# National Policy and Guidelines for Micronutrient Supplementation to Prevent and Control Deficiencies in Cambodia

National Nutrition Programme
February 2011

# PREFACE

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# ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| ANC | Antenatal Care |
| BCC | Behaviour Change Communication |
| BFCI | Baby-Friendly Community Initiative |
| BMI | Body Mass Index |
| CAS | Cambodia Anthropometric Survey |
| CMDG | Cambodia Millennium Development Goals |
| CMS | Central Medical Stores |
| CSMC | National Child Survival Management Committee |
| DDF | Department of Drugs and Food |
| FAO | Food and Agricultural Organization of the United Nations |
| GDP | Gross Domestic Product |
| Hb | Hemoglobin |
| HC | Health Centre |
| HIV | Human Immunodeficiency Virus |
| Ht | Height |
| HIS | Health Information System |
| ID | Iron Deficiency |
| IDA | Iron Deficiency Anemia |
| IFA | Iron/Folic Acid |
| IYCF | Infant and Young Child Feeding |
| LBW | Low Birth Weight |
| MDG | Millennium Development Goal |
| MFP | Meat, fish, poultry factor |
| MNP | Multiple Micronutrient Powder |

| | |
|---|---|
| MoH | Ministry of Health |
| MPA | Minimum Package of Activities |
| MUAC | Mid-Upper Arm Circumference |
| NFP | Nutrition Focal Point |
| NGO | Non-Governmental Organization |
| NIP | National Immunization Programme |
| NNP | National Nutrition Programme |
| OD | Operational District |
| PCSMC | Provincial Child Survival Management Committee |
| PHD | Provincial Health Department |
| PNC | Postnatal Care |
| RBP | Retinol Binding Protein |
| SNID | Sub-National Immunization Days |
| SIA | Supplemental Immunization Activities |
| TIBC | Total Iron Binding Capacity |
| UNICEF | United Nations Children's Fund |
| UNSCN | United Nations Standing Committee on Nutrition |
| VAC | Vitamin A Capsules |
| VAD | Vitamin A Deficiency |
| VHSG | Village Health Support Group |
| WHO | World Health Organization |
| WIFS | Weekly Iron/Folic Acid Supplements |
| WRA | Women of Reproductive Age |
| Wt | Weight |

# EXECUTIVE SUMMARY

Nutritional deficiencies remain widespread in Cambodia across the lifespan, with particularly detrimental effects on the health and wellbeing of women and young children. As the causes of undernutrition are complex, related not only to food availability but to poor infant and young child feeding practices, disease, and inadequate health care, the solutions require a comprehensive strategy if Cambodia is to accelerate its progress towards achieving the MDGs. Food-based solutions are not presently able to provide for the needs of all population groups as the primarily plant-based Cambodian diet is limited in variety, and low in energy, fat, and bioavailable sources of micronutrients, particularly iron and vitamin A. Successfully addressing micronutrient deficiencies has the potential to improve the cognitive and physical development of young children, improve maternal health, and reduce the complications of childbirth, while reducing overall levels of morbidity and mortality. Key components of a micronutrient deficiency prevention programme include dietary diversification, staple food fortification, supplementation, behaviour change communication, and disease control measures. Many approaches, while desirable, are longer-term and will take time to implement and have an impact at the population level. In the interim, a well-designed supplementation strategy is needed that will reduce present levels of micronutrient deficiencies. The purpose of the National Policy for the Prevention and Control of Micronutrient Deficiencies through Supplementation in Women and Children is to provide a clear rationale and guidelines to enable effective strategies that can be implemented and scaled-up, thereby, improving women and children's health and survival in Cambodia.

The National Policy and Guidelines were developed in close consultation with the National Nutrition Programme and key stakeholders with a focus on four key areas of supplementation:

1. Vitamin A supplementation programme for children 6-59 months and postpartum mother within 6 weeks of delivery
2. Iron/folic acid supplementation for pregnant and postpartum women
3. Weekly iron/folic acid supplementation (WIFS) for women of reproductive age (WRA)
4. Multiple Micronutrient Powders (MNPs) for children 6-24 months

The policy is based on the latest scientific evidence and "best practices" for the appropriate use of micronutrient supplements and "in-home fortification" to prevent and control deficiencies. In particular, research in the areas of iron, folic acid, vitamin A, and multiple micronutrient supplementation for women and children was evaluated to determine what changes need to be made to the current policy.

The present vitamin A policy and guidelines have been effective in reducing deficiencies according to recent research, and only minor changes have been recommended. Vitamin A supplementation has been identified as one of the key interventions with a proven potential to reduce child deaths and is a cost-effective measure for achieving MDG4 (Improving Child Survival) in Cambodia.

The situation of anemia, including iron deficiency anemia, has shown little improvement among pregnant and lactating women over the past 5 years, despite an estimated increase in iron/folic acid (IFA) supplement distribution and compliance. Issues remain around women's knowledge and understanding of the importance of iron/folic acid as well as the timing of supplementation during pregnancy, as many women do not present early enough in pregnancy to maximize the benefits of iron supplements or folic acid, and the latter is needed in the peri-conception period.

Current IFA supplementation policies will continue for pregnant and lactating women with the addition of a programme to provide weekly iron/folic acid for all women of reproductive age who are not pregnant. This strategy is designed to reduce the prevalence of anemia among women as they enter pregnancy, to reduce the most serious consequences of anemia, including maternal mortality. Preventative weekly supplementation with IFA for WRA will also ensure that folic acid is provided when it is most needed, which is often prior to pregnancy being confirmed. Reducing the prevalence of anemia among women has far reaching benefits that include improvements in productivity and gender equality as well as health.

Among young children in Cambodia, attempts to reduce the prevalence of anemia have also shown little progress with current infant and child feeding practices identified as key risk factors. The primary cause of anemia among young children is insufficient bioavailable dietary iron, though helminth infections and hemoglobinopathies are major contributing factors. General strategies for reducing anemia include fortification and disease control. As physiological iron requirements are highest during early childhood and concomitant vitamin and mineral deficiencies are widespread, dietary inadequacies need to be addressed through "in-home fortification," which is the provision of multiple micronutrients that can be added directly to complementary foods. For children 6-24 months of age this strategy has proven to be effective, safe, and acceptable for reducing anemia in Cambodia. It is also considered to be low cost and scalable.

These four micronutrient supplementation programmes will be integrated into broader public health programmes, which are directed at the same population target groups with the emphasis on increasing the capacity of antenatal, postnatal, and child health clinics to provide supplementation to women and children. Ultimately, multi-sectoral interventions that not only address ways to prevent and control micronutrient deficiencies, but also effectively tackle the causes of deficiencies, will be needed to ensure long-term sustainable results.

# 1. INTRODUCTION AND BACKGROUND

***"Providing micronutrients has immediate and important consequences for improving the well-being of poor people around the world – that's why it should be our number one priority."*** – Douglas C. North, Nobel Laureate in Economics, Copenhagen Consensus 2008.

## 1.1 MICRONUTRIENTS AND THE MILLENNIUM DEVELOPMENT GOALS

Malnutrition in Cambodia is the result of intergenerational issues related not only to food availability but to poor infant and young child feeding practices, gender disparity, disease and inadequate health care[1-8]. At the recent Millennium Development Goals (MDGs) Summit in New York City (September 2010), the UN Standing Committee on Nutrition (UNSCN) issued a statement on how nutrition is linked to most, if not all of the MDGs. The right to food and good nutrition is fundamental to achieving the MDGs and the critical importance of micronutrients in survival and overall human development is well recognized[9, 10]. The Royal Government of Cambodia has signed the Millennium Declaration and is committed to achieving the Cambodia Millennium Development Goals by 2015. The following summarizes the relationship between nutrition and the MDGs as expressed in the UNSCN release with a focus on the role of micronutrients and how prevention of deficiencies can help Cambodia achieve its MDGs.

1. *Eradicating extreme poverty and hunger* – The prevalence of underweight children under-5 years of age is an indicator for this MDG. Malnutrition contributes to poverty and hunger across the lifecycle. Underweight is a consequence of undernutrition related to an inadequate dietary intake and/or diseases which causes malabsorption, poor appetite and altered metabolism.[11-13] There is a well-recognized cyclical relationship between malnutrition and infection with deficiencies in micronutrients impacting the body's ability to fight infection. Vitamin A plays a key role in the body's infection fighting systems, protecting against bacterial invasion. Iron deficiency anemia is associated with a decreased appetite leading to underweight. Reducing the prevalence of iron deficiency anemia can therefore reduce hunger and undernutrition as children who are not anemic will eat more available foods.

2. *Achieving universal primary education* – Malnutrition, and in particular micronutrient deficiencies such as iron and iodine deficiency, lowers children's ability to attend and perform at school and diminishes their chances to achieve a complete education. Iron deficiency *in utero* and early life is associated with impaired cognitive ability later in life.

Child malnutrition undermines national education programmes and can cause depletion of GDP by up to 3%.

3. *Promote gender equality and empower women* – Since women play a key role in family nutrition - breastfeeding, producing, buying, preparing and distributing family foods, taking care of children and the sick, visiting health centres and ensuring hygiene - good nutrition contributes to women's empowerment. Micronutrient deficiencies weaken women and reduce their capacity to work and care for their families.

4. *Reduce child mortality* – Severe undernutrition accounts for 1 million deaths every year. More than 1/3 of all deaths in children under-5 years of age are attributed to undernutrition as the underlying cause, as common childhood diseases become fatal in undernourished children[14, 15]. Research has repeatedly shown that micronutrient deficiencies are associated with an increased risk of child mortality and preventing deficiencies of key micronutrients such as vitamin A and iron is essential for child survival rates to improve.

5. *Improve maternal health* – Maternal undernutrition contributes to maternal mortality, ill-health and other complications during pregnancy and childbirth. Women who suffer from micronutrient deficiencies are less productive, more likely to be ill and less likely to survive multiple pregnancies with devastating impact on families and society[16, 17]. In particular, iron deficiency anemia puts women's lives at risk[18-20].

6. *Combat HIV/AIDS, malaria and other diseases* – Undernutrition makes individuals more susceptible to disease, which in turn increases nutritional needs and weakens the capacity of the body to assimilate food. Nutritional care is therefore a key dimension of successful clinical treatment of HIV/AIDS patients and micronutrients have a role in diminishing the severity of disease[21-26]. Individuals who are deficient in micronutrients tend to have more frequent infections that are more severe and of longer duration.

7. *Ensure environmental sustainability* – There is increased recognition that the health of people and the health of the environment are closely associated. Environmental health and sustainable diets are essential to ensure good nutrition and sustainable management of biodiversity and environment.

8. *Develop a global partnership for development* – Given the multi-sectoral nature of nutrition, sustainable improvement of nutrition requires the involvement of stakeholders from different institutional and sectoral backgrounds. Nutrition is therefore a key entry point for a global partnership for development and Cambodia has prioritized improving reducing

micronutrient deficiencies in young children and women in the National Nutrition Strategy 2009-2015.

### *1.1.1 Purpose*

The purpose of the National Policy for the Prevention and Control of Micronutrient Deficiencies through Supplementation in Women and Children is to provide a clear rationale and guidelines to enable effective strategies to be implemented and scaled up, therefore improving women and children's health and survival in Cambodia. This policy is based on the latest evidence and "best practices" for the appropriate use of supplements and "home (point of use) fortification" to prevent and control micronutrient deficiencies. Supplementation programmes should be integrated into broader public health programmes, which are directed to the same population target groups. Emphasis should be placed upon increasing capacity of antenatal, postnatal and child health clinics to provide supplementation for mothers and children.

## 1.2 DEVELOPMENT OF POLICY AND IMPLEMENTATION GUIDELINES FOR THE PREVENTION AND CONTROL OF MICRONUTRIENT DEFICIENCIES IN WOMEN AND CHILDREN: FOCUS ON SUPPLEMENTATION PROGRAMMES

The National Policy and Guidelines were developed by the National Nutrition Programme (NNP) of the National Maternal and Child Health Center in close consultation with the development partners, especially members of the Nutrition Working Group. All parties worked on the situation analysis traveling to the provinces, conducting meetings at the Provincial Health Department (PHD) and Operational District (OD) level as well as with Village Health Support Groups (VHSGs), mothers and other community members. In Phnom Penh, consultative workshops were held with key stakeholders including government officials from the MoH and line ministries, Nutrition Working Group Members, NGOs and International Organizations. The National Nutrition Programme personnel were instrumental in providing the contextual framework on which the policy was developed.

### *1.2.1 Limitations*

The National Policy for the Prevention and Control of Micronutrient Deficiencies is focused on micronutrient supplementation as one of the key strategies to prevent and control deficiencies in Cambodia. It recognizes the need for a comprehensive strategy that includes improving dietary diversification, staple food fortification, behaviour change communication as well as helminth and other disease control measures. The policy is limited in scope to address the causes of micronutrient deficiencies, which will require multi-sectoral interventions and inputs. Ultimately an integrated strategy should reduce the need for supplementation in some population groups but at present current approaches are not adequate to meet the needs of women and children in Cambodia.

## 1.3 Micronutrients and the Lifespan: Supplementation Policy Rationale

This policy approaches supplementation through a lifespan approach as part of an integrated strategy to improve overall nutritional status and reduce micronutrient deficiencies in Cambodia. Undernutrition in Cambodia is evidenced in the high prevalence of stunting and underweight among children under-5 years as shown in Table 1[27]. While progress was made in reducing undernutrition in the early part of the last decade, reduction slowed between 2005 and 2010. Stunting, low height for age, is the result of chronic undernutrition with a window of opportunity for prevention identified as -9 months (conception), to 24 months of age. As such, proper maternal nutrition and appropriate early childhood feeding practices are key to reducing the unacceptably high levels of stunting.

**Table 1. Comparison of anthropometrics characteristics 2005-2010**

| | CDHS 2005[1] n=3101 (rural) | CAS 2008[2] n=7019 | MDG-F baseline 2010[3] n=2044 |
|---|---|---|---|
| Wt for Ht <-2 SD | 7.1% | 8.9% | 13.9% |
| Wt for Age <-2 SD | 35.7% | 28.8% | 34.5% |
| Ht for Age <-2 SD | 38.3% | 39.5% | 37.3% |

[1]Cambodia Demographic and Health Survey
[2]Cambodia Anthropometric Survey
[3]Baseline Survey for the Joint Programme for Children, Food Security and Nutrition in Cambodia (Spanish Millennium Development Goal Fund)

Underlying the micronutrient supplementation policy is a fundamental understanding of the dietary, agricultural, economic and cultural limitations to achieving nutritional adequacy from the diet alone. An evaluation of the most recent data from the Food and Agricultural Organization (FAO, 2010) clearly elucidates the difficult task faced by families in Cambodia as the majority of food energy is supplied by milled rice (Table 2). The primarily plant based Cambodian diet is limited in variety, low in energy, fat and bioavailable sources of micronutrients, particularly iron and vitamin A, due to the low consumption of animal foods (9% of total energy intake).

**Table 2. Energy content from selected foods[1]**

| Food Item | Percent of Energy |
|---|---|
| Rice | 65% |
| Maize | 6% |
| Pig meat (pork) | 4% |
| Sugar | 4% |
| Cassava | 3% |
| Fish | 2% |
| Sesame seed | 2% |
| Wheat | 1% |
| Soy beans | 1% |
| Bovine meat (beef) | 1% |
| Vegetables | 1% |

[1]FAO, 2010

According to the most recent FAO data (2010), 22% of Cambodians suffer from undernourishment, which refers to the condition when "dietary energy consumption is continuously below a minimum dietary energy requirement for maintaining a healthy life and carrying out a light physical activity with an acceptable minimum body-weight for attained-height". Broadly speaking, a low energy intake is normally associated with a micronutrient poor diet as it is unlikely that vitamin and mineral needs can be met when energy needs are not.

Table 3 indicates the distribution of food energy in the Cambodian diet in relation to current recommendations. The minimum fat intake is too low as the recommended intake for women of childbearing age is 20% of total energy in order to meet their requirements for essential fatty acids. Absorption of fat-soluble vitamins is also limited when fat intake is low. The nutritional status of women is directly related to that of their children as low energy intake and micronutrient deficiencies can lead to increased morbidity and mortality of both mother and child. For young children, fat should exceed 30% of energy intake. While adequate energy and macronutrient intake is essential for fetal and child growth, micronutrients such as iron, iodine and zinc are also essential during all phases of development. Poor growth in childhood has far reaching effects ranging from lower productivity to an increased risk of obstructed labor related to stunting[5, 28, 29]. Mineral deficiencies are associated with a decrease in appetite, which impacts on food intake and undernutrition[30].

**Table 3. Macronutrient distribution in the Cambodian diet vs. recommendations (as a % of total energy intake)**

| Macronutrient | Cambodia[1] | Recommended Range: Women[2] | Recommended Range: Children[2] |
|---|---|---|---|
| Carbohydrates | 76% | 45-65% | 45-65% |
| Protein | 10% | 10-35% | 10-30% |
| Fat | 14% | 20-35% | 30-40% |

[1]FAO, 2010
[2]Dietary Reference Intakes for Individuals, Institute of Medicine, National Academy of Science, 2004

Improving energy and macronutrient intake across the lifespan for all Cambodians is essential for improving health and the quality of life, but micronutrient needs must also be met at each stage of life for human health and development. As Figure 1 indicates, an inadequately nourished mother who has a low BMI, does not gain an adequate amount of weight, or has poor micronutrient status, is more likely to give birth to a low birth weight baby, suffer a still birth, premature delivery, miscarriage, or bear a child with fetal defects such as spina bifida. Low birth weight babies are at greater risk of dying and experiencing a higher incidence of developmental disorders, many related to micronutrient deficiencies including iodine and iron deficiency[31-34]. More recent research has also implicated undernutrition during the perinatal period in chronic diseases later in life[35].

Smaller, less robust babies tend to nurse less vigorously, and may experience accompanying growth failure that may manifest in irreversible stunting. Inappropriate, inadequate introduction of complementary foods, low in energy and micronutrients, is associated with an increased risk of infection, poor cognitive and physical development. Many of the consequences of undernutrition early in a child's life can have a lifelong impact and are implicated in diminished reproductive capabilities and poor birth outcomes.  For women and girls, micronutrients such as iron and vitamin A are critical for their survival and health in pregnancy and lactation.

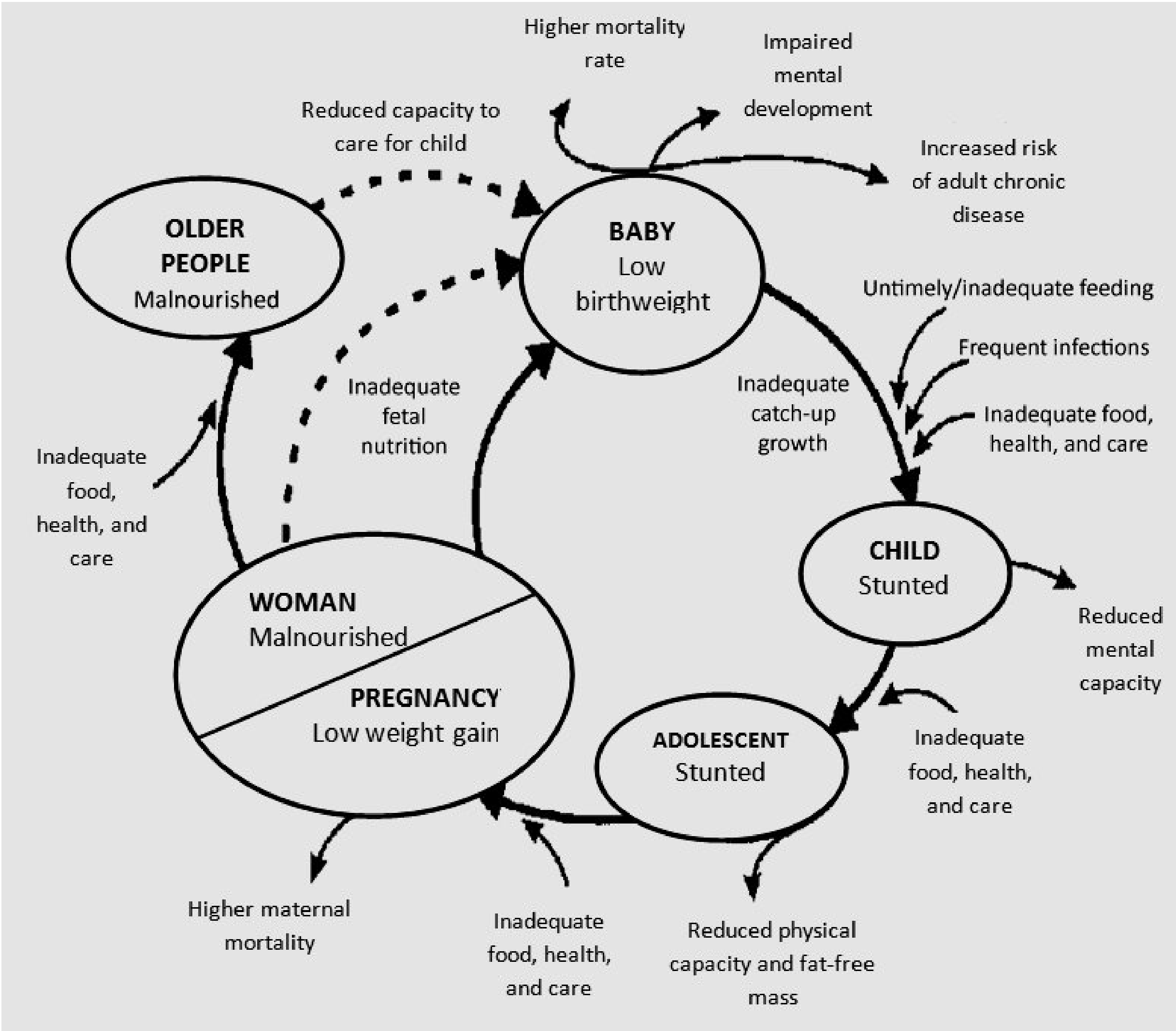


**Figure 1. The implications of undernutrition across the lifespan**

## 1.4 Recent Updates in the Scientific Literature

In constructing the National Policy for the Prevention of Micronutrient Deficiencies in Cambodia, the relevant scientific literature was reviewed and evaluated in order to decide on the most effective and up-to-date strategies for the region. Of particular importance, research in the areas of iron, folic acid, vitamin A and multiple micronutrient supplementation for women and children was evaluated to determine what changes, if any, should be made to current policy. With regard to the current strategy for iron/folic acid supplementation for pregnant women, there has been no change in the policy of the international agencies as the prevalence of anemia and associated risks remain high. There is research examining the differential impact of multiple micronutrients in pregnancy with iron/folic acid alone with inconclusive results at this point[36, 37]. Similarly, the policy with regard to vitamin A supplementation for children and women postpartum is supported by a strong evidence base and will remain relatively unchanged. Current areas of vitamin A research include neonatal supplementation, maternal supplementation and the timing of postpartum supplementation.

In Cambodia there will be four micronutrient supplementation programmes. Existing vitamin A and Iron/Folic Acid supplementation programmes will continues with no change and two new supplementations will be added and policy will cover the four supplementation programmes:

1. Vitamin A supplementation programme for children 6-59 months and postpartum mother within 6 weeks of delivery
2. Iron/folic acid supplementation for pregnant and postpartum women
3. Weekly iron/folic acid supplementation (WIFS) for women of reproductive age (WRA)
4. Multiple Micronutrient Powders (MNPs) for children 6-24 months

**Document Structure**

This document has been set up such that each of the four sections (vitamin A, iron/folic acid, weekly iron/folic acid, and multiple micronutrient powders) can stand on its own with a general introduction to the situation of micronutrient deficiencies at the beginning of the document and a specific introduction at the start of the individual sections. Each of the sections is structured the same way so the reader can easily move from one to the other to find the relevant information.

This policy and guidelines should be reviewed regularly, especially during the first two years of the implementation of the new supplementation programmes (WIFS and MNPs). Through this process timely revision or updating can be made based on new experience and lessons learnt not only from Cambodia’s own experience, but also from new international scientific recommendations.

