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Strategies to prevent anaemia: Recommendations from an Expert Group Consultation

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Summary

In 2011, WHO estimated that over 200 million women of reproductive age (191 million non-pregnant women and 11.5 million pregnant women) in the SEAR were anaemic. The adverse effects of anaemia, such as poor pregnancy outcomes, cognitive impairment and reduced work capacity impacts on both health and economic development. Anaemia due to iron deficiency is among the top 10 leading causes of years lost to disability in low- and middle-income countries, and the 7th leading cause of years lost to disability in women. WHO estimates that 12.8% of maternal death could be attributed to anemia.

Anaemia in women and children is a moderate public health problem in some countries in the South- East Asia Region (Indonesia, Thailand, Sri Lanka and Democratic People's Republic of Korea), while others (India, Bangladesh, Nepal and Timor Leste) face a severe public health problem. While nutritional anaemias are widely regarded as the most prevalent, inflammation caused by infections, and genetic causes such as haemoglobinopathies also contribute.

Only a few countries have managed to significantly reduce the prevalence of anaemia. While evidence informed recommendations to prevent anaemia are available, many policy gaps and programmatic bottlenecks limit the effectiveness of anaemia intervention programmes within countries. At current rates of reduction, the 2nd Global Nutrition Target for 2025, a 50% reduction of anaemia in women of reproductive age, is unlikely to be met.

The expert consultation discussed the current global recommendations and their applicability to the Region, reviewed key policy issues and gaps in implementing evidence-informed interventions to prevent anaemia among the relevant population groups in the Region, identified local research needs and gaps and reached consensus in providing policy, technical and operational recommendations on strategies to prevent anaemia.

At a glance

Global Nutrition target for anaemia

In 2012, World Health Assembly Resolution 65.6 Comprehensive Implementation Plan on Maternal, Infant and Young Child Nutrition (CIP), specified a global nutrition target for anaemia; a 50% reduction of anaemia in women of reproductive age (15-49 years).

50% reduction
of anaemia in women of
reproductive age

Addressing anaemia in women of reproductive age is a focus of the Decade of Action on Nutrition 2016-2025 and the commitments made by countries in the 2nd International Conference of Nutrition (ICN2) and its Framework for Action.

Expert consultation on anaemia in South- East Asia

The objective of this consultation, held in December 2016 in WHO Regional Office for South-East Asia, New Delhi, was to provide policy, technical and operational recommendations on strategies to reduce anaemia, to identify gaps in available knowledge products and specific research needs in the South- East Asia Region. The consultation reached consensus on strategies to be recommended to Member States to address anaemia.

POLICY AND TECHNICAL RECOMMENDATIONS OF THE EXPERT GROUP

Policy recommendations to accelerate actions

Update	if necessary, national policies with regard to anaemia and other micronutrient deficiencies.
Advocate	donors and other stakeholders to support national efforts in preventing anaemia
Communicate	with policymakers, the importance of preventing anaemia using appropriate communication strategies.
Develop	evidence informed strategies to address anaemia using current evidence from a situational analysis. Use primary and secondary data to obtain the following : - magnitude, prevalence and distribution of anaemia. - dietary information and food habits, adequacy of complementary feeding. - socio- economic status, food security status of vulnerable groups. - presence of iron deficiency and other micronutrient deficiencies - water, sanitation and hygiene status, worm load, anti- helminthic therapy interventions. - prevalence of diarrhoea and respiratory infections. - malaria status, prevalence of other chronic infections and haemoglobinopathies. - epidemiology of anaemia using smaller studies of population sub samples. If technical / financial resources are inadequate to conduct an in-depth assessment, information from similar countries could be utilized.

Programme planning; to develop specific plans of action & their strategic implementation

Prioritize	national goals for anemia a) prioritize target groups for anaemia assessment, prevention and control, based on resources available, from highest to lowest priority; women of reproductive age particularly pregnant women, lactating women, pre -pregnant women, adolescents, children aged

	0-2 years, children aged 2-10 years, other groups. b) adopt national targets and timelines for anaemia reduction based on current prevalence and determinants of anaemia in the national setting.
Implement	a programme of action using WHO's evidence -informed guidance on preventing anaemia to facilitate best practices on preventing iron deficiency and other causes of anemia using specific entry points in the life cycle and action sequences most appropriate to the country context. These include a) population measures to improve overall diets, promote and support consumption of micronutrient rich diets through dietary diversification. b) enacting relevant legislation for fortifying staple commodities within national food safety frameworks. c) adherence to WHO' s guidelines on regimes and dosages, while taking into consideration other interventions containing iron (fortified foods, multiple micronutrient powders). d) promoting overall improvement in diets, adherence to supplementation and other interventions through effective communication.
Develop and strengthen	surveillance mechanisms to monitor and guide anaemia prevention programmes, using reliable and valid methods.
Build capacities	a) of health workers and other related personnel to provide clear and specific messages to prevent and treat anaemia. b) of community volunteers or workers (as relevant) to provide key messages on anemia, iron deficiency/other causes to target populations.
Ensure	comprehensive and sustained actions to improve water, sanitation and hygiene, immunization, malaria prevention activities and genetic counselling for thalassemia patients and their convergence with anaemia programmes.
Address	socio economic and equity issues including women's education and empowerment, improve knowledge and behaviours on nutrition and understanding the importance of improving overall nutrition status.

Technical and research considerations

Organize	an expert consultation at national level to review the situation (prevalence, on-going policy and program), consensus on causes and feasible interventions, in collaboration with implementation agencies and consensus on the plan of action.
Review and assess	a) evidence of success in reducing anemia using regional and country level information. b) program performance and effectiveness : coverage, technical and operational issues to improve and/or scaling up programmes. c) feasibility to implement a new, innovative programmes.
Advance	c) capacities of health workers and other related personnel to provide clear and specific messages to prevent and treat anaemia. d) knowledge of community volunteers or workers (as relevant) to provide key messages on anemia, iron deficiency/other causes to target populations.
Support	research and development on a) strategic/innovative implementation that suit national and local contexts for prevention and treatment of anemia and its causes b) scientific evidence on anaemia which would contribute to the global knowledge base.

Dissemination of information: communication strategies

Disseminate information	a) on consequences of iron deficiency at all life stages. b) on promoting diversified and adequate diets to prevent iron and other micronutrient deficiencies c) on importance of addressing socio economic and women's equity issues in preventing anaemia d) on success in reducing anaemia. using regional and country platforms to facilitate best practices.

