-five years of age and pregnant women during first and second trimester, and less than 105 g/L during the third trimester. For non-pregnant women of reproductive age a haemoglobin level less than 120 g/l is the cut-off point, and for men above 15 years of age it is 130 g/l (WHO 2011).

Table 6: Haemoglobin Values Defining Anaemia in Different Population Groups

Age or Sex Group	Haemoglobin Values Defining Anaemia (g/dl)
Children 6-59 months	<11.0
Children 5-11 yrs	<11.5
Children 12-14 yrs	<12.0
Non-pregnant women >15	<12.0
Pregnant women	<11.0
Men > 15	<13.0
<i>WHO/UNICEF/UNU (2001) values used in EDHS</i>	

WHO considers a prevalence of anaemia (WHO 2011):

- Over 40% to be a severe public health problem.
- Between 20% to less than 40% to be a moderate public health problem.
- Between 5% to less than 20% to be a mild public health problem.

This data clearly indicated that anaemia is an important public health issue in Ethiopia.

4.3 Rationale for Intervention

Iron-deficiency anaemia quietly but severely deteriorates not only individual health, but also the economic development of a country. The efficient implementation of internationally recommended interventions should, therefore, be considered in the context of the local social and environmental factors related to the aetiology of anaemia, in order to reduce maternal mortality, premature birth, inter-uterine retardation, low birth weight and infant mortality (due to low birth weight), as well as increasing the learning capacity and productivity of all individuals.

4.4 Recommended Protocols and Activities to Implement the Protocols

The strategies to reduce Iron deficiency anaemia include:

- Supplementation of Iron-Folic Acid.
- Food based approach:
 - Dietary diversification and modification (for detailed information refer chapter 7).
 - Fortification of processed or staple food - home food fortification.
- Control of helminthiasis (specifically hookworm), schistosomiasis and malaria (prophylaxis and treatment).
- Treatment of anaemia.
- Other measures, such as optimising maternal nutrition before and during pregnancy; preventing low birth weight and pre-term births; delayed cord clamping; control of parasites, and improvements in access to healthcare, infant feeding, food security and amelioration in socioeconomic status.

4.4.1 Iron-Folic Acid Supplementation

4.4.1.1 *Supplementation of IFA for the Treatment of Anaemia*

Iron supplements are essential for the rapid treatment of severe Iron deficiency anaemia in all sex and age groups. With proper training, health workers can assess very low haemoglobin levels or extreme pallor with reasonable sensitivity and high specificity. Anaemia is diagnosed:

By clinical examination - extreme pallor of the palms of the hands.

By laboratory - haemoglobin/ haematocrit tests.

Table 7: Iron and Folic Acid Doses for Treating Severe Anaemia in Vulnerable Groups

Group	Iron-Folic Acid Dose	Duration
Children < 2 years old	Iron: 25 mg/day + Folic Acid: 100-400 mcg/day	3 months
Children 2-12 years old	Iron: 60 mg/day + Folic Acid: 400 mcg/day	3 months
Adolescents and Adults - including pregnant women	Iron: 120 mg/day + Folic Acid: 400 mcg/day	3 months

4.4.1.2 *Iron and Folic Acid Supplementation for Pregnant Women*

Pregnant women should take daily oral Iron and Folic Acid supplements for 180 days during pregnancy as part of the antenatal care, in order to reduce the risk of low birth weight, maternal anaemia and Iron deficiency (WHO 2012). If she didn't finish the full dose during pregnancy she can finish the dose after delivery. If the area is endemic

for anemia iron can be supplemented for extra 3 months. A formulation containing 30-60 mg elemental Iron and 400µg Folic Acid is recommended.

Table 8: Daily Iron and Folic Acidsupplementation in pregnant women:

Supplement Composition	Iron: 30–60 mg of elemental Iron* + Folic Acid: 400µg (0.4 mg)
Frequency	One supplement daily
Duration	Six months during pregnancy, Iron and Folic Acidsupplementation should be given for 180 days
Target group	All pregnant adolescents and adult women
Settings	All settings

*30 mg of elemental Iron equals 150 mg of ferrous sulphate heptahydrate, 90 mg of ferrous fumarate or 250 mg of ferrous gluconate.

4.4.1.3 *Iron and Folic Acid Supplementation for Adolescent Girls*

It is recommended for adolescent girls (10-19 years) to take a weekly dose of Iron folate for the prevention of anaemia as indicated in the table below:

Table 9: Scheme for intermittent Iron and Folic Acid supplementation in adolescent girls

Supplement Composition	Iron: 60 mg of elemental Iron*+Folic Acid: 2800 µg (2.8 mg)
Frequency	One supplement per week
Duration and Time Interval BetweenPeriods of Supplementation	3 months of supplementation followed by 3 months of no supplementation, after which the provision of supplements should restart. If feasible, intermittent supplements could be given throughout the school or calendar year.
Target group	Adolescent girls
Settings	Populations where the prevalence of anaemia among non-pregnant women of reproductive age is 20% or higher

*60 mg of elemental Iron equals 300 mg of ferrous sulphate heptahydrate, 180 mg of ferrous fumarate or 500 mg of ferrous gluconate.

4.4.2 Food Fortification

The fortification of staple foods with Iron is a major method of increasing the dietary intake of Iron in countries where Iron-rich foods are too expensive for many to purchase. This strategy would be beneficial for the whole population if numerous food types were to be processed and fortified at the factory level. However, it is crucial to set the fortification standards based on evidence of dietary patterns and the iron intake of a population.

4.5 Program Management

4.5.1 Service Delivery for Supplementation of IFA and Program Planning

For the successful integration of IFA supplementation activities into the woreda health plans, program based supportive supervision and monitoring checklists are important.

The Focused ANC is the accepted policy/strategy through which IFA supplements are delivered to pregnant women in Ethiopia. Since the introduction of the HEP, health posts have been conducting ANC, including IFA supplementation, alongside health centres and hospitals. Clinicians, Nurses, HEWs and other service providers are able to distribute and counsel pregnant and lactating women during ANC visits.

Where and when appropriate, the supplementation of IFA for adolescent girls should be coordinated in collaboration with the MOE and MOH, as a package of the National School Health and Nutrition Strategy. To reach non-school attending adolescent girls, targeted social mobilisation through the HEP, as well as a youth friendly approach, is worthy of consideration. Strategies to reach more women, particularly in hard to reach settings, should be in place. In order to significantly improve service uptake and utilisation, those critical service bottlenecks, on both the supply and demand side, must be addressed and various approaches to maximising utilisation explored.

4.5.2 Social Mobilisation

The demand side of the program calls for the strengthening of social mobilisation approaches and the early initiation of ANC follow-up visits. Creating community awareness on the benefits of IFA supplements and improving maternal motivation to adhere to them requires due emphasis.

Service uptake can be improved through social mobilisation at the community level, using the HEW, HDA and other community based structures.

4.5.3 Capacity Building Training

Improving the knowledge among health providers on maternal anaemia, the national protocol of IFA supplementation, and adherence monitoring and counselling skills catalyses an improvement in service quality - and hence utilisation. The IRT designed for the HEWs, and the BINLM designed for service providers at health centres and hospitals, and health and nutrition program managers at all levels, addresses the knowledge and skills required for the proper administration of Iron supplements and the management of this supplementation.

4.5.4 Supply Management

Issues pertaining to supply management – forecasting, distribution and stock monitoring are important components of program management. The FMoH

(pharmaceutical and supply unit is responsible for forecasting, submitting annual stock requests and inventory monitoring (including Iron/Folic Acid supply), alongside the PFSA (national quantification committee). The PFSA is responsible for compiling and submitting all requests to the Essential Medical Supply System of the FMOH for the procurement of Iron/Folic Acid supplements. The supply distribution follows the Essential Medicine Supply System.

Health centres and hospitals quantify their own resupply every two months and submit it to the nearest PFSA hub, using a combined order and report form. The PFSA hubs deliver supplies every two months. A copy of the report is shared with the Woreda Health Office (WoHO), in the case of Health Centres (HC), and the Regional Health Bureaus (RHB), in the case of hospitals. Every month, health centres estimate the resupply quantities of health posts based on reported data, and issue supplies accordingly. When required, there may be an information flow from a PFSA hub to the Woreda health offices or HCs, and vice versa. The tracer drug report, which includes IFA, is an important source of information for the improvement of supply management practices at the health facility level.

Beyond receiving and aggregating the reports and orders of health facilities and WoHOs, the RHBs also supervise stock management, ordering and reporting functions and provide technical support.

4.6 Monitoring and Evaluation

Reports of control and prevention of anaemia programs must be compiled by health institutions following the Health Management Information System (HMIS). They are then routinely analysed for the feedback, follow up and fine-tuning of programs.

Review meetings on the national anaemia control and prevention program must be conducted alongside family health program reviews. Food processing plants carrying out Iron fortification will be monitored on a regular basis, in order to verify the proper management of the fortification processes.

Process Indicators:

- Number of health workers trained in anaemia prevention.
- Percentage of target groups dewormed.
- Percentage of target groups aware of at least one benefit of IFA intake.
- Types and amount of fortified foods available in the market.
- Number (percentage) of food factories fortifying food with Iron.

Outcome Indicators:

- Percentage of pregnant women who consume at least 90 Iron/Folic Acid tablets.
- Percentage of target groups consuming the recommended number of Iron/Folic Acid tablets.
- Percentage of target groups (children, PLWs and Adolescents) consuming Iron rich foods.

Impact Indicators:

Percentage of target groups with anaemia.

- Prevalence of LBW.
- Shift in population's haemoglobin curve.
- The status of anaemia in at-risk groups will be assessed periodically through EDHS and national micronutrient surveys.

4.7 RESPONSIBILITIES AT EACH LEVEL

National-Federal Ministry of Health, and the Pharmaceutical Fund and Supply Agency:

- Formulating any health and nutrition related policy, including IFA supplementation.
- Developing operational approaches, technical guidelines and protocols, training materials and behaviour change communications strategies.
- Coordinating, monitoring and evaluating IFA supplementation activities in conjunction with the EPHI, PFSA, FMHACA, RHBs, WoHOs and development partners.
- With support from the PFSA (national quantification committee), the FMOH is responsible for forecasting, submitting annual stock requests and inventory monitoring (including Iron/Folic Acid supply).
- The PFSA is responsible for compiling all requests and submitting them to the Essential Medical Supply System of the FMOH for the procurement of Iron/Folic Acid supplements and their distribution to hospitals and health centres.

Regional Health Bureau and Zonal Health Desks:

- Implementing and monitoring the IFA supplementation program.
- Ensuring that the WoHOs have adequate supplies of IFA.
- Support the WoHOs in planning and implementing IFA supplementation activities.
- Monitor activities at the district and health centre levels.
- Compile and analyse coverage data and provide program feedback to the WoHOs.
- Ensure HMIS reports (including IFA coverage) are completed and sent on time to the FMOH.
- Receive reports from hospitals in their respective regional states.
- RHBs supervise stock management, ordering and reporting functions, as well as providing technical support

Woreda Health Offices:

- Plan, monitor and evaluate health activities, including IFA supplementation, and routinely monitor activities at the health facilities.
- Compile and analyse IFA coverage and/or utilisation data, and provide feedback to health centres.
- Coordinate with HC pharmacists and HMIS focal person to ensure the sufficient IFA supplementation for target groups.
- Ensure that HCs report their bi-monthly consumption in a timely manner, and request

and refill their stock.

- Collect data regarding supplementation and utilisation patterns in the community.
- Supervise stock management, ordering and reporting functions, and provide technical support to health centres.

