Controlling Iron Deficiency – Nutrition policy discussion paper No. 9

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written and edited by

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ADMINISTRATIVE COMMITTEE ON COORDINATION/SUBCOMMITTEE ON NUTRITION

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UNITED NATIONS – ADMINISTRATIVE COMMITTEE ON COORDINATION – SUBCOMMITTEE ON NUTRITION – (ACC/SCN)

The ACC/SCN is the focal point for harmonizing the policies and activities in nutrition of the United Nations system. The Administrative Committee on Coordination (ACC), which is comprised of the heads of the UN Agencies, recommended the establishment of the Subcommittee on Nutrition in 1977, following the World Food Conference (with particular reference to Resolution V on food and nutrition). This was approved by the Economic and Social Council of the UN (ECOSOC). The role of the SCN is to serve as a coordinating mechanism, for exchange of information and technical guidance, and to act dynamically to help the UN respond to nutritional problems.

The UN members of the SCN are FAO, IAEA, World Bank, IFAD, ILO, UN, UNDP, UNEP, UNESCO, UNFPA, UNHCR, UNICEF, UNRISD, UNU, WFC, WFP and WHO. From the outset, representatives of bilateral donor agencies have participated actively in SCN activities. The SCN is assisted by the Advisory Group on Nutrition (AGN), with six to eight experienced individuals drawn from relevant disciplines and with wide geographical representation. The Secretariat is hosted by WHO in Geneva.

The SCN undertakes a range of activities to meet its mandate. Annual meetings have representation from the concerned UN agencies, from 10 to 20 donor agencies, the AGN, as well as invitees on specific topics; these meetings begin with symposia on topics of current importance for policy. The SCN brings certain such matters to the attention of the ACC. The SCN sponsors working groups on inter–sectoral and sector–specific topics. Ten–year programmes to address two major deficiencies, vitamin A and iodine, have been launched.

The SCN compiles and disseminates information on nutrition, reflecting the shared views of the agencies concerned. Regular reports on the world nutrition situation are issued, and flows of external resources to address nutrition problems are assessed. State–of–the–Art papers are produced to summarize current knowledge on selected topics. As decided by the Subcommittee, initiatives are taken to promote coordinated activities – inter–agency programmes, meetings, publications – aimed at reducing malnutrition, primarily in developing countries.

ACKNOWLEDGEMENTS

At the 15th Session of the ACC/SCN in February 1989 the urgent need to provide guidance on measures for improving the effectiveness of iron supplementation programmes was expressed. While efficacy had been proven in field trials, when scaled–up, programmes had been seen to have limited impact. During 1989, the Advisory Group on Nutrition (AGN) reviewed currently available knowledge, and defined key questions regarding these programmes. These questions were to be answered as far as possible on the basis of experience in developing countries on what has been shown to work under given conditions. The AGN hoped there was sufficient information about determinants of effectiveness to allow firm recommendations, noting that this was becoming increasingly urgent to help control programmes to expand in scope and number.

In the 16th Session in February 1990, the SCN concluded that explicit answers to these key questions were not available in the current literature. It was decided that a workshop be convened as soon as possible to draw on experience, from a sample of large–scale iron supplementation programmes, of the conditions and measures associated with effectiveness. On this basis, a set of guidelines could be developed for programme use. The workshop should also include consideration of other interventions for iron deficiency control, such as fortification and dietary modification. Funding for the workshop was provided by The World Bank, UNICEF and WHO.

In early 1990, efforts were made to identify ongoing large–scale supplementation programmes in as many countries as possible, and to seek individuals, responsible for their operation, who were willing to complete a detailed questionnaire. These were subsequently collated to serve as background material for the workshop. Several illustrative programme descriptions – from Thailand, India (Gujarat), Indonesia, Burma and the Caribbean region – are provided in Part II of this report, following a synthesis of the questionnaire responses.

The workshop was held between 6–8 June 1990 in Trinity College, Dublin. We would like to thank all 20 participants, whose names are listed in Annex II. We are particularly indebted to Dr Chakravarty, Dr Kachondham, Dr Khin Swe Min, Dr Kodyat, Dr Patterson, and Dr Seshadri, who took time to gather relevant information from programmes they were responsible for. This report is partly based on the outcomes of specialised working groups, set up during the workshop to review specific issues relating to supplementation programmes. Earlier drafts have been distributed for comments to all participants.

We are very grateful to Viki Elliot for typing and transcribing questionnaires. Finally, we would like to express our thanks to Professor John Kevany of Trinity College, Dublin for hosting and chairing the workshop, as well as for his valuable contributions to this document

S R Gillespie
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ACC/SCN
February 1991

FOREWORD

Since its inception, the SCN has been concerned with micronutrient deficiencies – iodine, iron, and vitamin A – because of their high prevalence and severe consequences for mothers and children in the developing world. As expressions of its interest, it has sponsored the Ten Year Plans for iodine and vitamin A deficiency control, specifying the magnitude and geographical distribution of the problems and the role that the international community should play in cooperating with governments for reaching the overall goals. The SCN has also established working groups on iodine and vitamin A to examine every year progress made (or lack or it), outcomes of research, and trends towards the elimination of these conditions.

While recognizing that iron deficiency is more prevalent than iodine and vitamin A deficiencies together, and has also very severe consequences, the attention of the SCN, until recently, did not focus on it. The main argument was that iron supplementation induced side effects that discouraged mothers to comply with the treatment. On the other hand, in the developing countries, iron fortification and consumption of foods to improve overall iron bioavailability, because of their complexity, are not yet in vogue.

At a workshop held in Dublin, June 1990, sponsored by the SCN, on Iron Deficiency Control, it was clearly established that the major constraints to compliance with iron supplementation, were not the side effects but the limited coverage of primary health care services and, particularly, issues of supply and timely delivery of iron supplements to anaemic mothers. The Report of this meeting, contained in this document, emphasizes the significance of iron deficiency for social and economic development, examines in detail the different approaches to deal with it, and urges governments and the international nutrition community to give priority to control programs so as to progressively reduce the incidence and severe sequelae of this condition.

At its 18th Session, the SCN examined the Report and issued a statement to be transmitted to the ACC indicating, in a succinct but clear way, that science has provided sufficient evidence to guarantee that well designed and effectively implemented programs will prevent and/or control iron deficiency.

An ad–hoc group on Iron Deficiency Control has been created. Like the ones on iodine and vitamin A, it will report to each Session of the SCN how this problem is evolving, as a result of the activities of governments and external cooperation, and how research is contributing to its solution.

A Horwitz
Chairman, ACC/SCN

ACC/SCN STATEMENT ON THE CONTROL OF IRON DEFICIENCY[1]

[1] Agreed at the 18th Session of the ACC/SCN, held in UNFPA, New York, 25 February – 1 March 1991.

Iron deficiency is the commonest nutritional disorder in the world and affects over one billion people, particularly reproductive women and pre–school children in tropical and sub–tropical zones; it also has a serious impact on school children and working males. If uncorrected it leads to anaemia of increasing severity, reduced work capacity, diminished learning ability, increased susceptibility to infection and greater risk of death associated with pregnancy and childbirth.

It results from consuming diets with insufficient iron, reduced dietary iron availability, increased iron requirements to meet reproductive demands and losses due to parasitic infections; these factors often operate concurrently.

Iron deficiency and its multiple adverse consequences can be corrected by simple, low cost and generally acceptable measures of proven efficacy. The most frequent approach is to provide iron supplementation during pregnancy, lactation and early childhood as a basic primary health care measure. While the efficacy of this approach has been clearly demonstrated, effectiveness under programme conditions is often low. Problems of supply, distribution and consumption of iron supplement have been identified in the majority of programmes based on primary health care. While these problems are widely acknowledged, their cause, extent and contribution to lack of effectiveness has not been sufficiently analyzed as a basis for improving performance.

"Controlling Iron Deficiency" (ACC/SCN State of the Art Series. Nutrition Policy Discussion Paper No. 9. Geneva February 1991.) sets out a framework for problem analysis and provides detailed guidance on effective programme management for use by national health services. It also identifies and explores alternative and complementary approaches to deficiency control through food fortification, dietary modification and parasitic disease control.

The report clearly indicates that the limited coverage of many national primary health care systems is a major limitation in iron supplementation where it is most needed and suggests the need to consider alternate delivery systems. It also identifies the importance of supply and logistic problems in limiting the steady flow of supplements to mothers. The skills and commitment of primary care workers appear to be critical in actively encouraging mothers to consume the supplement. Side effects do not seem to be as great a constraint as previously supposed. Perhaps most importantly, the report emphasizes the need for a commitment and priority at the policy and programme planning level to be given to this problem and its control. Health and social sector staff need to be convinced of the serious effects of iron deficiency and that its control is an urgent necessity for the improvement of maternal and child health.

The SCN wishes to draw attention to the persistence of this debilitating condition in the developing world, despite the availability of reliable preventative measures. It acts as a clear constraint on the effectiveness of agricultural, educational and social development programmes promoted and supported by the U.N. system.

It is important, therefore, that the social and economic impact of this problem be identified by agencies in sectoral assessments and reviews, and that support for its control and prevention be incorporated in their programmes and recommendations to governments.

SUMMARY

Iron deficiency anaemia is the most common nutritional disorder in the world, affecting particularly pregnant and lactating women and pre–school children. Supplementation with ferrous sulphate tablets (often including folic acid) is efficacious but problems exist with effectiveness of large scale programmes in developing countries. Nonetheless, improvement in such programmes remains the best approach for impact in the short–term among priority groups, and depends on improving all aspects of the system. Information from six operational programmes (in Burma, the Caribbean, India, Indonesia, Thailand, Zimbabwe) with recent research and evaluation experience gave background for a workshop convened by the SCN in June 1990. The components of the system from overall supply of tablets through to individual adherence were reviewed as outlined below. In this context, iron deficiency control depends on service supply and delivery and shares many of the problems of primary health care and essential drugs programmes. Central to this is the need for *daily* supplementation. At the same time, longer–term strategies of iron fortification and dietary modification were briefly considered.

Supply and logistics. Overall supplies of iron supplements are a frequent constraint. This arises not only from inadequate financing, but from failures in procedures for assessing community requirements, ordering and scheduling deliveries, ensuring quality control, adequate storage, monitoring distribution, etc., at all levels of administration. Higher priority for tackling iron deficiency at every point of decision making in the health system is needed – as well as better recognition of the problem among those affected themselves – which in turn requires better communication and information.

Service delivery system. In the first place, iron supplementation through existing service delivery systems requires regular contact of those in need with the services – especially health in this instance – and this is commonly lacking in areas most affected by anaemia. Other delivery systems including through the private sector show promise. *Blanket* coverage of vulnerable groups (notably pregnant and lactating women) is recommended. Within the heath system, capabilities for preventive measures, for diagnosis, treatment and referral need to be enhanced, starting at the village health post level.

Training. Additional training of health and other service delivery personnel is required in the prevention and treatment of anaemia. This applies to basic and in–service training, and should include management, surveillance, communication with clientele, screening, etc. As well, increased awareness of the problem at managerial and policy making levels is essential, which can be helped during training.

Form of iron. Ferrous sulphate is currently the most suitable preparation, being of low cost and high bioavailability. However, low−cost paediatric preparations for infants need to be developed. New forms of iron preparations providing sustained gastric delivery are promising, but have yet to be made widely available.

Dosage of iron. For *prevention* in pregnant and lactating women 60 mg elemental iron (= 200 mg ferrous sulphate, often with 250 mcg folate) per day (1 tablet) for four months is recommended in areas where iron deficiency anaemia is of low prevalence; in areas of higher prevalence 2 tablets, i.e. 400 mg ferrous sulphate per day is recommended. For *infants* breastmilk should be adequate for the first six months. From six months supplementation may also be widely necessary. In low birth weight infants supplementation may be required from two months onwards. The preventive dose of elemental iron is 1 mg/kg/day. Suitable liquid preparations need to be developed. For *children* supplementation is less widely needed and screening may be advised; the dose is 100 mg ferrous sulphate per day (pre−school) to 200 mg (school age).

For *treatment* the dose depends on the severity of the anaemia. For severe anaemia (Hb < 7 g/dl) in *pregnant and lactating* women 60 mg elemental iron (200 mg ferrous sulphate) *three* times daily is recommended; twice daily for mild−moderate anaemia. In *infants and young children* the recommended dose of elemental iron is 3 mg/kg/day; for *adolescents and other adults* 60 mg elemental iron daily is recommended for mild anaemia, and 60 mg twice daily for mild−moderate. Courses of 2−3 months duration will correct severe anaemia, while shorter courses of 2−3 weeks may be indicated where anaemia is predominantly of mild−to−moderate severity. Parenteral iron is seldom essential, and can be risky particularly in malaria endemic areas.

Potential *toxicity* of iron needs to be borne in mind, while not counter−indicating control programmes. However, it is stressed that oral iron supplementation to normal pregnant women causes no risk of toxicity and present evidence indicates only minor undesirable side effects when the dose is relatively small. Furthermore limited periods of supplementation are not a concern even in patients susceptible to iron overload.

Adherence (compliance). Information from the programmes reviewed and from previous literature indicates that side effects from ferrous sulphate are associated with only a relatively small proportion of drop outs from supplementation programmes. Supply and distribution constraints tended to be more important in causing lack of adherence. Cultural issues as well as improved community understanding and participation in programmes are important. Improved monitoring of adherence within programmes would be important in improving the effectiveness of these programmes.

Vulnerable/target groups. Pregnant and lactating women are of highest priority, and generally require blanket coverage in areas of high anaemia prevalence. Premature and low birth weight infants are also a high priority target group. Supplementation of pre−school children should be considered in areas of high anaemia prevalence, and similar considerations apply to school age children. In adolescent girls pilot studies have shown benefit from supplementation to build iron stores before pregnancy.

Fortification. If effective in the long−term, fortification may generally raise the iron status of the population, and while not necessarily substituting for supplementation can reduce its urgency and allow it to be more specifically targeted. Effective fortification programmes require long−term commitment, a bioavailable but not reactive iron source, and suitable vehicles (foods) to be fortified. Efficacious iron sources exist (such as iron−EDTA), as do several examples (but mostly in developed countries) of suitable foods for fortification. In some cases fortification can be targeted to vulnerable groups, e.g. weaning foods.

Dietary modification. The three main ways in which diets can increase iron status are:

− increasing the intake of haem iron (from animal products);

− increasing the intake of vitamin C, along with foods promoting iron absorption e.g. acidic, fermented;

− reducing the intake of iron absorption inhibitors, e.g. in coffee, tea, some cereals.

Changing diets in such directions − allowing for cultural constraints especially concerning animal products −provides a potential solution to preventing iron deficiency anaemia in the long run.

Parasitic disease control. Control of hookworm and malaria are significant strategies for reducing iron deficiency anaemia. Hookworm transmission may be reduced by environmental and behavioural measures. In malaria−endemic regions the benefits of *oral* iron outweigh the risks (which exist partly because the malaria

parasites need iron for replication).

Conclusions. Inadequate and unreliable supply of supplements and low service utilization are major constraints in most programmes. Programme effectiveness depends on coverage and outreach of service delivery. Recognition of the importance of iron deficiency must be increased at all levels, including among those affected. Adherence to a supplementation regime is a constraint, probably more related to unreliable supply to the individual than to undesirable side effects, although the latter also need to be tackled.

Blanket coverage of pregnant and lactating women in at risk areas is recommended. Greater attention is needed to iron supplementation in premature and low birth weight infants, for which new preparations are needed. In other age groups selective supplementation (e.g. using screening) may be desirable. Fortification and dietary modification are complementary approaches, and should be developed. In general, a mix of strategies is likely to be the most successful.

INTRODUCTION

Introductory Statement

“Iron deficiency is the most common nutritional disorder in the world. It occurs when the amount of iron absorbed in the body is insufficient to meet its requirements, and if prolonged, results in iron deficiency anaemia (IDA). It is estimated that 1.3 billion people suffer from anaemia, of which most is due to iron deficiency. Iron deficiency anaemia is an important cause of morbidity and, when severe, mortality. This situation persists although the interventions required for prevention and treatment are available, effective and inexpensive.

“The frequency of iron deficiency anaemia is more than 50% amongst pregnant women and pre–school children in many communities, and progressively less in school children, non–pregnant women and adult males. Iron deficiency anaemia reduces work–capacity, with adverse effects on productivity, earnings and the ability to care for children and the home. In developing countries, severe anaemia can be an associated cause in 50% and the main cause in up 20% of maternal deaths. Maternal anaemia results in intrauterine growth retardation, low birth weight and increased perinatal mortality. Iron deficiency in infancy and childhood is associated with apathy, inactivity and significant loss of cognitive abilities.

“The target group of highest priority for intervention is women during pregnancy and early lactation. In areas where iron deficiency is highly prevalent, blanket coverage of the group with supplements is recommended. Major constraints on effective intervention include low accessibility and utilization of ante–natal care, inefficient supply and distribution of supplement (usually ferrous sulphate/folic acid tablets), inadequate training and motivation of first line health workers, insufficient and inappropriate counselling of mothers, and failure of effective screening and referral procedures (where these are required). Iron deficiency control, in other words, shares many of the same problems as primary health care and essential drugs programmes. Another priority group is premature and low birth weight infants, for whom an affordable preparation for administration in the first weeks of life needs to be developed. For pre–school children in areas of high prevalence, screening for anaemia and selective supplementation should be considered.

“In general, supplementation programmes are of limited effectiveness outside these target groups and other approaches are needed to correct deficiency states. Of these, food fortification with a suitable iron compound is the method of choice in most situations. Attempts to improve iron intake and availability by dietary change are important in the long term, but behavioural change is gradual. Theoretically, there are three ways in which the amount of bioavailable iron in the diet can be improved: by increasing intake of haem iron; by increasing ascorbic acid intake to favour iron absorption; and by reducing inhibitors of iron absorption in the diet.

“For the immediate future, raising the effectiveness of programmes providing iron supplementation during pregnancy and lactation as a component of primary care appears to be the most practical approach to alleviating the problem of iron deficiency and anaemia for the most vulnerable group in areas of high prevalence. The successful prevention of iron deficiency in a community will lead to improved health especially in women and children, reduction of maternal and infant mortality, increased productivity in adults and improved learning capacity in children. Programmes should be highly cost–effective with the costs being offset by a better economic performance. The control of iron deficiency is an essential component of primary

health care, the Safe Motherhood Initiative and the AIDS Control Programme (the latter through the reduction of the need to transfuse blood in severe anaemia)."

This statement, as agreed by the workshop participants, summarises the nature of the iron deficiency problem, its size and distribution, causes and consequences along with the means and benefits of overcoming it.

Workshop Objectives

While field trials have usually shown iron supplementation to be efficacious in raising haemoglobin levels in targeted groups, when scaled up to district or country level many programmes have had a relatively limited impact. The Advisory Group on Nutrition (AGN) of the ACC/SCN in its meeting of September 1989 recognised there was an urgent need for a detailed consideration of the conditions and designs associated with effectiveness including the resources required and the potential contribution of technological advances. A proposal to hold a workshop was supported at the 16th Session of the ACC/SCN in February 1990.

The overall purpose of the workshop was to identify means of increasing the effectiveness of iron deficiency control programmes, particularly supplementation. Specific goals included identifying current issues with important implications for agencies, considering guidelines for managers of iron supplementation programmes, determining urgent operations research questions and assessing the role of other interventions, such as fortification, in a country's overall strategy for iron deficiency control.

Structure of Report

Prior to the workshop, information on the operational and technical constraints limiting the effectiveness of a number of large–scale iron supplementation programmes had been gathered using questionnaires distributed to a number of people with experience of such programmes. This approach provided for a degree of standardisation in the assessments and facilitated subsequent inter–programme comparisons. Completed questionnaires were received from several programmes, including Burma, Caribbean, India, Indonesia, Thailand, Zimbabwe, and the information thus gleaned enabled a summary report to be compiled. This report served as background to the discussions at the workshop, and is presented in Part II. Following the summary, the programme descriptions are reproduced verbatim, as they do seem to provide useful information not readily available elsewhere.

Part I of the report comprises the proceedings of the workshop. It describes the obstacles to successful control of iron deficiency in the community, followed by recommendations as to how policy–makers, administrators, programme managers, health–professionals and the community can overcome them.

PART I

IRON SUPPLEMENTATION

In order to provide an initial structure to the questionnaire and to orientate subsequent discussion on type of constraints within iron supplementation programmes, a flow diagram of the processes involved was prepared, and is presented in Figure 1. This incorporates aspects of tablet supply, service access and utilisation, within–facility factors (e.g. staff training), adherence with iron therapy and factors resulting in iron loss. This was sent out along with the questionnaires. Questionnaire results from those countries with iron supplementation programmes underway have been summarised in written form (Part II) and tabular form here (Table 1 and 2), to illustrate the type and degree of constraint imposed by the various factors.

