

# Screening for Iron Deficiency Anemia and Iron Supplementation in Pregnant Women to Improve Maternal Health and Birth Outcomes: U.S. Preventive Services Task Force Recommendation Statement

Albert L. Siu, MD, MSPH, on behalf of the U.S. Preventive Services Task Force\*

**Description:** Update of the 2006 U.S. Preventive Services Task Force (USPSTF) recommendation on screening for iron deficiency anemia.

**Methods:** The USPSTF reviewed the evidence on the association between change in iron status as a result of intervention (oral supplementation or treatment) in pregnant women and adolescents and improvement in maternal and infant health outcomes.

**Population:** This recommendation applies to pregnant women and adolescents living in the United States who do not have symptoms of iron deficiency anemia. It does not address pregnant women who are malnourished, have symptoms of iron deficiency anemia, or have special hematologic conditions or nutritional needs that may increase their need for iron.

**Recommendations:** The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening for iron deficiency anemia in pregnant women to prevent adverse maternal health and birth outcomes. (I statement)

The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of routine iron supplementation for pregnant women to prevent adverse maternal health and birth outcomes. (I statement)

*Ann Intern Med.* doi:10.7326/M15-1707

[www.annals.org](http://www.annals.org)

For author affiliation, see end of text.

\* For a list of USPSTF members, see the Appendix (available at [www.annals.org](http://www.annals.org)).

This article was published online first at [www.annals.org](http://www.annals.org) on 8 September 2015.

**T**he U.S. Preventive Services Task Force (USPSTF) makes recommendations about the effectiveness of specific preventive care services for patients without related signs or symptoms.

It bases its recommendations on the evidence of both the benefits and harms of the service and an assessment of the balance. The USPSTF does not consider the costs of providing a service in this assessment.

The USPSTF recognizes that clinical decisions involve more considerations than evidence alone. Clinicians should understand the evidence but individualize decision making to the specific patient or situation. Similarly, the USPSTF notes that policy and coverage decisions involve considerations in addition to the evidence of clinical benefits and harms.

## SUMMARY OF RECOMMENDATIONS AND EVIDENCE

The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening for iron deficiency anemia in pregnant women to prevent adverse maternal health and birth outcomes. (I statement)

The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of routine iron supplementation for pregnant women to prevent adverse maternal health and birth outcomes. (I statement)

Go to the Clinical Considerations section for suggestions for practice regarding the I statements.

See the Figure for a summary of the recommendation and suggestions for clinical practice. Appendix Table 1 describes the USPSTF grades, and Appendix Table 2 describes the USPSTF classification of levels of certainty about net benefit (both tables are available at [www.annals.org](http://www.annals.org)).

## RATIONALE Importance

The aims of iron supplementation or screening for and treatment of iron deficiency anemia in pregnant women are to improve maternal and infant health outcomes. Few data are available to estimate the current prevalence of iron deficiency anemia in pregnant women in the United States. Based on older data from 1999 to 2006, an estimated 18.6% of pregnant women have iron deficiency; of those, an estimated 16.2% have anemia (1). Rates may be higher in low-income and minority populations (1, 2).

### See also:

Summary for Patients . . . . . 1

**Figure.** Screening for iron deficiency anemia and iron supplementation in pregnant women to improve maternal health and birth outcomes: clinical summary.

**Annals of Internal Medicine**



|                                       |   |   |
|---------------------------------------|---|---|
| Population                            | Asymptomatic pregnant women and adolescents in the United States  |   |
| Recommendation                        | Screening: No recommendation.<br>Grade: I statement (insufficient evidence)   | Iron supplementation: No recommendation.<br>Grade: I statement (insufficient evidence)  |
| Risk Assessment                       | No studies assessed the performance of risk assessment tools to identify pregnant women who are at increased risk for iron deficiency anemia  |   |
| Screening Tests                       | Although the evidence is insufficient to recommend specific tests for screening, measurement of serum hemoglobin or hematocrit is often the first step.   |   |
| Treatment and Interventions           | Iron deficiency anemia in pregnant women is treated through additional iron intake with oral iron pills (usually 60 to 120 mg of elemental iron per day) and diet. Intravenous iron treatment can also be used during pregnancy.  | Although the evidence is insufficient to recommend routine iron supplementation for pregnant women, prenatal vitamins often include a low dose of iron (usually 30 mg of elemental iron per day). |
| Balance of Benefits and Harms         | The current evidence is insufficient to assess the balance of benefits and harms of screening for iron deficiency anemia in pregnant women.   | The current evidence is insufficient to assess the balance of benefits and harms of routine iron supplementation for pregnant women.  |
| Other Relevant USPSTF Recommendations | The USPSTF addresses screening for iron deficiency anemia in children and folic acid supplementation during pregnancy in separate recommendation statements (available at <a href="http://www.uspreventiveservicestaskforce.org">www.uspreventiveservicestaskforce.org</a> ). |   |

For a summary of the evidence systematically reviewed in making this recommendation, the full recommendation statement, and supporting documents, please go to [www.uspreventiveservicestaskforce.org](http://www.uspreventiveservicestaskforce.org).

