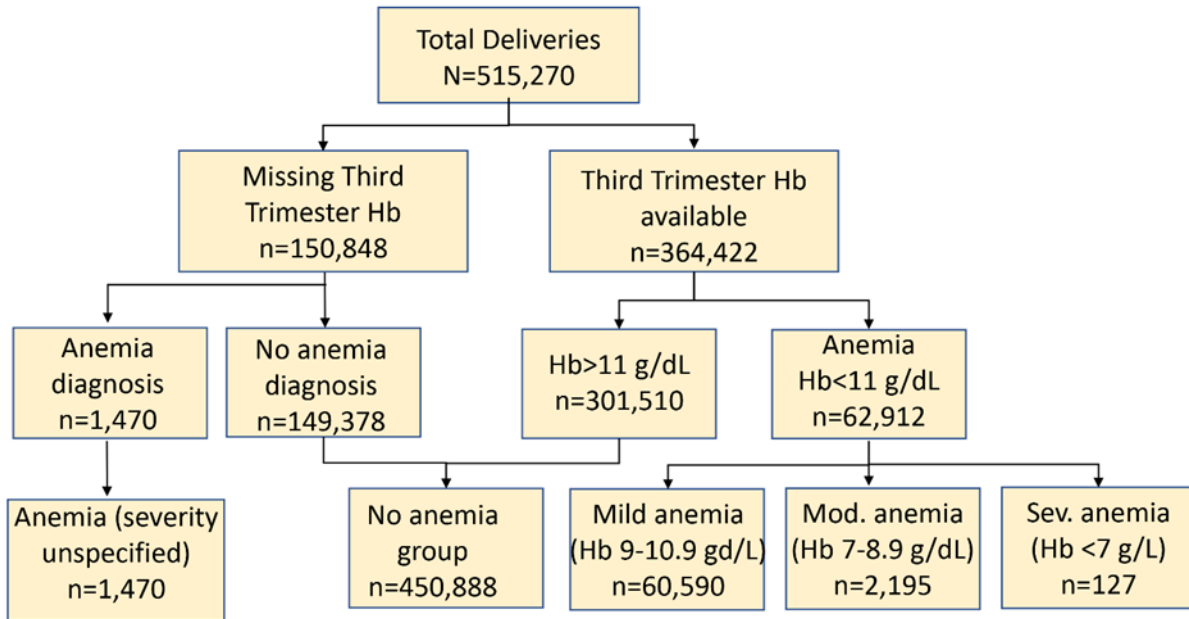


Appendix 1. Diagnosis of anemia and severity of anemia.



Smith C, Teng F, Branch E, Chu S, Joseph KS. Maternal and perinatal morbidity and mortality associated with anemia in pregnancy. *Obstet Gynecol* 2019;134.

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Appendix 2. ICD-10CA Codes for Anemia

ICD-10CA Code	Diagnosis
D50	iron deficiency anemia
D51	vitamin B12 deficiency anemia
D52	folate deficiency anemia
D53	other nutritional anemias
D55	anemia due to enzyme disorders
D56	anemia due to thalassemia
D57	anemia due to sickle-cell disorders
D58	other hereditary hemolytic anemias
D59	acquired hemolytic anemia
D60	anemia due to acquired pure red cell aplasia
D61	other aplastic anemias
D62	acute post-hemorrhagic anemia
D63	anemia due to chronic diseases
D64	other anemias
O99.0	anemia complicating pregnancy childbirth and the puerperium

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Appendix 3. Proportion of Deliveries Affected by Anemia (Based on Third-Trimester Hemoglobin) Who Had a pre-Delivery Admission Diagnostic Code for Anemia in Their Medical Record, British Columbia, 2004-2016

Third trimester hemoglobin (g/dL)	Anemia in medical record		Total
	No	Yes	
	Number (%)	Number (%)	Number
>=11	299,986 (99.5)	1,524 (0.51)	301,510
>=9 to <11	57,404 (94.7)	3,186 (5.26)	60,590
>=7 to <9	1,344 (61.2)	851 (38.8)	2,195
<7	70 (55.1)	57 (44.9)	127
Not available	149,378 (99.0)	1,470 (0.97)	150,848
Total	508,182 (98.6)	7,088 (1.4)	515,270

Cells including women considered to have anemia appear in bold text.