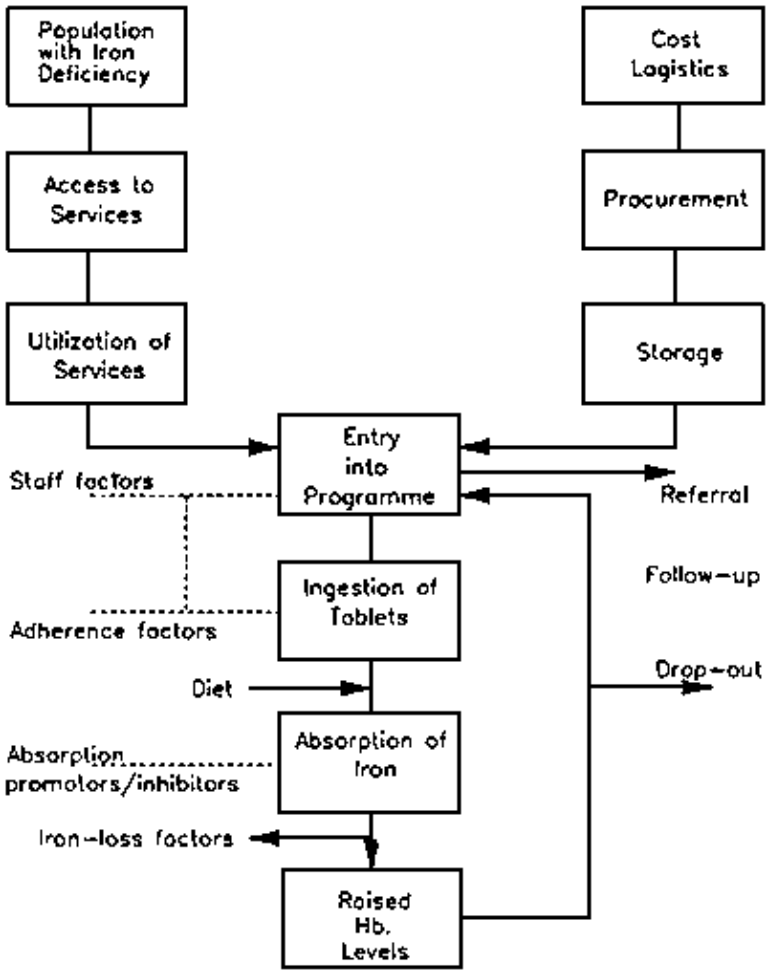

Figure 1: Process Involved in Iron Supplementation

In order to ensure that those people most in need actually do ingest iron supplements on a daily basis so as to raise their haemoglobin levels, a system of supply, delivery and consumption needs to be functioning smoothly. This has been seen in the past to be more manageable in smaller scale programmes than when these are scaled up to national level. Figure 1 above has been used to represent this system, in questionnaires distributed prior to the ACC/SCN workshop to help identify constraints in large–scale programmes.

The top half of the "Y" shows how the iron–deficient population and the iron supplements reach the 'distribution point' e.g. an antenatal clinic, on a regular basis (marked "Entry into Programme"). People with iron deficiency need first to be identified. If the iron supplementation is carried out through health services, these people need access to the services and to be sufficiently informed and motivated then to utilise them. Iron tablets should be regularly available in sufficient quantities at the distribution point. This will involve considerations of cost, logistics, transport, distribution and finally storage within the clinic.

The bottom half of the "Y" illustrates how, having entered into an iron supplementation programme, an individual's haemoglobin levels can be raised. The human element is critical here. Staff at the distribution point need to be trained to reassure the patient of the benefits of supplementation, particularly if there are any initial side–effects. They need to know when and where to refer a severely anaemic patient, how to monitor patients within the programme as well as to motivate those who have dropped out. Finally, given regular ingestion of an appropriate dose of iron by the patient, dietary and disease factors can modify iron absorption and loss, hence the degree to which haemoglobin levels are raised.

Following discussion of the questionnaire results, agreement on the following grouping of problem areas was reached:

Supply and logistics
Service delivery system
Training
Assessment of iron status during pregnancy
Forms of iron

Dosage of iron
Compliance (adherence) with iron therapy
Monitoring adherence

Some of these are operational problems (e.g. supply and logistics), some infrastructural (e.g. access to services), and some technological (e.g. detection of iron status, pill characteristics). Underpinning several of these problem groupings were issues such as policy awareness, information/monitoring/evaluation systems and research needs/gaps in knowledge. These do not form discrete sub−sections here but are discussed as they arise within each of the problem groups above. For example, policy awareness is linked to supply, research needs are particularly prominent in the technology section.

This section is organised in sub−sections focusing on country programme experience and relevant discussion from the workshop relating to the problem areas, followed by guidelines and recommendations.

Table 1: Ranking of constraints in five iron supplementation programmes

	Thailand	***India***	***Indonesia***	***Burma***	***Caribbean***
Service utilization	***	****	**	***	*
Tablet supply	***	***	**	**	**
Within−facility factors	**	**	*	*	*
Individual compliance	*	*	*	*	**

Key: **** major constraint, * minor constraint

Table 2: Programme constraints (*) checklist

	Thailand	***India***	***Indonesia***	***Burma***	***Caribbean***
Target group (PW = pregnant women)	PW	PW	PW	PW	PW
Utilization of services (% target group)	30	22	60	50	90
access	*	*	*	*	
time available	*	*		*	
awareness of benefits	*	*	*	*	
Tablet supply					
procurement	*	*	*	*	*
cost ($ per 1000)	3.0	0.6	UNICEF	UNICEF	2.8
budgetary allocation	*	*			*
Within−facility factors					
coverage (B = blanket)	B	B	B	B	B
monitoring?	No	No	No	No	Yes
staff training	*	*			
Individual compliance					
awareness of individual	*	*	*	*	
side−effects (%)	30	4	?	8	30−40

	drop–out (%)	12	58	?	?	33
	compliance monitoring?	No	Yes	No	No	Yes
Prevention of iron loss						
	hookworm infestation	*	*	*		
	malaria				*	*
Impact		Yes	No	Yes	7	Yes

Supply and Logistics

An inadequate supply of iron supplements will have a fundamental influence on the outcome of an iron supplementation programme. Iron tablets will not get to all those in need, while those tablets reaching the distribution point may be "spread too thinly" (i.e. too few and/or too infrequently administered) throughout the community to reduce anaemia prevalence. For example, community health workers (CHWs) may be "required" to provide some medicine to patients seeking their services and an inadequate supply of iron tablets may lead to administration of token or symbolic amounts.

An inadequate supply of iron supplements may arise from insufficient budgetary allocations to iron deficiency anaemia (IDA) control. This itself may be due to several factors including:

– a lack of overall governmental resources,
– a low priority for health expenditure within the government
– a lack of awareness by policy–makers of IDA as a problem,
– a lack of knowledge of the prevalence and distribution of IDA
– scepticism about the effectiveness of interventions for its control,
– limited exposure to evidence concerning the benefits of control.

In 1989, UNICEF supplied nearly 1 billion iron/folate tablets to some 47 countries at a cost of about US $1 per 1,000 tablets. These tablets are often included in kits of essential drugs and in emergency health kits, which can be packed as appropriate for any desired level within the health care system.

The questionnaires revealed that the supply of iron supplements and their distribution were in fact major constraints (see Tables 1 and 2). An interesting illustration comes from the state of Gujarat, India. At district level, 83% of the target group were judged to be covered by supplement supply; at PHC centre level, this proportion was 67%, at sub–centre level, 61%, and finally at village level, only 8% of the target group were covered by the actual supply. Moving from district to village level, two major factors bring down the level of coverage. Firstly, the target group is often considerably under–estimated at district level, and "need" is progressively revised upwards from district to village level (thus lowering the proportion covered by a given supply). Secondly, distribution bottlenecks progressively reduce the flow of supplements from district to village level. A third factor reported by some peripheral workers was that the supply actually reaching the villages was often going to school children rather than the intended target group of pregnant women, as they were a captive audience in direct daily contact with a distributor (the teacher).

This highlights the need when considering coverage to differentiate between the proportion of the population targeted, and the proportion in need. The former may often be an under–estimate of the latter as a result of budgetary limitations. This again leads to the need to convince decision–makers that IDA is a sufficient problem for the budget to be increased. In order to market iron deficiency control so as to increase governmental awareness and commitment, backed up by sufficient funds, a package might need to include: a description of the size and distribution of the problem, its causes and consequences, the benefits, costs and means of reducing it, as well as how these may link in with other health interventions. The introductory statement to this report reflects the need for such a heightened awareness of iron deficiency as a major health problem and one that can be controlled given a modest level of resources.

A major hurdle is the fact that anaemia is not *perceived* as a major health problem, by many policy–makers, district health officials, PHC managers, village health workers, and even by sufferers who may ascribe its consequences to general fatigue. Evidence of the independent effect of iron status on function would help in advocacy. Even where the problem is recognised, there may be a reluctance to invest necessary funds owing to scepticism regarding the effectiveness of interventions for controlling it. Measures to improve and

demonstrate programme effectiveness through built–in evaluation procedures should thus go hand–in–hand with a drive to increase awareness of the need for iron supplements. Such an increased awareness will lead to an increased demand, which in turn will put pressure on the supply system; both supply and demand thus need to be developed simultaneously.

In Thailand, there is a system of allocation of a lump sum for IDA control at *provincial*, not national, level. This in itself allows a more accurate assessment of the size of the problem and the resources needed to overcome it. A commitment to reduce IDA in Thailand has arisen in part from a recognition of the linkages of IDA with low birth weight in children – an example of the value of stressing the various adverse consequences of not seeking to control IDA.

Building an effective system of supply and logistics will involve consideration of factors such as needs assessment, budgetary provision, supply source, quality control, tablet composition as well as ordering, storage, monitoring and distribution. Requirements are detailed below. Inadequate supply at a village level may represent problems with distribution, discussed in detail in the section on "Service Delivery Systems".

Requirements for Adequate Supply and Logistics

1. *Assessment of total iron supplement needs* in eligible population plus 25% surplus. Assessment should be built up from district to national level in a systematical rather than piecemeal fashion. The basis for calculating "need" should be demographic;

2. *Adequate budgetary provision*;

3. *Source of supply*: internal (government) or external (UNICEF or other agency direct support or procurement on behalf of government);

4. *Quality control*: periodic sample checking of different levels of supplements, including a check on the authenticity of the drug;

5. *Composition of tablet*: usually the tablet is ferrous sulphate/folate, and film coated. Blister packing should be considered (e.g. for 2 per day: 4 weeks supply, i.e. 56 per pack; for 1 per day: 6 weeks supply, i.e. 42 per pack). Colour could be modified according to local perceptions;

6. *Ordering*: in time, to assure regular supply. 1 months stock should be maintained at village health post level, 3 months stock at district hospital level;

7. *Storage*: sufficient for needs mentioned above. Tablets should be stored in a shady, waterproof and accessible place;

8. *Monitoring*: monthly monitoring of stock at each level of distribution;

9. *Distribution*: *if* possible, as component of essential drug distribution system. Private distribution may be feasible. The main principle is that it should reach the most peripheral worker e.g. TBA, CHW, VHW, AWW, traditional village head, school teacher. Requirements should be indicated by supervisor (e.g. ANM, Health assistant, LHV) every month.

Service Delivery Systems

Providing a regular and sufficient supply of supplements at village level to cover local needs requires the efficient operation of a system of service delivery.

The questionnaires revealed considerable problems in both getting supplements (supply) as well as people (service delivery) to the distribution point Health services e.g. antenatal clinics are the most common network for the delivery of iron supplements to the priority target group – pregnant women. Levels of access and utilisation of such services, however, are very low (often below 50% target group) in many countries (see Table 1). Reasons for this include the lack of access – both in physical terms (clinics out of reach) as well as economic (transport costs, wages foregone in using services), and lack of awareness of benefits.

Expanding health services throughout countries will help reduce the access problem, while specific training modules need to be developed for health workers (see “Training”) to facilitate delivery and promote awareness among the community of the problem of IDA, the means to alleviate it through supplementation, and the ensuing benefits.

Other delivery systems?

Apart from health services, there may be other feasible networks for distribution. The private sector may hold considerable potential for the future. For example, in Central America, in areas where little prestige is attached to PHC posts, people would be more inclined to buy iron tablets (particularly if packaged attractively e.g. “blister” packs) than be given them free at a clinic. In Thailand, elixirs for children are successfully marketed by the private sector as “enhancing the blood” – a message appropriate to local health concepts. Another possibility is the distribution of iron tablets through linking in with other health activities e.g. the Safe Motherhood Initiative. It was, however, recognised that opportunities for linking iron with the Expanded Programme for Immunisation (EPI) were limited owing to the danger of overloading EPI, along with the different periodicities for administration of iron and other EPI components. Non–PHC systems that have wide outreach, such as schools, churches, party networks should be considered.

In India, where village houses are often scattered over a wide area making distribution difficult for peripheral workers, responsibility may be delegated to one person at the local–level (supervised by the peripheral worker) to distribute tablets. Village–level mid–wives and indigenous medical practitioners can distribute iron. This is happening in Burma, although the constraint here is inadequate supply to fulfill demand – the tablets reach the mid–wife but there simply aren’t enough. Such initiatives would need to be supported by both relevant training and a reliable supply system.

Blanket coverage or screening?

Where the prevalence of iron deficiency anaemia is known to be very high in certain population subgroups, as it is among pregnant women in many countries, blanket coverage may be less costly than targeting only to frankly anaemic women. Despite the problems involved in screening however, it may still be *perceived* as being more cost–effective than a blanket approach. Research on the costs per beneficiary of blanket vs. screened coverage therefore would be useful here. A blanket approach is generally favoured for high priority groups (pregnant women, premature and low–birth–weight children) while the operational levels at which haemoglobin monitoring and laboratory analysis are introduced need to be clearly specified (as outlined in the guidelines below).

Recommended Functions at Different Levels of the Service Delivery System

The following guidelines are described according to the tasks related to iron deficiency prevention, diagnosis, treatment and referral as carried out by different functionaries at the levels of village, primary health care centre and district hospital. They are intended for use at the district hospital level as a means for identifying constraints in service delivery in order to advocate for any resource re–allocation necessary to alleviate these.

Village level (sub–centres)

1. The *targets* are pregnant women (as early in pregnancy as possible), premature infants, pre–school children (6 months – 3 years) and adolescent girls. Blanket coverage is recommended for pregnant women and premature infants, while the level of coverage of other groups is of a lower priority and more area–specific.

2. *Prevention*: The delivery system for distribution is the primary health care system. At the village level the distribution may preferably be done by the traditional birth attendants, village health guide/primary health care workers. This would be particularly appropriate for pregnant women, premature infants and pre–school children. Alternative distributors, particularly for adolescent girls, can be school teachers. Where adolescent girls are not in school one of them may be identified and entrusted with the responsibility of supplement distribution. Nutritional anaemia can be ameliorated through the effect of appropriate family planning measures on reducing iron loss; thus a contribution to control can be family planning services. *Recommendations* here are to delay the first pregnancy, space successive pregnancies, improve the availability/provision of appropriate family planning devices and the promotion of breast feeding (the iron in breast milk being highly absorbable).

3. *Diagnosis, Treatment and Referral*: Therapeutic supplements are indicated for those identified as severely anaemic based on pallor signs, while those with pallor *and* breathlessness at rest should be referred.

Health Centre level

1. *Functionaries*: Health Assistants/Lady Health Visitors (LHVs), Auxiliary Nurse Midwives (ANMs) should be available to distribute iron supplements.

2. *Prevention*: The functions as above under village level plus all MCH care. The beneficiaries come to the clinic to collect the supplements.

3. *Diagnosis*: At this level, simple laboratory haemoglobinometers should be available and equipment for other analyses (such as microscopy of blood, faeces and urine for the detection of malaria, hookworm and *Schistosoma*).

4. *Treatment*: Of patients with moderate anaemia (Hb levels between 7–10 g/dl); hookworm infestation, malaria.

5. *Referral*: Patients with severe anaemias (below Hb 7 g/dl), refractory anaemia and other unresponsive anaemias, complicated and unresponsive malaria cases should be referred to the district level.

District Hospital level

1. *Functionaries*: Medical officers (MOs), LHVs, ANMs

2. *Prevention*: Their tasks will include the training, supervision and support of primary health care workers, TBAs etc. organizing the supply and logistics of supplements, along with other MCH care duties. Haemoglobinopathy and severe anaemia clinics will be operational at this level.

3. *Diagnosis*: Using district laboratory facilities.

4. *Treatment*: Severe iron deficiency should be treated with parenteral iron, while blood transfusion is indicated for life–threatening anaemias.

5. *Referral*: All conditions that require specialized attention e.g. leukaemias, should be referred to more specialised hospitals.

Training

Training may be considered as an integral part of service delivery, but one that warrants particular attention. Several of the programmes reviewed were constrained in some degree by inadequate or inappropriate training. As the distribution point was very often the antenatal clinic at the health centre, functionaries were often not specifically charged with the responsibility for iron tablet distribution. They had many competing responsibilities, which had to be prioritised. Iron deficiency control was felt by many to be peripheral or expendable in the crowded agenda of activities. This relates to health centre management and a system of organising an achievable number of daily tasks. Once management is effective and iron supplementation is emphasised as important, this should be backed up by relevant training and refresher courses. The different levels and sectors of training along with guidelines on the required content of training packages are outlined below.

Recommendations on Training within Different Sectors

Public health sector

Health Centre personnel, including MDs: Within basic training, greater emphasis needs to be placed on the problem of iron deficiency, the population at risk and the solutions at hand. In–service training should include consideration of work management, basic surveillance

procedures, estimation of needs, adherence or compliance evaluation, communication with clientele to increase adherence, taking finger–prick blood samples and appropriate use of screening instruments.

Pharmacists/suppliers: This is a critical group to ensure an adequate and constant supply; the estimation of needs being a crucial component.

Managers: Training should focus on implementation of policy and supervisory functions, with detailed information on procedures by service staff (e.g. a limited number of clearly defined tasks should be specified); preparation of norms, surveillance procedures and general evaluation of programmes.

Primary health care workers, traditional birth attendants, traditional heaters: Any training package for functionaries at this level should comprise the following fundamental elements:

– Iron deficiency should be linked to what the people recognize as undesirable because of “weak blood” etc;

– Awareness of the undesirable consequences of iron deficiency during pregnancy and delivery should be heightened. To benefit both women and children, this may be linked with stressing the benefits of delaying conception (family planning);

– The importance of dose and duration of supplementation needs emphasis;

– All public and private supplies as well as traditional or locally produced iron preparations should be identified for further evaluation of their effectiveness and proper use. Side effects should be considered;

– Aspects of diet, infection, general health, environmental health (prevention of hookworm, etc.) should all be highlighted with respect to their relevance to iron deficiency control;

– The linkages with health services in general within PHC, should be clarified;

– Effective communication to clientele and adequate use of available materials to improve compliance should be achieved.

Private health sector

Medical doctors, nurses, TBAs, pharmacists, drug industry and HMOs: Training should be geared to improving awareness of iron deficiency and the means for its control.

Other sectors

This group includes policy–makers in such areas as finance and planning, legislature, public health training, medicine, nursing, pharmacy; also sectors of education, agriculture, employment and trade, the Food and Drugs Administration (FDA) or equivalent, and finally, the media. Any training components designed for the above groups should include sensitization to the problem and the means to develop a coherent national strategy for the control of iron deficiency. The role that iron supplementation has within the national strategy should also be brought out.

Assessment of Iron Status During Pregnancy

There are a large number of laboratory measurements that are now available for assessing iron nutriture in pregnant women. The best diagnostic tests involve measuring the concentration of haemoglobin in circulating blood or the packed volume of red cells (haematocrit). Other measurements include serum iron, iron–binding capacity, serum ferritin, free erythrocyte protoporphyrin (FEP), mean corpuscular volume (MCV) and mean

red cell diameter. The cost and complexity of most of these methods however precludes their widespread application except as part of an investigation. Nevertheless, in severely anaemic women, some additional laboratory assessment in addition to haemoglobin determinations is desirable to identify iron lack as the cause. This is especially important in geographic regions where other causes of anaemia are common such as malaria, folate deficiency or haemoglobinopathies.

It is recommended that iron supplementation during pregnancy not be limited to women in whom anaemia has been identified. Haemoglobin or haematocrit determinations are nevertheless important for monitoring the prevalence of anaemia, assessing the efficacy of interventions and identifying severely anaemic women. Because of its low cost and high reliability, the Spencer haemoglobinometer is considered to be the optimal instrument at present when more sophisticated hospital based instrumentation such as microhaematocrit centrifuge colorimeter or Coulter counter are not available. The battery–powered solid state PHC haemoglobinometer has also been proposed as an accurate, cheap and rugged instrument but further development and evaluation is needed. Techniques based simply on visual inspection of skin, conjunctival colour or dubious symptoms (except in extremely pale women) cannot be regarded as a reliable index of anaemia during pregnancy.

