Guidelines for the Use of Iron Supplements to Prevent and Treat Iron Deficiency Anemia

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PREFACE

Iron deficiency anemia is the most common micronutrient deficiency in the world today. It impacts the lives of millions of women and children contributing to poor cognitive development, increased maternal mortality and decreased work capacity. Yet with appropriate public health action, this form of micronutrient malnutrition can be brought under control. These guidelines are offered as an important component of iron deficiency anemia control programs.

The International Nutritional Anemia Consultative Group (INACG) has a long standing commitment to provide scientifically sound recommendations to public health planners and managers about ways to control iron deficiency anemia. This publication is another in a series of publications aimed at providing such guidance.

While the main focus of these guidelines is on iron supplementation programs and parasite control, these guidelines acknowledge the beneficial role food fortification and dietary diversification can have in controlling iron deficiency anemia. Further information on these approaches can be found in other INACG documents as well as those of other organizations.

It is hoped that these guidelines, which reflect our current state of knowledge, will be useful to those charged with planning and implementing iron supplementation programs. Please feel free to send your comments regarding these guidelines, so that they might be improved at a future date.

Joy Riggs-Perla
Director
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INACG organized an expert panel review of the initial draft guidelines prepared by Drs. Stoltzfus and Dreyfuss. The members of this panel were: Dr. George Beaton, GHB Consulting, Canada; Dr. Joanne Csete, UNICEF; Dr. Ian Darnton-Hill, OMNI Project, John Snow, Inc.; Dr. Frances Davidson, U.S. Agency for International Development; Dr. Alan F. Fleming, University Teaching Hospital, Zambia; Dr. Wilma Freire, Pan American Health Organization; Ms. Rae Galloway, MotherCare, John Snow, Inc.; Prof. Tara Gopaldas, Tara Consultancy Services, India; Dr. Mahshid Lotfi, Micronutrient Initiative; Dr. Sean Lynch, Hampton Veterans Affairs Medical Center; Dr. Judith McGuire, The World Bank; Dr. Antonio Montresor, World Health Organization; Dr. Sonya Rabeneck, ACC/Sub-Committee on Nutrition; Dr. Barbara Underwood, National Eye Institute; Dr. Fernando Viteri, University of California, Berkeley. The contribution of these experts to the development of the final product is greatly appreciated.

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About INACG

The purpose of the International Nutritional Anemia Consultative Group (INACG) is to guide international activities aimed at reducing nutritional anemia in the world. INACG offers consultation and guidance to various operating and donor agencies that are seeking to reduce iron deficiency and other nutritionally preventable anemias. As part of this service, INACG has prepared guidelines and recommendations for:

- assessing the regional distribution and size of nutritional anemia,
- developing intervention strategies and methodologies to combat iron deficiency anemia,
- evaluating the effectiveness of implemented programs on a continuing basis so that evaluation of the effectiveness of intervention techniques is a continuing and dynamic process, and
- performing research needed to support the assessment, intervention, and evaluation of programs.

INACG is dedicated to reducing the prevalence of iron deficiency and other nutritionally preventable anemias worldwide. In fulfilling this mandate, INACG sponsors scientific reviews and convenes task force groups to analyze issues related to etiology, treatment, and prevention of nutritional anemias. The need to examine these issues is acknowledged as being important to the establishment of public policy and action programs. A series of monographs and reports are the result of these task force groups' efforts:

- *Guidelines for the Eradication of Iron Deficiency Anemia* (1977)
- *Iron Deficiency in Infancy and Childhood* (1979; available in English, French, and Spanish)
- *Iron Deficiency in Women* (1981; available in English, French, and Spanish)
- *Iron Deficiency and Work Performance* (1983)
- *Design and Analysis of Iron Supplementation Trials* (1984)
- *Measurements of Iron Status* (1985)
- *Guidelines for the Control of Maternal Nutritional Anemia* (1989; available in English, French, and Spanish)
- *Combating Iron Deficiency Anemia Through Food Fortification Technology: An Action Plan* (1992; available in English, French, and Spanish)
- *Iron EDTA for Food Fortification* (1993)

- *Iron Multi-Micronutrient Supplements for Young Children* (1997)
- *Child Development and Iron Deficiency* (1997)
- *Iron EDTA for Food Fortification* (Fact Sheet; 1997)

Single copies of these reports are available free of charge to developing countries and for $3.50 (U.S.) to developed countries. Copies are available from the INACG Secretariat:

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Background

Iron deficiency is the most common form of malnutrition in the world, affecting more than 2 billion people globally. Iron deficiency anemia (inadequate amount of red blood cells caused by lack of iron) is highly prevalent in less-developed countries but also remains a problem in developed countries where other forms of malnutrition have already been virtually eliminated. Iron deficiency is not the only cause of anemia, but where anemia is prevalent, iron deficiency is usually the most common cause. The prevalence of anemia, defined by low hemoglobin or hematocrit, is commonly used to assess the severity of iron deficiency in a population (Table 1).

Table 1. Hemoglobin and hematocrit cutoffs used to define anemia in people living at sea level

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

From WHO/UNICEF/UNU, 1997

Iron deficiency anemia is most prevalent and severe in young children (6–24 months) and women of reproductive age, but is often found in older children and adolescents and may be found in adult men and the elderly. Iron deficiency anemia occurs when iron stores are exhausted and the supply of iron to the tissues is compromised. Iron deficiency anemia is a severe stage of iron deficiency in which hemoglobin (or hematocrit) falls below the above cutoffs. Iron deficiency anemia is defined as anemia with biochemical evidence of iron deficiency. Serum ferritin, transferrin saturation, transferrin receptor, and erythrocyte protoporphyrin are indicators used as biochemical evidence of iron deficiency.

Iron deficiency generally develops slowly and is not clinically apparent until anemia is severe even though functional consequences already exist. Where iron deficiency anemia is prevalent, effective control programs may yield benefits to human health as shown in Table 2.

Table 2. Benefits of effective control programs

Population group	Benefits
Children	■ Improved behavioral and cognitive development ■ Where severe anemia is common, improved child survival
Adolescents	■ Improved cognitive development ■ In girls, better iron stores for later pregnancies
Pregnant women and their infants	■ Decreased low birth weight and perinatal mortality ■ Where severe anemia is common, decreased maternal mortality and obstetrical complications
All individuals	■ Improved fitness and work capacity ■ Improved cognition

Purpose of These Guidelines

These guidelines address the appropriate uses of iron supplements to prevent and treat iron deficiency anemia in the context of public health programs. The specific purposes of this document are:

- to provide clear and simple recommendations for people planning to use iron supplements in anemia control programs at the local, district, or national levels;
- to address both the prevention of iron deficiency anemia and the treatment of severe anemia in public health contexts; and
- to integrate recommendations for the use of antimalarial and anthelminthic medications where appropriate along with iron supplements to prevent or treat anemia.

It is important to remember that these are guidelines, not rules. Any document written outside the context of a real program can only serve as a starting point for program planners, who are responsible for creatively adapting general guidelines to their particular social, political, and epidemiological situation. As much as possible, these guidelines draw on previous INACG and WHO documents as well as recommendations made by other expert groups.

