



Iron Deficiency and Anemia

Exploring the impact and opportunities on
maternal and newborn outcomes

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Conflicts of Interest

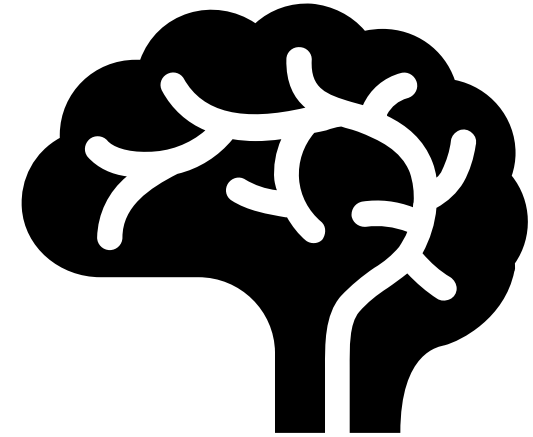
- We have no financial disclosures



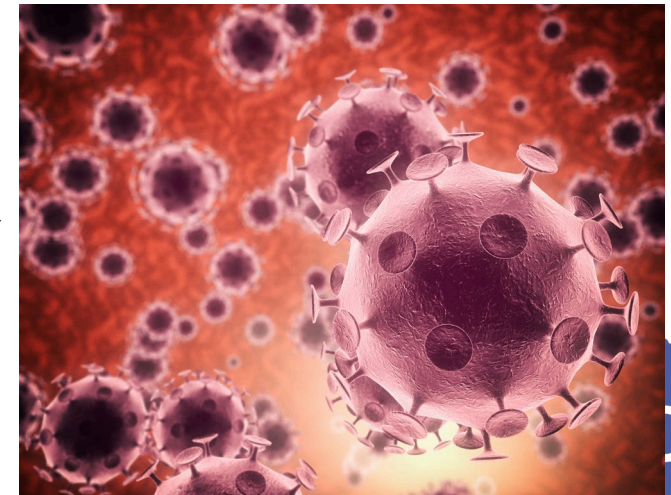
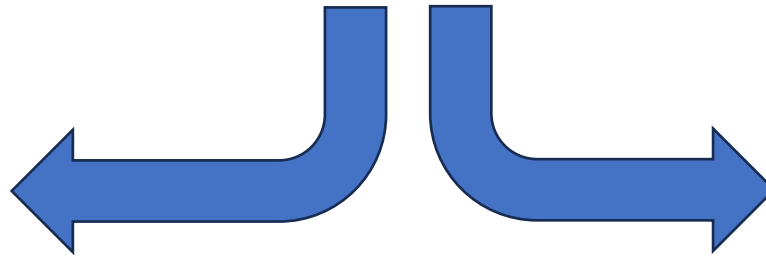
Objectives

- Review role of Iron in human physiology
- Effects of Iron Deficiency (ID) and Iron Deficiency Anemia (IDA)
 - Neonatal and Maternal
 - Prevalence of Anemia and Iron Deficiency in Pregnancy
 - SMM
- Clinical guidelines and recommendations
- Quality Improvement Project at Providence**





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Maternal Complications of ID and IDA

- Fatigue
- Reduced quality of life
- Preterm labor
- Placental abruption
- Postpartum hemorrhage
- Preeclampsia
- Cesarean Delivery
- Postpartum depression
- Severe Maternal Morbidity and Mortality

