Pan American Health Organization
Regional Office of the World Health Organization

Anemia among adolescent and young adult women in Latin America and the Caribbean: A cause for concern

During adolescence, (i.e. 10-19 years of age[a]), anemia is estimated to be the greatest nutritional problem.[2,b,c] Anemia in adolescents and young adults can have negative effects on their cognitive performance and growth. If pregnancy occurs during adolescence, anemia can not only increase maternal morbidity and mortality, but increase the incidence of poor birth outcomes in the infant (e.g., low birth weight, and prematurity) and also negatively impact infant iron status. Furthermore, through its effects on cognitive and work performance, anemia can impact current and future economic productivity: the productivity benefits for correcting anemia in adults range from 5-17% for manual work, and 4% for all other work.[4] At all levels, the negative effects of anemia during adolescence justify public health action; unfortunately because initiatives to prevent anemia commonly target infants, young children and pregnant and lactating women, and not necessarily adolescents, the needs of adolescents may remain unmet, and the consequences of anemia in adolescents continue.

What is anemia and why does it occur among adolescents and young adults?

The period of adolescence is a period of intense growth, second only to infancy. Thus, similar to infancy, overall nutrient needs are high in order to support optimum growth and development. Iron is one nutrient that is in particularly high demand. Iron is present in all body cells and is fundamental for basic physiological processes such as hemoglobin production and enzyme function. Iron deficiency generally results when dietary iron intake cannot meet required needs and iron reserves in the body are depleted in order to support the body's physiological demands. The body needs more iron when it is growing rapidly and when frequent blood loss occurs (e.g. through menstruation); thus, adolescent girls are at particularly high risk of developing iron deficiency. This is especially true for some adolescent girls who experience heavy blood loss during menstruation.

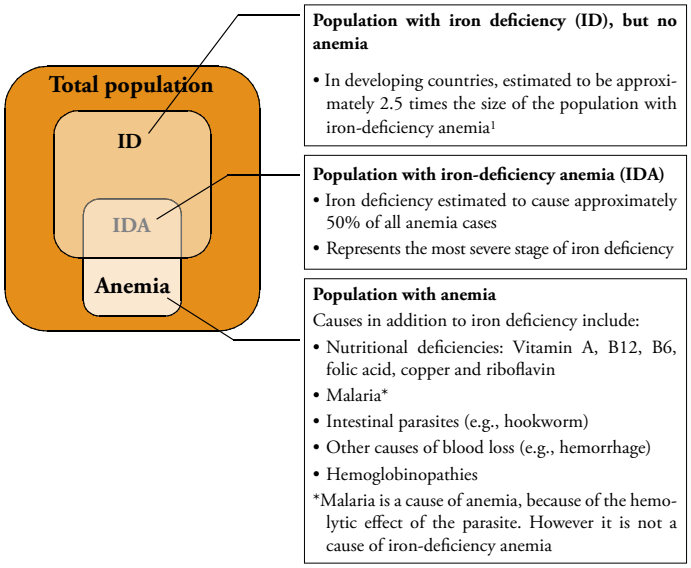
Prevention of iron deficiency is essential, as iron deficiency, similar to other micronutrient deficiencies, is generally not outwardly apparent, even though it may already be negatively affecting fundamental physiological processes. In its most advanced stage, when iron reserves have been depleted, anemia develops. Anemia is defined as insufficient hemoglobin or red blood cells for a given age and sex, and can only be diagnosed by taking a small sample of blood. Anemia caused by iron deficiency is referred to as iron deficiency anemia. The relationship between iron deficiency, anemia and iron-deficiency anemia is illustrated in Figure 1. Because iron deficiency is thought to be the primary cause of anemia (causing up to 50% of anemia cases in women),[1] poor iron status is the most commonly addressed cause of anemia; however, it is important to recognize that anemia can also have other causes.

[a] The World Health Organization defines the period of adolescence from 10 to 19 years of age; the period defined as "youth" overlaps adolescence and extends to 24 years of age (15-24 years of age); "young people" are defined as all individuals between the ages of 10 and 24.