Overview of Interventions for Controlling Iron Deficiency Anemia

Iron Supplements in Context

A varied array of interventions exist that are designed to prevent and correct iron deficiency anemia. These include dietary improvement, fortification of foods with iron, iron supplementation, and other public health measures, such as helminth control. All of these approaches improve iron status in some contexts. The appropriate use of iron supplements will be an important part of anemia control programs in almost all contexts, but supplements should be viewed as one of several tools in the battle against iron deficiency anemia.

In many populations, the amount of iron absorbed from the diet is not sufficient to meet many individuals' requirements. This is especially likely to be true during infancy and pregnancy, when physiological iron requirements are the highest. If the amount of absorbable iron in the diet cannot be immediately improved, iron supplementation will be a necessary component of programs to control iron deficiency anemia. This will almost always be the case for children 6–24 months of age and pregnant women.

The priority among target groups for iron supplementation is based on the likelihood of both iron deficiency and the public health benefits resulting from its control. Pregnant and postpartum women and children 6–24 months of age are the priority target groups for both reasons. Where anemia is very prevalent, supplementation would also benefit women of reproductive age, preschool children, school-age children, and adolescents, and this might be a reasonable strategy. In these target groups, the decision to supplement will likely depend most on feasibility, which might be highest in a daycare or school setting for children and adolescents or in a workplace setting for women.

Iron supplements are essential for the rapid treatment of severe iron deficiency anemia in all sex and age groups. With proper training, health workers can assess very low hemoglobin levels or extreme pallor with reasonable sensitivity and high specificity. Where severe anemia is relatively common (prevalence 2 % or more of a population group), its detection and treatment in primary care facilities is necessary to prevent morbidity and mortality from severe anemia.

A daily protocol of iron supplementation is recommended for treatment and prevention in the priority target groups. Numerous studies have evaluated whether the frequency of iron supplementation can be reduced from daily to twice or once per week without compromising the efficacy of supplementation. The efficacy of once- or twice-weekly supplementation in school-age children, adolescents, and nonpregnant women is promising, and the operational efficiency of intermittent dosing regimens is being evaluated. While research is ongoing to evaluate these regimens in different population groups, the current recommendation remains daily supplementation for young children and pregnant women.

The dosage for iron supplementation in mass programs is unchanged from previous recommendations, except that the pregnancy dose has been reduced to 60 mg/day. Because the efficiency of absorption of iron increases as iron deficiency anemia becomes more severe, this dose should provide adequate supplemental iron to women who do not have clinically severe anemia if it is given for an adequate duration. However, if the duration of supplementation during pregnancy is short, a higher dose (120 mg/day) is recommended.

Supplementation with 400 μg of folic acid around the time of conception significantly reduces the incidence of neural tube defects, a group of severe birth defects. Folate supplementation begun after the first trimester of pregnancy is too late to prevent birth defects. A daily dose of 400 μg folic acid is a safe and healthy intake for women during pregnancy and lactation but is more than the amount required to produce an optimal hemoglobin response in pregnant women. Nevertheless, if iron supplements containing 400 μg folic acid are available, their use in supplementation programs is recommended. If such supplements are not available, the currently available iron supplement containing 250 μg folic acid should be used until higher folate formulations can be obtained.

Food-based Interventions

Fortification of suitable food vehicles with absorbable forms of iron is a highly desirable approach to controlling iron deficiency. If a fortifiable food exists that is consumed by many people at risk of iron deficiency, fortification is likely to be the most cost-effective component of its control. Therefore, some fortification activity, either planning or implementation, is a recommended part of programs in all contexts.

There are many possible strategies for iron fortification. One approach is to fortify a staple food that is consumed in significant quantities by most of the population. Fortification of wheat flour with iron is technically relatively simple and this has been successfully implemented in several countries in the Caribbean, South America, North America, and Great Britain. Another approach is to fortify a widely consumed condiment. Fish sauce, curry powder, salt, and sugar have all been successfully fortified with iron. In South America, both dried and liquid milk and milk products such as yogurt have been fortified with iron. Fortified infant foods are an especially important component of iron deficiency anemia control in children receiving complementary foods. Fortified complementary foods have been shown to be effective in preventing infant iron deficiency anemia in the United States and Latin America.

The amount of iron absorbed from the diet is highly dependent on the composition of the diet, namely, the quantities of substances that enhance or inhibit dietary iron absorption. Tea and coffee inhibit iron absorption when consumed with a meal or shortly after a meal. Heme food sources, predominately red meats, contain highly absorbable iron and promote the absorption of iron from other less bioavailable food sources. Vitamin C (ascorbic acid) is also a powerful enhancer of iron absorption from nonmeat foods when consumed with a meal. The size of the vitamin C effect on iron absorption increases with the quantity of vitamin C in the meal. Unfortunately, foods rich in vitamin C tend to be seasonally available, and both meat and vitamin C–rich foods tend to be expensive in less-developed countries. Germination and fermentation of cereals and legumes improve the bioavailability of iron by reducing the content of phytate, a substance in food that inhibits iron absorption. Although much is known about factors that enhance or inhibit iron absorption, the amount of change in iron absorption that can be achieved through dietary improvements accessible to poor populations remains in question. Dietary improvement becomes more feasible as economic means and dietary diversity increase.

Even where poverty limits dietary choices, some general nutrition education messages have benefits for controlling iron deficiency anemia. All nutrition education programs should promote and support exclusive breastfeeding for about 6 months followed by breastfeeding with appropriate complementary foods, including iron-rich or iron-fortified foods where possible, through the second year of life. Some breast-milk substitutes, especially cow milk, are prone to cause gastrointestinal bleeding in infants, which can cause iron deficiency anemia. Also, promoting adequate food intake in young children and pregnant women can ensure that total iron intake is high even though the percentage of iron absorbed from each meal (i.e., the iron bioavailability) remains low. Promoting adequate food intake in young children requires the development or promotion of low-viscosity, nutrient-dense foods for infants. Educational messages might include teaching mothers to feed 4-5 meals per day to young children and encouraging adequate food intake and weight gain in pregnancy.

Helminth Control

Where hookworm infection is endemic (prevalence 20-30% or higher) and anemia is very prevalent, hookworm infection is likely to be an important cause of anemia, especially moderate-to-severe anemia. Hookworms (*Necator americanus* and *Ancylostoma duodenale*) infect approximately 1 billion of the world's population, an estimated 44 million of whom are pregnant women. Hookworms cause intestinal blood loss by feeding on the intestinal mucosa. The amount of blood lost is directly proportional to the number of worms infecting the host. A moderate infection of hookworms approximately doubles the iron losses of a child or menstruating woman. At the population level, endemic hookworm infection contributes to the prevalence of anemia and has the greatest effect on the prevalence of moderate and severe anemia. The prevalence and intensity of hookworm infection increases with age, so that its effect is greatest on the iron status of school-age children, adolescents, and adults, including pregnant women.

