

Appendix 1. International Classification of Diseases (ICD) 9th/10th Edition Codes for Influenza¹⁻³

ICD-9	ICD-10
079.89, 079.99, 460, 462, 464.x, 465.x, 466.x, 478.9, 480, 487.x, 488.x, 490	B33.8, B34.1, B34.2, B34.8, B9781, B9789, J00, J028, J029, J0410, J042, J060, J069, J09Xx, J100x, J10x, J11x, J129, J20x, J21x, J39x, J40

References

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Wen T, Arditi B, Riley LE, Sobhani NC, Norton M, D’Alton M, et al. Influenza complicating delivery hospitalization and its association with severe maternal morbidity in the United States, 2000–2018. *Obstet Gynecol* 2021;138.

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Appendix 2. Frequency and Association Between Influenza and Severe Maternal Morbidity, Death, Influenza-Related Complications, and Obstetric Complications (Weighted Sample)										
	No influenza			Influenza			Unadjusted analysis		Adjusted analysis	
PRIMARY OUTCOME	N (95% CI)	%	Per 10,000 deliveries	N (95% CI)	%	Per 10,000 deliveries	RR	95% CI	aRR	95% CI
Severe maternal morbidity (SMM)	507,650	0.7%	68.1	3,880	2.3%	226.3	3.32	3.22, 3.43	2.24	2.17, 2.31 ¹
SECONDARY OUTCOMES										
Maternal death	3,615	0.0%	0.5	75	0.0%	4.3	8.73	6.92, 11.02	3.56	2.82, 4.49 ²
Influenza-related complications										
Mechanical ventilation/tracheostomy	10,490	0.0%	1.4	295	0.2%	17.3	12.31	10.97, 13.81	6.80	6.06, 7.64 ¹
Sepsis and shock	43,480	0.1%	5.8	735	0.4%	42.9	7.35	6.84, 7.91	5.50	5.11, 5.92 ¹
Acute respiratory distress syndrome	36,705	0.1%	4.9	1,140	0.7%	66.6	13.53	12.76, 14.35	7.74	7.29, 8.21 ¹
Obstetrical complications										
Preterm birth, any	4,909,185	6.6%	658.6	20,115	11.7%	1173.6	1.78	1.76, 1.81	1.49	1.47, 1.51 ³
Hypertensive disorders of pregnancy	5,716,225	7.7%	766.8	22,570	13.2%	1316.8	1.72	1.69, 1.74	1.57	1.55, 1.59 ⁴
¹ Model adjusted by maternal race, age, payer, median income quartile based on ZIP code, mode of delivery, placental abruption/antepartum hemorrhage, hypertension status, multiple gestation, diabetes subtype, obesity, asthma, hospital location/teaching status, hospital region, and year. ² Model adjusted for factors listed in Footnote 1 along with severe maternal morbidity and postpartum hemorrhage. ³ Model adjusted for maternal race, age, payer, median income quartile based on ZIP code, placental abruption/antepartum hemorrhage, hypertension status, multiple gestation, obesity, diabetes subtype, asthma, hospital region, and year. ⁴ Model adjusted for maternal race, age, payer, median income quartile based on ZIP code, placental abruption/antepartum hemorrhage, multiple gestation, obesity, diabetes subtype, asthma, hospital region, and year.										

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Appendix 3. Frequencies of Severe Maternal Morbidity by Presence of Influenza Diagnosis Code		
Severe Maternal Morbidity Condition	Delivery hospitalization WITHOUT influenza diagnosis code	Delivery hospitalization WITH influenza diagnosis code
Severe maternal morbidity excluding blood transfusion	507, 650	3,879
Acute myocardial infarction	1330	DS
Aneurysm	1275	15
Acute renal failure	25,690	355
Acute respiratory distress syndrome	36,705	1,140
Amniotic fluid embolism	3,110	DS
Cardiac arrest/ventricular fibrillation	4,255	50
Conversion of cardiac rhythm	4,195	35
Disseminated intravascular coagulation	152,700	665
Eclampsia	70,255	340
Heart failure/arrest during surgery or procedure	105,605	565