1. INTRODUCTION

1.1 Anaemia in South- East Asia

Globally, two billion people are anaemic, which includes 315 million (95% CI: 291–340) in the South- East Asia Region (SEAR).[1] Iron deficiency, the primary contributor to anaemia, is the most widespread nutritional disorder while other micronutrient deficiencies including folate and vitamin B_{12} also contribute to anaemia. Recent evidence indicates a greater role for anaemia of inflammation caused by parasitic infections including malaria.[2] Inherited disorders such as haemoglobinopathies also contribute to anaemia.[3]

In 2012, the World Health Assembly Resolution 65.6 endorsed a Comprehensive Implementation Plan on Maternal, Infant and Young Child Nutrition (CIP), with six Global Nutrition Targets for 2025.[4] The second target is a 50% reduction of anaemia in women of reproductive age (WRA, 15-49 years). Anaemia is interlinked with other Global Nutrition Targets; stunting, low birth weight, exclusive breastfeeding and wasting and focused actions are required to reach the anaemia target by 2025, and the 2nd and 3rd Sustainable Development Goals (SDG) of reducing all forms of malnutrition and ensuring healthy lives for all at all ages by 2030.

Comprehensive data on the prevalence of anaemia and the proportion that is iron responsive are based on nationally representative data and published.[1] In the SEAR, anaemia prevalence in children aged 6-59 months is 53.8% amounting to 96.7 million affected children. Among pregnant women, 48.7% are anaemic with severe anaemia affecting 1.1%, while 41.5 % non-pregnant women are anaemic, with 1.9% women being severely anaemic, affecting a total of 202.0 million anaemic women of reproductive age (WRA). The data from WRA is also the baseline for monitoring progress toward achieving the 2nd Global Nutrition Target.

Anaemia affects health, survival, productivity, income and development.[5] Iron deficiency with or without anaemia impairs cognitive development, limits attention span and shortens memory capacity, resulting in poor classroom performance, high absenteeism, and early dropout rates among schoolchildren. Iron deficiency can cause

up to a 30% impairment of physical work capacity and performance and losses of up to 8% of GDP. Anaemia due to iron deficiency is among the top 10 leading causes of years lost to disability in low- and middle-income countries, while anaemia is the 7th leading cause of years lost to disability in women. WHO estimates that 12.8% of maternal deaths in Asia could be related to anaemia.[6]

While modest improvements in anaemia status of women and children in South -East Asia have occurred, many policy and programmatic gaps limit the effectiveness of current anaemia interventions. The invisibility of anaemia makes it difficult to focus attention of policymakers and uncertainties regarding the applicability of current anaemia definitions, and the proportion of anaemia responsive to iron supplementation confound the issue. The apparent resistance of anaemia to supplementation programmes, though often caused by inadequate coverage, discourages programme planners and implementers from scaling up interventions. The need for multifactorial solutions beyond health, further complicate the problem. Only few countries have comprehensive programmes which have achieved sufficient coverage and [7] if the current status continues, the global nutrition target on anaemia is unlikely to be achieved.

There is evidence to suggest that a reduction in anaemia prevalence between 2012 and 2025 is considered feasible, if there is significant government commitment, as shown by achievements in some countries. The prevalence of anaemia among women of reproductive age decreased, in China, from 50.0% to 19.9% in 19 years; in Nepal, from 65% to 34% in 8 years; in Sri Lanka, from 59.8% to 31.9% in 13 years; in Bhutan from 54.8 to 31.1 % in 12 years, and in Viet Nam, from 40.0% to 24.3% in14 years.[8] Determined and effective actions are required to reduce iron deficiency and anaemia in WRA. Reducing anaemia rates in children is also important, considering the putative impact on cognitive functions and work capacity. The Decade of Action in Nutrition 2016-2025, which was endorsed by all Member States at the UN General Assembly, provides a unique opportunity to accelerate efforts to reduce anaemia through reviewing and scaling up both direct and indirect interventions to reduce anaemia.

1.2 Etiology of anaemia in South -East Asia

Nutritional deficiencies, mainly of iron, caused by inadequate diet is the predominant cause of anaemia in the SEAR.[3] Infections, particularly parasitic diseases, including malaria and helminth infections that cause both extracorporeal iron loss and anemia of inflammation, decreasing bioavailability of iron to host tissues [9] [10] Genetic disorders such as thalassemia traits in the population also contribute.[11] Figure 1.1 provides an overview of the determinants of anaemia at individual, intermediate and underlying levels.

South Asian diets are mostly based on staples with little intake of animal foods, have low iron bio-availability and contain inhibitors of iron absorption, so that intake and/or absorption of iron and other nutrients is inadequate for haemopoesis.[12] Iron responsive anaemias are estimated as 40-50% of anaemias in the Region.[3] However, effect sizes are heterogenous between countries, and even within regions of countries. Other nutrients that contribute include vitamins B_{12}, and folate and deficiencies of other minerals including zinc and copper may also influence.[12] Severe protein-energy malnutrition also contribute to anaemia.[12] Intestinal infections causing diarrhoea, malabsorption and blood loss (e.g. hookworm infection) may, in addition to depleting body iron also exacerbate risk of other micronutrient deficiencies by reducing digestion and absorption and enhancing nutrient losses. [10]

Another frequent cause of anaemia, globally, is the anaemia of chronic disease, triggered by inflammation.[11] In malaria, tuberculosis, HIV infection, and perhaps other common bacterial, viral and parasitic infections (eg diarrhea, pneumonia, cutaneous infections), inflammation, mediated via hepcidin, suppresses haemoglobin synthesis and red blood cell (RBC) production. Poor water, sanitation and hygiene (WASH) may therefore play an important role in contributing to high anaemia rates through gastrointestinal infections, causing diarrhoea and loss of nutrients, as well as through systemic inflammation which prevents iron absorption and utilisation.[10] This latter mechanism has not yet been empirically established. WHO estimates that 50% of malnutrition is

