

Table 1
Perinatal mortality rates by chronic hypertension among non-malformed singleton births:
United States, 2015-2018

Perinatal mortality	Perinatal mortality: Number (Rate per 1000 births)		
	Total births (n=15,090,678)	Normotensive (n=14,816,553)	Chronic hypertension (n=274,125)
Perinatal mortality	127,355 (8.4)	121,199 (8.2)	6156 (22.5)
Stillbirth	82,438 (5.5)	78,037 (5.3)	4401 (16.1)
Neonatal mortality	44,917 (3.0)	43,162 (2.9)	1755 (6.4)
Early neonatal mortality	34,620 (2.3)	33,346 (2.3)	1274 (4.6)
Late neonatal mortality	10,297 (0.7)	9816 (0.7)	481 (1.8)

Table 2
Risk of perinatal mortality in relation to chronic hypertension among singleton births: United States, 2015-2018

Perinatal mortality	Risk difference (95% confidence interval) for mortality		Risk ratio (95% confidence interval) for mortality		
	Unadjusted	Adjusted	Unadjusted	Adjusted	Bias-corrected
Perinatal mortality	14.3 (13.7, 14.8)	11.0 (10.5, 11.5)	2.75 (2.68, 2.82)	2.05 (2.00, 2.10)	4.86 (3.42, 5.98)
Stillbirth	10.8 (10.3, 11.3)	7.7 (7.2, 8.3)	3.05 (2.96, 3.14)	1.86 (1.81, 1.92)	7.76 (4.52, 11.12)
Neonatal mortality	3.5 (3.2, 3.8)	2.8 (2.6, 3.1)	2.20 (2.10, 2.30)	1.86 (1.78, 1.96)	2.54 (1.78, 3.13)
Early neonatal mortality	2.4 (2.1, 2.7)	1.9 (1.6, 2.1)	2.07 (1.95, 2.18)	1.74 (1.65, 1.84)	2.20 (1.54, 2.71)
Late neonatal mortality	1.1 (0.9, 1.3)	1.0 (0.8, 1.1)	2.66 (2.40, 2.91)	2.29 (2.09, 2.52)	6.54 (4.57, 8.18)

Risk difference is expressed per 1000 births

Risk difference and risk ratios are adjusted for maternal age, parity, education, race/ethnicity, pre-pregnancy smoking, smoking during pregnancy, pre-pregnancy body-mass index and year of delivery, and are based on multiple imputation analysis

Bias corrected risk ratios refer to multiple probabilistic bias-corrected risk ratio, following simultaneous corrections for exposure (chronic hypertension) misclassification and unmeasured confounding biases

Table 3
Causal mediation analysis to estimate the impact of preterm delivery (<37 weeks) on the association between chronic hypertension and perinatal mortality among singleton births: United States, 2015-2018