It should be noted that many of the more sophisticated techniques of evaluating iron status are influenced by pregnancy independently in a manner that greatly diminishes their diagnostic utility and specificity. A new measurement, the serum transferrin receptor concentration that promises to provide a more sensitive and specific measure of tissue iron deprivation during pregnancy has been developed. The assay is performed by the identical technology used for the measurement of serum ferritin. It also has the major advantage that it requires only a few microlitres of serum and is therefore suitable for capillary (finger prick) blood specimens. This assay is not yet available commercially and it is recommended that efforts be made to promote the development of a commercial assay and to assess its diagnostic utility more widely in developing countries.

Results of tests for iron deficiency need to be interpreted in relation to reference standards. Grades of anaemia tend to vary; for the purpose of this report the WHO definitions, based on haemoglobin concentrations, are used:

Table 3: Haemoglobin Levels Indicative of Anaemia in Populations Living at Sea Level

Age/sex group	***Haemoglobin level (g/dl)***
Children 6 months – 5 years	< 11
Children 6 – 14 years	< 12
Adult males	< 13
Adult females (non–pregnant)	< 12
Adult females (pregnant)	< 11

Table 4: Degrees of anaemia

Grades	***Haemoglobin level (g/dl)***
Mild	above 10
Moderate	7 – 10
Severe	below 7

Source: WHO Technical Report Series No. 405, 1968 (Nutritional Anaemias: Report of a WHO Scientific Group); DeMaeyer et al. (1989) Preventing and Controlling Iron Deficiency Anaemia through Primary Health Care: A Guide for Health Administrators and Programme Managers, World Health Organisation, Geneva.

Form of Iron

The primary form of iron used in supplementation programmes is the ferrous sulphate tablet, due to its low cost and high iron bioavailability. The colour of the tablet may influence perception and acceptability in certain cultures. Gastric dissolution can be influenced by physical properties such as coating and degree of compression of the tablet. While other bioavailable forms of iron exist, none are better absorbed than ferrous sulphate and all cost more. In fact, ferrous sulphate is one of the least expensive medicaments in health care.

Liquid iron preparations that exist are useful for paediatric applications. Such elixirs have the disadvantages of several–fold higher costs per equivalent tablet dose, are less chemically stable after opening the container, and may cause staining of teeth. It is recognized that elixirs are needed to treat low birth weight and premature infants, but overall prophylaxis of preschool children should be targeted at encouraging extended breastfeeding and utilizing iron–containing weaning foods.

Parenteral iron preparations (e.g. Imferon) should not be used within a public health strategy, but are important for targeted therapeutic treatment of severe anaemia. Hazards associated with use (worsening of malaria, risks of HIV transmission with injections, intra–venous contamination) and the high costs of product and its delivery restrict their application to medically supervised use only.

Recent laboratory–based human studies have reported reduced side–effects and increased efficacy from a new form of oral iron. Known as either the Hydrodynamically Balanced System (HBS) or Gastric Delivery System (GDS), this capsule enables sustained gastric delivery of ferrous sulphate over a several hour period. Initial results shown that a single HBS capsule provides bioavailable iron equivalent to two or three 60 mg iron tablets.

Because of the potential advantages of reduced frequency of administration and lower side effects, it was recommended that negotiations be initiated with the manufacturer to provide cost estimates for large scale production and distribution in order to more fully evaluate the potential use of the HBS capsule. Several large scale field studies should also be initiated under different conditions to provide additional data on which to make further recommendations.

Dosage of Iron

Dosages are recommended both for the prevention and the treatment of iron deficiency anaemia within specific age–groups:

Prevention of Iron Deficiency Anaemia

Iron supplementation as a preventive measure has a greater chance of success when directed to specific groups. Coverage of an entire population is usually unnecessary, logistically impossible, and prohibitively expensive. Supplementation should be aimed at high risk groups such as pregnant and lactating women, infants and preschool children and perhaps to captive audiences – e.g. school children, plantation workers – who can receive supplements at work.

The effectiveness of iron supplementation is constrained by two major factors: gastrointestinal side effects of oral iron (which in turn is related to dosage), and the difficulty of sustained motivation.

In all groups supplementation should be short term (no more than 4–5 months) for each individual. In the meantime other therapeutic and preventive measures should be implemented. If needed, repeated supplementation can be undertaken (e.g. every other year) depending on recurrence rates.

Pregnant women

Pregnant women are a priority group for iron supplementation and it is generally agreed that (a) iron tablets should be distributed to all pregnant women and that (b) this task is within the competence of primary health care workers and should be emphasized as their formal responsibility.

The recommended daily dose for prevention is:

i) 60 mg elemental iron (i.e. 200 mg ferrous sulphate) and 250 mcg folate (1 tablet) per day, in areas *where iron deficiency anaemia is of low prevalence* (i.e. Hb < 11 g/dl. in less than 20% women in second half of pregnancy)

ii) 2 tablets/day (i.e. 120 mg elemental iron and 500 mcg folate) in areas *where iron deficiency anaemia prevalence is moderate or high*.

Supplementation should especially occur during the second half of pregnancy. Biologically, however, pregnant and lactating women are not a very responsive target group; interventions directed towards them may be more effective but less efficacious than those directed to non–pregnant, non–lactating women. Supplementation of pregnant women may prevent a deterioration of the anaemic condition during the increased physiological burden of pregnancy, but does not address the underlying iron deficiency present at its onset One programmatic option that would thus seem to warrant further exploration is the targeting of adolescent girls/women after marriage and before conception, as well as in the inter–pregnancy period i.e. aiming to prevent iron deficiency at the onset of a pregnancy.

Infants

For normal birth weight infants, breast milk is usually adequate in supplying iron for the first 6 months. In low birth weight infants (< 2.5 kg) iron supplementation is required from 2 months onwards.

For infants from 6 months of age, a liquid preparation (drops) may be necessary. Unfortunately these are usually expensive, deteriorate in storage and are sometimes mixed with other vitamins and minerals. Nevertheless liquid preparations are useful in infants and preschool children. There may be a role for concerned development agencies to emphasise their importance and seek ways of reducing their price. The dose for prevention is 1 mg/kg/day.

Preschool children

The emphasis on prophylaxis in this age group should be on the promotion of breastfeeding and utilisation of iron–containing weaning foods. When supplementation is required in areas where iron deficiency anaemia is prevalent in preschool children, the dose is 30 mg elemental iron daily, in tablet or liquid form. To ensure better adherence to the supplementation regime, it may be more practical to give children a 2–3 weeks course several times a year.

School children

School age children do not usually have such high prevalence of iron deficiency anaemia. If it is thought to be a significant problem, the primary health care workers in collaboration with the teacher could provide short courses of daily dose 30–60 mg/day of elemental iron, depending on child's age and weight.

Treatment of Iron Deficiency Anaemia

Pregnant women

The dosage depends on the severity of the anaemia. For most tropical rural populations where malaria is endemic (e.g. the African Region), the recommended regimen for initial treatment at PHC level comprises a combined attack on iron and folate deficiency, malaria, hookworm and infection if necessary.

For severe anaemia (Hb < 7 g/dl.) this includes 60 mg elemental iron 3 times per day until 4 weeks after haemoglobin levels normalise and cease to rise. The full treatment regimen for anaemia includes:

– oral ferrous sulphate 200 mg (60 mg elemental iron) and 250 mcg folate in a combination tablet, 3 times per day

– anti–malarials e.g. oral chloroquine, proguanil (in areas where appropriate)

– albendazole (where women are exposed to heavy hookworm infestations)

– antimicrobials as indicated.

For moderate anaemia (Hb > 7 g/dl. < 10 g/dl.) of pregnancy the dosage recommended is:

– ferrous sulphate 200 mg. (60 mg elemental iron) and 250 mcg folate in a combination tablet, 2 times per day:

Infants and young children

For treatment of iron deficiency anaemia the recommended dose is 3 mg of elemental iron per kg body weight per day. Higher doses have been used but are probably unnecessary, and may increase the risk of accidental overdose.

Adolescents and Adults

The recommended daily dose of elemental iron is:

– for mild anaemia: 60 mg
– for moderate/severe anaemia: 120 mg

Although folate deficiency is not a common problem among non–pregnant women, where ferrous sulphate/folic acid combination tablets are available, they should still be given to such groups (e.g. infants, young children, adolescents).

Parenteral Iron

The parenteral route is really only indicated when oral administration causes severe vomiting that cannot be stopped by lowering the dose of iron, or in cases of persistent non–compliance. Parenteral iron can be given by either intramuscular or intravenous routes and for both the most commonly used preparation is iron dextran (*Imferon R*).

The advantages of the intravenous method is that the complete iron requirement/needs can be supplied as a single dose (total dose infusion). The recommended intravenous dose for adults, including pregnant women is calculated from the body weight (kg) and the haemoglobin concentration, according to tables supplied by the manufacturer, or from the formula, [body weight (kg) x (14.0 – observed Hb g/dl) x 0.1] ml (1 ml = 50 mg of iron). Iron dextran is added to physiological saline, not more than 50 ml to 1 litre, and infused intravenously. The solution is run slowly for 10 minutes as a test dose, and the patient observed for any adverse reactions.

Toxicity and Undesirable Effects

Issues concerning the toxicity and undesirable effects of iron include effects of interference with trace metal absorption (e.g. zinc), chronic iron overload due to haemochromatosis or thalassaemia, carcinogenesis, and accidental overconsumption of tablets/elixirs by children.

Regarding oral iron, however, it should be stressed that *in iron supplementation to normal pregnant women there is no risk of toxicity and present evidence indicates only minor undesirable side–effects when the dose is relatively small. Furthermore, limited periods of supplementation are not a concern even in patients susceptible to iron overload*.

Idiopathic haemochromatosis is an inherited defect in iron absorption regulation which may lead to tissue iron excess and death from liver cirrhosis or heart failure. One in 300 people in certain Caucasian populations may have the gene for haemochromatosis. It is easy to prevent iron overload in such people, although providing additional iron to them over many months or years could accelerate the development of iron excess.

The dangers of iron supplementation to individuals with genetic abnormalities has often been over–emphasised in the past. The heterozygous states (sickle–cell trait (HbAS), HbAC, HbAE, beta–thalassaemia minor, heterozygous and homozygous alpha^{+} thalassaemia and heterozygous alpha $^{\circ}$ thalassaemia) are <u>not</u> iron–loading conditions, and iron status of these subjects reflects that of the general population. *High gene frequencies for these disorders should not influence iron supplementation and fortification policies*.

The alpha and beta thalassaemia minors are causes of mild anaemia and hypochromia, which may be misdiagnosed as persistent iron deficiency, both in the individual and the community. Allowance must be made for this in problem definition and evaluation of impact

Homozygous patients with haematological diseases (sickle–cell disease, HbH disease, beta–thalassaemia intermedia including HbE beta–thalassaemia and beta–thalassaemia major) should be identified and treated appropriately. Iron supplementation will accelerate iron overload in undiagnosed beta–thalassaemia major, but prognosis is already extremely poor where medical services are undeveloped, and the ultimate outcome will not be materially affected.

Regarding interference with trace metal absorption, zinc absorption may be competitively inhibited by ferrous iron in aqueous solution when the total ionic concentration of both metals exceeds 25 mg. There is no clearcut evidence supporting such a competitive interaction in the presence of food, i.e. concerning fortification.

The means to avoid accidental overdose of iron tablets among young children should be ensured by child–proof packaging and instructions to patients (as twelve tablets taken together could prove fatal at this age).

Nutrient–nutrient Interactions

Interactions between iron and zinc have been mentioned above. There is experimental, biochemical and epidemiological evidence that iron metabolism is disrupted when vitamin A deficiency exists, and that this may aggravate the consequences of iron deficiency. The administration of both iron and vitamin A under controlled conditions, when both nutrients are deficient, results in a better haematological response than when only one nutrient is given. More research was recommended on this, and in the general area of nutrient–nutrient (both desirable and undesirable) interactions in the control of iron deficiency.

Compliance (Adherence) with Iron Therapy

The term “adherence” as used in this report was felt to be preferable to “compliance” as it implies active acceptance of an understood regime, rather than passive response to an imposed rule.

To date very little emphasis has been placed on documentation of issues of compliance or adherence with iron supplementation therapy, although two recent reviews[1] throw some light on its relative importance as a constraint among iron supplementation programmes, along with the summary of questionnaire responses (see Part II).

> [1] “Iron Supplementation during Pregnancy: Why Aren’t Women Complying?” (1990) Review prepared by Odaybea Morrow for the Safe Motherhood programme, World Health Organisation, Geneva; “Determinants of Medical Compliance” (1990) by Rae Galloway, consultant to The World Bank, Washington DC.

If supply–side programme constraints are reduced, adherence with iron supplementation therapy may be a major factor affecting treatment outcome. Barriers to adherence have not been fully explored. Undesirable side–effects of iron intake have been reported, especially when a higher dosage is administered, and may be a cause of non–adherence. A high frequency of dose may also reduce adherence; one tablet being more easily accepted than two or three per day. Colour preference of the tablets and cultural preferences may be other factors. To date, most emphasis has been on the role of side effects in the discontinuation of treatment with the focus being more on *user* barriers rather than health care provider/system factors.

The problem of non–adherence due to side effects may however have been over–stated in the past. Evidence from the questionnaires suggests that drop–out from programmes is much more related to the lack of availability of supplements than to side–effects. For example, in a 1985–86 ICMR study in India, the mean drop–out rate varied from 9% to 87% between States with a mean of 58%. Over 80% drop–outs cited tablet supply failure as the reason; less than 3%, side–effects. Recent documentation presents evidence that the contribution of cultural barriers to non–adherence may also be greater than that of side effects. The full degree of constraint due to non–adherence however will not be manifested until supply factors are dealt with and more tablets reach the beneficiaries more regularly.

Formative qualitative research should be conducted to promote design of culturally appropriate and acceptable approaches to iron supplementation delivery systems, treatment methods and communication/education strategies.

The level of *popular participation* has been shown to affect adherence in programmes. Efforts to assure participation in iron supplementation programmes have hitherto been minimal. Clinic based health workers often lack time and/or motivation to foster involvement through improved patient/provider communication at health centres. This lack of involvement at clinic and community level must be improved through attention, during programme design, to factors which can increase involvement such as screening and distribution by community health volunteers, women's groups, the use of community channels for anaemia/iron education and community cost–sharing.

Ultimately, adherence with iron therapy at the user level is affected by interactions between policy, service system and user factors. As already mentioned, a lack of awareness of the prevalence, health impact and economic cost of anaemia, and the efficacy of iron supplementation at all three levels: health policy makers, health care providers and among vulnerable groups within communities, are all significant problems. Information, Education and Communication (IEC) efforts should be directed towards increasing levels of awareness and commitment at all levels.

Monitoring Adherence

Determining the accurate level of adherence can assist in determining whether it will be cost effective to sustain a programme. Adherence monitoring will also be helpful in determining if modifications to a programme have impaired or detracted from performance. Most approaches to monitoring do not measure consumption directly due to high costs (in time and equipment) and invasiveness. Possibilities include the counting of returned tablets or reporting by the subject of tablets consumed (either directly to the health worker or by marking a calendar each time a tablet is taken). These methods, however, are limited by their dependence on recall and the accuracy and reliability of reporting.

Another more direct approach to monitoring adherence is stool colour, since iron will darken stools, although this method may give false results if the subject has gastrointestinal blood loss, and may be culturally unacceptable in certain settings.

There are methods to monitor tablet consumption currently employed by the pharmaceutical industry which incorporate an appropriate substance into a test tablet that functions as a urinary marker. For example, vitamin B_2 (riboflavin) is a fluorescent substance that perhaps could be used as a qualitative marker in an iron tablet.

Another interesting method of monitoring adherence with a tablet–taking sequence is the use of a light sensitive (or in some cases a radiological sensitive) paper on which the test tablets are "blistered" (packaged). The paper is affected as the tablets are removed for use. The sequence of removal is recorded since the "density" of the paper exposed is affected by length of exposure to light. A combination of this method with a urinary marker would permit more accurate monitoring. The constraints, however, are cost and perhaps labour.

It was recommended that a stronger emphasis be placed on the development and use of an accurate and reliable measure of adherence in both programmes and research efforts.

Priority Target Groups

Pregnant and lactating women

Iron supplementation is used primarily to prevent anaemia and depletion of iron reserves resulting from the increased demands of pregnancy and lactation. Folate demands are also increased and folate deficiency can contribute to a fall in haemoglobin levels.

It is relevant mainly to women getting antenatal care before the second trimester. Countries however differ with respect to levels of health service utilisation. Where effective coverage of primary health care is poor, community based distribution should be considered as a mechanism for reaching high risk groups, accompanied by communications and education promoting ingestion of iron supplements.

If successful, haemoglobin (Hb) levels are maintained above critical level in beneficiaries. Generally supplementation is not a means of actually reducing prevalence of iron deficiency among women of reproductive age.

Premature and low–birth–weight infants

Supplementation may prevent iron deficiency and anaemia appearing among premature and low–birth–weight infants undergoing catch–up growth. It must be recognised that, even during accelerated growth, these babies have iron reserves that most often last for the first 2–3 months of life. Difficulties or bottlenecks are: i) stable preparation; ii) adherence with daily administration; iii) provision of constant supply; iv) significant danger of toxicity if given in excess by mothers and other caretakers. Supplementation is an effective and well–established practice in higher levels of primary health care systems, less so at lower levels.

Pre–school children

Supplementation should only be considered in areas of high anaemia prevalence; even then, only after screening (i.e. for treatment). In principle, iron should be supplied with other nutrient supplements, especially general supplementary feeding.

School children

General prevention of iron deficiency through supplementation *may* be useful if iron is not given in another form (e.g. fortification of school meals, etc), particularly in preventing a fall in haemoglobin levels at puberty. If iron supplements are distributed through the school system under the supervision of teachers, adherence may be quite high.

Adolescent girls

Iron supplementation may be used to maintain normal haemoglobin levels and to build up a store of iron before pregnancy so that iron deficiency during pregnancy can be largely circumvented. In small scale pilot studies (in India), 60 mg. elemental iron per day for 120 days in one year, given for 60 days in each school term, produced a significant improvement in haemoglobin levels and reduced prevalence of anaemia from about 90% to 40%.

OTHER INTERVENTIONS

The three main interventions discussed on the third day were fortification, dietary modification and parasitic disease control. These are all long–term (at least 2–3 years are needed to demonstrate results) measures of iron deficiency control, as opposed to the more immediate effects of iron supplementation.

Fortification

In developing countries, approaches to fortification will differ to those adopted in developed countries owing to a lower dietary iron bioavailability and fewer food items being centrally processed. Overall effectiveness will depend on regional delivery systems. Pre–requisites for effective fortification include:

– a long–term commitment;

– a bioavailable iron source compatible (not chemically reactive) with suitable food vehicles, that conforms to existing regulations;

– a suitable food vehicle i.e. one that is centrally processed, technologically and economically fortifiable with no change to taste, texture, appearance, acceptable and frequently used by the target (e.g. infants) or total population, made available through an effective distribution system.

Examples of food vehicles have included whole and white wheat bread, salt, sugar, 26%–fat milk powder, infant formulae, cookies, curry powder, fish sauce, soy sauce and fruit flavoured drinks.

The selection of an iron source often entails a compromise between the use of inert compounds which are poorly absorbed and chemically reactive forms with high bioavailability. The vehicle and fortification compound must be chosen in tandem because most iron compounds cause discolouration and adverse

changes in flavour. Ideally, an iron compound less susceptible to iron absorption–inhibitors should be used and vitamin C added, although the latter is expensive and will be destroyed in cooking and by high moisture content in a food vehicle.

Iron–EDTA (ethylene diamine tetraacetate) and disodium EDTA plus ferrous sulphate have been successfully used as iron fortificants. They are compatible with food vehicles as well as increasing dietary iron bioavailability considerably through reducing the inhibitory effect of both wheat phytate and high bread–baking temperatures. They cause neither nutrient interactions or deleterious effects to the consumer. Both fortificants are temperature stable and have been found to be compatible with bread and sugar, as well as holding potential for use with other food vehicles.

What is the role of fortification in iron deficiency control? Fortification does not necessarily substitute for supplementation, although if it is effective in the long term, supplementation may be of less urgency and may become only very specifically targeted (i.e. only for 2–3 months during pregnancy). If fortification and supplementation are undertaken concurrently in an area, then iron deficiency anaemia prevalence may be reduced faster than is possible using supplementation alone, allowing the latter to be withdrawn once the problem has been sufficiently alleviated. Adequate monitoring of the impact of fortification is needed, which necessitates a consideration of the technical means for assessment and evaluation.