**Detection and Recognition of Risk Status**

The USPSTF found inadequate evidence that specifically addressed the accuracy of screening tests in asymptomatic pregnant women. The USPSTF found inadequate evidence to evaluate risk prediction tools to identify pregnant women who are at increased risk for iron deficiency anemia.

**Benefits of Early Detection and Treatment Screening**

The USPSTF found inadequate evidence on screening for iron deficiency anemia in asymptomatic pregnant women. No studies evaluated the direct effects of routine screening in asymptomatic pregnant women on maternal health or birth outcomes. The USPSTF also found inadequate evidence on the treatment of iron deficiency anemia in pregnant women because none of the recent studies on treatment were generalizable to the general U.S. population. This represents a critical gap in the evidence.

**Preventive Medication**

Overall, the USPSTF found inadequate evidence on the effect of routine iron supplementation during pregnancy on maternal health or birth outcomes, such as maternal iron deficiency anemia, Cesarean delivery, preterm delivery, infant mortality, or low birthweight. Several studies reported inconsistent findings on these health outcomes. The USPSTF found adequate evidence that routine iron supplementation during pregnancy improves intermediate maternal hematologic indexes, such as serum ferritin and hemoglobin levels. The USPSTF found adequate evidence that routine iron supplementation during pregnancy has no effects on the length of gestation and infant Apgar scores at 1 and 5 minutes.

**Change in Iron Status**

No studies were found that directly assessed the association between change in iron status as a result of treatment or supplementation and improvement in ma-

ternal or infant health outcomes. This represents a critical gap in the evidence.

### Harms of Early Detection and Treatment

#### Screening

The USPSTF found inadequate evidence on the harms of routine screening for iron deficiency anemia in asymptomatic pregnant women. No studies were found that evaluated the harms of routine screening on maternal health or birth outcomes. The USPSTF found inadequate evidence on the harms of treatment of iron deficiency anemia in pregnant women; no recent studies were generalizable to the current general U.S. population.

#### Preventive Medication

The USPSTF found adequate evidence that the magnitude of the harms of routine iron supplementation in pregnant women is small to none. Several studies assessed the harms of iron supplementation in pregnant women. Most reported no statistically significant increase in harms. Of the harms reported, most were self-limited and transient effects of treatment, such as nausea, constipation, and diarrhea.

#### USPSTF Assessment

The USPSTF concludes that the evidence of the effect of routine screening for iron deficiency anemia in asymptomatic pregnant women on maternal health and birth outcomes is insufficient. Evidence is lacking, and the balance of benefits and harms cannot be determined.

The USPSTF concludes that the evidence on the effect of routine iron supplementation in pregnant women on maternal health and birth outcomes is insufficient. Evidence is lacking, and the balance of benefits and harms cannot be determined.

## CLINICAL CONSIDERATIONS

### Patient Population Under Consideration

This recommendation addresses screening and supplementation in pregnant women and adolescents living in the United States who do not have symptoms of iron deficiency anemia. It does not address pregnant women who are malnourished, have symptoms of iron deficiency anemia, or have special hematologic conditions or nutritional needs that may increase their need for iron. Screening for iron deficiency anemia in young children is addressed in a separate recommendation statement (available at [www.uspreventiveservices.org](http://www.uspreventiveservices.org)).

### Suggestions for Practice Regarding the I Statement

#### Potential Preventable Burden

Based on older data, estimates of the prevalence of iron deficiency anemia in pregnant women in the United States range from 2% to 27%, with higher rates in later trimesters and minority populations (2). Based on calculations of total body iron from 1999 to 2006 National Health and Nutrition Examination Survey

(NHANES) data, the estimated prevalence of iron deficiency in pregnant women is 18.6%; of these, 16.2% also have anemia (1). However, given the physiologic hemodilution that normally occurs during the later stages of pregnancy, determining exact prevalence rates of anemia in pregnant women may be difficult.

Several factors have been identified that may increase a pregnant woman's risk for iron deficiency anemia, including a diet lacking in iron-rich foods (for example, a vegetarian diet with inadequate sources of iron), gastrointestinal disease and/or medications that can decrease iron absorption (for example, antacids), and a short interval between pregnancies. Non-Hispanic black and Mexican American women have higher prevalence rates of iron deficiency than white women and women with parity of 2 or more. Evidence on additional risk factors, such as lower educational level and family income, has been less consistent. On the basis of a scan of the literature, the USPSTF found limited evidence on the use of risk prediction tools to identify pregnant women who are at increased risk for iron deficiency anemia.

Many observational studies have explored the association between adverse maternal and infant health outcomes (such as postpartum hemorrhage, preterm birth, low birthweight, and perinatal death) and iron deficiency or iron deficiency anemia in pregnancy, but findings have been inconclusive (2).