[b] Our analysis of recent data of young women from Latin America and the Caribbean (LAC) indicate that overweight is a growing concern, outpacing anemia in some countries.[3]

[c] Anemia affects young males at the same, or higher, rates as in young women. Because of the potential ramifications of anemia for maternal morbidity and neonatal outcomes however, this document will focus only on young women.

Figure 1. Relationship between iron deficiency, anemia and iron deficiency anemia[1]



[1]Source: Adapted from Yip R. Iron nutritional status defined. In: Filer IJ, ed. Dietary Iron: birth to two years. New York, Raven Press, 1989:19-

What are the negative effects of anemia for adolescents?

Much emphasis has been placed on the negative and irreversible developmental effects of iron deficiency during infancy and childhood. However, the negative effects of iron deficiency on cognitive performance may not be limited to just younger ages, but continue through adolescence. In a randomized controlled iron-supplementation trial in iron-deficient adolescent girls who had not yet become anemic, girls receiving iron supplements performed better on a test of verbal learning and memory than girls with similar iron status receiving a placebo.[5] Similarly, adolescent children in the United States with iron deficiency had twice the risk of scoring below average in math than did children with adequate iron status (even after adjusting for various confounding factors), though there was no effect on verbal skills in this population.[6] Thus, even before anemia develops, negative effects of iron deficiency on cognitive performance in adolescents are evident.

As it is estimated that roughly 20% of adult height is gained during adolescence,[7] ensuring adequate conditions for optimal growth--including appropriate nutrition and the prevention of pregnancy--during this period is essential. Iron status at the beginning of adolescence may be important for ensuring adequate growth during this period, because iron deficiency can decrease appetite, and thus food and energy intake.[8] Studies in which iron supplements were given to anemic adolescent children, showed an increase in weight and height gain among supplemented children, particularly during the earlier part of adolescence (10-14 years) in comparison to those children not receiving iron supplements.[8,9] Children receiving iron supplements reported greater appetite and had greater energy intake, than those not receiving supplements.

Pregnancy and lactation can cause linear growth to cease, and deplete fat and lean body mass;[10] thus, avoiding adolescent pregnancy will ensure girls reach their full growth potential and avoid future negative reproductive health effects of short stature. Maternal short stature is a risk factor for obstructed labor during delivery, largely due to cephalopelvic disproportion (CPD), in which the infant's head or body is too large to pass through the mother's pelvis.[11] In settings where adequate delivery care is available, CPD is commonly addressed by delivering the infant by cesarean section; in contrast, in settings where delivery care is inadequate, obstructed labor can be a significant contributor to maternal mortality. Currently, obstructed labor contributes to 13% of maternal deaths in Latin America and the Caribbean, higher than in either Asia (9%) or Africa (4%).[12]

Pregnancy during adolescence: What are the negative effects for mother and baby?

Preventing iron deficiency and anemia in adolescents has obvious direct health and cognitive benefits, but can also incur benefits to the future generation. It is estimated that at least 25% of women in developing countries will have their first child by 19 years of age,[2] and many more in the following years, thus making adolescence an important "preparatory period" for a healthy mother and infant. However, because it is difficult to know when pregnancy will occur, maintaining adequate iron status throughout the entire period of adolescence and young adulthood will not only ensure the nutritional sta-

tus and health of the current generation, but that of the future generation as well.

Approximately 1000 mg of iron are needed to support pregnancy-related changes in the mother (e.g. blood volume expansion, development and growth of the placenta) and the development of the fetus Ideally, approximately 300 mg of iron or more is needed within stores at the start of pregnancy in order to maintain adequate iron status of the mother and support the iron needs of the fetus for development.[13] Most women in developing countries, as well as many in developed countries, begin pregnancy with little iron in stores: from a study of iron stores in women of reproductive age in Guatemala, 39 to 67% of women had no iron in stores, depending on their residence and level of hookworm infection.[13] Maintaining adequate iron status during adolescent pregnancy is even more challenging because the iron needs for pregnancy will be combined with the iron needs for the adolescent's rapid rate of growth.