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Appendix 4. Frequency of Women With Specific Anemia Subtypes Among Those With a Predelivery Diagnosis of Anemia in the Medical Record, British Columbia, 2004-2016

Anemia type	Frequency
Iron deficiency	24
Hemolytic anemia	9
Aplastic anemia (and others)	78
Anemia unspecified	7,010

Some women had more than 1 anemia type.

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Appendix 5. Numbers and Rates of Selected Maternal Outcomes Within Categories of Anemia Severity Based on Third-Trimester Hemoglobin (Hb) and Predelivery Admission Diagnosis of Anemia Among Nulliparous, British Columbia, 2004-2016 (n=239,315)

Outcome	Third trimester hemoglobin and pre-delivery admission diagnosis of anemia									
	No anemia (Hb \geq 11 g/dL, no anemia diagnosis)		Mild anemia (Hb 9-10.9 g/dL)		Moderate anemia (Hb 7-8.9 g/dL)		Severe anemia (Hb<7 g/dL)		Unspecified (pre- delivery diagnosis of anemia)	
	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Additional Care										
Prolonged LOS	4,441	2.14	832	3.131	69	9.10	<5	<10.9	<5	<13.9
Antenatal admission	19,605	9.27	3,127	11.6	152	19.9	10	20.8	<5	<13.9
Admission to SC Unit*	140	0.09	22	0.11	<5	<0.90	0	0.00	0	0.00
Labour & Delivery										
Labour induction	93,539	20.8	13,156	21.7	462	21.1	26	20.5	8	22.2
Operative vaginal	34,754	16.4	4,599	17.0	124	16.2	7	14.6	8	22.2
Cesarean deliveries	69,597	32.9	9,696	35.9	334	43.7	26	54.2	16	44.4
Obstetric Morbidity										
Pre-eclampsia	3,470	1.64	488	1.81	25	3.27	<5	<10.9	<5	<13.9
HELLP syndrome*	671	0.45	91	0.47	0	0.00	0	0.00	0	0.004
Placenta previa with h'hage	609	0.29	135	0.50	10	1.31	<5	<10.9	0	0.00
Placental abruption	2,369	1.12	408	1.51	21	2.75	<5	<10.9	<5	<13.9
Infectious Morbidity										
Prophylactic antibiotics: CD*	37,224	75.7	5,474	78.9	195	80.3	18	81.8	7	77.8
Chorioamnionitis	5,841	2.78	994	3.68	32	4.19	<5	<10.9	53	3.57
Postpartum wound infection*	454	0.31	56	0.29	<5	<0.90	<5	<10.9	0	0.00
Postpartum infection*	1,103	0.75	161	0.84	7	1.26	<5	<10.9	0	0.00
Postpartum UTI*	213	0.14	36	0.19	<5	<0.90	0	0.00	0	0.00

CD denoted cesarean delivery and UTI denotes urinary tract infection.

* Information on these maternal outcomes was only available for deliveries between 2008 and 2016.

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Appendix 6. Unadjusted (OR) and Adjusted Odds Ratios (adj. OR) Showing the Association Between Anemia Severity and Maternal Outcomes Among Nulliparous Women, British Columbia, 2004-2016 (n=239,315)

Maternal outcome	Third trimester hemoglobin and pre-admission diagnosis of anemia							
	Mild anemia (Hb 9-10.9 g/dL)		Moderate anemia (Hb 7-8.9 g/dL)		Severe anemia (Hb <7 g/dL)		Unspecified (pre-delivery diagnosis of anemia)	
	OR (95% CI)	Adj. OR (95% CI)	OR (95% CI)	Adj. OR (95% CI)	OR (95% CI)	Adj. OR (95% CI)	OR (95% CI)	Adj. OR (95% CI)
Additional Care								
Prolonged LOS	1.48 (1.37-1.60)	1.45 (1.34-1.57)	4.59 (3.58-5.90)	†	1.02 (0.14-7.39)	†	4.17 (1.28-13.6)	†
Antenatal admission (yes)	1.28 (1.23-1.34)	1.29 (1.24-1.34)	2.43 (2.03-2.91)	2.34 (1.95-2.80)	2.58 (1.28-5.17)	†	1.22 (0.43-3.46)	†
Admission to Special Care Unit	1.21 (0.77-1.90)	†	5.74 (1.82-18.1)	†	-	-	-	-
Labour & Delivery								
Labour induction	1.06 (1.03-1.09)	1.11 (1.07-1.14)	1.22 (1.05-1.42)	1.32 (1.13-1.55)	0.91 (0.47-1.75)	†	1.20 (0.59-2.43)	†
Operative vaginal delivery	1.04 (1.01-1.08)	1.02 (0.98-1.05)	0.99 (0.81-1.20)	0.94 (0.77-1.14)	0.87 (0.39-1.94)	†)	1.45 (0.66-3.19)	†
Cesarean deliveries	1.14 (1.11-1.17)	1.16 (1.13-1.19)	1.58 (1.37-1.83)	1.76 (1.51-2.03)	2.41 (1.37-4.25)	†	1.63 (0.85-3.15)	†
Obstetric Morbidity								
Pre-eclampsia	1.10 (1.00-1.21)	1.13 (1.03-1.25)	2.03 (1.36-3.03)	†	1.28 (0.18-9.25)	†	3.53 (0.85-14.7)	†
Placenta previa with hemorrhage	1.74 (1.44-2.10)	1.63 (1.35-1.96)	4.59 (2.45-8.61)	†	7.37 (1.02-53.5)	†	-	-
Placental abruption	1.36 (1.22-1.51)	1.30 (1.17-1.45)	2.50 (1.61-3.86)	†	1.88 (0.26-13.6)	†	2.52 (0.35-18.4)	†