In populations with endemic hookworm, anthelminthic therapy should be given presumptively to anyone with severe anemia, because treatment is safe and much less expensive than diagnosing hookworm infection. Anthelminthic treatment to school children without prior screening is currently recommended in the school setting and combined with iron-folate supplementation in antenatal care. School-based anthelminthic chemotherapy (deworming) alone may help prevent moderate-to-severe anemia in schoolchildren, but the most effective strategy for anemia control is to combine anthelminthic chemotherapy with iron supplementation. In antenatal care, anthelminthic therapy combined with iron and folate supplementation enhances the hemoglobin response to iron supplementation. Mebendazole, albendazole, levamisole, and pyrantel may all be safely administered to pregnant women after the first trimester.

Three schistosomes can cause anemia: *Schistosoma mansoni* and *S. japonicum*, which are intestinal parasites, and *S. haematobium*, which infects the bladder and urinary tract. Although all three forms can cause severe anemia, the role of *S. haematobium* (urinary schistosomiasis) as a cause of anemia in populations is more firmly established than that of intestinal schistosomiasis. The geographic distribution of endemic *S. haematobium* is limited to Africa and the Middle East. Hematuria can be detected by using reagent test strips (for example, Hemastix, Ames Laboratories, Elkhart, IN), and in severe infection, blood in urine can be observed visually (red, brown, or foggy urine). Urinary schistosomiasis is transmitted by swimming or wading in bodies of water that are habitats for infected snails. Infection is usually most prevalent and severe in children, older boys, and men, who are more likely to swim. Where urinary schistosomiasis is endemic, it should be considered in the treatment of severe anemia and in school-based anthelminthic chemotherapy programs. Praziquantel safely and effectively treats this infection.

Malaria Control

Plasmodium falciparum malaria causes a profound anemia during and after acute infection. The anemia is caused by hemolysis of red cells combined with suppression of erythropoiesis. Consequently, body iron is shifted from hemoglobin to storage forms. Whether malaria increases iron losses from the body is not fully understood but is unlikely. The increased red cell turnover may bring about folate deficiency, especially during pregnancy when folate requirements are already high. For these reasons, detecting and treating malaria are essential for treating severe anemia where *P. falciparum* malaria is endemic. Where *P. falciparum* malaria is endemic, the use of insecticide-impregnated bednets in communities decreases the prevalence of severe anemia in young children. Malaria prophylaxis during pregnancy may reduce the prevalence of anemia in first and second pregnancies and improve birth weight. Malaria prophylaxis has less benefit as a public health measure in multiparous women. Although malaria-related anemia is usually not primarily iron deficiency anemia, such distinctions are not important to primary health care providers and some recommendations about the use of antimalarial drugs are included in these guidelines.

Reproductive and Obstetric Interventions

Preventing adolescent pregnancies, reducing the total number of pregnancies, and increasing the time between pregnancies will also contribute to the control of iron deficiency anemia in women. Pregnancy creates a large demand for iron, which is needed to develop the fetus and placenta and to expand a woman's blood volume. Additional iron is lost with blood lost at delivery. When the iron demands of pregnancy are combined with the iron demands of adolescent growth, girls enter adulthood at great risk of iron deficiency. The postpartum period is a time of recuperation of iron status, as iron in additional red blood cells made during pregnancy becomes available. This is especially true during the period of full breastfeeding and lactational amenorrhea, because the iron cost of breastfeeding is typically less than the iron cost of regular menstruation. Thus, the promotion of exclusive breastfeeding for about 6 months followed by breastfeeding with complementary feeding into the second year of life will contribute to the control of iron deficiency anemia in women of reproductive age. When women have 2 or more years between pregnancies, they are more likely to enter the subsequent pregnancy with adequate iron status. However, these interventions alone will not be sufficient to control anemia where dietary iron deficiency persists.

Obstetrical practices can also contribute to the control of iron deficiency anemia in infants. More red blood cells are transferred from the placenta to the newly born infant if the umbilical cord is not clamped and ligated until it stops pulsating. By holding the infant on the mother's abdomen, continued blood flow to the infant is allowed without an excess risk of polycythemia (i.e., the baby getting too many blood cells). This increases the body iron content of the infant, which will help to prevent iron deficiency in later infancy.

Selecting and Prioritizing Interventions

Ideally, all countries where iron deficiency anemia exists would have a comprehensive anemia control program that includes an appropriate mix of interventions designed to best address local conditions. However, countries with the most widespread and severe anemia are often those with the most limited resources. It is important to prioritize program efforts so that scarce resources can be most effectively used.

The appropriate selection of interventions depends on many factors. It first depends on the epidemiology of iron deficiency anemia in the area. Who has iron deficiency anemia, and why? Because of their high physiological demands for iron, young children and pregnant women will be at greatest risk of iron deficiency anemia in almost every context. If no epidemiological information is available, it is safe to assume that these are the groups in which to begin. However, useful information often exists even when formal surveys have not been conducted. The contributing etiologies of anemia (e.g., whether there are hookworms or malaria) and the extent of iron deficiency anemia in other population groups (e.g., schoolchildren) varies by region. If surveys cannot be conducted, impressions of health care workers, midwives, and doctors should be gathered. If anemia seems to be a clinical problem in men as well as women and children, then it is likely that malaria, hookworm, or other diseases are playing an important role in addition to dietary iron deficiency.

Second, the available infrastructures determine the cost and feasibility of different approaches. Prenatal care, growth monitoring, and immunization clinics may be effective ways to reach mothers and children, with interventions in some places, but where coverage of health services is very low, village women's groups, traditional birth attendants, schools, religious groups, or other community organizations may also need to be involved. The feasibility of iron fortification of foods will depend on the existence of widely consumed, centrally processed foods. The feasibility of dietary improvement depends on the diversity of foods available.

A third critical factor is the opinions and priorities of the community being served. Community involvement is key to the acceptance and sustainability of interventions. The community as a whole must develop a sense of active partnership with the health system based on their conviction that the programs will benefit its members. Involving community members in the development of a program generates a sense of community ownership of the program that may be essential to its success.

Guidelines for Iron Supplementation to Prevent Iron Deficiency Anemia

Although many of the recommended dosages for iron supplementation are derived from dose per body weight, the recommended dosages in these guidelines are given in absolute quantities of elemental iron. A number of different iron-containing compounds are used in iron supplements. A list of some commonly used iron compounds and the amount of elemental iron they contain are included as Appendix A.

Where parasitic infections are common, giving anthelminthic or antimalarial drugs along with iron supplements may increase the effectiveness of supplementation. Where appropriate, complementary parasite control measures are given along with the guidelines for iron supplementation.

Pregnant Women

The high physiological requirement for iron in pregnancy is difficult to meet with most diets. Therefore, pregnant women should routinely receive iron supplements in almost all contexts. Where the prevalence of anemia in pregnant women is high (40% or more), supplementation should continue into the postpartum period to enable women to acquire adequate iron stores (Table 3). Complementary parasite control measures in pregnancy are given in Table 4.