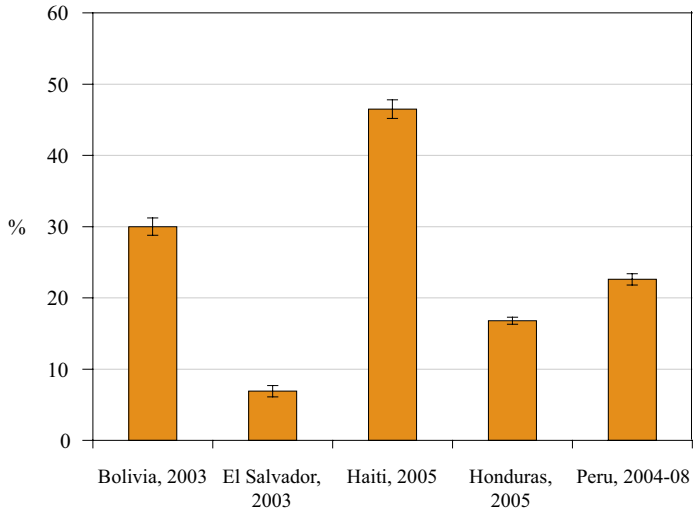
During pregnancy, anemia is associated with increased maternal morbidity and mortality.[14,15] While severe anemia is an acknowledged risk factor for maternal mortality, a recent analysis found that even women with mild to moderate anemia were at greater risk of death than non-anemic women.[16] Anemia has direct effects on maternal survival, and also may increase the possibility of additional complications during delivery, such as postpartum hemorrhage: a recent study from India found that women whom had not received iron-supplementation during pregnancy were more likely to experience postpartum hemorrhage,[17] which is the leading cause of maternal mortality.[11] Similarly, in Tanzania, moderate to severe anemia during pregnancy (at 29 and 32 weeks) was associated with greater blood loss during pregnancy.[18] For the infant, anemia during pregnancy can mean an increased risk of low-birth weight, premature delivery, and iron deficiency and anemia later in infancy.[19] As mentioned previously, iron deficiency and anemia in infants can negatively, and in some cases irreversibly, affect cognitive development.[20]

Although the highest iron requirements during pregnancy occur in the third trimester, ensuring adequate iron status in early pregnancy may be particularly important for newborn outcomes. In a study of US pregnant women, beginning prenatal supplements during the first or second trimester of pregnancy was associated with a reduction in the risk of preterm and low birth weight delivery.[21]

What is the extent of the problem in Latin America and the Caribbean?

Data on anemia or iron deficiency among adolescents are generally scarce, as much in Latin America and the Caribbean (LAC), as in other parts of the world. In LAC countries with recent nationally representative data, the prevalence of anemia among females aged 15-24[d] ranges from approximately 7% in El Salvador to 47% in Haiti (Figure 2). When separated into women aged 15-19 and those aged 20-24, at the national level

Figure 2. Prevalence (and standard error) of anemia[1] in young females 15-24 years of age in countries of Latin America and the Caribbean with nationally representative data



[1] Anemia defined as hemoglobin < 11 g/dL in pregnant women and < 12 g/dL for non-pregnant women. Data presented are for both categories combined. The differences between women 15-19 and 20-24 were very small; thus the prevalence of anemia for the combined group is presented. The data for Peru 2004-08 (continuous DHS survey) were collected in 2005 and 2007.

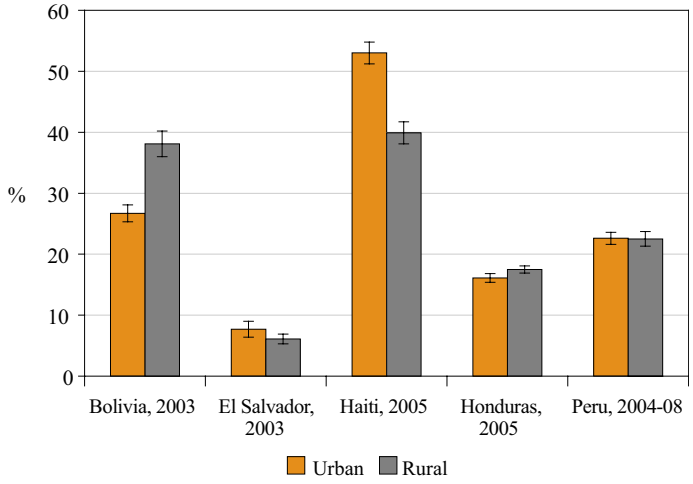
[d] The Demographic and Health Survey or Center for Disease Control data used for these analyses do not include data for women under age 15. Thus the age range studied in this document includes 15-24 year-olds, encompassing the period defined by the World Health Organization as "youth".