#### Potential Harms

The harms of screening for iron deficiency anemia have not been well-studied but are likely minor. Potential harms of screening include false-positive results, anxiety, and cost. Reported adverse events of iron supplementation or treatment with iron include limited gastrointestinal symptoms, darkening color of urine or stool, staining of teeth and gums, and drug interactions with other medications.

#### Current Practice

Rates of screening for iron deficiency anemia and iron supplementation in pregnant women by clinicians are not well-documented. However, based on anecdotal evidence, it is probably common. In addition, there may be other reasons to screen for anemia in pregnant women, such as to prepare for Cesarean delivery or anticipated blood loss during a complicated delivery. Older data from 1988 show that 97% of pregnant women who received prenatal care reported being advised to take a multivitamin-mineral supplement (3). Based on 1996 to 2006 NHANES data, 77% of pregnant women reported using a supplement within the previous 30 days and they most frequently used a multivitamin containing 48 mg of iron (4).

#### Screening Tests

Measurement of serum hemoglobin or hematocrit levels is often the first step used in primary care practice.

### Treatment

Treatment of iron deficiency anemia in pregnant women is similar to that in nonpregnant women and includes additional iron intake through oral iron pills, prenatal vitamins, and diet. The usual dose is 60 to 120 mg of elemental iron per day (2, 5). Intravenous iron treatment is also used during pregnancy.

### Supplementation

Prenatal vitamins often include a low dose of iron; the usual dose prescribed in early pregnancy is 30 mg of elemental iron per day. Higher doses (60 to 100 mg of elemental iron per day) are sometimes prescribed in populations at increased risk for iron deficiency anemia (2).

### Other Approaches to Prevention

#### Dietary Iron

According to the Institute of Medicine, the Recommended Dietary Allowance for iron in pregnant women is 27 mg per day. Natural food sources of iron include certain fruits, vegetables, meat, and poultry. The Institute of Medicine also notes that nonheme iron, which is found in vegetarian diets, may be less well-absorbed than heme iron, which is found in diets containing meat; therefore, the iron requirement may be almost twice as much in women who eat a purely vegetarian diet (6).

Fortified breads and grain products (such as cereal) are also important potential sources of iron (7, 8). Federally regulated iron fortification of U.S. food products began in 1941, and the iron content in enriched grain products has increased over the years (7). It is estimated that more than 50% of the iron in the U.S. food supply comes from iron-fortified cereal grain products (7, 8).

### Useful Resources

The USPSTF has published separate recommendation statements on screening for iron deficiency anemia in young children and folic acid supplementation during pregnancy (available at [www.uspreventiveservicestaskforce.org](http://www.uspreventiveservicestaskforce.org)).

## OTHER CONSIDERATIONS

### Research Needs and Gaps

Studies that directly evaluate the effects of screening for and early treatment of iron deficiency anemia on maternal and infant health outcomes are needed. Although adequate evidence shows that iron supplementation improves maternal hematologic indexes, the clinical significance of this improvement needs to be defined. Well-designed and adequately powered studies that evaluate the effects of iron supplementation, or change in maternal iron status as a result of intervention, on maternal and infant health outcomes (for example, postpartum hemorrhage, maternal illness, preterm delivery, low birthweight, and perinatal death) are needed, particularly in settings similar to the United States with respect to nutrition, hemoparasite burden, and socioeconomic status.

## DISCUSSION

### Burden of Disease

Iron is necessary for the production of hemoglobin, which is an essential protein found in erythrocytes. During pregnancy, iron is also needed for the development of the fetus and placenta and to expand maternal erythrocyte mass. Iron deficiency occurs when body stores of iron become depleted. It can develop as a result of an increased need for iron (for example, during pregnancy), decreased iron intake and absorption (for example, lack of iron sources in the diet), or a loss of iron (for example, bleeding). Iron deficiency anemia results when iron stores become so low that hemoglobin synthesis is impaired, which causes anemia.

Current data on the prevalence of iron deficiency anemia in pregnant women in the United States are lacking. Based on older data from a cohort of mostly racial or ethnic minorities, the estimated prevalence of iron deficiency anemia in pregnant women ranges from as low as 1.8% during the first trimester to as high as 27.4% during the third trimester (9). Based on calculations of total body iron from 1999 to 2006 NHANES data, the estimated prevalence of iron deficiency in pregnant women is 18.6%, which ranges from 6.9% in the first trimester to 29.5% in the third trimester (1).

The major concern about iron deficiency anemia in pregnant women is whether it has adverse effects on maternal health or infant outcomes. Older observational studies suggest an association between adverse outcomes in infants and anemia in the early stages of pregnancy but not during the third trimester (2). Although iron supplementation and treatment during pregnancy have been observed to improve hemoglobin levels and iron status, the clinical significance of this finding is not clear and the evidence on maternal and infant health outcomes is limited (10). Further, studies evaluating these outcomes are often conducted in countries whose nutritional status and hemoparasite burden vary significantly from that of the United States.