Table 3. Guidelines for Iron Supplementation to Pregnant Women

Prevalence of anemia in pregnancy	Dose	Duration
<40%	60 mg iron + 400 μg folic acid daily	6 months in pregnancy
≥40%	60 mg iron + 400 μg folic acid daily	6 months in pregnancy, and continuing to 3 months postpartum

Notes:

- If 6 months duration cannot be achieved in pregnancy, continue to supplement during the postpartum period for 6 months or increase the dose to 120 mg iron in pregnancy.
- Where iron supplements containing 400 μg of folic acid are not available, an iron supplement with less folic acid may be used. Supplementation with less folic acid should be used only if supplements containing 400 μg are not available.

Table 4. Complementary parasite control measures in pregnancy

- Where **hookworms** are endemic (prevalence 20-30% or more) give anthelminthic treatment once in the second trimester of pregnancy. If hookworms are highly endemic (prevalence more than 50%), repeat anthelminthic treatment in the third trimester of pregnancy. The following anthelminthic treatments are effective and safe outside of the first trimester of pregnancy:

Albendazole	400 mg single dose
Mebendazole	500 mg single dose or 100 mg twice daily for 3 days
Levamisole	2.5 mg/kg single dose, best if a second dose is repeated on next 2 consecutive days
Pyrantel	10 mg/kg single dose, best if dose is repeated on next 2 consecutive days

- If ***Plasmodium falciparum*** **malaria** is endemic and transmission of infection is high, women in their first or second pregnancies should be given curative antimalarials at the first prenatal visit, followed by antimalarial prophylaxis according to local recommendations.

Children 6–24 Months of Age

Infants need a relatively high iron intake because they are growing very rapidly. Infants are normally born with plenty of iron. However, beyond 6 months of age, iron content of milk is not sufficient to meet many infants' requirements and complementary foods are usually low in iron. Low-birth-weight infants (less than 2500 g) are born with fewer iron stores and are at high risk of deficiency after 2 months. Where iron-fortified complementary foods are not widely and regularly consumed by young children, infants should routinely receive iron supplements in the first year of life (Table 5). Where the prevalence of anemia in young children (6–24 months) is 40% or more, supplementation should continue through the second year of life.

Table 5. Guidelines for iron supplementation to children 6–24 months of age

Prevalence of anemia in children 6–24 months	Dosage	Birth-weight category	Duration
<40%	12.5 mg iron + 50 μg folic acid daily	Normal	6–12 months of age
		Low birth weight (<2500 g)	2–24months of age
≥40%	12.5 mg iron + 50 μg folic acid daily	Normal	6–24 months of age
		Low birth weight (<2500 g)	2–24 months of age

Note:
- If the prevalence of anemia in children 6–24 months is not known, assume it is similar to the prevalence of anemia in pregnant women in the same population.
- Iron dosage is based on 2 mg iron/kg body weight/day.

Other Population Groups

Although pregnant women and young children are at greatest risk of iron deficiency anemia, other population groups frequently suffer its consequences and may benefit from iron supplementation programs. In some contexts it may be feasible and cost effective to distribute iron supplements to other groups if the prevalence of anemia is high (Table 6). Complementary parasite control measures for other population groups are given in Table 7.

Table 6. Guidelines for iron supplementation to other population groups

Group	Dosage
Children 2–5 years	20–30 mg iron
Children 6–11 years	30–60 mg iron
Adolescents and adults	60 mg iron (see notes)

Notes:

- For children 2–5 years, iron dosage is based on 2 mg iron/kg body weight/day.
- If the population group includes girls or women of reproductive age, 400 µg folic acid should be included with the iron supplementation for the prevention of birth defects in those who become pregnant.
- Research is ongoing to determine the most cost-effective dosing regimen for iron supplementation to these age groups in different contexts. The efficacy of once- or twice-weekly supplementation in these groups appears promising, and the operational efficiency of intermittent dosing regimens is being evaluated. While policy recommendations are being formulated, program planners should adopt the dosing regimen believed to be most feasible and sustainable in their communities.

Table 7. Complementary parasite control measures for other population groups

- Where **hookworms** are endemic (prevalence 20-30% or greater) it will be most effective to combine iron supplementation with anthelminthic treatment to adults and children above the age of 5 years. Universal anthelminthic treatment, irrespective of infection status, is recommended at least annually. High-risk groups, women and children, should be treated more intensively (2–3 times per year). The following single-dose treatments are recommended:

Albendazole	400 mg single dose
Mebendazole	500 mg single dose
Levamisole	2.5 mg/kg single dose
Pyrantel	10 mg/kg single dose

(Anthelminthic treatment can be given to pregnant and lactating women. However, as a general rule, no drug should be given in the first trimester.)

- Where **urinary schistosomiasis** is endemic, provide annual treatment for urinary schistosomiasis to school-age children who report having blood in their urine. Give the following treatment:

Praziquantel	40 mg/kg, single dose

Guidelines for Treatment or Referral of Severe Anemia in Primary Care Settings

Severe anemia usually comprises a small proportion of the cases of iron deficiency in a population but may cause a large proportion of the severe morbidity and mortality related to iron deficiency. It is important that primary health care providers are able to recognize these cases and treat or refer individuals with severe anemia. The training and supervision of this activity in primary health care settings becomes a priority activity when the prevalence of severe anemia in population groups (e.g., pregnant women) exceeds 2%.

Iron deficiency is not the only cause of severe anemia. Other possible causes include malaria, folate deficiency, hemoglobinopathies such as sickle cell anemia or thalassemias, and the anemia of chronic disorders such as HIV infection, tuberculosis, or cancer. In primary care settings, health care workers should know when to refer individuals who do not respond to oral iron therapy or who are at urgent risk of serious complications.

Detection of Severe Anemia

Severe anemia is defined clinically as a low hemoglobin concentration leading to cardiac decompensation, that is, to the point that the heart cannot maintain adequate circulation of the blood. A common complaint is that individuals feel breathless at rest. In practical settings, severe anemia may be defined by using a hemoglobin or hematocrit cutoff or by extreme pallor. If the hemoglobin or hematocrit can be determined, cutoffs of hemoglobin below 7.0 g/dL or hematocrit below 20% should be used to define severe anemia. If this is not feasible in the primary care setting, a method is available for evaluating the color of a drop of blood on a special filter paper. This method (formerly called the Talqvist method) requires standard blotting or filter paper and color comparison charts, which are available from the World Health Organization (Haemoglobin Colour Scale). The third choice for detection is assessment of pallor. Three sites should be examined: the inferior conjunctiva of the eye, the nail beds, and the palm. If any of these sites is abnormally pale, the individual should be considered to be severely anemic. This method will detect most but not all of people who are truly severely anemic (i.e., hemoglobin below 7.0 g/L) and will rarely identify a healthy person as severely anemic. Descriptions and pictures of each of these methods can be found in *Anemia Detection in Health Services—Guidelines for Program Managers* (PATH 1996).

In addition, any child with kwashiorkor or marasmus should be assumed to be severely anemic and treated for severe anemia (Table 8). However, oral iron therapy should not be started until the child regains appetite and is gaining weight. This is usually about 14 days after nutritional rehabilitation has begun.