[e] For this reason, all remaining analyses presented are for the entire age group, 15-24 years.

there is little difference in the prevalence of anemia, indicating that the problem of anemia spans the 15-24 age range at roughly the same level.[e]

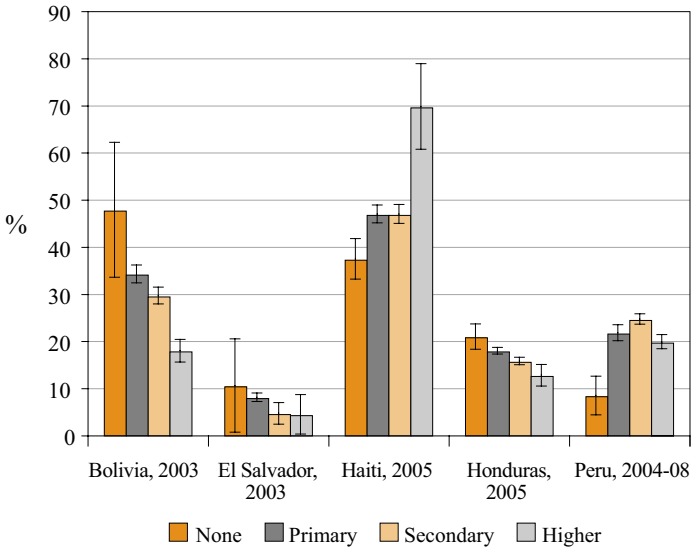
It is generally expected that rural, less educated individuals will have higher levels of nutritional deficiencies, including iron deficiency and anemia, either because they do not have the means to achieve a healthy diet, do not have access to medical or nutrition services to prevent or treat these conditions, or have greater levels of infection and disease, increasing their risk of nutritional deficiency. Within the five countries with available nationally representative data, the prevalence of anemia appears to be higher among rural women in two countries (Bolivia and Honduras). In the remaining three countries, Peru, El Salvador and Haiti, anemia prevalence in urban women tends to be either slightly higher or equivalent to anemia prevalence in rural women (Figure 3). In three countries (Bolivia, El Salvador and Honduras) the prevalence of anemia decreases with greater education achieved, while in the remaining countries (Peru and Haiti), a tendency towards the opposite pattern is seen, with more educated women tending to have greater levels of anemia (Figure 4). The countries that do not follow the "expected" pattern for anemia deserve particular attention, in order to determine what risk factors are present in urban or better educated adolescents that are not being addressed adequately. For example, urban adolescents may have poor eating habits favoring high-calorie but nutrient-poor "junk" foods or fast foods which are more available in urban environments; eating disorders or restrictive eating patterns may be more prevalent among women with higher education or of higher socioeconomic status in order to achieve desired thinness idealized by popular culture; or urban, better-educated adolescents, because they are considered a "low-risk" group for nutritional deficiencies, may lack access to medical/nutritional services or exposure to public-health/nutrition campaigns addressing anemia.

Figure 3. Prevalence (and standard error) of anemia[1] by urban and rural residence among females 15-24 years of age in countries of Latin America and the Caribbean with nationally representative data



[1] Anemia defined as hemoglobin < 11 g/dL in pregnant women and < 12 g/dL for non-pregnant women. Data presented are for both categories combined.