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Appendix 6 (cont.). Unadjusted (OR) and Adjusted Odds Ratios (adj. OR) Showing the Association Between Anemia Severity and Maternal Outcomes Among Nulliparous Women, British Columbia, 2004-2016 (n=239,315)

Outcome	Third trimester hemoglobin and pre-delivery admission diagnosis of anemia							
	Mild anemia (Hb 9-10.9 g/dL)		Moderate anemia (Hb 7-8.9 g/dL)		Severe anemia (Hb <7 g/dL)		Unspecified (pre-delivery diagnosis of anemia)	
	OR (95% CI)	Adj. OR (95% CI)	OR (95% CI)	Adj. OR (95% CI)	OR (95% CI)	Adj. OR (95% CI)	OR (95% CI)	Adj. OR (95% CI)
Transfusions & Postpartum Anemia								
Antepartum transfusion	2.77 (1.09-7.01)	2.75 (1.08-7.00)	165.0 (75.3-361.4)	144.2 (63.7-326.5)	540.8 (121.5-999.9)	†	731.7 (162.7-999.9)	†
Intra/postpartum transfusion	2.09 (1.19-3.71)	2.04 (1.15-3.62)	19.9 (7.19-54.9)	20.2 (7.25-56.5)	251.7 (76.0-833.7)	†	-	-
Postpartum anemia	1.86 (1.81-1.92)	1.87 (1.81-1.92)	4.43 (3.84-5.11)	4.53 (3.92-5.23)	5.46 (3.10-9.63)	†	3.09 (1.57-6.10)	†
Infectious Morbidity								
Antibiotics during delivery admission	1.13 (1.10-1.16)	1.13 (1.10-1.16)	1.46 (1.26-1.69)	1.52 (1.32-1.76)	2.62 (1.41-4.90)	†	0.97 (0.50-1.86)	†
Prophylactic antibiotics for cesarean delivery	1.20 (1.13-1.28)	1.17 (1.10-1.25)	1.30 (0.95-1.79)	1.28 (0.93-1.75)	1.44 (0.49-4.27)	†	1.12 (0.23-5.41)	†
Chorioamnionitis	1.33 (1.25-1.43)	1.29 (1.21-1.38)	1.53(1.07-2.17)	†	1.52 (0.37-6.25)	†	-	-
Postpartum wound infection	0.95 (0.72-1.25)	†	1.18 (0.29-4.72)	†	8.31 (1.14-60.6)	†	-	-
Postpartum infection	1.12 (0.95-1.33)	1.10 (0.93-1.30)	1.70 (0.801-3.59)	†	3.41 (0.47-24.8)	†	-	-
Postpartum UTI	1.30 (0.91-1.85)	†	1.25 (0.18-8.94)	†	-	-	-	-

UTI denotes urinary tract infection.

Models adjusted for maternal age, parity, pre-pregnancy weight, smoking, previous cesarean delivery, alcohol use, pre-existing hypertension, chronic diseases and in vitro fertilization. ORs for acute renal failure, acute fatty liver, HELLP syndrome and blood positive culture undefined/ could not be estimated.

Statistically significant odds ratios appear in bold text.

† Adjusted ORs not estimated as these categories had few events relative to the number of variables in the regression model.