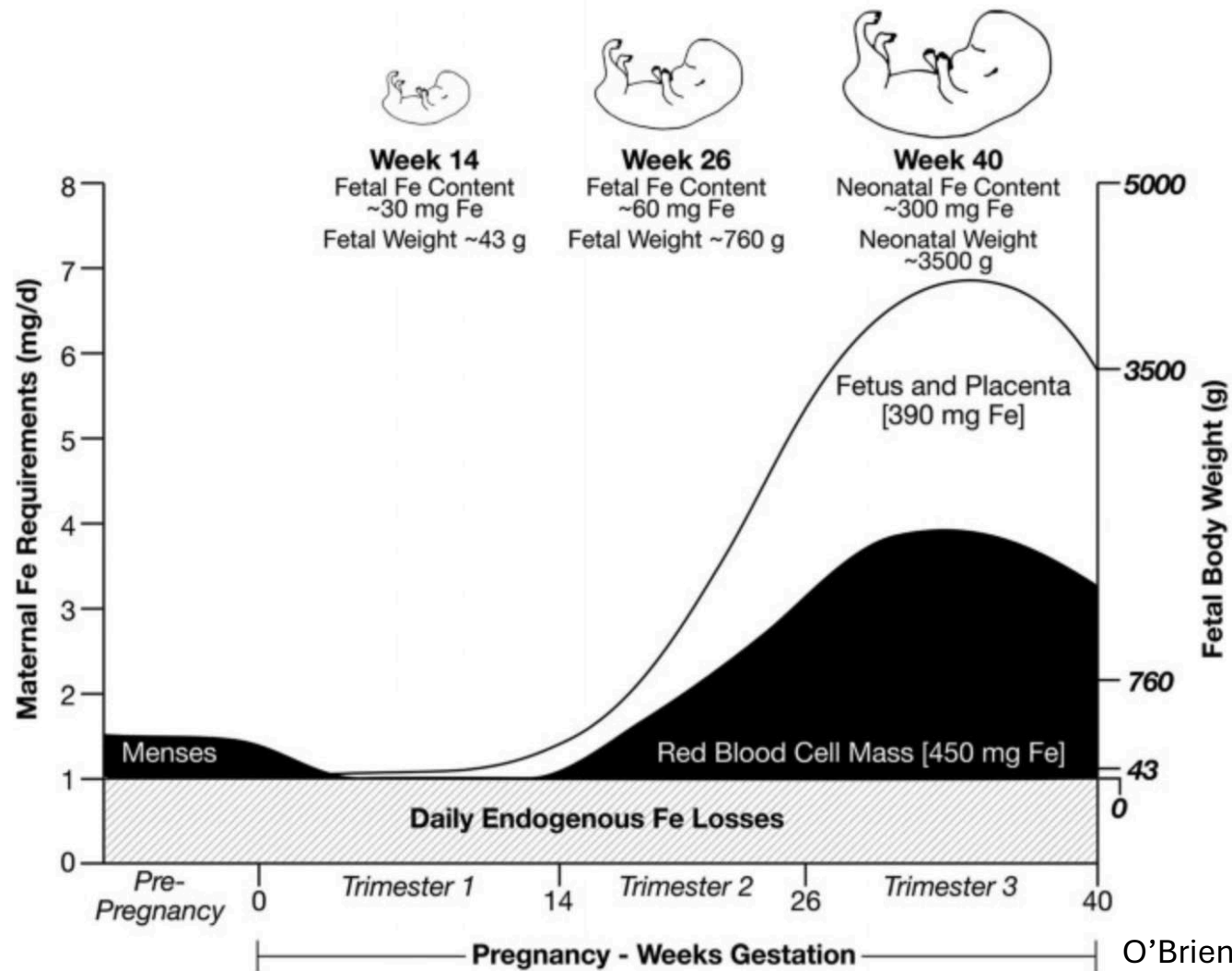


Neonatal Outcomes Associated with Maternal ID and IDA

- Preterm delivery
- Small for Gestational Age
- Lower APGAR Score
- Perinatal mortality
- Neurodevelopmental & behavioral abnormalities in childhood
- Impaired bonding



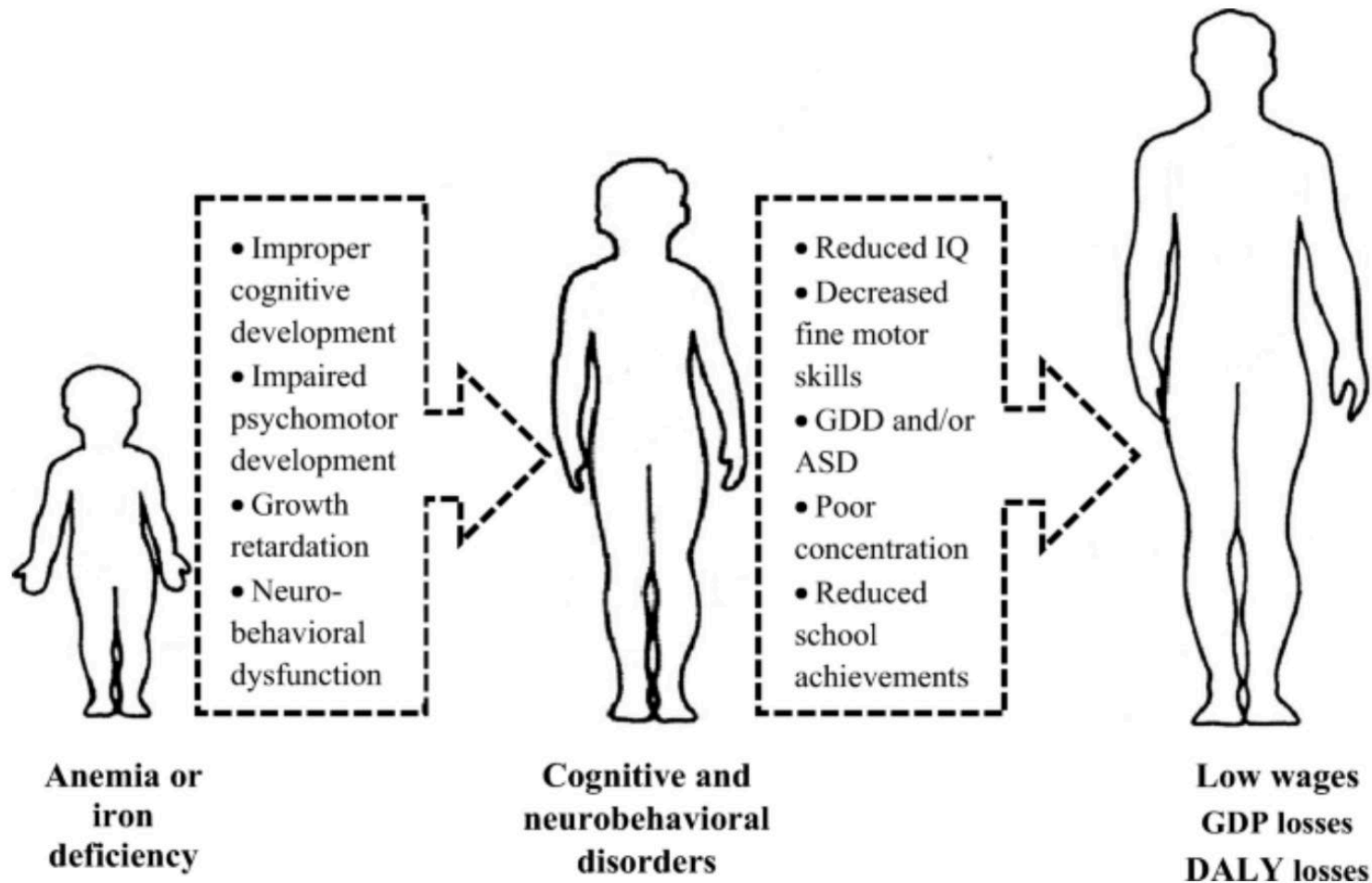
Iron demands in Pregnancy



O'Brien, Thomas *Handbook of Nutrition and Pregnancy*. 2018



Neonatal effects cause lifelong outcomes



How iron deficiency anemia in childhood may lead to loss of earnings in adult life