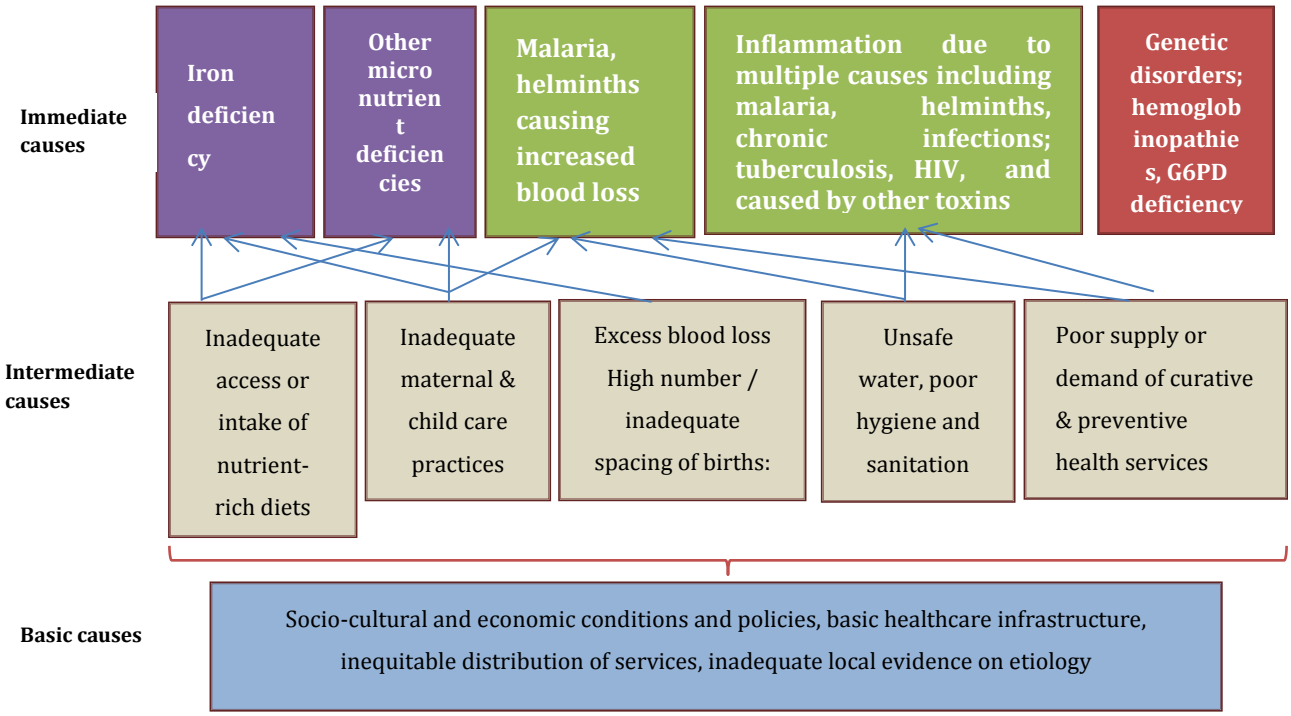
associated with repeated diarrhoea or intestinal worm infections from unsafe water or poor sanitation or hygiene.[9] Children who are exposed to open defecation or without access to safe water have increased risk of intestinal infection and chronic gastrointestinal track inflammation (environmental enteropathy), contributing to stunting and anaemia, and poor early childhood development. [10]

Haemoglobinopathies are the most common genetic disorders in South-East Asia that contribute to anaemia.[11] The most prevalent are α and β-thalassaemias, and haemoglobin (Hb) E. The gene frequencies of α-thalassaemia are approximately 30-40% in Northern Thailand and Lao PDR. Hb Constance Spring (a form of alpha thalassemia) gene frequencies vary between 1% and 8%. β-thalassaemias vary between 1% and 9%. Hb E trait is most common in parts of South-East Asia, attaining a frequency of 50-60% at the junction of Thailand, Laos and Cambodia. Data from India show that thalassemia, G6PD deficiency and sickle cell disease are significant contributors amongst speicifc populations (Sindhis in Gujarat and Maharashtra) and in some regions (North-Eastern states, tribal areas of Orissa and West Bengal). [13,14,15,16] These abnormal genes in different combinations lead to over 60 different thalassaemia syndromes, making South and East Asia the Regions with the most complex thalassaemia genotypes. In the Central Terai region of Nepal, some tribal populations have a significant incidence of sickle cell disease.[a] These genetic conditions do not preclude iron deficiency, which needs to be treated when present, except in thalassemia intermedia and major, which are relatively rare.

Determinants of anaemia vary across countries, but the relative degree of influence of each remains largely unclear. Most likely anaemia is due to a combination of causes which coexist, with individual contributions varying in different settings. Since anaemia is the result of multiple factors, it is essential to obtain adequate information on the main causes of anaemia in a given population.

[a] Shrestha A, Karki S. Analysis of sickle hemoglobin, Journal of Pathology of Nepal (2013) Vol. 3, 437 -40.

Figure 1.1 Determinants of anaemia



Adapted from USAID. Conceptual Frameworks. Multisectoral Anemia Partners Meeting, hosted by the USAID Anemia Task Force held on 18 October 2013. Washington DC, USA. https://www.spring-nutrition.org/sites/default/files/events/multisectoral_anemia_meeting_diagrams.pdf

1.2 Regional anaemia prevalence data

Estimates of the prevalence of anaemia across countries is provided in Table 1.[1] Country data from different national surveys is given in Annex 1.

Table 1.1 Anaemia prevalence & Public Health Significance in countries of SEAR- National estimates for 2011

	Children aged 6–59 months			Women 15–49 years - Non-pregnant			Women 15–49 years - Pregnant		
Country	Anaemic children[b] and mean Hb (95 % CI)	Severely anaemic [c]	Public Health Significance	Anaemic non-pregnant[d] mean Hb (95 % CI)	Severely anaemic[e]	Public Health Significance	Anaemic pregnant[18] mean Hb (95 % CI)	Severely anaemic [19]	Public Health Significance
Bangladesh	56% 107(102-112)	1.1%	Severe	43% 122 (119 – 124)	0.7%	Severe	48% 110 (107 - 113)	0.5%	Severe
Bhutan	55% 107 (107 -119)	2.3%	Severe	44% 121 (112- 129)	2.2%	Severe	46% 110 (104 – 118)	1.2%	Severe
DPR Korea	34% 114(105-122)	0.5%	Moderate	25% 127(121- 133)	0.6%	Moderate	27% 118 (111 – 124)	0.4%	Moderate
India	59% 106 (101-112)	1.8%	Severe	48% 119 (113- 125)	2.5%	Severe	54% 108 (104- 113)	1.3%	Severe
Indonesia	32% 114 (111 to 119)	0.3%	Moderate	22% 128 (123- 131)	0.6%	Moderate	30% 117 (109 – 123)	0.5%	Moderate
Maldives	30% 115 (107 to 122)	0.4%	Moderate	37% 124 (119 – 128)	0.6%	Moderate	39% 113 (105 – 119)	0.6%	Moderate
Myanmar	40% 112 (104 to 120)	0.7%	Severe	30% 125 (118- 132)	1.0%	Moderate	33% 115 (108 – 122)	0.7%	Moderate
Nepal	51% 109(103 to 114)	0.9%	Severe	36% 125 (122 – 127)	0.8%	Moderate	36% 111 (108 – 115)	0.6%	Severe
Sri Lanka	36% 113 (107 to 120)	0.2%	Moderate	26% 127 (120 – 132)	0.7%	Moderate	25% 118 (112 – 124)	0.4%	Moderate
Thailand	29% 116 (107 to 123)	0.5%	Moderate	24% 127 (115 – 132)	0.9%	Moderate	30% 117 (104 – 126)	0.6%	Moderate
Timor Leste	45% 111 (107 to 115)	0.2%	Severe	22% 128 (124- 132)	0.7%	Moderate	24% 119 (115 – 123)	0.6%	Moderate

[b] Percentage with blood haemoglobin concentration <110 g/L (for children 6-59 months and pregnant women)
[c] Percentage with blood haemoglobin concentration <70 g/L (for children 6-59 months and pregnant women)
[d] Percentage of non-pregnant women with blood haemoglobin concentration <120 g/L
[e] Percentage of non-pregnant women with blood haemoglobin concentration <80 g/L
WHO classifies countries by degree of public health significance of the problem, based on blood haemoglobin concentration: <5% = no public health problem; 5–19.9% = mild public health problem; 20–39.9% = moderate public health problem (*maroon in the Table*); ≥40% = severe public health problem (*red in the table*). (WHO. Worldwide prevalence of anaemia 1993–2005: WHO global database on anaemia. WHO, Geneva, 2008. De Benoist B, McLean E, Egli I, Cogswell M, editors.)