A distinction needs to be made between fortification directed to certain segments of the population (targeted) and that directed to the entire population (global). In Chile, haemoglobin–fortified cookies targeted to school children were successful. In the Caribbean, food aid is targeted to school children and, in such situations, it was recommended that i) the donors pre–specify the nutrient content of the food, and ii) the food be fortified with iron.

Infants are known to be especially susceptible to the development of iron deficiency, with the period of greatest vulnerability between 6 and 18 months of age. One of the most effective ways of averting this iron deficiency is by *fortifying all weaning foods*. Because of the high availability of iron in human milk, breast feeding offers the greatest protection against the development of iron deficiency during the first year of life. However, *if* formulas are used, it is essential that they be fortified with iron plus vitamin C.

A further recommendation of the meeting concerned the need for a comprehensive up–to–date review of fortification interventions (both targeted and global). The following broad guidelines for such a review were recommended:

– focus on developing countries.

– experience of fortification programmes in developing countries, with reference to criteria for selecting vehicles and fortificants, costs, monitoring, and fate of each programme described. What is the potential for fortification in developing countries, based on experience in industrialised countries?

– review should be comprehensive, and give indicators (references, names, addresses) of where further details of programmes and sources of expert advice can be obtained.

The specific but very important need for a suitable iron vehicle for fortification in India was highlighted, and renewed concerted efforts were urged to find a means to double–fortify salt with both iron and iodine (to date, double fortification has resulted in the sublimation of iodine).

Of primary concern when considering fortification will be a country's food regulatory system. A stringent commitment and follow–up by the authorities, achieved through a coordinated collaboration between governments, public and private sectors, and the scientific community will be needed, along with an appropriate legislative mandate, objective laboratory testing capability and system of rewards and penalties.

Dietary Modification

It may be possible to modify local methods of selecting, processing and consuming foods, within given economic confines, to improve overall iron bioavailability. In designing suitable social marketing and education techniques for facilitating this, food beliefs, preferences and taboos governing consumption should be understood, particularly as these are likely to be most evident in at–risk groups such as pregnant women and

young children.

Modifying peoples diets may involve imparting new knowledge and changing attitudes and practices of individuals, essentially behavioural modification. The three recommended modifications are:

– increasing the intake of haemoglobin iron, usually from meat (although this may not be economically/culturally acceptable)

– increasing the intake of vitamin C, along with foods which promote iron absorption (e.g. acidic and fermented foods) and

– reducing the intake of inhibitors of iron absorption e.g. tannins (in legumes, coffee and tea), phytates (in some cereals), polyphenols.

While green leafy vegetables are good sources of other micronutrients, they may have counterbalancing effects on iron absorption in that they contain both promoters (vitamin C) and inhibitors (polyphenols) of iron absorption. There is, as yet, no evidence that long–term intake of *dietary* vitamin C has any effect on iron nutrition, although associations have been found between very low haem iron intakes and high vitamin C intakes in iron–replete populations e.g. the Yoruba. As both the efficacy and cost–effectiveness of vitamin C–rich foods in raising iron status in individuals is uncertain, the group recommended further research to establish the links between dietary vitamin C and iron status. The need for such research is accentuated by the fact that a recommendation on another dietary modification – raising haem iron intake – is unrealistic for populations who do not consume meat. Prospective studies may also may also throw light on any existing inter–relationship between the coincidence seen in India between vegetarianism, high anaemia prevalence among pregnant women and low birth weights.

Other points made in the discussion included a recognition that the common practice of drinking tea (containing tannin) with meals was likely to be detrimental to iron status. On vitamin C addition to foods, it was pointed out that it is often more costly to add vitamin C to the diet to enhance iron absorption than to add the iron itself.

Parasitic Disease Control

Two main strategies for reducing anaemia prevalence are de–parasitisation (in general) and the reduction in the prevalence of hookworm infestation (in particular). Concerning the overall effect of general infections on iron status, diarrhoea per se does not impair iron absorption, although repeated and/or chronic infections can impair iron utilization.

Hookworm infestation is a significant contributor to iron deficiency among certain populations. Two main recommendations were made on preventive measures to break its transmission:

– keep faeces out of the soil, for example, through the use of pit latrines,
– keep skin from contact with the soil, e.g. through use of adequate footwear.

De–parasitization should be carried out the first time a pregnant women attends an antenatal clinic, preferably in the first trimester. This will prevent iron loss due to hookworm in this pregnancy although there is then the probability of subsequent re–infestation. Ideally, de–parasitization needs to be complemented with hygiene education plus improvements in water and sanitation and the use of adequate footwear. Schistosomiasis, trichuriasis and *Giardia* infestation are other less important diseases adversely affecting iron status.

Malaria is a prime cause of anaemia through causing haemolysis. The malaria parasite requires iron for its multiplication in the blood, and there is evidence of a possible association of parenteral iron treatment and malaria. Any person requiring parenteral iron should be given anti–malarials. It should be stressed though that the benefits of anaemia treatment through supplementation in moderate doses (including immune response) outweigh the risks in malaria–endemic regions.

CONCLUSIONS

The extent and consequences of iron deficiency anaemia clearly merit greater attention to its control than has hitherto been given. This is all the more imperative now that examples have shown that the problem can be addressed effectively and inexpensively. The introductory statement of this report highlights the main findings gathered from the large–scale supplementation programmes reviewed and summarises the conclusions of the workshop regarding approaches to iron deficiency control.

Regarding the different problem areas, one of the main findings of the workshop and the information–gathering which preceded it, was that *inadequate and unreliable supply of supplements and low service utilization were the major constraints in most iron supplementation programmes reviewed. In comparison, problems of low adherence with the supplementation regime as a result of side–effects, were relatively minor*.

Iron deficiency first and foremost is under–perceived as a health concern. Even where decision–makers do perceive it as one of many problems, the full range of its adverse consequences – physical, economic and intergenerational – in the high proportion of the population that suffers from it, is often not recognised. It is thus not seen as a priority. This lack of priority is reflected in the health budget, and percolates down as erratic and inadequate tablet supply to health centres. Even if sufficient supplies have reached the centre, supplementation often loses out in the range of competing duties of overworked health workers. Of course, problems of access are not particular to iron deficiency control, but affect the entire system of primary health care, where these exist But given the current situation of limited outreach, tablet supply can be improved.

Although under–studied, lack of adherence or compliance was frequently held out in the past as the reason for the failure of so many supplementation programmes – “people won’t take the tablets anyway”. This workshop found little evidence to support the contention that this is the main problem. It may be one of several problems in some programmes, although the proportion of patients dropping out due to side–effects was found to be low. Terminated supply was a far more common reason for drop–out. (It should however be borne in mind that “adherence” may become a more significant problem once the “upstream” problems become resolved and more targeted individuals receive a more adequate and reliable supply of tablets.). New low–cost preparations with fewer side–effects are currently being developed and may soon be marketed. On the whole therefore, technological problems relating particularly to iron preparations and iron status detection, are not nearly so serious as operational ones.

Other needs of the programmes reviewed included minimal monitoring and evaluation, pertinent local–level education of both beneficiaries and health workers and greater community participation. Many of these needs interact and are mutually reinforcing. For example, better education on the benefits of reducing anaemia will promote a greater community participation in programmes and a greater demand on governments to deal with the problem through allocating sufficient resources to building and sustaining effective interventions.

The place of iron supplementation in an overall strategy for the control of IDA in different population sub–groups has been outlined above. Priority target groups for intervention are pregnant women and premature and low–birth–weight babies for whom blanket coverage with iron supplementation is recommended. For other groups, particularly pre–school children, screening for IDA in areas of high prevalence should be considered. Other approaches include the iron fortification of foods, dietary modification and parasitic disease control. The success of such long–term interventions may be reflected in some part by the degree to which short–term iron supplementation to vulnerable groups becomes increasingly unnecessary. In the meantime in most developing countries, both long and short–term approaches are required, and effective large–scale supplementation programmes directed at vulnerable groups are the highest immediate priority need. The guidelines and recommendations regarding supply and logistics, service delivery, training, technology and adherence are aimed at facilitating the design and management of such interventions. As well as their relevance to programme managers, several of the recommendations concern outstanding research needs and are aimed at technologists, while many issues highlighted have important implications for external development agencies supporting iron deficiency control.

PART II

SYNTHESIS OF IRON SUPPLEMENTATION QUESTIONNAIRES

This report summarises information on the operational aspects of iron supplementation programmes in several countries, originally provided in questionnaire format. Fuller descriptions of iron supplementation programmes in Thailand, India, Indonesia, Burma and the Caribbean region are presented in the second part of Part II.

A. Brief description of programmes

India: The National Nutritional Anaemia Programme (NNAP)

Coverage:	all States and Union Territories of India
	questionnaire refers to Gujarat State (33.9 m. popn)
	pregnant women (II and III trimester: 1 m. popn)
Prevalence:	90% < 11 g Hb/dl in pregnant women (30% < 8 g Hb/dl)
	66% < 11 g Hb/dl in pre–school children
Causes:	low dietary iron bioavailability
	losses due to hookworm and Giardia
	low dietary iron intake
Inception:	1970
Last evaluation:	1985/6

Delivery system:

State Medical Officer (coordinates NNAP)
|
District Health Officer (DHO) (popn. 2 m.)
|
Primary Health Centre Medical Officer (popn: 100,000)
|
Family Health Worker (popn: 5,000)
|
Anganwadi worker.....Community Health Volunteer

Beneficiary
Beneficiaries:	pregnant women
	lactating women
	IUD users
	pre−school children (1−5 years)
Elements:	assessment of baseline prevalence
	continuous monitoring of distribution and consumption of supplements
	periodic impact evaluation through Hb estimations
	relevant nutrition education for motivation

Thailand: Iron Supplementation in Pregnant Women in N.E. Thailand (study)

Coverage:	Varin Chamrab district (100,000 popn) of Ubon Province
	80 villages; 840 pregnant women screened
Prevalence:	51−64% < 11 g Hb/dl in pregnant women
Causes:	low dietary iron bioavailability
	low dietary iron intake
	iron losses due to parasites

Indonesia

Coverage:	3.5 m. pregnant women
Prevalence:	50−70% < 11 g Hb/dl in pregnant women
	30−40% < 11 g Hb/dl in pre−school children

Causes:	low dietary iron intake
	iron losses due to malaria and hookworm

Burma: Anaemia component of People's Health Plan

Coverage:	Entire country (40 million population in 1988)
	Pregnant women, specifically last trimester
	150,000 reached
Prevalence:	42–71% in pregnant women
	20–37% in pre–school children
Causes:	low dietary iron bioavailability
	low dietary iron intake
	iron losses due to malaria

Caribbean

Coverage:	6 m. people in 17 countries
	Targeted to pregnant women, then lactating women, then pre–school children.
Prevalence:	42% in pregnant women
	30% in lactating women
	49% in pre–school children
Causes:	low dietary iron intake
	possibly low dietary iron bioavailability

Zimbabwe

Coverage:	Entire country (9.5 m popn)

	Pregnant women (356,000 targeted)
Prevalence:	3% < 10 g Hb/dl (Masvingo Province 1988)
	1% < 7 g Hb/dl
Causes:	low dietary iron intake
	repeated pregnancies
	malaria – usually acute

B. Access and utilisation of services

Thailand:	antenatal care distribution points
	30% utilisation (rural)
	70% attenders only report 1–2 visits for gestation period
	problems of lack of time, access and awareness of benefits
India:	primary health sub–centres
	22% utilisation
	problems of inadequate supply, lack of time, access, training and awareness
	possible improvement through village–level distribution by adequately trained worker
Indonesia:	community health centres, schools, plantations, factories
	60% utilisation
	problems are lack of awareness and poor access
	possible improvement through intensive education, social marketing
Burma:	primary health care centres
	50% utilisation (overall)

	90% utilisation in villages where mid–wife resides
	problems of poor access, lack of time and awareness of benefits
	possible improvement through improved transport to centre
Caribbean:	health centres (some in hospitals)
	utilisation high (sometimes 90–99%)
	problem: lack of attendance in early stages of pregnancy
Zimbabwe:	health centres
	90% pregnant women attend ANCs at least once
	average attendance: 2–3 times per pregnancy
	problems of poor access in some areas

The main distribution point by far was the health centre, where tablets were distributed every month to pregnant women at antenatal clinics. Consequently, problems of outreach of iron supplementation were similar to those for health care *per se*. Levels of access and utilisation of health centres is often very low in some of the larger rural countries, particularly in Asia. The chief reasons for the lack of attendance at clinics were difficult access and transport and limited awareness of the need for and benefit of supplementation. Improved outreach could maybe be attained through a decentralisation of distribution whereby village–level distributors could be entrusted with the task and regularly supervised by a medium–level worker.

C. Within–facility factors

Thailand:	blanket coverage
	no monitoring of iron status
India:	blanket coverage
	ANMs not trained for assessment
	lack of ANMs time and transport to

	laboratory also constraints
Indonesia:	blanket coverage
	no monitoring
	no budget for screening
Burma:	blanket coverage
	no monitoring
	no programme staff as such (health service personnel)
Caribbean:	monitoring and screening does take place
	Spencer Haemoglobinometer used
	clinical management of anaemia workshops held
	District Medical Officers and Senior Public Health Nurses attend
Zimbabwe:	blanket coverage
	clinical assessment in rural health centres
	haemoglobinometer used in District Hospitals
	monthly Hb monitoring in women < 10 g Hb/dl
	routine referral system
	training as part of nurse training curriculum
	routine monthly supervision of ANC nurses

Blanket coverage of the target group, usually pregnant women, was near universal. In Asia, there rarely existed any routine monitoring of iron status and screening was often considered to be too expensive and/or unnecessary. Elsewhere, haemoglobinometers seemed to be the instrument of choice for measurement.

D. Supply to distribution point

Thailand:	inadequate supply in 78% health centres
	$ 3 per 1000 tablets; some donated
	financial constraint no policy or commitment
India:	ad hoc procurement, not related to size of target group
	irregular and short supply
	$ 0.64 per 1000 tablets
	budgetary allocation insufficient for entire target group
Indonesia:	UNICEF tablets
	poor distribution system
Burma:	inadequate and uncoordinated supply
	UNICEF tablets ($ 1.2 per 1000)
	uncertainty of funding
	limited government support/manpower
	administrative regulations curtail planning
	transport limitations
Caribbean:	logistics of purchase and supply a major constraint
	Eastern Caribbean Drug Service set up to purchase and distribute tablets
	$ 2.8 per 1000 tablets
	budgetary limitations
	transport difficulties
Zimbabwe:	supply is the average of need and use
	e.g. 1991: 50,000 units of 1,000 tablets
	80,000 needed

20,000 used (in 1989)

supply through Essential Drugs Prog.

stocks sometimes low Z$7.3 per 1,000

tablets no major constraints

Inadequate and irregular supply throughout the service delivery system was one of the most serious constraints of most programmes. This often was associated with inadequate and irregular budgetary allocations to iron supplementation deriving in turn from a weak or non−existent commitment and policy on iron deficiency control. Physical factors such as transport were also problematic.

E. Individual adherence

Thailand: 2–4 weeks supply per visit

side−effects (% people): 30% (240 mg/day)

10% (120 mg/day)

drop−out rate: 10–15%

problems of inadequate information and reassurance

no adherence monitoring

altering dosage was effective

India: 4 weeks supply per visit

advice offered

side−effects: 4%

drop−out: from 9–87% (States); mean: 58%

45% due to non−supply

1.5% due to side−effects

left−over tablets checked (adherence)

Indonesia: 4 weeks supply per visit plus nutrition education

Burma: 4 weeks supply per visit plus education

tablet colour change improved acceptability

side−effects: 5−10% (dropped out as result)

drop−out: unknown

no adherence monitoring

Caribbean: 4 weeks supply per antenatal visit

reducing size may improve acceptability

side effects: up to 41% (abdominal pain)

up to 29% (nausea)

up to 25% (heartburn)

up to 10% (vomiting)

drop−out: 33%

monitoring by questioning returning antenatal

Zimbabwe: 4 weeks supply per visit

changing packaging may improve acceptability

e.g. plastic packets with instructions

side−effects: unknown

drop−out: unknown

no adherence monitoring

In nearly all programmes, the beneficiary is given a month's supply of tablets every month on arrival at the distribution point (usually antenatal clinic). Where information was available, it revealed that the prevalence of reported side−effects varied between programmes and depended on the dosage. Side−effects, except in the Caribbean, were not widely reported; even when reported, they did not always lead to drop−out from the programme. Improvements in adherence could be achieved through changing the supplement packaging, reducing the dosage and reassuring the beneficiary. Adherence was rarely systematically monitored.

F. Prevention of loss of iron

Thailand:	among pregnant women, 73% had parasites (33% hookworm)
	no action to reduce infestation
India:	1–22% hookworm prevalence
	10% malaria (Baroda)
	6–16% Giardia (Baroda)
Indonesia:	low iron intake and parasites significant problem
	need education and shoes for tea plantation workers
Burma:	malaria a problem
Caribbean:	hookworm, schistosomiasis, malaria *not* major problems
	medium whipworm infection levels
Zimbabwe:	family planning programmes aim to space pregnancies
	seasonal acute malaria, possibly problematic
	hookworm not a problem

Loss of iron due to hookworm, malaria and Giardia appears to be particularly a problem in Asia, less so elsewhere.

G. Impact

Thailand:	prevalence in pregnant women (1978–79): dropped from 68% to 24% and from 78% to 32% in two trial studies.
India:	prevalence in pregnant women (1970–1986): no change (88%)

Indonesia:	prevalence in pregnant women (1983–88): dropped from 70% to 55%
Burma:	unknown
Caribbean:	positive impact only in those countries where constant supply had been achieved
Zimbabwe:	unknown

I. Priority needs

Thailand:	coherent policy and commitment
	financial support
	better distribution channels
	better management
	improved awareness of beneficiaries
	better training of functionaries
India:	proper enumeration of beneficiaries
	training in requirement estimation
	adequate and regular supply
	village–level distribution
	follow–up to check distribution and compliance
	education of functionaries and beneficiaries
Indonesia:	multi–approach strategy, incl. increased reliance on fortification and education towards year 2000
Burma:	adequate funding
	adequate and regular supply
	specific anaemia education

Caribbean:	constant supply of tablets at clinic level
	improved awareness of beneficiaries
	adequate haemoglobin screening technique at clinic level
	low–cost iron preparation with fewer side–effects
Zimbabwe:	prevalence estimates in non–pregnant women and children

In summary, the following five priority needs appeared to be common to most of the programmes reviewed:

– adequate supply of iron compounds,

– financial commitment and support,

– locally relevant education and advocacy efforts,

– basic monitoring and evaluation,

– community participation and awareness–raising (through primary health care, education sectors, plantations, etc.)

A predominant concern was getting supplies of iron tablets to the most peripheral level on a regular basis. A sustained financial commitment and an efficient system of delivery will be required to achieve this. Educational efforts directed both to the beneficiaries and the distributors are also needed. Technological constraints are less pronounced, but still visible in some programmes. These relate to the acceptability of the iron supplement, the method of detecting iron status in the field, and the means of monitoring and evaluating programmes.

FIVE PROGRAMME DESCRIPTIONS

THAILAND

[*] Based on the paper “Study in Northeastern Thailand on Pregnant Women” (1978–1979) and (1985–1986), submitted by Sakorn Dhanamitta and Thara Viriypanich, Institute of Nutrition, Mahidol University.

A. Brief description of iron deficiency problem

Iron deficiency anemia is one of the major public health problems in Thailand. The prevalence of anemia in Thai adults was reported to be between 30 and 45 percent[1], and a higher prevalence was found in the North–east and South. Hospital data in 1970[2] showed that 31 percent of pregnant women in Bangkok (Central) and 39 percent in Ubon Province (North–east) were anemic, based on the criteria of hemoglobin (Hb) less than 11 g/dl.

Study of the serum iron from both Bangkok and Ubon group showed that among the Bangkok subjects 12 percent and 73 percent demonstrated serum iron in deficient range (< 50 ug/dl) and marginal range (50–150 ug/dl) respectively; and those among the Ubon pregnant women were 35 percent and 55 percent respectively. The data suggested that iron deficiency and/or marginal status exists in both regions or in Bangkok urban as well as Ubon rural population.[2]

However, Ubon pregnant women tend to show lower serum protein and albumin. The Ubon pregnant subjects who showed lowest hemoglobin level also demonstrated the lowest serum protein and albumin.[2] The findings indicate that iron deficiency is the major cause of anemia in the Thai population whose staple diet is rice, from which iron is poorly absorbed due to high phytate content. The iron deficiency is probably present in the general population and is aggravated during pregnancy and lactation due to increased requirements and blood loss during deliveries and multiple pregnancies. Other factors such as hemoglobinopathies (Hb EE) with the highest prevalence in North–east or highest rate of hook worm infestation in the South as well as poor sources of iron intake eg. low animal protein intake in the Northeast would contribute to the high prevalence of iron deficiency anemia in the South and Northeast regions.

a) What is the total population in the area covered by the programme? Is the programme targeted to specific groups in the population, and, if so, how are these defined? How many are estimated to be in the target groups?