Treatment or Referral of Cases

Once an individual is determined to have severe anemia, a decision must be made regarding whether to treat in the local setting or refer to a hospital. Treatment should be given in a hospital if the individual is a pregnant woman beyond 36 weeks gestation (i.e., in the last month of pregnancy) or if signs of respiratory distress or cardiac abnormalities (e.g., labored breathing at rest or edema) are present. Other individuals should be treated as indicated in Table 8. Complementary parasite control measures for individuals with severe anemia are given in Table 9.

Table 8. Guidelines for oral iron and folate therapy to treat severe anemia

Age group	Dose	Duration
< 2 years	25 mg iron + 100-400 μg folic acid daily	3 months
2-12 years	60 mg iron + 400 μg folic acid daily	3 months
Adolescents and adults, including pregnant women	120 mg iron + 400 μg folic acid daily	3 months

Notes:

- After completing 3 months of therapeutic supplementation, pregnant women and infants should continue preventive supplementation regimen.
- Children with kwashiorkor or marasmus should be assumed to be severely anemic. However, oral iron supplementation should be delayed until the child regains appetite and starts gaining weight, usually after 14 days.

Table 9. Complementary parasite treatments for individuals with severe anemia

- Where **hookworms** are endemic (prevalence 20-30% or more), if the affected person is older than 2 years, give one of the following anthelminthic treatments:

Albendazole	400 mg single dose
Mebendazole	500 mg single dose or 100 mg twice daily for 3 days
Levamisole	2.5 mg/kg single dose, best if second dose is given after 7 days
Pyrantel	10 mg/kg single dose, best if dose is repeated on next 2 consecutive days

  If the affected person is a woman who might be in the first trimester of pregnancy, delay anthelminthic treatment until pregnancy can be ruled out (e.g., menstruation resumes) or until the second trimester of pregnancy (e.g., until the uterus can be easily palpated).

- Where **urinary schistosomiasis** is endemic, if the affected person is older than 5 years, check for visual hematuria. If present, give the following treatment:
  Praziquantel 40 mg/kg, single dose

- Where ***P. falciparum*** **malaria** is endemic, if the affected person is a child younger than 5 years, give antimalarial treatment according to local recommendations. If the affected person is a pregnant woman, give curative antimalarial treatment at the first prenatal visit, followed by antimalarial prophylaxis according to local recommendations. For other affected individuals, examine blood film for malarial infection and treat if the film is positive. If a blood film cannot be made, give presumptive treatment.

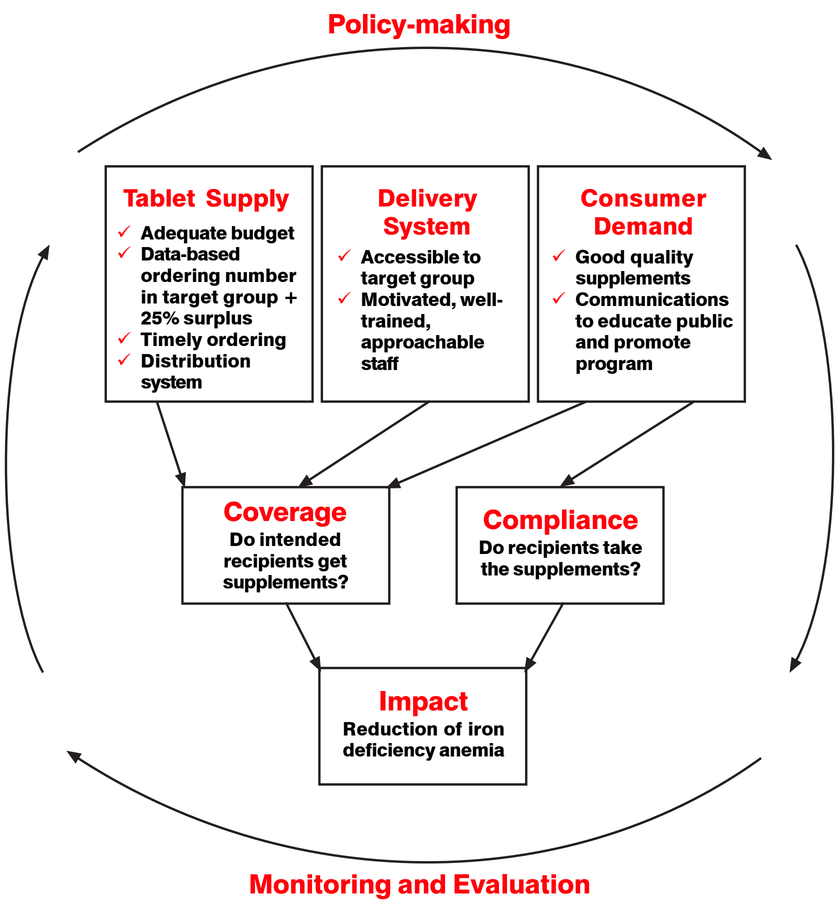
Follow-up of Treated Cases

Individuals diagnosed with severe anemia and treated with oral iron and folate therapy should be asked to return for evaluation 1 week and 4 weeks after iron supplementation is begun. The purpose of this follow-up is to refer individuals who are in need of further medical attention. Specifically, individuals should be refered to a hospital if their condition has worsened at the 1 week follow-up visit or if their condition shows no improvement at the 4-week follow-up visit.

From Guidelines to Programs

The evidence is indisputable that iron supplements can substantially reduce iron deficiency anemia. However, there are also many experiences that show that iron supplementation programs do not always work. Fortunately, although every program will have its unique aspects, some general elements of a successful iron supplementation programs are beginning to emerge from these experiences. These elements are summarized in Figure 1.

Figure 1. Elements of Successful Iron Supplementation Programs



Developing an iron supplementation program or revitalizing an established program that is not working well is a process that involves several interactive steps. There are lessons to be learned at each step of the process that might necessitate adjustments in decisions made in previous steps. One may set out to take each step in turn to establish the perfect program, but in reality, the best programs develop from constant learning and adjusting, especially at the beginning. Here is a summary of the key steps:

1. Establish a Policy

Policies are needed to legitimize program activities, establish standard practices within programs, and engender the resource base necessary to bring programs to life. These resources include not only funds, but people's time, equipment, and space and the credibility and influence of the policy-setting organization. If a policy for the control of iron deficiency anemia is not in place, it is important to establish one.

Policy makers often do not fully understand the cost of iron deficiency anemia to the national health and economy. They need to be informed of the prevalence of anemia in the population or targeted subgroups (e.g., pregnant women and infants); the major causes of anemia; its consequences for the individual, the family, the community and the economy; and the cost effectiveness of interventions. In many situations, all of this information is not available before a program is implemented, which illustrates the interactive nature of these various steps. As the program gains experience and is monitored and evaluated, there needs to be a regular flow of information back to policy makers so that policies can be adjusted and strengthened.