2. KEY CONSIDERATIONS AND DISCUSSION POINTS LEADING TO THE RECOMMENDATIONS

2.1 Current status of anaemia in SEAR

- **Anaemia is a moderate or severe public health problem** with significant inter-country/district variations. Some success has been achieved by countries in reducing prevalence of severe anaemia while few countries have also shown significant improvements in moderate and mild anaemia. However, progress across the SEAR is insufficient to reach the global nutrition target on anaemia and to prevent socio economic consequences. Urban- rural disparities in socio economic status, food insecurity, health care coverage, access to safe water and sanitation and equity issues exist in varying degrees across all countries and need consideration.

- **Majority of anaemia is of mild or moderate severity**. Prevalence of severe anaemia is currently ≤ 2.5 percent in all countries, though high population numbers in some countries means that a significant number of women and children need urgent attention.

- **There appears to be a sense of fatigue with anaemia programmes** in many countries. Policy makers need to be advocated to revamp anaemia and micronutrition related policies and allocate more attention and resources to determine etiology of anaemia, population interventions to improve intake of micronutrients and to provide resources to scale up specific lifecycle interventions to prevent and treat anaemia, while focusing on quality and equity of services.

- **Prevention and treatment of anaemia in women of reproductive age is essential** to prevent low birth weight, perinatal and maternal mortality, and associated risk of disease. It is therefore in the interests of policy makers to carry out necessary investments in prevention of anaemia as a means to promote human capital development, economic growth and long-term health.

- **While iron deficiency is the main cause, other micronutrient deficiencies, inflammation and inherited disorders of RBCs** also contribute. Since the epidemiology of anaemia is likely to be a complex combination of nutrition, inflammation, infection and genetics, it's etiology needs further assessment prior to scaling up interventions.

- **Two approximate patterns in anaemia prevalence and prevention emerged** from the discussions and data presented at the consultation.

1) Countries such as the Democratic People's Republic of Korea, Indonesia, Maldives, Sri Lanka and Thailand, where anaemia is a moderate public health problem as per the WHO estimates, 2011, report a > 70 % coverage of iron and folic acid supplementation of pregnant and lactating women, and other anaemia prevention programmes, an adequate status in supply of safe water and sanitation services and low rates of open defecation, low rates of diarrhoeal disease in children and low rates of malaria, high women's literacy and education levels and a high Human Development Index.[f]

2) Anaemia is a severe public health problem in India, Bangladesh, Myanmar and Nepal, where coverage of anaemia programmes are inadequate, safe water and sanitation status is moderate or poor, open defecation rates are significant, incidence of diarrhoeal diseases are high and malaria prevalence is significant (in specific regions). These countries are rated as low-moderate on the Human Development Index.[e]

While priorities and approaches to prevent anaemia in these two groups of countries are expected to differ, strategies to address anaemia remain similar for all.

[f] The Human Development Index (HDI) is a summary measure of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living.

2.2 Prevention of anaemia

- **Decisions to implement new programmes or scale up should be informed by evidence.** Better understanding of the etiology, prevalence of risk factors and details of current programmes is needed to initiate policy discussions on addressing at country level and to inform context-specific adaptations of recommendations.

- **Food-based approaches** should be considered the main approach to a nutritional deficiency and are the most desirable and sustainable method of preventing anaemia and other nutritional deficiencies and should be part of all anaemia prevention and control programmes. Enhancing dietary diversity remain the key intervention, through increasing availability and accessability of of iron/micronutrient rich foods, where agriculture and education sectors have a significant role. All aspects of food production, preservation, processing, marketing, and preparation of food should consider micronutrient content. In addition, knowledge and practice enhancement through counselling and behaviour change commincation are vital aspects of improving diets.

- **Exclusive breastfeeding** of infants up to 6 months of age should be protected, promoted and supported. Benefits to the mother are significant- in terms of a longer amenorrhoea, and increased birth spacing. Breast milk is an important source of iron for young children and is highly bioavailable.

- **Improving complementary feeding** is vital. Regional data reflects inadequate complementary feeding practices in most countries, with the proportion of young children who receive a minimum acceptable diet being low. Scientific assessemnt of nutritional quality of complementary food through linear programming would help identify if iron or other micronutrients are deficient in diets and provide evidence based recommendations to alter/adjust complementary foods.

- **Fortification of food** could be a cost effective way to improve micronutrient content. Evidence of success in improving iron status are available for wheat or maize flour fortification in programme settings with limited success in reducing anaemia.[g] An example is Costa Rica's fortification program which was possibly responsible for reduction in anaemia in women and children.[h] Many technical, operational and financial issues challenges have to be addressed before embarking on fortification. Preliminary assessment of micronutrient deficiencies, development of fortification standards and legislation, communication strategies and social marketing, quality assurance, and assessment of health impact need consideration. For food fortification to be effective, appropriate food vehicles that are consumed in adequate amounts by those in need of increased intake of micronutrients and appropriate fortificants must be selected. Many countries in SEAR consume rice as a staple. Rice fortification studies conducted in Asian countries indicate some success in reducing anaemia and other micronutrient deficiencies, but is not yet implemented at scale. Therefore scaling up rice fortification in a way that lessons can be learnt with regard to implementation, including it's production, processing, storage and distribution is important. Biofortification is another option, which is currently undergoing testing of biological effectiveness. When setting fortification standards, WHO guidelines should be followed. All fortification interventions have to be accompanied by nutrition education and behaviour change communication to improve dietary habits, dietary diversity and WASH. The impact of fortification on anemia and micronutrient status implemented at-scale is best assessed through regular monitoring, including actual consumption of fortified vehicles and their micronutrient level at household level, and of other factors that may affect micronutrient status.

[g] Pachon H, Spghrer R, Mei Z, Serdula MK. Evidence for the effectiveness of flour fortification programs on iron status and aanemia; a systematic reveiw. Nutr Rev. 2015 Nov;73(11):780-95. doi: 10.1093/nutrit/nuv037. Epub 2015 Oct 2.