Health Facilities:

- Provide IFA supplementation to pregnant and post-natal women in their kebeles, mainly during ANC and other relevant contacts.
- Provide counselling on anaemia prevention and control, and healthy nutrition practices, while communicating the importance of adhering to the supplementation program.
- Address cultural and individual barriers to service utilisation at the health facilities and during community outreach sessions.
- Health Posts must register services in the ANC registration book and monitor program coverage in their respective kebeles.
- Compile and submit health centre and health post coverage reports under their catchment to the WoHOs.
- Health Centres receive and aggregate the reports and orders of the health facilities.
- Health Centres and hospitals quantify supply requirements, report consumption to the PFSA and refill their stocks in a timely fashion.
- Health Centre staff supervise health posts, and provide technical and managerial supports.

The Community

The Health Extension Program serves as the primary vehicle for the implementation of essential community-centred health care packages, like IFA supplementation to pregnant & lactating women.

The HDA provide support to HEWs for IFA supplementation at the community level. This includes:

- Encouraging pregnant women to initiate ANC follow up visits early.
- Identifying, referring and tracking pregnant and postpartum women in their village.
- Providing education about the importance of Iron supplements and an Iron rich diet.

CHAPTER 5

PREVENTION AND CONTROL OF ZINC DEFICIENCY

5.1 Introduction

Zinc is an essential trace mineral required for optimal health, proper growth and development, and the overall functioning of the human body. It plays a pivotal role in the function of the immune system, and thus its deficiency can result in an increased susceptibility to infectious diseases, like pneumonia, diarrhoea and malaria. Zinc deficiency is a major public health problem around the world. The estimated global prevalence of Zinc deficiency is about 31%. According to the WHO, a stunting rate of more than 20% indicates that there is Zinc deficiency in the population. Mini EDHS (2014) demonstrated that the stunting rate in Ethiopia is 40% - well above the WHO cut-off point. Furthermore, the dietary pattern in Ethiopia is mostly plant based, high in zinc absorption inhibitors and low in animal products, which together increase the likelihood of zinc deficiency (Black and Caulfield, 2004).

5.2 Situation Analysis

Ethiopia has a very high child mortality and morbidity rate, with diarrhoea, pneumonia and malaria being the major contributors. According to the EDHS (2011) and Mini EDHS 2014 child mortality revealed that 88 and 68 per 1000 live births respectively, though an improvement has been recorded since 2000. Diarrheal diseases contribute to 20% of child deaths. The WHO and UNICEF recommend the co-administration of low-Osmolarity oral rehydration solution (Lo-ORS) and Zinc for the clinical management of diarrhoea. Zinc is already included in the list of essential drugs for HC and HPICCM/IMNCI guidelines in Ethiopia. The most convenient delivery mechanism to ensure co-administration at the community level is through bundling the Lo-ORS with Zinc tablets. A trial distribution of Zinc bundled with lo-ORS packaged in pouch-like containers is currently underway. These packages include dosage instructions and important messages on the utilisation of Zinc and lo-ORS. Until now, there is no guideline for a preventive supplementation of zinc to

combat diarrhoea, as the literature does not seem to agree on an ideal formulation, dose, frequency and duration.

A study conducted among stunted children in a rural Ethiopian village suggested that zinc supplementation significantly improved appetite and food intake (Umeta M. et al 2000). A Cochrane review of 18 randomised controlled trials has shown that zinc significantly enhances the treatment of childhood diarrhoea (Lazzerini and Ronfani 2008). Several studies also indicate that zinc supplementation plays a vital role in Otitis media, thalassemia, Sickle cell diseases and HIV/AIDS.

5.3 Rationale for Intervention

Zinc plays a pivotal role in reducing the most common childhood illnesses, such as diarrhoea, pneumonia and malaria. It is no surprise, therefore, that it is designated as an essential micronutrient for the prevention of child mortality. In a study conducted among small-for-gestational-age infants in North India, the supplementation of zinc significantly reduced mortality by 67% (Sazawal et al. 2001). Another trial among older children in Burkina Faso also demonstrated that mortality from all causes was reduced by more than 50% among those who received zinc supplements (Muller et al. 2001). Zinc supplementation in children is associated with a 13% reduction in diarrheal mortality and a 15% reduction in pneumonia mortality (Yakoob et al. 2011).

Zinc is a low cost compound and interventions to alleviate its deficiency and can also contribute towards the achievement of three of the four health-related MDGs:

- MDG 4: Reduce Child Mortality - Zinc deficiency contributes substantially to decreased diarrhoea and pneumonia mortality - the most common causes of death among children in developing countries. Therefore, interventions to enhance the Zinc intake of children in low-income countries act as a useful strategy in reducing child mortality rates.
- MDG 5: Reduce Maternal Mortality - Zinc deficiency can result in a protracted labour, which increases maternal mortality rates and adversely affects foetal health. Therefore, improving zinc intake of women before and during pregnancy may help to reduce maternal mortality and benefit infant growth and survival.
- MDG 6: Combat HIV/AIDS, Malaria and Other Diseases — there is evidence that Zinc supplementation may reduce the severity of malaria, as well as the risk of both diarrhoea and pneumonia, which frequently complicate HIV infections. Therefore, zinc supplementation may reduce fatalities from these diseases.

5.4 Strategies for Zinc as a treatment of Diarrhoea

5.4.1 Zinc Supplementation for the Treatment of Diarrhoea

Several studies, as shown above, suggest that zinc supplementation improves health, growth and development. For example, it is indicated that the use of Zinc supplementation together with low osmolality ORS (Lo-ORS) significantly decreases morbidity and mortality related to diarrheal diseases. These studies have also shown that Zinc supplementation results in a reduction of both the duration and severity of acute diarrhoea, alleviating the risk of treatment failure or death from

persistent diarrhoea. As a result of this evidence, the WHO and UNICEF recommend 20 mg per day of Zinc supplements (Table 10) for 10days in children with acute diarrhoea, and 10 mg per day for infants under six months old. Several other studies have also suggested that Zinc supplementation improves growth and development.

The WHO has indicated that a 10 days course of Zinc treatment can reduce the duration and severity of diarrheal episodes and may also prevent future episodes for up to 2-3 months. Zinc should be provided with Lo-ORS to all types of diarrhoea patients, and a full 10days course of treatment should be taken.

Table 10: Dosage of Zinc for the Treatment of Diarrhoea

Age	Dose
< 6months	1/2 tablet of 20mg Zinc for 10days
6 months – 5years	1tablet of 20mg Zinc for 10days

NB: Zinc comes in a dispersible tablet. It should be dissolved in a small amount of breast milk, ORS or clean water in a cup or spoon. It should be given together with ORS for all types of diarrheal disease.

5.4.2 Zinc for the Treatment of Diarrhoea Delivery Mechanisms:

- Through the Health Facility: When a child with diarrhoea comes to any public or private health facility (HP, HCS, hospital or pharmacy), the health worker should provide Zinc and Lo-ORS as an integral part of diarrhoea management.
- Through House-to-House Visits: When HEWs visit households, they provide Zinc and lo-ORS for any child suffering with diarrhoea.
- Through CHDs/Health Campaigns: Caregivers will be provided with Zinc and Lo-ORS to treat future episodes of diarrhoea in their children when and if it occurs.
- Over the Counter: In order to promote the wide and early use of Zinc and ORS, supplements should be made available over the counter (OTC) at all pharmacies. This will increase the accessibility of Zinc and ORS.

5.5 Program Management

5.5.1 Supply Chain Management:

Supply chain management is a crucial component of the overall program management of Zinc and Lo-ORS. The supply management should have an emphasis on ensuring the availability of equal proportions of Zinc and Lo-ORS from the central PFSA to the health facility level. The co-packaging (bundling) of Zinc and Lo-ORS is an effective strategy for ensuring appropriate treatment by the providers and adherence to treatment by caregivers.

5.5.2 Inter-sectoral Collaboration

In order to make this program effective and sustainable, there must be a dedicated collaborative partnership between the government, private sector and NGOs, including all key sectors - health, agriculture, education, water and others; the implementation of national diarrhoea treatment protocol, and the local production of Zinc and Lo-ORS.

5.5.3 Program Communications

- In order to ensure the proper utilisation of Zinc and ORS in diarrhoea cases, there must be an improvement in the community's health seeking behaviour and the appropriate utilisation of the products. This can be achieved through effective behavioural communication interventions, such as social marketing approaches using different communication channels (print and electronic media).
- Health workers, both at the private and public health facilities, need to be provided with training on the proper administration of Zinc and Lo-ORS as an integral part of diarrhoea management.
- Communications strategies need to focus on adherence issues with regards to individuals taking the full 10 days course of treatment.
- Including Zinc on the family health card to increase awareness, as it is a good tool for interpersonal communications at the community level.

5.6 Monitoring and Evaluation

Appropriate monitoring and evaluation is vital in ensuring that the program is on track (Table 11):

- Percentage of children 0-59 months receiving Zinc for diarrhoea treatment during the recent episode.
- Percentage of caregivers/ anybody? Who seek Zinc and Lo-ORS for the treatment of diarrhoea?
- Reduction in the prevalence of stunting (height-for-age Z-score below -2 SD).

Table 11: ZINC and Lo-ORS Monitoring Plan

Key Indicators	Baseline and Sources	Sources of data (Results)	Method of data collection	When/ Frequency	Responsibility
Diarrhoea prevalence (%) in area(s)	13.4% (EDHS, 2011) ¹	National LQAS	Survey	March 2014/bi-annual	FMoH and Stakeholders
Percentage of caregivers who seek any form of treatment for diarrhoea at different public and private health facilities	31.8% (EDHS, 2011)	National LQAS	Survey	March 2014/ biannual	FMoH and Stakeholders
What percentage of episodes reported are treated with ORS alone, Zinc alone, and both Zinc and ORS at different public and private health facilities	24% (Zinc formative research conducted in Feb 2012)	National LQAS	Survey	March 2014/Bi-annual	FMoH and Stakeholders
SUPPLY: Number of courses of treatment (to be) made available via different health facilities	Zero				FMoH and Stakeholders
When caregivers seek treatment, what percentage seeks it from Public sector health facilities (HCs and Hospitals)?	31.8% (EDHS, 2011)	National LQAS	Survey	March 2014/Bi-annual	FMoH and Stakeholders
What is the national policy on where Zinc + ORS may be sold by the private sector?	Only ORS at pharmacies without a prescription (Over The Counter)	Include Zinc at pharmacies without a prescription (Over The Counter)	Program Report	Jan 2014 Annual	FMoH and Stakeholders
Attitude: The extent to which caregivers express "intention to treat" the next episode of childhood diarrhoea in the household with Zinc +ORS	No data	National LQAS	Survey	March 2014/Bi-annual	FMoH and Stakeholders
Knowledge: Extent to which caregivers are informed of (1) The benefits of using Zinc and ORS as first line treatment for diarrhoea; (2) Where to get it, and (3) how to use them in treating diarrhoea	No data	National LQAS	Survey	March 2014/Bi-annual	FMOH and Stakeholders
Knowledge: Percentage of health workers who are (a) Informed of the benefits of providing/prescribing Zinc and ORS as a first line treatment for childhood diarrhoea, and (b) How to use them in treating diarrhoea	No data	National LQAS	Survey	March 2014/Bi-annual	FMOH and Stakeholders

EDHS 2011 serves as the baseline for a number of indicators.

5.7 Responsibilities at Each Level

It is crucial that all responsible bodies at each level play their role in ensuring that Zinc and ORS are utilised properly as part of diarrhoea treatment, as well as to prevent and control Zinc deficiency in the country in an effective and sustainable way. This can be achieved by:

- Conducting baseline, midline and end line research to see the impact of different Zinc-

related intervention projects in the country.

- Conducting operational research for a variety of projects.
- Holding regular review meetings on Zinc programs at the national, regional and woreda levels.
- Regular program reporting from different levels in the country.
- Ensure that Zinc is included in the EDHS data.