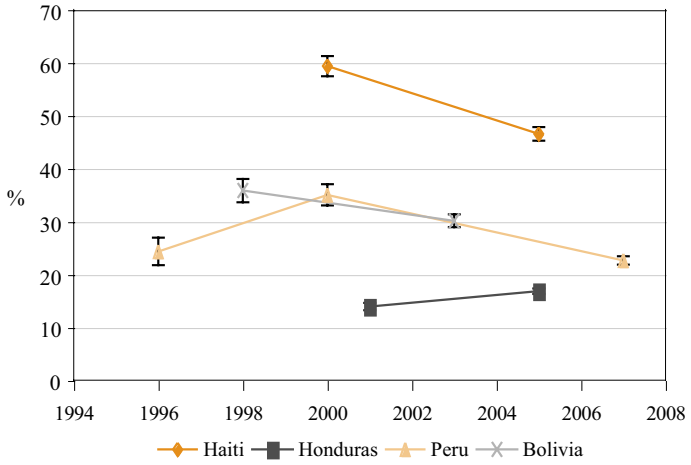
Figure 4. Prevalence (and standard error) of anemia[1] by highest level of maternal education attained among females 15-24 years of age in countries of Latin America and the Caribbean with nationally representative data



[1] Anemia defined as hemoglobin < 11 g/dL in pregnant women and < 12 g/dL for non-pregnant women. Data presented are for both categories combined.

Of the four LAC countries with multiple years of nationally representative data, the prevalence of anemia has decreased in three (Bolivia, Peru, and Haiti), and increased in the remaining country (Honduras) (Figure 5). While decreasing levels of anemia are a very positive sign, it is important to remember that anemia is the "visible" endpoint of the gradually worsening progression of iron deficiency. Thus a much higher, and generally undetected, percentage of adolescent girls will still be suffering from the earlier stages of iron deficiency.

Figure 5. Trends in the prevalence of anemia[1] among females 15-24 years of age in countries of Latin America and the Caribbean with nationally representative data



[1] Anemia defined as hemoglobin < 11 g/dL in pregnant women and < 12 g/dL for non-pregnant women. Data presented are for both categories combined.

What needs to be done to prevent iron deficiency and anemia in adolescents and young women?

In order to provide sufficient iron for growth while compensating for increased losses with the onset of menstruation, iron requirements for girls during adolescence are high (Table 1). Interventions to improve iron status among adolescent girls are similar to interventions during other time periods of life (e.g. increasing dietary intake of iron, and reducing pathological iron losses), and thus the period of adolescence should also be encompassed by programs that address iron deficiency and anemia during other vulnerable periods (infancy and early childhood, and pregnancy). Specific actions to prevent iron-deficiency and anemia and improve iron status among adolescent girls include:

■ Encourage consumption of iron-rich foods through dietary change and nutritional education.

Iron-rich foods include those naturally rich in bioavailable iron (e.g. a source of heme-iron, such as that found in red meat) as well as iron-fortified foods (i.e. food to which additional iron is added). Heme-iron is the most bioavailable source of iron in the diet. Furthermore, an added benefit of the consumption of heme iron is that it also improves the absorption of the non-heme forms of iron found in plants, which are less easily absorbed but also more commonly consumed in developing countries. Phytic acid (the storage form of phosphorus in plants found mainly in the hulls of grains, seeds and nuts) interferes with the absorption of non-heme iron. Reducing the consumption of foods high in phytic acid such as coffee, tea, legumes and whole cereals at mealtime will improve iron absorption. Food-processing techniques such as fermentation, sprouting and soaking will also reduce the inhibitory effects of phytic acid on iron absorption, as will the addition of ascorbic acid (vitamin C).

Table 1: Recommended dietary allowance (RDA)[1] for iron for pregnant and non-pregnant adolescent and young females[2]

Age group	Pregnant status	Recommended Dietary Allowance (mg/day)
9-13 years	Not-pregnant	8
14-18 years	Not pregnant	15
14-18 years	Pregnant	23
19-30 years	Not pregnant	18
19-30 years	Pregnant	27

[1] The RDA is the average daily dietary nutrient intake level sufficient to meet the nutrient requirements of nearly all (97 to 98%) healthy individuals in a particular life stage and gender group.