Pivina L, et al *Journal of Molecular Neuroscience*. 2019



Anemia in Pregnancy

	Definition Hgb(Hct)	Prevalence (%)	Prevalence of Hgb<10 g/dl (%)	Previdence ^{^^} Prevalence (%)
1 st trimester	<11.0 (33.0)	1.8		3.5
2 nd trimester	<10.5 (32.5)	8.2		
3 rd trimester	<11.0 (33.0)	27.4		23.4
Non-Hispanic white			1.8%	
Non-Hispanic Black			3.5%	

ACOG Practice Bulletin #233, 2021

*ACOG Practice Bulletin #95, 2008

^{^^} Unpublished internal data, 2023



Iron deficiency in Pregnancy

	ACOG Definition Ferritin (mg/dl)	ACOG/Mei* Prevalence (n=1171)	Auerbach, 2019** Prevalence (n=102)	Providence** Prevalence (n=1296)
1 st trimester (%)		6.9	42	39.6
2 nd trimester (%)	<10 (2008) <30 (2021)	14.3		
3 rd trimester (%)		29.5		

*Prevalence based on limited data and rates defined based on ferritin <12 mg/dl

** Ferritin <30 mg/dl

ACOG Practice Bulletin #233, 2021

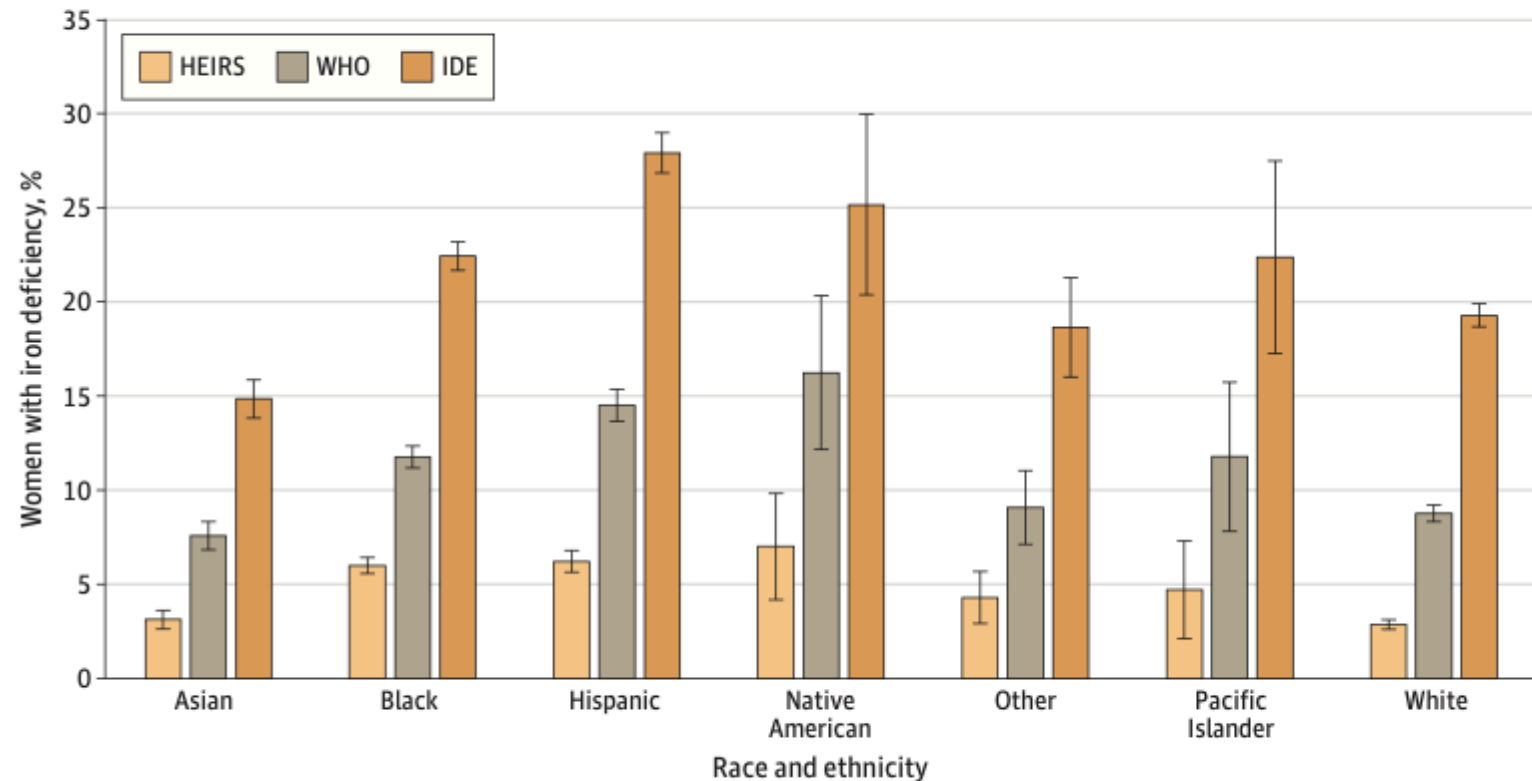
Mei et al., Am J Clin Nutr. 2011

Auerbach et al, J Matern Fetal
Neonatal Med. 2021



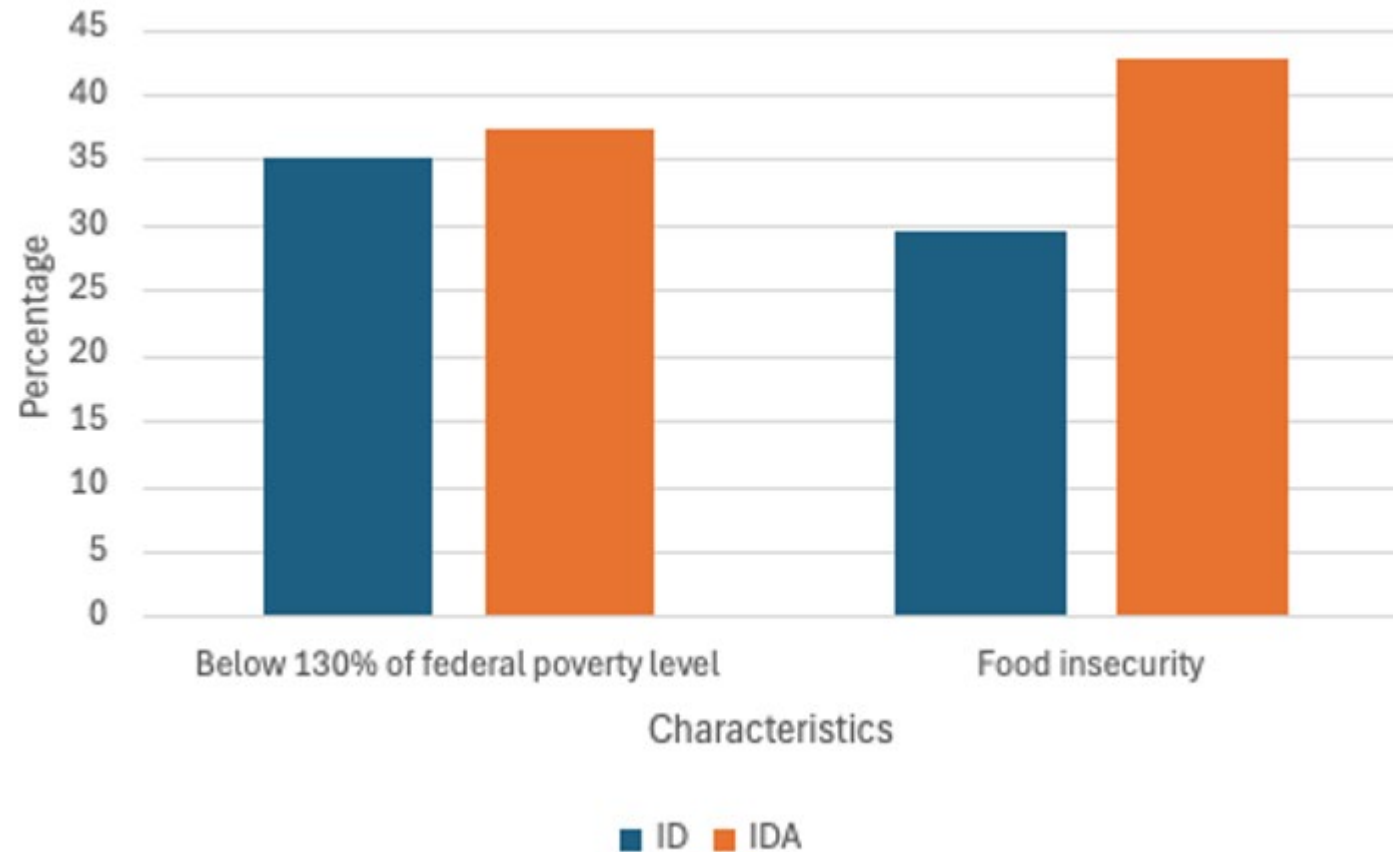
Iron deficiency and Race

Figure 1. Absolute Prevalence of Iron Deficiency Among 40 381 Women Aged 25 to 54 Years



Iron deficiency was defined according to 3 definitions: Hemochromatosis and Iron Overload Screening (HEIRS) Study, World Health Organization (WHO), and iron-deficient erythropoiesis (IDE). Women who reported 2 or more racial and ethnic groups or unknown race and ethnicity were classified as other. Error bars denote 95% CIs.

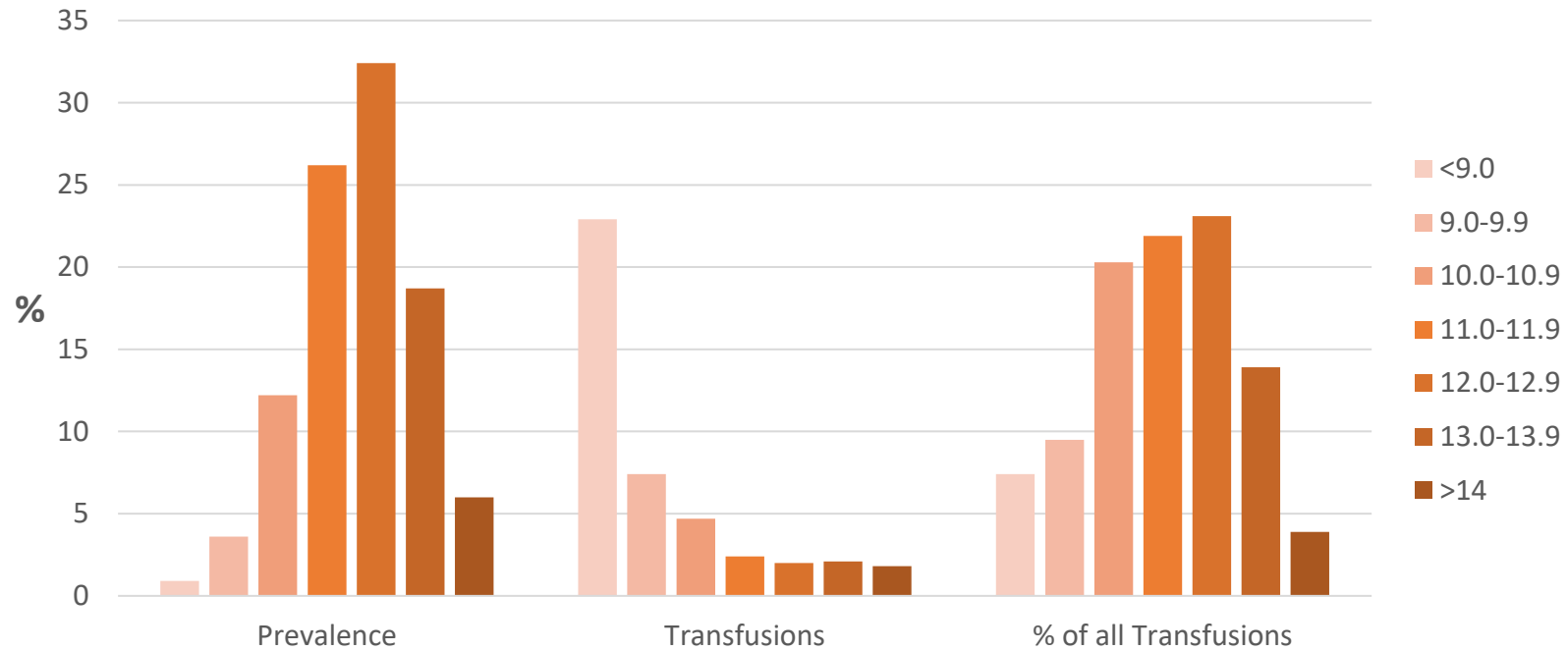
Social Determinants of Health Affect ID and IDA