2. Get the Right Product

There are a wide variety of iron supplements in use around the world, and their quality varies. The quality of a supplement and its attractiveness to users is a major key to success. Iron supplementation programs to pregnant women typically use tablets, which are relatively inexpensive and easy to transport and store. UNICEF has supported the production of a tablet that contains 60 mg iron (as ferrous sulfate) and 250 µg folic acid but is now changing to a tablet that contains 60 mg iron plus 400 µg folic acid. Children younger than 2 years will likely need a liquid supplement that can be dropped into their mouth, although a powder or crushable tablet could be mixed with an infant food. The higher costs associated with a liquid formulation for young children must be weighed against the greater ease of its use and potential for greater compliance.

The appearance and packaging of supplements may greatly influence their attractiveness to users. The color used to coat tablets can carry positive or negative connotations for women. In many cultures, women prefer a red, sugar-coated tablet. The coating of tablets also influences their stability in different storage conditions and their taste. The packaging of a product not only influences its appeal, but its cost and the frequency of contacts needed to deliver it (i.e., how long one package will last). The size and quality of the packaging also determines its safety in the household. Packages of iron supplements that contain a total of more than 1 g iron (e.g., 16 tablets each containing 60 mg iron) could cause serious injury or death if ingested by a child, and as little as 400 mg may be fatal to an infant. It may be possible to work with a local pharmaceutical company to develop a product and packaging uniquely suited to the tastes and beliefs of the population.

Once a product is chosen, a system must be made for ordering, storing, and transporting supplements to their point of distribution to consumers. Although these processes may seem straightforward, they have been major problem areas in the past. A lack of supplies within programs is a well-documented problem. The number of supplements needed in a given period should be based on the actual number of intended recipients (e.g., pregnant women or children younger than 2 years). Usually this number can be estimated from census information. A good rule of thumb is to procure the estimated number needed plus a 25% surplus. The frequency of procurements will depend upon the storage life of the supplements. This needs to be carefully planned, as out-of-date supplements represent lost money and lost opportunities to improve people's health.

3. Choose Effective Delivery Systems

People planning iron deficiency anemia control programs are encouraged to explore nontraditional modes for delivering supplements. Traditionally, iron supplementation programs have been delivered through health centers, but a wider variety of delivery systems are being tried to increase coverage and compliance. One innovative approach is to distribute iron tablets during national immunization days. Increasingly, the private sector is an important means of making iron supplements available to consumers. This requires collaboration with pharmaceutical industries to market the iron tablets attractively, regulate their quality and labeling, and ensure they are available in small villages. In several places people have discovered that even the poor are willing to spend small amounts on medications and tonics. Use of traditional healers and birth attendants, schools, religious centers, community centers, women's groups, and factories are all being tried.

Qualitative research (e.g., focus groups and interviews) with target groups in representative communities should focus on their access to different delivery systems and users' perceptions of them. It is essential to realistically assess the coverage through different mechanisms. Where they exist, community health committees should be important partners in developing and implementing appropriate supplementation strategies.

A key to the success of any delivery system is the people who work there. Do women or other users feel good about interacting with these people? Can the people become truly committed to implementing the iron supplementation program, or are there important structural barriers (e.g., staff lack facilities and time), social barriers, or political barriers? The answers to the latter question will depend in part on the strength of the policy, because strong policies can create the resource base needed to overcome existing barriers.

4. Linking with Other Health and Nutrition Activities

As described in the first part of this document, supplementation may be an essential intervention for some target groups in the population, but supplementation must be combined with other interventions to effectively control anemia. Building linkages with these programs will broaden the efforts to combat iron deficiency anemia and may increase the base of support for iron supplementation programs. Contacts with young children, pregnant women, and perhaps other groups through health services can be used to ensure or reinforce supplementation. Immunization programs provide an opportunity for reminding child caregivers of supplementation protocols and for providing or selling supplements for young children or lactating women. Where other nutrition interventions are being implemented, aspects of the anemia control strategy may be effectively integrated. Examples include periodic distribution of anthelminthics with vitamin A supplements and screening for severe anemia in growth-monitoring programs for young children. Important linkages may also be made with agriculture or nutrition programs that carry out nutrition education or that might generate food intake data needed to plan an iron fortification program. Other potential partners are food industries that might participate in fortification efforts, family planning programs, obstetricians and midwives, pediatricians, and malaria and helminth control programs.

5. Develop a Communications Strategy

A strategy is needed to communicate the plan and purpose of the program at multiple levels. To start a new program or to revitalize an existing one, many agents—from community members to health planners—need to act in new ways. Evaluations of unsuccessful programs have shown that health care personnel at all levels were confused or ignorant about the program plan and objectives. Often health care workers need to be educated about iron deficiency anemia almost as much as do community members. Even health care workers who are not directly involved in distributing supplements should be knowledgeable about the program so that they reinforce the program messages in their work.

Materials can be developed to help recipients remember to take supplements and to help health care workers (or other distributors) to distribute supplements appropriately and counsel pregnant women (or other users) about their use. Some examples are included in Appendix B. Communications strategies need to be reviewed and adjusted as people's experience and knowledge evolve. For example, as women become used to taking iron supplements, different messages may be needed to promote long-term compliance. Some of the most important objectives of the communications strategy and also potential points of resistance are summarized in Table 10.

6. Monitoring and Evaluation

Monitoring and evaluation are essential to the life of any program and should be planned and integrated from the start of the program. Monitoring is the continual activity of collecting information about the different parts of the program, whereas evaluation may be periodic and involves judgement about whether the program is working. These activities provide opportunities to reward excellence within the system, identify and solve problems in program implementation, and provide the additional information that policy makers need to revise and strengthen policies. Several types of monitoring and evaluation activities can be carried out; these may be grouped into two general categories.

In the first category of activity, specific program activities are monitored to assess whether all parts of the system are working as planned (sometimes called process evaluation). This level of evaluation is essential to all programs. This level may be expanded to include the assessment of knowledge, attitudes, and practices of program agents and beneficiaries, and the compliance of beneficiaries with supplement usage. Measurable outcomes are listed in Table 11. Data on these

Table 10. Scope and behavior goals of an effective communications strategy for iron supplementation programs

Agent	Behavior Goal	Challenges
Pregnant women, mothers	Obtain and use iron supplement at right frequency and dose	Women not asking for services or knowing where they are Lack of awareness of anemia and how to prevent it Lack of knowledge of how to manage side effects Fears, beliefs, and suspicions (e.g. that iron pills will make baby too big) Forgetfulness
Health care providers	Distribute or sell iron supplements and counsel women properly about their use	Lack of awareness and knowledge Poor communication skills Infrequent contacts with pregnant women Providers may act disrespectfully to women
Health planners and drug managers	Train and supervise staff, monitor supplies, and manage resources	Lack of awareness of purpose of program May be part of poorly functioning system
Agents in complementary activities, such as family planning workers, midwives, and pediatricians	Support and reinforce messages of iron supplementation program, integrate anemia education into their activities	Lack of awareness of anemia and iron supplementation activities False sense of competition or threat between health care agents
Policy makers	Make and enforce necessary policies and allocate sufficient resources	Lack of awareness of cost of iron deficiency anemia to health and economy of society

outcomes will provide information about whether the implementation plan is functioning. It is critical that the information is compiled and reported so that the people implementing the program learn from the evaluation.