[2] Source: Institute of Medicine. Dietary reference intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc. Washington D.C.: National Academy Press, 2001.

Fortifying staple foods with iron will provide a source of iron for vulnerable groups across the lifespan. For adolescent girls, and all women of reproductive age, promoting consumption of an iron-fortified staple food is a way to build their iron stores before and after pregnancy. Investing in iron-fortification of staple-foods was ranked as the third best "world investment" in 2008 by the Copenhagen Consensus (a group of leading economists tasked with prioritizing interventions to tackle world problems based on both impact and cost-benefit analyses).[4]

While dietary change can be challenging, interventions that have included both dietary and behavioral components and have involved the community in the development of the interventions (in terms of cost and local acceptability of iron-rich foods), have shown success on a small scale. For example, a community-based randomized controlled trial in Peru aimed at improving iron intake among adolescent girls through community kitchens, identified the best iron-rich foods for the lowest price in the particular communities. They also researched how to present the accompanying educational messages regarding the effects of iron intake on school performance in a culturally-appropriate way. As a result, the adolescents receiving the interventions had increased knowledge on which foods to eat to improve iron intake, which was reflected in a greater total daily intake of iron, including a tripling of heme iron intake.[22]

Treat and prevent parasitic infections.

Intestinal parasites are estimated to affect more than a third of the world's population, with the highest rates among children 5-15 years of age, among whom intestinal worms represent the single largest contributor to disease.[23] Of the intestinal helminths, hookworm in particular (N. americanus and A. duodenal) negatively affects iron status by causing damage to the intestinal mucosa causing intestinal bleeding and iron loss. In addition to greater loss of iron, hookworm infection is also associated with the malabsorption of all nutrients including iron, and appetite inhibition,[24] both of which may further contribute to further deterioration in nutritional status. In areas where intestinal helminths are common, deworming medicine should be provided once or twice yearly to all at-risk populations (Table 2). Measures aimed at preventing transmission–for example, providing safe water and sanitation facilities, and promoting hand-washing, use of latrines and wearing shoes–should also be included in the deworming program.

Provide preventative iron supplementation.

Even in developed countries, diets of adolescents generally do not contain enough iron to meet their requirements.[25] Thus, it follows that in less-developed countries as well, many adolescents will likely not be able to meet their iron needs through their regular diet alone. Preventative iron supplementation may be needed; however, currently, there is not an established dosing regimen for adolescents (i.e. daily, weekly, or twice-weekly) (Table 3). Several studies have shown that iron supplementation provided on a weekly basis to be as effective as daily supplementation for increasing iron stores and correcting anemia in non-pregnant adolescents, if compliance can be assured.[26-28] From a programmatic perspective, weekly supplementation could be more easily implemented and less expensive than daily supplementation. A weekly dosing regimen may also have the added advantage of increased compliance, due to fewer gastrointestinal side effects [28] and less need for pill-taking;[26] however, with either dosing regimen, pill availability needs to be ensured, as unavailability of iron supplements, rather than gastrointestinal side effects, has been the significant barrier to compliance in previous programs.[29] Combined iron and folic acid supplementation is recommended in order to maintain and ensure adequate folate status in case pregnancy occurs. Adequate folate status is essential for the early stages of pregnancy to prevent neural tube defects in the developing fetus.

Table 3: Recommended iron supplementation regimens for adolescents[1]

Age group	Pregnant status	Recommended dosage[2]
6-11 years	Not-pregnant	20-30 mg elemental iron
12+ years	Not pregnant	60 mg elemental iron + 400 µg folic acid
12+ years	Pregnant	60 mg elemental iron + 400 µg folic acid[3] daily

[1] Source: Stoltzfus RJ, Dreyfuss ML. Guidelines for the Use of Iron Supplements to Prevent and Treat Iron Deficiency Anemia. Washington D.C.: International Life Sciences Institute Press, 1998

[2] The most cost-effective and effective dosing regimen--weekly or daily--for non-pregnant adolescents is still under review.

