

Appendix**Supplemental Table 1**

Distribution of pollutant concentrations by exposure windows

Pollutants	3 months' preconception			Trimester 1			Trimester 2			Whole pregnancy		
	Min	Max	IQR	Min	Max	IQR	Min	Max	IQR	Min	Max	IQR
CO (ppm)	0.17	1.13	0.26	0.18	1.10	0.26	0.18	1.10	0.26	0.22	1.05	0.21
NO _x (ppb)	5.09	92.97	28.51	5.51	89.62	30.21	5.77	90.65	30.27	6.39	81.64	24.20
O ₃ (ppb)	7.55	49.37	12.30	8.11	48.73	12.32	9.13	49.53	11.96	13.39	46.38	7.83
PM ₁₀ (μg/m ³)	10.26	39.44	6.29	10.29	39.24	6.32	10.14	41.90	6.36	10.73	39.80	4.42
PM _{2.5} (μg/m ³)	4.60	22.04	5.52	4.63	22.00	5.28	4.64	21.98	4.97	5.74	19.65	4.69
SO ₂ (ppb)	0.80	21.00	3.29	0.81	18.66	3.30	0.80	18.99	3.10	0.97	15.83	2.89

Supplemental Table 2

Spearman's correlation coefficients between pollutants over the whole pregnancy

	CO	NO _x	O ₃	PM ₁₀	PM _{2.5}	SO ₂
CO	1					
NO _x	0.60	1.00				
O ₃	-0.25	-0.37	1.00			
PM ₁₀	0.06	0.22	-0.15	1.00		
PM _{2.5}	0.23	0.44	-0.66	0.35	1.00	
SO ₂	0.10	0.15	-0.44	-0.19	0.62	1.00

Supplemental Table 3Associations between criteria air pollutants and neonatal respiratory outcomes among all births ($n = 233,375$)

Exposure windows	Pollutants	TTN [†] ($n = 8007$) (RR, 95% CI)	Asphyxia [†] ($n = 590$) (RR, 95% CI)	RDS [†] ($n = 7325$) (RR, 95% CI)
3 months' preconception	CO	0.96 (0.91, 1.02)	1.15 (0.83, 1.58)	0.73 (0.68, 0.78)
	NO _x	1.06 (0.97, 1.16)	1.22 (0.74, 1.99)	1.39 (1.25, 1.54)*
	O ₃	0.97 (0.91, 1.04)	1.76 (1.25, 2.48)*	1.09 (1.01, 1.18)*
	PM ₁₀	1.10 (1.04, 1.17)*	0.77 (0.67, 0.89)	1.02 (0.96, 1.09)
	PM _{2.5}	1.01 (0.94, 1.10)	1.80 (0.96, 3.35)	0.83 (0.76, 0.91)
	SO ₂	0.84 (0.79, 0.90)	0.47 (0.30, 0.74)	0.76 (0.71, 0.82)
Trimester 1	CO	0.97 (0.91, 1.03)	1.15 (0.83, 1.58)	0.72 (0.68, 0.78)
	NO _x	1.09 (1.00, 1.20)	1.22 (0.70, 1.60)	1.42 (1.27, 1.58)*
	O ₃	0.98 (0.91, 1.06)	1.72 (1.32, 2.24)*	1.21 (1.12, 1.31)*
	PM ₁₀	1.09 (1.03, 1.16)*	0.65 (0.52, 0.82)	1.00 (0.93, 1.06)
	PM _{2.5}	1.01 (0.93, 1.09)	1.48 (1.09, 2.03)*	0.95 (0.87, 1.03)
	SO ₂	0.81 (0.76, 0.86)	0.61 (0.46, 0.81)	0.73 (0.68, 0.78)
Trimester 2	CO	1.05 (0.99, 1.12)	1.32 (1.04, 1.67)*	0.74 (0.69, 0.79)
	NO _x	1.06 (0.97, 1.17)	0.83 (0.55, 1.26)	1.33 (1.19, 1.49)*
	O ₃	0.94 (0.87, 1.01)	1.34 (1.03, 1.75)*	1.13 (1.04, 1.22)*
	PM ₁₀	1.04 (0.99, 1.11)	0.71 (0.56, 0.91)	1.06 (0.99, 1.13)
	PM _{2.5}	1.01 (0.93, 1.09)	1.20 (0.86, 1.67)	0.90 (0.82, 0.97)
	SO ₂	0.80 (0.75, 0.85)	0.68 (0.52, 0.89)	0.75 (0.70, 0.81)
Whole pregnancy	CO	1.10 (1.04, 1.16)*	1.28 (1.02, 1.61)*	0.75 (0.70, 0.80)
	NO _x	1.01 (0.93, 1.10)	1.09 (0.73, 1.64)	1.40 (1.25, 1.56)*
	O ₃	0.97 (0.89, 1.05)	1.73 (1.24, 2.42)*	1.16 (1.05, 1.29)*
	PM ₁₀	1.01 (0.95, 1.07)	0.71 (0.57, 0.90)	1.02 (0.95, 1.09)
	PM _{2.5}	1.17 (1.05, 1.30)*	1.84 (1.17, 2.90)*	0.89 (0.79, 1.01)
	SO ₂	0.72 (0.67, 0.78)	0.47 (0.30, 0.68)	0.74 (0.69, 0.81)