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Appendix 7. Numbers and Rates of Fetal and Infant Outcomes Associated With Maternal Anemia, British Columbia, 2004-2016 (Anemia Severity Based on Third-Trimester Hemoglobin (Hb) and Predelivery Admission Diagnosis of Anemia; n=523,669)

Outcome	Third trimester hemoglobin and pre-delivery admission diagnosis of anemia									
	No anemia (Hb≥11 g/dL and no diagnosis of anemia)		Mild anemia (Hb 9-10.9 g/dL)		Moderate anemia (Hb 7-8.9 g/dL)		Severe anemia (Hb<7 g/dL)		Unspecified (pre- delivery diagnosis of anemia)	
	Number	(%)	Number	(%)	Number	(%)	Number	(%)	Number	(%)
Multiple births	6,815	3.19	1,554	5.59	85	10.5	6	11.8	174	11.1
Preterm birth (<37 weeks)	20,773	9.80	3,009	10.9	149	18.7	9	18.4	301	19.4
Very preterm birth (<32 wks)	3,598	1.70	584	2.11	47	5.90	0	0.00	75	4.84
SGA (<10th centile)	19,472	9.19	2,427	8.78	95	12.0	12	24.5	137	8.86
SGA (<3rd centile)	4,864	2.30	602	2.18	35	4.41	<5	<10.2	35	2.26
5-minute Apgar <7	5,201	2.45	680	2.46	32	4.02	<5	<10.2	59	3.83
5-minute Apgar <4	797	0.38	98	0.35	7	0.88	0	0.00	20	1.30
SCN admission	18,109	8.53	2,775	10.2	157	19.7	9	18.4	237	15.3
Resp. distress syndrome	2,345	1.10	404	1.45	29	3.59	<5	<10.2	58	3.69
Fetal asphyxia	1,602	0.75	197	0.71	7	0.87	0	0.00	11	0.70
Birth asphyxia	414	0.19	60	0.22	0	0.00	<5	<10.2	5	0.32
Convulsions	351	0.16	45	0.16	<5	0.63	0	0.00	5	0.32
HIE	216	0.10	24	0.09	0	0.00	<5	<10.2	<5	<0.32
Bacterial sepsis	995	0.47	146	0.53	9	1.13	0	0.00	11	0.71
Congenital anomalies	12,343	5.78	1,604	5.77	67	8.30	7	13.7	109	6.94
Stillbirth	1,113	0.52	72	0.26	9	1.12	<5	<10.0	19	1.21
Neonatal death	399	0.19	49	0.18	<5	0.63	0	0.00	12	0.76
Perinatal death	1,512	0.71	121	0.44	12	1.49	<5	<10.0	31	1.97

SGA denotes small for gestational age live birth, SCN denotes Special Care Nursery, and HIE denotes hypoxic ischaemic encephalopathy. Total births served as the denominator for rates of multiple birth, fetal asphyxia, congenital anomalies, stillbirth and perinatal death rates and live births served as the denominator for all other rates.

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Appendix 8. Unadjusted (OR) and Adjusted Odds Ratios (adj. OR) Showing the Association Between Anemia Severity and Fetal/Infant Outcomes Among Nulliparous Women, British Columbia, 2004-2016 (n=243,661)