# 2. VITAMIN A

## 2.1 INTRODUCTION

Vitamin A deficiency (VAD) is a major contributor to the morbidity and mortality of children under-5 years of age in developing countries[38-40]. While long recognized as playing a key role in vision, historically, supplementation with vitamin A was primarily considered a strategy to prevent blindness. Over years of research, the broader implications of vitamin A deficiency were elucidated and vitamin A became known as the "anti-infective vitamin" due to its key role in immune function. The mucosal surfaces that line the respiratory, digestive and urinary tract, as well as the surface of the eye, require vitamin A for differentiation and the production of mucous secreting cells that protect them from pathogenic invasion and related diseases[38].

Vitamin A deficiency occurs when the amount ingested, absorbed and utilized is insufficient to meet the basic needs of growth and development and the added needs during times of infection. A diet low in bioavailable sources of vitamin A is the leading cause of deficiency in developing countries such as Cambodia where the diet is primarily plant based[5, 41, 42]. Physiological needs for vitamin A vary across the lifecycle, increasing during growth periods and when conditions such as acute or chronic disease are present.

A decreased resistance to common childhood diseases such as diarrhea and respiratory infections occurs with vitamin A deficiency long before visual symptoms such as night blindness are reported[43-46]. Weakened immune function from malnutrition accompanied by disease increases the risk of death. Improving the vitamin A status of deficient children has been shown to improve resistance to infectious disease and significantly reduce the duration and severity of illness and risk of mortality[40]. The elimination of vitamin A deficiency is essential to improving the survival, growth and development of children.

In The Lancet series on child survival [47-50], vitamin A supplementation was identified among the key interventions achievable at a large scale that has proven potential to reduce the number of preventable child deaths each year. In addition, vitamin A supplementation is recognized as one of the most cost-effective interventions for improving child survival (ref) and therefore a prerequisite for achieving MDG 4, particularly in countries such as Cambodia with a high under-5 mortality rate[4].

Evidence also suggests that postpartum vitamin A supplementation can improve maternal stores of vitamin A, reduce maternal morbidity, improve breast milk vitamin A concentrations and improve infant liver stores of vitamin A[16, 37, 51]. Postpartum supplementation of mothers in Cambodia should therefore continue to be part of a comprehensive strategy to improve women and children's health.

The symptoms of mild to moderate vitamin A deficiency generally go unrecognized making it part of a spectrum of micronutrient deficiencies known as "hidden hunger" due to the lack of visible symptoms. The lack of overt symptoms make it all the more imperative that preventative strategies be implemented in all areas where vitamin A deficiency is a risk.

**Population groups at special risk of VAD and its complications:**

- Children under-5 years of age
- Pregnant women – due to extra requirements during pregnancy and lactation
- Sick children and adults

**Benefits of adequate vitamin A intake include:**

- Significant reduction in overall child mortality
- Reduced severity of infectious illness, especially measles and persistent diarrhea – with reduction in rates of hospital admissions and outpatient consultations
- Reduced prevalence of anemia
- Prevention of vitamin A deficiency blindness

Supplementation with vitamin A is currently recommended in all countries where the under-5 mortality rate exceeds 70 deaths per 1,000 live births, an internationally accepted proxy indicating a high risk of deficiency among children under-5. Worldwide today, an estimated 127 million pre-school children and 7 million pregnant women are vitamin A deficient. Supplementation with vitamin A capsules is the single most cost-effective health intervention according to the World Bank and other global health experts[52, 53].

Supplementation is just one of a number of strategies to reduce vitamin A deficiency including food based approaches such as fortification and improving production and consumption of vitamin A rich foods[54-57]. While dietary improvements are key to long-term sustainability of vitamin A deficiency prevention programmes, high dose supplementation currently remains the principal strategy for preventing deficiencies.

## 2.2 SITUATION IN CAMBODIA: VITAMIN A DEFICIENCY PREVENTION AND TREATMENT

Two commonly used Khmer terms describing night blindness – “kwak moin” (blind chicken) and “lo’nget moin” (poor sighted chicken) – indicate that Khmer people are very familiar with the clinical symptoms of vitamin A deficiency. Several surveys conducted since 1993 demonstrated that vitamin A deficiency has been a serious public health problem in Cambodia[5, 42, 58, 59]. The National Micronutrient Survey (2000) found that 7 of the 10 rural provinces had a prevalence of night blindness among young children greater than 1% and the prevalence of low serum retinol levels (<0.70 µmol/L) among children under-5 was 22.3%.

Since the adoption of the National Vitamin A Policy in August 1994, the MoH has conducted a national supplementation programme. Beginning in 1999, the National Vitamin A Policy Guidelines recommended distribution of vitamin A capsules to all children aged 6-59 months twice yearly during March and November and for postpartum mothers within 8 weeks of delivery. The distribution of vitamin A supplements has been conducted through routine outreach and through Supplemental Immunization Activities (SIAs) and through polio Sub-National Immunization Days (SNIDs) and at health facilities. In 2002, the NNP revised the Policy Guidelines to included recommendations to distribute vitamin A capsules to postpartum women during monthly outreach sessions as well as at health facility level. In 2007, the National Vitamin A Policy was updated and two major changes were: 1) change from March to May for the first round distribution for children and change from eight weeks postpartum to six weeks postpartum. The current main operational strategies for vitamin A supplement distribution are through outreach activities and at health centers, national and referral hospitals:

1. Vitamin A supplementation for children 6-59 months and Mebendazole distribution for children from 12-59 months twice per year (during the months of May and November) as part of regular outreach services
2. Vitamin A supplementation of post-partum women within 6 weeks after delivery (as part of a comprehensive package of services for postpartum women)
3. Screening and administration at any contact with routine health services, including immunization and maternal health services
4. Supplemental distribution during campaigns when VAC distribution is feasible, such as Supplemental Immunization Activities and other campaign-like activities in remote areas

consequences for young children[58].

The results of vitamin A supplementation coverage are shown in Table 4.

**Table 4. Vitamin A Supplementation Coverage: 2000 -2010 (Health Information System)**

| Target Group | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Children 6-59 months | 44% (29%)[1] | 53% | 46% | 59% | 74% | 72% (35%)[2] | 79% R1 78% R2 79% | 88% R1 100% R2 76% | 89% R1 88% R2 89% (59%)[3] | 99% R1 98% R2 100% | 96% R1 95% R2 96% |
| Postpartum mothers | 13% (11%)[1] | 16% | 13% | 21% | 48% | 50% (27%)[2] | 53% | 60% | 68% | 71% | 73% |

[1] CDHS 2000
[2] CDHS 2005
[3] Cambodia Anthropometric Survey 2008

There has not been a countrywide micronutrient survey since 2000 although there have been smaller surveys which have evaluated vitamin A status using retinol binding protein (RBP). These surveys, including the recent "Good Food for Children" study (*"Combating anaemia and micronutrient deficiencies among young children in rural Cambodia through in-home fortification and nutrition education"* - unpublished) indicate the supplementation programme has been effective in reducing vitamin A deficiency, as only a small percentage of children were deficient.

In spite of the positive benefits of the vitamin A supplementation programme in Cambodia, the under-5 child mortality rate remains above the cutoff of 70 deaths per 1000 live births, which is used to indicate that vitamin A deficiency is still a public health problem (World Bank, 2008). In addition, surveys indicate diarrhea and respiratory illnesses are extremely common with serious consequences for young children[58].

This policy has been developed in accordance with the timeline and events given below. Since 1992, several policy and planning documents relating to child survival and the elimination of vitamin A deficiencies have been approved and signed by the Royal Cambodian government including:

- 1992: The Convention on the Rights of the Child.
- 1994: The National Vitamin A Policy document adopted by the MoH.
- 1997: The National Plan of Action for Nutrition adopted with the elimination of vitamin A deficiencies as one of the priority areas for action.
- 1998: The Cambodian Nutrition Investment Plan adopted providing a strategy framework for an investment plan for nutrition.
- 1999: The National Seminar on Food Security and Nutrition, chaired by the Prime

Minister, adopted resolutions supporting elimination of vitamin A deficiency (Resolution 7).

- 1999: The National Vitamin A Policy was revised to recommend 1 capsule with 100,000 IU (blue capsule) for children 6-11 months and 1 capsule with 200,000 IU (red capsule) for children 12-59 months every 6 months. Postpartum women should receive 1 capsule with 200,000 IU (red capsule) within 8 weeks after delivery.
- 2002: Revisions were made to the National Vitamin A Policy to allow the health centre staff to carry vitamin A capsules with them on outreach *every* month for postpartum women within 8 weeks of delivery.
- 2005: The Sub-decree on Marketing of Products for Infant and Young Child Feeding (IYCF) was passed and the MoH developed a comprehensive Behaviour Change Communication (BCC) strategy to promote early initiation within one hour of delivery and exclusive breastfeeding for the first 6 months of the infant's life and continued breastfeeding for 2 years and beyond. Support for breastfeeding is recognized as a key element for reducing vitamin A deficiency among young children.
- 2006: The Cambodia Child Survival Strategy (CCSS) was finalized outlining Cambodia's approach to reduce under-5 mortality to 65 per 1000 live births by 2015. Vitamin A supplementation was one of the 12 score-card interventions of the Child Survival Strategy.
- 2007: National Vitamin A Policy Guidelines revised, supplementation rounds changed to six monthly in May and November and post partum vitamin A supplementation changed from within 8 weeks post partum to 6 within weeks post partum.
- 2008: National Policy on Infant and Young Child Feeding revised.
- 2009: The first National Nutrition Strategy 2009-2015 approved by the MoH.

## 2.3 INTERVENTION STRATEGIES FOR ADDRESSING VITAMIN A DEFICIENCY

Numerous strategies exist for addressing vitamin A deficiencies and it is recognized that an integrated approach is essential for the success and sustainability of the programme in Cambodia[57]. This policy is based on the National Vitamin A Policy Guidelines and primarily addresses supplementation with an overview of accepted and effective interventions given in the following.

### *2.3.1 Overview of strategies for the prevention and control of vitamin A deficiency in Cambodia*

1. Dietary diversification and modification
2. Improved infant and young child feeding practices
3. Food fortification
4. Public health measures for disease control
5. Supplementation with vitamin A capsules

#### 2.3.1.1 Dietary diversification and modification

Inadequate dietary intake is an immediate cause of VAD and strategies must address the underlying as well as the immediate and basic causes of food insecurity and malnutrition. Food based strategies such as increasing homestead food production, particularly animal husbandry and poultry production, can lead to improved vitamin A status although they must be accompanied by effective behavioral change strategies to have an impact on those most vulnerable[56, 57]. Current knowledge of bioavailable sources of vitamin A rich foods is low among caregivers and more effective communications strategies are needed if consumption of available food sources of vitamin A is to increase.

As dietary diversification is an affordable and sustainable approach to reducing VAD in Cambodia, efforts should be made to increase availability, access and utilization of vitamin A rich foods such as organ meats (liver), other animal foods, including eggs (yolk), as well as orange fleshed fruits (ripe mangos and papayas) and vegetables (orange sweet potato). Dark green leafy vegetables contain vitamin A (as beta carotene) although absorption is low and considerably higher amounts must be consumed[60-63], making this an option for adults but not young children with limited stomach capacity.

The scope of strategies for modifying the diet in Cambodia is broad and requires a multi-sectoral approach to be successful. It is recognized that dietary diversification is an essential component of a longer-term strategy to reduce VAD and improve overall nutritional status in Cambodia although behavioral change as well as improved agricultural activities take time.

#### 2.3.1.2 Improved infant and young child feeding practices

Appropriate infant and young child feeding (IYCF) is essential for preventing vitamin A deficiency in infants and young children[15]. Breastfed infants are considered to be protected against vitamin A deficiency, although breastfed infants of mothers with marginal vitamin A status may become vitamin A deficient. As complementary foods in Cambodia are generally low in vitamin A, infants and young children are dependent on vitamin A that is either available from accumulated liver stores, or still being ingested through breastfeeding. Hence there is a strong rationale for continuing to promote exclusive breastfeeding for 6 months and continued breastfeeding for at least 2 years. Dietary messages to caregivers should promote vitamin A rich foods for complimentary feeding, particularly those of animal origin as they are not only higher in vitamin A but contain a form of the vitamin that is easily absorbed. In addition, fat should be added to children's meals to increase absorption of both plant and animal forms of vitamin A[60].

Exclusive breastfeeding of infants under 6 months of age is recognized as the best strategy for prevention of vitamin A deficiency in young children, although this is dependent on the nutritional status of the mother[55, 64]. Continued breastfeeding to at least 2 years of age can provide the young child with an ongoing source of bioavailable vitamin A and is a key component of appropriate IYCF[15].

#### 2.3.1.3 Food fortification

Widely recognized as an effective strategy for preventing and controlling vitamin A deficiency, fortification of centrally processed food is the public health strategy employed in most developed countries[65, 66]. The success of a food fortification program is dependant on there being a commonly consumed food that can be centrally processed and that the food is affordable by those families who are most at risk of deficiency. This poses a challenge in Cambodia where many households have limited resources and do not buy processed foods. In spite of this, fortification is recognized as an important component of a longer-term strategy to eliminate vitamin A deficiency in Cambodia and the MoH is exploring the potential of various food vehicles and approaches to fortification.

#### 2.3.1.4 Public health measures for disease control

Infectious diseases exacerbate VAD by a variety of mechanisms, including reduced food intake (due to both a lack of appetite and withdrawal of solid food), reduced intestinal absorption, and urinary loss of vitamin A[38, 67]. Many public health interventions have implications for vitamin A status and should continue to be promoted and strengthened as they contribute both directly and indirectly to VAD reduction. These include but are not limited to, immunization, especially measles, and measures to improve sanitation and hygiene, deworming, management of malnutrition and malaria prevention[9].

#### 2.3.1.5 Supplementation with vitamin A capsules

Universal supplementation (periodic distribution of vitamin A capsules) to children and postpartum women is the main strategy in Cambodia to reduce VAD and its consequences. In addition, disease-targeted supplementation protects individuals at highest risk of VAD related disease and complications.

High dose supplementation of lactating mothers has been shown to be an efficacious way of improving the vitamin A status of breastfeeding infants[68]. Supplemented mother's breastmilk vitamin A levels are still elevated at 8 months postpartum, at a time when complementary feeding is becoming increasingly important.

In addressing this issue, supplementing infants and young children every 6 months with high dose vitamin A capsules is routinely done in Cambodia. The scientific basis for the impact of this strategy on reducing mortality and nutritional blindness is unequivocal and will continue to be the practice[9].

The main operational strategies for vitamin A supplementation are through outreach activities, health centres, and national and referral hospitals.

This includes screening and administration at any contact with routine health services (e.g. immunization and maternal health services) and supplemental distribution during Supplemental Immunization Activities (SIA) and measles outbreaks.

## 2.4 TARGET POPULATIONS FOR VITAMIN A SUPPLEMENTATION

### *2.4.1 Protocols for Universal Vitamin A Capsule Supplementation*

As illustrated in Table 5, the target populations for routine vitamin A supplementation are children 6-59 months and postpartum women.

**Table 5. Universal vitamin A capsule supplementation**

| | | |
|---|---|---|
| **Screen all children and mothers coming <u>for any reason</u> to health centers or referral hospitals.** | | |
| Give vitamin A to children (6-59 months) that have not received a dose in the previous four months. | Children 6-11 months<br><br>Children 12-59 months | 100,000 IU<br><br>200,000 IU |
| Give vitamin A capsule <u>once</u> to mothers, irrespective of their mode of infant feeding, within six weeks after delivery – if they did not receive vitamin A at delivery. | | 200,000 IU |
| **For all children during outreach services around May and November** | | |
| Give vitamin A capsule to children (6-59 months) that have not received a dose in the previous four months | Children 6-11 months<br><br>Children 12-59 months | 100,000 IU<br><br>200,000 IU |
| **For all post-partum women within 6 weeks after delivery during any outreach services every month throughout the whole year** | | |
| Give vitamin A capsule once to mothers, irrespective of their mode of infant feeding, within six weeks after delivery – if they did not receive vitamin A at delivery. | | 200,000 IU |

- Before giving vitamin A, always check if the child already has received a dose in the previous four months. If yes, do not give a second dose.
- The health worker should always explain to the caretaker that the child is receiving vitamin A and that vitamin A strengthens the child’s resistance to common childhood illnesses and reduces child mortality.
- Always record on the child’s Yellow Card and on the Mother’s Book the dose and the date VAC was given.
- Remind the mother/caretaker to keep the health card in a safe place and always to bring it when going to the health centre or hospital.

## SPECIAL DISTRIBUTION OF VITAMIN A SUPPLEMENTS

Additional supplementation is indicated during measles outbreaks with the details given in Tables 6 and 7.

**Table 6. During measles outbreaks**

| ACTION | TARGET GROUP | DOSE |
|---|---|---|
| Give one preventive dose of vitamin A to all children 6 months – 12 years living in areas of measles outbreak that have not received a dose in the previous four months | Children 6-11 months<br><br>Children 1-12 years | 100,000 IU<br><br>200,000 IU |
| Give vitamin A treatment to all children with active measles or who have had measles within the past three months | < 6 months<br><br><br><br>Children 6-11 months<br><br><br><br>Children 1-12 years | Day 1: 50,000 IU*<br>Day 2: 50,000 IU*<br>Day 14: 50,000 IU*<br><br>Day 1: 100,000 IU<br>Day 2: 100,000 IU<br>Day 14: 100,000 IU<br><br>Day 1: 200,000 IU<br>Day 2: 200,000 IU<br>Day 14: 200,000 IU |

- Record these doses on the Yellow Card of the child (when available) and on the special measles outbreak response Tally Sheet.

**Table 7. During supplementary immunization activities such as SNIDs/NIDs**

| | | |
|---|---|---|
| Give a vitamin A capsule to children (6-59 months) that have not received a dose in the previous four months | Children 6-11 months<br>Children 1-12 years | 100,000 IU<br>200,000 IU |
| Give a vitamin A capsule to mothers, irrespective of their mode of infant feeding, within six weeks after delivery if they did not receive vitamin A at delivery. | | 200,000 IU |

- Record these doses on the tally sheet.

### *2.4.2 Protocols for Disease-Targeted Vitamin A Capsule Supplementation*

For children with persistent diarrhea, children who are underweight, or for individuals with advanced clinical signs of vitamin A deficiency, the following disease-targeted protocols are indicated (Tables 8, 9, and 10).

**Table 8. Treatment of xerophthalmia (night blindness and active corneal lesions)**

| All age groups except women of reproductive age ( > 12 years) | | |
|---|---|---|
| Infant<br><6 months of age | Immediately:<br>Next day:<br>At least 2 weeks later: | 50,000 IU*<br>50,000 IU*<br>50,000 IU* |
| Children<br>6-11 months | Immediately:<br>Next day:<br>At least 2 weeks later: | 100,000 IU<br>100,000 IU<br>100,000 IU |
| Individuals 12 months and older<br><br>Note: * Give half of the 100,000 IU | Immediately:<br>Next day:<br>At least 2 weeks later: | 200,000 IU<br>200,000 IU<br>200,000 IU |

| Women of reproductive age ( > 12 years) | | |
|---|---|---|
| With night-blindness or Bitot's spots | Daily for 30 days | 10,000 IU** |
| With severe signs of active xerophthalmia (acute corneal lesion), whether or not pregnant<br><br>Note: ** 10,000 IU not available in Cambodia | Immediately:<br>Next day:<br>At least 2 weeks later: | 200,000 IU<br>200,000 IU<br>200,000 IU |

- Individuals with acute corneal lesions must be referred to a specialized unit as an emergency.

**Table 9. Treatment of measles**

| Treatment of measles | | |
|---|---|---|
| Infant<br><6 months of age | Immediately:<br>Next day:<br>At least 2 weeks later: | 50,000 IU*<br>50,000 IU*<br>50,000 IU* |
| Give a vitamin A capsule treatment to all children with active measles or with measles within the past three months. | Children 6-11 months | 100,000 IU on Day 1<br>100,000 IU on Day 2<br>100,000 IU on Day 14 |
| | Children 1-12 years | 200,000 IU on Day 1<br>200,000 IU on Day 2<br>200,000 IU on Day 14 |

**Table 10. Treatment of persistent diarrhea and severe malnutrition**

| Treatment of persistent diarrhea (>14 days) and severe malnutrition | | |
|---|---|---|
| Give a vitamin A capsule to all children with persistent diarrhea or severe malnutrition. | Children 6-11 months<br>Children 1-12 years | 100,000 IU<br>200,000 IU |

## 2.5 PROCUREMENT AND DISTRIBUTION

The NNP is responsible for vitamin A supply forecasting, submitting annual stock requests, and inventory monitoring. The Department of Drugs and Food (DDF) is responsible for compilation of all requests and submission of requests to the Essential Medical Supply System of the MOH for procurement of vitamin A supplements. The supply distribution follows the Essential Medicine Supply System as illustrated in Figure 2.

Operational Districts, national hospitals and provincial hospitals submit a request for vitamin A capsules (VACs) to the Central Medical Store (CMS) on a quarterly basis and the CMS distribute VACs to them on a quarterly basis.

Health centers, private health facilities, and referral hospitals submit a request for VACs from OD every month and the OD distribute VACs to them on a monthly basis, as shown in Figure 2 below.

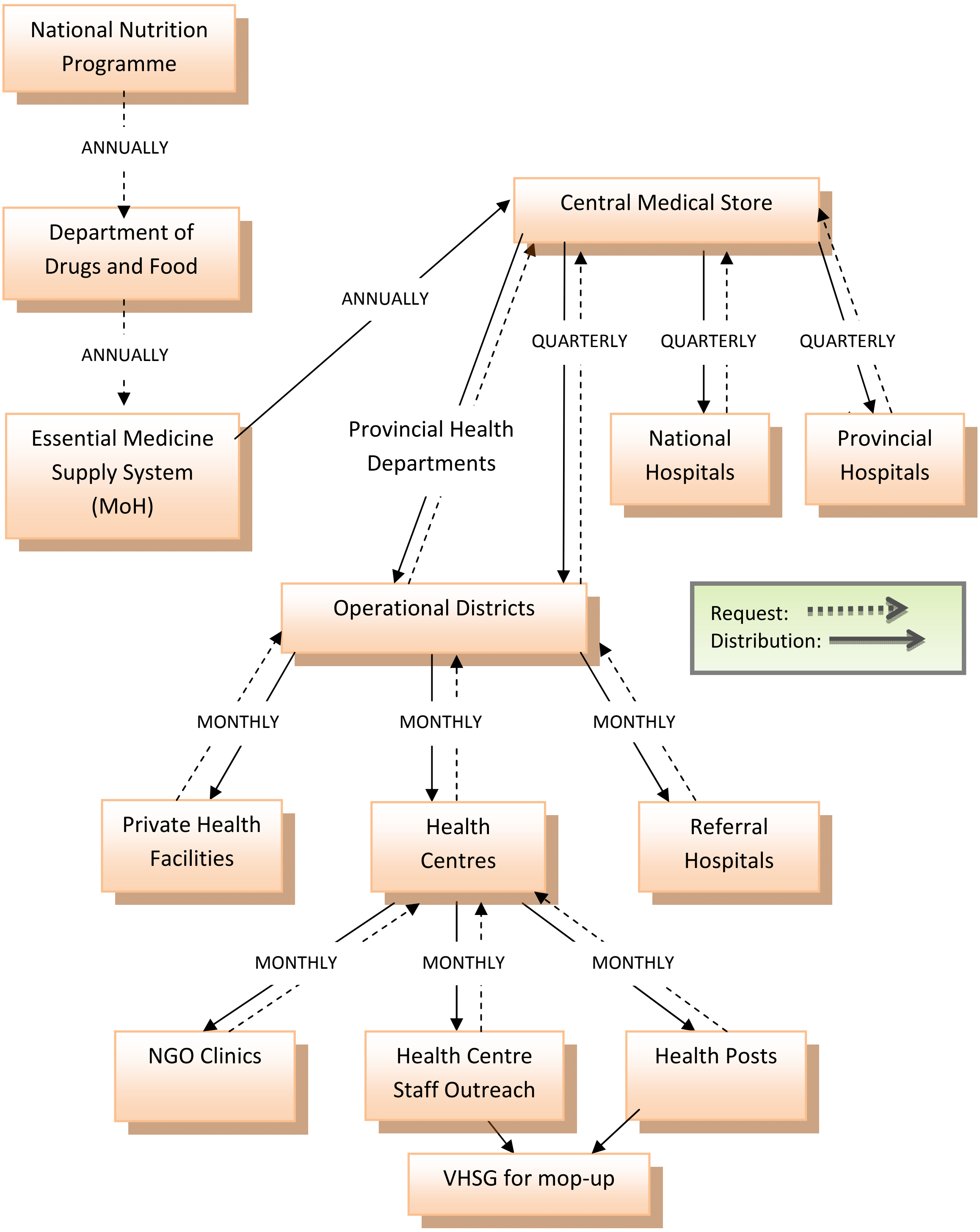


**Figure 2. Request, supply and distribution of vitamin A supplements**

## 2.6 Programme Management: Roles and Responsibilities

This policy and guidelines follow the National Vitamin A Policy Guidelines, 2007. The existing vitamin A supplementation programme has reached a majority of the target population although there are some groups within target populations who have not been reached. Thus, these guidelines recommend that the hard to reach populations/areas should be the main focus and different distribution strategies employed to reach these people and areas.