### Scope of Review

The USPSTF commissioned a systematic evidence review to update its 2006 recommendation on screening for iron deficiency anemia. The USPSTF focused on reviewing the evidence on the association between change in iron status as a result of intervention (oral supplementation or treatment) in pregnant women and adolescents and improvement in maternal and infant health outcomes. The use of intravenous iron was not assessed. The USPSTF considered studies conducted in settings similar to the United States in rates of malnutrition, hemoparasite burden, and general socioeconomic status. The focus of the current recommendation is on screening and supplementation for the prevention of iron deficiency anemia; however, findings on iron deficiency are also described as reported by individual studies and to provide a better understanding of the potential burden in the U.S. population.

### Accuracy of Screening Tests

The primary screening test for anemia is to measure serum hemoglobin or hematocrit levels. However, given the hemodilution and physiologic anemia that normally occurs during pregnancy, using hemoglobin or hematocrit measurement alone to determine iron deficiency status can be imprecise, and its sensitivity and specificity for detecting iron deficiency anemia in pregnant women are unknown. Serum ferritin, which is often used to measure iron status, may have limited use during pregnancy because its concentration often decreases in late pregnancy despite adequate iron stores in the bone marrow. Also, serum ferritin is an acute phase reactant, which means its levels increase during periods of inflammation (11).

### Effectiveness of Early Detection and Treatment

#### Screening and Treatment

No good- or fair-quality studies directly evaluated the effectiveness of screening for iron deficiency anemia in asymptomatic pregnant women or adolescents with regard to maternal or infant health outcomes. In addition, no new studies that would be applicable to the current U.S. population evaluated oral iron treatment of iron deficiency anemia in asymptomatic pregnant women.

#### Supplementation

Twelve good- or fair-quality randomized, controlled trials evaluated the effects of iron supplementation on various maternal hematologic indexes, including hemoglobin level, serum ferritin level, anemia, iron deficiency, and iron deficiency anemia. Eight studies were conducted in the United States or Europe, 3 in Iran, and 1 in Hong Kong; sample sizes ranged from 45 to 1164 participants. Supplement doses ranged from 20 to 120 mg per day, and outcomes were measured at various time points, from the second trimester to the postpartum period (2). Overall, the evidence was most consistent on improvement in hemoglobin and ferritin levels. Of the 8 studies (12-19) reporting maternal hemoglobin levels at term or delivery, 6 (12, 13, 15, 17-19) reported a significantly higher mean hemoglobin level in the supplemented versus control groups (122 to 139 g/L vs. 115 to 128 g/L, respectively). Of the 7 studies (13-19) reporting serum ferritin levels at term or delivery, 5 (13, 15, 17-19) reported a significantly higher ferritin level in the supplemented versus control groups (12.0 to 30.0  $\mu\text{g/L}$  vs. 6.2 to 24.9  $\mu\text{g/L}$ , respectively). Although adequate evidence shows that supplementation increases hemoglobin and ferritin levels, the evidence is unclear on whether this increase leads to an improvement in maternal and fetal health outcomes. In most of these studies, the supplemented groups had higher mean hemoglobin levels than the nonsupplemented groups; however, both groups reported values within normal limits. Evidence on the effects of supplementation on maternal iron deficiency anemia and anemia was inconsistent.

Five trials (12, 13, 15, 17, 20) evaluated the effects of iron supplementation during pregnancy on maternal

health outcomes (for example, Cesarean delivery and quality of life), and 11 trials (12-18, 20-23) evaluated various infant birth outcomes (for example, preterm delivery, low birthweight, small for gestational age, and infant mortality). Studies were conducted in the United States, Australia, Hong Kong, Ireland, Iran, and Norway; sample sizes ranged from 45 to 1164 participants. Studies used varying doses of iron, ranging from 20 to 200 mg per day. Studies on Cesarean delivery and maternal quality of life were sparse or reported inconsistent results. Studies on individual infant birth outcomes were sparse, were frequently underpowered, or reported inconsistent findings overall. Only 4 studies reported on infant mortality (12, 13, 17, 20), and none reported a significant difference with prenatal iron supplementation. However, given the relatively low frequency of this outcome, studies were likely underpowered to detect a change and none reported power calculations for this outcome. Evidence on the effects of supplementation on birthweight was mixed. Of the 8 studies (14-18, 21-23) reporting this outcome, 3 (15, 21, 22) found that women receiving iron supplementation during pregnancy gave birth to infants with a significantly higher mean birthweight (95 to 205 g more) than women not receiving iron supplementation; however, both groups reported values within normal limits (2). Of the 6 studies reporting on low birthweight (12, 13, 16, 17, 21, 22), only 1 (21) found a significantly lower rate of low-birthweight infants; however, these studies may have been underpowered to detect a change.

Further, of 4 studies (15, 20-22) reporting on small-for-gestational-age infants, 1 study (22) reported no significant difference in rates between supplemented and nonsupplemented groups, 2 studies (15, 21) reported fewer small-for-gestational-age infants in supplemented groups, and 1 study (20) reported more small-for-gestational-age infants in the supplemented group. Overall, the USPSTF found inadequate evidence on the effectiveness of supplementation during pregnancy.