[h] Martorell R, Ascencio M, Tacsan L et al. Effectiveness evaluation of the food fortification program of Costa Rica: impact on anemia prevalence and hemoglobin concentrations in women and children. Am J Clin Nutr January 2015 vol. 101 no. 1 210-217

- **Special measures to address anaemia are needed at critical life stages** where nutrient requirements are increased; pregnant and postpartum women, young children and adolescents. The WHO evidence-informed guidelines[i] focus on specific interventions for preventing and reducing anaemia in each life stage. Countries should implement these interventions as suitable to their country context. Selection of the most appropriate delivery platform for supplements should be context specific, with the aim of reaching the most vulnerable populations and ensuring a timely and continuous supply of supplements. Regimes and dosages recommended by WHO should be adhered to for maximum benefits to recipients. Iron folic acid (IFA) supplementation programmes have challenges which include both supply side failures, and demand side issues such as poor attendance at antenatal clinics, or insufficient emphasis on behavioural aspects of taking supplements on a regular basis and consumting diverse diets which have limited their effectiveness. An operational review of current programmes would be essential to provide information on challenges and methods of improving their effectiveness.

- **To ensure safe upper levels for iron are not exceeded**, all ongoing nutrition interventions should be considered when implementing a new programme. Any new interventions (e.g. multiple micronutrient powders) should be preceded by an evaluation of the nutritional status in the target population and other existing measures to control anaemia and vitamin A deficiency (eg, supplementation, other types of fortification), to ensure that the daily micronutrient needs are met and not exceeded.

- **Messaging gaps in anaemia programmes are significant and exist at different levels**; policy, planning, service delivery and at the community, which have possibly led to invisibility and inadequate attention to anaemia. Clear, unambiguous messages which are factually accurate and evidence based are required, keeping in mind that many groups are involved in messaging-

[i] At present, the iron supplementation guidelines do not assess functional outcomes, but only biomarkers.

policymakers, programme planners and implementers (both health and other sectors), media and community. Therefore, suitable and appropriate messages need to be available, taking into account the different functions of these diverse groups. Messaging also needs to take into account background, training and expertise of the groups, as well as the dynamic and complex knoweldge such as bioavailability issues that may need to be communicated. For example, health workers and others who carry out anaemia prevention should have adequate skills in behaviour change communication, knowledge on determinants and consequences of anaemia, bioavailability of iron in local foods and on iron supplementation to ensure better adherence to supplemetation as well to promote intake of micronutrient rich foods.

- **The visibility of anaemia** within reproductive, maternal and child health needs to be enhanced, and convergence increased with programmes including environmental health, malaria, immunisation and helminth control.

- **Promoting safe water, sanitation and hygeine (WASH) maybe important in anaemia prevention**. WASH acts through several possible mechanisms: preventing infections, reducing elevated hepcidin levels and reduced enteropathy causing improved intestinal surface area leading to better iron absorption and reduced loss through lower diarrohoea prevelence. A recent WHO, UNICEF and USAID publication summarized the current evidence on the benefits of WASH for improving nutrition outcomes,specially in young children by integrating WASH interventions into national nutrition policies and programmes. [j] However, while the broader impact of WASH on general nutrition status is well documented, which would also indirectly impact on anaemia status, there is an urgent need for empiric evidence of direct linkages of WASH programmes on anaemia. Further understanding of WASH and its impact on anaemia prevelence would support more appropriate intevrentions to prevent anaemia.

[j] World Health Organization, UNICEF, USAID, 2015. Improving nutrition outcomes with better water, sanitation and hygiene: practical solutions for policies and programmes. WHO.

- **Helminths** that impair nutrition status include soil-transmitted helminths (STH) and schistosomes. Nutrition is affected by blood loss, malabsorption of nutrients, diarrhoea, and decreased appetite. Periodic treatment (deworming) of children together with improvement of water and sanitation, and health education can reduce the transmission of soil-transmitted helminths and schistosome infections. Preschool-aged and school-aged children and women of childbearing age are at risk. Regular deworming is thought to reduce morbidity through reducing worm loads, though benefits of deworming programmes on hemoglobin or functional outcomes have been quueried in a recent systematic reveiw.[k]

- **Prevention and treatment of infections such as malaria and tuberculosis** may help prevent anaemia. Much of the Region is malaria endemic, and iron supplementation in infants and children should be done in conjunction with strong public health measures to prevent, diagnose and treat malaria as recommended in the WHO guideline. Further clarity is needed on the specific measures and benchmarks that should be used.

- **Multisectoral interventions are essential in resolving anaemia**. Improvement and enhancement of supportive interventions; social safety support, livelihod approaches, womens empowerment and education positively impacts anaemia and overall nutritional status in several ways and need more focus and priority. These will cause improved dietary diversity, food security, delayed pregnancies, birth spacing and health seeking behaviours. Different sectors would need to focus on specific areas in prevention of anaemia:
  Education sector: - School Health and Nutrition Programs, intermittent iron and folic acid supplementation of adolescent girls, adolescents awareness and food behaviours, extended classroom education for girls and nutrition literacy.

[k] Welch VA, Ghogomu E, Hossain A et al.Mass deworming to improve developmental health and wellbeing of children in low-income and middle-income countries: a systematic review and network meta-analysis
The Lancet Global Health , Volume 5, Issue 1, Pages e40-e50 (January 2017) .DOI: 10.1016/S2214-109X(16)30242-X

Agriculture sector: role in improving food security, dietary diversity and availability of iron rich foods.

Infrastructure, planning and development: improved sanitation and water Facilities.

Social services- livelihood imporvement, poverty alleviation

Annex 5 provides and example of a multisectoral framework for addressing anaemia.

- **Monitoring and evulation** of programmes is inadequate in many countries and needs more systematic attention. This would be of importance to assess and address gaps in programmes and targets for improvement. Strategic and systematic monitoring and evaluation of the anaemia situation in the country would also ensure that and also to track anaemia prevalence. The countries which have achieved reduction in prevalence of anemia such as Sri Lanka, have possibly achieved the current reduction due reasons including high coverage of IFA supplementation programmes. Hence, such countries need to ensure that measures to maintain anaemia prevalence at a low rate through supplementtaion or testing and treating strategies are in place. Any exit strategy needs to be carefully developed and implemented.

2.3 Specific problems/concerns stated by experts

- **Current thresholds to define anaemia** and possible ethnic variations: WHO is planning to review the global guidelines for hemoglobin thresholds to define anaemia. The intial process is underway. However, the development of full guidelines will take several years. Even if thresholds are redefined, there is a possibility that they are not likely to change by more than 1 g/dl or so. Therefore, a fair proportion of the population may yet be be anaemic, considering the presence of significant numbers of people who are defined as moderately anaemic at present. Therefore, a focus on anaemia remains urgent.