National Level:

- Formulating policies and guidelines pertaining to the local production of Zinc tablets and food fortification with Zinc.
- Ensuring supply availability.
- Mobilising resources and allocating budgets for the implementation of different activities.
- Coordination of the prevention and control of Zinc deficiency.
- National level M& E activities (e.g. National review meetings).

Regional Level:

- Formulating regional level implementing policies and guidelines.
- Regional level M&E activities.
- Organising regional level meetings.
- Supervising and providing technical support to zonal offices.
- Preparing annual regional plans.

Zonal Level:

Providing technical support to Woreda offices.

Regular supervision Woreda offices.

Implementing zonal level M & E activities.

Woreda Offices:

- Supervising and providing technical support to Health centres under the woreda.
- Implementing woreda level M& E activities.
- Organising woreda level review meetings.

Kebele Level:

- Supervising the implementation of each activity at the community level.
- Creating awareness among the community on diarrhoeal management with Lo-ORS & Zinc.
- Collecting feedback from the community and reporting to woreda offices.

Facility Level:

- Treating patients.
- Providing counselling to the community.
- Referring cases to higher levels when better management is required.
- Filling log books in an accurate and timely manner, and providing reports to higher levels.

Household Level:

1. Properly utilising all services provided.
2. Improving their health-seeking behaviour.

CHAPTER 6

EMERGING MICRONUTRIENT DEFICIENCY PROBLEMS CURRENTLY UNDER CONSIDERATION FOR PUBLIC HEALTH INTERVENTION

6.1 INTRODUCTION

Calcium and, more recently, vitamin D have been gaining much attention globally for their contributions to a healthy life. Deficiencies in calcium and vitamin D have been linked to various negative health outcomes, including poor maternal and child health. Maternal and child health remain a preoccupying situation in Ethiopia. Still, one in every 11 Ethiopian children dies before the age of 5 - despite continuous improvement over the past 15 years. The maternal mortality ratio (MMR) is estimated at 676 deaths per 100,000 live births and ranks among one of the highest in the world (EDHS, 2011). But recently according to the study result the MMR is 420 per 100,000 live births indicating a tremendous declining of maternal deaths.

Although much more research is needed to determine the extent of these micronutrient deficiencies in the country and their contribution to the burden of mortality and morbidity, little effort is needed to put in place measures that can reduce their risk.

6.2 CALCIUM

Calcium is the most abundant mineral in the body and is essential for many aspects of health, including bones and teeth, as well as a normal heart rhythm. This mineral is also required for muscle contractions and relaxation, nerve and hormone function, and blood pressure regulation. Ninety-nine percent of the body's calcium is found in the bones and teeth, where it supports their structure and function; approximately 1% is present in the intracellular structures, cell membranes and extracellular fluids. Serum calcium levels fluctuate very little from changes in dietary intakes. In fact, the body uses bone tissue as

a reservoir for calcium to maintain a constant calcium concentration level in the blood and intracellular fluids.

Unfortunately, we do not know the calcium status in most populations, but, considering the low dairy intake in most developing countries, it is highly likely that calcium deficiencies are prevalent in Ethiopia (WHO 2006).

6.2.1 Assessing Calcium Deficiency

Serum calcium concentration is not useful in determining a person's calcium status for the reasons explained above. Therefore, an estimate of an individual or population's calcium intake is the most reliable measure of calcium status.

6.2.2 Daily calcium Requirements

Table 12: Recommended daily amount of calcium by age and sex:

Age	Male (mg)	Female (mg)	Pregnant & Lactating (mg)
0-6 months	200	200	
7-12 months	260	260	
1-3 years	700	700	
4-8 years	1000	1000	
9-13 years	1300	1300	
14-18 years	1300	1300	1300
19-50 years	1000	1000	1000
51-70 years	1000	1200	
71+ years	1200	1200	

Source: IOM 2010

6.2.3 Sources of Calcium

The main sources of calcium are milk, other dairy products and fortified foods. Calcium is also found in kale, cabbage and canned fish (sardines, salmon etc.).

In supplements, calcium is present in good bioavailability in the form of carbonate (, citrate, lactate or gluconate. Calcium supplements can cause gastrointestinal discomfort, mainly gas, bloating and constipation. Calcium citrate appears to cause lesser side effects than calcium carbonate (WHO 2013).

6.2.4 Causes of Calcium Deficiency

There are two types of calcium deficiency - dietary calcium deficiency and hypocalcaemia. The first is related to inadequate calcium intake. Calcium intake is low when dairy products are not consumed. Calcium absorption is homeostatically regulated by vitamin D, and also depends on the calcium status of the individual and the content of calcium in the food. Calcium absorption inhibitors are oxalates (spinach, sweet potato and beans) and, to a lesser extent, phytates- found in legumes

and cereals, predominant in the Ethiopian diet (Tizazu et al., 2011). Hypocalcaemia is a low level of calcium in the blood. It can occur from taking medications (such as diuretics), medical treatment or disease (such as renal failure or malignancies) (Pravina et al., 2013).

6.2.5 Consequences of Calcium Deficiency

Depleted calcium stores cause thinning and weakening in the bones, which in turn leads to osteoporosis - a disease characterised by a reduced bone mass that causes increased skeletal fragility and susceptibility to fractures. Elderly populations are particularly vulnerable to this condition.

Dietary calcium deficiency during pregnancy can lead to adverse effects in both the mother and foetus, including osteopenia, tremor, paraesthesia, muscle cramping, tetanus, delayed foetal growth, low birth weight and poor foetal mineralisation (WHO 2013). Preeclampsia - the development of high blood pressure and protein in the urine during pregnancy, and its more severe complications eclampsia - is linked to calcium deficiency (WHO 2011).

Preeclampsia occurs in about 5% of pregnancies, usually after 20 weeks of gestation. Preeclampsia manifests as problems with the placenta of the expectant mother and increased blood pressure. This causes a reduction in blood flow to the foetus, and thus a reduced oxygen supply. The consequences for the baby are intra-uterine growth retardation and early delivery. For the mother, the consequences can also be devastating, and preeclampsia is estimated to be the cause of 40,000 maternal deaths per year (WHO 2013 Calcium Guidelines). Numerous studies have suggested that calcium supplementation during pregnancy reduces the occurrence of pregnancy-induced hypertension, especially for women at a higher risk of gestational hypertension - women with multiple pregnancies, older age, increased BMI (Hofmeyer et al., 2010; WHO 2011).

6.2.6 Strategies to Prevent and Control Calcium Deficiency

6.2.6.1 Supplementation for Pregnant Women

Women, especially during pregnancy, need an increased dietary intake of calcium. According to the WHO, a dietary intake of 1200 mg/day of calcium is recommended for pregnant women. In populations where calcium intake is low, an elemental calcium supplementation of 1.5 to 2.0gm per day is proposed as one ANC component for the prevention of preeclampsia among pregnant women (WHO 2013)

Table 13: WHO Guideline for Calcium Supplementation in Pregnant Women (2013)

Dosage	1.5g to 2.0g elemental calcium
Frequency	Daily - divided into 3 doses at mealtimes to increase absorption
Duration	From 20 weeks gestation to end of pregnancy
Target group	All pregnant women, particularly those at high risk of gestational hypertension
Setting	Areas with low calcium intake

The guideline should be adapted to the Ethiopian context, in order to integrate the supplementation as one of the ANC components. To do so, it should be preceded by an assessment of calcium intake at a population level. The National Food Consumption Survey will be a good starting point in helping to determine the average calcium intake of the population (EPHI, 2013).

6.2.7 Other Strategies

- Food Diversification: Promoting a diversified diet is the easiest way to prevent micronutrient deficiencies, including calcium deficiency. Promoting access and consumption of foods rich in calcium on a regular basis, particularly for children and pregnant women in the household, can reduce the risk of calcium deficiency.
- Food fortification (see fortification section).

6.3 VITAMIN D

Vitamin D - a liquid soluble vitamin and pro-hormone - has multiple functions that are important for growth and development, including immune system and brain development. It also plays an important role in bone metabolism through the regulation of calcium and phosphate homeostasis. There are two major forms of vitamin D - Vitamin D2 (Ergocalciferol) and Vitamin D3 (Cholecalciferol). Vitamin D is obtained by humans through cutaneous synthesis from the precursor 7-dehydrocholesterol upon ultraviolet B (UVB) irradiation of the skin or from dietary intake. The circulating Vitamin D travels to the liver, where the mitochondrial enzyme, 25-hydroxylase, rapidly converts it in to 25-hydroxyvitamin D.

6.3.1 Assessing Vitamin D Deficiency

The main circulating and storage form of Vitamin D is Vitamin D 25-hydroxy, which is used as a biomarker for the status of Vitamin D in the body. Using this biomarker, a deficiency of vitamin D is defined as a serum level of 25-hydroxyvitamin D less than 37.5nmol/L in adults (Dror and Allen, 2010, WHO, 2011). In infants and young children, a serum level below 27.5nmol/L is indicative of deficiency (WHO, 2006). Dietary intake can also be assessed, but it does not give the full picture of the Vitamin D status of an individual because it does not take into account Vitamin D produced from sun exposure. In Ethiopia, like most countries in the world, there is no nationally representative data available on the Vitamin D status of the population. Worldwide, Vitamin D deficiency is now recognised as a pandemic, and deficiencies can be

found in all ethnicities and age groups(Holick and Chen, 2008).

6.3.2 Sources of Vitamin D

Vitamin D comes primarily (80%) from exposure to sunlight and is found only in a few foods, such as oily fish, eggs and fortified dairy.

6.3.3 Causes of Vitamin D Deficiency

The main risk factors for Vitamin D deficiency are a lack of adequate sun exposure, darker skin pigmentation, latitude of place of residence (above 40° - both north and south) and a limited intake of major vitamin D sources (fish and fish oils, egg yolks, cheese, fortified milk and beef liver). Even in countries with year-round sunlight, exposure is sometimes restricted for cultural reasons, such as women consistently covering their bodies with clothing.

6.3.4 Populations at Risk

- Children
- Pregnant Women

6.3.5 Consequences of Vitamin D Deficiency

6.3.5.1 Children

Research has demonstrated that the Vitamin D status of the foetus is entirely dependent on the mother. Infants are born with low vitamin D stores and are dependent on breastmilk, sunlight or supplements as a source of vitamin D during the first few months of life. Vitamin D deficiency in infants has been associated with rickets - a bone malformation - seizures and difficulty breathing. Vitamin D deficiency during pregnancy is common in some parts of the world, and can have many negative health implications for the mother and developing foetus. A systematic review of nutritional rickets found that the major cause in Ethiopian children is a lack of exposure to sunshine and/or inadequate intake of vitamin D (Wondale et al., 2005).

6.3.5.2 Pregnancy

Vitamin D deficiency during pregnancy is associated with an increased risk of preeclampsia, gestational diabetes mellitus, preterm birth, small-for-gestational age infants, impaired foetal skeletal formation (leading to infant rickets) and reduced bone mass, as well as other tissue-specific conditions. Although evidence is lacking regarding appropriate cut-off points to define vitamin D status during pregnancy, 25 (OH) D levels higher than 75nmol/L are considered as optimal during pregnancy(Holick and Chen 2008).

Although most studies found that vitamin D deficiency is very common in all age groups and that few foods contain vitamin D, supplementation guidelines for Vitamin D have not yet been developed by the World Health Organisation. The reason for this is that very few studies have illustrated strong evidence of the benefits of supplementation.

6.3.6 Strategies to Prevent Vitamin D Deficiency

Food fortification remains the most appropriate strategy to prevent Vitamin D deficiency, because there is currently no consensus around the benefits of supplementation for children or pregnant women. In Canada and the United States, Vitamin D has been added to milk since the 1920s - a policy that has allowed the elimination of Vitamin D deficient rickets in children (WHO 2006).