### *2.6.1 National*

The National Nutrition Programme (NNP) is responsible for formulating vitamin A policies; developing operational strategies, technical guidelines, protocols, training materials, behaviour change communication strategy; and for coordinating and monitoring vitamin A supplementation activities in conjunction with relevant MoH departments, PHD, OD, and development partners. The NNP submits an annual programme report to the MoH and the National Council for Nutrition/Inter-ministerial Technical Committee on Nutrition. National hospitals request supplies of vitamin A from the CMS for distribution in their facilities and report the quantity distributed to the MoH using the standard national hospital reporting form.

### *2.6.2 Provincial*

The Provincial Health Department is responsible for implementing and monitoring the vitamin A supplementation programme. The PHD and Nutrition Focal Point (NFP) ensures ODs have adequate supplies of vitamin A, supports ODs in planning and implementing vitamin A supplementation activities, monitors activities at the district and health centre levels, compiles and analyzes coverage data, and provides programme feedback to the ODs. The designated PHD Nutrition Focal Point (NFP) should ensure that HIS reports are completed and sent on time (that include vitamin A coverage) to the Department of Planning and Health Information (DPHI) and NNP using the PRO4 form which is submitted on a monthly basis. Provincial hospitals report quantities distributed using the HO2 form which is submitted to the PHD on a monthly basis.

### *2.6.3 Operational District*

The OD submits a quarterly request for vitamin A supplements from the CMS and ensures the OD, referral hospitals, and health centres and health posts have adequate stocks for eligible children and postpartum women. The OD coordinates with health centre staff to conduct vitamin A supplementation, monitors activities at the health centre level, compiles and analyzes coverage data, and provides feedback to health centres. The OD Nutrition Focal Point needs to coordinate with OD pharmacists and HIS person to ensure sufficient vitamin A supplements for target groups and to ensure that HIS reports are completed and submitted on time (that include vitamin A coverage) to the PHD on a monthly basis using the DO3 form. Referral hospitals report quantities distributed using the HO2 form which is submitted to the OD on a monthly basis (Figure 3).

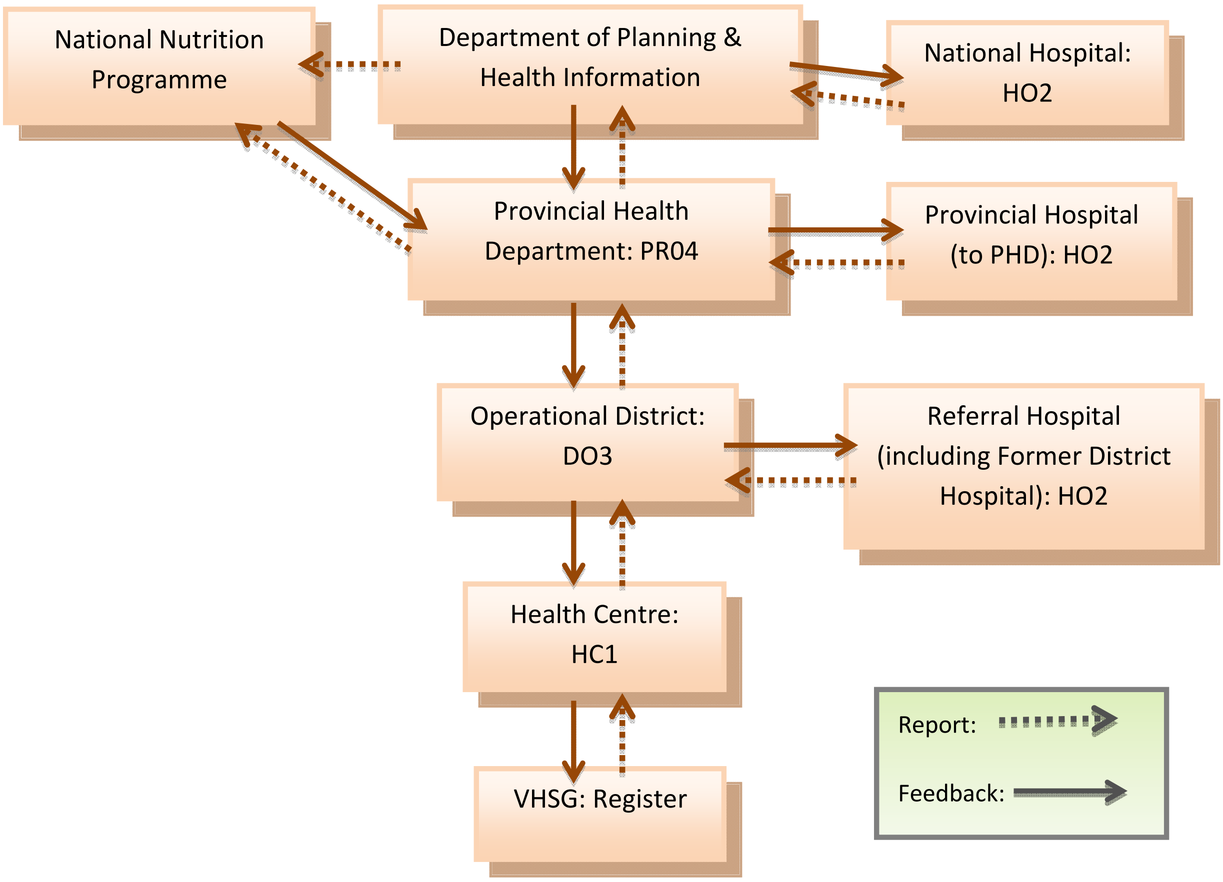


**Figure 3. Health Information System (HIS) for tracking and reporting vitamin A coverage**

Provincial and district staff should also be responsible for identifying and developing strategies for accessing hard to reach populations in remote and urban poor areas. The hard to reach is comprised of those living in very remote areas, areas with no health center or limited health center staff, minority tribes, and floating communities. PHD and OD Nutrition Focal Points should map their catchment populations by geographic area based on available data sources (e.g. HIS, Health Coverage Plan, CAS, CDHS) and develop strategies for accessing the hardest to reach groups based on practical considerations and programmatic realities.

### *2.6.4 Health Centre*

Health centres are responsible for conducting vitamin A supplementation in their respective catchment areas, for both universal supplementation and treatment. This includes maintaining adequate supplies, planning semi-annual distribution rounds for children 6-59 months, and ensuring vitamin A supplements are provided to postpartum women within the first 6 weeks after delivery. Health center should prepare distribution schedules and informs VHSGs and local authority of the schedule. Health centre staff provide health education during outreach sessions, record vitamin A distributed on the Tally Sheet and report on the HC1 form which is submitted to the OD on a monthly basis. The use of Child Health Card (Yellow Card) and Mother's Book for documenting the date and dose of vitamin A should be emphasized by health workers.

### *2.6.5 Community (village)*

Village Health Support Groups (VHSGs) provide support to health centre staff for vitamin A supplementation at the community level. This includes registering and tracking the number of children 6-59 months and the number of postpartum women, and mobilizing communities to participate in monthly health centre outreach sessions. Some VHSGs provide vitamin A to children who are missed during the semi-annual rounds (May and November) and to postpartum women within 6 weeks after delivery; these are considered "mop-up" activities.

For children not reached through routine outreach distribution channels, special outreach activities should be conducted to ensure coverage of this group. In urban areas, this includes the very poor, those living in informal settlements, and transient/migrant populations. For example, in Phnom Penh, the current practice of vitamin A distribution for children 6-59 months through VHSGs, under the supervision of health center staff, should continue.

VHSGs can assist health centre and district staff in identifying where hard to reach and vulnerable children live so they can be accessed by health centre staff with transportation.

## 2.7 Monitoring and Evaluation

The NNP monitors the effectiveness of the vitamin A programme. Programme impact is primarily assessed through nation-wide surveys (CDHS, CAS). Key indicators for assessing process and impact are presented in Table 11.

**Table 11. Vitamin A supplementation: process and impact indicators**

| Process indicators | Data sources |
|---|---|
| 1. % of children 6-59 months who receive vitamin A at each supplementation round<br>2. % of women within 6 weeks after delivery who receive vitamin A | HIS data |
| **Impact indicators** | **Data sources** |
| Clinical indicators<br>• Prevalence of night blindness in pregnant women<br>• Prevalence of night blindness in children | CDHS |
| Biochemical indicators<br>• Serum retinol; retinol binding protein | Micronutrient Survey |
| Health and Nutrition indicators<br>• Under-5 mortality<br>• Anthropometric indicators<br>• LBW prevalence<br>• IYCF indicators<br>• Market and household availability of vitamin A-rich foods (plant vs. animal)<br>• Dietary consumption | CDHS<br>FAO Food Security Data<br>Food Consumption Surveys |
| Disease-related indicators<br>• Measles case fatality rate<br>• Immunization coverage rates<br>• Diarrhea and ARI prevalence rates | NIP<br>NIP<br>CDHS |

# 3. IRON/FOLIC ACID (IFA)

## 3.1 INTRODUCTION

Anemia is a serious public health problem affecting more than 2 billion people globally[69]. Iron deficiency is the leading nutritional cause of anemia accounting for over half the cases worldwide. Iron deficiency anemia (IDA) is a severe form of iron deficiency with symptoms often going undetected except in the most severe cases.

The consequences of anemia are far reaching, impacting almost every aspect of life from cognitive to physical development as well as productivity at the individual, as well as national level when the prevalence is widespread[70, 71]. The most serious negative consequences include increased risk of maternal and child mortality, still births and low birth weight babies[20, 72]. Recent research has demonstrated that it is not only severe anemia that increases the risk of maternal mortality but any anemia, with risk decreased by about 20% for each 1 g/dL increase in hemoglobin [73].

The population groups most vulnerable to developing iron deficiency or IDA are infants, children, and women of reproductive age due to the increased iron needs during rapid growth stages and/or blood loss related to menstruation and childbirth. Iron deficiency and IDA may be due to a number of interrelated factors including low dietary intake of bioavailable iron[74], increased requirements during pregnancy and other growth periods, repeated pregnancies, and closely spaced births[75, 76].

In addition, infectious diseases – particularly malaria, helminth infections and other infections such as tuberculosis and HIV/AIDS – are important factors contributing to the high prevalence of anemia in many populations[77, 78] *P. falciparum* malaria causes a profound anemia during and after acute infection through hemolysis of red cells and suppression of erythropoiesis[79]. The associated anemia contributes significantly to maternal and child mortality in malaria endemic regions making controlling both malaria and anemia essential for reducing related mortality and morbidity among women and children.

Helminth infections, particularly hookworms, cause intestinal blood loss, thus contributing to the etiology of anemia[80-82]. A moderate infection of hookworms approximately doubles the iron losses of woman of reproductive age[77, 80]. At the population level, endemic hookworm infection contributes to the prevalence of anemia and has the greatest effect on the prevalence of moderate and severe anemia. The prevalence and intensity of hookworm infection increases with age, so that its effect is greatest on the iron status of school-age children, adolescents, and adults, including pregnant women.

Deficiencies of other micronutrients including vitamin B12, folate, and vitamin A can cause anemia, although the magnitude of their contribution is unclear in Cambodia[78]. Furthermore, the impact of hemoglobinopathies on anemia prevalence needs to be considered, particularly in Cambodia where a high prevalence of thalassemias has been repeatedly documented[83-87]. Most recently, the results from the "Good Food for Children" ("*Combating anaemia and micronutrient deficiencies among young children in rural Cambodia through in-home fortification and nutrition education")* study identified over 50% of children as having a hemoglobinopathy (unpublished, 2010).

The prevalence of anemia, defined by low hemoglobin or hematocrit, is commonly used to assess the severity of iron deficiency in a population. Iron deficiency anemia occurs when iron stores are exhausted and the supply of iron to the tissues is compromised. Iron deficiency anemia is a severe stage of iron deficiency in which hemoglobin (or hematocrit) falls below the cutoffs (Table 12). Iron deficiency anemia is defined as anemia with biochemical evidence of iron deficiency. Serum ferritin, transferrin saturation, transferrin receptor, and erythrocyte protoporphyrin are indicators used as biochemical evidence of iron deficiency[88].

**Table 12. Hemoglobin and hematocrit cutoffs for anemia in people living at sea level**

| Age or sex group | Hemoglobin level (g/dL) | Hematocrit below (%) |
|---|---|---|
| Children 6 months to 5 years | 11.0 | 33 |
| Children 5 -11 years | 11.5 | 34 |
| Children 12 -13 years | 12.0 | 36 |
| Non pregnant women | 12.0 | 36 |
| Pregnant women | 11.0 | 33 |
| Men | 13.0 | 39 |

## 3.2 Situation of Iron Deficiency and Anemia in Cambodia

Anemia remains a major public health problem in Cambodia, particularly among women and young children (Table 13). Although the causes of anemia in Cambodia have not been thoroughly documented in the past, World Vision Cambodia conducted a study on the "Prevalence of Common Causes of Anemia among Young Children in Four Provinces of Cambodia" with a final report available in 2011. Other research estimates that approximately 50% of the anemia is caused by iron deficiency with hemoglobinopathies also a major factor in the high prevalence[84-86, 89] . Despite some positive changes in the anemia status of women since 2000 anemia prevalence improved little in the five years between the 2005 Demographic and Health Survey and the MDG-F baseline survey as shown in Table 13. In particular, the prevalence of anemia during pregnancy remains very high when the most serious consequences can occur, although it should be noted that the number of pregnant women assessed in the MDG-F baseline (2010) was small (n=111). A woman's ability to survive bleeding during and after delivery (postpartum hemorrhage) is greatly reduced if she is anemic. Maternal mortality in Cambodia is unacceptably high at 461 maternal deaths per 100,000 live births (General Population Census, 2008) and worldwide anemia is believed to contribute to ~20% of maternal deaths[20, 90].

Cambodia set a target for the reduction in the prevalence of anemia among pregnant women in 2010 at 39% and other groups as noted in Table 13, while it is clear from the MDG-F baseline data that this has not been reached in the 4 provinces surveyed (2010 DHS data will be available in early 2011).

**Table 13. National Nutrition Program – trends and targets on anemia for women 15-49 years and children**

| Target Group | Hemoglobin | CDHS 2000[1] | CDHS 2005[2] | Target 2010 | MDG-F baseline 2010[3] |
|---|---|---|---|---|---|
| Non-pregnant Women | <12 g/dL | 58% | 47% | 32% | 56% |
| Pregnant Women | <11 g/dL | 66% | 57% | 39% | 88%[4] |
| Children | <11 g/dL | 63% | 62% | 35% | 78% |

[1]Cambodia Demographic and Health Survey 2000
[2]Cambodia Demographic and Health Survey 2005
[3]Baseline Survey for the Joint Programme for Children, Food Security and Nutrition in Cambodia (Spanish Millennium Development Goal Fund)
[4]Note - sample size was small (n=110)

The lack of progress towards the 2010 target is likely to be due to a number of factors, but further investigation is needed to clarify the influence of each. Disease states, diet, and genetic factors are all possible causes. An inadequate intake of "bioavailable" dietary iron is a leading cause of iron deficiency anemia and the Cambodian diet is particularly limited in bioavailable iron as it is primarily plant based. Bioavailability refers to the amount ingested and actually absorbed and is highly dependent on the composition of the diet. Iron found in animal foods ("heme" form) is much more readily absorbed than iron found in plant foods ("non-heme" form) which is affected by a number of absorption inhibiting factors and few absorption enhancing factors as shown in Table 14[91-93]. Heme iron is not impacted by factors other than an individual's deficiency state in which absorption increases to try and compensate for low levels of iron in the body. Food sources of heme iron, such as red meat, are not consumed frequently in Cambodia. Germination and fermentation of cereals and legumes improves the bioavailability of iron by reducing the content of phytates, although these are not common practices in Cambodia[94].

**Table 14. Substances that inhibit or enhance non-heme iron absorption**

| Dietary Factor | Food Sources | Inhibit or Enhance |
|---|---|---|
| Tannins | Tea or coffee | Inhibit |
| Oxalates | Green leafy vegetables | Inhibit |
| Phytates | Whole grains, legumes | Inhibit |
| Fiber | Whole grains, legumes, vegetables | Inhibit |
| Meat, fish, poultry factor | Meat, fish or poultry | Enhance |
| Vitamin C, citric acid | Guava, citrus fruits, papaya, passion fruit, some vegetables | Enhance |

Currently, the main strategy for reducing anemia targets pregnant women by providing them with 90 iron/folic acid tablets during pregnancy and 42 tablets postpartum. Cambodia has made considerable progress since 2000 with regard to the distribution and consumption of iron/folic acid supplements with 93% of pregnant women reporting having been given 90 tablets according to the MDG-F baseline survey (2010 in 4 provinces); however, only 42% of the women reported taking all 90 tablets (Table 15). This may be due in part to the late stage of pregnancy in which they received antenatal care, and a lack of understanding of the importance of the supplements for their infants as well as their own health. Most women did not know how many tablets they were to take during pregnancy (only 43% said 90) and even fewer knew the number that should be taken postpartum (3.6% said 42). With regard to food sources of iron, most women did not correctly identify meat in the MDG-F baseline, and most erroneously believe that green leafy vegetables are a good source of iron. Considerable work needs to be done in improving women's knowledge and understanding of the importance of iron/folic acid and good dietary sources of iron.

**Table 15. Trends in iron/folic acid supplementation coverage in Cambodia**

| Indicator | CDHS 2000[1] | CDHS 2005[2] | CAS 2008[3] | MDG-F baseline 2010[4] |
|---|---|---|---|---|
| Pregnant women who received 90 tablets | No data | 62% | 83% (HIS 2009) | 93% |
| Pregnant women who reported taking 90 tablets | 2% | 18% | 40% | 42% |
| Postpartum women who received 42 tablets | No data | No data | 33% | No data |
| Postpartum women who reported taking 42 tablets | No data | No data | No data | No data |

[1]Cambodia Demographic and Health Survey 2000
[2]Cambodia Demographic and Health Survey 2005
[3]Cambodia Anthropometric Survey 2008
[4]Baseline Survey for the Joint Programme for Children, Food Security and Nutrition in Cambodia (Spanish Millennium Development Goal Fund)

In addition to iron/folic acid, women are to receive Mebendazole after the first trimester of pregnancy and also during their first postpartum contact. Due to the importance of deworming in preventing anemia in Cambodia, coverage with Mebendazole must be addressed alongside efforts to increase iron/folic acid coverage.

## 3.3 INTERVENTION STRATEGIES FOR ADDRESSING IRON DEFICIENCY AND ANEMIA AMONG PREGNANT AND POSTPARTUM WOMEN

While the focus of this policy is on iron/folic acid supplementation, supplements should be viewed as one of several tools in the battle against iron deficiency anemia, which includes food based strategies, deworming, and malaria prevention and control.

### *3.3.1 Overview of strategies for the prevention and control of iron deficiency and anemia among pregnant and postpartum women*

1. Dietary diversity and modification
2. Food fortification
3. Helminth control
4. Malaria control

5. Reproductive and obstetric strategies
6. Public health measure for disease control
7. Supplementation with iron/folic acid

#### 3.3.1.1 Dietary diversification and modification

Improving iron status is not only dependant on the amount of dietary iron consumed but the overall composition of the diet as numerous factors can inhibit or enhance iron absorption (Table 14). Current strategies to modify and diversify the diet include increasing food production, promoting consumption of iron rich foods, primarily those that are sources of heme iron, and decreasing consumption of iron absorption inhibitors such as tea[74, 95]. For pregnant and lactating women, the starting point is to increase overall food consumption, as energy needs are higher than when not pregnant. Increasing food consumption alone may slightly boost iron intake but improving the quality of food in terms of iron content is even more important if there is to be an impact on maternal iron status. As shown in Figure 4, the concentration of iron per kilocalorie consumed needed is highest during pregnancy[96]. Therefore the diet has to be modified accordingly, which means increasing the consumption of foods that are good sources of heme iron, or fortified foods.

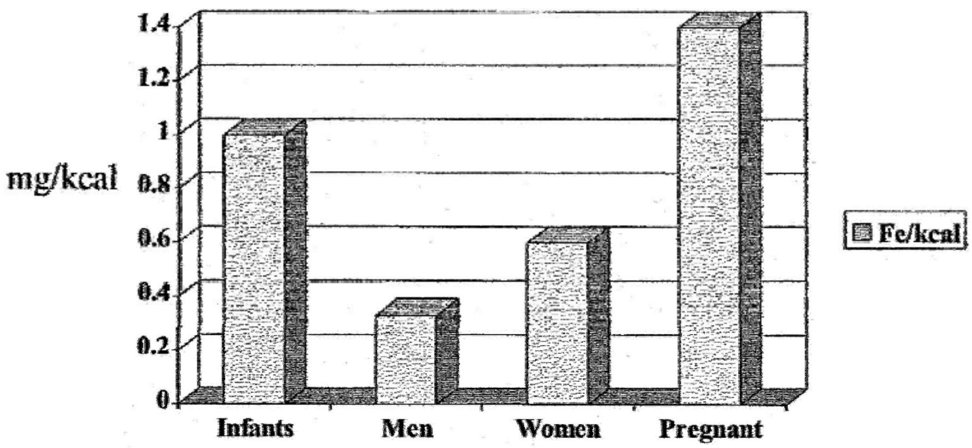


**Figure 4. Iron needs per kilocalorie across the lifespan.**

Adapted from the Institute of Medicine's Dietary Reference Intakes

#### 3.3.1.2 Food fortification

Iron fortification of staple foods or condiments, such as fish sauce, is often considered a good long-term strategy to address inadequate iron intake. In developed countries iron fortification of wheat flour and breakfast cereals is widely practiced but these are not foods commonly consumed in Cambodia. The advantage of fortifying staple foods is that it addresses population needs and does not require dietary behaviour change in the target groups. A key limitation in Cambodia is that the population is primarily rural and they consume little commercially processed food. Identifying an appropriate food vehicle is an issue as rice is the staple food and there are numerous obstacles to fortifying rice with iron. While fish sauce has been successfully fortified in the region, the effectiveness for the target group, pregnant and lactating women, has not been clearly demonstrated as their iron needs are particularly high. Further research in this area is needed as it is recognized that fortification should be a component of a longer-term strategy to reducing anemia and iron deficiency among pregnant and lactating women. Purchasing power of the target group has to be considered in the process.

#### 3.3.1.3 Helminth control

Where hookworm infection is endemic (prevalence 20-30% or higher) and anemia prevalence is high, hookworm infection (*N. americanus* and *A. duodenale*) is likely to be an important cause of anemia, especially moderate-to-severe anemia[73]. Hookworms cause intestinal bleeding, block iron absorption through the mucosa, and consume iron, all of which impact the host's iron status. The amount of blood lost is directly proportional to the number of worms infecting the host. In antenatal care, antihelminthic therapy combined with iron/folic acid supplementation enhances the hemoglobin response to supplementation[97, 98]. Mebendazole is safely administered to pregnant women after the first trimester and to postpartum mothers.