Weyand, A et al. JAMA 2023



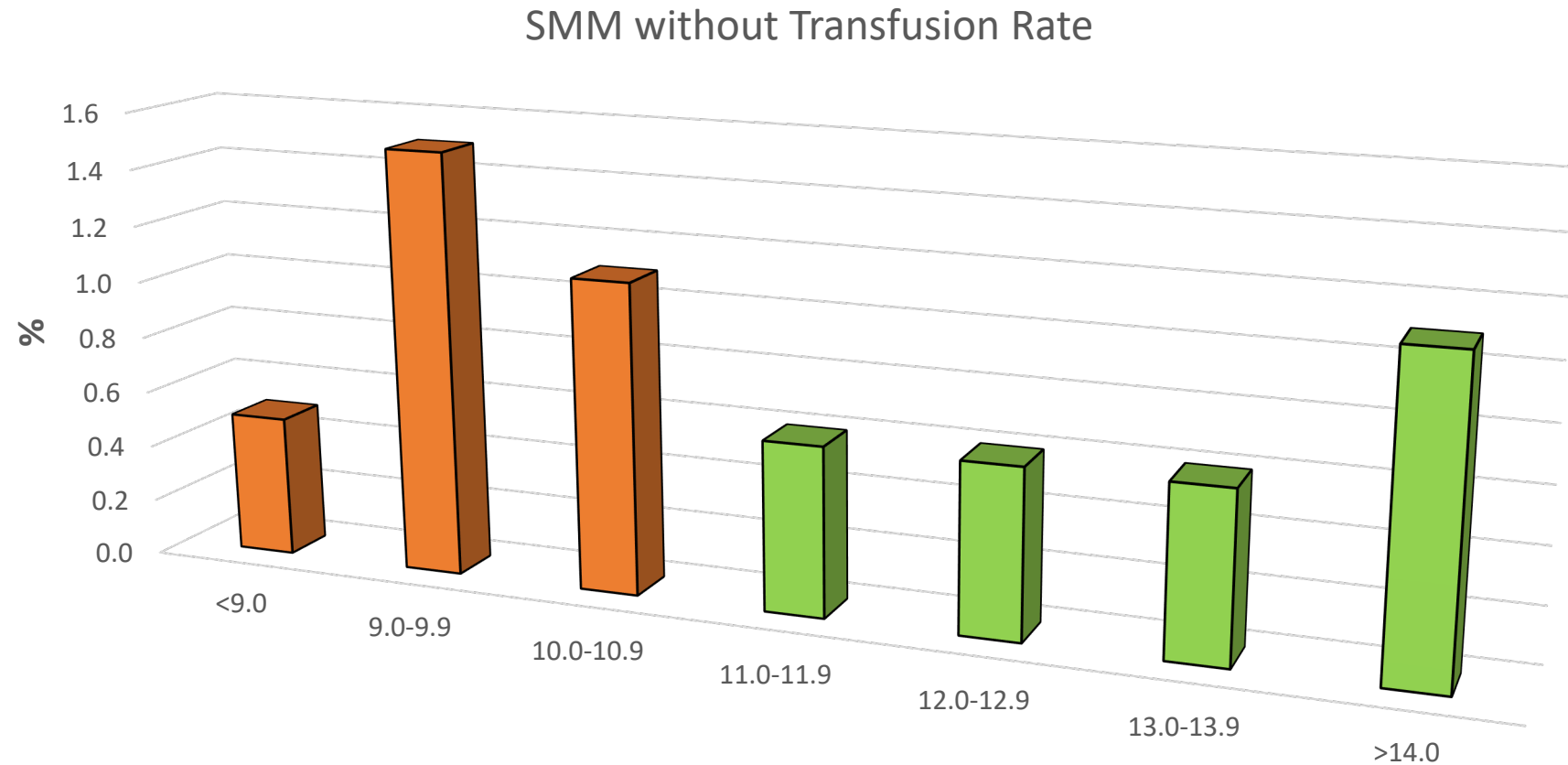
Anemia at Admission and Transfusion at Providence