CHAPTER 7

FOOD BASED APPROACHES FOR THE PREVENTION AND CONTROL OF MICRONUTRIENT DEFICIENCIES

7.1 Introduction

A Food-based approach is defined as a preventive and comprehensive strategy that uses food (i.e. whole, refined, processed and fortified, including bio-fortification or combinations) as a tool to overcome micronutrient deficiencies. Food-based approaches also promote the consumption of foods that are naturally rich in micronutrients or are enriched through fortification. It includes micronutrient-rich food production, dietary diversification and food fortification. In addition to the immediate efforts, like the promotion of dietary diversification and staple food fortification with micronutrients, bio-fortification, such as conventional plant breeding, will in the future be a sustainable approach to improve micronutrient adequacy in the diets of entire households across generations.

By increasing the availability and consumption of micronutrient-rich foods, food based approaches play a very important role in the prevention of micronutrient deficiencies. The benefits of such approaches are not immediate; however, they are more likely to pay dividends in the longterm. These approaches entail multi-sectoral involvement in the design, implementation and management stages, including the monitoring and evaluation of flexible programs. Sustainable improvements brought about by such food-based strategies will contribute to nutritional wellbeing and, in the long run, provide overall economic benefits at both the local and national levels. But, in order to be successful, they require concrete, comprehensive and cost-effective efforts by governments.

7.2 Situation Analysis

The National Nutrition Strategy, which was launched in 2008, considers multi-sectoral engagement as being key in ensuring nutritional security. Food based approaches to combat malnutrition were highlighted in this strategy. Vegetables and fruits are the main

sources of a number of essential micronutrients; they are the most important sources of vitamin A - a nutrient important for several metabolic activities in the body, in addition to its role as an antioxidant. Fruits and vegetables provide foliate and potassium, which are known to prevent birth defects, cancer, heart disease, hypertension and strokes. Fruits and vegetables are a good source of minerals such as Iron, zinc, calcium, potassium and phosphorus, and contain ample fibre - important for digestion and bowel movements (Quebedeaux and Bliss, 1998; Prior and Cao, 2000).

Generally, vegetable and fruit production and consumption in Ethiopia is very low. On average, public and private commercial farms produce more than 2,399,566 tonnes of vegetables and fruits. This is estimated to be less than two percent of the total crop production (4).

According to recent information obtained from the Central Statistics Authority, the total area used to grow fruits and vegetables was about 12,576 hectares in 2011 - less than one per cent of the total land area under cultivation during the same year. This is insignificant when compared to other food crops. The Government emphasised the priority given to agricultural development through its policy document, entitled Agricultural Development Led Industrialisation (ADLI). Thus, the production and processing of horticultural crops, vegetables and fruits has been placed in the list of high priority areas by the government and various incentives have been provided to investors in this sub-sector.

The Government of Ethiopia has developed a 'Plan for Accelerated and Sustained Development to End Poverty' (PASDEP: 2005-2010), which explicitly calls for the development and implementation of the National Nutrition Strategy, and an action plan to achieve the Millennium Development Goal 1 of halving poverty by 2015. In Ethiopia, bio-fortification has not been realised thus far, with the exception of some small trials on yellow-fleshed sweet potatoes by Hawassa University, as a source of vitamin A. Food fortification with multiple micronutrients, such as the fortification of edible oil and flour with Vitamin A and Iron, is envisaged.

7.3 Rationale for Food-Based Approach

The rationale for implementing food-based approaches in order to overcome micronutrient deficiencies includes the following:

- They are preventive, cost-effective, sustainable and income-generating when compared to supplementation strategies.
- They are culturally acceptable and feasible to implement; they can be adapted to different cultural and dietary traditions and local feasible strategies.
- They Promote self-reliance and community participation.
- They take into account the crucial role of breastfeeding and the special needs of infants during the critical weaning period.
- They foster the development of environmentally sound food production systems.

- They are broad-based, aiming to improve the overall diet quality of a population; they can address multiple nutrient deficiencies simultaneously.
- They help to build alliances among the government, consumer groups, the food industry and other relevant organisations to achieve the shared goal of preventing micronutrient malnutrition.
- Agricultural planners are alerted to the necessity of protecting the micronutrient content of soils and crops.

7.4 Strategies for Food-Based Approaches

The main food-based strategies that can be used to overcome micronutrient deficiencies are:

- Dietary Diversification.
- Bio-Fortification, and
- Food Fortification.

7.4.1 Dietary Diversification

A. Promotion of Diet Diversity

Dietary diversity is defined as the number of individual foods or foods groups consumed over a given period of time. It can reflect household access to a variety of foods and also acts as a proxy for individual nutrient adequacy. Measures of dietary diversity typically do not indicate the quantity of food consumed. Low dietary diversity is a particular problem in low and middle-income countries, where the diets are frequently based on starchy staples, such as rice, maize, potatoes and wheat. In most parts of Ethiopia, fruits, vegetables and animal foods are not commonly consumed for different reasons. As these food groups are important sources of protein, vitamins and minerals, it is advisable that they are consumed as much as possible.

B. Promotion of Community/Home Vegetable and Fruit Gardening

Ensuring the adoption of dietary diversification practices at the household level is made possible by the promotion of home garden food production. Home garden is defined as a small-scale, supplementary food production system by and for household members, which mimics the natural, multi-layered ecosystem. In rural areas, major food-based efforts will likely be through horticultural programs. In urban settings, there is generally an improved overall food availability, as well as the potential to access fortified food products. It is, however, still beneficial to promote home gardens in peri-urban areas. Regardless of the location, nutrition education activities strengthen and complement efforts to enhance the availability of micronutrient-rich foods. Hence, Vitamin A deficiency can be addressed through Vitamin A supplementation, homestead food production and food fortification.

C. Promotion of Animal-Source Food Consumption

An increased intake of animal-source foods is key to improving the nutritional status of a population with high levels of nutrient deficiencies. In this regard, a community-managed revolving fund for the rearing of small animals, accompanied by intensive nutrition education to promote the consumption of animal products, can contribute to the reduction in the prevalence of micronutrient deficiencies.

Aquaculture, specifically fish farming, has the potential to improve the diets of even the poor segments of the population through the increased consumption of protein, fatty acids, vitamins and minerals (calcium, phosphorus, selenium, Iron and iodine). Moreover, engaging households with small stock production will increase the availability and accessibility of foods of animal origin at the homestead. Foods from animal sources contain multiple nutrients and only a small quantity is needed to make a difference. Therefore, it is important:

To encourage and support local-level animal production, especially poultry, small animals (goats, chicken etc.) and fish, in order to enable communities to access foods of animal origin.

To promote animal-source foods, which are excellent sources of bio-available essential nutrients e.g. Iron, zinc and vitamin A, through educational activities. Such foods also provide multiple micronutrients from one source and, again, only a small quantity is needed to make a difference.

To introduce school feeding programs (milk and micronutrient-rich snacks).

To guide policy decisions on which food-based intervention alternatives are most efficient, feasible and affordable in improving children's micronutrient status, growth, cognitive function and school performance.

To provide start-up funding and support on the part of the local administration and/or civil society, and to support the education and training of producers - as the cost and inexperience in production methods can be major constraints.

D. Enhancing Improved Food Processing, Preparation and Dietary Practices

Plant-source foods, in particular legumes or a combination of cereals and legumes, have high quality proteins - although they also contain some anti-nutrients, such as phytates and tannins, or inhibitors of digestive enzymes, which may limit the absorption of some micronutrients, particularly minerals. For this reason, food diversification and processing approaches need to be complemented by food source specific research and development interventions.

Dietary diversification promotion in conjunction with nutrition education in this area should focus on:

- Enhancing the energy and nutrient density of cereal-based foods.
- Increasing the production and consumption of micronutrient-dense foods.

- Incorporating enhancers of micronutrient absorption, and
- Reducing the phytate content of cereals and legumes, through germination, fermentation and soaking.

7.4.2 Bio-Fortification

An adequate and diverse diet, comprising of fruits, vegetables and animal products, is the best solution for good nutrition - both in terms of energy requirement and micronutrient needs. However, this remains out of reach for a large proportion of the world's population. Introducing bio-fortified staple crops with increased nutritional content can therefore have a huge impact, as the strategy relies on improving an already existing food supply. It can also indirectly target low-income households who cannot afford a more diverse diet. Bio-fortification is the practice of breeding crops to increase their nutritional value. This can be done either through conventional selective breeding or genetic engineering. However, it must be noted that genetic engineering is illegal in Ethiopia.

Bio-fortification differs from ordinary fortification because it focuses on making plant foods more nutritious as the plants are growing, rather than having nutrients added to the foods when they are being processed. This is an improvement on ordinary fortification when it comes to providing nutrients for the rural poor, who rarely have access to commercially fortified foods. As such, bio-fortification is a promising strategy for dealing with vitamin and mineral deficiencies in developing countries. Bio-fortification is a long-term strategy, requiring a significant upfront investment in agricultural research and development. Its success will depend on the current diets of target populations; how much of the staples they eat; in what forms, and with what other foods. Hence, bio-fortification should focus on food types that are commonly consumed in a specific area. Bio-fortification is usually applied for vitamin A, iron and zinc deficiencies.

7.5 Food Fortification

Fortification is the practice of deliberately increasing the content of an essential micronutrient, i.e. vitamins and minerals (including trace elements), in a food, so as to improve the nutritional quality of the food supply and provide a public health benefit with minimal risk to health (WHO 2011). The fortification of commonly consumed foods is a relatively inexpensive and effective method of increasing micronutrient intake. The choice of a food vehicle depends on a series of factors, including the target group, food consumption patterns, industry structure and technological factors of the food.

The 'Assessment of Feasibility and Potential Benefits of Food Fortification in Ethiopia', conducted in 2011 by the FMOH, explored different food vehicles, including edible oil, wheat flour and sugar. The recommendation was for wheat flour to be fortified with nine minerals and vitamins, namely -Iron and Folic Acid, Zinc, thiamine, riboflavin, niacin, vitamins B12 and vitamin A - and edible oil with vitamins A and D. Sugar was also considered as a

vehicle, with the fortification of Vitamin A, however it is not currently recommended due to the high cost, emerging public health related problems and cost implications. In spite of this, sugar might be a potential vehicle for fortification in the future.

Similarly, a National Food Consumption Survey, conducted by the EPHI at the same time, also recommended the fortification of Vitamin A and Folic Acid in edible oil and wheat flour, respectively. It is highly recommended that mass fortification in selected food vehicles becomes mandatory, in order to create a level playing field for all industries to improve compliance to national standards.

Ethiopia has already taken significant steps to use fortified food vehicles to address micronutrient deficiencies in the country. Universal Salt Iodisation (USI) was enacted as a mandatory law in 2011, and since then extensive improvements have been observed. USI has been considered as a long-term, sustainable, cost-effective and safe strategy in ensuring sufficient iodine intake in Ethiopia. Fortification can also prevent deficiencies, which are not currently considered of public health significance, such as vitamin D, zinc, B vitamins and calcium.