Programme area and target groups[3]

The study programme was carried out in Varin Chamrab district of Ubon Province. North–eastern Thailand. The province borders on Laos and Cambodia and is about 500 km, north–east of Bangkok. The population of Ubon province is 1.2 million.

The study area in Varin Chamrab district is adjacent to the town of Ubon. The population of the district is 100,000. The overall prevalence of anemia in pregnant women is 68%.[2]

The study was conducted in 80 villages from 12 out of 14 sub–districts where there are mid–wives or subdistrict health centers that can be reached by road all year.

During the 2 years study (1978–1979), 840 pregnant women were screened for participation. Chronic illness, complicated pregnancy, severe anemia (Hb<8 gm/dl), hemoglobinopaties Hb (EE) and (EF) and unwillingness to cooperate on the part of subjects were reasons for exclusion. Altogether 557 pregnant women participated, among these 325 had Hb (AA) and 232 Hb (AE).

b) Please provide any recent known estimates of prevalence of anaemia (below 11 g/dl. of haemoglobin) and severity (below 7 g/dl. being severe), if possible by group (e.g. reproductive age women). Please give any estimates, including those with other (specified) cut–off points. Also please indicate sources of data (e.g. survey, clinic records), dates, reliability, etc.

Prevalence of anemia before treatment (18–22 wk gestation) was 51% in pregnant women with Hb (AA) and 64% in those with Hb (AE) (Using Hb<11 g/dl as cut off point). Prevalence of hemoglobinopaties from 840 pregnant women was Hb (AE) 34.4%, Hb (EE) 3.4% and Hb (EF) 0.7%.

However, from the same WHO Collaborative study[3], the report of the prevalence of anemia in central Thailand was 5% in adult male factory workers, 29% in adult male farmers, and 40% in non pregnant adult women.

In northern Thailand the prevalence of anemia in two groups of nonpregnant adult women was 7% and 30% respectively.

In northeast Thailand, the pregnant women (18–26 wk gestation) the prevalence of anemia from 557 pregnant women participated in the study (Hb (AA) 325 and Hb (AE) 232) were 67% for the Hb (AA) and 77% for Hb (AE). (Using Hb<11 g/dl as cut off point).

c) Regarding the main causes of iron deficiency anaemia in the programme area, please comment on the following, if feasible indicating order of importance as well as priority for intervention:

low dietary iron intake
low bioavailability of iron in the normal diet
iron losses due to malaria, hookworm or other parasites causing iron loss (see F)
genetic abnormalities of haemoglobin synthesis or iron metabolism
other factors (specify any)

i) Low bioavailability of iron in the normal diet.

ii) Low dietary iron intake.

Rice which is the main staple diet contributed more than half of daily total iron intakes especially in rural northeastern Thailand. Per capita daily intake of iron is approximately 9.4–10.3 mg[4]. Fish is the only major animal source for iron among these rural population while meat intake is very infrequent. Vitamin C intake was also low in rural northeast population approximately 21.4–29.6 gm daily. Therefore both low dietary iron intake and low bioavailability of iron in habitual diet are main causes of the problem.

iii) Iron losses due to parasites especially hookworm and opistorechis.

In this study programme stool examinations were performed on 199 subjects. Thirty–four percent had hookworm and about fifty percent had opistorechis with 4 percent Giardia. For hookworm, stool egg counts revealed light infection, 600–1900 eggs/g feces.

iv) Hemoglobinopathies

Thalassemia major Hb (AE) and (EE) and Hb (EF) were those genetic abnormalities of hemoglobin which were found in Northeast Thailand especially Hb (AE) and (EE) the prevalence is high in this area.

In our total 840 pregnant women screened it was shown that Hb (AE) 34.4%, Hb (EE) 3.4% and Hb (EF) was 0.7%.

From 289 cases of Hb (AE), the anemic cases were 187 or 65% and from 29 Cases of Hb (EE) the anemic cases were 27 cases or 93%, while the 6 cases of Hb (EF) the anemic cases were 5 cases or 83% (Using Hb<11 g/dl as a cut off point).

v) Reproductive blood losses and increase requirement.

These two factors of increased iron requirement during pregnancy and lactation period as well as increased blood losses during delivery or abortion

which is common in Northeast rural women who usually had multiple pregnancies were aggravating factors contributed to high prevalence of iron deficiency anemia in these target groups.

B. Access and utilisation of services

a) What are the major distribution points currently used, and what might be used in the future (e.g. health centres, community health workers, industry)?

The current major distribution points of iron tablets for pregnant women have been limited to antenatal care (ANC) services of the public health infra structure which include various hospitals and clinics in town and out of town. For rural population which is approximately 80% of total population of the country the distribution points were provincial hospitals and clinics as well as district hospitals and district health centers. The most important points for rural people was the most peripheral health infrastructure which are the subdistrict health centers or mid−wife centers. Usually only one midwife or junior sanitarian is responsible for all activities at the subdistrict level. Use of the ANC has been discouraging as utilization rates are reported as low as 30% in rural areas.[5]

In future, the major distribution, points at the most peripheral level can either be i) the subdistrict health centers with an aid of simple, well design nutrition education tool to enhance programme participation or ii) at village levels through the primary health care system, with the trained village health volunteers being responsible for iron tablet distribution. A simple well designed nutrition education tool will also be essential. The subdistrict health officers (mid−wife and junior sanitarian) can act as supervisors to the village health volunteers.

An ongoing project in Supanburi (Central) Thailand was started in early 1990 to investigate the effectiveness of the two new alternatives in comparison to the current activities carried out at subdistrict health center.

b) Do you have any estimates of the proportion of the population (better still, target group) that attends the distribution point (e.g. clinic), and with what frequency (e.g. % each month, % each three months, % each year)?

Only 20% of urban population can attend the hospitals or clinics in town and have a good chance of receiving the iron supplementation as needed. However, from the other 80% rural population, the proportion of pregnant women which attended the distribution point was very low. According to the report of The Ministry of Public Health Thailand.

Iron supplementation is an activity included in antenatal care. However, out of 77 percent of rural pregnant women who attend ante−natal clinic, as high as 54 percent reported 1−2 visits only for the whole period of gestation.

c) What are the major reasons for low attendance (e.g. poor access − distance, lack of time, lack of awareness of benefits, etc.)?

The reason for not paying the visit according to the appointment schedules were following: (1) do not have time, (2) waste of time, (3) not necessary, (4) feel physically normal and healthy.

Therefore the main reasons for low attendance are lack of time, poor access−distance and lack of awareness of benefits.

d) What would be the best ways to improve attendance (if this is a major problem)?

The best ways to improve attendance are to establish an effective distribution mechanism in health care delivery system which involves not only the service providers but also the target population's decision in seeking the services. The following points are essential factors:

− Convenience and accessibility of the services.

– Awareness of the significance of iron supplementation during pregnancy.

– Adequate reinforcement and reassurance by service providers.

– Influence of village leaders in community programme.

– Attitude, practices and beliefs regarding health and nutrition during pregnancy and childbirth.

– Levels of performance of providers.

C. Within–facility factors

a) Is there any assessment of individual's iron status for deciding on supplementation – or, for example, are all pregnant or women of child–bearing age intended to be supplemented? If specific targeting is made, what method is used for *screening* individuals into the programme? This would include the type of instrument used to detect anaemia in an individual, and the standards and cut–offs used to compare a measurement with, in order to decide whether he or she should receive iron supplements.

At the sub–district health center, paleness from clinical examination is the criteria used for assessment of anemic condition in all patients. There is no standard procedure for assessment of individual's iron status for deciding on supplement. Even iron supplementation supposed to be one routine activity at ante natal clinic, there is no recommended screening method. Although 89 percent of the health officers reported existence of iron tablet supplementation service, only 22 percent reported adequate iron tablets supply at the health center all the lime, the others reported inadequate supply sometimes or often no supply.

b) Is there *monitoring* of iron status of individuals receiving the supplement? If so, what method is used and how frequently are individuals monitored?

There is no monitoring of iron status of individuals receiving the supplement at subdistrict health center yet. However in our specific programme at Varin Chamrab district, Ubon Province Hemoglobin concentration of the individual is determined by using cyanmethemoglobin assay read in the spectrophotometer at 540 mu. Those with severe anemia (Hb<8 gm %) will be referred to hospital for treatment. The cut–off point of Hb<11 gm % is used as criteria of anemia in the pregnant women.

For current assessment and monitoring of iron status of individuals attending the provincial or district hospital, the same procedure and criteria used in the study programme at Varin Chamrab district were used. However, attendance is very much dependent on the convenience of the pregnant women who usually do not meet the Health centers' schedules.

c) What procedure exists for *referring* individuals who are severely anaemic, for further treatment?

d) What are the problems with assessment procedures – both actual and intended? For example, expense, complexity, equipment and supplies, time required per person screened? Is availability of trained staff a major constraint? Is the procedure quite acceptable to the local population? Are there any outstanding technical problems with screening? Please describe.

e) What type of training of programme staff is employed?

f) What procedures exist for supervising and supporting staff at different levels, especially within–facility (e.g. for auxiliary staff, for doctors in charge). Indicators such as ratios of staff at different levels would be useful.

D. Supply to distribution point

a) What is the intended supplementation scheme (e.g. x mg. ferrous sulphate per person daily)? What quantities of iron tablets are provided at what intervals (e.g. 30 tablets per month) to individuals *currently* registered with the programme? What amounts are needed to cover the entire *intended* target group's requirements?

b) Please describe any problems with the procurement of supplements and ensuring their regular supply to the distribution point.

c) What type of storage is used for supplements? Please describe any existing problems.

There is no special storage place for the iron tablets at the sub−district health center. The supply are from Provincial Health Office to district health office then to sub−district health centers. Inadequate iron tablets supply is the common problem since there is no definite policy and commitment from the Central (Ministry of Public Health and Thailand Government). The supply from provincial health offices depends on the decision of the provincial health officers and varies from one to the other depending on the vision of the provincial health officers to set a budget for this.

d) Are the supplements donated, and if so, by whom? If not, what is the unit cost per 1000 (or other number) iron tablets?

A number of the supplements are from donation in some provinces. Those who give donations are drug companies, politicians, private organizations etc. and these will be given to the pregnant women free of charge.

If the health centers had to buy the tablet, they can buy from the Thai Government Pharmaceutical Department in Bangkok. The price is 82.50 Baths per 1000 tablets.

e) Do you believe there are major financial and/or other constraints which limit the programme's effectiveness? If so, where do these constraints exist e.g. in transport, storage, distribution, logistics and/or other areas? Please describe.

i) The financial constraint is one of the major obstacles since the intended supplementation scheme are to be given to all pregnant women from the first trimester (16 week of gestation) until delivery (40 week of gestation) and 6 weeks after delivery which covers millions of pregnant women each year.

ii) Although iron supplementation has been recommended, there is no definite policy and commitment at the Provincial level. The Ministry of Public Health set up a lump sum budget for Provincial level to pay for all medicine each year.

iii) Although iron supply to the district levels did not appear to be an obstacle, there is only a loose protocol for this routine, and there is no enforcement of the program. Iron tablets are given free of charge to the pregnant women.

E. Individual compliance

Questions in this section relate to whether a person takes the supplements on a regular basis. Of importance here is the acceptability of the tablet to the individual, the level of awareness of the need to take the tablets, the level of supervision by health workers, the dosage and frequency of supplementation and the interrelationships between dosage, frequency, side−effects, compliance and drop−out from the programme. There is also the question of risk of toxic effects from iron overload.

a) What is the daily *dosage* (how many mg. iron per person per day), and the *frequency* (how many times per day) of supplementation for each age−sex group targeted by the programme?

For pregnant women, the daily dosage is 60−120 mg iron per person per day as ferrous sulphate tablets (either 1 or 2 tablets/day). This is the dose for pregnant women and the tablet is taken 1 time per day 1 tablet (60 mg) or 2 tablets (120 mg) per day.

b) How often do they receive a supply of supplements (e.g. weekly or monthly)? How much information is given the first time, and how is this reinforced in subsequent visits?

Majority of rural pregnant women (From preliminary study at Korat) have received iron supplements from the ante natal clinics at subdistrict center at least once. Nevertheless, they showed no indication of awareness of the significance of iron supplementation. The supply of the supplement at each visit is 30 tablets which last for 1/2 −1 month. Not adequate

information is given at the first lime of visit and reinforcement for continued supplementation is lacking.

c) Please describe the characteristics of the tablet What colour is it? How is it packaged? In your opinion, would changing the colour and/or packaging improve the acceptability of the supplement? What else might enhance acceptability?

The tablet is approximately 0.8 mm in diameter, red brown colour. It is packaged 1000 tablets in large brown glass bottle and stored on the shelf at room temperature. When the pregnant women receive the iron supply, it is packaged in a plastic bag (30 tablets) and the bag is not sealed.

d) What type of side−effects have been reported? If data are available, what is the proportion of recipients reporting side−effects? How far do you feel side−effects reduce compliance with supplementation?

As mentioned earlier, the side effects from INMU−WHO study including abdominal discomfort, nausea, vomiting, dizziness and fatigue, were found in 30% of subjects receiving 240 mg Fe per day (INMU−WHO Study at Varin Chamrab. Ubon Province), and 10% in those receiving 120 mg Fe per day. Since the side effects usually occurred during the first 3 days and after this period the side effects, particularly vomiting, decreased in both severity and frequency. In our experience, the midwives and/or tablet distributors had to reassure the subjects that side effects would disappear with time and that supplementation should be continued for their own benefits. As a result most of mothers in our study continued faking the tablets until the lime of delivery (15 weeks of supplementation) and continued until 6 more weeks after delivery (altogether they received 24 weeks of supplementation).

However, in routine ante−natal care clinics at the sub district health centers, the information on the benefit of iron supplementation is not given or not adequately emphasized and there is no assurance on the side effect that it will decrease with time. Therefore under current practice side effects are one major reason for the high drop out rate.

e) How is compliance monitored?

Under current iron supplementation of antenatal care at subdistrict health centers there is no monitoring of compliance.

In our experience from Varin Chamrab study the compliance with an iron supplementation program depends on the cost of tablets, the availability at convenient outlets, the time and effort required, awareness of need and encouragement. Recipients must be motivated to realize their needs and the significance of iron supplementation. In addition, socio economic status and availability and accessibility of the services may affect demand. Dosage should be at the level that side effect will be minimal. Adequate information and reinforcement for continuation of iron supplement especially during the first 3 days of supplement is critical.

In our study, the midwives were trained to give information and motivation of the subjects aiming at three levels (knowledge, attitude and practice). A calendar was being made for subjects to mark daily after taking the iron pill. It was found that the messages stated in the calendar are crucial and the most important point is to state that the iron pills will make delivery easier, lower risks during the delivery and make the subjects and their babies stronger and healthier. However, reassurance during the first 3 days in those who had side−effects is also another crucial point to prevent drop out. It is essential also that the tablet must be taken after a meal.

f) What is the drop−out rate (% of recipients over specified time period leaving the programme), if known? Please specify any known reasons for drop−out? For example, what proportion drop out as a result of side−effects?

As mentioned before the drop−out rate in our Varin Chamrab is low. Percentage of drop−outs from the beginning of supplementation until delivery was between 10 to 15% (15 week of supplementation). The reasons given for drop−outs include: (i) moving from home to the field during ploughing or harvesting = inconvenience and inaccessibility of receiving the supplement. (ii) the transportation problems due to flood and others: (iii) abortion or

premature delivery; and (iv) being afraid of blood drawing. In our case side effects from the supplementation was not given as cause of drop−out; however in current activities at sub−district centers the side−effect is a major cause of drop−out.

g) Have you tried altering the dosage and/or frequency of supplementation or other conditions of use to alleviate side−effects, and if so, with what success?

In our field trial study at Varin Chamrab programme, we have tried altering the dosage. Additional 48 pregnant women had participated in this study, they were assigned to receive the supplementation at the daily dosage of 66 mg iron under motivation (instead of 120 mg iron in our protocol). The side effects are minimal and the hemoglobin response is close to the 120 mg iron supplement.

We had also tried to alleviate the side−effects of those who had severe symptoms of vomiting or diarrhoea in cases given 120 or 240 mg Fe by given only half the dosage and divided the frequency to 2 times per day for the first 2−3 weeks and increase to full dosage in the following week with good success. The side effects decrease with time and later the mothers can take the full dose with mild symptoms and eventually no symptoms later on. If two tablets to be given, one tablet should be given during the first 3 days, increasing to two tablets later on.

h) Do you believe there are any potential problems with iron overload and toxicity?

In our experience from the Varin Chamrab Study, we believe that there is not any problem with iron overload and toxicity from oral administration.

Results of ferritin determinations in subjects with Hb (AA) in group receiving Fe, the mean ferritin concentration increased significantly after 10 and 15 weeks and was significantly higher after 15 week that after 10 week supplementation. The dose of Fe of those receiving 240 mg per day appears to influence the ferritin concentration since the result showed higher mean ferritin level that those receiving 120 mg Fe per day. However, there was no statistically significant difference between mean ferritin concentration in subject with Hb (AA) and Hb (AE) at any time,

F. Prevention of loss of iron

a) Please describe the relative importance of factors which may cause the loss of iron from individuals in the programme area. For example, how serious are problems of hookworm infestation, schistosomiasis or reproductive loss of blood in women through menstruation or post−partum haemorrhage? How feasible and practical is it to aim to reduce (i) malabsorption due to infectious organisms e.g. Giardia, and (ii) blood loss due, for example, to hookworm infestation or schistosomiasis? What actions, if any, have been taken to reduce iron loss?

In our study at Varin Chamrab district, Ubon Province (INMU−WHO Study) out of 533 pregnant women a random sampling of stool examination were performed on 199 subjects. The results showed 73% positive for parasites and among these 33% had hook−worms, stool egg count demonstrated light infestations 600−1900 eggs/g feces. However, among these 199 subjects 50% had opistorechis and 4% Giardia lambia. No action had been taken to reduce iron loss due to parasitic infestation.

G. Impact of the programme

a) Has a change in prevalence of iron deficiency anaemia been observed over a given time period in the targeted group? If so, please specify. Is there evidence that this is due to the programme (e.g. by comparison with an unsupplemented population), or partly attributable to other factors?

Change in prevalence of iron deficiency anemia had been observed in our Varin−Chamrab district study.

The prevalence of anemia before treatment was 63−73% in pregnant women with Hb (AA) and 69−86% in those with Hb (AE). A higher percentage of pregnant women with Hb (AE) had an Hb concentration <11 g/dl at the beginning of the study. After oral administration of Fe

120 mg or 240 mg with and without 5 mg folic acid from the first trimester (16–22 week gestation), the Hb concentration increased significantly in both Hb (AA) and Hb (AE) groups. The duration of Fe administration but not the dose significantly influenced this increase (10 week vs. 15 week and 120 mg Fe vs. 240 mg Fe per day).

After 15 week treatment with Fe, there was a significant difference in the rise of Hb concentration between women with Hb (AA) and Hb (AE). Subjects with Hb (AE) failed to achieve the same Hb levels as those with Hb (AA), and the percentage of subjects who remained anemia (Hb<11 g/dl) was higher in subjects with Hb (AE). Between 20 and 28% of women with Hb (AA) and 26 and 38% of those with Hb (AE) had a hemoglobin concentration <11 g/dl at the end of treatment with Fe.

There was no observable difference in the hemoglobin response to Fe administration between supervised and unsupervised but motivated (with calendar, nutrition education messages and reassurance by interpersonal technique) during the first week of the oral administration.

There was no obvious explanation for the failure of the Hb to increase to >11 g/dl in some women. Among the factors that may have played a role, other than the presence of Hb (AE), are the low intake of animal protein (as shown by low serum protein and albumin in these groups), the presence of hookworm infestation, liver fluke infestation and decreased Fe absorption because of dietary inhibition etc.

b) Are particular groups of individuals found to respond better than others to supplementation? If so, which groups? Please suggest any reasons for this.

In our INMU–WHO study at Varin Chamrab district the administration of Fe resulted in statistically significant higher serum ferritin concentrations. The duration of Fe administration orally (10 week, 15 week and 24 week) and the dose of Fe (120 mg Fe, 240 mg Fe per day) had a significant influence on the rise in ferritin concentration, additional folate supplementation (5 mg per day) did not significantly affect the changes in Hb or ferritin concentration.

It was concluded from out study that in pregnant women commencing at 18–22 weeks gestation and continuing until 6 weeks post–partum, iron supplementation can be used for prevention and treatment of iron deficiency anemia (Hb responses satisfactory after 12 week of supplement Hb>11 g/dl and satisfactory increase in serum ferritin level >70 ug/l were observed at 6 weeks).