#### 3.3.1.4 Malaria control

*Plasmodium falciparum* malaria causes a profound anemia during and after acute infection. The anemia is caused by hemolysis of red cells combined with suppression of erythropoiesis. Consequently body iron is shifted from hemoglobin to storage forms. Where *P. falciparum* malaria is endemic, the use of insecticide-impregnated bednets in communities decreases the prevalence of severe anemia in young children. Malaria prophylaxis during pregnancy in malaria endemic areas is not practiced in Cambodia.

#### 3.3.1.5 Reproductive and obstetric strategies

Iron deficiency across the lifespan can be reduced through a number of preventative strategies related to reproduction, which can help to reduce iron needs and iron losses. These include the following:

- Prevent adolescent pregnancies, reduce the total number of pregnancies, and increase the time between pregnancies.

Adolescent pregnancies are particularly undesirable for women as this is still a period of growth and growth stops when an adolescent girl becomes pregnant[99, 100]. Also, an adolescent woman's iron reserves may not be adequate to meet the needs of pregnancy in addition to her own needs during this period. Frequent and numerous pregnancies deplete iron reserves and when they are spaced too closely together do not allow time for rebuilding iron stores leaving women vulnerable to severe anemia[75, 76].

- Delay cord clamping

After delivery of the baby, more blood cells are transferred from the placenta to the newly born infant if the umbilical cord is not clamped and ligated until it stops pulsating. By holding the infant on the mother's abdomen, continued blood flow to the infant is allowed without an excess risk of polycythemia (i.e. the baby getting too many red blood cells). This increases the body iron content of the infant, thus helping to prevent iron deficiency in later infancy[101, 102].

- Promote exclusive breastfeeding

The promotion of exclusive breastfeeding for 6 months followed by breastfeeding with complementary feeding until 2 years of age or longer will contribute to the control of iron deficiency anemia in women of reproductive age through lactational amenorrhea[75].

#### 3.3.1.6 Public health measures for disease control

In addition to controlling hookworms and other parasites through direct measures, other public health measures that address sanitation and hygiene are important for reducing the burden of disease in Cambodia.

HIV/AIDS is also associated with anemia and iron deficiency[103]. Both the disease and its treatment increase the risk of anemia and treatment of anemia along with the provision of anteretorviral drugs is correlated with improved survival and quality of life measures.

#### 3.3.1.7 Iron/folic acid supplementation

The supplementation policy is based on existing "National Guidelines for the Use of Iron Folate Supplementation to Prevent and Treat Anemia in Pregnant and Postpartum Women". Developed in 2007. The recommended dose of iron in pregnancy and during the postpartum period is 60 mg per day. Iron/folic acid should be started as soon as possible in pregnancy and at the first postpartum contact. This dose should provide adequate supplemental iron to women who do not have clinically diagnosed anemia if it is given for an adequate duration[104-106].

Supplementation with 400 µg per day of folic acid around the time of conception significantly reduces the incidence of neural tube defects, a group of severe birth defects[107, 108]. Folic acid supplementation begun after the first 28 days of pregnancy is too late to prevent neural tube defects although there are still benefits to intake that begins later in pregnancy. A daily dose of 400 µg of folic acid is a safe and healthy intake for women during pregnancy and lactation but is more than the amount required to produce an optimal hemoglobin response in pregnant women. Nevertheless, iron supplements containing 400 µg folic acid are recommended as pregnancy increases the need for folic acid due to its role in cell division.

The percentage and amount of iron in some commonly used iron compounds is given in Appendix 1.

## 3.4 TARGET GROUPS FOR IRON/FOLIC ACID SUPPLEMENTATION

### *3.4.1 Protocol for iron/folic acid supplementation for pregnant and postpartum women*

The high physiological requirement for iron in pregnancy is difficult to meet with most diets, particularly those that are plant based containing a high level of inhibitors of iron absorption and few enhancers, as is the diet in Cambodia. Therefore, it is recommended that pregnant women should routinely receive iron supplements in almost all contexts in accordance with the guidelines in Table 16. Where the prevalence of anemia in pregnant women is high (40% or more), supplementation should be continued in the postpartum period. This will enable women to acquire adequate iron stores. Complementary parasite control measures in pregnancy and postpartum are presented in Table 17.

**Table 16. Guidelines for iron/folic acid supplementation for pregnant and postpartum women**

| Dose | Timing |
|---|---|
| 60 mg iron and 400 µg folic acid daily | At first contact give 60 tablets |
| 60 mg iron and 400 µg folic acid daily | At second contact give 30 tablets |
| 60 mg iron and 400 µg folic acid daily | During the postpartum period give 42 tablets at first postpartum contact |

Note: When giving iron/folic acid supplement, it is important to provide information about possible side effects and how to avoid troublesome side-effects.

Possible side effects of iron/folic acid supplementation:

- Epigastric discomfort, nausea, diarrhea, or constipation may appear with a daily dose of 60 mg or more. If these symptoms occur, supplement should be taken with meals.
- Faeces may turn black, which is not harmful. Treatment should continue.
- All iron preparations inhibit the absorption of tetracyclines, sulphonamides, and trimethorprim. Thus, iron should not be given together with these agents.
- High-dose vitamin C supplements should not be taken with iron tablets, because this would likely cause epigastric pain.

**Table 17. Complementary parasite control measures in pregnancy and postpartum**

| Dose | Timing |
|---|---|
| Mebendazole 500 mg single dose | After the first trimester of pregnancy |
| Mebendazole 500 mg single dose | Give during first contact in the postpartum period |

**Screening of pregnant women living in malaria endemic areas who are anemic**

Malaria in pregnant women has the same features as in adult malaria except that the risk of evolution into severe or complicated malaria in case of infection by *P. falciparum*, is faster and relapses in infections by P. vivax are more common. Anemia is a common complication of malaria in pregnant women. If a pregnant or postpartum women living in a malaria endemic area is anemic rule out malaria infection. If positive treat as advised in the National Malaria Guidelines.

Note: In Cambodia malaria prophylaxis is not routinely given to pregnant women living in malaria endemic areas.

## 3.5 Treatment of Anemia in Pregnant and Postpartum Women

Treatment of mild or moderate anemia (hemoglobin 7.0g/dL-<11.0 g/dL or hematocrit 21-<33%) can occur at the Health Facility Level. Where hemoglobin testing is not available the WHO "Palmar Pallor" photographs may be used (IMCI photographs Appendix 2).

Treatment for anemia is outlined in Table 18. Advise the pregnant or postpartum woman to take one tablet in the morning with the morning meal, and one in the evening with the evening meal. Follow up after 14 days to ensure that the condition has not worsened. If the condition has worsened the women may be in need of further medical attention and should be referred for assessment, as iron deficiency is not the only cause of anemia. Other possible causes include malaria, folate or vitamin B12 deficiency, hemoglobinopathies such as thalassemias, and the anemia of chronic disorders such as HIV infection, tuberculosis, or cancer.

Treatment should continue for three months and the protocol repeated if the woman is still anemic at the end of this period of time.

**Table 18. Guidelines for oral iron/folic acid therapy to treat anemia**

| Target Group | Dose | Duration | Follow up |
|---|---|---|---|
| **Mild or moderate** (Hb 7.0-<11.0 g/dL or hematocrit 21 -<33%) | 60 mg iron/ 400 µg folic acid 2 times per day | 3 months | Request the woman to return for follow up after 14 days[1] |
| **Severe** (Hb <7.0 g/dL or severe palmar and conjunctival pallor)<br>• Pregnant (gestation < 36 weeks) and postpartum women – refer to nearest referral hospital | 60 mg iron/400 µg folic acid 2 times per day[2] | 3 months | Request the woman to return for follow up after 14 days |
| • Pregnant (36 gestation weeks and over)<br>WOMAN SHOULD BE HOSPITALIZED UNTIL DELIVERY | 60 mg iron/400 µg folic acid 2 times per day[2] | 3 months | |
| Note: If the patient remains anemic after 3 months of treatment, 2 tablets of iron/folic acid per day should be given for a further 3 months. | | | |

[1]The purpose of this follow-up is to refer individuals who may be at risk and are in need of further medical attention. Specifically, individuals should be referred for assessment if their condition has worsened or they are not showing any sign of improvement.

[2]Initiate treatment but if severe anemia is clinically or biochemically diagnosed, refer immediately to hospital.

### 3.5.1 Detection of severe anemia

If the hemoglobin or hematocrit can be determined, cutoffs of hemoglobin below 7.0 g/dL or hematocrit below 20% should be used to define severe anemia. Severe anemia is defined clinically as a low hemoglobin concentration leading to cardiac decomposition, which is defined as the point that the heart cannot maintain adequate circulation of the blood. A common complaint is that individuals feel breathless at rest. If the hemoglobin or hematocrit cannot be determined use the WHO Palmar Pallor photographs to estimate the severity of the anemia[109]. (See details in appendix 2)

### 3.5.2 Referral and treatment of severe anemia

Severe anemia usually comprises a small proportion of the cases of iron deficiency in a population but may cause a large proportion of the severe morbidity and mortality related to iron deficiency. Once a pregnant woman is determined to have severe anemia, she should be referred to the nearest referral hospital where she can be fully assessed and treated accordingly. If a pregnant woman is beyond 36 weeks gestation she should be immediately transferred to a hospital (i.e. in the last month of pregnancy) or if signs of respiratory distress or cardiac abnormalities (e.g. labored breathing at rest or edema) are present. Pregnant women with severe anemia who are 36 weeks pregnancy or over should be hospitalized until their delivery.

It is expected that if the anemia is caused by iron deficiency and compliance is good, hemoglobin will increase by 0.7-1.0 g/dL after one to two months of supplementation. After 3 months of treatment pregnant or postpartum women should continue preventive regimen unless they are still anemic in which case treatment levels should be continued for 3 more months.

With regard to parasite control during pregnancy the guidelines given in Table 19 should be followed. Women should also receive 500 mg of Mebendazole at their first postpartum contact.

**Table 19. Complementary parasite treatment for individuals with severe anemia**

| |
|---|
| As hookworms are endemic in Cambodia (prevalence 20-30%). Mebendazole single dose of 500 mg should be given to all women with severe anemia.<br>If the affected woman is in the first trimester of pregnancy, delay giving Mebendazole until the second trimester of pregnancy (when the uterus can be easily palpated). |
| **In areas where *P.falciparum* is endemic** |
| If a pregnant or postpartum woman is severely anemic and living in a malaria endemic area, it is important to check for malaria. If malaria positive, treat as advised per National Guidelines for malaria during pregnancy. |

## 3.6 PROCUREMENT AND DISTRIBUTION

The NNP is responsible for iron/folic acid supply forecasting, submitting annual stock requests, and inventory monitoring. The Department of Drugs and Food (DDF) is responsible for compilation of all requests and submission of requests to the Essential Medical Supply System of the MOH for procurement of iron/folic acid supplements. The supply distribution follows the Essential Medicine Supply System as illustrated in Figure 5.

Operational Districts, national hospitals and provincial hospitals submit a request for iron/folic acid (IFA) to the Central Medical Store (CMS) on a quarterly basis and the CMS distribute IFA to them on a quarterly basis.

Health centers, private health facilities, and referral hospitals submit a request for IFA from OD every month and the OD distribute VACs to them on a monthly basis, as shown in Figure 5 below.

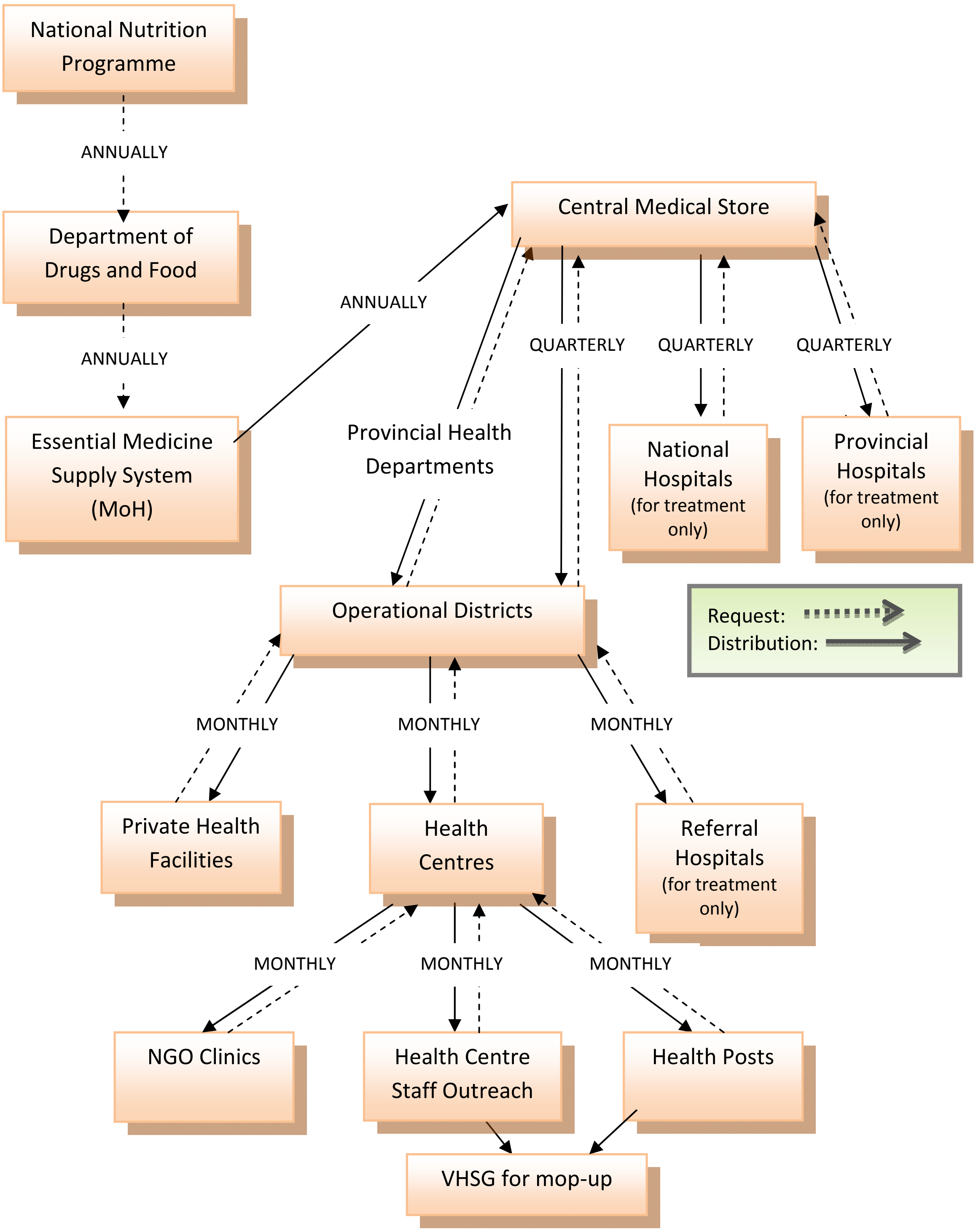


**Figure 5. Request, supply and distribution of iron/folic acid supplements**

## 3.7 PROGRAM MANAGEMENT: ROLES AND RESPONSIBILITIES

This policy and guidelines follow the "National Guidelines for the Use of Iron Folate Supplementation to Prevent and Treat Anemia in Pregnant and Lactating Women", developed in 2007. The roles and responsibilities at the different program levels remain the same although there a greater effort is needed to ensure that all women are provided with IFA supplements early in pregnancy and that compliance to the recommended protocol is improved. In particular, there are many in the target groups who are not being reached due to their geographical inaccessibility or other limitations. Thus, these guidelines recommend that the hard to reach populations/areas should be a strong focus and different distribution strategies employed to reach all women in these areas.

### *3.7.1 National*

The National Nutrition Programme (NNP) is responsible for formulating iron/folic acid (IFA) policies; developing operational strategies, technical guidelines and protocols, training materials, behaviour change communication strategy; and for coordinating and monitoring IFA supplementation activities in conjunction with relevant MoH departments, PHD, OD, and development partners. The NNP orders IFA supplements from the CMS on an annual basis based on quarterly requests received from Operational Districts (ODs). The NNP submits an annual programme report to the MoH and the National Council for Nutrition/Inter-ministerial Technical Committee on Nutrition. National hospitals request supplies of IFA from the CMS for distribution in their facilities and report the quantity distributed to the MoH using the standard national hospital reporting form.

### *3.7.2 Provincial*

The Provincial Health Departments (PHD) is responsible for implementing and monitoring the IFA supplementation programme. The PHD and Nutrition Focal Point (NFP) ensures ODs have adequate supplies of IFA, supports ODs in planning and implementing IFA supplementation activities, monitors activities at the district and health centre levels, compiles and analyzes coverage data, and provides programme feedback to the ODs. The designated PHD Nutrition Focal Point should ensure that HIS reports are completed and sent on time (that include IFA coverage) to the Department of Planning and Health Information (DPHI) and NNP using the PRO4 form which is submitted on a monthly basis. Provincial hospitals report quantities distributed using the HO2 form which is submitted to the PHD on a monthly basis.

For hard to reach areas, provincial and district staff should map their catchment populations by geographic area based on available data sources (e.g. HIS; CAS) and develop strategies for accessing the hardest to reach groups based on practical considerations and programmatic realities.

### *3.7.3 Operational District*

The OD submits a quarterly request for IFA supplements from the CMS and ensures the OD, referral hospitals, health centres and health posts have adequate stocks for pregnant and postpartum women taking into consideration the routine needs and the needs for treatment of anemia. With more health centers doing hemoglobin checks during antenatal visits there may be an increase in the number of women diagnosed with anemia and hence more stock required for treatment. The ODs coordinate with health centre staff to conduct IFA supplementation, routinely monitor activities at the health centre level, compile and analyze IFA coverage data, and provide feedback to health centres. The OD Nutrition Focal Point needs to coordinate with OD pharmacists and HIS person to ensure sufficient IFA supplements for target groups and to ensure that HIS reports are completed and submitted on time (that include IFA coverage) to the PHD on a monthly basis using the DO3 form. Referral hospitals report quantities distributed using the HO2 form which is submitted to the OD on a monthly basis (Figure 6).

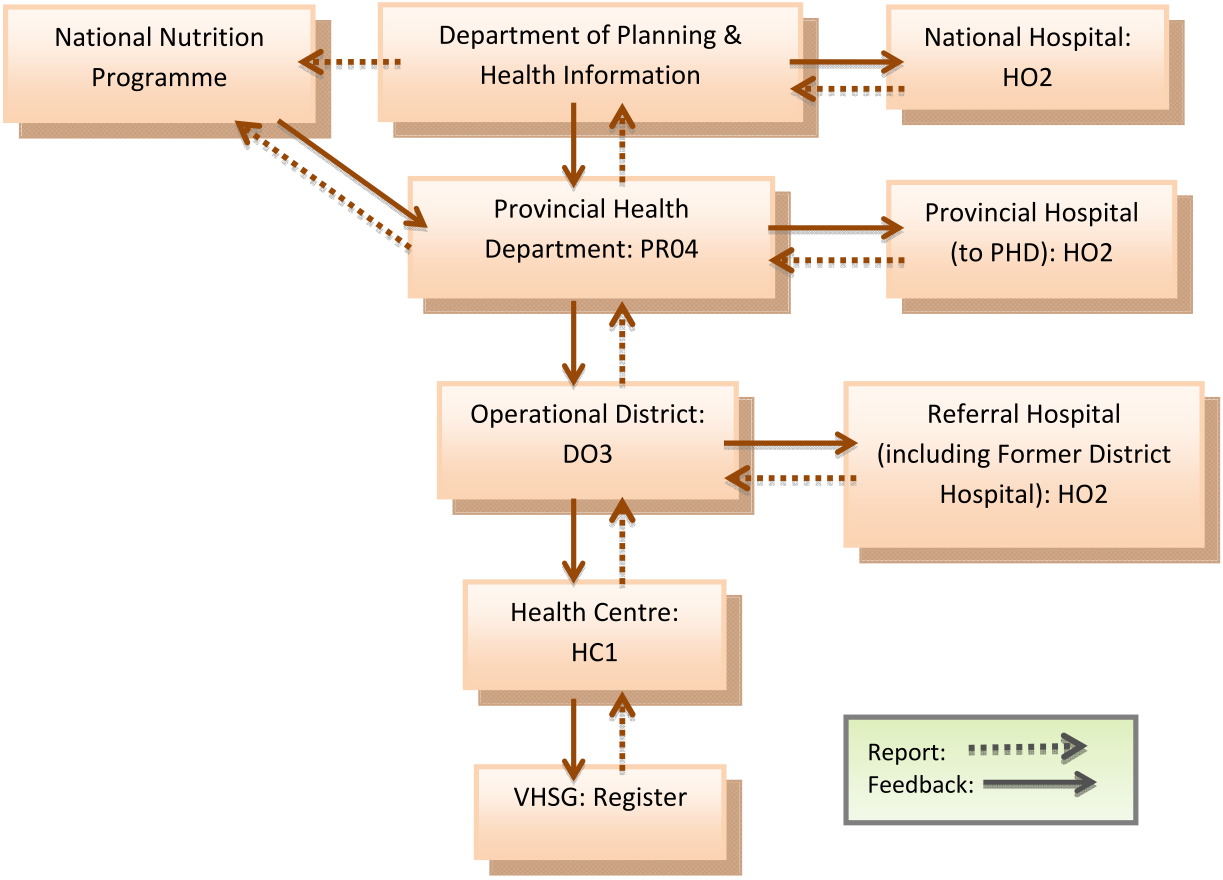


**Figure 6. Health Information System (HIS) for tracking and reporting iron/folic acid supplement coverage**

### 3.7.4 Health Centre

Health education and counseling about anemia prevention and control, including IFA supplementation for pregnant and postpartum women, are delivered through antenatal and postnatal visits at health facilities and during monthly health centre outreach sessions. Health centre staff record the number of women who receive IFA on Tally Sheets during outreach sessions and on log books at the health centre. These data are compiled and reported on the HC1 form which is submitted to the OD on a monthly basis. The use of Mother's Book for documenting IFA supplements received should be emphasized by health workers.

For women delivering at hospitals and private clinics, the provision of a postpartum package containing vitamin A, IFA, and Mebendazole should be provided prior to being discharged from the facility. This will reduce the number of women currently not provided with this critical trio of supplements/drugs soon after delivery because they do not present at health centers for PNC visits or attend outreach sessions. Hospitals and private clinics would report postpartum distribution of vitamin A and IFA to the OD or PHD, as appropriate.

### 3.7.5 Community (village level)

Village Health Support Groups (VHSGs) provide support to health centre staff for IFA supplementation at the community level. This includes tracking the number of pregnant and postpartum women in their village, providing education about the importance of iron supplements and an iron rich diet during pregnancy and the postpartum period, mobilizing the community to participate in outreach activities, and distributing IFA tablets to pregnant and postpartum women (within six weeks of delivery) as part of routine "mop-up" activities. Mop-up activities are defined as those that take place outside routine supplementation provided by Health Center staff during antenatal or postpartum care.

For pregnant and postpartum women not reached through routine distribution channels, special outreach activities should be conducted to ensure coverage of these groups. In urban areas, this includes the very poor, those living in informal settlements, and transient/migrant populations. In rural areas, the hard to reach comprise those living in very remote areas, areas with no health center or limited health center staff, minority tribes, and floating communities.

## 3.8 Monitoring and Evaluation

The NNP monitors the effectiveness of the IFA supplementation programme. Programme impact is primarily assessed through nation-wide surveys (CDHS, CAS). Key indicators for assessing process and impact are presented in Table 20.