No good- or fair-quality studies that would be applicable to the current U.S. population (2) evaluated the association between change in iron status as a result of intervention (supplementation or treatment) and improvement in maternal or infant health outcomes.

### Potential Harms of Early Detection and Treatment

#### Screening and Treatment

No good- or fair-quality studies reported on the harms of screening or early treatment (2). Potential harms of iron treatment include mild reversible gastrointestinal symptoms.

#### Supplementation

Ten trials (12-17, 20-23) reported on the harms of routine iron supplementation during pregnancy. Studies were conducted in the United States, Ireland, Hong Kong, Norway, Iran, and Australia, and sample sizes ranged from 45 to 1164 participants. Supplementation

doses ranged from 20 to 200 mg per day. Most reported harms, including nausea, constipation, and diarrhea, were transient and not serious. In general, no significant difference was found between supplemented and control groups. Reported rates of nausea ranged from 29% to 63% in supplemented groups and 28% to 65% in control groups. Reported rates of vomiting ranged from 12% to 41% in supplemented groups and 15% to 41% in control groups. Reported rates of constipation (or  $\leq 3$  bowel movements per week) ranged from 4% to 29% in supplemented groups and 1.6% to 28% in control groups. Evidence on supplementation and maternal hypertension was inconsistent, ranging from 1.4% to 7.5% in supplemented groups and 0% to 9% in control groups (2). Overall, the USPSTF found adequate evidence that the harms of supplementation are small to none.

### **Estimate of Magnitude of Net Benefit**

#### ***Screening and Early Detection***

Overall, the USPSTF found insufficient evidence on screening for iron deficiency anemia in asymptomatic pregnant women and adolescents. No good- or fair-quality studies were found that evaluated the benefits or harms of screening in this population. There was 1 older poor-quality study on the benefits and harms of treatment, but it was not applicable to the current U.S. population of pregnant women. Given the lack of studies on screening, the USPSTF did not find sufficient evidence to determine the balance of benefits and harms of screening for iron deficiency anemia and thus cannot make a recommendation in favor of or against screening.

#### ***Supplementation***

Overall, the USPSTF found insufficient evidence on the effects of iron supplementation during pregnancy. Although the USPSTF found adequate evidence on harms and deemed them to be small to none, it found inadequate evidence on benefits. Reported benefits of supplementation were limited to intermediate outcomes (maternal hematologic indexes), and evidence on the benefits of supplementation on maternal and infant health outcomes was inadequate because of inconsistent results and underpowered studies. Given the inconsistent findings and lack of adequately powered studies on the effect of supplementation on maternal and infant health outcomes, the USPSTF did not find sufficient evidence to determine the balance of benefits and harms of supplementation and thus cannot make a recommendation in favor of or against iron supplementation.

### **Response to Public Comment**

A draft version of this recommendation statement was posted for public comment on the USPSTF Web site from 31 March to 27 April 2015. A few comments requested more information on which populations are at increased risk for iron deficiency anemia and to which population the recommendation applies. Existing language describing risk factors for iron deficiency

anemia and the target population for this recommendation was inserted earlier in the statement to make this information clearer. Some comments also requested separate analyses of certain high-risk populations. Although the USPSTF sought this information, limitations in the evidence prevented it from performing separate analyses. A few comments noted ambiguity in how the terms "iron deficiency" and "iron deficiency anemia" were used. The recommendation was reviewed to ensure consistent use of each term, and language was added to better explain that the focus of the recommendation is on iron deficiency anemia. The USPSTF also clarified that intravenous iron treatment is a potential therapy that is offered in current practice; however, it was not a focus of the current review.

### **How Does the Evidence Fit With Biological Understanding?**

Based on older observational data, the association between negative iron status during pregnancy and adverse maternal and infant health outcomes is inconsistent. Some findings indicate that anemia occurring earlier in pregnancy may be associated with serious adverse infant outcomes, but anemia occurring during the third trimester may not. Evidence on the association between improvement in maternal iron status and improvement in maternal and infant health outcomes is lacking. Although treatment and supplementation with oral iron can improve maternal hematologic indexes (most often, hemoglobin and serum ferritin levels), subsequent improvement in maternal and infant outcomes has not been well-demonstrated. This raises questions on whether the timing of identification and correction of iron deficiency anemia plays an important role and whether currently used measures of iron deficiency anemia (primarily hemoglobin, hematocrit, and ferritin levels) are effective in identifying women who may need additional iron during pregnancy, given the normal occurrence of physiologic anemia and the limitations of interpreting ferritin levels.