- **The confounding relationship between iron biomarkers (ferritin) and inflammation** may result in a substantial underestimation of iron deficiency. Inflammation is a common occurance in SEAR countries and identification of the key drivers of anemia in a population are essential to ensure that misinterpretation of results do not occur. Better identification of the key drivers of anemia are also important to ensure iron is not being given to those that do not need it, especially given potential safety issues with iron supplementation in settings with a high prevalence of malaria, tuberculosis or other infections.

- **There are many gaps in regional and country information** in terms of etiology, response to supplementation and fortification, functional outcomes of mild anaemia, anaemia and infection in young children and other problems related to anaemia that need local/regional data.

- **Functional iron deficiency vs biochemical deficiency of iron**: The current guidance on anaemia by WHO is based on biochemical evidence of anaemia (pathologic and physiologic measures that may precede or lead to health outcomes). Additional evidence on functional health benefits of current interventions used to control anaemia are needed, particularly in young children. While there is evidence that iron deficiency leads to cognitive impairments, and a few studies exist that indicates that iron interventions lead to improvements in cognition,[l] specially in younger children, high quality evidence from randomised controlled trials is unclear.[m] Definining the functional benefits of iron interventions in 6-24 month old children in the Region is an urgent scientific research priority.

[l] Lozoff B, De Andraca I, Castillo M, Smith JB, Walter T, and Pino P. "Behavioral and developmental effects of preventing iron-deficiency anemia in healthy full-term infants," Pediatrics 2003; 112, no. 4, pp. 846–54.
Moffatt MEK, Longstaffe S, Besant J, and Dureski C, "Prevention of iron deficiency and psychomotor decline in high-risk infants through use of iron-fortified infant formula: a randomized clinical trial," Journal of Pediatrics,1994; 125 (4):527–34

[m] Grantham-McGregor S and Ani C, "A review of studies on the effect of iron deficiency on cognitive development in children," Journal of Nutrition, vol. 131, no. 2, pp. 649S–668S, 2001.

- **Populations with a high burden of thalassaemia, status of iron deficiency in carriers of thalassemia and iron supplementation and fortification interventions** needs further study. In South East Asia, thalassemia carriers constitute a larger proportion of those with hemoglobinopathies, and are well known to have iron deficiency if diets are inadequate. However, it is also possible (currently unknown) that prolonged, high dose iron via iron supplementation or iron via fortification could place some carriers at risk of iron overload, and may present a possible risk of iron interventions in regions where gene frequencies for thalassaemia are highly prevalent. Further research is needed to confirm that such individuals do not accrue a toxic level of iron over time.

- **Evidence from new research** will possibly provide more information on interactions between iron metabolism, inflammation and on mediators of iron metabolism such as hepcidin and erythroferrone and anaemia which will be useful in future population based recommendations on prevention and treatment of anaemia. In particular, the role of poor hygiene, leading to chronic inflammation via chronic infections, on iron absorption and hence anaemia, has to be explored further.

- **The evidence for the effective dose of folic acid in intermittent supplementation** is based on the rationale of providing seven times the supplemental dose to prevent neural tube defects (400 μg or 0.4 mg daily). Further limited experimental evidence suggests this dose can improve red cell folate concentrations to levels associated with a reduced risk of neural tube defects. Concerns were expressed about the weekly dose of folic acid supplementation since it is not based on evidence. The optimal weekly dose of folic acid, and the effects of long- term folic acid supplementation on human health needs clarification.

- **Etiology of anaemia**; Interventions adressing anaemia need to be aligned with the underlying causes of anaemia since the region has multiple determinents of anaemia.

2.4 Examples of specific country issues, priority actions for countries and requests from the secretariat

Bangladesh*:* The distinct environmental situation, where in certain areas, there is a high level of iron in the groundwater may interact with anaemia epidemiology. People in these areas appear to have little iron deficiency, when based on measurement by serum ferritin, compared with people living in areas with low levels of iron in water, raising concerns on the provision of iron supplements to pregnant women in these areas. The variability of iron content in water within geographic areas makes the targeting of programmes to improve or limit iron intake difficult. Other causes of anaemia in Bangladesh are other micronutrient deficiencies, water and sanittaion problems and haemoglobinopathies.

India*:* The pevalence of anemia in pregnant women is more than 50 % in most states, while in young children it is approximately 70 %. Coverage of supplementation programmes remains poor despite both institutional and community based delivery mechanisms. The current dose of iron supplement for women (100mg) is higher than recommended by WHO and should be revisited as an urgent priority. Identifying operatonal issues to improve programme success and learning lessons from states which have achieved successful coverage of anaemia control programmes is important.

Nepal: Success with iron and folic acid supplementation (IFA) has been achieved in pregnant women, but the rate of reduction in anaemia has stagnated with the prevalence around 35 percent during 2006 -2011 directed to understand the aetiology of anemia. Anemia prevalene among young chilren under 23 months was also a very high at 69 % in 2011. Nepal is seeking robust evidence and strategice directions for addressing the high prevalence of childhood anemia. Nepal's report of its National Micronutriet Status Survey is due and would provide much needed evidence on etiology of anaemia in the population. Nepal initiated intermitent IFA supplementation to adolescent girls based on WHO Guidelines , however, request more evidence on dosage of iron and folic acid to adolescent girls and possible adverse effects to scale up the interventions. Nepal also has mandatory legislation to all national level roller mills for fortification of wheat flour,

however, the BCC component in this regard and social marketing of the product is lacking.