**Table 20. IFA supplementation: process and impact indicators**

| Process indicators | Data sources |
|---|---|
| 1. % women who received 90 IFA tablets during pregnancy<br>2. % women who reported taking 90 IFA tablets during pregnancy<br>3. % women who received 42 tablets during 6 weeks postpartum<br>4. % women who reported taking 42 tablets during postpartum period | HIS data/survey<br>Survey<br>HIS data<br>Survey |
| **Impact indicators** | **Data sources** |
| Clinical indicators<br>• Anemia prevalence (clinical symptoms and referral)<br>• Maternal mortality prevalence | HIS and survey |
| Biochemical indicators<br>• Anemia (hemoglobin)<br>• Iron deficiency, iron deficiency anemia (serum ferritin, total iron binding capacity (TIBC), transferrin receptor)<br>• Hemoglobinopathies | Survey |
| Health and Nutrition indicators<br>• Under-5 and infant mortality rate<br>• Anthropometric indicators for women and children (wt/ht. wt/age, ht/age, MUAC, BMI)<br>• Low birth weight prevalence and other pregnancy outcomes | Survey |

# 4. WEEKLY IRON/FOLIC ACID SUPPLEMENTS (WIFS)

## 4.1 INTRODUCTION

Urgent measures are needed in Cambodia to improve the iron status of women of reproductive age (WRA) prior to entering pregnancy, as current approaches have not been adequate. The provision of weekly iron/folic acid supplements (WIFS) to WRA in Cambodia is one of the most relevant nutrition interventions for achieving the MDGs of improving child survival (MDG 4) and maternal health (MDG 5). Research has shown that improving women's iron and folate status not only influences safe motherhood and birth outcomes, but also enhances the health and well-being of WRA by optimizing educational performance and increasing overall productivity, helping with poverty reduction (MDG 1) and gender equality (MDG 3)[110-113].

As noted in the earlier section on iron/folic acid (IFA) supplementation in Cambodia, this approach alone has not proved to be effective in preventing and controlling iron deficiency and anemia. Primarily, this is due to women already being anemic when they enter pregnancy and not being provided with IFA until a point when it is too late to successfully treat their condition. In non-pregnant women, iron deficiency anemia may be reduced by an estimated 0.7-1.0 g/dL after one to two months through supplementation. During pregnancy however, this is not necessarily the case due to the additional iron requirements of pregnancy. Reversing iron deficiency in the third trimester is difficult to attain through supplementation making it imperative that women receive iron earlier. Ideally, women should enter pregnancy without being anemic to reduce their risks of complications at and after delivery.

An improvement in iron status pre-pregnancy is associated with a reduction in maternal mortality, fetal growth retardation, and perinatal mortality. The recent WHO position on providing WIFS (Appendix 3) is in response to the success of numerous programs targeted at improving women's iron and folate status prior to pregnancy, thus reducing iron deficiency anemia as well as the risk of neural tube defects. WIFS has been the policy choice of a number of developing countries including Egypt, India and Vietnam, and they have recently scaled up their programmes.

## 4.2 SITUATION IN CAMBODIA

According to international criteria, iron deficiency (ID) and iron deficiency anemia (IDA) are severe public health problems in a region when the prevalence of anemia in pregnant women is over 40% or anemia in WRA is over 20%. Surveys in Cambodia have consistently found the prevalence of anemia to be above the cutoff of 40% as indicated in Table 13, although ID is rarely measured due to logistical constraints. As anemia has been established as a public health problem with serious implications for women's health, building pre-pregnancy iron stores and preventing anemia in WRA in Cambodia is essential. It is well documented that ID is the single most common cause of anemia in pregnant women as well as the WRA group, which includes adolescent girls post-menarche.

It is unlikely that food based interventions, including dietary diversification and fortification, are going to provide an adequate amount of iron for women in their reproductive years in the near to medium term. In spite of this, continued efforts need to be made to maximize dietary iron consumption and absorption through nutrition education campaigns. Weekly iron/folic acid supplementation should be part of an integrated approach to preventing iron deficiency anemia in Cambodia, which also includes public health measures to reduce helminth and other infections. The results of recent studies in Cambodia have been positive and provide direction for the recommended strategy through lessons learned.

In 2001-2002 the MoH, in collaboration with other ministries and agencies, undertook a pilot weekly iron/folic acid supplementation programme for WRA in Cambodia in selected secondary schools, garment factories, and rural villages. The program utilized social marketing and community outreach and all three groups of women showed considerable improvement in knowledge of the causes, consequences and ways to prevent anemia. The program improved hemoglobin levels among WRA. Further expansion of weekly iron/folic acid programme activities occurred in 2007-2008 with an evaluation of the programme conducted among rural WRA in one OD and schoolgirls in 5 provinces. WRA showed significant improvement in iron stores across the study period with a decrease in the prevalence of iron deficiency and iron deficiency anemia. Programme activities since 2009 involve free distribution of WIFS through health system in six provinces. The NNP plans to expand the programme with the ultimate goal of achieving national coverage.

## 4.3 INTERVENTION STRATEGIES FOR ADRESSING IRON DEFICIENCY AND ANEMIA AMONG WOMEN OF REPRODUCTIVE AGE (WRA)

While the focus of the supplementation strategy for addressing iron deficiency and anemia among non-pregnant women of reproductive age will be the provision of weekly iron/folic acid supplements (WIFS), the strategy should be integrated with other anemia prevention programme components and regularly evaluated for effectiveness

### *4.3.1 Overview of strategies for the prevention and control of iron deficiency and anemia among women of reproductive age*

1. Dietary diversity and modification
2. Food fortification
3. Helminth control
4. Malaria control
5. Reproductive and obstetric strategies
6. Public health measure for disease control
7. Supplementation with weekly iron/folic acid

#### 4.3.1.1 Dietary diversification and modification

Improving iron status is not only dependant on the amount of dietary iron consumed but the overall composition of the diet as numerous factors can inhibit or enhance iron absorption. Current strategies to modify and diversify the diet include increasing food production, promoting consumption of iron rich foods, primarily those that are sources of heme iron, and decreasing consumption of iron absorption inhibitors such as tea. For the majority of women in Cambodia consumption of iron rich foods is limited by availability and accessibility due to their lack of affordability. Dietary modification may be addressed through behaviour change strategies but it is acknowledged that these take time as will improvements in economic status designed to increase purchasing power.

#### 4.3.1.2 Food fortification

Iron fortification of staple foods or condiments, such as fish sauce, is often considered a good long-term strategy to address inadequate iron intake. In developed countries iron fortification of wheat flour and breakfast cereals is widely practiced but these are not foods commonly consumed in Cambodia. The advantage of fortifying staple foods is that it addresses population needs and does not require dietary behaviour change in the target groups. A key limitation in Cambodia is that the population is primarily rural and people consume little commercially processed food outside urban areas. Identifying an appropriate food vehicle is an issue as rice is the staple food and there are numerous obstacles to fortifying rice with iron. While fish sauce has been successfully fortified in the region, the effectiveness for the target group, WRA, has not been clearly demonstrated. Further research in this area is needed as it is recognized that fortification should be a component of a longer-term strategy to reducing anemia and iron deficiency among WRA.

#### 4.3.1.3 Helminth control

Where hookworm infection is endemic (prevalence 20-30% or higher) and anemia prevalence is high, hookworm infection (*N. americanus* and *A. duodenale*) is likely to be an important cause of anemia, especially moderate-to-severe anemia[73]. Hookworms cause intestinal bleeding, block iron absorption through the mucosa, and consume iron, all of which impact the host's iron status. The amount of blood lost is directly proportional to the number of worms infecting the host. Control of hookworm infection is an important intervention strategy for controlling and preventing anemia in all WRA in Cambodia.

#### 4.3.1.4 Malaria control

Malaria is a risk factor for anemia on its own and women who are anemic are more likely to experience malaria that is more severe and of a longer duration. Anemia is related to drug resistance and treatment failure in uncomplicated malaria thus there is a cyclic relationship between malaria and anemia. Reducing the prevalence of anemia among WRA can help reduce malaria related mortality. Patients infected with *P. falciparum* are more likely to become anemic and recover slower than those infected with *P.vivax*.

#### 4.3.1.5 Reproductive and obstetric strategies

For women of reproductive age, iron deficiency across the lifespan can be reduced through preventative strategies related to reproduction, which can help to reduce iron needs and iron losses. These include preventing adolescent pregnancies, reducing the total number of pregnancies, and increasing the time between pregnancies.

Adolescent pregnancies are particularly undesirable for women as this is still a period of growth and growth stops when an adolescent girl becomes pregnancy. Also, an adolescent woman's iron reserves may not be adequate to meet the needs of pregnancy in addition to her own needs during this period. Frequent and numerous pregnancies deplete iron reserves and when they are spaced too closely together do not allow time for WRA to rebuild reserves.

#### 4.3.1.6 Public health measures for disease control

In addition to controlling hookworms and other parasites through direct measures, other public health measures that address sanitation and hygiene are important for reducing the burden of disease in Cambodia.

HIV/AIDS is also associated with anemia and iron deficiency. Both the disease and its treatment increase the risk of anemia and treatment of anemia along with the provision of anteretorviral drugs is correlated with improved survival and quality of life measures.

#### 4.3.1.7 Supplementation with weekly iron/folic acid supplements (WIFS)

Providing WIFS to WRA in Cambodia the recommended policy strategy for the prevention of iron deficiency and anemia across the lifespan. Consumption of WIFS is expected to continue throughout the reproductive life cycle, until other ways of ensuring adequate iron and folate status among women of reproductive age are achieved through dietary improvements which may include fortification as well as increasing and improving dietary diversity. As such, it is recognized that the financial and human resources needed for distribution may exceed current capacity making a dual strategy desirable.

Since ID and IDA in WRA is prevalent across socio-economic situations, a dual approach is recommended comprised of: 1) free distribution of supplements accompanied by nutrition education to women in low socio-economic circumstances, and 2) social marketing of the supplement at a reasonable cost to those WRA who can afford the supplements. This, along with measures to increase consumption of food rich in iron and low in absorption inhibitors, combined with disease prevention strategies, would provide a sustainable solution to improving iron status and reducing anemia among WRA.

## 4.4 Target Population

### *4.4.1 Women of Reproductive Age (WRA) 15-49 years of age (non-pregnant)*

The target population (Table 21) includes all women of reproductive age who are not pregnant and have completed the IFA regimen for postpartum women if they have recently been pregnant. Distinct strategies may be used for designing WIFS programmes for four primary sections of the WRA population: adolescent girls in schools; adolescent girls out of school; women in factories, other workplaces, or institutions; and women in communities. Non-pregnant WRA are a section of the population that is not routinely reached through the health sector so careful consideration must be given to how to access this group.

**Table 21. Guidelines for weekly iron/folic acid supplementation for non-pregnant women**

| Target Group | Dose | Dosage/Frequency |
|---|---|---|
| Women aged 15-49 years | 60 mg iron and 2.8 mg folic acid | 1 tablet per week until pregnant[1] |

[1]Resume WIFS once IFA programme through pregnancy and postpartum is completed
WIFS should be blister packed, 4 tablets per pack – one month supply

Note: Iron supplements are essential for the rapid treatment of iron deficiency anemia in all sex and age groups and weekly iron/folic acid supplements are not a replacement for proper treatment when anemia is diagnosed. Guidelines for treatment shown in Table 22 should be followed where anemia is diagnosed.

**Table 22. Guidelines for oral iron/folic acid therapy to treat anemia in WRA**

| Target Group | Dose | Duration | Follow up |
|---|---|---|---|
| **Mild or moderate** (Hb 7.0-<11.0 g/dL or hematocrit 21 -<33%) | 60 mg iron/ 400 µg folic acid 2 times per day | 3 months | Request the woman to return for follow up after 14 days |
| **Severe** (Hb <7.0 g/dL or severe palmar and conjunctival pallor) – refer to the nearest hospital | 60 mg iron/400 µg folic acid 2 times per day[2] | 3 months | Request the woman to return for follow up after 14 days |
| Note: If the patient remains anemic after 3 months of treatment, 2 tablets of iron/folic acid per day should be given for a further 3 months.<br><br>The purpose of this follow-up is to refer individuals who may be at risk and are in need of further medical attention. Specifically, individuals should be referred for assessment if their condition has worsened or they are not showing any sign of improvement. | | | |

### 4.4.1.1 Adolescent girls (15-19 years of age)

Designing and implementing WIFS programmes for adolescent girls should be a high priority as iron needs are particularly high due to a combination of the adolescent growth spurt and blood loss during menstruation. Building iron stores pre-pregnancy can prevent the most serious complications of ID during pregnancy and delivery and women in Cambodia commonly marry in their early twenties and become pregnant soon thereafter. Moreover, reaching this section of the WRA population is a good start for addressing anemia in WRA since females at this age may be more responsive and motivated to take action when mobilized in school or community groups. It is envisaged that establishing a habit of regularly consuming WIFS in the adolescent years will help build a habit of consuming IFA supplements as adults and also improve compliance during pregnancy. Different strategies may be needed for adolescent girls in school and adolescent girls out of school as estimates of school attendance in girls 15 years of age and older are low (<20%).

#### 4.4.1.2 Women post-adolescence and pre-menopausal (20-49 years of age)

Recognizing that women in this age group as well as those in adolescence generally do not participate in the healthcare system until their first antenatal visit means that alternate methods of reaching them are required. Education materials and messages must be developed that will promote and encourage the consumption of WIFS by women who can afford to purchase them as well as those who cannot.

In situations where WRA can afford to buy the supplements, social marketing has been successfully used as a strategy for reaching non-pregnant WRA. In Cambodia, responses to buying WIFS were better in higher socio-economic groups compared to lower ones[110-112]. Introduction of a social marketing strategy is of particular significance for non-pregnant, non-adolescent women of higher socio economic groups who are also anemic but are not reached by the public health system. Also, purchase of WIFS through a social marketing approach is a sustainable solution since WRA need to consume WIFS throughout their entire reproductive life unless iron rich food or iron/folic acid fortified food is readily available to the population.

The planning and implementation of an effective social marketing programme has demonstrated positive results in terms of demand creation, sustaining satisfactory sales, and high compliance[111]. A successful social marketing strategy requires a quality WIFS product be made available at the correct price and place. Ensuring availability of and access to WIFS at an affordable price in traditional drug stores and in local village or urban shops encourages WRA to buy the supplements as over-the-counter products. Additionally, WIFS can be made readily available and accessible through various groups, including: NGOs, community development programmes, marriage registration systems, community based youth programmes, and networking with organized and non-organized WRA groups employed in factories and other workplaces.

## 4.5 Communication Strategy

One of the most important components of a successful WIFS programmes is the communication strategy. The communication strategy should include the following two primary objectives:

1. Create demand for WIFS
2. Motivate WRA to regularly consume the supplements.

For promoting regular, sustained consumption of WIFS it is critical that the community and recipient understand the benefits of WIFS. This should include all family members as well as the target group. The benefits often reported to influence compliance among WRA include: improved concentration in school, feeling stronger and less tired, increased energy levels and work output, increased appetite, increased earning potential, better sleep, improved skin appearance, regularization of menstruation, and improved pre-pregnancy health.

In Cambodia's earlier programmes, sharing of information on hemoglobin levels was noted to be a motivating factor for secondary school girls to purchase the IFA supplements[111]. While this may not be possible in most situations, it may be considered where feasible.

As with all iron/folic acid supplements, women should be informed of possible side effects such as black stools, nausea and vomiting, although care should be taken to present the information in such a manner that there is less significance attached to negative consequences as compared to the benefits of regular supplementation.

Particularly during the early stages of a WIFS programme care and attention needs to be paid to incorrect rumors that can negatively impact on the success of the programme. In Cambodia, rumors that the WIFS tablets contained amphetamines to make women work harder and also had a contraceptive effect were handled by addressing these issues through a well-planned communication strategy.

## 4.6 Procurement and Distribution

Establishing a mechanism for streamlining an uninterrupted supply of weekly iron/folic acid tablets, whether they are distributed free of cost or through a social marketing strategy, is critical for ensuring a regular supply on a long-term basis.

The annual supply requirement for WRA can be estimated by using the following formula:

[(52 tablets/person/year) x estimated number of WRA recipients projected to be reached]
+ 10% buffer stock

Taking into consideration the resources and storage facility, the entire annual supply of WIFS could be procured at one time to reduce costs since WIFS have a good shelf life. This is currently what the MoH does once per year. Channels for supply of WIFS from production to procurement to service providers to consumers will depend entirely on whether the tablets are distributed free of charge or marketed to WRA. Allocation of resources and defining roles and responsibilities of government sectors, the private pharmaceutical industry, and donors will ensure adequate and consistent supply of supplements.

It is evident from the experiences of the WIFS programmes in various countries that it is not practical or cost-effective to be dependent on a single delivery channel, such as the health care system, to maximize coverage of the target population. Integrating WIFS programmes with other available infrastructure and networks is feasible, sustainable, and more cost effective.

The Department of Drugs and Food (DDF) will forward the request and specifications from the NNP to the Essential Drugs Management System of the MoH for the procurement of WIFS. The CMS will distribute supplements to Operational Districts (ODs) on a quarterly basis. The proposed distribution of WIFS is illustrated in Figure 7.

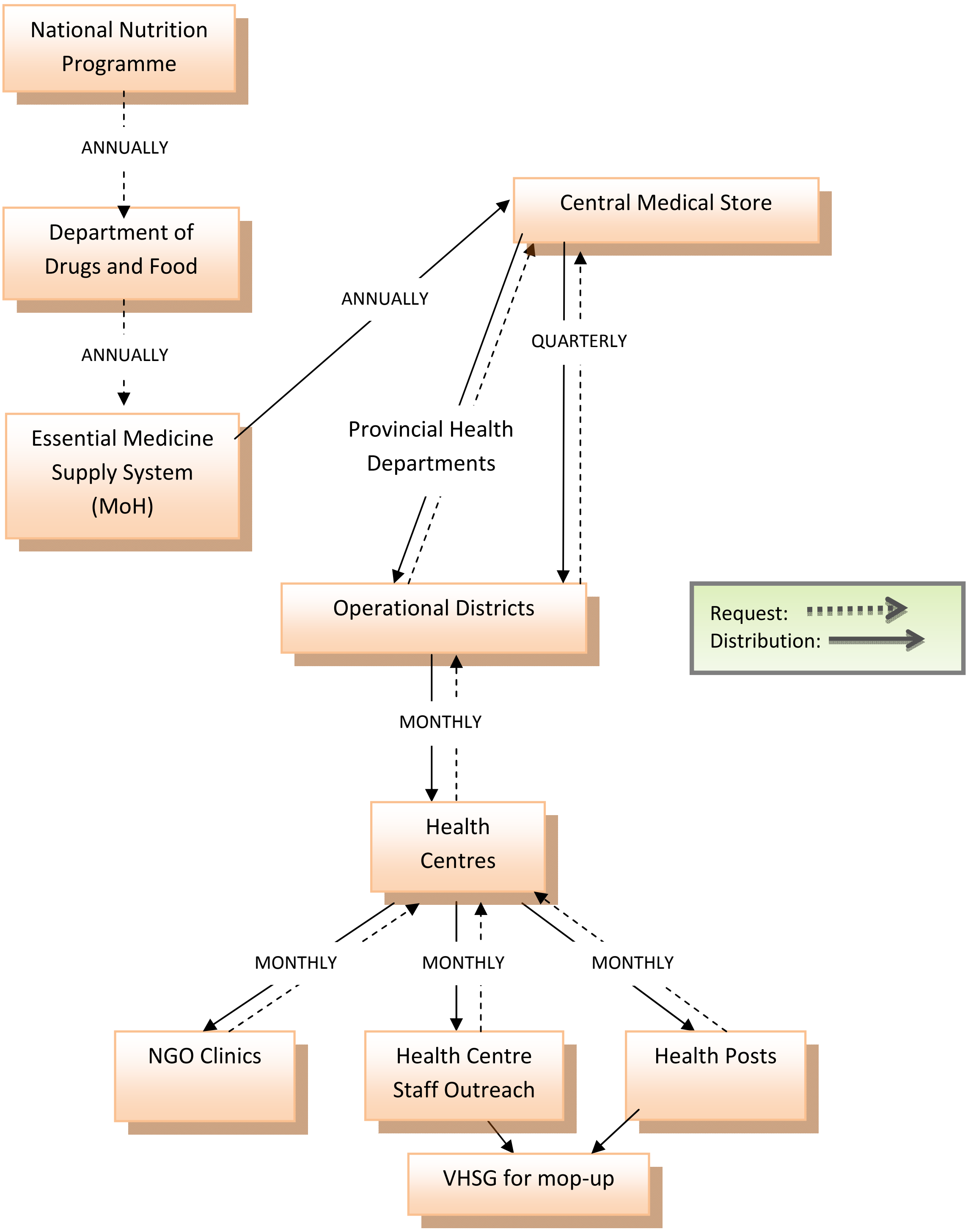


**Figure 7. Request, supply and distribution of weekly iron/folic acid supplements**

## 4.7 Program Management: Roles and Responsibilities

### *4.7.1 National*

The National Nutrition Programme (NNP) is responsible for formulating anemia prevention and control policies; developing operational strategies, technical guidelines and protocols; and will coordinate and monitor WIFS activities in conjunction with relevant MoH departments, ministries and external partners. As with IFA, the NNP will submit an annual WIFS programme report to the National Council for Nutrition. The NNP will develop a Tally Sheet for recording WIFS distribution and will work with the Department of Planning and Health Information to formulate new indicators for WIFS and to include these indicators in the HIS. The NNP will ensure that health staff at all levels are trained on how to fill in the Tally Sheet and reporting form for the distribution of the WIFS.

### *4.7.2 Provincial*

Provincial Health Departments (PHDs) will ensure ODs have adequate supplies of WIFS; support ODs in planning and implementing WIFS activities; monitor activities at the district level; compile and analyze coverage data; and provide programme feedback to the ODs. Like IFA, the designated provincial focal person for nutrition activities (MPA 10) should submit complete and timely (quarterly) HIS reports (that include WIFS coverage) to the Department of Planning and Health Information/NNP using the PRO4 form.

### *4.7.3 Operational District*

Operational Districts (ODs) will order WIFS from the CMS on a quarterly basis and oversee distribution and stock management at the health centres. ODs are to ensure the health centres have adequate supplies for their catchment populations; coordinate with health centre staff to conduct WIFS distribution; routinely monitor activities at the health centre level; compile and analyze WIFS coverage data; and provide programme feedback to health centres. The designated OD focal person for nutrition should submit complete and timely (quarterly) HIS reports (that include WIFS coverage) to the PHD using the DO3 form (Figure 8).

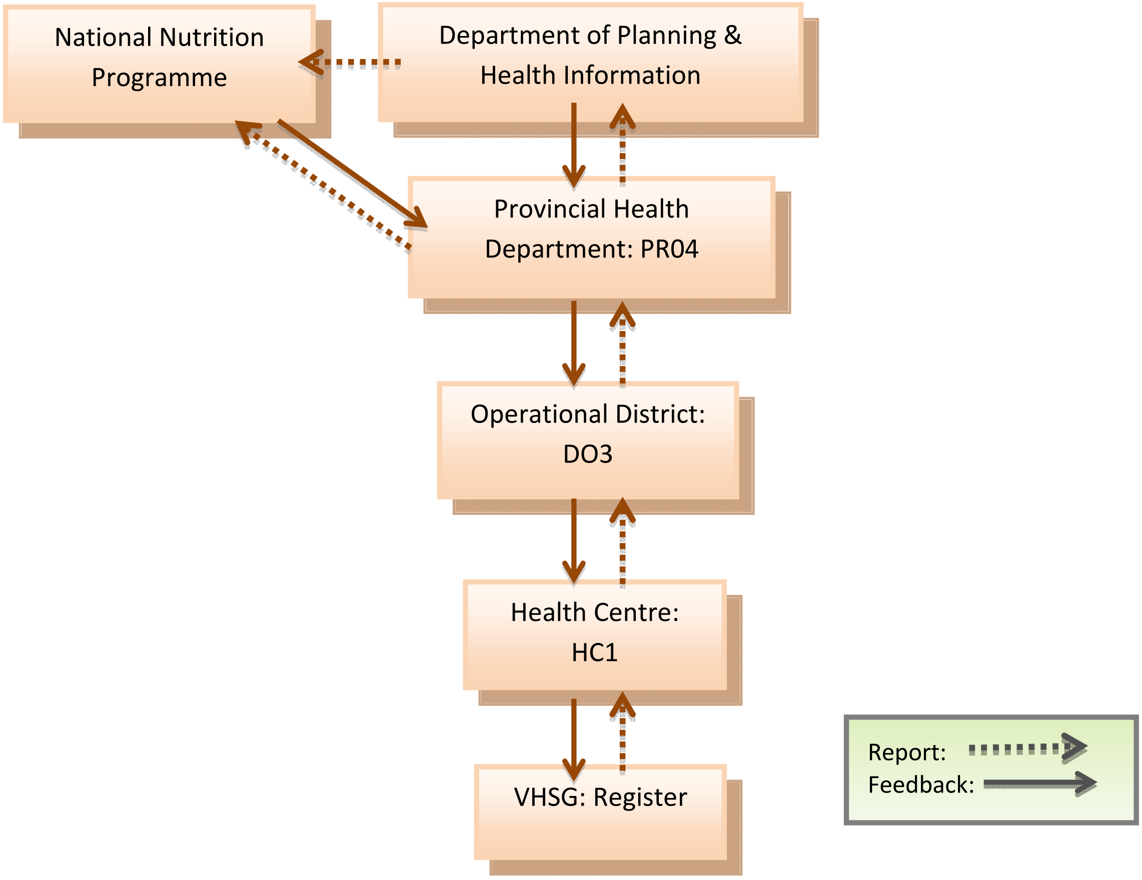


**Figure 8. Health Information System (HIS) for tracking and reporting WIFS coverage**

#### *4.7.4 Health Centre*

Primary distribution of WIFS will be by health centre staff at health facilities and during routine monthly outreaches. Health centre staff will record the number of women who receive WIFS on Tally Sheets during outreach sessions and in registration books at the health centre. These data will be combined with information from other distribution channels and be reported to the OD on a monthly basis using the HC1 HIS form. Women of reproductive age will receive blister packs of a monthly supply, 4 tablets of IFA in the dosage recommended for weekly consumption, on a monthly basis, in combination with anemia prevention education information.

