

SUPPLEMENTAL MATERIAL

Table S1. Hospitalization and emergency department International Classification of Diseases, Ninth and Tenth Revision, Clinical Modification (ICD-9-CM) and (ICD-10-CM) codes or as reported on birth certificates or death certificates for the exposure, covariates, and outcomes of interest

DIAGNOSIS	ICD-9-CM CODE	ICD-10-CM CODE
Outcome of delivery, birth *	V27, V30, 640-649, 650-659, 660-669	Z37.x
Single liveborn, single live birth *	V27.0, V30.0	Z37.0
Congenital heart disease †	745, 745.5, 746, 746.4, 746.8, 746.87, 746.9, 746.93, 746.99	Q20.x, Q21.x, Q22.x, Q23.x, Q24.x
Diabetes:		
Maternal/Gestational diabetes	250.00-250.92, 648.0, 648.8	E10, E11, O24.3, O24.4, O24.9
Pre-pregnancy and Gestational diabetes (birth certificate)	--	--
Heart failure:		
Hypertensive heart disease with heart failure; Hypertensive heart and chronic kidney disease with heart failure; Congestive heart failure	402.01, 402.11, 402.91, 404.x1, 404.x3, 428	I11.0, I13.0, I13.2, I50.x
Hypertensive disorders of pregnancy (HDP):		
Gestational hypertension; Pre-eclampsia; Eclampsia;	642.3-642.7	O11, O13-O15
Pre-existing hypertension with pre-eclampsia;	--	--
Gestational hypertension (birth certificate)	--	--
Kidney transplant	procedure code: 55.6, V42.0	Z94.0
Peripartum cardiomyopathy	674.5	O93.0
Peripartum death	--	O93.0
Pre-pregnancy hypertension:		
Benign essential hypertension complicating pregnancy, childbirth, and the puerperium; Hypertension secondary to renal disease complicating pregnancy, childbirth, and the puerperium; Other pre-existing hypertension complicating pregnancy, childbirth, and the puerperium; Pre-existing essential hypertension complicating pregnancy, childbirth, and the puerperium, Pre-existing hypertensive heart disease complicating pregnancy, childbirth and the puerperium.	642.0-642.2, 642.9	O10, O16
Pre-pregnancy hypertension (birth certificate)	--	--
Pre-pregnancy hypertension with superimposed HDP: ‡	642.7	O11
Pre-eclampsia or eclampsia superimposed on pre-existing hypertension; Pre-existing hypertension with pre-eclampsia		

* Obtained from the mother's hospitalization/emergency department visit record

† Based on Honigberg *et al.* 2019¹

‡ Also defined by a combination of the above diagnosis codes for hypertensive disorder of pregnancy and pre-pregnancy hypertension.

REFERENCES

1. Honigberg MC, Zekavat SM, Aragam K, et al. Long-Term Cardiovascular Risk in Women With Hypertension During Pregnancy. *J Am Coll Cardiol.* 2019;74(22):2743-2754.

Table S2. Data source(s) and completion of variables included in the models

Characteristic	Data source(s)	Total N=425,649	Non-Hispanic White (NHW) N=250,506	Non-Hispanic Black (NHB) N=134,220	Hispanic N=40,923
		Proportion of complete data			
Sociodemographic					
Age (maternal)	Birth certificate and/or hospitalization	100%	100%	100%	100%
Education	Birth certificate	100%	100%	100%	100%
Median household income per year	Hospitalization/ED visit encounter	97.9%	97.6%	98.9%	96.5%
Payer during pregnancy	Birth certificate	99.3%	99.4%	99.3%	98.2%
Race/ethnicity	Birth certificate and/or hospitalization/ED visit encounter	100%	100%	100%	100%
Rural/urban residence	Hospitalization/ED visit encounter	100%	100%	100%	100%
WIC eligibility during pregnancy	Birth certificate	98.5%	98.6%	98.5%	98.0%
Behavioral					
Smoking during pregnancy	Birth certificate	>99.9%	>99.9%	>99.9%	>99.9%
Clinical					
Change in BMI after delivery *	Birth certificate	99.6%	99.7%	99.5%	99.3%
Gestational age at delivery	Birth certificate	99.9%	>99.9%	99.9%	99.9%
Pre-pregnancy or gestational diabetes	Birth certificate and/or hospitalization/ED visit encounter	100%	100%	100%	100%
Induced labor	Birth certificate	100%	100%	100%	100%
Mode of delivery	Birth certificate	>99.9%	>99.9%	>99.9%	>99.9%
Number of pregnancies prior to index pregnancy	Birth certificate	100%	100%	100%	100%
Pre-pregnancy BMI	Birth certificate	100%	100%	100%	100%
Previous cesarean section ^{b†}	Birth certificate	100%	100%	100%	100%
Previous pre-term delivery	Birth certificate	100%	100%	100%	100%
Prenatal care, measured by R-GINDEX [‡]	Birth certificate	71.6%	77.3%	66.2%	54.5%

BMI, body mass index; ED, emergency department; R-GINDEX, Revised-Graduated Prenatal Care Utilization Index; WIC, Women, Infants, and Children.