7.5.1 Situation Analysis

Micronutrient deficiency is a major public health problem in Ethiopia. According to the Central Statistics Agency (CSA) 2011 report, 69 percent of the population consumes a cereal-based diet limited in nutrient density. Similarly, less than 2.7 percent of the population consumes an animal-based diet, which significantly contributes to the current magnitude of micronutrient deficiency. Moreover, 96 percent of breastfed children aged 6-23 months consume less than four food groups (EDHS 2011). In order to address this high level micronutrient deficiency in the country, the government has initiated a number of programs, including supplementation, bio-diversification, food fortification and supportive public health interventions (De-Worming, and water and sanitation interventions). The government has planned and conducted the following food fortification related initiatives to comprehensively address micronutrient deficiencies:

- USI mandatory law enacted in 2011, which has created a platform for the implementation and regulation of the program. However, quality issues remain to be a significant challenge that needs to be addressed on an on-going basis.
- 'Assessment of Feasibility and Potential Benefits of Food Fortification' completed and food consumption survey conducted.
- Vegetable oil purchase in 2011 was estimated at 38 million people in Ethiopia. With the current urbanisation rate of more than 18%, fortified oil has the potential to reach an even a wider population (EDHS 2011).
- Capacity Building Needs Assessment, which involved SWOT analysis of different government sectors on food fortification, was conducted as part of the landscaping for the public sector role in food fortification.
- Standards for fortified wheat flour and edible oil have been initiated, requiring the development of further regulation and implementation directives.
- Fortification related works, including millers' assessment; strengthening of the NFFSC/

NFFA; quality control and assurance systems; strengthening the public and private partnership; supply management systems, and detailed multi-year national plans of action are being developed. In order to facilitate the smooth implementation of food fortification programs, there is a need to register the required premixes and explore different incentive measures, such as tax exemption during importation.

7.5.2 Rationale for Food Fortification

- We don't get adequate micronutrients from our staple food, thus there is the need for replacing nutrients lost during food processing or increasing the nutrient density of staple foods.
- Contribute to the reduction of morbidity and mortality related to micronutrient deficiencies.
- Contribute to the improvement of national economic growth and development, health, cognitive development, education and productivity.
- It is a cost-effective, safe and sustainable food-based approach to combating micronutrient deficiencies.
- There is a need to address micronutrient deficiencies that could not be addressed by on-going national public health interventions, such as Calcium, vitamin D, Zinc, Folic Acid and B-vitamins.

7.5.3 Approaches for Food Fortification

Food fortification can be conducted through a range of different approaches, namely - mass fortification, targeted fortification, home fortification and/or market-driven fortification.

7.5.3.1 Mass Fortification

Mass fortification is the term used to describe the addition of one or more micronutrients to foods commonly consumed by the general public, such as cereals, oil, condiments and milk. It is usually initiated, mandated and regulated by the government regulatory body. Mass fortification is generally the best option when the majority of the population has an unacceptable risk of being or becoming deficient in specific micronutrients. In some situations, deficiency may be demonstrable by unacceptably low intakes and/or biochemical signs.

Identified Food Vehicles for Mass Fortification:

- Salt – Salt fortification with Iodine is one of the oldest strategies to channel micronutrients through a food vehicle that is widely consumed. Currently, the Universal Iodisation Program is being rolled out at the national level. Iodisation quality continues to be a significant challenge that needs to be addressed.
- Edible Oil: The fortification of oil with vitamins A and D is a widely used approach. According to a FMOH study, fortified oil is estimated to reach over 38 million people in Ethiopia. As a short-term measure, the introduction of fortified imported oil is relatively easy to implement and enforce at the entry point.

Table 14: Recommended Vitamin A and D level for oil fortification

Recommended Micronutrients for Oil	Recommended Level
Vitamin A	20 ppm (66.7 IU)
Vitamin D	1.167 nmol/L(6.7 IU)

- **Wheat Flour:** Fortification of wheat flour with Iron, Folic Acid, Zinc, thiamine, riboflavin, niacin, vitamins B12 and vitamin A is also a recommended practice. Fortified wheat flour is estimated to reach over 22 million people in Ethiopia.
- **Sugar:** Sugar as a vehicle, fortified with Vitamin A, was considered. Currently, however, it is not recommended due to the high cost, emerging public health related problems and cost implications.

Table 15: Recommended mineral and vitamin levels for flour fortification

Recommended Vehicle	Recommended Levels (ppm)
Iron as Sodium Iron EDTA	40
Zinc	55
Folic Acid	2.6
Vitamin A	1.5
Thiamine	9.8
Riboflavin	6.6
Niacin	60
Pyridoxine	6.5
Vitamin B12	0.02

7.5.3.2 Market-Driven Fortification

The term “market-driven fortification” is applied to situations whereby a food manufacturer takes a business-oriented initiative to add specific amounts of one or more micronutrients to processed foods. Although voluntary, this type of food fortification usually takes place within government-set regulatory limits. Market-driven fortification is more widespread in industrialised countries, whereas in most developing countries the public health impact of market-driven food interventions is still rather limited. Their importance is, however, likely to be greater in the future, because of increasing urbanisation and the wider availability of such foods.

7.5.3.3 Targeted Fortification

In targeted fortification programs, foods aimed at specific subgroups of the population are fortified, thereby increasing the intake in that particular group - rather than the population as a whole. For example, complementary foods for infants and young children, foods developed for school feeding programs, special therapeutic and supplementary foods (RUTF/RUSF) for children and pregnant women, rations

(blended foods) for emergency feeding(CSB, Famix) and displaced people. In some cases, such foods may be required to provide a substantial proportion of the daily micronutrient requirements of a target group.

7.5.3.4 Home Fortification

Home (point of use) fortification with multiple micronutrient powders involves the sprinkling of a mixture of vitamins and minerals (supplied in powdered form in single-serving sachets) over any semi-solid food before consumption. In 2011, the WHO recommended the home fortification of foods with MNP to improve Iron status and reduce anaemia among infants and young children aged 6-23 months. This is a global guideline that must be adapted to the local context with well-defined objectives, taking into account the available resources, existing policies, supply and delivery mechanisms and potential stakeholders. All programs involving home fortification with MNPs should be preceded by an evaluation of the nutritional status of the beneficiary children to ensure that daily micronutrient needs are met and not exceeded. Furthermore, in malaria-endemic areas, the provision of Iron should be implemented in conjunction with measures to prevent, diagnose and treat malaria (WHO 2011). The WHO guidelines also recommend that home fortification should start with a pilot project that can be scaled up once evidence of its effectiveness is established.

The efficacy of several different product types at the household level, including soluble or crushable tablets, micronutrient-based powder (“sprinkles”) and micronutrient-rich spreads, are currently being evaluated. Crushable tablets, micronutrient-based powder and especially micronutrient-rich spreads, are relatively expensive ways of increasing micronutrient intakes – certainly more costly than mass fortification, but less expensive than conventional micronutrient supplementation programs. Hence, they are especially useful for improving local foods fed to infants and young children, or where universal fortification is not possible (Zlotkin S et al., 2001).

Table 16: Suggested schemes for home fortification with multiple micronutrient powders

Parameters for home fortification of foods consumed by infants and children aged 6-23 months	Description
Composition per sachet	Iron: 12.5mg of elemental Iron - preferably as encapsulated ferrous fumerate. Vitamin A: 300µg of retinol Zinc: 5mg of elemental Zinc - preferably as Zinc gluconate.
Frequency	One sachet per day

Duration and time interval between periods of intervention	At minimum, for a period of 2 months, followed by a period of 3-4 months off supplementation, so that the use of the micronutrient powders is started every 6 months
Target Group	Infants and children aged 6 – 23 months, starting at the same time as complementary foods are introduced into the diet.
Settings	Populations where the prevalence of anaemia in children under 2 years or under 5 years of age is 20% or higher.

(WHO, 2011)

There is also clear evidence that they have a high impact on the reduction of micronutrient deficiencies in children, especially anaemia and Iron deficiency, as children cannot eat adequate amounts of the fortified staple to meet their daily micronutrient requirement. Moreover, MNPs target resource-limited communities, where mass fortification does not reach people at the bottom of the pyramid and residing in rural settings. In such areas, markets do not work well and are fragmented, making it difficult to access centrally processed and fortified foods.

Delivery channels for MNP should be explored through public and private distribution modalities in Ethiopia. The Health Extension Program, with its extended Health Development Army, provides an excellent opportunity as a major delivery channel. This is in addition to other potential non-traditional private delivery channels or market outlets, including social marketing outlets (using youth groups), pharmaceutical outlets, milling facilities and small shops.

There is also a newly developed home fortification guideline for adolescents by the Home Fortification Technical Group (HFTG), which is currently being reviewed.

7.6 Food fortification Program Management

Program management is an important component in the effective implementation of food fortification programs. It includes capacity building, monitoring and evaluation and communications.

7.7 Monitoring and Evaluation

The development of fortification monitoring and evaluation systems requires careful planning. The following aspects need to be considered:

7.7.1 Quality Control and Assurance System

This needs to be in place for monitoring the compliance of standards applicable to micronutrient premixes, as well as domestically produced and imported fortified flour. This covers a wide range of regulatory activities, such as internal and external monitoring, and social enforcement.

Internal monitoring - Industries should have a department to monitor the quality of their products on a regular basis, in order to ensure that it meets the minimal national standard. Industries need to have a research and product development component within their organisation to improve their product and meet the standards.

External monitoring - Undertaken by the regulatory body:

- Licensing and certification of the industry and registration of the premises should be done after fulfilling the regulatory body requirement and meeting the minimum standards set for the premises.
- Technical auditing and inspection - the regulatory body makes regular inspections and audits of products at various levels, including factories, ports of entry, distributor warehouses, retail outlets and points of consumption.
- Enforcement - different regulatory measures should be put in place, including various administrative and legal measures, to ensure compliance to the legislation.

Social Enforcement

- Various measures need to be taken to raise consumer awareness, in order to be able to demand and identify selectively fortified foods.
- Branding of fortified products with catchy logos for wider recognition and easy identification by consumers.
- Using consumer groups, professional associations and media to put pressure on industries to comply with regulations.

7.7.2 Monitoring and Evaluation of Food fortification Programs

Monitoring is the regular collection, analysis and interpretation of data, and the use of the resulting information, on program inputs, and an evaluation of the impacts.

Why Monitor a Food Fortification Program?

- To ensure that fortified foods meet nutrient content and safety standards.
- To assess the access, utilisation and coverage of fortified foods by the consumer.
- To effectively manage and sustain the fortification program to eliminate vitamin and mineral deficiencies.

Indicators

Impact Indicator

- The prevalence of micronutrient deficiencies among target groups.
- The prevalence of morbidity and mortality related to micronutrient deficiencies.

Process Indicator

- Increased production, availability and distribution of fortified foods.
- Number of industries certified or licensed to produce and/or import fortified foods.
- Increased consumer awareness and demand for fortified foods.
- Proportion of people having access to fortified foods at the household level.
- Proportion of tested samples meeting specified requirements.

7.8 Public Private Partnership

This requires the coordination of fortification activities, the involvement of the private sector in fortification related forums and the provision of incentives to the private sector (tax relief).

7.9 Program Communication

Program communications plays an important supportive role in successful micronutrient programs by inducing target groups to improve their micronutrient-related behaviours. Successful communication strategies seek to:

- Create awareness and social mobilisation.
- Generate consumer demand for improved micronutrient status.
- Remove barriers to the adoption of a specific micronutrient-enhancing practice. Such strategies are critical for the long-term program sustainability and effectiveness.
- Ensure public-private partnerships and collaboration in the supply chain management, as well as the involvement of a government body in the program management.

In addition to this, appropriate communications strategies need to be designed for an effective food fortification program in the country (this will be addressed in the program communication thematic area).

7.10 Other Supportive Measures

- Strengthening political commitment in the government stakeholders.
- Capacity building at different levels for the industry, regulatory body and other implementing agencies.
- Creating awareness and demand for the consumption of fortified foods.
- Providing incentives for investors interested in food fortification programs.
- Ensuring sustainable supply chain management:
 - Sustainable Cost Recovery System – for the successful implementation of food fortification programs and to ensure quality, it is vital to put in place a cost-recovery system that can be managed on a sustainable basis.
 - Procurement System – many countries have different procurement systems. One of the mechanisms to be explored is the development of a centralised procurement system regulated by the government; another, is a system of direct food procurement by unions or associations from processing plants.