[3] Supplementation should be provided for 6 months during pregnancy, and in regions where the prevalence of anemia during pregnancy is greater than or equal to 40%, supplementation should continue for 3 months postpartum

Table 2: Recommended parasite control measures[1]

Parasitic infection	Prevalence of infection	Pregnant status	Recommendation for treatment	Prevention measures

Hookworm	**Endemic (20-30%)**	**Not-pregnant**	• Combine iron supplementation with anti-helminthic treatment
			• Anti-helminthic treatment should be provided at least annually, and high-risk groups (women and children) should be treated 2-3 times/year
			• Safe and effective single-dose treatments include:
			  • Albendazole: 400 mg single dose
			  • Mebendazole: 500 mg single dose
			  • Levamisole: 2.5 mg/kg single dose
			  • Pyrantel: 10 mg/kg single dose
				• Provide safe water and sanitation facilities
				• Promote hand-washing, latrine use, and shoe-wearing

Hookworm	**Endemic (20-30%)**	**Pregnant**	• Anti-helminthic treatment once in the second trimester of pregnancy
			• Safe and effective single-dose treatments include:
			  • 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 repeated on next consecutive day
			  • Pyrantel: 10 mg/kg single dose, best if dose is repeated on next 2 consecutive days
			• Treatment should be avoided in the first trimester	

Hookworm	**Highly-endemic (> 50%)**	**Pregnant**	• Same as above for endemic areas, plus additional anti-helminthic treatment in the third trimester • Treatment should be avoided in the first trimester	
Malaria (Plasmodium falciparum)	**Endemic**	**Non-pregnant**	• Curative antimalarial combination therapy (ACT) appropriate for country/region should be provided	• Promote vector-control measures (e.g. spraying, insecticide-treated bed-nets)
Malaria (Plasmodium falciparum)	**Endemic**	**Pregnant**	• First trimester: quinine + clindamycin for 7 days. ACT should be used if only effective treatment available • Second and third trimesters: effective ACT for country/region, or artesunate + clindamycin for 7 days, or quinine + clindamycin for 7 days	

[1] Sources: Stoltzfus RJ, Dreyfuss ML. Guidelines for the Use of Iron Supplements to Prevent and Treat Iron Deficiency Anemia. Washington D.C.: International Life Sciences Institute Press, 1998; and WHO. Guidelines for the treatment of malaria. Geneva. World Health Organization, 2006

How do we reach adolescents and young women effectively?

Adolescents may be more challenging to reach through traditional routes used to access other "high-risk" groups for iron-deficiency (e.g. assessing iron status at "well-child" care appointments for infants and prenatal exams for pregnant women), as adolescents may not use health services with the same frequency. An exception may be in settings where reproductive health or HIV programs are established and have already targeted the adolescent population to provide services and education; "piggy-backing" nutrition education, anemia screening, and treatment onto these programs would not only take advantage of this established link to adolescents, but also reinforce nutritional status as an important component of reproductive health.

Another potential route of targeting adolescent girls is through schools, although school attendance will vary by region (e.g. urban vs. rural), socioeconomic status and cultural influences, and the most at-risk individuals may not be reached through this venue. Furthermore, to prevent the negative effects of anemia on pregnancy and neonatal outcomes, targeting through schools may fall short, as many young women will likely end their schooling years before they become pregnant. Thus alternative targeting strategies specific to the local community characteristics should be investigated; previous successful examples of venues in which adolescent girls were targeted include community kitchens in Peru,[22] and marriage registries in Indonesia.[30] Though it is best for young women to stay in school, if women commonly leave school for employment at early ages–in Latin America, between 40-50% of the economically active population are adolescents between 15 and 19 years of age[31]–the possibility of developing work-based anemia prevention programs as part of a healthy work environment should be investigated.[32] Religious organizations, or teen/women's groups might also be additional routes for reaching this population. Alternatively, creating local demand (for example, through social marketing techniques) for "attractive" iron supplements supplied through the private sector, that would be considered "worth buying" by adolescent and young adult women, may be an effective strategy for improving iron status among adolescents.[33]

Are there special interventions for pregnant adolescents?