Bold text indicates statistical significance.

* Indicates a significant increase in risk of the neonatal respiratory outcomes.

[†] Multipollutant model adjusted for region, marital status, parity, maternal age, maternal race, caesarean delivery, type of insurance, maternal BMI, smoking/alcohol, comorbidities (HIV, hypertension, diabetes, thyroid disease), season of conception, and asthma.**Supplemental Table 4**Associations between criteria air pollutants and neonatal respiratory outcomes among term births ($n = 197,255$)

Exposure windows	Pollutants	TTN [†] ($n = 5211$) (RR, 95% CI)	Asphyxia [†] ($n = 322$) (RR, 95% CI)	RDS [†] ($n = 1266$) (RR, 95% CI)
3 months' Preconception	CO	0.98 (0.91, 1.05)	1.38 (1.00, 1.91)	0.54 (0.45, 0.64)
	NO _x	1.03 (0.92, 1.15)	0.80 (0.45, 1.41)	1.96 (1.46, 2.63)*
	O ₃	0.97 (0.89, 1.06)	1.57 (1.15, 2.14)*	1.32 (1.07, 1.61)*
	PM ₁₀	1.12 (1.04, 1.20)*	0.77 (0.56, 1.04)	0.81 (0.69, 0.96)
	PM _{2.5}	1.06 (0.96, 1.17)	0.97 (0.60, 1.56)	1.06 (0.85, 1.32)
	SO ₂	0.89 (0.82, 0.95)	0.92 (0.66, 1.30)	0.75 (0.62, 0.91)
Trimester 1	CO	1.00 (0.93, 1.08)	1.28 (0.90, 1.83)	0.52 (0.44, 0.63)
	NO _x	1.07 (0.95, 1.21)	0.80 (0.44, 1.46)	1.99 (1.47, 2.68)*
	O ₃	1.00 (0.92, 1.10)	2.21 (1.52, 3.21)*	1.38 (1.14, 1.67)*
	PM ₁₀	1.11 (1.02, 1.19)*	0.67 (0.49, 0.92)	0.82 (0.69, 0.96)
	PM _{2.5}	1.04 (0.94, 1.14)	1.68 (1.11, 2.55)*	1.12 (0.91, 1.37)
	SO ₂	0.83 (0.77, 0.89)	0.65 (0.43, 0.99)	0.69 (0.58, 0.82)
Trimester 2	CO	1.12 (1.04, 1.21)*	1.59 (1.12, 2.24)*	0.54 (0.45, 0.66)
	NO _x	1.04 (0.92, 1.17)	0.72 (0.40, 1.30)	1.82 (1.33, 2.49)*
	O ₃	0.97 (0.88, 1.06)	1.45 (1.01, 2.07)*	1.22 (1.00, 1.49)
	PM ₁₀	1.07 (0.99, 1.15)	0.69 (0.50, 0.95)	0.81 (0.69, 0.95)
	PM _{2.5}	1.05 (0.95, 1.16)	1.10 (0.71, 1.70)	1.10 (0.90, 1.34)
	SO ₂	0.80 (0.74, 0.86)	0.67 (0.45, 1.00)	0.74 (0.62, 0.89)
Whole pregnancy	CO	1.17 (1.09, 1.25)*	1.41 (1.00, 1.99)	0.54 (0.45, 0.65)
	NO _x	1.00 (0.89, 1.12)	1.00 (0.54, 1.82)	1.82 (1.35, 2.44)*
	O ₃	1.06 (0.96, 1.17)	2.97 (1.83, 4.85)*	1.32 (1.05, 1.65)*
	PM ₁₀	1.04 (0.96, 1.12)	0.93 (0.68, 1.27)	0.85 (0.71, 1.01)
	PM _{2.5}	1.29 (1.13, 1.47)*	1.93 (1.06, 3.54)*	1.23 (0.93, 1.64)
	SO ₂	0.70 (0.63, 0.76)	0.56 (0.35, 0.89)	0.70 (0.56, 0.86)