Other Food Based Supportive Measures

- Food production.
- Food safety and quality assurance.
- Food hygiene and sanitation.
- Promote economic strengthening.

Food Production

Any program that increases the production of micronutrient-rich foods is likely to have a beneficial effect on the micronutrient status of a population. The implementation of such a program requires that certain conditions be met, such as water availability, appropriate fertile soils, and seeds and seedlings of a satisfactory quality. It also requires a strong commitment by the agricultural extension service in disseminating small-scale fruit and vegetable production techniques. This implies that agricultural training and extension programs, and research institutions, must pay sufficient attention to these foods.

The Ministry of Agriculture intervenes to improve production systems. Various agricultural research centres are working on improved crop production to ensure food security in Ethiopia. However, much effort needs to be exerted to increase the production of micronutrient-rich crops, as 80% of Ethiopian people who live in rural areas consume their own crops. Replacing white sweet potato with orange-fleshed sweet potato is one example that can prevent vitamin A deficiency. Agricultural food production should consider the following issues:

Reducing Post-Harvest Losses of Nutrient-Rich Foods

The fruit and vegetable sector has a vital role to play in reducing the hidden hunger that is prevalent in developing countries. Most fruits and vegetables are rich in minerals and vitamins, and are reasonably good sources of trace elements, such as copper, manganese and Zinc, which act as enzyme cofactors. The nutrient content of fruits and vegetables varies in accordance with the fruit and vegetable variety, cultural practices, stage of maturity, post-harvest handling and storage conditions. This sector, however, suffers greatly from post-harvest losses. Some estimates suggest that around 30-40% of fruit and vegetables are lost or abandoned after leaving the farm gates.

Poor infrastructure, such as access roads to markets, and appropriate storage and food processing equipment, combined with limited knowledge about modern production and management practices in many developing countries, such as Ethiopia, contributes to a high proportion of waste. Post-harvest losses (PHL) can be especially high for micronutrient-rich foods, which tend to be perishable. They can occur as a result of spillage during transport or bio-deterioration (caused by moulds, insects, rodents and birds). Estimates for Africa have suggested a regional PHL in cereals of 16%. A public awareness strategy must be developed and implemented in order to increase the knowledge of fruit and vegetable growing farmers on the costs and implications of losses after harvest. Public-private partnerships for investment in post-harvest and value addition to fruits and vegetables are also important.

Improvement of Nutrient Levels in Soil and Plants

- This approach involves using agricultural practices to improve the micronutrient content of foods.
- Includes correcting soil quality and pH, and increasing mineral content etc., in order to improve the composition of plant foods and enhance yields.
- Requires investment in agricultural inputs and practices.
- An example is the enrichment of fertilisers with Zinc to improve the Zinc concentration of soils. This increases both the yields and the Zinc content of grain grown in such soils. Success with this approach has been seen in the Central Anatolia region of Turkey, where trials of Zinc fertilisers doubled grain Zinc concentrations as well as providing increased yields.

Food Safety and Quality Assurance

Analysis and food quality control systems ensure that processed and marketed foods are of good quality and are safe from chemical residues, adulteration and other possible sources of contamination. They also ensure the quality and safety of micronutrient-rich foods on the market, especially in respect to those fortified with one or more micronutrients. The role of the food industry is important in this respect. Governments should establish laws and regulations on food quality control, and inspect food production facilities to ensure that the required standards are being enforced. Both the food industry and the government can establish information campaigns to raise awareness of health issues that may arise from improper food storage and food-handling practices.

Diarrheal disease is the main cause of health problems, especially among children under five years of age, causing micronutrient deficiencies. Poor appetite, mal-absorption and improper utilisation due to disease or health problems are also among the causes of micronutrient deficiencies. Addressing food hygiene and sanitation is an important element in the prevention of health problems that cause malnutrition. Food hygiene and sanitation should be considered when any food-based intervention is being designed.

7.11 Promote Economic Strengthening

Economic strengthening (HES) aims to reduce the economic vulnerability of people. It involves a portfolio of complementary and/or competing intervention approaches (PEPFAR 2012).

These include:

- Household Economic Strengthening: Savings, credit, income-generating activities (IGAs) and jobs.
- Social Protection: Cash transfers and access to services.
- Other Economic Approaches: Youth livelihoods, school financing and CBO financing.

Income generation simply means gaining or increasing income. Income can be generated through self-employment, by working for others or by adding to personal resources through investment (Klennert 2005). Another important purpose is to upgrade work ethics, so that people become useful and productive members of society and are able to meaningfully contribute to nation building. The central focus of income generation is to contribute to the development of human resources. This is achieved in the following ways:

- By empowering people to identify their economic needs, and explore ways and means of fulfilling those needs.
- By nurturing self-confidence and the ability to undertake income-generating activities through appropriate and adequate training and motivation.
- By providing opportunities for the continuous upgrading of vocational knowledge and skills for gainful employment.
- By developing a team spirit for working together for sustainable social and economic growth.

Strategies for Income Generation

- Establishing a community saving and credit program
- Linking with microfinance institutions
- Revolving funds
- Establishing associations
- Establishing cooperatives
- Social protection

Promoting economic strengthening activities will increase the income of poor households. This, in turn, will enhance purchasing power. This requires, however, a strong behaviour change communications effort, aimed at enabling people to translate the income gained from economic strengthening activities towards the purchase of commodities and services, and to utilise their disposable income at the household level. To ensure that increases in production, or of purchasing power, do lead to accelerated reductions in malnutrition, agricultural development programs must focus on nutrition security, not just food security.

Nutrition security refers to the “quality” aspect of food production, consumption and utilisation by all individuals in a household. While **Food security** may increase the total quantity of energy available for consumption, **only nutrition security** can guarantee the quality and diversity of food necessary for protecting and promoting good nutritional status and health. Just as improving food security can be thought of in terms of narrowing the gap between current and potential production yields, improving nutrition security can be thought of in terms of narrowing the “nutrition gap” between current food intake patterns and intake patterns that are optimal in terms of macro and micronutrient content (Thompson and Meerman 2010).

7.12 Monitoring and Evaluation for Food-Based Approaches

Monitoring and evaluation systems should be in place to ensure the smooth implementation of food-based approaches to combat micronutrient deficiencies through a framework

Table 17: Food based approach to combat micronutrient deficiencies: monitoring framework

No.	Intervention Strategies	Indicators	Remark
1	Capacity building on food-based approach.	Number of people trained in food-based approach from different sectors.	Process indicator
2	Enhance SBCC Approach	Number of food-based SBCC/IEC promotion materials developed.	Process indicator
3	Increase the production of fruit, vegetable, nutritious roots and animal source foods to encourage a diversified food intake at the household level.	Increase the proportion of households consuming fruit and vegetables by 30%.	Outcome indicator
		Increase the production of fruit and vegetables from 894,000 tonnes to 5,905,000 tonnes.	
		Increase proportion of animal source food production and consumption at household level.	
		Reduce the percentage of PHL of fruit and vegetables.	Outcome indicator
4	Develop appropriate standards, legislation and manuals to control the quality of food safety.	Increase percentage of producers, manufacturers and service providers that adhere to recommended food safety procedures.	Outcome indicator
5	Improve optimal food hygiene and sanitation.	Increase potable water coverage from 60% to 76%.	Outcome indicator
6	Implement a coordinated food-based approach.	Reduced prevalence of micronutrient deficiencies to - no more public health importance.	Impact indicator
		Percentage of households that consume Vitamin A-rich vegetables or fruits,	Outcome indicator
		Percentage of households that consume iron-rich foods	Outcome indicator

CHAPTER 8

PUBLIC HEALTH APPROACHES FOR THE CONTROL OF MICRONUTRIENT DEFICIENCIES

8.1 Introduction

Public health in nutrition is a broad-based, problem-solving approach to combine and analyse the nutritional risk and vulnerability with action-oriented policies, strategies and programs. It is also an approach for improving nutritional status, particularly in large populations with significant income, health and nutritional problems.

Public health is one of the four main strategies to control micronutrient malnutrition (dietary improvement, food fortification, supplementation and public health). The major public health interventions to improve micronutrient malnutrition include - optimal breastfeeding, personal hygiene and environmental sanitation practices, and other infection prevention and control measures.

8.2 Breastfeeding

Breast milk is generally higher in nutritional value than any other alternative food and liquid for children under six months. In their first six months of life, breast milk protects infants against infectious diseases. Optimal breastfeeding practice provides the infant with all the micronutrients required for optimal health, growth and development. The promotion and support for exclusive breastfeeding until the age of 6 months and continued breastfeeding up to two years with appropriate complementary feeding starting at six months is, therefore, crucial for the health of an infant.

8.3 Infection Control

Parasitic infections contribute to child malnutrition and micronutrient deficiency. Parasites affect the intake of food, its subsequent digestion, absorption, metabolism and the maintenance of nutrient pools. The most important parasites related to nutritional status are - intestinal parasites, like soil transmitted helminthes (hookworm, *Giardia lamblia*, *Entamoebahistoltyca*, *Ascarislumbricoides* and *Trichuristrichiura*), and others, such as

the *Schistosoma* sp. and malarial parasites. Key public health interventions, like personal hygiene, food hygiene, environmental sanitation, De-Worming, and the early detection and treatment of infections, therefore, need to be implemented.

8.4 Situation Analysis

Breastfeeding is widely practiced in Ethiopia across all social groups and for an extended period of time. According to the EDHS, 98% of children are breastfed at some point and 82% continue to be breastfed up to two years of age. However, exclusive breastfeeding until the age of 6 months remains low, with only 52% of Ethiopian children receiving this recommendation. Furthermore, complementary feeding for children from 6 to 23 months remains suboptimal (EDHS 2011).

Despite much progress, the under-5 mortality rate remains high in Ethiopia (88 per 1000 live births), and this is mostly due to infectious diseases linked to under-nutrition. Poor water, sanitation and hygiene conditions are an important contributor to this prevailing condition. According to the most recent survey, the proportion of the population using improved sanitation facilities is 8.8%, with 50.8% utilising an improved drinking water source (EDHS 2011). Currently Child Mortality Rate is 68/1000 live births indicating the declining of under-5 deaths in Ethiopia (Mini EDHS 2014).

8.5 Rationale for Intervention

- Key public health interventions contribute to the reduction of under-nutrition in vulnerable populations. Improving water, sanitation and hygiene promotes healthy environments, which in turn reduce the prevalence of infectious diseases. Such interventions are immunisation, creating environments free of open defecation, hand washing with soap, access to clean drinking water, and the prevention and treatment of malaria (UNICEF 2013). Hence, public health measures are a necessary support for the prevention and control of micronutrient deficiencies.
- They contribute to the achievement of the millennium development goals, particularly MDG-4 –reducing child mortality.
- Breastfeeding and complementary feeding promotion is a well-known cost-effective measure to improve nutrition, prevent infection and contribute to a child's physical and intellectual development. These interventions can prevent one fifth of under 5 children deaths (UNICEF 2013).
- Studies have shown that the cost-effectiveness of school age De-Worming programs is high. These preventions also benefit pregnant women by improving maternal haemoglobin and child survival rates (Alderman et al 2008).

8.2 Strategies

The implementation of public health interventions predominantly utilise existing community based structures.