Table 11. Measurable outcomes in process evaluation

- A budget dedicated and spent
- Supplements and other supplies procured
- Quality of supplements
- Provision of adequate storage
- Distribution system in place
- Availability of supplements at distribution points
- Training activities planned and conducted for health care workers and others as needed
- Knowledge, attitudes, and practices of health care workers and other agents
- Community education programs in place
- Knowledge, attitudes, and practices of community leaders, family decision makers, and mothers
- Number of supplements distributed
- Number of supplements reported received by mothers
- Program coverage (percentage of intended recipients who actually received supplements)
- Number of supplements consumed by women/infants

The second category of activity is to measure changes in iron deficiency anemia in target groups (sometimes called impact evaluation). One approach is to periodically conduct surveys of anemia (or iron deficiency anemia, if possible) in the target groups in the community. Ideally, a survey is carried out before the program is initiated, and follow-up surveys are conducted at intervals of 2–5 years after the program has begun. Demographic and health surveys in several countries now include hemoglobin measurements, and these are excellent resources for program evaluation. Coverage and compliance of iron supplementation by target individuals can also be ascertained within periodic surveys. It is especially important to do this if compliance (i.e., how many supplements are actually consumed) is not assessed as part of program monitoring. These periodic surveys let health planners and policy makers know whether anemia prevalence is declining. It is difficult to conclude with certainty that the changes observed in anemia rates result directly from the activities of the supplementation program. However, evidence from this type of evaluation can be very influential in maintaining political support for policies and programs or advocating for additional iron deficiency anemia control activities. Usually program effect, if it is assessed at all, is assessed in this way.

Sometimes resources are available to do a more in-depth evaluation of effect. The strength of evidence about program effect will be increased if iron status is linked to coverage and compliance at the level of the individual. If data are collected to show that the general nutritional status of the population has not changed, improvements in women's hemoglobin levels can be attributed with greater confidence to program activities. The strongest level of evidence about effect is obtained if individuals' iron status is measured before and after supplementation (e.g., early and late in pregnancy or postpartum or in infants at 6 and 12 months), and the change in status is linked to degree of iron supplement usage.

7. Development of an Applied Research Program to Support Program Activities

Experience has shown that programs to control anemia and other forms of malnutrition are most successful in countries where they are supported by one or more teams of researchers dedicated to carrying out applied research related to nutrition interventions. A few noteworthy examples are Chile, Argentina, and Venezuela in the control of anemia and Indonesia and Guatemala in the control of vitamin A deficiency. In each of these countries, scientists at local universities or institutes carried out critical research needed to develop, evaluate, and refine program strategies; and in each of these countries the nutritional problem has been substantially reduced. Where such linkages between applied research and programs do not already exist, they should be encouraged in every way by program planners and implementers. These collaborations provide technical support for programs and also provide invaluable opportunities for nutrition and public health scientists to carry out research that will have an enduring effect in their country.

Where to Go for More Help and Information

The selected bibiolography lists books and documents by other expert groups that provide more in-depth information on topics related to the control of iron deficiency anemia. The documents *Iron deficiency: indicators for assessment and strategies for prevention* (WHO, UNICEF, UNU, 1998) and *Major issues in developing effective approaches for the prevention and control of iron deficiency* (Gillespie S., 1997) are especially recent and comprehensive.

Appendix C provides a list of addresses and World Wide Web sites for international agencies that provide support or technical assistance for the control of iron deficiency anemia, and Appendix D is a listing of some sources for supplements and other supplies needed to establish programs.

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WHO, UNICEF, UNU (1998) IDA: Prevention, Assessment and Control. Report of a joint WHO/UNICEF/UNU consultation. World Health Organization, Geneva

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Appendix A. Percentage and amount of iron in some commonly used iron compounds

Preparation	Iron compound (mg) per tablet		Percent (%) of iron		Elemental iron (mg) per tablet
Ferrous fumarate	200	x	33	=	66
Ferrous gluconate	300		12		36
Ferrous sulfate ($7H_20$)	300		20		60
Ferrous sulfate, anhydrous	200		37		74
Ferrous sulfate, exsiccated ($1H_20$)	200		30		60

Appendix B. Examples of materials used in iron supplementation programs

INFORMASI PENTING
TABLET TAMBAH DARAH
untuk Ibu Hamil

Kanwil Departemen Kesehatan -
Dinas Kesehatan
Propinsi Kalimantan Selatan

U.S. Agency for
International Development
Office of Health

MotherCare™
John Snow, Inc.

TANDA TANDA KURANG DARAH

- Lesu, letih, lemah, cepat lelah dan lalai
- Pusing dan mata berkeuang-kunang

1

MANFAAT TABLET TAMBAH DARAH

- Membaut ibu sehat dan kuat selama hamil
- Membuat bayi tumbuh sehat dan kuat
- Membuat ibu lebih bertenaga waktu melahirkan

2

Counseling card from Indonesia telling the pregnant women about the symptoms of anemia

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These materials were developed by the MotherCare Project funded by USAID and implemented by John Snow, Inc.

CARA MINUM TABLET TAMBAH DARAH

- Minumlah satu tablet sehari
- Selama hamil minumlah 1 tablet perhari, paling sedikit 90 tablet selama kehamilan
- Minumlah menjelang tidur untuk mengurangi rasa mual
- Tablet tambah darah diminum bersama air putih atau buah
- Jangan minum tablet tambah darah dengan *teh* atau *kopi* karena teh dan kopt mengurangi manfaat tablet tambah darah

3

TABLET TAMBAH DARAH

- Tidak menyebabkan darah tinggi atau kebanyakan darah
- Tadak menyebabkan bayi menjadi terlalu besar

4

KELUHAN YANG BISA TIMBUL BILA MINUM TABLET TAMBAH DARAH

- Mual-mual
- Susah buang air besar
- Tanja berwarna hitam
- Perut terasa tidak enak setelah minum tablet tambah terjadi

Ini mungkin terjadi dan sama sekali tidak berbahaya, akan hilang dengan sendirinya

5

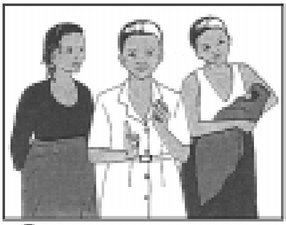
IBU BISA MENDAPATKAN TABLET TAMBAH DARAH

- Gratis di Puskesmas, Pustu, Posyandu
- Ibu bisa beli pada Bidan di desa atau di warung / toko obat yang bertanda khusus

6

INFORMASI PENTING
TABLET TAMBAH DARAH
DIKEMBANGKAN UNTUK DIGUNAKAN
OLEH BIDAN
DALAM PENYULUHAN & KONSELING

Counseling card from Indonesia telling pregnant women when and how to take iron pills



M'bulu umodzi maonekedwe osiyana koma mphamvu zofanana

Pilisi limodzi loonjezera magazi patsiku kuti mukhale wa thanzi ndi mphamvu

A calendar for pregnant women in Malawi to use to help them remember to take one iron pill per day

Promoting increased intake of “best buys” of iron by Peruvian adolescents

Appendix C. Addresses and World Wide Web sites for international agencies engaged in the control of iron deficiency anemia

Caribbean Food and Nutrition Institute (CFNI)
University of the West Indies
P.O. Box 140
Kingston 7, Jamaica
http://www.uwimona.edu.jm/caribbean/html

- CFNI improves food and nutrition situations in its member countries through education, training, information dissemination, coordination, and research.