Outcome	Third trimester hemoglobin and pre-admission diagnosis of anemia							
	Mild anemia (Hb 9-10.9 g/dL)		Moderate anemia (Hb 7-8.9 g/dL)		Severe anemia (Hb <7 g/dL)		Unspecified (pre-delivery diagnosis of anemia)	
	OR (95% CI)	Adj. OR (95% CI)	OR (95% CI)	Adj. OR (95% CI)	OR (95% CI)	Adj. OR (95% CI)	OR (95% CI)	Adj. OR (95% CI)
Multiple births	1.80 (1.66-1.94)	1.65 (1.52-1.80)	3.55 2.60-4.86	†	4.07 1.26-13.1	†	3.80 3.05-4.74	3.52 (2.77-4.47)
Preterm birth (<37 weeks)	1.06 (1.01-1.10)	1.02 (0.98-1.07)	1.98 (1.63-2.40)	1.84 (1.51-2.24)	1.84 (0.82-4.11)	†	1.95 (1.69-2.24)	1.84 (1.60-2.12)
Very preterm birth (<32 weeks)*	1.13 (1.04-1.23)	1.08 (0.99-1.18)	3.34 (2.51-4.44)	†	-	-	2.94 (2.36-3.65)	†
SGA (<10th centile)	0.93 (0.89-0.98)	0.86 (0.82-0.90)	1.32 (1.06-1.65)	†	3.04 (1.55-5.98)	†	0.94 (0.78-1.12)	0.92 (0.76-1.10)
SGA (<3rd centile)	0.94 (0.86-1.02)	0.87 (0.80-0.95)	1.90 (1.34-2.69)	†	1.91 (0.46-7.88)	†	1.01 (0.72-1.41)	†
5-minute Apgar <7	1.00 (0.92-1.08)	1.01 (0.93-1.09)	1.55 (1.06-2.27)	†	2.81 (0.87-9.07)	†	1.59 (1.22-2.08)	†
5-minute Apgar <4*	0.68 (0.58-0.80)	†	2.24 (1.36-3.69)	†	4.52 (1.10-18.6)	†	2.84 (2.06-3.91)	†
SCN admission	1.16 (1.11-1.21)	1.14 (1.09-1.19)	2.46 (2.04-2.96)	2.39 (1.98-2.88)	2.62 (1.26-5.44)	†	1.75 (1.50-2.03)	1.67 (1.43-1.94)
Respiratory distress syndrome	1.26 (1.13-1.42)	1.24 (1.10-1.39)	3.10 (2.04-4.69)	†	1.13 (0.16-8.06)	†	3.27 (2.43-4.39)	†
Fetal asphyxia*	0.95 (0.81-1.10)	0.94 (0.81-1.10)	1.16 (0.55-2.44)	†	-	-	0.93 (0.52-1.69)	†
Birth asphyxia*	1.11 (0.85-1.46)	†	-	-	10.7 (1.47-77.4)	†	1.66 (0.69-4.00)	†

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Appendix 8 (cont.). Unadjusted (OR) and Adjusted Odds Ratios (adj. OR) Showing the Association Between Anemia Severity and Fetal/Infant Outcomes Among Nulliparous Women, British Columbia, 2004-2016 (n=239,315)

Outcome	Third trimester hemoglobin and pre-admission diagnosis of anemia							
	9-10.9 g/dL		7-8.9 g/dL		<7 g/dL		Hb unknown, with antepartum diagnosis of anemia	
	OR (95% CI)	Adj. OR (95% CI)	OR (95% CI)	Adj. OR (95% CI)	OR (95% CI)	Adj. OR (95% CI)	OR (95% CI)	Adj. OR (95% CI)
Convulsions*	0.98 (0.72-1.34)	†	1.52 (0.38-6.10)	†	-	†	1.95 (0.81-4.83)	†
HIE*	0.85 (0.56-1.30)	†	-	-	20.5 (2.81-148.9)	†	0.63 (0.09-4.52)	†
Bacterial sepsis*	1.13 (0.95-1.34)	1.13 (0.95-1.35)	2.40 (1.24-4.65)	†	-	†	1.50 (0.83-2.73)	†
Congenital anomalies	0.99 (0.94-1.05)	0.99 (0.93-1.04)	1.45 (1.12-1.88)	†	2.79 (1.25-6.22)	†	1.16 (0.95-1.42)	1.14 (0.93-1.39)
Stillbirth	0.47 (0.36-0.60)	†	2.20 (1.12-4.33)	†	8.69 (2.11-35.8)	†	2.32 (1.44-3.72)	†
Neonatal death*	0.94 (0.70-1.27)	†	2.00 (0.64-6.26)	†	-	†	4.14 (2.33-7.38)	†
Perinatal death	0.58 (0.48-0.71)	0.59 (0.48-0.72)	2.14 (1.19-3.86)	†	6.48 (1.57-26.7)	†	2.87 (1.98-4.16)	†

HIE denotes hypoxic ischaemic encephalopathy, SGA denotes small for gestational age and SCN denotes Special Care Nursery. All models included adjustment for maternal age, parity, pre-pregnancy weight, smoking, previous cesarean delivery, alcohol use, pre-existing hypertension, chronic diseases and in vitro fertilization and multiple birth. Models adjusted for maternal age, parity, pre-pregnancy weight, smoking, previous cesarean delivery, alcohol use, multiple birth, pre-existing hypertension, chronic diseases and in vitro fertilization. ORs for acute renal failure, acute fatty liver, HELLP syndrome and blood positive culture undefined/ could not be estimated.

Statistically significant odds ratios appear in bold text.

* Not adjusted for the non-independence of births following multi-fetal gestation (due to model fitting constraints).

† Adjusted ORs not estimated as these categories had few events relative to the number of variables in the regression model.

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