Health Extension Program: Health extension workers will provide breastfeeding,

complementary feeding, hygiene sanitation, and infection prevention and control services, as part of the HEP package. They use three modalities for service delivery: (i) Health post level contacts, (ii) During outreach services, and (iii) House-to-house visits. Each and every contact between the HEW and target population will be used to implement the preventive and curative public health interventions. HEWs are strengthening the capacity of women-based structures and associations at all levels, in order to reach households with key preventive public health interventions. The Health Development Army (HDAs) and one-to-five network structure is an opportunity for maternal and IYCN promotion. In addition to the health extension workers, hospitals and health centres will promote and support breastfeeding and complementary feeding practices as part of their antenatal, delivery, postnatal, sick-baby and well-baby clinics, as well as providing maternal, IYCN and infection prevention and control services.

Schools: Schools are important platforms to promote positive health and nutrition practices. The main strategies are through regular school health programs for health extension workers, capacity building for teachers and PTAs, and through school health and nutrition clubs. Creating awareness for school children, especially on hygiene and sanitation and food choices, is of paramount importance.

Mass Media: The use of mass media is another strategy not only for the promotion of breastfeeding, complementary feeding and infection prevention, but also to create open dialogue between the general public and health/nutrition professionals. It protects the public from media-based commercial pressures (advertisements) that are contrary to optimal nutrition practices.

8.6.1 Breastfeeding and Complementary Feeding

- Below are the key focus areas for the promotion and support of optimal breastfeeding practices at the community level, using all community based structures and local media:
- Initiate breastfeeding in the first hour after birth.
- Breastfeed exclusively for about six months.
- Continue breastfeeding for two years or more with appropriate complementary feeding from six months of age.
- Enact and enforce legislation for a Code of Marketing for Breast Milk Substitute.
- Advocacy for better maternity protection, at least as part of the minimum ILO recommendations.
- Strengthen and expand baby-friendly health institutions for better breastfeeding promotion and support.
- Collaborate with mass media for the promotion of optimal IYCF practices.
- Promote the utilisation of optimal complementary food for children 6-23 months, using all community based structures (including HEP, agriculture extension programs, schools, women and youth forums) and local media.

Improve Maternal Nutrition (especially during pregnancy and lactation)

- Encourage increased food intake during pregnancy and lactation.
- Monitor weight gain during pregnancy.
- Counsel on reduced energy expenditure by pregnant women.
- Eat at least one extra serving of staple food per day during pregnancy and the equivalent of an extra meal per day during lactation.
- Gain at least one kilogram per month in the second and third trimesters of pregnancy.
- Rest more during pregnancy and lactation.
- Improve ANC, delivery and PNC service.
- Practice family planning to space births over a minimum of three-year intervals.
- Delay first pregnancy until the age of 19.
- Delay cord clamping for 2 to 3 minutes

8.6,2 Prevention and Control of Infections

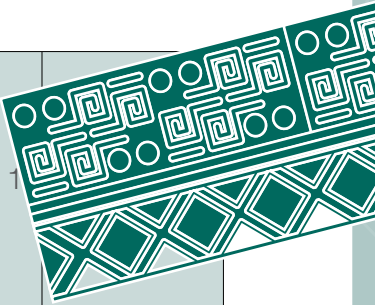
- Promote and support the construction and utilisation of latrines.
- Promote proper hand washing practices through the health extension program and schools.
- Provide De-Worming tablets to all pregnant women in their third trimester of pregnancy.
- Bi-annual De-Worming to all children 2-5 years of age.
- Identify and treat diarrhoea as per the IMNCI/ICCM protocol.
- Distribute Zinc with ORS for diarrhoea treatment in children.
- Distribute LLINs in all malaria endemic woredas and promote their utilisation.
- Early detection and treatment of malaria.
- Proper and hygienic food handling and preparation.
- Environmental protection for malaria prevention (spray chemicals and drain stagnant water, etc.).
- Collaborate with mass media for the promotion of good sanitation and hygiene practices.

8.2 Monitoring and Evaluation

To ensure that public health approaches contribute to the prevention and control of micronutrient deficiencies, indicators are chosen to track the progress of activities and targets. Below is a table giving an overview of selected indicators and their 2015 targets:

Table 18: Monitoring and Evaluation Framework for Public Health Approaches

Activity/initiative	Indicator	Target by 2015	Periodicity	Source of Data	Means of verification
Promote, support and protect optimal breastfeeding practices for infants aged 0 to 6 months.	Proportion of infants 0-6 months being exclusively breastfed.	80%	Every 5 years	Survey	EDHS
	Percentage of new-borns who started breastfeeding within 1 hour of birth.	70%	Every 5 years	Survey	EDHS
Distribution of LLINs in all malaria endemic woredas and utilisation of the nets by pregnant and lactating women. Promote utilisation of the nets by all pregnant women and children under five.	Percentage of Pregnant women and children living in malaria endemic woredas who are utilising LLINs.	61%	Every year	Annual health service report	HMIS report
Provide De-Worming tablets to all pregnant women in their third trimester of pregnancy.	Proportion of women who received De-Worming drugs during recent pregnancy.	6%	Every year	Annual health service report	HMIS report
Promote and support optimal breastfeeding practices at the community level, using all community-based structures.	Proportion of infants 0-6 months being exclusively breastfed	70%	Every 2 years	EDHS and NNP survey	Survey report
Expand Baby Friendly Health Institutions for better breastfeeding promotion and support.	Number of hospitals/health centres certified for BFHI.	200	Every year	Annually	FHI assessment report
Enact and reinforce legislation for BMS code.	Code of marketing for BMS ratified and enforced.	1	Every year	Once	Ratified document



Advocacy for better maternity protection.	Number of advocacy sessions to influence maternity leave proclamation revised to align with ILO/global recommendations.	# of advocacy	2 per year for the advocacy sessions	Reports and 1 2 per year	
Promote the construction and utilisation of toilets by each household.	Proportion of households with improved toilet facility.	25%	2- 3 years	Survey/ EDHS	Survey report
Promote and support proper hand washing practices.	Proportion of households practicing hand washing before feeding.	95%	2 - 3 years	Survey/ NNP	Survey report
Promote proper personal and environmental hygiene and sanitation practices to prevent incidences of diarrhoea through the health extension program.	Number of promotional campaigns on hygiene and sanitation conducted.		2 - 3 years	Survey/ NNP	Survey report
	Proportion of households practicing household water treatment.	77	2 - 3 years	Survey/ NNP	Survey report
Identify and treat diarrhoea as per the ICCM protocol.	Proportion of children 0 to 59 months receiving Zinc for diarrhoea treatment.	80%	Every 2 years	EDHS and NNP survey	Survey report
Provide Bi-annual De-Worming to all children 2-5 years.	Targeted coverage of De-Worming for children (2-5 years).	>90%	Bi-annual	Administrative report	HMIS
Delay first pregnancy until the age of 19.	Prevalence of teenage (15 - 19 years) pregnancy.	8%	5 years	Survey	DHS

CHAPTER 9

COMMUNICATION FOR THE CONTROL OF MICRONUTRIENT DEFICIENCIES

9.1 Introduction

Nutrition is one of the broad elements of the bigger health program in Ethiopia, which is presented accordingly in the revised National Nutrition Program (NNP). The NNP has taken many elements into consideration, among which micronutrient intervention is a critical one. As a result, the Government of Ethiopia, and nutrition stakeholders and partners embarked on various micronutrient interventions. Although a nationwide intervention has been started, there is a long way to go before micronutrient deficiency problems are labelled as non-public health problems.

The communications strategy is based on the idea that effective micronutrient communication involves the convergence of 'senders' and 'receivers', in which the differences between the two begins to disappear. It is also based on the recognition that communications need not be treated as a 'spare' wheel, used only when other micronutrient efforts start to falter or fail, but as a 'steering' wheel that can serve as a basis for making informed choices.

9.2 Situation Analysis

In Ethiopia, micronutrient communications activities lack a long-term holistic approach; rather, they are merely seen as a tool to be used occasionally. There is long-held belief that simple provision of food and supplements, or similar micronutrient interventions is adequate, while overlooking behaviour change communication interventions. Social and behaviour change communications activities must be given greater emphasis. The core purpose of this strategic guideline is to provide practical guidance to those who are in a position to design, implement or support a strategic micronutrient communications effort, so as to develop a comprehensive, long-term approach to micronutrient communications that responds appropriately to audience needs on addressing the knowledge gap on diet diversification, demand on micronutrient supplementation services, use of fortified foods and policy gaps.

9.3 Rationale for Intervention

For micronutrient interventions to become significant in achieving targeted results, emphasis must be given to social and behaviour change communications activities. In this way, the desired behaviour change can be solicited and service-seeking practices increased. UNICEF's causal framework for malnutrition clearly indicates feeding and caring behaviours as critical determinants of nutritional status. Improvement in these practices requires clear, evidence-based and well-designed communications strategies at all levels.

9.4 Strategies

9.4.1 Social and Behavioural Change Communications

SBCC materials, if used effectively and strategically, are very powerful in educating and changing behaviours in the general public towards healthier practices. Owing to this, the public needs to be addressed in terms of creating awareness on micronutrient deficiency diseases, their impact and the programs in place to tackle these problems. It is especially important that mothers, adolescent and pregnant women and their children are addressed through behaviour change communications activities.

Social marketing is a tool used to promote positive social and behavioural change among individuals, and within communities and populations. Social marketing uses the principles and experience acquired from the marketing and sales sectors, and is particularly useful in creating demand for services. Such approaches can also be designed for hard to reach groups. Social marketing (which evolved into a total marketing approach) has been successfully used to promote child health, vaccination, and reproductive health (Fhi360 2012).

Core Activities

- Promote and support early initiation of breastfeeding within one hour of delivery.
- Promote exclusive breastfeeding for the first six months.
- Promote continued breastfeeding beyond one year
- Promote optimal complementary feeding among children 6-24 months old
- Promote timely initiation of solid, semisolid or liquid food at six months of age.
- Promote the use of diversified food.
- Promote the use of and create access to micronutrient-rich complementary foods.
- Promote usage of fortified foods or locally fortified food items.
- Promote prevention and control of micronutrient deficiencies, including the treatment of anaemia, Vitamin A supplementation for children 6-59 months, iodized salt utilisation, and the use of Zinc and ORS for diarrhoea treatment.
- Promote the early treatment and referral of malnutrition cases.
- Promote access and utilisation of improved WASH practices – use of clean water, use of HH water treatment, use of safe and hygienic preparation and handling of food, and hand washing with appropriate detergents.
- Promote utilisation of De-Worming every six months and vitamin A supplementation.
- Promote the use of multiple micronutrient supplementations to children 6-59 months of age to enrich general ration with micronutrients.

- Promote adolescent nutrition
- Promote optimal feeding practices during pregnancy and lactation
- Promote Iron and Folic Acid supplementation for adolescent and women of reproductive age.
- Promote access to micronutrient services, including iodized salt use, use of fortified foods and adolescent friendly services.
- Create awareness to prevent harmful traditional practices.
- Provide comprehensive and routine nutrition counselling and support services.
- Ensure the use of iodized salt and De-Worming during second and third trimester of pregnancy.

9.4.2 Policy and Public Dialogue

The prevention and control of micronutrient deficiencies requires a commitment and active involvement by decision makers across each key sector. The rapid increase in the availability of iodised salt in the market after the mandatory salt iodisation legislation was enforced is a good example to illustrate how decision makers are instrumental in creating an enabling environment for micronutrient interventions.

Core Activities

- Facilitate dialogue among decision makers:
 - Dialogue on maternity leave at higher level.
 - Dialogue on food fortification policy and practice at higher level.

9.5 Target Audiences of the Micronutrient Guideline

- **Primary Audiences**
 - Breastfeeding mothers/Care givers
 - Husbands
 - Mother-in-laws/Father-in-laws
 - Teachers and students
 - Health and agriculture extension workers
 - Religious leaders
 - Community elders
 - Frontline health professionals at health facilities
 - Policymakers and representatives of funding agencies, who determine the level of support for micronutrient interventions.
- **Secondary Audiences**
 - Program managers, who are responsible for designing and implementing micronutrient programs.
 - Communications specialists, who are responsible for designing and executing micronutrient communications strategies, and developing materials and messages.