N=22,092 Delivery Admissions from 1/21-12/23



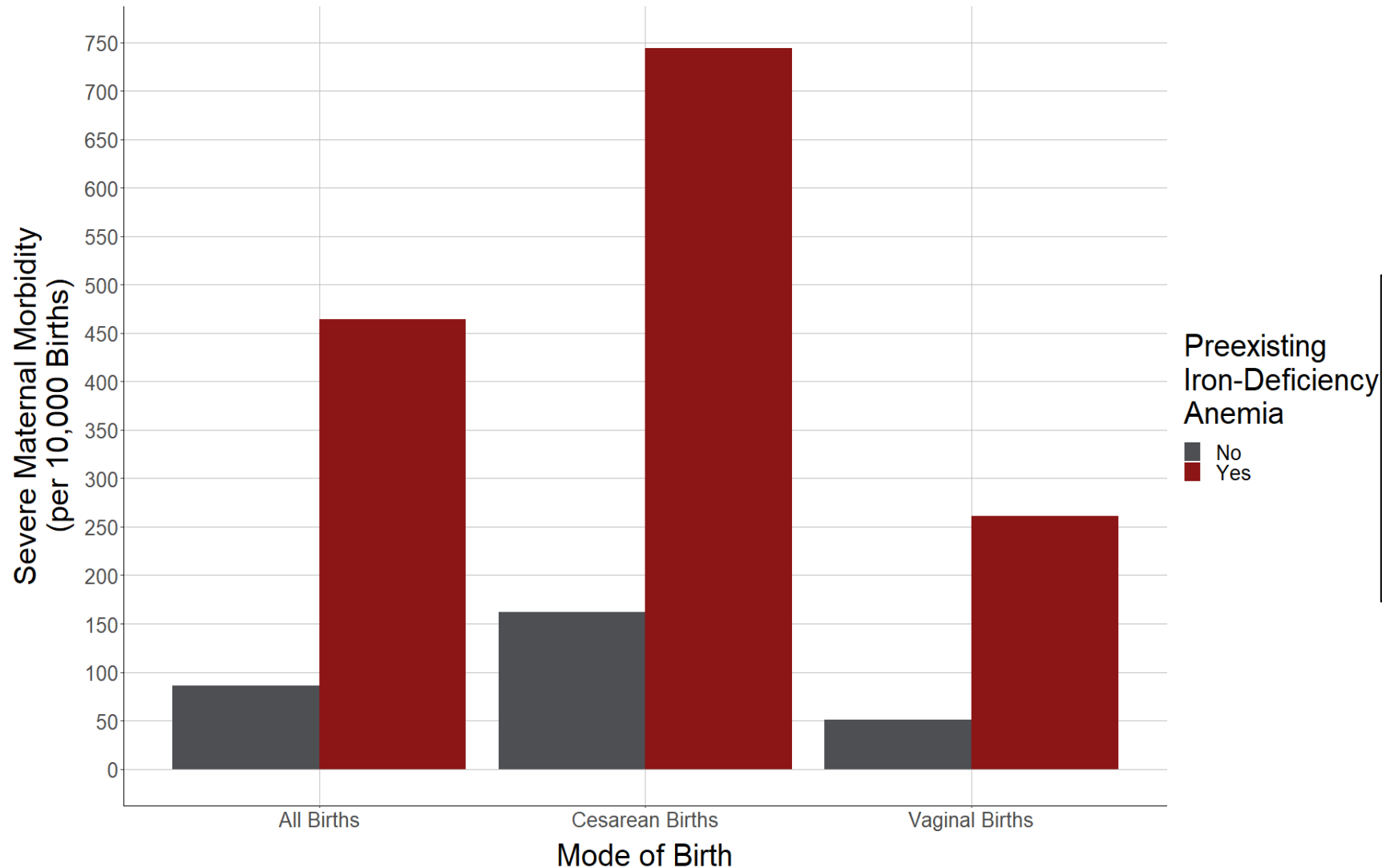
Anemia at Admission and SMM without Transfusion



N= 22,092 Delivery Admissions from 1/21-12/23



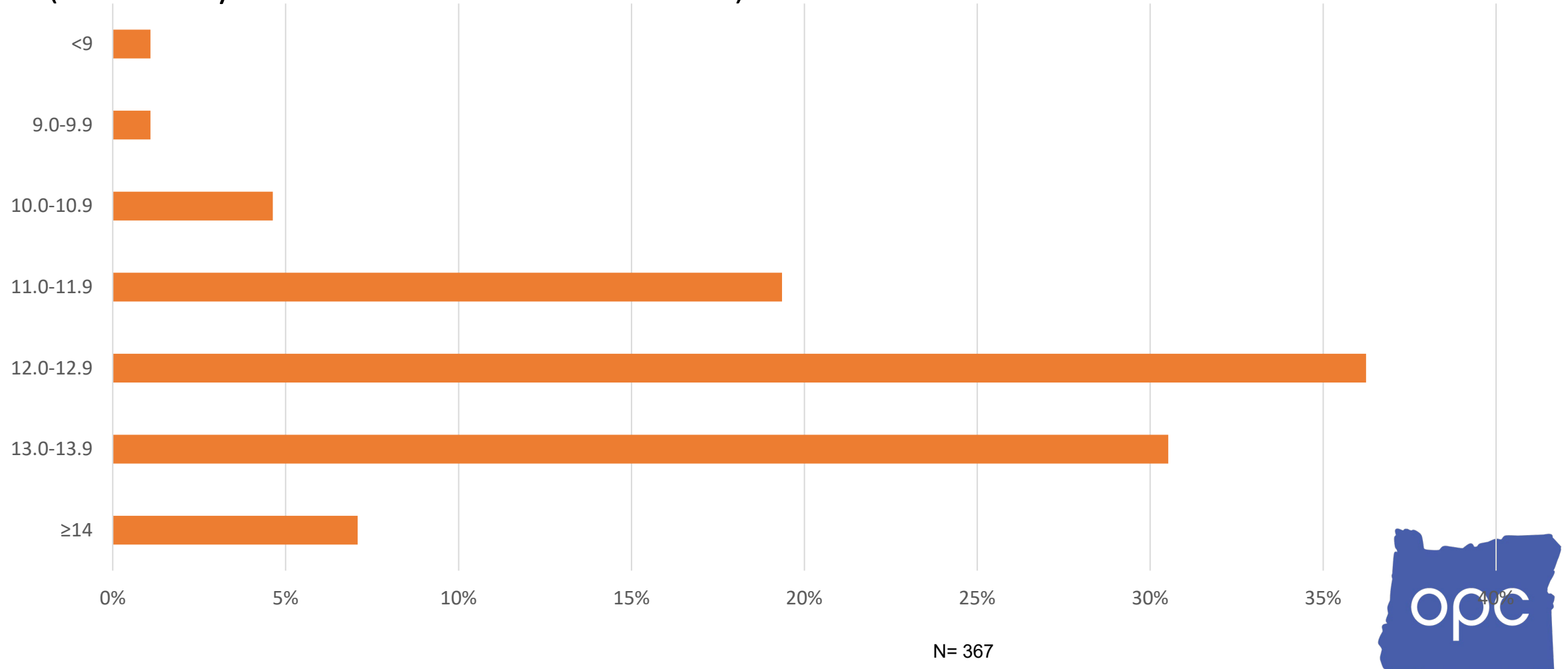
Severe Maternal Morbidity & Mortality and Anemia