No differences in the hemoglobin and serum ferritin responses between the subjects under–supervision or under–motivation. The motivation was carried out by the mid–wives using a calendar with pre–testing motivating messages for motivation and reminding the subject about continuation of taking the iron pills daily. The mid–wife paid a regular visit to the subjects once or twice a month and most important during the first 3 days of oral administration for reassurance regarding any side–effects,

H. Other factors or constraints

In formulating this questionnaire, we may well not have asked *all* the pertinent questions relating to the effectiveness of supplementation programmes. We therefore request you to describe on a separate sheet of paper (a) any further positive factors and/or (b) any constraints, if any, that you feel influence the effectiveness of the programme.

Constraints:

Loose Government Policy and commitment, resulting in not enough financial support for iron tablets, lack of appropriate distribution channels as well as poor management and logistics problems. Lack of an effective delivery mechanism and system caused inconvenience and inaccessibility of the service.

Rural population is often impeded by lack of health and nutrition knowledge, beliefs, and traditional practices. Effective communication techniques are needed to create awareness

and motivation to improve health seeking behaviour for preventative health care.

Levels of performance of personnel from district level to the final outlets. Training and technical assistance is still lacking.

I. Critical factors and priority needs

Please list in order three critical factors that have, in the past, contributed to the programme's effectiveness, and (ii) three priority needs (if any) for increasing the effectiveness of the programme in the future.

Priority needs:

i) Policy and commitment from decision–makers with definite protocol and sufficient budget allocation for the iron supplementation programme especially iron tablet supply and establishment of effective delivery system from central to village level.

ii) Training of personnel at district, sub district and village level and providing essential facilities in terms of both equipment and supply.

The supplementation can be carried out by trained village health volunteers under the supervision of trained mid–wives or other heath personnel within the context of primary health care (PHC).

iii) Identification and utilization of effective communication tools (channel and messages) to create awareness among the recipient and appropriate means for motivation and improve health seeking behaviour.

A Formative research and development of special communication tools in different socio economic and cultural areas may be needed.

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INDIA (GUJARAT STATE)

A. Brief description of iron deficiency problem

a) What is the total population in the area covered by the programme? Is the programme targeted to specific groups in the population, and, if so, how are these defined? How many are estimated to be in the target groups?

Total population

The National Nutritional Anaemia Programme (NNAP): 680 million.
Programme in Gujarat: 33.9 million.

Target groups and estimates as % in total population.

Pregnant women (II & III Trimester) (3%)
Lactating Women (with infants under one year) (3%)
Family Planning acceptors (IUCD and terminal methods) (2%)
Pre–school children 1–5 years (15%)
School–age girls 12 – 18 years (10%)

b) Please provide any recent known estimates of prevalence of anaemia (below 11 g/dl. of haemoglobin) and severity (below 7 g/dl. being severe), if possible by group (e.g. reproductive age women). Please give any estimates, including those with other (specified) cut–off points. Also please indicate sources of data (e.g. survey, clinic records), dates, reliability, etc.

Groups	***N***	***Prevalence of anaemia %***			***Source of Data/Dales***
		Mild/Moderate		***Severe < 8 g/dl.***	
		< 11 g/dl	***< 12 g/dl***		
Pre–school children	*4838*	*66*	*–*	*–*	*Survey/1977–1984*
School children	*3527*	*–*	*65*	*–*	*Survey/1981–1984*
Pregnant women	*985*	*90*	*–*	*30*	*Surveys/1984–1988*
Lactating women (48 h after delivery)	*5439*	*66*	*–*	*13*	*Survey/1988*
Non–pregnant Non–lactating women	*2674*	*–*	*59*	*–*	*Survey/1983* *(Reliability relatively high in all).*

c) Regarding the main causes of iron deficiency anaemia in the programme area, please comment on the following, if feasible indicating order of importance as well as priority for intervention:

low dietary iron intake
low bioavailability of iron in the normal diet
iron losses due to malaria, hookworm or other parasites causing iron loss (see F)
generic abnormalities of haemoglobin synthesis or iron metabolism
other factors (specify any)

Order of Importance	***Priority of Intervention***
1) Low bio–availability of iron in normal diet (3%)	*1) Supplementation/fortification.*
2) Losses due to Malaria (prevalence 10%), Hookworms (prevalence range 0.9 – 22%) and giardia (prevalence 6 – 16%)	*2) Improving bio–availability.*
3) Low dietary iron intake: Children 3–6 y –12.7 mg. Children 6–10 y – 18.0 mg. Adults – 20.6 mg.	*3) reducing iron losses due to infection and infestations.*

B. Access and utilisation of services

a) What are the major distribution points currently used, and what might be used in the future (e.g. health centres, community health workers, industry)?

Currently used distribution points:

** Sub centres attached to the primary health centres in rural areas.*

** Family–welfare centres in urban slums.*

** Anganwadis (of the Integrated Child Development Services scheme) in the rural areas and urban slums.*

** Hospitals*

** Home delivery (the most common).*

Personnel who distribute the supplements currently:

** Family Health Worker (FHW) and formerly Auxiliary Nurse Mid–wife (ANM)*
** The anganwadi worker.*

Personnel who can be used in the future:

** Traditional birth attendants*
** Community health volunteers*
** Out of school adolescent girls.*

b) Do you have any estimates of the proportion of the population (better still, target group) that attends the distribution point (e.g. clinic), and with what frequency (e.g. % each month, % each three months, % each year)?

Distribution of the tablets:

** Once a month 12.2%*
** Once in 15 days 7.7%*
** Once a week 6.4%*
** All at a time 64.2%*

(Note:– All at a time includes those who received 30 tablets or less; distribution point home or hospital; also only 22% of the beneficiaries received the tablets; 75% were never offered any).

c) What are the major reasons for low attendance (e.g. poor access – distance, lack of time, lack of awareness of benefits, etc.)?

Inadequacy and irregular supply of the tablets.

ANM finds it difficult to reach the families in distant/interior villages (time factor as well as the distance and inaccessibility).

Functionaries as well as the families do not have adequate information about the programme.

d) What would be the best ways to improve attendance (if this is a major problem)?

The distribution may be entrusted to a person who lives in the village, such as a dai or community health volunteers (CHVs). They will need to be adequately informed about the programme before they are entrusted with this responsibility. The ANM should, however,

supervise this. A day in a week may have to be set aside by the ANM, so that she can visit the 4 villages under her care at least once a month to supervise this programme.

C. Within−facility factors

a) Is there any assessment of individual's iron status for deciding on supplementation − or, for example, are all pregnant or women of child−bearing age intended to be supplemented? If specific targeting is made, what method is used for *screening* individuals into the programme? This would include the type of instrument used to detect anaemia in an individual, and the standards and cut−offs used to compare a measurement with, in order to decide whether he or she should receive iron supplements.

No assessment of iron status is made as the functionaries are not trained to carry out an Hb estimation, nor is equipment available at the sub−centres. Many sub−centres do not have a building or an infrastructure. Currently, blanket coverage is recommended.

b) Is there *monitoring* of iron status of individuals receiving the supplement? If so, what method is used and how frequently are individuals monitored?

No − not monitored.

c) What procedure exists for *referring* individuals who are severely anaemic, for further treatment?

FHW uses pallor symptoms to identify severe cases of anaemia. She treats them on priority by directing the limited supplies to these individuals but not necessarily giving a larger dose.

She also refers the patients to the PHC/hospital by giving them a reference on a slip of paper but more often verbally informing them to see the doctor. They can also meet the doctor when he visits the village, which is not very frequent.

d) What are the problems with assessment procedures − both actual and intended? For example, expense, complexity, equipment and supplies, time required per person screened? Is availability of trained staff a major constraint? Is the procedure quite acceptable to the local population? Are there any outstanding technical problems with screening? Please describe.

Lack of trained staff. The FHWs who are the grass root level functionaries are not trained in the procedure. Even medical officers are sometimes not trained adequately to carry out a Hb estimation.

The procedure is quite unacceptable to the population. During our survey, there were usually requests for screening from the non−target groups. We have done house−to−house visits and used the filter paper method and cyanmethhemoglobin method.

Lack of time is also a major constraint. For a population of 5000, the estimated target groups (pregnant, lactating women and pre−school children 1−5y) maybe about 800 in number. The ANM even if trained may require quite a few days to carry out these 800 estimations.

Transport of the samples to a laboratory within a specified period of time is also a constraint.

Adequate and satisfactory sterilization is difficult in the field.

e) What type of training of programme staff is employed?

The FHW goes through 18 months training in a recognized institution. They have a course on health problems and plans, in which they receive information related to ongoing national nutrition programs. With reference to the National Nutritional Anaemia Programme, they are told about the objectives of the programme, who the beneficiaries are, the dosage and frequency of tablets to be given, the total number to be given. They are also trained in record keeping. A 17 week practical training reinforces these.

The other functionaries such as the anganwadi workers, do not receive any training specific to NNAP.

f) What procedures exist for supervising and supporting staff at different levels, especially within–facility (e.g. for auxiliary staff, for doctors in charge). Indicators such as ratios of staff at different levels would be useful.

A monthly meeting of the FHWs, lady health visitors (LHVs) and the medical officers at the PHC – during which time the FHWs present their monthly reports and they also discuss specific problems.

The Medical Officers also undertake field visits along with FHWs.

D. Supply to distribution point

a) What is the intended supplementation scheme (e.g. x mg. ferrous sulphate per person daily)? What quantities of iron tablets are provided at what intervals (e.g. 30 tablets per month) to individuals *currently* registered with the programme? What amounts are needed to cover the entire *intended* target group's requirements?

At the moment it is 60 mg elemental iron and 0.5 mg folic acid in the form of ferrous sulphate for all women beneficiaries and 20 mg elemental iron and 0.1 mg folic acid for the child beneficiaries. 100 tablets in all, at intervals of one month i.e. 30 tablets every month, one tablet/day.

For correction of anaemia (therapeutic dose) in women, 300 adult tablets. Two to three tablets a day for 100 days.

Prophylactic doses (tablets) 100 per person. Amount needed to cover the entire target group: 142 billion tablets.

Therapeutic doses (300 tablets/person – only for women – 50% of whom may be anaemic). Amount needed to cover the entire target group: 6,1 billion tablets.

b) Please describe any problems with the procurement of supplements and ensuring their regular supply to the distribution point.

Indenting for tablets is not done on the basis of estimates of target groups in the population. It is adhoc and therefore results in short supply.

Because there is no systematic procedure for indenting, the supplies do not arrive regularly causing disruption.

c) What type of storage is used for supplements? Please describe any existing problems.

The tablets packed in tin boxes of 1000 tablets each, come in wooden cartons, 16' x 16', that can take 36 tins of adult tablets and 72 tins of pediatric tablets. Once opened stored in wooden or steel almirahs.

Inadequate storage space in some of the state level offices.

d) Are the supplements donated, and if so, by whom? If not, what is the unit cost per 1000 (or other number) iron tablets?

Unit cost per 1000 adult tablets: Rs. 11.00 (US$ 0.64)
Unit cost per 1000 child tablets: Rs. 5.00 (US$ 0.29)

e) Do you believe there are major financial and/or other constraints which limit the programme's effectiveness? If so, where do these constraints exist e.g. in transport, storage, distribution, logistics and/or other areas? Please describe.

The budgetary allocation provided for 1989 – 1990 was Rs. 80 million. This will be adequate only to provide the full prophylactic and therapeutic doses for pregnant and lactating women. Unless the budgetary allocation is increased substantially the entire target population can not be brought under the programme.

E. Individual compliance

Questions in this section relate to whether a person takes the supplements on a regular basis. Of importance here is the acceptability of the tablet to the individual, the level of awareness of the need to take the tablets, the level of supervision by health workers, the dosage and frequency of supplementation and the interrelationships between dosage, frequency, side−effects, compliance and drop−out from the programme. There is also the question of risk of toxic effects from iron overload.

a) What is the daily *dosage* (how many mg. iron per person per day), and the *frequency* (how many times per day) of supplementation for each age−sex group targeted by the programme?

*Pregnant, lactating women and family planning acceptors: 1 tablet/day 60 mg elemental iron and 0.*5 *mg folic acid.*

Children 1−5 y: 1 tablet/day 20 mg elemental iron and 0.1 mg folic acid.

Women − reproductive age therapeutic: 3 tablets/day each tablet 60 mg elemental iron/day.

b) How often do they receive a supply of supplements (e.g. weekly or monthly)? How much information is given the first time, and how is this reinforced in subsequent visits?

Once a month/Once a week/Once in 15 days. First contact, the information on how many tablets to be taken in a day and that they should be taken with/after a meal. Advised not to take the tablets on an empty stomach. Reinforcement by checking on the regular consumption of the tablets, by asking the mothers to show them the left over tablets.

c) Please describe the characteristics of the tablet What colour is it? How is it packaged? In your opinion, would changing the colour and/or packaging improve the acceptability of the supplement? What else might enhance acceptability?

The adult tablets are orange red and the pediatric tablets are dark maroon in colour.

Usually given to the beneficiaries loose or wrapped in small strips of newspaper.

Yes, the colour of the pediatric tablet could be made more attractive.

The packaging can improve the acceptability, although it needs to be tried out.

However, the packaging should not resemble the oral contraceptive packaging.

d) What type of side−effects have been reported? If data are available, what is the proportion of recipients reporting side−effects? How far do you feel side−effects reduce compliance with supplementation?

Side Effects	***Proportion reporting % (N = 5884)***
G.I. tract upset/constipation	*1.4*
Nausea/Vomiting	*1.1*
Anorexia	*0.1*
Any combination	*0.2*
Unspecified + None	*96.0*

e) How is compliance monitored?

Mainly by checking left over tablets or by asking the beneficiaries verbally.

f) What is the drop−out rate (% of recipients over specified time period leaving the programme), if known? Please specify any known reasons for drop−out? For example, what proportion drop out as a result of side−effects?

The percentage of the target population who discontinued supplements ranged from a low 8.8% (found in our Survey in Gujarat) to a high of 87.3% in Haryana, with a mean for all states of 57.7%.

The main reason for discontinuing the supplement was the non−supply of the tablets. On an average, of the 57.7% who dropped out, 45.5% did so because of non−supply and only 1.5% due to side effects.

g) Have you tried altering the dosage and/or frequency of supplementation or other conditions of use to alleviate side−effects, and if so, with what success?

No, we have not tried this.

h) Do you believe there are any potential problems with iron overload and toxicity?

Not with iron overload. As the Hb levels are low in most people and storage iron is likely to be depleted, the existing dosage is unlikely to produce any overload. We have not come across any acute toxicity.

F. Prevention of loss of iron

a) Please describe the relative importance of factors which may cause the loss of iron from individuals in the programme area. For example, how serious are problems of hookworm infestation, schistosomiasis or reproductive loss of blood in women through menstruation or post−partum haemorrhage? How feasible and practical is it to aim to reduce (i) malabsorption due to infectious organisms e.g. Giardia, and (ii) blood loss due, for example, to hookworm infestation or schistosomiasis? What actions, if any, have been taken to reduce iron loss?

Hookworm infestation varies in prevalence − the reported prevalence rates are 0.9% to 22%. In Buroda, we have found the prevalence to be 0.9 to 1.8%. Loss due to malarial parasite again depends on whether it is widely prevalent. Prevalence rates in Baroda are 10%. Giardia is quite common, prevalence in children was found to be 6 − 16%. In our area, malarial parasite and giardia may be important in increased iron losses. Schistosomiasis is very uncommon. Curative but not preventative measures are practiced at the moment.

G. Impact of the programme

a) Has a change in prevalence of iron deficiency anaemia been observed over a given time period in the targeted group? If so, please specify. Is there evidence that this is due to the programme (e.g. by comparison with an unsupplemented population), or partly attributable to other factors?

No change in prevalence of anaemia over a period of lime as shown below. (Anaemia defined as Hb < 11 g/dl).

Source of data	***Year of Study***	***Prevalence of Anaemia in Pregnant Women %***
WHO Collaborative Studies	*1960s*	*80 (Northern India rural)*
WHO Collaborative Studies	*1960s*	*57 (Southern India urban)*
NNAP Evaluation	*1984−85*	*88 (All India)*

In the women who received no supplementation the prevalence was 87.5% while in those receiving supplements it was 88%.

b) Are particular groups of individuals found to respond better than others to supplementation? If so, which groups? Please suggest any reasons for this.

There is not adequate data to make a decision on this.

H. Other factors or constraints

In formulating this questionnaire, we may well not have asked *all* the pertinent questions relating to the effectiveness of supplementation programmes. We therefore request you to describe on a separate sheet of paper (a) any further positive factors and/or (b) any constraints, if any, that you feel influence the effectiveness of the programme.

I. Critical factors and priority needs

Please list in order three critical factors that have, in the past, contributed to the programme's effectiveness, and (ii) three priority needs (if any) for increasing the effectiveness of the programme in the future.

Priority needs:

i) Adequate and regular supply of the drugs and proper enumeration of the beneficiaries.

ii) The FHWs require help in distributing the tablets – a person such as a traditional birth attendant (dai) who lives in the village must distribute the tablets.

iii) Information dissemination about the programme to the functionaries as well as the community.

INDONESIA

A. Brief description of iron deficiency problem

a) What is the total population in the area covered by the programme? Is the programme targeted to specific groups in the population, and, if so, how are these defined? How many are estimated to be in the target groups?

Target group	***Estimate No. of Population***
1. Pregnant women	*3.5 million*
2. School children	*27.0 million*
3. Low income worker	*16.0 million*

b) Please provide any recent known estimates of prevalence of anaemia (below 11 g/dl. of haemoglobin) and severity (below 7 g/dl. being severe), if possible by group (e.g. reproductive age women). Please give any estimates, including those with other (specified) cut–off points. Also please indicate sources of data (e.g. survey, clinic records), dates, reliability, etc.

Target group	***Prevalence***	***Cut off point***
1. Pregnant women	*50–70%*	*11 g/dl*
2. Adult female	*30–40%*	*12 g/dl*
3. Adult male	*20–30%*	*13 g/dl*
4. Low income worker	*30–40%*	
5. Preschool children	*30–40%*	*11 g/dl*
6. School children	*25–35%*	*12 g/dl*
7. Post partum mother (3 months)		*12 g/dl*

c) Regarding the main causes of iron deficiency anaemia in the programme area, please comment on the following, if feasible indicating order of importance as well as priority for intervention:

low dietary iron intake
low bioavailability of iron in the normal diet

iron losses due to malaria, hookworm or other parasites causing iron loss (see F)
genetic abnormalities of haemoglobin synthesis or iron metabolism
other factors (specify any)

No data/survey available, but from scattered surveys done by different researchers there are assumptions of the main causes which are: low dietary iron intake, iron losses due to malaria and parasites particularly hookworm.

B. Access and utilisation of services

a) What are the major distribution points currently used, and what might be used in the future (e.g. health centres, community health workers, industry)?

Community health centers and Integrated Health services posts.
School health programme.
Plantation (tea plantation) and factory.

b) Do you have any estimates of the proportion of the population (better still, target group) that attends the distribution point (e.g. clinic), and with what frequency (e.g. % each month, % each three months, % each year)?

60% pregnant women attend community health centers for prenatal care, but no data on population covered by iron tablet distribution.

c) What are the major reasons for low attendance (e.g. poor access – distance, lack of time, lack of awareness of benefits, etc.)?

Lack of awareness
Poor access

d) What would be the best ways to improve attendance (if this is a major problem)?

Intensive nutrition/health education
Social marketing

C. Within–facility factors

a) Is there any assessment of individual's iron status for deciding on supplementation – or, for example, are all pregnant or women of child–bearing age intended to be supplemented? If specific targeting is made, what method is used for *screening* individuals into the programme? This would include the type of instrument used to detect anaemia in an individual, and the standards and cut–offs used to compare a measurement with, in order to decide whether he or she should receive iron supplements.

Blanket approach for pregnant women. For other target groups, an appropriate tool (simple and low cost) is needed.

b) Is there *monitoring* of iron status of individuals receiving the supplement? If so, what method is used and how frequently are individuals monitored?

No, there isn't. Recent monitoring available is iron tablets/logistic monitoring system.

c) What procedure exists for *referring* individuals who are severely anaemic, for further treatment?

Referral system:

Integrated Health Services Post
|
Public health Sub–center
|
Community health center
|

District General Hospital (type D or C)
|
Provincial General Hospital (type B)
|
National General Hospital (type A)

d) What are the problems with assessment procedures – both actual and intended? For example, expense, complexity, equipment and supplies, time required per person screened? Is availability of trained staff a major constraint? Is the procedure quite acceptable to the local population? Are there any outstanding technical problems with screening? Please describe.

Equipment & supplies: available only in selected Health centers.

Trained staff: selected health centers. Cadres are trained to recognize the signs and simply symptoms.

Budget: no budget for screening.

e) What type of training of programme staff is employed?