The same recommendations for improving iron status among non-pregnant adolescents outlined above will apply in this at-risk group, with the following additional recommendations:

- **Treat and prevent parasitic infections.**
  In pregnancy, even relatively light hook-worm infections may have deleterious effects on maternal anemia and fetal outcomes.[34] Antenatal treatment of intestinal parasites has been shown to decrease severe maternal anemia, increase infant birth weight and decrease infant mortality.[35] Parasite control measures during pregnancy are provided in Table 2. Malarial infection also causes anemia, although the mechanism for the anemia is different from that of the intestinal helminths: malaria causes hemolysis of red blood cells, which decreases hemoglobin concentration, but does not increase iron loss. Malaria during pregnancy is also associated with poor pregnancy outcomes such as premature birth and intrauterine growth retardation.[34] Thus, malaria during pregnancy should be treated by providing curative antimalarials known to be effective in the country/region.[36] (Table 2).

- **Provide preventative iron supplementation during pregnancy.**

  As most women in developing countries will begin pregnancy with depleted iron stores and will not be able to meet the high iron requirements of pregnancy from their diet alone, supplementation with iron will be necessary. Iron supplementation recommendations for pregnant adolescents are included in Table 3.

- **Prevent excessive blood loss at delivery through active management of the third stage of labor**

  Excessive blood loss (> 500 ml) at delivery will negatively impact the mother's already low iron stores. If mothers are anemic to begin with, severe blood loss at delivery can be a cause of maternal death; currently postpartum hemorrhage (defined as vaginal bleeding greater than 500 ml within 24 hours after delivery) is the leading cause of maternal mortality worldwide, contributing to roughly one

quarter of the approximately 500,000 maternal deaths per year.[37] An intervention that can prevent postpartum hemorrhage is active management of the third stage of labor (AMTSL), which includes three steps: 1) administration of a uterotonic agent (oxytocin is the drug of choice); 2) delayed cord clamping followed by controlled cord traction; and 3) uterine massage after delivery of the placenta.[38] AMTSL should be offered by a skilled provider to all pregnant women.

- **Promote and support exclusive breastfeeding to maintain post-partum iron stores via the Lactational Amenorrhea Method (LAM)**

  Establishing exclusive breastfeeding early and allowing frequent and on-demand nursing by the infant has several beneficial effects for the mother, in addition to the wealth of benefits provided to the infant. The infant's frequent suckling will suppress the production of hormones necessary for ovulation, thus providing a method of contraception for the mother. In addition, menstruation (and therefore its associated loss of iron) is inhibited, thus protecting maternal iron stores during the postpartum period. To establish early and exclusive breastfeeding, hospitals should eliminate practices that are detrimental to breastfeeding, including supplementation with formula or sugar water, use of pacifiers, artificial teats and bottles, separation of mother and newborn in the postpartum period, and provision of free formula packs to new mothers. Support for new breastfeeding mothers should be provided via trained hospital staff, and extended throughout the primary care system.

Anemia in adolescence: The way forward

Nationally representative data on anemia among young women in the countries of Latin America and the Caribbean are scarce; however, the data available indicate that anemia is a significant problem in several countries, and that the pattern within countries as to affected groups (e.g. urban vs. rural) may not be entirely consistent across countries. The recognition of anemia as a public health concern among young women in several LAC countries (and likely in others) and the potential negative effects of iron deficiency and anemia during adolescence on growth, school performance and reproductive outcomes, indicates that improved monitoring of this outcome is essential in more counties.

In addition, the creation of multi-faceted programs, including dietary change, nutrition education and parasitic infection control, that will target anemia in this group in particular, are needed. In order to effectively reach the groups of young women most affected by anemia in each country, development of programs to reach this group should be tailored to the local cultural, demographic, health, and socioeconomic characteristics of adolescents in each country. In this way, those most at risk will be adequately reached by the developed programs, and the interventions well-received.

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For more information, please contact:
Unit on Child and Adolescent Health
Pan American Health Organization
525 23rd Street, NW, Washington D.C. 20037
Website: http://www.paho.org
Telephone: (202) 974-3519

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