Among women with Cesarean Birth, the proportion of SMM that is due to preexisting anemia is 30%.



Distribution of Hgb Values when Ferritin <30 in early pregnancy (EDD July 2024 – December 2024)





ACOG Recommendations

- Low dose iron supplementation (27 mg daily) is recommended starting in the first trimester to decrease the prevalence of maternal anemia at delivery (Level A)
- **All Pregnant women should be screened for anemia in the first trimester and at 24-28 wks GA** (Level C)
- Failure to respond to iron treatment should prompt further evaluation (Level C)
- ACOG defines iron deficiency as ferritin <30





FIGO[©]
International Federation of
Gynecology and Obstetrics

the global voice for women's health

Iron deficiency and anaemia in women and girls

Anaemia is an under-recognised and undertreated chronic state that adversely impacts more than 2 billion people worldwide, predominantly women, the fetus and children.¹ Iron deficiency is the most common micronutrient deficiency worldwide and is the most frequent cause of anaemia.¹

FIGO, 2023



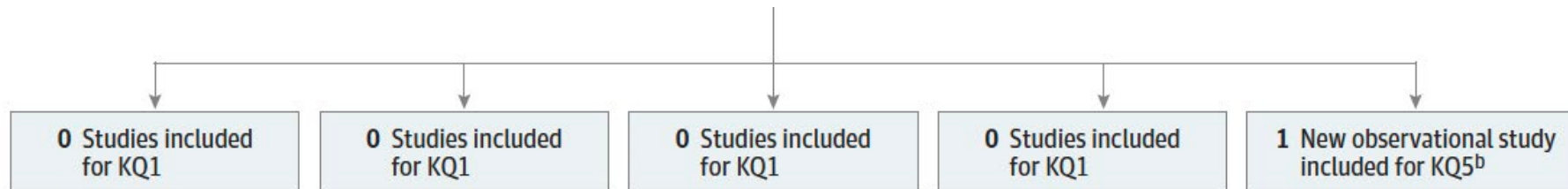
USPSTF Recommendation Statement, Updated 2024

Recommendation Summary

Population	Recommendation	Grade
Asymptomatic pregnant adolescents and adults	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening for iron deficiency and iron deficiency anemia in pregnant persons to prevent adverse maternal and infant health outcomes.	I
Asymptomatic pregnant adolescents and adults	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of routine iron supplementation in pregnant persons to prevent adverse maternal and infant health outcomes.	I

Absence of evidence of benefit is not the same as evidence of no benefit

Evidence for Screening for ID and ID anemia



Summary

- ID & IDA are common and associated with adverse maternal and infant outcomes
- IDA is a late consequence of ID
- Incidence of anemia increases as pregnancy progresses due to increased iron demands of pregnancy
- Disparities exist in both prevalence of anemia and incidence of adverse outcomes
- Recommendations are lacking from national/international organizations
- More studies are needed



References

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Quality Improvement Project at Providence

- Main outcome measure: Anemia at Admission for Delivery
- First trimester testing ferritin
 - Recommendation of oral iron supplementation if ferritin <30
- 28 week Hemoglobin testing
 - Recommendation of oral iron supplementation if Hgb <12
- Improved follow up for anemia