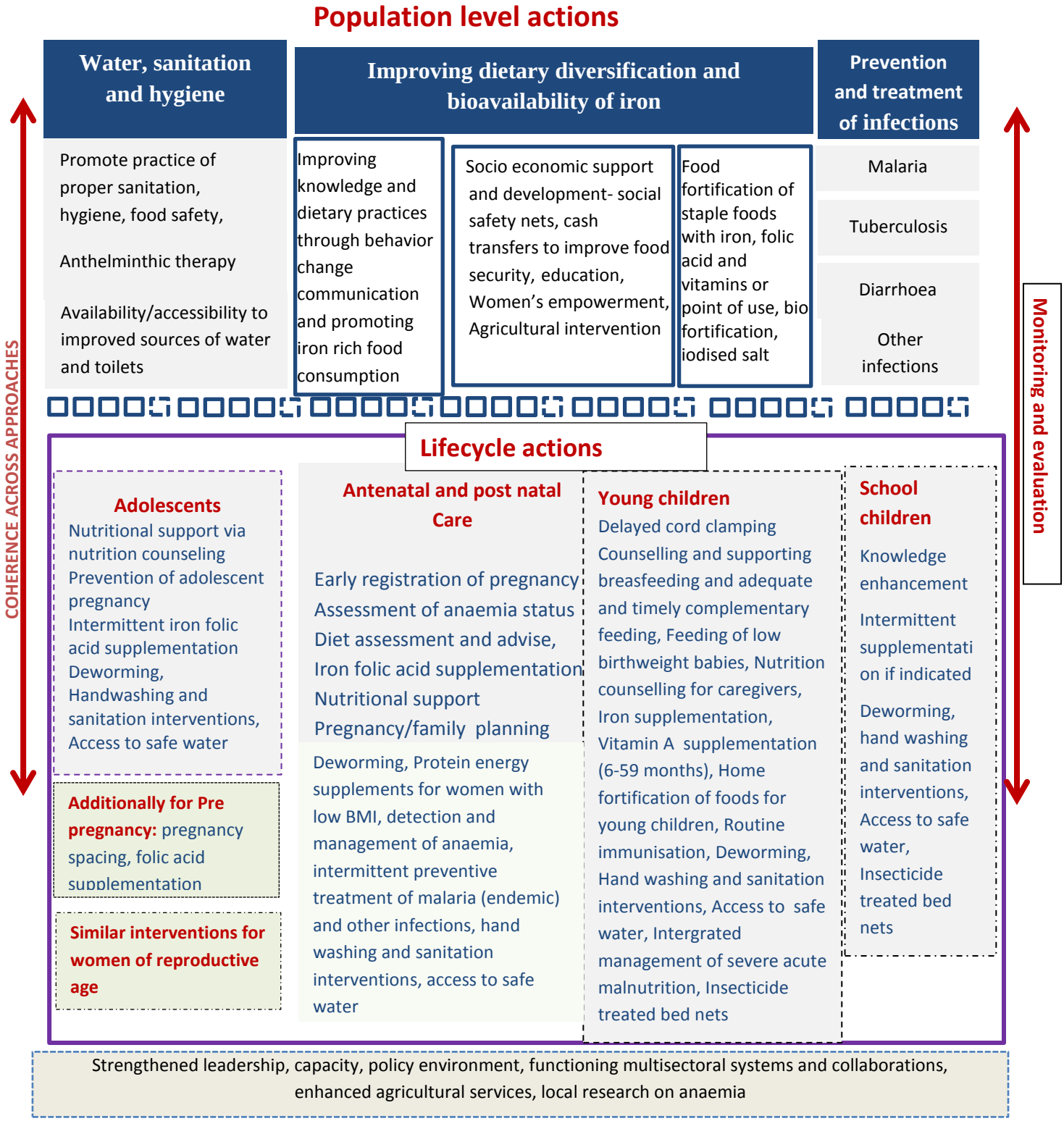
Sri Lanka: The prevalence of anaemia among pregnant women and children have decreased gradually. The contribution of iron deficiency to anaemia is approximately 40 percent. Hemoglobinopathies/traits contribute to about 12 percent of anaemia. The prevalence of anaemia in pregnant women have reached a plauteau with high iron and folic acid (IFA) supplementaion coverage and compliance. Sri Lanka requests an exit strategy for IFA blanket supplementation since it would be prudent at this stage to consider a test and treat strategy.

Thailand: Thailand is considering implementing intermittent IFA supplementtaion but requests more evidence on folic acid supplementation; specifically on the dosage and on possible adverse effects. Thailand also raised concerns regarding the high prevalence of anaemia in infants < 1 year compared to children > 1 year of age, and stated the need for further local research in this age group and also requested for further evidence on associations between mothers with very poor nutrition status, food supplementation during lactation, breastfeeding for 6 months and iron status in young children and associations with anaemia.

2.5 Actions to prevent and treat anaemia

Actions to prevent anaemia are complementary, with their relative importance depending on local conditions and specific needs. When impelmenting policy actions, a package of interventions should be considered.

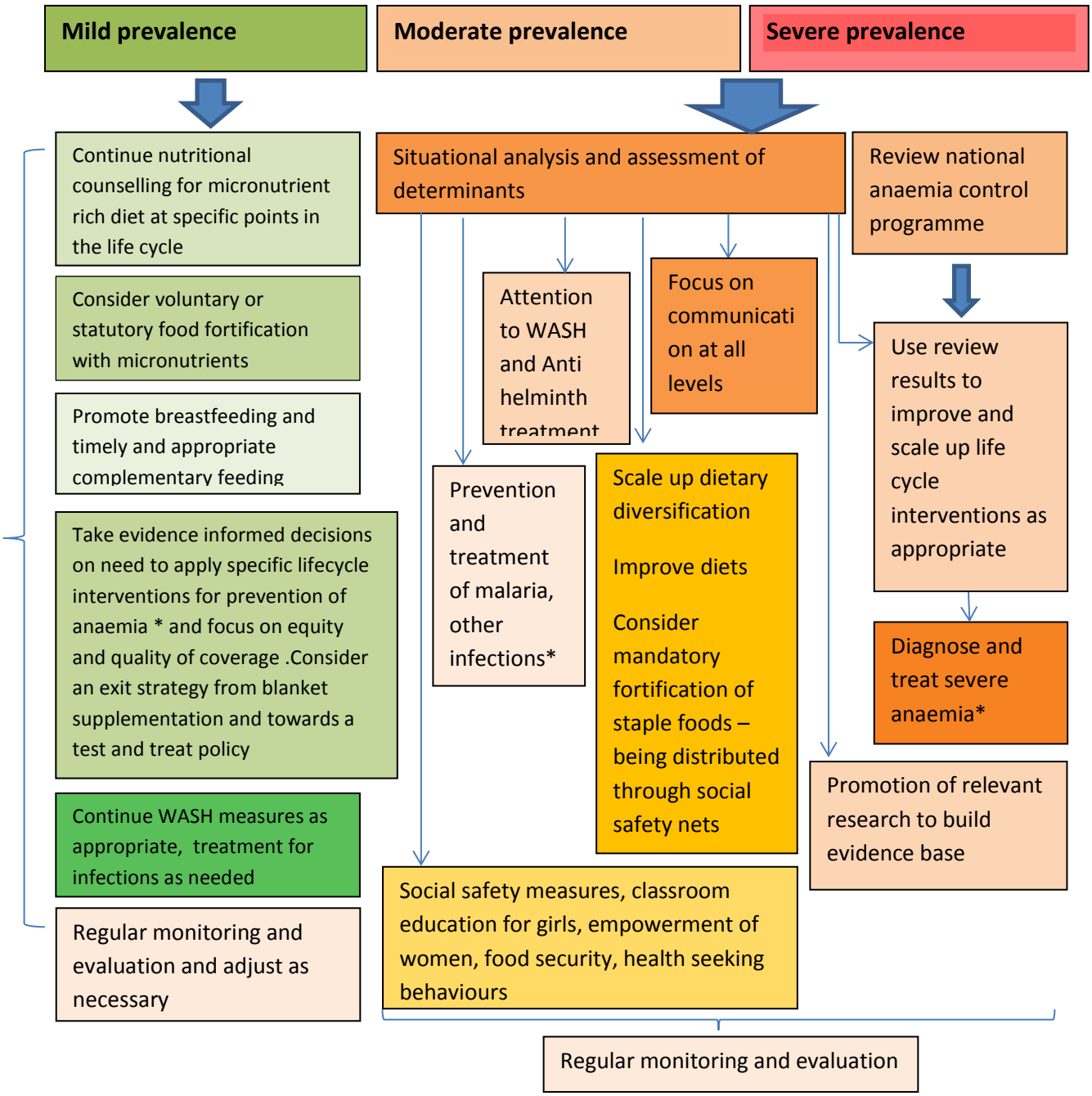
Figure 2. 1 Actions to prevent and treat anaemia



2.4.1 Framework for prevention of anaemia

Countries could consider strategizing their anaemia programmes depending on the country context and degree of the public health problem. Figure 2.2 provides a framework for countries to consider adapting, depending on the prevalence of anaemia.