Anaemia module is included in the curriculum of the training for physicians and staff (midwives/nurses), e.g. Nutrition programme training, child survival/MCH training.

Nutrition cadres are trained for 5 days, family nutrition improvement programme package.

f) What procedures exist for supervising and supporting staff at different levels, especially within–facility (e.g. for auxiliary staff, for doctors in charge). Indicators such as ratios of staff at different levels would be useful.

Procedures existing for supervising and supporting staff are training, retraining, meeting, site supervision etc.

Ratio health staff/population (1988):

Community health center 1:30,000
Physicians 1:7,000
Nurses/midwives 1:1,800

D. Supply to distribution point

a) What is the intended supplementation scheme (e.g. x mg. ferrous sulphate per person daily)? What quantities of iron tablets are provided at what intervals (e.g. 30 tablets per month) to individuals *currently* registered with the programme? What amounts are needed to cover the entire *intended* target group's requirements?

– pregnant women trimester II & III: 1 tablet (200 mg ferrous sulphate) daily, if possible until 3 months post partum.

The amount needed is about 700 million tablets.

b) Please describe any problems with the procurement of supplements and ensuring their regular supply to the distribution point.

c) What type of storage is used for supplements? Please describe any existing problems.

1000 iron tablets for each tin.

d) Are the supplements donated, and if so, by whom? If not, what is the unit cost per 1000 (or other number) iron tablets?

UNICEF

e) Do you believe there are major financial and/or other constraints which limit the programme's effectiveness? If so, where do these constraints exist e.g. in transport, storage, distribution, logistics and/or other areas? Please describe.

Yes, especially in the distribution and delivering system.

E. Individual compliance

Questions in this section relate to whether a person takes the supplements on a regular basis. Of importance here is the acceptability of the tablet to the individual, the level of awareness of the need to take the tablets, the level of supervision by health workers, the dosage and frequency of supplementation and the interrelationships between dosage, frequency, side−effects, compliance and drop−out from the programme. There is also the question of risk of toxic effects from iron overload.

a) What is the daily *dosage* (how many mg. iron per person per day), and the *frequency* (how many times per day) of supplementation for each age−sex group targeted by the programme?

1 tablet (200 mg ferrous sulphate) daily

b) How often do they receive a supply of supplements (e.g. weekly or monthly)? How much information is given the first time, and how is this reinforced in subsequent visits?

Pregnant women received monthly in Integrated services post or health center.
Nutrition education is given once a month in mass group or individually in clinics.

c) Please describe the characteristics of the tablet. What colour is it? How is it packaged? In your opinion, would changing the colour and/or packaging improve the acceptability of the supplement? What else might enhance acceptability?

Non−sugar coated tablet, the colour is brown, packaged in tin.
Less acceptable compared with sugar coated tablets.

d) What type of side−effects have been reported? If data are available, what is the proportion of recipients reporting side−effects? How far do you feel side−effects reduce compliance with supplementation?

Dizziness, nausea and sometimes vomiting.

e) How is compliance monitored?

f) What is the drop−out rate (% of recipients over specified time period leaving the programme), if known? Please specify any known reasons for drop−out? For example, what proportion drop out as a result of side−effects?

No data.

g) Have you tried altering the dosage and/or frequency of supplementation or other conditions of use to alleviate side−effects, and if so, with what success?

No

h) Do you believe there are any potential problems with iron overload and toxicity?

No data reported about iron overload or toxicity.

F. Prevention of loss of iron

a) Please describe the relative importance of factors which may cause the loss of iron from individuals in the programme area. For example, how serious are problems of hookworm infestation, schistosomiasis or reproductive loss of blood in women through menstruation or post−partum haemorrhage? How feasible and practical is it to aim to reduce (i) malabsorption due to infectious organisms e.g. Giardia, and (ii) blood loss due, for example, to hookworm infestation or schistosomiasis? What actions, if any, have been taken to reduce iron loss?

Generally the main causes are low intake and parasites. Actions that have been taken are giving nutrition education, using shoes for workers in the plantation.

G. Impact of the programme

a) Has a change in prevalence of iron deficiency anaemia been observed over a given time period in the targeted group? If so, please specify. Is there evidence that this is due to the programme (e.g. by comparison with an unsupplemented population), or partly attributable to other factors?

During the fourth five year development plan anaemia prevalence among pregnant women reduced from 70% to 55% (1988)

b) Are particular groups of individuals found to respond better than others to supplementation? If so, which groups? Please suggest any reasons for this.

H. Other factors or constraints

In formulating this questionnaire, we may well not have asked *all* the pertinent questions relating to the effectiveness of supplementation programmes. We therefore request you to describe on a separate sheet of paper (a) any further positive factors and/or (b) any constraints, if any, that you feel influence the effectiveness of the programme.

I. Critical factors and priority needs

Please list in order three critical factors that have, in the past, contributed to the programme's effectiveness, and (ii) three priority needs (if any) for increasing the effectiveness of the programme in the future.

Priority needs:

i) Multi approach strategy whereby reliance on iron supplementation can progressively be reduced as efforts with fortification and dietary modification bear results.

ii) Developing information and monitoring system

iii) Development of appropriate technology, e.g. research in slow release iron tablet, simple method and low cost equipment for screening.

BURMA

General description of programme

Control Programme for Prevention of Iron Deficiency (Burma)

Iron deficiency anaemia is quite common in Burma especially in pregnant women and young children. The control programme is, however, directed towards the pregnant women mainly in the last trimester only. The programme attempts to cover the whole country and has been developed as part of primary health care when the country health programme. "The People's Health Plan", was developed in 1978. Funding has been through USAID, WHO and UNICEF initially, later supplemented by JNSP.

The objective of the programme is to correct existing anaemia if present, to prevent further development of anaemia during pregnancy and to prevent anaemia in infants by building up iron reserves in the last trimester. The strategy is blanket therapy for all pregnant women in the latter part of pregnancy, especially in the last trimester. No screening is done and targeting is based on the ante–natal register of the health worker or the volunteer. The People's Health Plan (PHP) is composed of six components, out of which the project "Community Health Care" contains the maternal and child health care, and nutrition. Iron supplementation is therefore integrated in the ante–natal care programme covering the whole country.

The PHP is implemented through the existing health infrastructure, re–training the basic health staff and developing the community volunteers. The Department of Health heads the health services, with each state

and division having its own health departments. Under these are the township health departments, each with five rural health centres (RHC) and 1–2 station hospitals. Each in turn has four sub–centres. There is the township medical officer (TMO) at the township level, Health Assistant and Lady Health Visitor at the RHC level and a Midwife (MW) at the sub–centre level. The MW is therefore the peripheral worker. Primary Health Care (PHC) develops the community volunteers, the Auxilliary Midwives (AMWs) and the community health workers (CHWs). All projects of PHP extend their services through this infrastructure covering almost the whole country, even some parts of the country controlled by insurgents. Ante–natal care and iron supplementation therefore covers the whole country theoretically.

Distribution points are the township hospitals, station hospitals, rural health centres (LHVs), sub–centres (MWs) and the AMWs.

The iron supplies from the central medical stores are distributed level–wise until the peripheral workers are reached. There are no fortification programmes nor other programmes for specific control of anaemia.

Iron supplementation of pregnant women as blanket therapy has reached more of the vulnerable group than has been possible with specific targeting of anaemic women. Given a situation of inadequate facilities and trained staff amid a high prevalence of iron deficiency anaemia in pregnant women population, this strategy has been chosen as an appropriate intervention.

General constraints such as irregular funding, supply, transportation and distribution has hindered efficient functioning of the programme but it has continued.

A. Brief description of iron deficiency problem

a) What is the total population in the area covered by the programme? Is the programme targeted to specific groups in the population, and, if so, how are these defined? How many are estimated to be in the target groups?

> *Programme coverage*
>
> *Total population covered by the iron supplementation programme is almost the entire population of Burma, since it covers the whole country except the extremely inaccessible areas due to security or geographical reasons.*
>
> *The programme is targeted towards the pregnant women, specifically those in the last trimester (from 7 months to time of delivery). Approximately 150,000 PW have been reached by the programme.*

b) Please provide any recent known estimates of prevalence of anaemia (below 11 g/dl. of haemoglobin) and severity (below 7 g/dl. being severe), if possible by group (e.g. reproductive age women). Please give any estimates, including those with other (specified) cut–off points. Also please indicate sources of data (e.g. survey, clinic records), dates, reliability, etc.

> *Prevalence of nutritional anaemia was 20–37% in children (0–5 years), 23–25% in school children, 20–49% in women and 42–71% in pregnant women. However, only a small percent has severe anaemia, Iron deficiency was associated with 25–60% of the anaemias seen. Prevalence of iron deficiency was 13–24% in pregnant women. This scientific survey was carried out by the Department of Medical Research from 1965 to 1975.*

c) Regarding the main causes of iron deficiency anaemia in the programme area, please comment on the following, if feasible indicating order of importance as well as priority for intervention:

> low dietary iron intake
> low bioavailability of iron in the normal diet
> iron losses due to malaria, hookworm or other parasites causing iron loss (see F)
> genetic abnormalities of haemoglobin synthesis or iron metabolism
> other factors (specify any)
>
> *Main causes of iron deficiency.*
>
> *i) Low bioavailability of dietary iron.*

Low iron absorption is believed to be one of the main causes of iron deficiency anaemia in Burma. Iron absorption from rice based meals is only about 5–7%. The inhibiting factors are probably phytic acid of cereals/pulses, tannin of plain tea (taken with meals) and low dietary intake of meat and fish.

ii) Low dietary iron intake.

Burmese diets tend to be low in iron and calcium as shown in ad–hoc surveys over the past 20 years and a recent survey in 1987 in the context of nutrition surveillance.

iii) Iron losses due to parasites.

Malaria is a leading disease of national importance and anaemia following malarial attacks occurs in varying grades. Severe anaemia is usually associated with malaria rather than nutrition, and is seen in all ages and both sexes.

Hookworm prevalence rate is high in certain areas but is not a leading cause of iron deficiency anaemia.

Giardiasis is very common in young children and is responsible for malabsorption but it is not known how much it contributes to iron deficiency anaemia.

iv) Genetic abnormalities.

Thallasemia E prevalence rate is high in the young population of Burma; many exhibiting severe pallor and enlarged spleen and splenectomy, indicated by hypersplenism and huge spleen. Surveys have been in progress only recently by haematologists.

B. Access and utilisation of services

a) What are the major distribution points currently used, and what might be used in the future (e.g. health centres, community health workers, industry)?

The major distribution points used currently are the health centres, basic health staff (Lady Health Visitors, Midwives, and the community volunteers – the AMW and the CHW). Since this infrastructure has been established and utilized for a long time, it will probably be continued for basic health services delivery and PHC.

b) Do you have any estimates of the proportion of the population (better still, target group) that attends the distribution point (e.g. clinic), and with what frequency (e.g. % each month, % each three months, % each year)?

About 30% of the target population, the pregnant women, have regular contact with the distribution points. These are the women residing in the villages of the MWs or the AMWs and coverage is 90%, having contact monthly or 2 monthly. The remaining 70% are those living outside the residing villages of the MW/AMW or the RHC, at least about 1–2 miles away. They would attend the health centre or have contact only at an average of 3 times per pregnancy, generally in the latter half of pregnancy.

c) What are the major reasons for low attendance (e.g. poor access – distance, lack of time, lack of awareness of benefits, etc.)?

Major reasons for the irregular and low contact by the 70% of the target population are that they have to travel on foot 1–2 miles, working even during pregnancy and do not feel the need to contact health workers if they are feeling well. Even those residing in the villages of the MW/AMW may lose contact for a few months sometimes if they shift to the fields during harvest times.

d) What would be the best ways to improve attendance (if this is a major problem)?

The best way to improve attendance/contact would be to provide better transport facilities in these rural areas so that MWs/AMWs can conduct home visiting either by bus or by her own bicycle and the women can easily visit RHC by bus or ferry.

Adequate regular supply of iron tablets will ensure regular distribution by the health workers, in adequate amounts.

Better communications and transport system will promote effective referral for further management of severe anaemias, thallasemia and malaria.

C. Within–facility factors

a) Is there any assessment of individual's iron status for deciding on supplementation – or, for example, are all pregnant or women of child–bearing age intended to be supplemented? If specific targeting is made, what method is used for *screening* individuals into the programme? This would include the type of instrument used to detect anaemia in an individual, and the standards and cut–offs used to compare a measurement with, in order to decide whether he or she should receive iron supplements.

All pregnant women in last trimester are intended blanket therapy of iron tablets daily until delivery. Targeting is through AN register only so coverage depends on the reach of AN care services. Anaemia in other sex and age groups may be detected only when they seek medical help.

b) Is there *monitoring* of iron status of individuals receiving the supplement? If so, what method is used and how frequently are individuals monitored?

There is no facility for monitoring iron status of individuals receiving the iron supplements.

c) What procedure exists for *referring* individuals who are severely anaemic, for further treatment?

The severely anaemic are identified by clinical examination, i.e. visible pallor or conjunctiva, tongue and nails. The peripheral health workers refer severe anaemia cases to township hospitals where parenteral iron is available.

d) What are the problems with assessment procedures – both actual and intended? For example, expense, complexity, equipment and supplies, time required per person screened? Is availability of trained staff a major constraint? Is the procedure quite acceptable to the local population? Are there any outstanding technical problems with screening? Please describe.

Assessment procedures – Cyanmeth Hb and transferrin assessment is not feasible for use in the field due to general constraints such as lack of transport, electricity, trained staff in the field and proper laboratory facilities etc. it planned as a regular assessment for surveillance or monitoring. The public health nutrition division is still in the process of upgrading its new laboratory at the National Nutrition Centre. In the future, evaluative assessment of a representative sample is possible as a joint survey with the Dept. of Medical Research. There is no problem with regard to procedure acceptance by the local population.

e) What type of training of programme staff is employed?

There is no programme staff as such since the iron supplementation programme has been integrated into the health services. The health staff receive refresher training for on–the–job training.

f) What procedures exist for supervising and supporting staff at different levels, especially within–facility (e.g. for auxiliary staff, for doctors in charge). Indicators such as ratios of staff at different levels would be useful.

Each MWs supervises and supports about 2–3 AMWs (community volunteers). The MWs themselves are supervised by the LHVs, about 1 LHV to 5 MWs at the RHC level. At the station hospital level also, the SMO supervises 5 MWs. All RHCs and SHs are supervised by the TMO. The TMOs answer directly to state and division health directors and indirectly to the central Dept. of Health.

D. Supply to distribution point

a) What is the intended supplementation scheme (e.g. x mg. ferrous sulphate per person daily)? What quantities of iron tablets are provided at what intervals (e.g. 30 tablets per month) to individuals *currently* registered with the programme? What amounts are needed to cover the entire *intended* target group's requirements?

Blanket therapy to all pregnant women intended to supplement 60 mg of iron twice a day. Currently, actual field distribution amounts to only, at an average of 14 tablets per contact and an average of 50 tablets per pregnancy only.

b) Please describe any problems with the procurement of supplements and ensuring their regular supply to the distribution point.

Regular funding for adequate supply is still lacking although different agencies have assisted (UNICEF, USAID, JNSP), and procurement is irregular in timing and quantity. Iron tablets are supplied by MCH division as well as Nutrition division and there is sometimes confusion at the peripheral. This is due to incoordination at central as well as fragmented funding.

Distribution is also irregular due to difficulty in transportation; delayed if consolidation is awaited and early if the individual townships have the funds to arrange their own shipment. There is no demand and supply system.

c) What type of storage is used for supplements? Please describe any existing problems.

There are limited storage facilities at the township levels but there are intermediate storage at most states and divisions. The central medical store in Rangoon supply these depots. However, there is no regular flow of stock.

d) Are the supplements donated, and if so, by whom? If not, what is the unit cost per 1000 (or other number) iron tablets?

Supplements supplied by UNICEF assistance cost about US$ 1.2 per unit tin of 1000 tablets.

e) Do you believe there are major financial and/or other constraints which limit the programme's effectiveness? If so, where do these constraints exist e.g. in transport, storage, distribution, logistics and/or other areas? Please describe.

The major constraints limiting the programme's effectiveness are uncertainty of funding, limited government support, and limited man–power. Due to these constraints, the target group has been limited to pregnant women in the last trimester, which is quite late for building up iron reserves especially if anaemia is already present.

Other constraints are the transportation limitations and administrative regulations which seriously curtail planning and management.

E. Individual compliance

Questions in this section relate to whether a person takes the supplements on a regular basis. Of importance here is the acceptability of the tablet to the individual, the level of awareness of the need to take the tablets, the level of supervision by health workers, the dosage and frequency of supplementation and the interrelationships between dosage, frequency, side–effects, compliance and drop–out from the programme. There is also the question of risk of toxic effects from iron overload.

a) What is the daily *dosage* (how many mg. iron per person per day), and the *frequency* (how many times per day) of supplementation for each age–sex group targeted by the programme?

> *Each PW is intended to receive 120 mg per person per day, 60 mg BD and a total of 180 mg per pregnancy.*

b) How often do they receive a supply of supplements (e.g. weekly or monthly)? How much information is given the first time, and how is this reinforced in subsequent visits?

> *The beneficiaries receive a weekly supply once a month on an average. Usage and benefits of iron supplements are explained the first time as well as on subsequent contacts. ANC register is used to record the number of tablets given per visit/contact and the PW is given nutrition counselling based on the nutrition monitoring of weight and iron supplementation.*

c) Please describe the characteristics of the tablet. What colour is it? How is it packaged? In your opinion, would changing the colour and/or packaging improve the acceptability of the supplement? What else might enhance acceptability?

> *UNICEF iron/folate tablets are used. They are of light green colour (khaki colour) and film–coated. They come in 1000 tablet tins.*
>
> *In Burma, acceptability was increased when the tablets were changed from a dark green colour to light green colour, became resistant to moisture with less smell of rust. Unfortunately, the original colour is called "iron rust colour" in Burmese.*
>
> *Change to bright colours e.g. red colour and sugar coating will promote better acceptability in Burma.*

d) What type of side–effects have been reported? If data are available, what is the proportion of recipients reporting side–effects? How far do you feel side–effects reduce compliance with supplementation?

> *Side–effects such as nausea, vomiting, diarrhoea/constipation, vague abdominal pains, belching rusty smell and black coloured stools have been reported in approximately 5–10% of a study group. (Exact data not yet available). This proportion comprises the group reporting as not taking the tables because they don't like it or feel that they are allergic to it and give the side–effects as reasons why.*
>
> *In the beginning of the programme, UNICEF iron tablets had to compete with the local iron tablets, which were bright red in colour and sugar–coated, and consumers preferred the local ones. After the local tablets became scarce and the price increased, people turned to UNICEF tablets in spite of a few complaining about the side–effects. There are many socio–economic and psycho–cultural factors influencing compliance.*

e) How is compliance monitored?

> *Compliance is not monitored as such and is not required to be reported so there is no data. However, it is always inquired and noted on supervisory tours by central staff. We have noted change in attitude and behaviour over the years, in health staff as well as in the community women.*

f) What is the drop–out rate (% of recipients over specified time period leaving the programme), if known? Please specify any known reasons for drop–out? For example, what proportion drop out as a result of side–effects?

> *Drop–out rate is not known but it probably represents the 5–10% group not taking the tablets in the residence villages of the MWs and the AMWs. Main reason given in this group is the side–effects but another important reason given by the majority is that the tablets are not readily available. This is due to infrequent contacts between the health staff and the women who live outside the residence villages of the MWs and the health centres.*

g) Have you tried altering the dosage and/or frequency of supplementation or other conditions of use to alleviate side–effects, and if so, with what success?

We have advised the health staff and the women to take the iron tablets immediately after the two main meals and if the side−effects still persist, to take only one tablet a day. We also had to emphasize that there is no harm taking the tablets with the sour soup of the meal since the Burmese believe that drugs should not be taken with anything sour. This advice helped the health staff promote the tablets better since previously they could not handle the complaints.

h) Do you believe there are any potential problems with iron overload and toxicity?

Currently, there is no problem of iron overload and toxicity, but because iron tablets may also be given to visibly anaemic people, there may be adverse effects in Thallasemia cases.

Supplement On Compliance:

As a follow−up to the questionnaire recently sent out to you, we are seeking additional information, not specifically asked for initially, but felt to be very important. We would very much appreciate it if you could attempt as far as possible to answer the following questions, with regard to the programme you have had experience with, and bring answers to the workshop:

i) Have you measured compliance with iron supplement consumption?

Compliance has not been specifically measured as such but is one of the points of interest during field supervisory tours. It has also been included in an operation research study looking at the consumption of iron supplements in relation to availability.