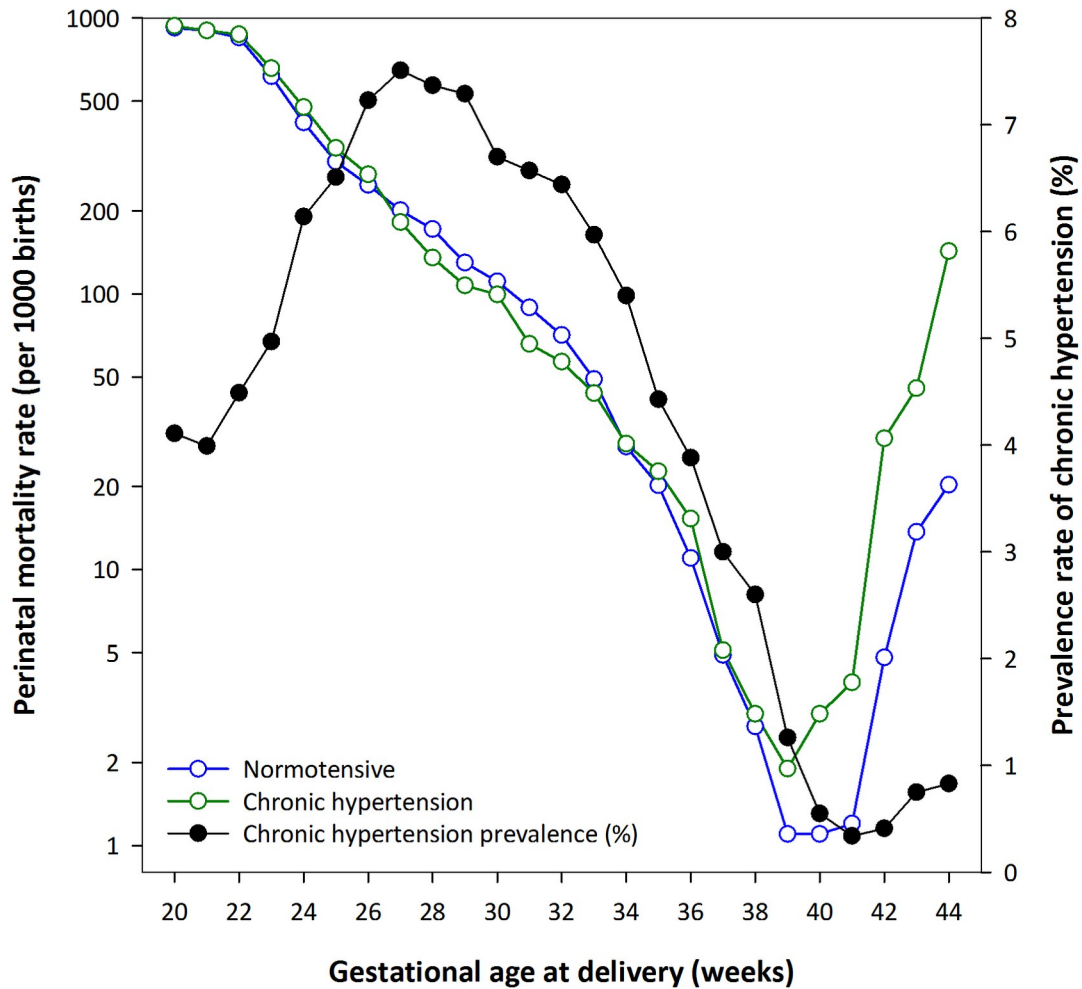
Perinatal mortality	Risk ratio (95% confidence interval) for mortality				Percent (95% confidence interval)	
	Total effect	Controlled direct effect	Natural direct effect	Natural indirect effect	Mediated	Eliminated
Perinatal mortality	1.93 (1.87, 1.99)	1.12 (1.09, 1.15)	1.07 (1.04, 1.12)	1.85 (1.82, 1.88)	92 (88, 96)	87 (84, 90)
Intrauterine fetal demise	2.12 (2.03, 2.20)	1.15 (1.11, 1.20)	1.17 (1.12, 1.22)	1.95 (1.91, 1.99)	85 (82, 89)	86 (83, 90)
Neonatal mortality	1.60 (1.52, 1.70)	1.08 (1.02, 1.13)	0.93 (0.88, 0.99)	1.67 (1.63, 1.71)	— ^a	— ^a
Early neonatal mortality	1.50 (1.41, 1.62)	1.02 (0.97, 1.08)	0.82 (0.76, 0.90)	1.68 (1.63, 1.73)	— ^a	— ^a
Late neonatal mortality	1.89 (1.70, 1.11)	1.23 (1.09, 1.40)	1.26 (1.11, 1.43)	1.63 (1.55, 1.72)	71 (60, 85)	74 (59, 89)

Risk ratios are adjusted for maternal age, parity, education, race/ethnicity, pre-pregnancy smoking, smoking during pregnancy, pre-pregnancy body-mass index and year of delivery

All 95% confidence interval estimates are based on bootstrap resampling (1000 replications)

^aPercent mediated and percent eliminated are not shown since risk ratio estimates for natural direct effect and natural indirect effects are on the opposite sides of the null

Figure: 1
Gestational age-specific risk of perinatal mortality (per 1,000 births) among normotensive and chronic hypertensive pregnancies in US, between 2015-2018.



Legend: We recognize the potential for a collider bias in this graphical presentation, but it is purely for descriptive purposes to guide the causal mediation analysis.