#### *4.7.5 Community (village level)*

Village Health Support Groups (VHSGs) will provide support to health centre staff for WIFS supplementation activities at the community level. This includes tracking the number of women of reproductive age (WRA) in their village; providing education about anemia prevention and control; mobilizing communities to attend outreach activities; and distributing WIFS to WRA who did not receive supplements through any of the other distribution channels. VHSGs will receive supplies of WIFS at their bimonthly meetings at the health centre for monthly distribution to WRA at regular meetings within their communities. As monthly distribution of multiple micronutrient powders (MNPs) to caregivers will also be part of VHSGs' regular activities, having the distribution from the health center and in the communities coordinated through regular meetings will help reduce the burden of the additional activities.

### 4.8 MONITORING AND EVALUATION

Evaluation, including process and impact evaluation, should be integrated into the WIFS programme plan from the beginning and particular attention paid to the results in the initial implementation provinces. Process evaluation provides information to review the effectiveness and constraints of the programme and allows for early modifications decisions to be made. Impact evaluation will help determine if the programme is having the desired impact on hemoglobin levels, anemia prevalence, iron and folate status and other biological parameters. It is recognized that at present, tests for measuring iron stores and folate status are not available in Cambodia although smaller research studies may send blood samples outside the country for evaluation.

Since the WIFS programme, to a great extent, is dependent on achievement of behavioral aims and objectives, it is critical that evaluation design includes assessment of knowledge, attitude and practices of programme agents and beneficiaries, compliance in taking the supplements, and cost per recipient. Annual evaluation for the first five years is recommended by the Global Consultation WIFS for WRA 2007, while close monitoring is considered desirable in the first year**.** Evaluation conducted early in the implementation phase is beneficial in modifying plans and making timely strategic shifts in programme implementation. Recommended biological indicators are presented in Table 23 and are the same as for other components of the anemia prevention and control programme. It should be noted that, as per the recommendation of the Consultation of 2007, the indicators presented are desirable indicators under ideal conditions.

The NNP will monitor the effectiveness of the WIFS programme. Programme impact will be primarily assessed through nation-wide surveys (CDHS and Micronutrient Survey) although regional surveys will be used during the early implementation phases of the programme. Key indicators for assessing process and impact are presented in Table 23.

**Table 23. Weekly iron/folic acid supplementation: process and impact indicators**

| Process indicators | Data sources |
| --- | --- |
| 1. % WRA who received a monthly supply of WIFS<br>2. % WRA who took 1 tablet per week for last 4 weeks<br>3. Number of tablets taken by WRA per week and per month for the last 3 months | HIS<br>Survey<br>Survey |
| **Impact indicators** | **Data sources** |
| Clinical indicators<br>• Anemia prevalence (clinical symptoms and referral)<br>• Maternal mortality prevalence | HIS<br>Survey |
| Biochemical indicators<br>• Anemia (hemoglobin)<br>• Iron deficiency, iron deficiency anemia (serum ferritin, total iron binding capacity (TIBC), transferrin receptor)<br>• Hemoglobinopathies | Survey |
| Health and Nutrition indicators<br>• Under-5 and infant mortality rate<br>• Anthropometric indicators for women and children (wt/ht. wt/age, ht/age, MUAC, BMI)<br>• Low birth weight prevalence and other pregnancy outcomes | Survey |

# 5. MULTIPLE MICRONUTRIENT POWDERS (MNPS)

## 5.1 INTRODUCTION

Appropriate infant and young child feeding (IYCF) that includes adequate vitamins and minerals is essential for survival, growth, and development[114-116]. In Cambodia today, ~80 of every 1000 children will not reach their fifth birthday[27] with over a third of these deaths attributed to malnutrition[15, 117]. Current infant and young child feeding practices have been identified as a key risk factor for child mortality and morbidity. CDHS 2005 reported that 44% of children under 5 years have stunted growth, about 28% are underweight, and over 60% are anemic with even higher rates of anemia among 6-9 month old children (>80%)[27, 118]. Improving the nutritional status of young children is a priority of the Royal Government of Cambodia and strategies are presently being evaluated that focus on improving micronutrient status as well as preventing and treating other forms of malnutrition in children.

Across the lifecycle, the first 2 years of life are recognised as crucial for the development of the brain, motor, and social-emotional skills. Children who suffer from micronutrient deficiencies in early life can experience irreversible damage to their physical and cognitive growth and health[15, 119]. Poor child development is associated with low IQ, poor school achievement, and extends the cycle of undernutrition and poverty.

Current and proposed strategies to improve micronutrient status among children include increasing the variety of foods in the diet, individual supplementation, and staple food fortification[114]. Progress has been made with regard to vitamin A and iodine but for young children the current strategies have had little impact on anemia or iron status, and iron deficiency anemia remains a serious public health problem[66, 74]. Increasing food variety is often not feasible due to lack of availability, affordability, and acceptability of iron rich foods. Dietary sources of iron tend to be expensive for bioavailable forms (heme iron in animal foods) and non-heme iron is poorly absorbed and has not been found to improve measures of anemia among children[92, 120]. The medical approach of iron supplementation with drops or syrup is associated with side effects and compliance is low in regions where this approach has been implemented.

The primary cause of anemia among young children is insufficient bioavailable dietary iron intake in relation to the high iron needs (Figure 9) to support rapid growth and brain development[121, 122]. For young children physiological iron requirements (as shown later in Figure 10) are highest at a time of life when they have limited stomach capacity which makes it difficult in the best of circumstances to consume enough iron rich foods. In Cambodia, the amount of iron available from the diet (FAO) is not adequate to meet most young children's requirements even if feeding practices improved. It is generally recommended that when the amount of bioavailable iron in the diet cannot be immediately improved, iron supplementation is a necessary component of programmes to control iron deficiency anemia. For children in Cambodia, this is the situation at present.

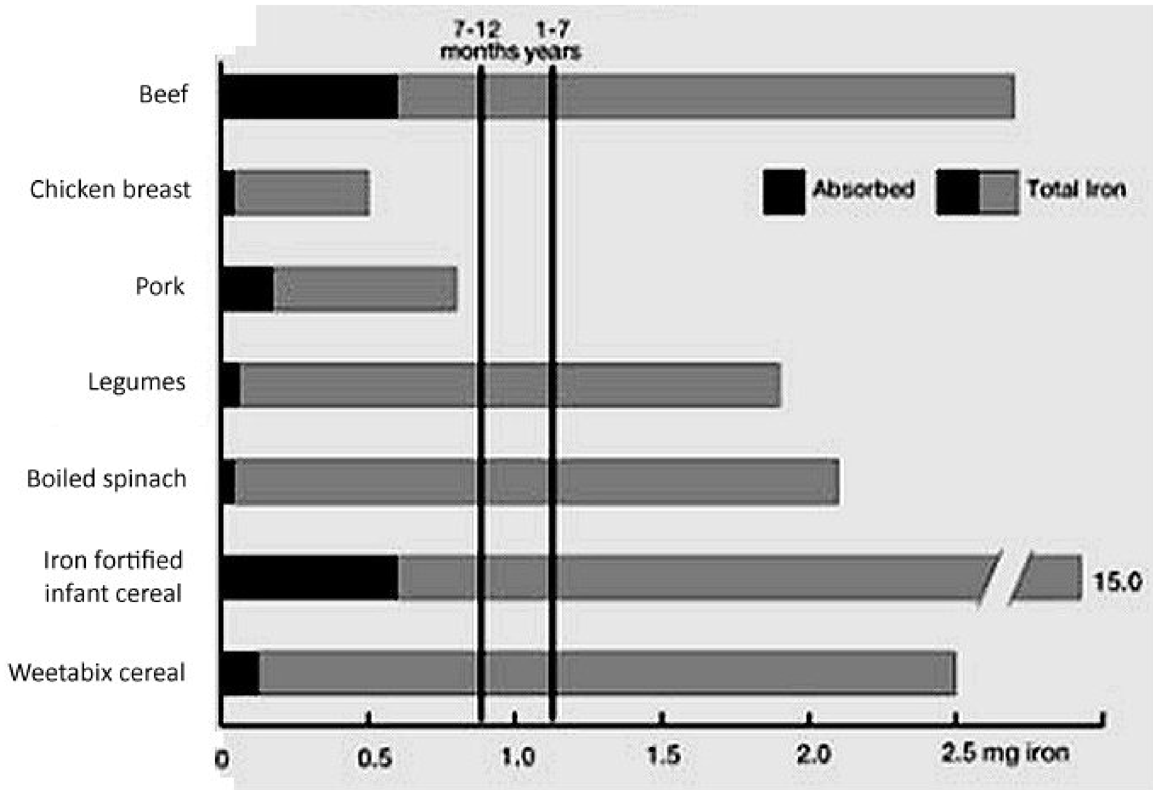


**Figure 9. Iron content and absorption of common foods**

Source: Iron Panel, 2004

Fortifying the food supply with micronutrients is a valid strategy for adults where there is a widely consumed staple food vehicle but not adequate for young children as they consume only small amounts of these foods and the concentration of bioavailable iron is too low to be effective[123-125]. Fortified commercially prepared infant foods are an option but are relatively expensive and are not affordable for most Cambodian families with children at the highest risk of micronutrient deficiencies, particularly iron deficiency anemia.

An alternative strategy to dealing with childhood micronutrient deficiencies is through "in-home fortification," which provides vulnerable populations with a vitamin and mineral preparation that can be easily added directly to foods prepared in the home[74, 126-128]. This concept enables families to fortify their young children's foods at an appropriate and safe level with the needed micronutrients. These preparations are called multiple micronutrient powders or MNPs with "Sprinkles" being the most widely tested worldwide and the product already in use in Cambodia. MNPs have been demonstrated through extensive research to be acceptable, efficacious, and effective at reducing and preventing anemia in young children at scale and are endorsed by UNICEF (2009)[126, 129-132].

The advantages of using MNPs:

- Easy to use and highly acceptable among families and children
- Focus on ages 6-24 months
- A food-based rather than a medical approach
- Do not require literacy
- Do not conflict with breast-feeding practices
- Used to promote timely introduction of complementary foods at 6 months of age and proper complementary feeding practices
- Inexpensive and easy to transport and store

While MNPs are primarily designed to control micronutrient deficiencies, their introduction provides an opportunity to accelerate implementation of the recommended infant and young child feeding (IYCF) strategy, which can lead to reductions in stunting, wasting, and underweight among young children in Cambodia. This has been demonstrated in large-scale effectiveness studies in multiple countries including Ghana, Bangladesh, South Africa, and Mongolia[133, 134]. Lack of appetite is a common side effect of anemia and food intake has been shown to increase among children provided with iron supplements[135, 136]. Therefore, MNPs in combination with appropriate complementary feeding can not only reduce micronutrient deficiencies but indirectly impact overall nutritional status.

### *5.1.1 Evidence of Efficacy and Effectiveness*

Community-based studies on MNPs involving both anemic and non-anemic children have been completed in Northern Canada, China, Bangladesh, India and Pakistan, Ghana, Bolivia, and Haiti, as well as in Cambodia[126, 127, 130, 132, 133, 137-139]. These studies assessed the efficacy, bioavailability, safety, and acceptability of MNPs in diverse settings. Three pilot projects showing effectiveness were done in Bangladesh, Mongolia, and Pakistan[128, 133]. Overall, results show that MNPs are successful in treating and preventing anemia. MNPs were also shown to be well tolerated by children, easy to administer and acceptable to their caregivers. Cure rates of anemia ranged from 49-91%, depending on the confounding presence of other factors that also lead to anemia, such as malaria. In 2003-2004 efficacy studies were performed in Cambodia in order to determine if treatment with multiple micronutrients, in the form of in-home fortification could reduce the prevalance of anaemia. Studies achieved a dramatic reduction in anaemia[140, 141]. Later an effectiveness study conducted in Svey Rieng province among chilldren 6-11 months demostrated that MNPs could be effectively integrated into an IYCF protocl with significant reductions in the prevalence of anemia and improvement in hemoglobin ("Good Food for Children", unpublished). In Cambodia, hemoglobinopathies are also a known risk factor[84, 85].

## 5.2 SITUATION IN CAMBODIA

The prevalence of anemia has been consistently very high among young children in spite of efforts to improve food and nutrition security in Cambodia (Table 24). Of particular concern are the poor infant and young child feeding practices that include a lack of dietary diversity, poor quality complementary foods, a low intake of animal foods as well as inadequate hygiene and sanitation leading to frequent illnesses[2, 27, 95, 118].

**Table 24. Prevalence of anemia among children in Cambodia[1]**

| Age[1] | Cambodia 2000 (n=1461)[2] | CDHS 2005 (n=3156)[3] | MDG-F baseline 2010 (n=1976)[4] |
|---|---|---|---|
| 6-59 months | 63% | 62% | 78% |

[1]Mean age differed with the population in the MDG-F baseline survey being younger
[2]Cambodia Demographic and Health Survey 2000
[3]Cambodia Demographic and Health Survey 2005
[4]Baseline Survey for the Joint Programme for Children, Food Security and Nutrition in Cambodia (Spanish Millennium Development Goal Fund)

Research indicates that a very high percentage of young children are anemic by 6 months of age, a time when iron from breast milk should have helped to protect infants from anemia ("Good Food for Children", unpublished). Reports indicate that excusive breastfeeding rates have sharply increased from 2000 to 2005, although the benefits have not been realized in the rate of anemia in the very young. Children are generally weaned on dilute rice porridge and receive little in the way of animal foods, particularly those containing heme iron, in the first year of life[27, 142].

Diarrhea and respiratory illnesses are very common among Cambodian children in early childhood and combined with helminth infections, compound the high needs for iron during this period of life[5]. Infancy is the period when iron needs per kilogram body weight (Figure 10) are the highest, leaving an inevitable gap between the requirement and intake[96].

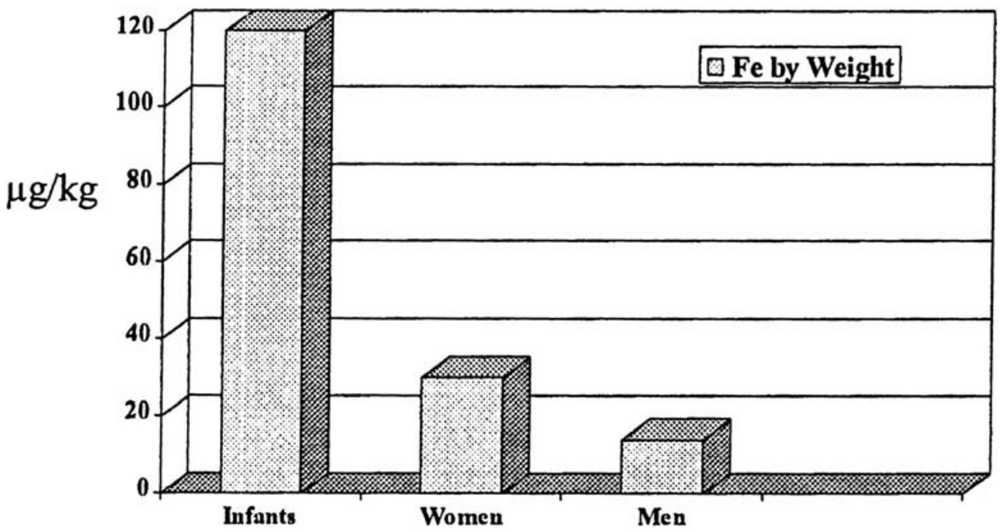


**Figure 10. Iron needs per kilogram body weight**

The unusually high prevalence of anemia at 6 months may also indicate that cord clamping is not being properly conducted in accordance with current recommendations designed to maximize infant iron stores[102, 143]. Improving newborn care can reduce neonatal mortality as well as decrease the risk of iron deficiency anemia.

In Cambodia there is a clear need for low cost scalable approaches to improving nutritional status among young children. MNPs, as part of IYCF programs show consistent results and offer a safe strategy that can reach large numbers of young vulnerable children in a relatively short time period with long lasting results as demonstrated by recent research in Cambodia. The country is ready to move to scaling up MNPs for 6-24 month old children.

## 5.3 Intervention Strategies for addressing iron deficiency and anemia among young children

There are a number of complementary public health strategies that should be integrated into a comprehensive approach to reduce the prevalence of iron deficiency and anemia in young children. These are described below.

### *5.3.1 Overview of strategies for the prevention and control of anemia and iron deficiency among children*

1. Dietary diversity and modification
2. Improved infant and young child feeding
3. Food fortification
4. Helminth control
5. Malaria control
6. Public health measure for disease control
7. Supplementation with iron
8. In-home fortification

#### 5.3.1.1 Dietary diversification and modification

Dietary diversification and modification includes the promotion of a diet with a wider variety of foods that contain large quantities of micronutrients, particularly iron[15, 144]. This intervention is often not adequate to control anemia and iron deficiencies among the poorest populations due to the limited access to foods rich in bioavailable iron such as meat and fish[114]. In some households, foods rich in iron are available but a lack of knowledge means that those most in need, particularly young children, may not receive these foods. For young children, complementary foods must not only be of adequate quality, but the quantity, frequency, and consistency of feeding must also be appropriate. Measures are ongoing in Cambodia to improve infant and young child feeding practices (IYCF) through initiatives such as the Baby Friendly Community Initiative (BFCI) although the impact of such programmes may take some time to be realized.

#### 5.3.1.2 Improved infant and young child feeding practices

Appropriate infant and young child feeding (IYCF) is essential for preventing iron deficiency and anemia in infants and young children[15]. Breastfed infants are considered to be protected against iron deficiency for the first 6 months of life as breast milk contains an adequate amount of absorbable iron. After this period, complementary foods must be introduced to meet not only micronutrient needs but also those for energy and macronutrients. Ideally these foods should provide the extra iron needed for the infant and young child. As complementary foods in Cambodia are generally low in iron, consideration must be given for how to maximize iron intake and absorption. Dietary messages to caregivers should promote iron rich foods for complimentary feeding, primarily those of animal origin such as organ meats (liver) as they are not only high in iron but contain a form of the mineral that is easily absorbed. In addition, where plant foods are the main additional source of dietary iron, consumption of fruits and vegetables rich in vitamin C should be encouraged to promote iron absorption.

#### 5.3.1.3 Food fortification

The fortification of staple foods is likely to increase micronutrient intake for those populations that have access to them. However, infants and children who have a limited capacity to eat large quantities of fortified foods are not likely to benefit significantly from this strategy[145, 146]. In Cambodia, iron fortification of fish sauce is one such strategy but this has limited applicability to the target population for MNPs.

Alternatively, targeted fortification (for example, the fortification of complementary foods such as commercially manufactured infant cereals) as is practiced in the developed world, is an excellent way to increase the intake of micronutrients among infants and young children, especially iron. This form of fortification is largely responsible for the low rates of vitamin and mineral deficiencies observed in industrialized countries but greatly improved economic conditions are required before staple food fortification will reach the majority of those in need in Cambodia[15]. Commercially prepared fortified infant foods are relatively expensive and not affordable for the majority of families with children at highest risk of micronutrient deficiencies.

#### 5.3.1.4 Helminth control

Where hookworm infection is endemic (prevalence 20-30% or higher) and anemia prevalence is high, hookworm infection (*N. americanus* and *A. duodenale*) is likely to be an important cause of anemia, especially moderate-to-severe anemia[73]. Hookworms cause intestinal bleeding, block iron absorption through the mucosa, and consume iron, all of which impact the host's iron status. The amount of blood lost is directly proportional to the number of worms infecting the host. Young children experience frequent hookworm infections and current recommendations are that Mebendazole be provided through the health care system. Regular deworming with Mebendazole is currently recommended for children from 12-59 months twice per year (during the months of May and November) as part of regular outreach services although there are still those in urban and hard to reach areas who may miss out on the distribution.

#### 5.3.1.5 Malaria control

A child is most vulnerable to malaria after 6 months of age when the mother's protective immunity wears off and before the child has established his or her own robust immune system. In Cambodia, 9% of all malaria cases occur in children under age 5. Children with malaria can, in most cases, be quickly and effectively treated with inexpensive oral malaria tablets. Families and communities must be trained to recognize the symptoms of malaria and to seek treatment as quickly as possible. Malaria can be prevented by avoiding contact with mosquitoes through the use of ITNs; eliminating mosquito breeding sites; and spraying households with insecticide to repel or kill mosquitoes. While ITN campaigns have been launched in various areas throughout Cambodia, universal coverage has yet to be achieved in high-risk areas.

#### 5.3.1.6 Public health measures for disease control

As with any anemia, non-diet related factors including a number of disease conditions, may play a large role in the etiology of anemia in infancy and early childhood making public health measures for disease prevention of high importance. In particular, children in Cambodia experience frequent episodes of diarrhea which is often persistent in nature. Diarrhea increases the risk if anemia as what little dietary iron is consumed is not absorbed. Children also experience other infections that induce fever often accompanied by anorexia (lack of appetite). A decreased appetite means a decreased intake. Information from the Cambodian Demographic and Health Surveys and smaller regional surveys indicate that fever and diarrhea are both very common and the interaction of these conditions with malabsorption and appetite suppression contribute to the overall high prevalence of anemia. Improving sanitation and hygiene can help to reduce common diseases that are associated with anemia.

#### 5.3.1.7 Supplementation with iron

Supplementation using preparations such as syrups and crushable tablets is one way to reach infants and young children in families that cannot afford expensive iron-containing or fortified foods. There are, however, numerous practical limitations to this strategy. Challenges with supplementation include sustainability, poor compliance, and reaching those that are most vulnerable[121]. In Cambodia, supplements are recommended for children diagnosed with anemia and low birth weight children from 2-6 months of age although the guidelines are generally not followed.

#### 5.3.1.8 In-home fortification

The “in-home fortification” concept is therefore recommended in Cambodia as it provides a vitamin and mineral preparation that can be easily added directly to young children's foods prepared in the home, enabling families to add an appropriate and safe level of needed iron and other micronutrients. This policy focuses on in-home fortification using multiple micronutrient powders (MNPs) to prevent and control iron deficiency and anemia among young children.

## 5.4 TARGET POPULATION FOR "IN-HOME FORTIFICATION" WITH MULTIPLE MICRONUTRIENT POWDERS

The target population is all children 6-24 months of age with eligibility beginning when a child has reached 6 months of age. The goal is for all children to receive MNPs for 18 months, graduating out of the program when they reach 24 months of age (Table 25). Children who enroll at an age greater than 6 months would not receive the full 18 months of MNPs as they would receive sachets only for the months until they reach 24 months (e.g. a 12 month old child would only be in the programme for 12 months).