### **UPDATE OF PREVIOUS USPSTF RECOMMENDATION**

This recommendation is consistent with the 2006 recommendation statement on iron supplementation during pregnancy. Both the 2006 and the current recommendation statements found insufficient evidence to determine the balance of the benefits and harms of iron supplementation during pregnancy. Although the 2006 statement recommended screening for iron deficiency anemia in pregnant women, the current recommendation found insufficient evidence to recommend for or against screening. In its review of the evidence to update the 2006 recommendation, the USPSTF found no good- or fair-quality studies on the benefits or harms of screening that would be applicable to the current U.S. population of pregnant women. Since 2006, the USPSTF has updated its methodology to better identify evidence that would be most applicable to the current U.S. population. Therefore, the USPSTF deter-

mined that the currently available and applicable evidence on screening for and early treatment of iron deficiency anemia in pregnant women is insufficient.

### RECOMMENDATIONS OF OTHERS

In 1998, the Centers for Disease Control and Prevention recommended screening for anemia and initiating low-dose iron supplementation at the first prenatal care visit for all pregnant women (5). The Institute of Medicine recommends screening for anemia in each trimester of pregnancy (24). The American Congress of Obstetricians and Gynecologists recommends screening all pregnant women for anemia and treating those with iron deficiency anemia with supplemental iron. It also states that whether iron supplementation in well-nourished pregnant women without anemia affects perinatal outcomes is unclear (25). Consistent with the USPSTF, the American Academy of Family Physicians concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening for iron deficiency anemia in pregnant women to prevent adverse maternal health and birth outcomes (26).

From the U.S. Preventive Services Task Force, Rockville, Maryland.

**Disclaimer:** Recommendations made by the USPSTF are independent of the U.S. government. They should not be construed as an official position of the Agency for Healthcare Research and Quality or the U.S. Department of Health and Human Services.

**Financial Support:** The USPSTF is an independent, voluntary body. The U.S. Congress mandates that the Agency for Healthcare Research and Quality support the operations of the USPSTF.

**Disclosures:** Authors followed the policy regarding conflicts of interest described at [www.uspreventiveservicestaskforce.org/methods.htm](http://www.uspreventiveservicestaskforce.org/methods.htm). Disclosures can also be viewed at [www.acponline.org/authors/icmje/ConflictOfInterestForms.do?msNum=M15-1707](http://www.acponline.org/authors/icmje/ConflictOfInterestForms.do?msNum=M15-1707).

**Requests for Single Reprints:** Reprints are available from the USPSTF Web site ([www.uspreventiveservicestaskforce.org](http://www.uspreventiveservicestaskforce.org)).

### References

1. Mei Z, Cogswell ME, Looker AC, Pfeiffer CM, Cusick SE, Lacher DA, et al. Assessment of iron status in US pregnant women from the National Health and Nutrition Examination Survey (NHANES), 1999-2006. *Am J Clin Nutr*. 2011;93:1312-20. [PMID: 21430118] doi:10.3945/ajcn.110.007195
2. McDonagh M, Cantor A, Bougatsos C, Dana T, Blazina I. Routine iron supplementation and screening for iron deficiency anemia in pregnant women: a systematic review to update the U.S. Preventive Services Task Force recommendation. Evidence synthesis no. 123. AHRQ publication no. 13-05187-EF-2. Rockville, MD: Agency for Healthcare Research and Quality; 2015.
3. Yu SM, Keppel KG, Singh GK, Kessel W. Preconceptional and prenatal multivitamin-mineral supplement use in the 1988 National Maternal and Infant Health Survey. *Am J Public Health*. 1996;86:240-2. [PMID: 8633743]