Bold text indicates statistical significance.

* Indicates a significant increase in risk of the neonatal respiratory outcomes.

[†] Multipollutant model adjusted for region, marital status, parity, maternal age, maternal race, caesarean delivery, type of insurance, maternal BMI, smoking/alcohol, comorbidities (HIV, hypertension, diabetes, thyroid disease), season of conception, and asthma. Relative risks are estimated for an IQR increase in pollutants.

Supplemental Table 5Associations between criteria air pollutants and neonatal respiratory outcomes with adjustment for pregnancy complications ($n = 233,375$)

Exposure windows	Pollutants	TTN [†] ($n = 8007$) (RR, 95% CI)	Asphyxia [†] ($n = 590$) (RR, 95% CI)	RDS [†] ($n = 7325$) (RR, 95% CI)
3 months' preconception	CO	0.96 (0.91, 1.02)	1.22 (0.94, 1.57)	0.73 (0.68, 0.78)
	NO _x	1.06 (0.97, 1.16)	0.92 (0.62, 1.38)	1.37 (1.23, 1.52)*
	O ₃	0.97 (0.90, 1.04)	1.48 (1.14, 1.91)*	1.08 (0.99, 1.17)
	PM ₁₀	1.11 (1.05, 1.18)*	0.70 (0.56, 0.89)	1.05 (0.98, 1.12)
	PM _{2.5}	1.01 (0.93, 1.10)	1.19 (0.84, 1.69)	0.82 (0.75, 0.90)
	SO ₂	0.83 (0.78, 0.89)	0.75 (0.56, 1.02)	0.74 (0.69, 0.80)
Trimester 1	CO	0.97 (0.91, 1.03)	1.16 (0.89, 1.50)	0.73 (0.68, 0.78)
	NO _x	1.09 (0.99, 1.20)	0.98 (0.64, 1.52)	1.40 (1.25, 1.56)*
	O ₃	0.98 (0.91, 1.05)	1.83 (1.40, 2.39)*	1.19 (1.10, 1.28)*
	PM ₁₀	1.10 (1.03, 1.17)*	0.66 (0.52, 0.83)	1.01 (0.95, 1.08)
	PM _{2.5}	1.01 (0.93, 1.09)	1.52 (1.11, 2.09)*	0.94 (0.87, 1.03)
	SO ₂	0.81 (0.76, 0.86)	0.61 (0.45, 0.82)	0.71 (0.66, 0.77)
Trimester 2	CO	1.05 (0.99, 1.12)	1.37 (1.07, 1.76)*	0.74 (0.69, 0.79)
	NO _x	1.07 (0.97, 1.17)	0.8 (0.52, 1.23)	1.32 (1.18, 1.47)*
	O ₃	0.94 (0.87, 1.01)	1.33 (1.01, 1.74)*	1.11 (1.03, 1.21)*
	PM ₁₀	1.05 (0.99, 1.11)	0.71 (0.55, 0.92)	1.08 (1.01, 1.15)*
	PM _{2.5}	1.00 (0.93, 1.08)	1.21 (0.86, 1.71)	0.88 (0.81, 0.96)
	SO ₂	0.79 (0.74, 0.84)	0.67 (0.51, 0.89)	0.73 (0.68, 0.78)
Whole pregnancy	CO	1.10 (1.04, 1.16)*	1.33 (1.05, 1.68)*	0.76 (0.71, 0.81)
	NO _x	1.01 (0.93, 1.10)	1.05 (0.69, 1.59)	1.38 (1.24, 1.53)*
	O ₃	0.97 (0.89, 1.05)	1.82 (1.29, 2.55)*	1.15 (1.04, 1.27)*
	PM ₁₀	1.01 (0.95, 1.07)	0.73 (0.58, 0.92)	1.04 (0.96, 1.11)
	PM _{2.5}	1.17 (1.05, 1.29)*	1.91 (1.20, 3.03)*	0.89 (0.78, 1.00)
	SO ₂	0.71 (0.66, 0.77)	0.50 (0.36, 0.68)	0.72 (0.66, 0.78)

Bold text indicates statistical significance.