**Table 25. Target population for "in-home fortification" with multiple micronutrient powders**

| Target Group | Dose | Dosage/Frequency | Duration |
|---|---|---|---|
| Children 6-24 months | 12.5 mg iron and 14 other micronutrients[2] | 15 sachets per month | 18 months[1] |

[1]Duration maximum 18 months not to exceed 24 months of age
[2]Full list in Appendix 4

Caregivers will be instructed to add the 15 sachets to their child's food over a month period with scheduling being flexible. In other words, caregivers may give the child the MNPs every other day or every day for 15 days of the month as long as all 15 sachets are consumed within the month. The protocol for caregivers is based on the finding that a 'flexible dosage' schedule was actually associated with improved adherence and reduction in anemia compared with a rigid schedule[147].

## 5.5 COMMUNICATION STRATEGIES

Generating political commitment and funding support to address vitamin and mineral deficiencies is a challenge because the symptoms of anemia and the effects of other deficiencies in young children are not always obvious, even to parents. With the introduction of a multiple micronutrient powders programme, communication support at three levels is needed. That support typically includes advocacy to obtain policy support and resources, training and motivational strategies targeting those involved in distributing and promoting MNPs, and effective communication to educate caregivers on how to obtain and effectively use MNPs for in-home fortification to prevent anemia and other vitamin and mineral deficiencies.

Basic instructions to caregivers should include the following:

- Tear open the top of the package and pour the entire contents of the package into any semi-solid food after the food has been cooked and has cooled to a temperature acceptable to eat.
- Mix MNPs with an amount of food that the child can consume at a single meal and mix the food well.
- Give no more than one full package per day at any mealtime.
- Do not share the food to which MNPs were added with other household members since the amount of minerals and vitamins in a single sachet of MNPs is just the right amount for one child.
- The food mixed with MNPs should be eaten within 30 minutes because the vitamins and minerals in the MNPs will cause the food to gradually darken.

It is important to give consistent messages on how and when to take MNPs and on how to manage the potential side effects. It is also crucial to ensure that caregivers understand what to expect and what not to expect from the use of MNPs. Results of clinical studies show side effects to be minimal although they could include darkening of the stool, constipation, or mild diarrhea. It is important, however to ensure caregivers are aware of these side effects to prevent them from discontinuing the use of MNPs should they occur.

If side effects are reported:

- Caregivers should be advised that these mild side effects are not serious and should subside in a few days to a few weeks.
- If side effects do not subside after a few days to a few weeks, caregivers should use 1/2 package of MNPs added to complementary foods at 2 different mealtimes throughout the day e.g. if ½ an MNP sachet is added to the complementary food in the morning, the other ½ should be added at the next mealtime.
- If side effects still do not subside, caregivers should be advised to divide an MNP package in 3 and feed it throughout the day with complementary foods at 3 different mealtimes.

Messages must be developed within the context of the community's current beliefs, attitudes and health knowledge. Recent focus group discussions conducted by World Vision Cambodia (unpublished, 2010) evaluated the acceptability of their current MNP programme and highlighted the following areas for future programme consideration:

1. Young mothers and VHSGs found that there was an overall acceptance of MNPs with positive behaviors noted including observations that children who were part of an MNP intervention were "stronger, taller, healthier, cleverer, braver, and more interested in their environment".

2. Caregivers expressed a lack of information or knowledge about food preparation and child feeding. It is important that clear information and support be provided for the mothers to ensure proper use of MNPs. Specifically, how and when to add MNPs (temperature of the food, timing, dosage) are important points that need to be addressed.

3. It is important that any misconceptions or rumors about MNPs be avoided or cleared up by support staff. Mothers need to be well informed about the contents of MNPs and their effects on a child's health, including any potential side effects. In order to provide mothers with the correct information, VHSGs need to be adequately trained and provided with appropriate and accurate training materials if they are to be distributing MNPs.

4. To increase awareness and effectiveness of MNPs, it is recommended that the Ministry of Health work in close cooperation with NGOs where possible who can assist with training, distribution, and monitoring and evaluation of programmes.

## 5.6 Treatment of Severe Anemia

Where available, MNPs can be used in place of IFA tablets, both in the treatment and prevention of anemia in children starting at 6 months of age according to the guidelines in Table 26. MNPs are likely to be more acceptable and easier to use than IFA tablets as compliance with the protocol requiring cutting IFA tablets is low. According to WHO guidelines, iron-containing supplements should be withheld from severely malnourished children during the first 7 days of treatment; MNPs can be used effectively and safely after this initial period. According to WHO guidelines on breastfeeding, infants 0-6 months should be exclusively breastfed and not be given any other food supplement; hence, MNPs cannot be used to treat severe anemia in children less than 6 months.

**Table 26. Guidelines for the treatment of severe anemia in children**

| Target Group | Dose | Dosage/Frequency | Duration | Follow up |
|---|---|---|---|---|
| Children 4-6 months (severe anemia) | ¼ IFA tablet (15 mg iron and 0.7 mg folic acid) | ¼ IFA tablet daily | 2 months[1] | Ask the caregiver to bring the child back for follow up after 14 days |
| Children 6-11 months (severe anemia) | ¼ IFA tablet (15 mg iron and 0.7 mg folic acid) **OR** 1 sachet of MNPs | ¼ IFA tablet daily **OR** 1 sachet of MNPs daily[2] | 2 months[1] | Ask the caregiver to bring the child back for follow up after 14 days |
| Children 1-5 years (severe anemia) | ½ IFA tablet (30 mg iron and 1.4 mg folic acid) **OR** 2 sachets of MNPs | ½ IFA tablet daily **OR** 2 sachets of MNPs daily[2] | 2 months[1] | Ask the caregiver to bring the child back for follow up after 14 days |
| The purpose of this follow-up is to refer individuals who may be at risk and are in need of further medical attention. Specifically, individuals should be referred for assessment if their condition has worsened or they are not showing any sign of improvement. | | | | |

[1]If still anemic at 2 months, refer to hospital to the nearest health facility
[2]If a child is between 6 and 24 months of age and is already receiving MNPs adjust the number of packets accordingly to meet the above recommendations, if it is determined that the anemia is severe.

In malaria-endemic regions, use of MNPs should be combined with malaria prevention and or treatment programs[148]. Where *P. falciparum* malaria is endemic, the use of insecticide-impregnated bednets in communities decreases the prevalence of severe anemia in young children.

## 5.7 Procurement and Distribution

The Department of Drugs and Food (DDF) will forward the request and specifications from the NNP to the Essential Drugs Management System of the MoH for procurement of MNPs. The Central Medical Stores (CMS) will distribute supplies to Operational Districts (ODs) on a quarterly basis. The proposed free distribution of MNPs is illustrated in Figure 11. At a later date, consideration mat be given to a dual strategy that involves free distribution coupled with a social marketing strategy to those who are able and willing to purchase MNPs. This could include caregivers of older children aged 24-59 months.

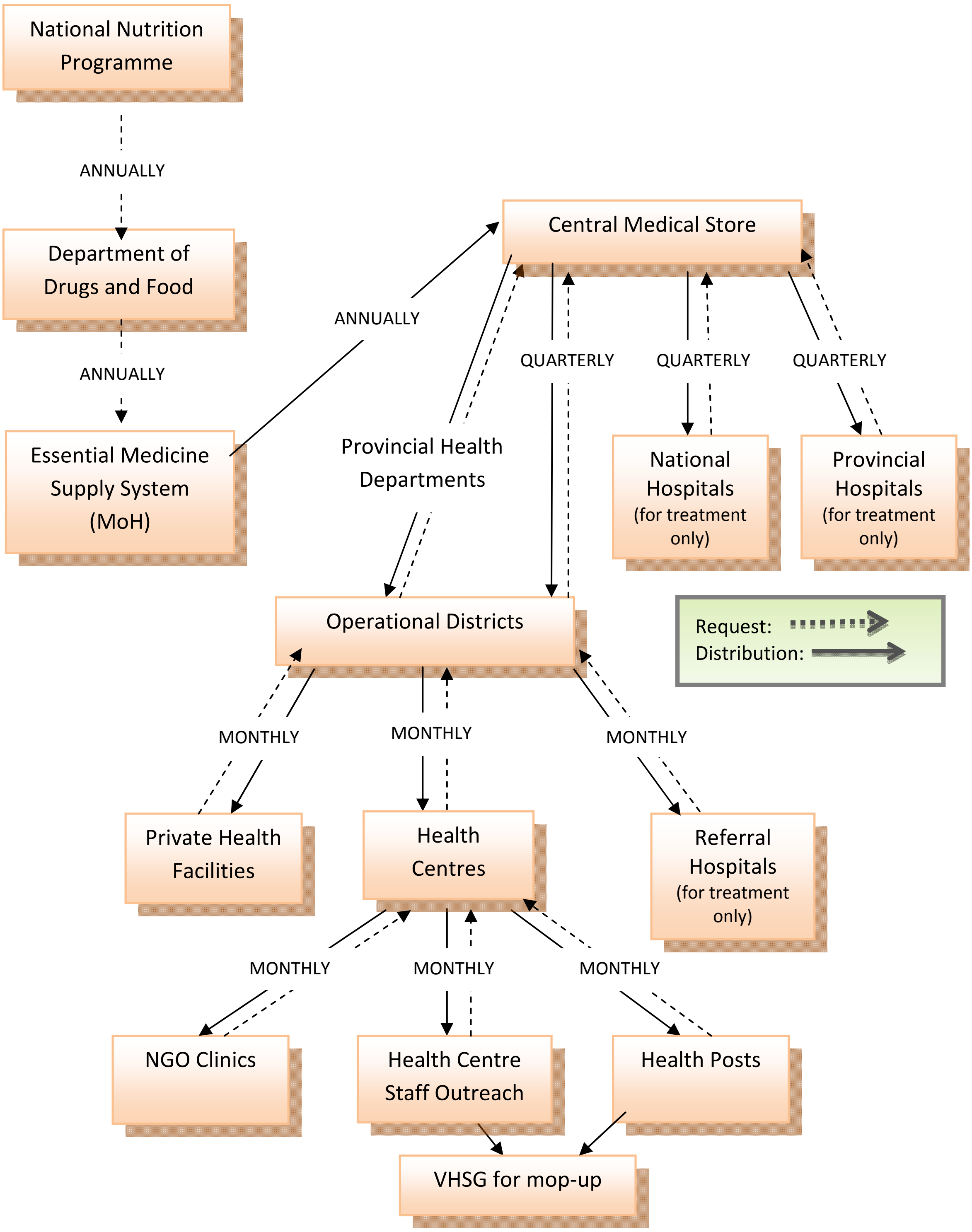


**Figure 11. Supply and distribution of Multiple Micronutrient Powders**

## 5.8 PROGRAM MANAGEMENT: ROLES AND RESPONSIBILITIES

### *5.8.1 National*

The National Nutrition Programme (NNP) is responsible for formulating MNP policies; developing operational strategies, technical guidelines, protocols, training materials, behaviour change communication strategy; and for coordinating and monitoring MNP activities in conjunction with relevant MoH departments, PHD, OD, and development partners. The NNP submits an annual programme report to the MoH and the National Council for Nutrition/Inter-ministerial Technical Committee on Nutrition.

The NNP will develop a Tally Sheet for recording MNPs distribution and will work with the Department of Planning and Health Information to formulate new indicators for MNPs and to include these indicators in the HIS. The NNP will ensure that health staff at all levels are trained on how to fill in the Tally Sheet and reporting form for the distribution of the MNPs.

### *5.8.2 Provincial*

The Provincial Health Department is responsible for implementing and monitoring the MNP in-home fortification programme. The PHD and Nutrition Focal Point (NFP) ensures ODs have adequate supplies of MNps, supports ODs in planning and implementing MNP activities, monitors activities at the district and health centre levels, compiles and analyzes coverage data, and provides programme feedback to the ODs. The designated PHD Nutrition Focal Point (NFP) should ensure that HIS reports are completed and sent on time (that include MNP coverage) to the Department of Planning and Health Information (DPHI) and NNP using the PRO4 form which is submitted on a monthly basis. Provincial hospitals report quantities distributed using the HO2 form which is submitted to the PHD on a monthly basis.

### *5.8.3 Operational District*

The OD submits a quarterly request for MNP supplements from the CMS and ensures the OD, referral hospitals, and health centres and health posts have adequate stocks for eligible children. The OD coordinates with health centre staff to conduct and monitor MNP activities at the health centre level, compiles and analyzes coverage data, and provides feedback to health centres. The OD Nutrition Focal Point needs to coordinate with OD pharmacists and HIS person to ensure sufficient MNPs for children 6-24 months and to ensure that HIS reports are completed and submitted on time (that include MNP coverage) to the PHD on a monthly basis using the DO3 form. Referral hospitals report quantities distributed using the HO2 form which is submitted to the OD on a monthly basis (Figure 12).

Provincial and district staff should also be responsible for identifying and developing strategies for accessing hard to reach children in remote and urban poor areas. The hard to reach is comprised of those living in very remote areas, areas with no health center or limited health center staff, minority tribes, and floating communities. PHD and OD Nutrition Focal Points should map their catchment populations by geographic area based on available data sources (e.g. HIS, Health Coverage Plan, CAS, CDHS) and develop strategies for accessing the hardest to reach groups based on practical considerations and programmatic realities. These children are often most at risk and careful consideration should be given to their needs.

### *5.8.4 Health Centre*

Health centres are responsible for conducting MNP activities in their respective catchment areas. This includes distribution of MNPs at health centres, during health centre staff routine monthly outreach and at the community level. Health centre staff provide health education during outreach sessions, record MNPs distributed on the Tally Sheet and report on the HC1 form which will be modified to include MNPs and is submitted to the OD on a monthly basis.

Caregivers will be provided with packaged supplies of 15 sachets of MNPs and careful instructions monthly for each child between 6 and 24 months of age. Caregivers will be instructed to give the child all 15 sachets over a one month period although they instructions allow for flexibility i.e. as long as they sachets are completed in one month is fine and they do not need to adhere to a rigid schedule.

At VHSGs' bimonthly meetings at the health centres, distribution of MNPs for village level distribution and trainings will occur in coordination with the provision of WIFS for village WRA missed through health centre activities. This will be part of the overall anemia prevention and control components of nutrition education provided by health centre staff to VHSGs.

### *5.8.5 Community (village level)*

Village Health Support Groups (VHSGs) will provide support to health centre staff for MNP programme activities at the community level. This will include tracking the number of children 0-59 months of age in their village using registration book developed by NNP; recruiting and enrolling eligible children; providing education about infant young child feeding (IYCF) practices, which will include the use of MNPs; mobilizing communities to attend outreach activities; and distributing MNPs to caretakers of children 6-24 months who did not receive them through health centre distribution channels. VHSGs will be provided with adequate supplies of MNPs at bimonthly health center meetings to support monthly distribution to caregivers as needed.

VHSGs can assist health centre and district staff in identifying where hard to reach and vulnerable children live so they can develop appropriate strategies for providing MNPs in remote rural areas (e.g. possibly providing caregivers of these children with several months supply at one time instead of the usual one month supply). Caregivers who are not readily accessed but do bring their young children in for immunizations could be given MNPs for more than the recommended one month period.

For children not reached through routine outreach distribution channels, special outreach activities should be conducted to ensure coverage of this group. In urban areas, this includes the very poor, those living in informal settlements, and transient/migrant populations.
In Phnom Penh, where the current practice of vitamin A distribution for children 6-59 months is conducted through VHSGs, under the supervision of health center staff, consideration should be given to incorporating MNP distribution beginning at 6 months.

## 5.9 MONITORING AND EVALUATION

The programme for in-home fortification with MNPs for young children in Cambodia will be monitored to evaluate supply, delivery, utilization (coverage and compliance), and allow for operational adjustments as needed.

The MNP programme should be carefully assessed to provide information to improve and adjust programme operations, and to measure whether overall programme objectives are achieved. The monitoring and evaluation activities will provide credible information that can be used as an advocacy tool for funders and to provide justification for continuing the programme.

Monitoring will be an on-going process and consists of collecting information on specific indicators designed to address all phases of the MNP programme from inception to completion. Evaluation will be periodic to determine how well the programme is meeting its objectives.

Monitoring and evaluation is challenging and it may not be possible to measure all of the process and impact indicators that are presented below (Table 27). However, as is the case with any programme, the more indicators that can be collected, the more easily the programme can be adjusted to improve operations and remedial measures taken to solve any problems encountered.

Process evaluation will be used to determine if the program is progressing as planned. It should answer questions such as to whether the intended population is participating, whether the program is being implemented as planned, what activities are working well, and what can be improved.

Impact evaluation should be used to assess the programme's effect on the health status of the target population (infants and children 6-24 months) as stated in the objectives and to improve program operations overtime.

In an ideal situation, indicators should be measured at the beginning and end of the intervention in all program beneficiaries. One or two midterm evaluations should also be conducted. Moreover, the changes in indicators should be linked to the degree of MNP usage (coverage and compliance). However, it is unlikely that this will be possible due to the vast resources needed to accomplish this. Thus, valuable results can still be found by selecting a sub-sample of the population receiving MNPs and measuring key indicators. The major challenge however, is to prove with absolute confidence that the observed changes in indicators in the target population are directly related to the program, as other factors may influence results. Nevertheless, if available, information on the change in impact indicators of a representative sample of the target population receiving the MNP intervention is still invaluable for motivating health administrators and the public to keep supporting the distribution of MNPs.

The NNP will monitor the effectiveness of the MNP programme. Programme impact will be primarily assessed through nation-wide surveys (CDHS and Micronutrient Survey). Key indicators for assessing process and impact are presented in Table 27.

### Table 27. MNP supplementation: process and impact indicators

| Process indicators | Data sources |
|---|---|
| 1. % of children 6-24 months received 15 sachets per month | HIS |
| 2. % of children 6-24 months who consumed 15 sachets per months for the last month (or 3 months) | Survey |
| 3. Number sachets given to the child per month | Survey |
| 4. % caregivers who gave child 15 sachets per month | |
| 5. % caretakers who correctly report the purpose of MNPs | |
| 6. % caretakers who correctly report how to use MNPs | |
| 7. % caregivers who observe positive changes in child (e.g. behaviour, physical, appetite, reduced frequency and or severity of illness) | Survey |

| Impact indicators | Data sources |
|---|---|
| Clinical indicators<br>• Anemia prevalence (clinical symptoms such as pallor of skin (palmar pallor) or conjunctiva and referrals) | HIS and survey |
| Biochemical indicators<br>• Anemia (hemoglobin)<br>• Iron deficiency, iron deficiency anemia (serum ferritin, total iron binding capacity (TIBC), transferrin receptor)<br>• Zinc status<br>• Hemoglobinopathies | Survey |
| Health and Nutrition indicators<br>• Under-5 child and infant mortality rate<br>• Anthropometric indicators (ht/age; wt/ht; wt/age; MUAC)<br>• Low birth weight prevalence and other pregnancy<br>• IYCF knowledge, attitudes and practices | Survey |

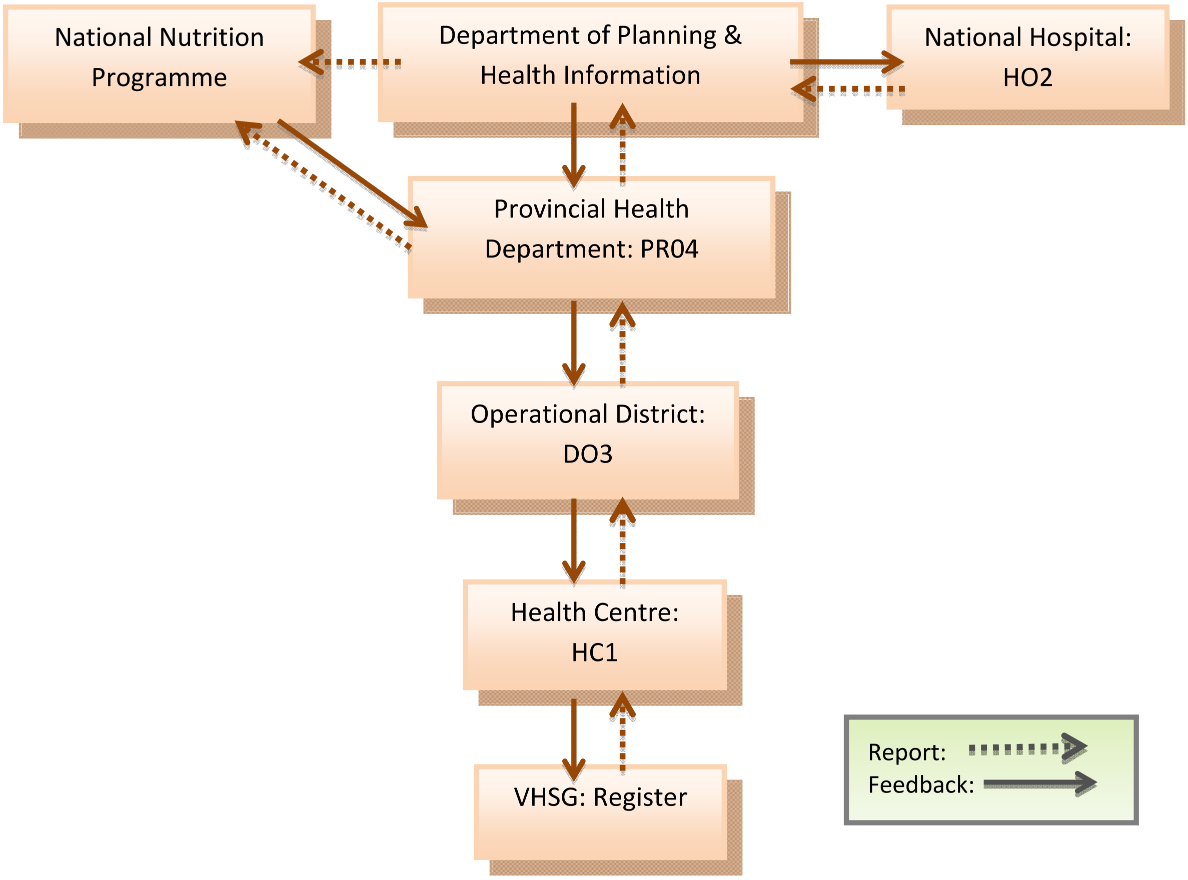


**Figure 12. Health Information System (HIS) for tracking and reporting MNP coverage**

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# APPENDIX 1. THE PERCENTAGE AND AMOUNT OF IRON IN SOME COMMONLY USED IRON COMPOUNDS

| Preparation | Iron compound per tablet (mg) | Percentage of iron (%) | Elemental iron per tablet (mg) |
|---|---|---|---|
| Ferrous fumarate | 200 | x 33 | = 66 |
| Ferrous gluconate | 300 | x 12 | = 36 |
| Ferrous sulfate ($7H_2O$) | 300 | x 20 | = 60 |
| Ferrous sulfate, anhydrous | 200 | x 37 | = 74 |
| Ferrous sulfate, exsiccated ($1H_2O$) | 200 | x 30 | = 60 |

## APPENDIX 2. WHO IMCI PHOTOGRAPHS

# INTEGRATED MANAGEMENT OF CHILDHOOD ILLNESS

# Photographs

World Health Organization
Western Pacific Region

unicef

World Health Organization
Western Pacific Region

UNICEF


ISBN 92 9061 178 2

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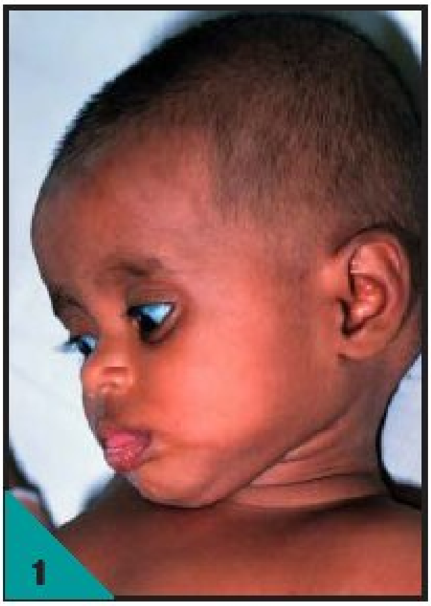
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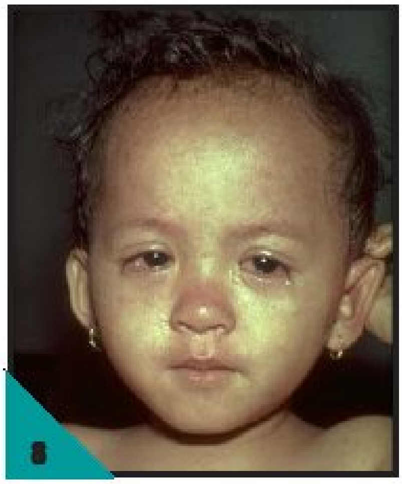