Canadian International Development Agency (CIDA)
200 Promenade Portage
Hull, Quebec K1A 0G4
Canada
http://w3.acdi-cida.gc.ca

- CIDA supports micronutrient activities in Africa, Latin America, and Asia.

Food and Agriculture Organization of the United Nations (FAO)
Via delle Terme di Caracalla
00100 Rome, Italy
http://www.fao.org

- FAO provides assistance and support to governments in developing the food, agriculture, and nutrition components of their micronutrient strategies.

German Agency for Technical Cooperation (GTZ)
PO Box 3852
Jakarta 10038
Indonesia
http://www.gtz.de/laender/english.asien.htm

- The GTZ office in Indonesia is actively involved in iron supplementation programs.

Helen Keller International (HKI)
15 West Sixteenth Street
New York, NY 10011, USA
http://www.hki.org

- HKI provides technical assistance on a wide range of components of micronutrient deficiency control programs, including advocacy, assessment, training, social marketing and operational research.

Instituto de Nutricion de Centro America y Panama (INCAP)
Centro Regional de Documentation
Apartado 1188
01901 Guatemala City, Guatemala
http://www.incap.org.gt

- INCAP promotes practical research and capacity building through training, formal education programs, technical assistance, research and information services.

The Manoff Group
2001 S Street, NW
Washington, D.C. 20009, USA
http://ourworld.compuserve.com/homepages/manoffgroup

- The Manoff Group provides technical assistance in social marketing in nutrition and health programs, including micronutrient malnutrition.

Pan American Health Organization (PAHO)
525 Twenty-third Street, NW
Washington, DC 20037-2895, USA
http://www.paho.org

- PAHO, a regional office for the World Health Organization, provides technical assistance to countries in the Americas for iron deficiency anemia control programs.

Program for Appropriate Technology in Health (PATH)
4 Nickerson Street
Seattle, WA 98109, USA
http://www.path.org

- PATH identifies, develops and applies appropriate and innovative solutions to public health problems including micronutrient malnutrition.

Program Against Micronutrient Malnutrition (PAMM)
Center for International Health
School Public Health, Emory University
1599 Clifton Road, NE
Atlanta, GA 30329, USA
http://www.emory.edu/GCA/healthcare.pamm.html

- PAMM holds training courses on laboratory methods and communication and management aspects of micronutrient control programs.

Swedish International Development Agency (SIDA)
International Child Health Unit
Uppsala University
75185 Uppsala, Sweden
http://www.sida.se

- SIDA is a bilateral agency that supports nutrition initiatives in anemia through capacity building and institution building activities.

UN Administrative Committee on Coordination/Sub Committee on Nutrition (ACC/SCN)
c/o World Health Organization
Avenue Appia 20,
CH-1211 Geneva 21
Switzerland
http://www.unsystem.org.accscn/

- The SCN serves as a focal point for harmonizing and disseminating information on nutrition policies and activities in the UN system.

UNICEF
3 UN Plaza
New York, NY 10017, USA
http://www.unicef.org

- UNICEF provides financial and technical support for developing country activities aimed at controlling micronutrient deficiencies through supplementation, fortification and dietary modification.

US Agency for International Development (USAID)
Office of Health and Nutrition
Bureau for Global Programs
Field Support and Research
Washington, DC 20523-1817, USA
http://www.info.usaid.gov

- USAID addresses major micronutrient deficiencies through supplementation, food fortification, dietary modification, and intervention programs in developing countries. Examples of ongoing USAID funded programs are:

  The Partnership for Child Health Care (BASICS)
  1600 Wilson Boulevard, Suite 300
  Arlington, VA 22209, USA
  http://www.basics.org

  - This partnership manages the USAID-funded BASICS project. The goal of BASICS is to continue and sustain reductions in morbidity and mortality in infants and children in developing countries.

Opportunities for Micronutrient Interventions (OMNI)
John Snow, Inc.
1616 North Fort Myer Drive, 11th Floor
Arlington, VA 22209, USA
http://www.jsi.com/intl/omni/home/

- This USAID-funded project's goal is to assist governments, donor agencies, and the private sector to implement expanded, more effective, and sustainable programs and policies to reduce micronutrient deficiencies, including iron deficiency anemia.

Project SUSTAIN
National Cooperative Business Association
1400 16th Street, NW, Box 25
Washington, D.C. 20036, USA
http://www.cooperative.org

- Project SUSTAIN, a USAID-funded project, provides access to the U.S. food processing and marketing industry for small and medium-sized food processing companies, host government officials, and USAID missions in targeting developing countries.

Linkages
Academy for Educational Development
1255 23rd Street, NW, Suite 400
Washington, D.C. 20037, USA
http://www.aed.org

- Linkages is the principal USAID initiative for improving breast-feeding and related maternal and child dietary practices.

MotherCare II
John Snow, Inc.
1616 North Fort Myer Drive, 11th Floor
Arlington, VA 22209, USA
http://www.jsi.com/intl/mcare/home

- With funding from USAID, MotherCare works to improve pregnancy outcomes by strengthening and improving service delivery, influencing behaviors that affect the health and nutritional status of women and infants, and enhancing policy formulation at the regional and national level for maternal and neonatal health care.

International Nutritional Anemia Consultative Group (INACG)
ILSI Human Nutrition Institute
1126 Sixteenth Street, NW
Washington, D.C. 20036, USA
http://www.ilsi.org

- The International Nutritional Anemia Consultative Group (INACG) with funding from USAID sponsors international meetings and scientific reviews and convenes task forces to analyze issues related to the etiology, treatment, and prevention of nutritional anemias. The outcome of these deliberations is then made available to policy makers and program planners for their use.

World Bank
1818 H Street, NW
Washington, DC 20433, USA
http://www.worldbank.org

- The World Bank provides loans for micronutrient programs in developing countries, with special interest in fortification programs.

World Health Organization (WHO)
CH-1211 Geneva 27
Switzerland
http://www.who.org

- WHO maintains data banks, provides international technical guidelines and provides technical assistance to micronutrient programs through national ministries of health.

Appendix D. Some sources of supplements and other supplies for iron supplementation programs

UNICEF
UNICEF Plads
Freeport
Copenhagen 2100
Denmark
Tel: 45-3527-3020
Fax: 45-3526-9421

Beginning in 1998, UNICEF will offer iron/folate tablets with the formulation recommended in this report for pregnant women (60 mg iron + 400 ug folic acid).

Iron tablets with and without folic acid and iron elixirs are widely available in the commercial market place. Before initiating an iron supplementation program, a survey should be conducted to determine local sources of the required supplements. If appropriate products from reliable sources cannot be identified, contact INACG for information about supplements available in other parts of the world.