Figure 2.2 Framework for prevention of anaemia



**the relevant guideline has to be updated and made available to all health care workers*

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Annex 1. Country data on anaemia taken from the latest available national surveys

Table 1. Country data on anaemia taken from the latest available national surveys

Country	Prevalence of anaemia (%)			Data Source
	Children (6-59 months)	Women of reproductive age (WRA)	Women (pregnant)	
Bangladesh	33	26		*2011-12 National Micronutrient Survey (NMS)*
Bhutan	43.8	34.9	31.2	
DPR Korea	28.7		31.2	*2012 National Nutrition Survey*
India	70	55	55	*NFHS-3 (2005-06)* *National Micronutrient survey ongoing*
Indonesia	28.1	17.9	37.1	*Indonesia Basic Health Research 2013:*
Maldives	26.2 (moderate 25.9, severe 0.4)	15.4 (moderate 15, severe 0.3)		*National Micronutrient Survey 2007*
Myanmar	57 (mild 32, moderate 25, severe >1)	47 (mild 38, moderate 8 and severe < 1)		*DHS 2016*
Nepal	46.2	35.2	48	*GON/MoHP/DoHS, Nepal Demographic and Health Survey 2011* *National Micronutrient survey ongoing*
Sri Lanka	15.1	22.2*	16.7 *	*MRI & UNICEF 2012* *** MRI & UNICEF 2009*
Thailand	23.9	22.7	23.8	*SEANUTS 2010-2012(0.5-4.9 y)* *NHES 5 (WRA)* *Pregnant women (Bureau of Policy and Stategy, MoPH, 2016)*
Timor Leste	62.5	38.9	-	*Timor Leste Food and Nutrition Survey 2013*

Annex 2. Knowledge products needed to scale up anaemia interventions

1. **A Framework tool for an operational review of in country anaemia programmes**.

   Countries with moderate/high prevalence of anaemia and inadequate coverage of programmes need an operational review of anaemia programmes to assess programme gaps prior to scaling up interventions. A common regional tool will be of benefit to Member States.

2. **Communication materials**

   A package of factually accurate, regionally relevant communication materials targeted at policy makers, program planners, implementers/multi-sectoral, (health, agriculture, WASH), frontline workers, community, individuals, media and others such as educationists is needed. A regional level package if developed, could be adapted by countries based on each country context.

3. **Compendium of micronutrient interventions**.

   Such a document would be a useful for programme managers. i.e to have a pocketbook of all guidelines pertaining to anaemia in a single concise document. This could be updated via the web as new guidance is developed and published.

4. **Repository of evidence for anaemia**

   A searchable repository of evidence for anaemia control interventions in the Region would be of benefit to local policymakers.

Annex 3

REQUESTS FROM THE SECRETARIAT

1.India's experts at the consultation had 2 requests:
a) Guidance on the use of enteric coated versus non-enteric coated iron tablets and the use of flavorings in iron syrups for children less than 2 years of age in India is urgently needed.
b) Updated guidance on the treatment of anaemia since the current guidance is from the 1980's.
c) The WHO guidelines on treatment of anaemia through iron and folic acid supplementation was requested as presently, WHO guidelines for prophylaxis of anaemia are available.

2. A review of evidence and updated guidance on anaemia cut-offs for young children, and women of reproductive age requested by the entire expert group.
3. Sri Lanka requested guidance on an exit strategy from blanket coverage of iron supplementation in areas where the prevalence of anaemia is less than 20%.
4. Thailand and Sri Lanka requested guidance on the optimal dose of intermittent folic acid supplementation and the potential risks of folic acid supplementation and fortification. Further, the optimal dose of folic acid which would reduce anaemia, as well as prevent birth defects needs to be defined.

Annex 4. Research data needed from South -East Asia Region

- Pilot studies evaluating effectiveness of iron interventions (iron supplements, fortification, MNPs) should ideally be designed as RCTs in order to gauge true effect and enable stakeholders (eg sponsors/ donors/ the community/government) appreciate what they are getting for their investment.

- Methods of preventing infections (especially malaria, where relevant, and diarrhoea) when providing iron interventions to young children must be established.

- The most feasible way of monitoring incidence of infection (i.e. safety) when implementing iron intervention programmes must be determined.

- The effect of control of malaria, diarrhoea and other infections on anaemia and iron status must be determined in the SEAR region. Likewise, the biologic effects of WASH interventions on improving iron absorption should be determined.

- The safety (in terms of risk of iron overload) of iron interventions to populations where haemoglobinopathy prevalence is high must be established. In particular, the safety of food fortification which may also affect men should be determined in such regions.

- The determinants of anaemia in Bangladesh where low ferritin appears uncommon must be addressed through high quality and innovative research studies.

- Determinants of anaemia , safety of long term interventions ie food fortification, and interactions with the environmental situation in Bangladesh, parts of Nepal and India.

- The functional benefits of iron interventions on child health (especially child development, wellbeing and growth) have not been established. This lack of data may compromise government/ donor willingness to invest in solutions. High quality trials addressing this question are needed in the SEAR region.

- Given that iron deficiency anemia (due to dietary insufficiency and infectious diseases) and anemia of inflammation are the two leading causes of anemia, and interventions to address these would differ, simple diagnostic tools to differentiate the two are important.

Annex 5. Global resources/support for anaemia prevention

- E- Library of Evidence for Nutrition Actions. http://www.who.int/elena/en/
- Accelerated Reduction Effort on Anaemia (AREA) Community of Practice. https://knowledge-gateway.org/area
- Anaemia Resource Review: a selection of materials that help stay on top of research and developments related to strengthening multi-sectoral approaches to preventing and controlling anaemia. https://www.spring-nutrition.org/technical-areas/anaemia/resource-review

Annex 5. Example of multisectoral actions to prevent anaemia; Nepal