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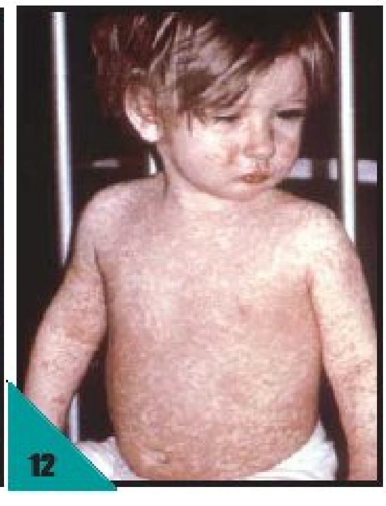

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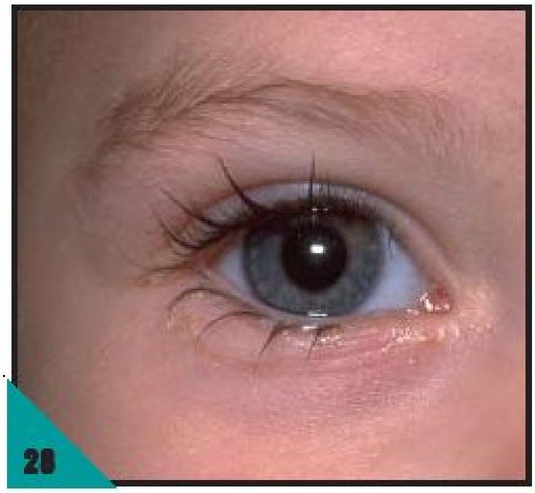
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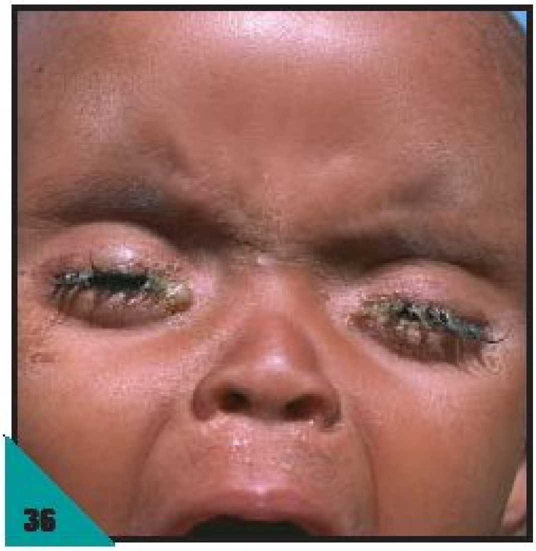
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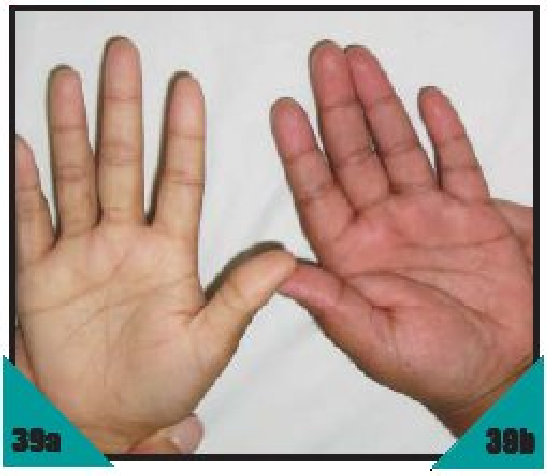
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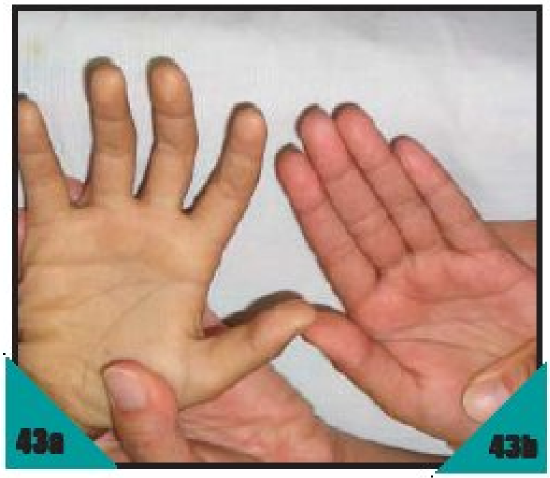
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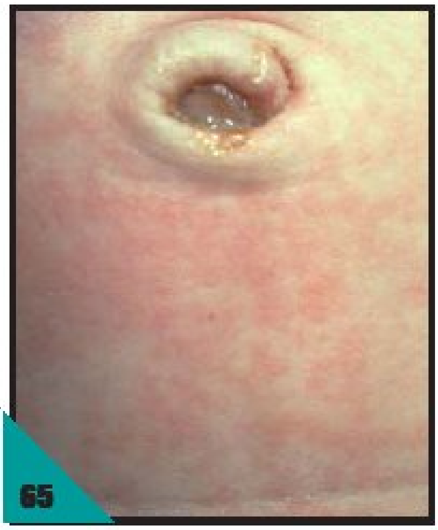
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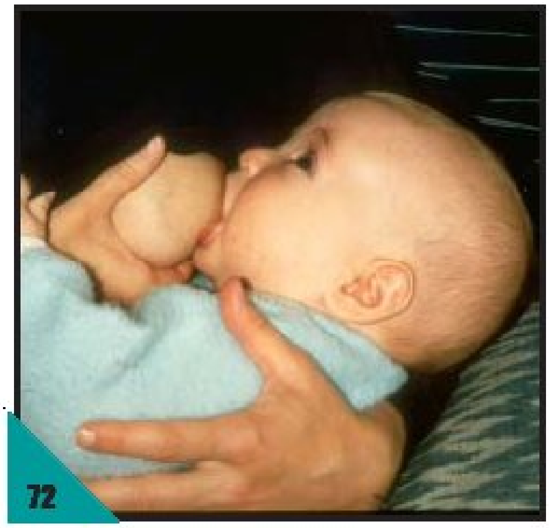
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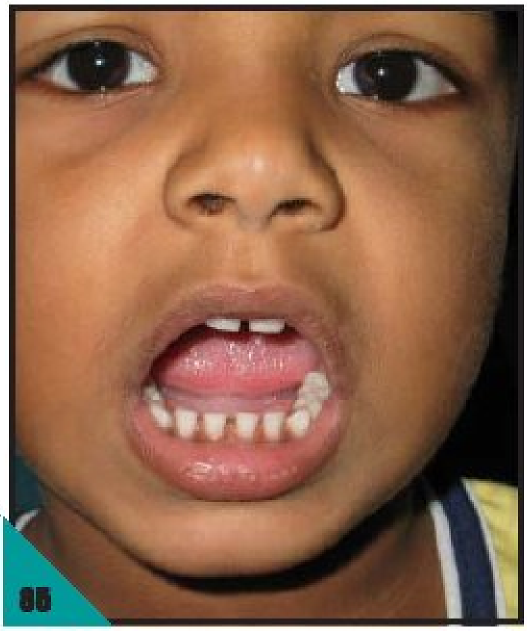
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# APPENDIX 3. WHO XEROPHTHLMIA CLASSIFICATION (1982)

**WHO Xerophthlmia Classification (1982)**
(Somer & Davidson. J Nutr, 2002)

| | | |
|---|---|---|
| XN | Night blindness | (>1%)* |
| X1B | Bitot's spots | (>0.5%) |
| X2 | Corneal xerosis or | |
| X3 | Corneal ulceration/Keratomalacia | (>0.01%) |
| XS | Corneal scarring | (>0.05%) |
| | Serum retinol (<.70 umol/L/20 ug/dl) | (>15%) |

* Who minimum criteria for public health significance

## Vitamin A Supplementation for Pregnant Women

When maternal biochemical vitamin A deficiency or night blindness exceeds tentative cutoffs of 15% and 5% respectively, prophylactic supplementation of up to 10,000 IU daily or 25,000 IU weekly has been recommended during pregnancy8. In 1999 in Nepal, in a chronically vitamin A population, routine weekly vitamin A supplementation with vitamin a (23,300IU) either preformed or as beta – carotene reduced pregnancy related mortality by more than 40 percentage.This is the first trail to link vitamin A supplementation to improve maternal survival and reductions in morbidity. Additional efficacy trails are currently underway in Bangladesh and Ghana and are expected to generate evidence to guide the development of future maternal supplementation recommendations.

Experiences from many countries have shown that vitamin A supplementation in the recommended doses is safe. However women of reproductive age (here defined as >12 years of age) should not receive high-dose vitamin A capsules (200,000 IU) - due to the risk of danger to the fetus if the woman is pregnant. The only exceptions are supplementation to post-partum women within six weeks after delivery and for the treatment of severe xerophthalmia during pregnancy.

# APPENDIX 4. WHO POSITION ON WEEKLY IRON/FOLIC ACID SUPPLEMENTATION

World Health Organization

WEEKLY IRON-FOLIC ACID SUPPLEMENTATION (WIFS) IN WOMEN OF REPRODUCTIVE AGE: ITS ROLE IN PROMOTING OPTIMAL MATERNAL AND CHILD HEALTH

WHO/AFRO GUBB L

## PURPOSE

This position statement is based on the consensus of a World Health Organization (WHO) Global Consultation on Weekly Iron and Folic Acid Supplementation (WIFS) for Preventing Anaemia in Women of Reproductive Age held in Manila, Philippines, 25-27 April 2007 and summarizes recommendations based on a desk review commissioned by the WHO Regional Office for the Western Pacific (WPRO) and additional evidence presented and discussed in the expert consultation. It is intended for a wide audience including program implementing partners, scientists and governments involved in the design and implementation of micronutrient programs as public health interventions.

## BACKGROUND

Anaemia is a multi-factorial disorder that requires a multi-pronged approach for its prevention and treatment. Iron deficiency and infections are the most prevalent etiological factors. However other conditions may have a contributory role. They include nutritional deficiencies of vitamin A, vitamin $B_{12}$, folate and riboflavin as well as thalassemias and hemoglobinopathies. The global prevalence of anemia is estimated to be 30.2% in non-pregnant women rising to 47.4% during pregnancy (de Benoist B et al, 2008). Weekly iron supplementation, in synchrony with the turnover of mucosal cells, has been proposed as a more efficient preventive approach in public health programs (Viteri FE,1995; Viteri FE et al 1998). The approach is attractive because side effects are thought to be less prominent, and it may be both operationally easier to manage at the community level and more sustainable over extended time periods. Improving iron and folate nutrition of women of reproductive age could improve pregnancy outcomes as well as enhance maternal and infant health. The prudent pragmatic approach is therefore considered to be the recommendation of WIFS in appropriately selected settings where the necessary program monitoring is feasible. Additional short-term efficacy trials are unlikely to provide more useful information about potential long-term effectiveness. The findings of the first three pilot projects were reviewed at a previous meeting held at WPRO in October 2003, a report of which is available on the WPRO website (w ww.wpro.who.int). The findings, conclusions and recommendations of these projects were published in a supplement of the international journal *Nutrition Reviews*, December 2005, (II)S95-S108. To date, more than 30 papers have been published globally, reporting findings, conclusions and recommendations on the use of the WIFS approach for the prevention of iron deficiency and anaemia.

## THE WHO GLOBAL EXPERT CONSULTATION

A WHO Global Expert Consultation on Weekly Iron and Folic Acid Supplementation for Preventing Anaemia in Women of Reproductive Age was convened in Manila, Philippines in 2007 to discuss the findings of a desk review and discuss the public health implications of the results, especially in developing countries. The consultation objectives included a formal assessment of the review, an analysis of all available evidence related to efficacy, effectiveness, safety and feasibility of preventive supplementation with WIFS programs in improving iron and folate status before and during the early months of pregnancy, a discussion on specific conditions under which WIFS may be implemented effectively and are most likely to have a significant impact on iron and folic acid status before and during pregnancy, and the identification and prioritization of knowledge gaps for which additional research is needed. The proceedings of the consultation, including conclusions and recommendations by the participants, are expected to be published in a special supplement of the *Food and Nutrition Bulletin* in 2009.

## WEEKLY IRON AND FOLIC ACID SUPPLEMENTATION

WIFS is an approach that can be effective for ensuring adequate iron status of women, particularly before pregnancy and during the first trimester in communities where food-based strategies are not yet fully implemented or effective.

Short-and medium-term WIFS has been effective in reducing the prevalence of anaemia among women of reproductive age in several community settings where the necessary support, social marketing and interpersonal advocacy ensured adequate compliance.

Although the proven method for decreasing the risk for neural tube defects (NTDs) is through daily dosing with folic acid before pregnancy through the first trimester of pregnancy, WIFS provides an additional opportunity for ensuring adequate folate status before pregnancy and in the very early stages of pregnancy particularly for those who may become pregnant or do not know that they are already pregnant and are not covered by other programs. Many pregnancies are not planned. Various studies have demonstrated that WIFS can improve iron status in women of reproductive age when supplementation is continuous for periods from several months to two years (Beaton GH, McCabe GP, 1999). A current review (Margetts B, 2007) concluded that WIFS taken for at least 12 weeks improved iron status, as judged by increased hemoglobin and in some studies serum ferritin levels. The impact of weekly supplementation with 60 mg of iron was similar to daily supplementation except in severely anaemic women.

## CONSULTATION RECOMMENDATIONS

The recommendations summarized here below represent the conclusions of the experts in the consultation.

- Strategies to combat both iron deficiency and anaemia, and to improve iron reserves and folate status in women of reproductive age should be integrated. Deworming, measures to prevent hookworm infections, the promotion of improved bioavailable iron intake, as well as interventions to control other prevalent causes of anemia, particularly malaria and other infections, and vitamin A deficiency need to be considered.
- In population groups where the prevalence of anaemia is above 20% among women of reproductive age and mass fortification programs of staple foods with iron and folic acid are unlikely to be implemented within 1-2 years, WIFS should be considered as a strategy for the prevention of iron deficiency, the improvement of pre-pregnancy iron reserves and the improvement of folate status in some women. If data on anaemia prevalence in women of reproductive age is not available, anaemia prevalence in other groups such as pregnant women (>40% anaemia prevalence) or children under 5 years of age may be used as a proxy. In the absence of such information, criteria such as dietary patterns and socioeconomic status may be considered. Women from low income groups who may not have access to processed iron-fortified food products and other sources of highly bioavailable iron could be considered a priority group for this intervention.
- The weekly supplement should contain 60 mg iron in the form of ferrous sulphate ($FeSO_4.7H_2O$) and 2800 µg folic acid, although evidence for the effective dose of folic acid for weekly supplementation is very limited. Daily folic acid supplementation is effective for reducing the risk of NTDs (Botto LD et al, 1999). The recommendation for the weekly folic acid dosage is based on the participants' rationale of providing 7 times the recommended daily dose to prevent NTDs and the limited experimental evidence demonstrating that this dose can improve red blood cell folate concentrations to levels that have been associated with a reduced risk for NTDs. The iron dose recommended for WIFS may cause short-term gastrointestinal discomfort and black stool, but there is no reported risk of long-term toxicity. The participants also agreed that the recommended weekly folic acid dose has no known toxicity, although evidence for this was limited. Two published studies evaluating weekly folic acid supplementation were considered. In Mexico, women received 5.0 mg folic acid for 3 months, and their red blood cell folate levels were still in the range associated with a 50% lower risk of NTDs one week after the last tablet was consumed (Martinez-de Villarreal LE et al, 2001). They also showed a 50% decrease in the incidence of anencephaly and spina bifida cases, and a significant reduction in infant mortality and disability after two years (Martinez-de Villarreal LE et al, 2002). In New Zealand, a once a week supplement of 2.8 mg of folic acid taken for 12 weeks increased women's red blood cell folic acid levels to concentrations associated with a reduced risk of bearing a child with a NTD (Norsworthy B et al 2004).
- Two situations may necessitate supplementation with iron alone. Fortification of staple foods with folic acid has been shown to be very effective and is being widely implemented. Iron alone should be used in weekly supplementation programs where mandatory folic acid fortification has been introduced and shown to be effective if fortification with iron has not been implemented or is ineffective. Antifolate antimalarial treatment is employed in some malaria endemic regions. There is some evidence to suggest that the efficacy of these drugs may be reduced by folic acid supplementation. In these settings, it is considered prudent to provide iron only weekly supplements.
- Upon confirmation of pregnancy, women should receive standard antenatal care. The current WHO recommendation is to provide daily supplementation with 60 mg iron and 400 ug folic acid to women during pregnancy and the first 3 months postpartum.
- WIFS programs must be integrated with other efforts to control iron deficiency and anaemia and should be planned as long-term self-sustained interventions that women of reproductive age will utilize during their childbearing years.
- Successful implementation of WIFS programs will require motivation and creation of demand by women of reproductive age as the starting point for promoting this new approach, establishing adequate mechanisms to start and sustain programs, including adequate funding, community level support and public-private partnerships including nongovernmental organizations, an uninterrupted supply of good quality iron and folic acid supplements, the development and implementation of effective communication strategies with the media and other information channels, establishment of methods for promoting compliance by women of reproductive age, especially when consumption is not supervised, and integration with effective existing delivery systems in health, education and the private sector (e.g. in factories, markets, and local shops) as well as through community organizations.
- Baseline data are needed before launching WIFS interventions; programs must be monitored closely with regard to both processes and outcomes, during the first year, and then annually for the first 5 years. Monitoring and evaluation systems should be implemented to determine if the intended outcomes are being achieved.

## SUMMARY OF STATEMENT DEVELOPMENT

This statement was prepared by the WHO Department of Nutrition for Health and Development in close collaboration with the Regional Office for the Western Pacific (WPRO). Dr. Juan Pablo Pena-Rosas (WHO) and Dr. Luca Tommaso Cavalli-Sforza (WPRO) summarized the conclusions and recommendations. This position statement is based on background documents, including a desk review commissioned to Professor Barrie Margetts and his team at the School of Public Health, University of Southampton (United Kingdom) in 2007 by WPRO. This review included all published work done on WIFS in women of reproductive age to better define the potential benefits of WIFS in preparing women of reproductive age for pregnancy. All available information related to WIFS was discussed at a global consultation held at WPRO jointly with WHO Headquarters in Manila, Philippines in 2007. The desk review provided the updated background for the expert consultation discussions. Studies considered in the review were identified through searching key databases, contacts with principal investigators, and contacts with a number of organisations and agencies that have been gathering literature in the relevant areas of work. Studies were a mix of efficacy and effectiveness designs. This was followed by four invited written commentaries by experts in the fields of iron and folic acid metabolism and public health. In making the recommendations, additional information gathered at the consultation was considered in conjunction with conclusions drawn from the review of both controlled and uncontrolled studies. The consensus conclusions and recommendations from the consultation were revised and summarized for this statement.

## CONFLICTS OF INTEREST

All participants in the consultation were asked to submit and sign a Declaration of Interest statement which are on file. There were no known conflicts of interest disclosed among the participants and those developing this statement.

## PLANS FOR UPDATE

It is anticipated that the recommendations in this position statement will remain valid until December 2010. The Department of Nutrition for Health and Development at WHO Headquarters in Geneva will be responsible for initiating a review following formal *WHO Handbook for Guideline Development* procedures at that time.

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### Suggested citation

WHO. *Weekly iron–folic acid supplementation (WIFS) in women of reproductive age: its role in promoting optimal maternal and child health. Position statement.* Geneva, World Health Organization, 2009 (http://www.who.int/nutrition/publications/micronutrients/weekly_iron_folicacid.pdf, accessed [date]).

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# APPENDIX 5. FORMULA FOR MNPS IN CAMBODIA

| | | |
|---|---|---|
| 1 | Iron (microencapsulated ferrous fumarate) | 12.5mg |
| 2 | Zinc (Zinc gluconate) | 10mg |
| 3 | Vitamin A (retinol acetate) | 300µg |
| 4 | Iodine | 90µg |
| 5 | Vitamin B1 | 0.5mg |
| 6 | Vitamin B2 | 0.5mg |
| 7 | Vitamin B6 | 0.5mg |
| 8 | Vitamin B12 | 0.9µg |
| 9 | Niacin | 6mg |
| 10 | Folate (folic acid) | 160µg |
| 11 | Vitamin C (ascorbic acid) | 30mg |
| 12 | Copper | 0.3mg |
| 13 | Vitamin D | 5µg |
| 14 | Vitamin E | 6 IU |
| 15 | Selenium | 30µg |

# APPENDIX 6. COMPOSITION OF MICRONUTRIENTS FOR USE IN WVC PROGRAM AREAS

| Micronutrient | Dose | mIRkUsarCati | kMrit |
|---|---|---|---|
| 1. Iron (Microencapsulated ferrous fumarate) | 12.5mg | CatiEdk | 12/5 mIlIRkam |
| 2. Zinc (Zinc gluconate) | 10mg | s½gásI | 10 mIlIRkam |
| 3. Vitamin A (Retinol acetate) | 300µg | vItavIn Ga | 300 mIRkURkam |
| 4. Iodine | 90µg | GIuy:Ut | 90 mIRkURkam |
| 5. Vitamin B1 | 0.5mg | vItamIn eb 1 | 0/5 mIlIRkam |
| 6. Vitamin B2 | 0.5mg | vItamIn eb 2 | 0/5 mIlIRkam |
| 7. Vitamin B6 | 0.5mg | vItamIn eb 6 | 0/5 mIlIRkam |
| 8. Vitamin B12 | 0.9µg | vItamIn eb 12 | 0/9 mIRkURkam |
| 9. Vitamin B3 (Niacin) | 6mg | éNy:asIun | 6 mIlIRkam |
| 10. Folate (Folic acid) | 160µg | hVÚlikGasIud | 160 mIRkURkam |
| 11. Vitamin C(Ascorbic acid) | 30mg | vItamIn es | 30 mIlIRkam |
| 11. Copper | 0.3mg | Tg;Edg | 0/3 mIlIRkam |
| 12. Selenium | 17 µg | EsIlnam | 17 mIRkURkam |
| 13. Vitamin D | 5µg | vItamIn ed | 5 mIRkURkam |
| 14. Vitamin E | 6mg | vItamIn GW | 6 mIRkURkam |

# APPENDIX 7. UNICEF FORMULA FOR MNPS

| | UNICEF Multis | Formulation | Good Food for Children (Cambodia) | Formulation |
|---|---|---|---|---|
| Composition | amount | chemical form | amount | chemical form |
| Vit A µg | 400 | acetate | 300 | |
| Vit C mg | 30 | l-ascorbic acid | 30 | |
| Vit D3 µg | 5 | cholecalciferol | 5 | |
| Vit E mg | 5 | dl-alpha tocopherol | 6 | |
| Vit B1(Thiamin) mg | 0.5 | hydrochloride/mononitarte | 0.5 | |
| Vit B2 (Riboflavin) mg | 0.5 | phosphate ester/monosodium salt | 0.5 | |
| Nicotinic Acid (Vit B3-niacin) mg | 6 | nicotinamide | 6 | |
| Vit B6 (Pyridoxine) mg | 0.5 | hydrochloride | 0.5 | |
| Vit B12 (Cyanocobalamin) µg | 0.9 | cyanocobalamin | 0.9 | |
| Folic Acid µg | 150 | pteroyl-glutamic acid | 160 | |
| Iron mg | 5.8 | ferrous fumarate | 12.5 | |
| Zinc mg | 4.1 | gluconate | 10 | |
| Copper mg | 0.56 | cupric gluconate | 0.3 | |
| Selenium µg | 17 | sodium selenate/selinite | 17 | |
| Iodine µg | 90 | potassium iodide | 90 | |