Compliance or consumer acceptance of iron tablets is generally quite good in Burma since pregnant women usually consume the tablets distributed even if not specifically asked for (UNICEF tablets). Previously, there was resistance to the UNICEF iron tablets compared to local iron tablets.

ii) As well as non−compliance with the supplementation programme, leading to “dropping out”, there may be partial compliance whereby patients take *some* tablets but either not in the prescribed daily dosage and/or not as frequently as required. Is such partial compliance a problem in the programme, and what causes it?

“Partial compliance” is a problem in Burma also but of a different nature. The actual level of consumption is only one quarter to one third of the ideal level prescribed as blanket therapy for the pregnant women in the latter half of pregnancy, not because of low compliance, but because of low availability. Low availability is due to insufficient and irregular supply stemming from asynchrony of services. There are other factors such as low frequency of contacts and low awareness but their effect is masked by low availability.

iii) How have you tried to improve compliance? (For example through changing the dosage, by switching to another iron preparation, by changing frequency or timing of supplement ingestion, or by counselling, mass media, or posters, etc. Please describe media used and messages given.)

The main strategy used to improve compliance is nutrition monitoring and counselling of pregnant women in the context of ante−natal care of basic health services and primary health care. UNICEF iron tablets are the only prenatal drugs given free and in relative bulk. Individual counselling is the only means by which nutrition education is promoted. The iron tablets are promoted as equivalents of local traditional Burmese drugs taken for pregnancy (in appropriate setting), blood generating drugs, emphasizing after−meal ingestion to minimize irritation, and highlighting the economical value of each tablet in contrast to the equivalent amount of iron−rich food.

Another factor improving compliance is the improvement of the colour and quality of the UNICEF iron/folate tablets.

iv) Have you been successful in improving compliance? (Please give number if available)

Compliance for iron tablets has increased over the last five years but there is no hard data, just field experience.

v) What are your recommendations for improving iron supplementation programme design to increase compliance?

Iron Supplementation programmes should be integrated components of an established or accepted national programme.

Iron tablets should be tailored for consumption, if compliance is the main issue, by consumer analysis etc. instead of painstaking promotion of cheap, donated drugs.

Availability should not become a constraint.

F. Prevention of loss of iron

a) Please describe the relative importance of factors which may cause the loss of iron from individuals in the programme area. For example, how serious are problems of hookworm infestation, schistosomiasis or reproductive loss of blood in women through menstruation or post–partum haemorrhage? How feasible and practical is it to aim to reduce (i) malabsorption due to infectious organisms e.g. Giardia, and (ii) blood loss due, for example, to hookworm infestation or schistosomiasis? What actions, if any, have been taken to reduce iron loss?

Iron losses due to malaria parasite is an important problem in Burma. Malaria is still not controlled and there is resistance to common drugs in certain areas.

Hookworm infestation is seen in some areas but not to the extent of being a public health problem.

Giardiasis is a major problem in young children, causing malabsorption and predisposing malnutrition. Most PEM children have giardiasis and ascariasis infestations and they are treated specifically as well as iron supplemented.

G. Impact of the programme

a) Has a change in prevalence of iron deficiency anaemia been observed over a given time period in the targeted group? If so, please specify. Is there evidence that this is due to the programme (e.g. by comparison with an unsupplemented population), or partly attributable to other factors?

PHP has been in implementation phase for the last 10 years and USAID had conducted evaluation, but impact of iron supplementation in PW has not been assessed due to logistic difficulties. Also, it has taken a long lime to set up and promote the iron supplementation through the ANC services of basic health services and the PHC. Acceptability has apparently increased only in the last 5 years or so. At the same time, the programme will need to function satisfactorily in terms of coverage, and effectiveness.

b) Are particular groups of individuals found to respond better than others to supplementation? If so, which groups? Please suggest any reasons for this.

There is no information on individual group response to iron supplementation in terms of alleviation of iron deficiency. However, multiparas, who have used the iron tablets before, tend to be more compliant than primps and report that they feel stronger.

H. Other factors or constraints

In formulating this questionnaire, we may well not have asked *all* the pertinent questions relating to the effectiveness of supplementation programmes. We therefore request you to describe on a separate sheet of paper (a) any further positive factors and/or (b) any constraints, if any, that you feel influence the effectiveness of the programme.

Positive factors:

i) Integration into the routine health services delivery and PHC ensures acceptance by the health staff and better survival of the programme.

ii) Usage of peripheral health workers (LHV, MW) and the community volunteers (AMW, CHW) lead to better contact points between community and distribution system.

iii) Traditional use, by pregnant women, of local herbs and medicine during prenatal and postnatal period allow better acceptance of iron tablets which "help new blood regeneration" and "give strength to blood".

iv) PW have come to know iron tablets as part of ANCare.

Constraints:

i) Insufficient funds and supply causing uncertainty in peripheral staff.

ii) Irregular distribution in quantity and frequency causing confusion.

iii) Transportation difficulty for small stock.

iv) Oxidation and discolouration leads to substantial losses when the containers are damaged or distributed in paper wraps.

I. Critical factors and priority needs

Please list in order three critical factors that have, in the past, contributed to the programme's effectiveness, and (ii) three priority needs (if any) for increasing the effectiveness of the programme in the future.

Critical factors for effectiveness:

i) Integration into an existing infrastructure.
ii) Utilizing a national programme.
iii) Re−orientation of staff for education of PW.

Priority needs:

i) Allocation of adequate funds.
ii) Adequate and regular supply to each peripheral worker.
iii) Specific education on anaemia.

CARIBBEAN REGION

A. Brief description of iron deficiency problem

a) What is the total population in the area covered by the programme? Is the programme targeted to specific groups in the population, and, if so, how are these defined? How many are estimated to be in the target groups?

The programme covers a population of approximately 6 million and includes 17 English–speaking Caribbean countries. In some of the countries the programmes are targeted to the whole population such as fortification programmes. The supplementation programmes with iron are targeted first to pregnant women, second to lactating and third to pre–school age children.

b) Please provide any recent known estimates of prevalence of anaemia (below 11 g/dl. of haemoglobin) and severity (below 7 g/dl. being severe), if possible by group (e.g. reproductive age women). Please give any estimates, including those with other (specified) cut–off points. Also please indicate sources of data (e.g. survey, clinic records), dates, reliability, etc.

c) Regarding the main causes of iron deficiency anaemia in the programme area, please comment on the following, if feasible indicating order of importance as well as priority for intervention:

low dietary iron intake
low bioavailability of iron in the normal diet
iron losses due to malaria, hookworm or other parasites causing iron loss (see F)
genetic abnormalities of haemoglobin synthesis or iron metabolism
other factors (specify any)

The main causes of iron deficiency anaemia are low dietary iron intake and possibly low bioavailability of iron in the diet. Iron losses from hookworm exist in the Indian population of three of the Caribbean countries and are not a major cause of iron deficiency in most countries. There is a moderate prevalence of whipworm in many of the countries but usually the infection is not great enough to cause iron loss. Another problem in the Caribbean is sickle cell disease; we have approximately 9% sickle cell trait or AS.

B. Access and utilisation of services

a) What are the major distribution points currently used, and what might be used in the future (e.g. health centres, community health workers, industry)?

The major distribution points are health centres in all English–speaking Caribbean countries and some of the health centres operate in hospitals.

b) Do you have any estimates of the proportion of the population (better still, target group) that attends the distribution point (e.g. clinic), and with what frequency (e.g. % each month, % each three months, % each year)?

The coverage of the antenatal clinics in most Caribbean countries is high. Sometimes as high as an estimated 90–99%.

c) What are the major reasons for low attendance (e.g. poor access – distance, lack of time, lack of awareness of benefits, etc.)?

Antenatals usually start attending the clinics approximately at the beginning of the second trimester (later in some countries). If they enter the clinic at the beginning of the second trimester then they may attend approximately every one–month to six weeks until delivery.

d) What would be the best ways to improve attendance (if this is a major problem)?

Attending antenatal clinics is not a major problem in the English–speaking Caribbean. The problem in many countries is that they start attending the clinic late in the pregnancy.

C. Within–facility factors

a) Is there any assessment of individual's iron status for deciding on supplementation – or, for example, are all pregnant or women of child–bearing age intended to be supplemented? If specific targeting is made, what method is used for *screening* individuals into the programme? This would include the type of instrument used to detect anaemia in an individual, and the standards and cut–offs used to compare a measurement with, in order to decide whether he or she should receive iron supplements.

Every antenatal that enters an antenatal clinic has a blood sample taken and a haemoglobin level measured. In some countries the haemoglobin is measured by the Coulter Counter of Cyanmethaemoglobin at a central laboratory. In some countries the haemoglobin is screened in the clinic. This is either done by copper sulphate or the Spencer Haemoglobinometer. Cut off points used are different in different countries. Some countries use 11 g/dl and some use 10 g/dl.

b) Is there *monitoring* of iron status of individuals receiving the supplement? If so, what method is used and how frequently are individuals monitored?

The monitoring of individuals varies from island to island but generally they try to monitor the antenatal by taking a blood sample and doing a haemoglobin level two to three times during the pregnancy.

c) What procedure exists for *referring* individuals who are severely anaemic, for further treatment?

The severely anaemic individuals – haemoglobin below 8 g/dl – are usually referred to the District Medical Officer or Obstetrician/Gynaecologist.

d) What are the problems with assessment procedures – both actual and intended? For example, expense, complexity, equipment and supplies, time required per person screened? Is availability of trained staff a major constraint? Is the procedure quite acceptable to the local population? Are there any outstanding technical problems with screening? Please describe.

In the smaller Caribbean countries the blood samples are taken and many times sent to a Central Laboratory where the haemoglobin is estimated by the Coulter Counter, however, in the larger Caribbean countries, this is a problem and programmes are at present underway to train personnel to screen haemoglobin by the Spencer Haemoglobinometer.

e) What type of training of programme staff is employed?

At present there are training programmes in several Caribbean countries to train people in the use of the Spencer Haemoglobinometer.

f) What procedures exist for supervising and supporting staff at different levels, especially within–facility (e.g. for auxiliary staff, for doctors in charge). Indicators such as ratios of staff at different levels would be useful.

The workshops that are being conducted on the clinic management of anaemia, District Medical Officers and Senior Public Health Nurses are asked to attend and usually do – they are given the same training that nurses in the field get.

D. Supply to distribution point

a) What is the intended supplementation scheme (e.g. x mg. ferrous sulphate per person daily)? What quantities of iron tablets are provided at what intervals (e.g. 30 tablets per month) to individuals *currently* registered with the programme? What amounts are needed to cover the entire *intended* target group's requirements?

The intended supplementation schemes vary in the different Caribbean countries. However, as a rule, when ferrous sulphate tablets are available which are usually 300 mg ferrous sulphate with 400 micrograms of folate per tablet, usually 2–3 tablets are given daily. The antenatal will come to the clinic and a one–month supply will be given to her.

b) Please describe any problems with the procurement of supplements and ensuring their regular supply to the distribution point.

The procurement of supplies and their distribution has been a problem in the English–speaking Caribbean countries, however, the Eastern Caribbean Drug Service was formed to purchase iron tablets at a cheaper cost and distribute them to the countries. CFNI has been working with the countries to help them with their distribution with the Eastern Caribbean Drug Service within the countries.

c) What type of storage is used for supplements? Please describe any existing problems.

The iron tablets are usually shipped to the Central Pharmacist or Central Supply Officer where they are stored and shipped to various health centres. They are usually divided in the health centres into small containers (30–60 tablets to give to each antenatal per month).

d) Are the supplements donated, and if so, by whom? If not, what is the unit cost per 1000 (or other number) iron tablets?

In some countries the iron tablets are donated (e.g. in one country by the Lions Club in the U.S.). Usually they are bought by the Eastern Caribbean Drug Service or the central purchasing system in the country. The costs vary greatly but usually are $2.80 (US) per 1,000 tablets.

e) Do you believe there are major financial and/or other constraints which limit the programme's effectiveness? If so, where do these constraints exist e.g. in transport, storage, distribution, logistics and/or other areas? Please describe.

Yes, there are major constraints. They are usually financial in that the countries do not have the funds to purchase the tablets or they have a problem transporting the tablets within the country. This is one area – the logistics of purchasing and supply of iron tablets is a major constraint in our countries.

E. Individual compliance

Questions in this section relate to whether a person takes the supplements on a regular basis. Of importance here is the acceptability of the tablet to the individual, the level of awareness of the need to take the tablets, the level of supervision by health workers, the dosage and frequency of supplementation and the interrelationships between dosage, frequency, side–effects, compliance and drop–out from the programme. There is also the question of risk of toxic effects from iron overload.

a) What is the daily *dosage* (how many mg. iron per person per day), and the *frequency* (how many times per day) of supplementation for each age–sex group targeted by the programme?

The daily dosage is usually 2–3 ferrous sulphate tablets per day. The ferrous sulphate is 300 mg or approximately 60 mg elemental iron with 400 micrograms of folate.

b) How often do they receive a supply of supplements (e.g. weekly or monthly)? How much information is given the first time, and how is this reinforced in subsequent visits?

The supplements are usually distributed to the antenatals monthly. They are encouraged to take the supplements and when they return on subsequent visits the public health nurse will question the antenatal whether or not she has taken the iron tablets and reinforce the necessity of continuing with the supplementation programme.

c) Please describe the characteristics of the tablet What colour is it? How is it packaged? In your opinion, would changing the colour and/or packaging improve the acceptability of the supplement? What else might enhance acceptability?

The iron tablets are usually either green or brown – packaged in small boxes in the clinic. We have no information as to whether changing the colour or the packaging will change the acceptability of the supplement. There are some people who believe that the large tablets are a problem and if they could be made smaller this could possibly help supplementation programmes.

d) What type of side–effects have been reported? If data are available, what is the proportion of recipients reporting side–effects? How far do you feel side–effects reduce compliance with supplementation?

Side effects noticed are usually nausea, vomiting, heartburn and constipation that the antenatals attribute to taking the iron tablets. The prevalence of people reporting side–effects varies according to the side–effects. We found that some antenatals – as many as 41.6% – report abdominal pain. As high as 28.6% report nausea; as high as 10.8% report vomiting. As

high as 25.8% report heartburn. It appears from our studies that the antenatals with severe side−effects do tend to reduce taking the iron tablets, so this could be a major factor in compliance.

e) How is compliance monitored?

Compliance is usually monitored by the clinic nurse of public health nurse asking the antenatal whether she took the tablets or not.

f) What is the drop−out rate (% of recipients over specified time period leaving the programme), if known? Please specify any known reasons for drop−out? For example, what proportion drop out as a result of side−effects?

On a recent study done in Jamaica it was found that approximately 33% of the antenatals dropped out of the study. (They discontinued taking the iron tablets).

g) Have you tried altering the dosage and/or frequency of supplementation or other conditions of use to alleviate side−effects, and if so, with what success?

In some Caribbean countries they have switched from ferrous sulphate to ferrous fumarate and some have switched from ferrous sulphate to liquid iron. In two countries which are small and can afford a more expensive iron compound we advised them to use Fefol. However, one tablet is approximately 7 times more expensive than the cost of 1 tablet of ferrous sulphate and thus could only be advocated in very small countries (those with populations of few antenatals)

h) Do you believe there are any potential problems with iron overload and toxicity?

We are careful with recommending distributing too many iron tablets because of the possible problem of overload but this is not viewed as a major problem.

Supplement on Compliance:

As a follow−up to the questionnaire recently sent out to you, we are seeking additional information, not specifically asked for initially, but felt to be very important We would very much appreciate it if you could attempt as far as possible to answer the following questions, with regard to the programme you have had experience with, and bring answers to the workshop:

i) Have you measured compliance with iron supplement consumption?

Compliance with iron supplementation was measured in a recent low cost slow release trial conducted in Jamaica. Compliance was measured by (1) asking the antenatal how many tablets she consumed; (2) by counting the tablets; and (3) the haemoglobin was determined in iron deplete individuals to lest whether this was an adequate measure of compliance.

ii) As well as non−compliance with the supplementation programme, leading to “dropping out”, there may be partial compliance whereby patients take *some* tablets but either not in the prescribed daily dosage and/or not as frequently as required. Is such partial compliance a problem in the programme, and what causes it?

Partial compliance whereby patients took some tablets but not the full dosage as required was experienced in the recent HBS Iron Study done in Jamaica by CFNI. It was a problem to a point because some patients started off taking all the tablets (as time went on they took some of the tablets and did not follow the dosage as instructed). Reasons for not taking all tablets as prescribed centres around forgetting, not liking to take tablets, tablets making them ill and some patients felt that the tablets were too big.

iii) How have you tried to improve compliance? (For example through changing the dosage, by switching to another iron preparation, by changing frequency or timing of supplement ingestion, or by counselling, mass media, or posters, etc. Please describe media used and

messages given.)

We have tried to get the antenatals to take tablets with food, we have had them switch to another iron preparation or to switch to liquid iron or by counselling and trying to explain to them the importance of taking iron tablets. Probably the approach of taking the tablets with food has been the most successful. The problem if an iron tablet is taken on an empty stomach is that you get maximum absorption. If the iron tablet is taken with food the absorption is decreased, however, the number of side−effects are Usually also decreased and hence the antenatal may continue taking the iron tablet.

iv) Have you been successful in improving compliance? (Please give number if available)

Compliance was improved in some cases. Some patients who initially did not follow the prescribed instructions later on increased their acceptance of the dosage. However, this should be noted that this was done in a careful controlled study and was not the usual clinic situation where one nurse may be seeing 60 patients/day.

v) What are your recommendations for improving iron supplementation programme design to increase compliance?

* *A constant supply of iron or iron folate tablets at the clinic level on an ongoing basis.*

* *Building awareness among the antenatals about the importance of iron intake during pregnancy.*

* *If low cost preparation that causes fewer side−effects could be used.*

F. Prevention of loss of iron

a) Please describe the relative importance of factors which may cause the loss of iron from individuals in the programme area. For example, how serious are problems of hookworm infestation, schistosomiasis or reproductive loss of blood in women through menstruation or post−partum haemorrhage? How feasible and practical is it to aim to reduce (i) malabsorption due to infectious organisms e.g. Giardia, and (ii) blood loss due, for example, to hookworm infestation or schistosomiasis? What actions, if any, have been taken to reduce iron loss?

In the English−speaking Caribbean infections of hookworm are usually not a major problem. We do find infection of hookworm in the Mayan Indian population of Belize, Suriname and Guyana. Schistosomiasis and malaria are not problems. We do find fairly high prevalence levels but medium infection levels of whipworm. In some studies in specific age groups whipworm has shown to be a problem and does decrease the haemoglobin level.

G. Impact of the programme

a) Has a change in prevalence of iron deficiency anaemia been observed over a given time period in the targeted group? If so, please specify. Is there evidence that this is due to the programme (e.g. by comparison with an unsupplemented population), or partly attributable to other factors?

Preliminary studies have shown the decrease in the prevalence of iron deficiency anaemia in 3 Caribbean countries − in all 3 cases this was attributed to changing the programme where a constant supply of iron tablets were available. In one country six ferrous sulphate tablets were given daily and it was suggested that the country only give 1 Fefol/day. This decreased the prevalence of anaemia. In the other two countries the constant supply of iron tablets seemed to decrease the prevalence of anaemia. We feel this has been one of our major problems and may have been one of our major breakthroughs.

b) Are particular groups of individuals found to respond better than others to supplementation? If so, which groups? Please suggest any reasons for this.

Studies done that have focussed on socio−economic and ethnic variables revealed no relationship so far between acceptance or response to supplementation.

H. Other factors or constraints

In formulating this questionnaire, we may well not have asked *all* the pertinent questions relating to the effectiveness of supplementation programmes. We therefore request you to describe on a separate sheet of paper (a) any further positive factors and/or (b) any constraints, if any, that you feel influence the effectiveness of the programme.

I. Critical factors and priority needs

Please list in order three critical factors that have, in the past, contributed to the programme's effectiveness, and (ii) three priority needs (if any) for increasing the effectiveness of the programme in the future.

Priority needs:

i) A constant supply of iron/folate tablets at the clinic level.

ii) Building awareness among antenatals about the importance of taking iron tablets during pregnancy.

iii) Using an adequate haemoglobin screening technique at the clinic level.

iv) Use of a low−cost iron preparation that causes fewer side−effects.

ANNEX I: GLOSSARY

ANC	Ante−natal care
ANM	Auxiliary nurse−midwife
AWW	*Anganwadi* worker (India)
CHW	Community health worker
EPI	Expanded Programme on Immunisation
FEP	Free erythrocyte protoporphyrin
GDS	Gastric Delivery System
Hb	Haemoglobin
HBS	Hydrodynamically Balanced System
HMO	Higher medical orderly
ICMR	Indian Council for Medical Research
IDA	Iron deficiency anaemia
LHV	Lady health visitor
MCH	Mother and child health
MCV	Mean corpuscular volume
MD	Medical doctor
MO	Medical orderly
PHC	Primary health care

TBA	Traditional birth attendant
VHW	Village health worker

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