4. Branum AM, Bailey R, Singer BJ. Dietary supplement use and folate status during pregnancy in the United States. *J Nutr*. 2013;143:486-92. [PMID: 23365107] doi:10.3945/jn.112.169987
5. Recommendations to prevent and control iron deficiency in the United States. Centers for Disease Control and Prevention. *MMWR Recomm Rep*. 1998;47:1-29. [PMID: 9563847]
6. Otten JJ, Hellwig JP, Meyers LD, eds. Dietary reference intakes: the essential guide to nutrient requirements. Washington, DC: National Academies Pr; 2006. Accessed at [www.nal.usda.gov/fnic/DRI/Essential\\_Guide/DRIEssentialGuideNutReq.pdf](http://www.nal.usda.gov/fnic/DRI/Essential_Guide/DRIEssentialGuideNutReq.pdf) on 13 August 2015.
7. Backstrand JR. The history and future of food fortification in the United States: a public health perspective. *Nutr Rev*. 2002;60:15-26. [PMID: 11842999]
8. Gorrion S, Bente L, Hiza H; Center for Nutrition Policy and Promotion; U.S. Department of Agriculture. Nutrient content of the U.S. food supply, 1909-2000. Washington, DC: U.S. Department of Agriculture, Center for Nutrition Policy and Promotion; 2004. Accessed at [www.cnpp.usda.gov/sites/default/files/nutrient\\_content\\_of\\_the\\_us\\_food\\_supply/FoodSupply1909-2000.pdf](http://www.cnpp.usda.gov/sites/default/files/nutrient_content_of_the_us_food_supply/FoodSupply1909-2000.pdf) on 13 August 2015.
9. Scholl TO. Iron status during pregnancy: setting the stage for mother and infant. *Am J Clin Nutr*. 2005;81:1218S-1222S. [PMID: 15883455]
10. Reveiz L, Gyte GM, Cuervo LG, Casasbuenas A. Treatments for iron-deficiency anaemia in pregnancy. *Cochrane Database Syst Rev*. 2011:CD003094. [PMID: 21975735] doi:10.1002/14651858.CD003094.pub3
11. World Health Organization. Serum ferritin concentrations for the assessment of iron status and iron deficiency in populations. Geneva: World Health Organization; 2011. Accessed at [http://apps.who.int/iris/bitstream/10665/85843/1/WHO\\_NMH\\_NHD\\_MNM\\_11.2\\_eng.pdf?ua=1](http://apps.who.int/iris/bitstream/10665/85843/1/WHO_NMH_NHD_MNM_11.2_eng.pdf?ua=1) on 13 August 2015.
12. Barton DP, Joy MT, Lappin TR, Afrasiabi M, Morel JG, O'Riordan J, et al. Maternal erythropoietin in singleton pregnancies: a randomized trial on the effect of oral hematinic supplementation. *Am J Obstet Gynecol*. 1994;170:896-901. [PMID: 8141223]
13. Meier PR, Nickerson HJ, Olson KA, Berg RL, Meyer JA. Prevention of iron deficiency anemia in adolescent and adult pregnancies. *Clin Med Res*. 2003;1:29-36. [PMID: 15931282]
14. Romslo I, Haram K, Sagen N, Augensen K. Iron requirement in normal pregnancy as assessed by serum ferritin, serum transferrin saturation and erythrocyte protoporphyrin determinations. *Br J Obstet Gynaecol*. 1983;90:101-7. [PMID: 6824608]
15. Chan KK, Chan BC, Lam KF, Tam S, Lao TT. Iron supplement in pregnancy and development of gestational diabetes—a randomised placebo-controlled trial. *BJOG*. 2009;116:789-97; discussion 797-8. [PMID: 19432567] doi:10.1111/j.1471-0528.2008.02014.x
16. Falahi E, Akbari S, Ebrahimzade F, Gargari BP. Impact of prophylactic iron supplementation in healthy pregnant women on maternal iron status and birth outcome. *Food Nutr Bull*. 2011;32:213-7. [PMID: 22073795]
17. Makrides M, Crowther CA, Gibson RA, Gibson RS, Skeaff CM. Efficacy and tolerability of low-dose iron supplements during pregnancy: a randomized controlled trial. *Am J Clin Nutr*. 2003;78:145-53. [PMID: 12816784]
18. Milman N, Agger AO, Nielsen OJ. Iron status markers and serum erythropoietin in 120 mothers and newborn infants. Effect of iron supplementation in normal pregnancy. *Acta Obstet Gynecol Scand*. 1994;73:200-4. [PMID: 8122498]
19. Ziaei S, Mehrnia M, Faghihzadeh S. Iron status markers in non-anemic pregnant women with and without iron supplementation. *Int J Gynaecol Obstet*. 2008;100:130-2. [PMID: 17977537]
20. Ziaei S, Norrozi M, Faghihzadeh S, Jafarbegloo E. A randomised placebo-controlled trial to determine the effect of iron supplementation on pregnancy outcome in pregnant women with haemoglobin  $\geq 13.2$  g/dL. *BJOG*. 2007;114:684-8. [PMID: 17516958]
21. Cogswell ME, Parvanta I, Ickes L, Yip R, Brittenham GM. Iron supplementation during pregnancy, anemia, and birth weight: a randomized controlled trial. *Am J Clin Nutr*. 2003;78:773-81. [PMID: 14522736]

## CLINICAL GUIDELINE

## Screening for Iron Deficiency Anemia and Iron Supplementation

22. Siega-Riz AM, Hartzema AG, Turnbull C, Thorp J, McDonald T, Cogswell ME. The effects of prophylactic iron given in prenatal supplements on iron status and birth outcomes: a randomized controlled trial. *Am J Obstet Gynecol.* 2006;194:512-9. [PMID: 16458655]
23. Eskeland B, Malterud K, Ulvik RJ, Hunskaar S. Iron supplementation in pregnancy: is less enough? A randomized, placebo controlled trial of low dose iron supplementation with and without heme iron. *Acta Obstet Gynecol Scand.* 1997;76:822-8. [PMID: 9351406]
24. **Institute of Medicine.** Clinical Preventive Services for Women: Closing the Gaps. Washington, DC: National Academies Pr; 2011.

Accessed at [http://books.nap.edu/openbook.php?record\\_id=13181](http://books.nap.edu/openbook.php?record_id=13181) on 13 August 2015.