Patient Handout



Iron and Anemia Prevention for the Health of You and Baby

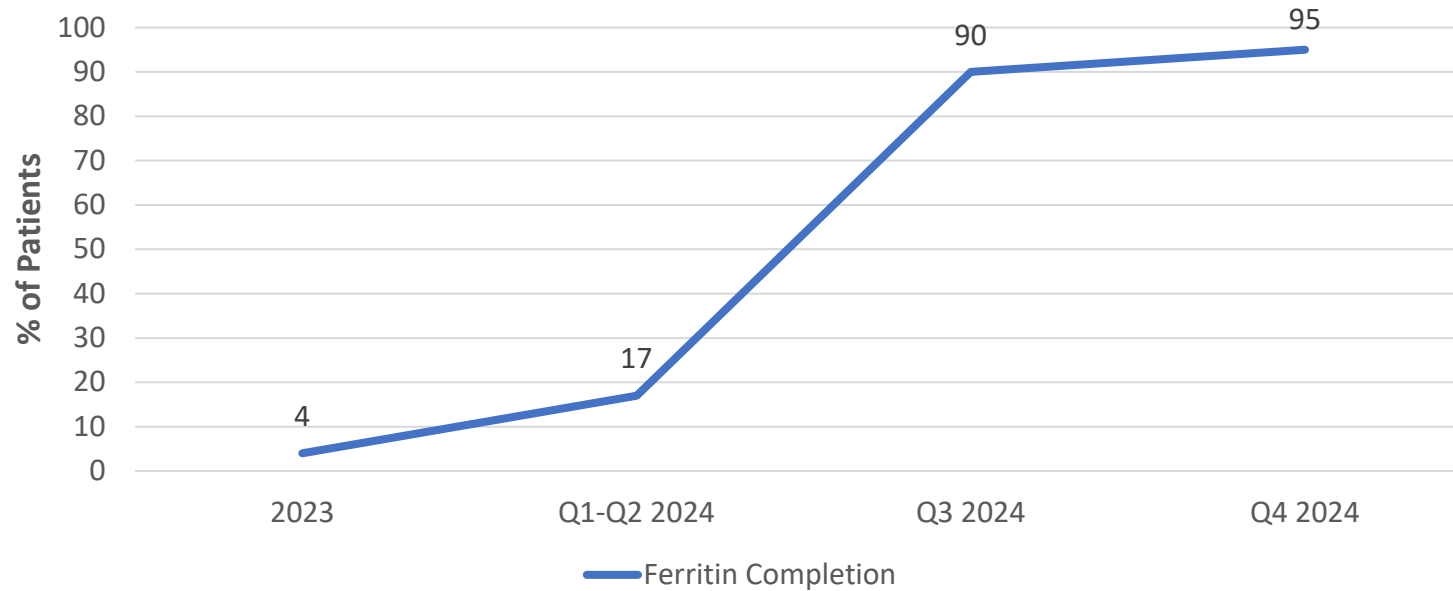
- Low iron can result in iron deficiency and anemia. These are common during pregnancy and can cause problems for you and your baby.
- Low iron raises the chances of problems like pre-eclampsia (high blood pressure), early delivery, low birth weight, and bleeding after birth. It can lead to more serious health problems.
- Even if you do not have anemia now, you might need iron. Your body and your baby need more iron as your pregnancy goes on.
- Iron is important for your baby's brain as well as other basic functions in your baby's body.
- People who get enough iron during pregnancy are less likely to have babies with autism and learning issues.
- After giving birth, having enough iron can reduce feelings of sadness and tiredness for you. And, if you choose to breastfeed, iron can help with breastfeeding success.



Talk to your OB provider to get your iron levels tested. We encourage all pregnant patients to receive a screening early in pregnancy.



Ferritin testing in First trimester by EDC



Protocol

EVALUATION AND TREATMENT:

First Trimester-New Prenatal Lab Panel					
Definition	Hemoglobin	Ferritin	Treatment	Nursing Education	Follow Up
Iron Deficiency w/o Anemia	>11 g/dL	Ferritin <30 mg/L	Oral Iron 325 mg daily or every other day	Nutritional education	
Mild to Moderate Iron Deficiency Anemia	9-10.9 g/dL	Ferritin <30 mg/L	Oral Iron 325 mg daily or every other day	Nutritional education	Recheck CBC q 4-6 weeks- <ul style="list-style-type: none"> If Hgb rise <1gm: <ul style="list-style-type: none"> Discuss oral iron use, discuss barriers to use, consider higher doses Reassign plan based on trimester, Hgb, and Risk
Severe Iron Deficiency Anemia	<9 g/dL	Ferritin <30 mg/L	Oral Iron 650 mg daily	Nutritional education	
Anemia-non-Iron Deficiency	<11 g/dL	Ferritin >30 mg/L	Full Anemia evaluation: <ul style="list-style-type: none"> Hgb Electrophoresis Transferrin saturation Alpha Thalassemia B12 and Folate 		Per provider management plan
		MCV ≤ 80	Recommend Electrophoresis		

Second Trimester-Perform if Hgb in First Trimester is <11 g/dL					
Definition	Hemoglobin	Ferritin	Treatment	Nursing Education	Follow Up
At risk for anemia	11-12 g/dL		Oral Iron 325 mg daily or every other day	Nutritional education	
Mild to Moderate Iron Deficiency Anemia	9-10.9 g/dL		Oral Iron 325 mg daily or every other day	Nutritional education	Recheck CBC q 4-6 weeks- <ul style="list-style-type: none"> If Hgb rise <1gm: <ul style="list-style-type: none"> Discuss oral iron use, discuss barriers to use, consider higher doses Reassign plan based on trimester, Hgb, and Risk
Severe Iron Deficiency Anemia	<9 g/dL		<u>Low risk</u> - oral iron 650 mg daily <u>**High risk</u> - consider IV iron if no improvement with oral iron	Nutritional education	Per provider management
Third Trimester-Universal screening at 28 weeks EGA					
At risk for anemia	11-12 g/dL		Oral Iron 325 mg daily or every other day	Nutritional education	
Mild to Moderate Iron Deficiency Anemia	9-10.9 g/dL		<u>Low risk</u> - oral iron 325mg daily or every other day <u>**High risk</u> - Consider IV iron if no improvement with oral iron	Nutritional education	Recheck CBC q 4-6 weeks- <ul style="list-style-type: none"> If Hgb rise <1gm: <ul style="list-style-type: none"> Discuss oral iron use, discuss barriers to use, consider higher doses
Severe Anemia	<9 g/dL		Consider IV iron or Blood transfusion if no improvement with oral iron		Reassign plan based on trimester, Hgb, and Risk

****High risk for bleeding or for early delivery include, but not limited to-** placenta previa, prior cesarean delivery x3, chronic placental abruption, declining blood products, multifetal gestation, placenta accreta spectrum

System changes

- Provider education
- Changes to MA and RN workflows to include ferritin ordering for prenatal labs
- Nursing education and empowerment through protocol guidelines



Prelim results:

- Decrease in anemia at 28 weeks by 2%
- Decreased anemia on admission from 2023 to Q2 2024
 - PPMC PWC- 15.6% -> 13.6%
 - St V PWC - 13.6% -> 10.3%