9.6 Core Communication Methods

- Public service announcement
- Advertisement and creative service promotion
- Brochures
- Posters
- Banners
- Websites, e-health
- Social media
- Features stories
- Dramas (short or series)
- policy briefs
- knowledge sharing workshops and meetings
- research findings and good experiences
- Press releases
- Press conferences
- Factsheets
- Guest columns in national newspapers.
- Community wide events

9.7 Responsibilities At Each Level

Federal

- Undertake research to identify critical behavioural determinants and evaluate effectiveness of SBCC interventions.
- Provide strategic directions on social behavioural change communication interventions.
- Develop generic key messages.
- Organise and implement national level advocacy events.

Regions

- Integrate/address SBCC activities into program plans.
- Develop locally appropriate SBCC materials.
- Organise and implement national level advocacy events.
- Undertake research to identify critical behavioural determinants of regional significance and evaluate the effectiveness of SBCC interventions in their respective region.

Woreda

- Integrate/properly address SBCC activities in to program plans.
- Plan, implement and monitor SBCC activities in the woredas.
- Organise and implement community-wide events on the local significance of SBCC issues.
- Ensure proper distribution of SBCC materials.

Kebele

- Identify local events that are appropriate for SBCC interventions.
- Plan and implement SBCC in their respective kebeles.
- Organise and implement community-based SBCC activities.

9.8 Monitoring And Evaluation

Monitoring and evaluation needs to be built into communication interventions of each micronutrient program from the beginning. The monitoring of communication activities for each specific micronutrient program should set up a communications framework with different levels of realistic and measurable indicators. The indicators should be developed to measure progress at different stages of the micronutrient communications program development, which includes inputs, process, outputs, outcomes and impact. Therefore, the monitoring process should include a basic routine data collection system, in addition to periodic in-depth evaluation and analysis of process, impact, lessons learned and best practices at the district and regional levels.

The micronutrient communications strategy is intended to inform and influence decision makers and the general public about the significance of micronutrient intervention programs to reduce public health concerns that arise from micronutrient deficiencies. The following are core indicators to measure and evaluate micronutrient communications strategies:

Number/proportion of communications and advocacy work concerning Iron deficiency and programs in place.

- Number/proportion of people addressed by communications activities concerning Iron deficiency and programs in place.
- Number/proportion of communications and advocacy work concerning Zinc deficiency and programs in place.
- Number/proportion of people addressed by communications activities concerning Zinc deficiency and programs in place.
- Number/proportion of communications and advocacy work concerning Vitamin A deficiency and programs in place
- Number/proportion of people addressed by communications activities concerning Vitamin A deficiency and programs in place
- Number/proportion of communications and advocacy work concerning Iodine deficiency and programs in place
- Number/proportion of people addressed by communications activities concerning Iodine deficiency and programs in place.
- Number/proportion of communications and advocacy work concerning food fortification and programs in place.
- Number/ proportion of people addressed by communications activities concerning food fortification and programs in place.

CHAPTER 10

MONITORING AND EVALUATION FOR MICRONUTRIENT DEFICIENCY INTERVENTIONS

10 INTRODUCTION

The routine monitoring of nutrition intervention programs is essential, in order to ascertain whether they are being implemented as planned and to provide the information required to take corrective action if necessary. In addition to this, the periodic evaluation of programs is necessary to ensure that overall goals and objectives are being met. The Micronutrient Deficiency (MND) Prevention and Control Program monitoring and evaluation is based on the logic model for micronutrient interventions in public health (WHO 2011), which sketches the logical linkages between the input/supply, delivery and utilisation (coverage and compliance) of interventions.

It could be challenging, and may not even be possible, to measure all of the process and impact indicators presented. And, most of the data sources do not require a separate operation; rather, they can be conducted with the integration of the health management information system and existing data base systems for nutrition, food security etc. However, as is the case with any program, the more indicators that can be collected, the more easily the program can be adjusted to improve operations and remedial measures taken to solve any problems that may have been encountered. Hence, the monitoring and evaluation activities of the MND prevention and control program are a subset of the NNP monitoring and evaluation activities.

Program evaluation and research should also be considered, in order to prove that the health and safety of target groups is not being jeopardised by an excessive intake of micronutrients due to the implementation of multiple integrated strategies.

10.2 Goals

The ultimate goals of the micronutrient prevention and control program are:

The virtual elimination of Vitamin A Deficiency, Iodine Deficiency Disorders, anaemia and neural tube defects, as well as the reduction of Iron and Zinc deficiencies, and morbidities and mortalities associated with deficiency states, through:

Supplementation of targeted population groups (Bi-annual vitamin A Supplementation for children 6-59 months, therapeutic Zinc supplementation for children under the age of 5 years with diarrhoea, Iron (Iron with Folic Acid) supplementation for pregnant women and use of iodized salt by the community as a whole.

A public health approach that includes the promotion of optimal breastfeeding practices, prevention and control of parasitic infections, and promotion of personal hygiene and environmental sanitation practices.

A food-based approach (dietary diversification, modification and fortification) that increases the production, availability and consumption of micronutrient rich foods and bio-availability of micronutrients in the diet. These will be integrated with nutritional education programs in order to change eating behaviours.

Provision of nutritional education and SBCC activities to improve health and nutrition practices in target groups and the community at large.

10.3 Impact Indicators

Table 19: The Health and Nutrition Impacts of adequate micronutrient intake

Indicators
<ul style="list-style-type: none">• Reduction of stunting prevalence (height-for-age Z-score below -2 SD)• Reduction of under-weight prevalence (weight-for-age Z-score below -2 SD)• Reduction of wasting prevalence (weight-for-height Z-score below -2 SD)• Prevalence of Low Birth Weight (birth weight < 2500 g)• Reduction of childhood blindness• Reduction of child mortality• Improved cognitive development and educational attainment

Information on most of the impact indicators is generated every five years through the National Demographic and Health Survey.

10.4 INPUT, PROCESS AND OUTCOME INDICATORS

Table 20: Micronutrient deficiency outcomes, indicators and sources of data

Micronutrients	Outcome and Impact Indicator	Indicator definition and targeted population group	Potential source of data/information and periodicity
Vitamin A	Prevalence of night blindness among pregnant women (XN).	Percentage of women who gave live birth during the last 3 years and who reported night blindness during their last pregnancy.	National Micronutrient survey (EMNS) - By 2014, and every 5 years DHS – (2015) Every 5 years Ad hoc & pocket nutrition surveys, National nutrition surveys.
	Prevalence of night blindness among under-5 children (XN).	Percentage of 2 - 5 year old children who are night blinded (reported).	
	Serum retinol level among under-5 children.	Percentage of under-5 children whose serum retinol level < 0.7 mol/L (or 20 g/dL)	EMNS - By 2015, and every 5 years.
	Serum retinol level among pregnant women.	Percentage of pregnant women whose serum retinol level < 0.7 mol/L (or 20 g/dL)	
Iron	Prevalence of Iron deficiency anaemia	Percentage of population groups (PLW, WRA, U5 children &/or adult men) whose haemoglobin level is below the cut off points - adjusted for altitude, sex and gestational age in case of pregnancy.	Ethiopian Micronutrient Survey (EMNS) - By 2015, and every 5 years EDHS – (2015), every 5 years Ad hoc & pocket nutrition surveys, National nutrition surveys.
	Iron deficiency status	Serum Ferritin (SF): Adult <15 µg/l and <12 µg/l for U5 children (in all age groups in the presence of infection <30µg/l)	National Micronutrient survey (EMNS) - By 2015, and every 5 years
		Soluble Transferrin Receptor (sTfR)	
TfR-index: Ratio of sTfR to the log of serum ferritin-estimate of total body Iron			

	Thyroid size (total goiter rate).	Percentage of 6 -12 year old children (in the community or at school) with grade 1 (palpable) or grade 2 (visible) goiter.	National Micronutrient survey (EMNS) - By 2015, and every 5 years Ad hoc & pocket nutrition surveys, National nutrition surveys.
Iodine	Iodine deficiency status - median urinary iodine excretion.	Percentage of HHs using adequately iodized salt.	National Micronutrient Survey (EMNS) - By 2015, and every 5 years.
		Percentage of children aged 6 years and above whose median UIE <100 µg/l (100–199 is adequate).	
		Percentage of UIE < 100 µg/l in general population except PLW and U5 (100–199 is adequate).	
		% of pregnant women with median UIE of <150 µg/l (150–249 is adequate).	
Folate	Folate deficiency status - Serum folate (nmol/L or ng/mL).	Negative balance: <7nmol/L ; Subclinical deficiency: < 10 nmol/L; Reduced risk of NTD-affected pregnancy: >16 nmol/L.	National Micronutrient survey (EMNS) - By 2015, and every 5 years.
		Deficiency: <305 nmol/L; Subclinical deficiency: < 340 nmol/L; Reduced risk of NTD-affected pregnancy: 900 nmol/L.	
	Folate deficiency status - RBC folate (nmol/L or ng/mL).		
	Incidence of Neural tube defects	Proportion of babies born with spinal bifida or anencephaly per year per 10,000 live births.	Secondary data review of health facility records, routine HMIS reports.

Table 21: Micronutrient intervention output and source of data

Micronutrient (Interventions/ programs)	Output and process Indicator	Potential source of data/information and periodicity
Vitamin A Supplementation	<p>Percentage of children 6 - 59 months that receive vitamin A at each supplementation round.</p> <p>Percentage of children 6 - 59 months that receive vitamin A twice a year.</p>	<p>Routine HMIS report & Administration report (Bi-annual)EOS/CHD reports, other nutrition surveys/ assessments and post supplementation validation survey (every other year).</p>
Iron (IFA supplementation)	<p>Percentage of women who received any number of IFA tablets during pregnancy and/or postnatal.</p> <p>Percentage of women who reported taking any number of IFA tablets during pregnancy and/or postnatal.</p> <p>Percentage of women who received 90 IFA tablets during pregnancy and/or postnatal.</p> <p>Percentage of women who reported taking 90 IFA tablets during pregnancy and/or postnatal.</p>	<p>Review health facility records (ANC registration book)- ad hoc DHS – every 5 years.</p>
Salt iodisation	<p>Percentage of households using adequately iodised salt (15 - 40 ppm of iodine).</p> <p>Percentage of salt produced for human consumption that contains 20 - 40 PPM of Iodine at ports of entry (custom).</p> <p>Percentage of salt appropriately packaged (HDPE (High-density Poly Ethylene) bag.</p> <p>Percentage of HH sprinkling iodised salt after cooking.</p> <p>Percentage of salt at wholesalers or retailers stored for more than the recommended date.</p>	<p>Monthly iodisation report</p> <p>Ad hoc nutrition surveys</p> <p>DHS – every 5 years.</p>

Micronutrient (Interventions/ programs)	Output and process Indicator	Potential source of data/information and periodicity
Zinc supplementation for diarrhoea treatment	<p>Number of diarrhoea episodes treated with ZINC& ORS.</p> <p>Percentage of children 0 - 59 months receiving Zinc for diarrhoea treatment during a recent episode.</p> <p>Percentage of caregivers who seek Zn-Lo ORS for the treatment of diarrhoea.</p>	Routine HMIS reports, IMNCI/ICGM registries DHS- every 5 years.
Home fortification	Percentage of children 6 - 23 months whose intake of vitamins and minerals improved through the consumption of home fortified complementary food.	Annual project performance report Ad hoc - IYCN surveys DHS – every 5 years.

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