* BMI at delivery was missing for 0.4% of women.

[†] Previous cesarean section was reported as unknown on the birth certificate for 53.4% of women. These women were included in the model by including an unknown category for this variable.

[‡] R-GINDEX was not able to be calculated due to missing information for 28.4% of women. These women were included in the model by including a missing category for this variable.

Table S3. Race/ethnic-specific adjusted hazard ratios for fatal and non-fatal heart failure (HF) within 5 years of delivery among women with hypertensive disorders of pregnancy (HDP) and/or pre-pregnancy hypertension (HTN) by exposure group, 2004-2017 *

Incident HF ≤5 years	Non-Hispanic White			Non-Hispanic Black		
	Event	Event Rate (95% CI) †	HR (95% CI) ‡	Event	Event Rate (95% CI) †	HR (95% CI) ‡
Neither pre-pregnancy HTN nor HDP	189	0.18 (0.16-0.21)	referent	244	0.48 (0.42-0.54)	referent
Pre-pregnancy HTN	<5	0.85 (0.27-2.64)	3.16 (1.00-9.95)	<5	0.84 (0.27-2.61)	1.11 (0.36-3.49)
HDP	176	0.96 (0.83-1.11)	4.14 (3.31-5.17)	293	2.28 (2.03-2.56)	3.74 (3.12-4.49)
Both pre-pregnancy HTN and HDP	25	1.22 (0.82-1.80)	4.11 (2.64-6.40)	104	4.30 (3.55-5.22)	4.88 (3.78-6.29)

Abbreviations: CI, confidence interval; HDP, hypertensive disorder of pregnancy; HF, heart failure; HR, hazard ratio; HTN, hypertension.

* p -value=0.3452 for interaction between HDP and pre-pregnancy hypertension and race-ethnic group.

† Per 1,000 person-years.

‡ Adjusted for sociodemographic (maternal age, education, rural/urban residence, median income, payer, Women, Infants, and Children [WIC]), behavioral (smoking during pregnancy), and clinical characteristics (pre-pregnancy body mass index [BMI], change in BMI after delivery, pre-pregnancy or gestational diabetes, gestational age at delivery, mode of delivery, induced labor, number of pregnancies prior to index pregnancy, previous cesarean section, previous pre-term delivery, Revised-Graduated Prenatal Care Utilization Index [R-GINDEX]).

Table S4. Demographic and clinical characteristics of mothers at index pregnancy in South Carolina by race/ethnic group, 2004-2016^{*, †, ‡}

Characteristic	Non-Hispanic White		Non-Hispanic Black		Hispanic		p-value [§]
	N=250,506 (58.9)		N=134,220 (31.5)		N=40,923 (9.6)		
	<i>n</i> (%)	<i>mean</i> ± <i>SD</i>	<i>n</i> (%)	<i>mean</i> ± <i>SD</i>	<i>n</i> (%)	<i>mean</i> ± <i>SD</i>	
Neither pre-preg HTN nor HDP	208,794	(83.3)	102,676	(76.5)	36,460	(89.1)	<0.0001
Pre-pregnancy HTN	708	(0.3)	715	(0.5)	107	(0.3)	
HDP	36,873	(14.7)	25,924	(19.3)	4036	(9.9)	
Both pre-preg HTN and HDP	4,131	(1.6)	4,905	(3.7)	320	(0.8)	
Maternal age at delivery, y	27.9	±5.9	25.9	±6.0	27.1	±6.0	<0.0001
<20	19,367	(7.7)	19,017	(14.2)	4,283	(10.5)	<0.0001
20-24	57,940	(23.1)	44,201	(32.9)	10,978	(26.8)	
25-29	74,010	(29.5)	35,091	(26.1)	11,887	(29.0)	
30-34	63,121	(25.2)	22,539	(16.8)	8,578	(21.0)	
35-39	29,641	(11.8)	10,711	(8.0)	4,208	(10.3)	
40+	6,427	(2.6)	2,661	(2.0)	989	(2.4)	
Education							
Less than HS	29,360	(11.7)	25,058	(18.7)	22,412	(54.8)	<0.0001
HS graduate	54,521	(21.8)	41,815	(31.2)	8,216	(20.1)	
Some college	61,958	(24.7)	41,411	(30.9)	5,142	(12.6)	
≥College graduate	104,667	(41.8)	25,936	(19.3)	5,153	(12.6)	
Urban/rural (based on RUCA by zipcode of residence)							
Urban	194,763	(77.7)	89,007	(66.3)	29,985	(73.3)	<0.0001
Rural	55,743	(22.3)	45,213	(33.7)	10,938	(26.7)	
Annual household income							
<\$36,000	45,936	(18.3)	59,624	(44.4)	9,672	(23.6)	<0.0001
\$36,000 to <\$54,000	128,925	(51.5)	52,323	(39.0)	19,525	(47.7)	
≥\$54,000	69,622	(27.8)	20,754	(15.5)	10,276	(25.1)	
Primary payer during pregnancy							
Medicaid	94,941	(37.9)	92,495	(68.9)	17,528	(42.8)	<0.0001
Private	130,673	(52.2)	33,230	(24.8)	6,039	(14.8)	
Self-pay	6,446	(2.6)	2,386	(1.8)	13,733	(33.6)	
Other	16,950	(6.8)	5,166	(3.8)	2,880	(7.0)	
WIC eligibility during pregnancy	92,516	(36.9)	99,691	(74.3)	26,318	(64.3)	<0.0001
Pre-pregnancy smoking	50,144	(20.0)	12,863	(9.6)	1,548	(3.8)	<0.0001
Smoking during pregnancy	38,989	(15.6)	9,485	(7.1)	930	(2.3)	<0.0001
Pre-pregnancy BMI (kg/m ²)	26.3	±6.4	29.1	±7.4	26.7	±5.5	<0.0001
Change in BMI at delivery	5.2	±2.8	4.3	±3.2	4.6	±2.9	<0.0001
Gestational age at delivery	38.6	±1.8	38.2	±2.3	38.7	±1.8	<0.0001
<28 weeks	761	(0.3)	1,418	(1.1)	145	(0.4)	<0.0001
28 to <34 weeks	3,607	(1.4)	4,012	(3.0)	552	(1.3)	
34 to <37 weeks	15,897	(6.3)	10,881	(8.1)	2,337	(5.7)	
≥37 weeks	230,125	(91.9)	117,808	(87.8)	37,861	(92.5)	
Mode of delivery							
Cesarean section	84,855	(33.9)	47,986	(35.8)	12,009	(29.3)	<0.0001
Vaginal	165,644	(66.1)	86,230	(64.2)	28,913	(70.7)	
Induced labor	39,640	(15.8)	18,470	(13.8)	4,149	(10.1)	<0.0001
No. of pregnancies prior to index pregnancy	0.7	±1.0	0.9	±1.1	1.1	±1.2	<0.0001
Previous cesarean section							
Yes	12,869	(5.1)	7,953	(5.9)	2,740	(6.7)	<0.0001
No	104,415	(41.7)	54,585	(40.7)	15,670	(38.3)	
Unknown	133,222	(53.2)	71,682	(53.4)	22,513	(55.0)	