25. **American College of Obstetricians and Gynecologists.** ACOG Practice Bulletin No. 95: anemia in pregnancy. *Obstet Gynecol.* 2008;112:201-7. [PMID: 18591330] doi:10.1097/AOG.0b013e3181809c0d

26. **American Academy of Family Physicians.** Clinical preventive service recommendation: iron deficiency anemia. Leawood, KS: American Academy of Family Physicians; 2015. Accessed at [www.aafp.org/patient-care/clinical-recommendations/all/iron-deficiency-anemia.html](http://www.aafp.org/patient-care/clinical-recommendations/all/iron-deficiency-anemia.html) on 12 March 2015.

## APPENDIX: MEMBERS OF THE U.S. PREVENTIVE SERVICES TASK FORCE

Members of the U.S. Preventive Services Task Force at the time this recommendation was finalized\* are Albert L. Siu, MD, MSPH, *Chair* (Mount Sinai School of Medicine, New York, and James J. Peters Veterans Affairs Medical Center, Bronx, New York); Kirsten Bibbins-Domingo, PhD, MD, MAS, *Co-Vice Chair* (University of California, San Francisco, San Francisco, California); David Grossman, MD, MPH, *Co-Vice Chair* (Group Health, Seattle, Washington); Linda Ciofu Baumann, PhD, RN, APRN (University of Wisconsin, Madison, Wisconsin); Karina W. Davidson, PhD, MASc (Columbia University, New York, New York); Mark Ebell, MD, MS (University of Georgia, Athens, Georgia); Francisco A.R. García, MD, MPH (Pima County Department of Health, Tucson, Arizona); Matthew Gillman, MD, SM (Harvard Medical School and Harvard Pilgrim Health Care Institute, Boston, Massachusetts); Jessica Herz-

stein, MD, MPH (Independent Consultant, Washington, DC); Alex R. Kemper, MD, MPH, MS (Duke University, Durham, North Carolina); Alexander H. Krist, MD, MPH (Fairfax Family Practice, Fairfax, and Virginia Commonwealth University, Richmond, Virginia); Ann E. Kurth, PhD, RN, MSN, MPH (New York University, New York, New York); Douglas K. Owens, MD, MS (Veterans Affairs Palo Alto Health Care System, Palo Alto, and Stanford University, Stanford, California); William R. Phillips, MD, MPH (University of Washington, Seattle, Washington); Maureen G. Phipps, MD, MPH (Brown University, Providence, Rhode Island); and Michael P. Pignone, MD, MPH (University of North Carolina, Chapel Hill, North Carolina). Former USPSTF members Virginia Moyer, MD, MPH, and Glen Flores, MD, also contributed to the development of this recommendation.

\* For a list of current Task Force members, go to [www.uspreventiveservicestaskforce.org/Page/Name/our-members](http://www.uspreventiveservicestaskforce.org/Page/Name/our-members).

**Appendix Table 1. What the USPSTF Grades Mean and Suggestions for Practice**

| Grade       | Definition   | Suggestions for Practice  |
|-------------|--|---|
| A           | The USPSTF recommends the service. There is high certainty that the net benefit is substantial.  | Offer/provide this service.   |
| B           | The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial.  | Offer/provide this service.   |
| C           | The USPSTF recommends selectively offering or providing this service to individual patients based on professional judgment and patient preferences. There is at least moderate certainty that the net benefit is small.                      | Offer/provide this service for selected patients depending on individual circumstances.   |
| D           | The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.  | Discourage the use of this service.   |
| I statement | The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined. | Read the Clinical Considerations section of the USPSTF Recommendation Statement. If the service is offered, patients should understand the uncertainty about the balance of benefits and harms. |

**Appendix Table 2. USPSTF Levels of Certainty Regarding Net Benefit**

| Level of Certainty* | Description  |
|---------------------|--|
| High                | The available evidence usually includes consistent results from well-designed, well-conducted studies in representative primary care populations. These studies assess the effects of the preventive service on health outcomes. This conclusion is therefore unlikely to be strongly affected by the results of future studies.   |
| Moderate            | The available evidence is sufficient to determine the effects of the preventive service on health outcomes, but confidence in the estimate is constrained by such factors as:<br>the number, size, or quality of individual studies;<br>inconsistency of findings across individual studies;<br>limited generalizability of findings to routine primary care practice; and<br>lack of coherence in the chain of evidence.<br>As more information becomes available, the magnitude or direction of the observed effect could change, and this change may be large enough to alter the conclusion. |
| Low                 | The available evidence is insufficient to assess effects on health outcomes. Evidence is insufficient because of:<br>the limited number or size of studies;<br>important flaws in study design or methods;<br>inconsistency of findings across individual studies;<br>gaps in the chain of evidence;<br>findings that are not generalizable to routine primary care practice; and<br>a lack of information on important health outcomes.<br>More information may allow an estimation of effects on health outcomes.  |

\* The USPSTF defines *certainty* as “likelihood that the USPSTF assessment of the net benefit of a preventive service is correct.” The net benefit is defined as benefit minus harm of the preventive service as implemented in a general primary care population. The USPSTF assigns a certainty level on the basis of the nature of the overall evidence available to assess the net benefit of a preventive service.