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Cerebrovascular disorders	20,845	105
Pulmonary edema/acute heart failure	15,845	255
Severe anesthesia complications	11,325	80
Sepsis	23,680	610
Shock	23,130	40
Sickle cell disease with crisis	6,330	113
Air and thrombotic embolism	13,205	95
Hysterectomy	61,005	340
Temporary tracheostomy	895	85
Ventilation	9,840	230

*DS = Data Suppressed per HCUP Data User Agreement with regards to cell size counts <11

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Appendix 4. Association Between Influenza Diagnosis at Delivery Hospitalization and Severe Maternal Morbidity Stratified by Severe Influenza Seasons and Time Period						
	Frequency n (%)		Unadjusted analysis		Adjusted analysis¹	
	No influenza	influenza	RR	95% CI	aRR	95% CI
PRIMARY ANALYSIS						
2000-2018 (overall)	0.7%	2.3%	3.32	3.22, 3.43	2.24	2.17, 2.31
SEVERE INFLUENZA SEASONS						
2009-2010	0.7%	2.4%	3.27	2.86, 3.75	2.19	1.91, 2.51
2012-2013	0.8%	2.3%	2.96	2.53, 3.47	2.05	1.75, 2.40
2014-2015	0.8%	3.1%	3.95	3.47, 4.49	2.78	2.44, 3.16
2017-2018	0.7%	3.9%	5.61	5.01, 6.29	3.60	3.21, 4.04
TIME PERIOD						
2000-2005	0.6%	1.3%	2.24	2.08, 2.40	1.55	1.44, 1.67
2006-2010	0.7%	1.9%	2.87	2.68, 3.06	1.99	1.86, 2.12
2011-2015	0.8%	3.1%	3.87	3.66, 4.09	2.56	2.42, 2.70
2016-2018	0.8%	3.9%	5.18	4.87, 5.52	3.14	2.95, 3.35
¹ Model adjusted by maternal race, age, payer, median income quartile based on ZIP code, mode of delivery, placental abruption/antepartum hemorrhage, hypertension status, multiple gestation, diabetes subtype, obesity, asthma, hospital location/teaching status, hospital region, and year.						

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Appendix 5. Association Between Influenza Diagnosis at Delivery Hospitalization and Severe Maternal Morbidity Using High Fidelity Codes				
	Unadjusted analysis		Adjusted analysis	
	RR	95% CI	aRR	95% CI
PRIMARY OUTCOME				
Severe maternal morbidity (SMM)	6.74	6.42, 7.07	3.98	3.79, 4.18 ¹
SECONDARY OUTCOMES				
Maternal death	33.64	25.95, 43.60	7.37	5.66, 9.59 ²
Influenza-related complications				
Mechanical ventilation/tracheostomy	44.22	38.71, 50.50	8.79	7.68, 10.05 ¹
Sepsis and shock	26.09	23.97, 28.39	8.99	8.25, 9.79 ¹
Acute respiratory distress syndrome¹	40.7	37.80, 43.82	14.86	13.79, 16.03 ¹
Obstetrical complications				
Preterm birth, any	1.42	1.37, 1.47	1.49	1.44, 1.55 ³
Hypertensive disorders of pregnancy	2.32	2.26, 2.38	1.60	1.56, 1.64 ⁴
¹ Model adjusted by maternal race, age, payer, median income quartile based on ZIP code, mode of delivery, placental abruption/antepartum hemorrhage, hypertension status, multiple gestation, diabetes subtype, obesity, asthma, hospital location/teaching status, hospital region, and year. ² Model adjusted for factors listed in Footnote 1 along with severe maternal morbidity and postpartum hemorrhage. ³ Model adjusted for maternal race, age, payer, median income quartile based on ZIP code, placental abruption/antepartum hemorrhage, hypertension status, multiple gestation, obesity, diabetes subtype, asthma, hospital region, and year. ⁴ Model adjusted for maternal race, age, payer, median income quartile based on ZIP code, placental abruption/antepartum hemorrhage, multiple gestation, obesity, diabetes subtype, asthma, hospital region, and year.				

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