Characteristic	Non-Hispanic White	Non-Hispanic Black	Hispanic	p-value [§]
	N=250,506 (58.9) <i>n (%)</i> , mean ±SD	N=134,220 (31.5) <i>n (%)</i> , mean ±SD	N=40,923 (9.6) <i>n (%)</i> , mean ±SD	
Previous preterm birth	5,429 (2.2)	4,746 (3.5)	941 (2.3)	<0.0001
Prenatal care, measured by R-GINDEX				
Inadequate	45,720 (18.3)	21,562 (16.1)	7,629 (18.6)	<0.0001
Intermediate	65,365 (26.1)	24,741 (18.4)	6,207 (15.2)	
Adequate	4,385 (1.8)	2,118 (1.6)	409 (1.0)	
Intensive	76,850 (30.7)	38,912 (29.0)	7,178 (17.5)	
No care	1,285 (0.5)	1,481 (1.1)	884 (2.2)	
Missing	56,901 (22.7)	45,406 (33.8)	18,616 (45.5)	
Pre-pregnancy or gestational diabetes	15,596 (6.2)	9,486 (7.1)	2,917 (7.1)	<0.0001

Abbreviations: BMI, body mass index; HDP, Hypertensive disorders of pregnancy; HS, high school; HTN, hypertension; no., number; pre-preg, pre-pregnancy; R-GINDEX, Revised-Graduated Prenatal Care Utilization Index; RUCA, Rural-Urban Commuting Area; SD, standard deviation; WIC, Women, Infants, and Children; y, years.

* Data includes person-level diagnostic codes at time of discharge or birth certificate. Hypertensive disorders of pregnancy (HDP) were defined as pre-eclampsia, eclampsia, or gestational hypertension (ICD-9/10-CM: 642.3-642.7; O11, O13-O15) or based on hospitalization/emergency department (ED) visit data, or gestational hypertension as reported on the birth certificate. Pre-pregnancy hypertension was based on hospitalization/ED visit data (ICD-9/10-CM: 642.0-642.2, 642.9; O10, O16) or birth certificates. Pre-pregnancy hypertension with superimposed HDP was based on hospitalization/ED visit data (ICD-9/10-CM: 642.7; O11) or a combination of the above diagnosis codes for HDP and pre-pregnancy hypertension.

† Pre-pregnancy diabetes, gestational diabetes, pre-pregnancy BMI, BMI at delivery, pre-pregnancy smoking, smoking during pregnancy, and primary payer during pregnancy were available from the birth certificate.

‡ Variables with >0.1% missing data included: annual household income, n=8,992; prenatal care as measured by R-GINDEX, n=120,923; primary payer, n=3,182; and WIC eligibility in pregnancy, n=6,449.

§ Characteristics are compared by race/ethnic group using p-values calculated by chi-square tests for categorical variables and analysis of variance (ANOVA) for continuous variables.