* Indicates a significant increase in risk of the neonatal respiratory outcomes.

† Multipollutant model adjusted for region, marital status, parity, maternal age, maternal race, caesarean delivery, type of insurance, maternal BMI, smoking/alcohol, comorbidities (HIV, hypertension, diabetes, thyroid disease), season of conception, asthma, gestational diabetes mellitus (GDM), and hypertension (gestational hypertension, preeclampsia, and eclampsia). Relative risks are estimated for an IQR increase in pollutants.

Supplemental Table 6Associations between criteria air pollutants and neonatal respiratory outcomes with the Benjamini-Hochberg adjusted p -values ($n = 233,375$)

		TTN [†] ($n = 8007$) (RR, 95% CI)	FDR	Asphyxia [†] ($n = 590$) (RR, 95% CI)	FDR	RDS [†] ($n = 7325$) (RR, 95% CI)	FDR
3 months' preconception	CO	0.96 (0.91, 1.02)	<.0001	1.14 (0.89, 1.46)	0.015	0.73 (0.68, 0.78)	<.0001
	NO _x	1.06 (0.97, 1.16)	<.0001	0.94 (0.63, 1.4)	<.0001	1.39 (1.25, 1.54)*	<.0001
	O ₃	0.97 (0.91, 1.04)	<.0001	1.43 (1.11, 1.84)*	<.0001	1.09 (1.01, 1.18)*	0.6737
	PM ₁₀	1.10 (1.04, 1.17)*	<.0001	0.72 (0.57, 0.90)	0.0527	1.02 (0.96, 1.09)	<.0001
	PM _{2.5}	1.01 (0.94, 1.1)	<.0001	1.19 (0.84, 1.68)	<.0001	0.83 (0.76, 0.91)	<.0001
	SO ₂	0.84 (0.79, 0.90)	0.0716	0.73 (0.55, 0.99)	<.0001	0.76 (0.71, 0.82)	<.0001
Trimester 1	CO	0.97 (0.91, 1.03)	<.0001	1.11 (0.87, 1.42)	0.07	0.72 (0.67, 0.77)	<.0001
	NO _x	1.09 (1.00, 1.2)	<.0001	1.06 (0.70, 1.60)	<.0001	1.42 (1.27, 1.58)*	<.0001
	O ₃	0.98 (0.91, 1.06)	<.0001	1.72 (1.32, 2.24)*	<.0001	1.21 (1.12, 1.30)*	<.0001
	PM ₁₀	1.09 (1.03, 1.16)*	0.083	0.65 (0.52, 0.82)	0.0835	1 (0.93, 1.06)	0.0173
	PM _{2.5}	1.01 (0.93, 1.09)	<.0001	1.48 (1.09, 2.03)*	<.0001	0.95 (0.87, 1.03)	<.0001
	SO ₂	0.81 (0.76, 0.86)	0.3729	0.61 (0.46, 0.81)	<.0001	0.73 (0.68, 0.78)	<.0001
Trimester 2	CO	1.06 (0.99, 1.12)	<.0001	1.32 (1.04, 1.67)*	0.281	0.73 (0.68, 0.79)	<.0001
	NO _x	1.06 (0.97, 1.17)	<.0001	0.83 (0.55, 1.26)	<.0001	1.33 (1.19, 1.49)*	<.0001
	O ₃	0.94 (0.87, 1.01)	<.0001	1.34 (1.03, 1.75)*	<.0001	1.13 (1.04, 1.22)*	<.0001
	PM ₁₀	1.04 (0.99, 1.11)	0.0106	0.71 (0.56, 0.91)	0.056	1.06 (0.99, 1.13)	0.0273
	PM _{2.5}	1.01 (0.93, 1.09)	<.0001	1.2 (0.86, 1.67)	<.0001	0.90 (0.82, 0.97)	<.0001
	SO ₂	0.80 (0.75, 0.85)	0.0137	0.68 (0.52, 0.89)	<.0001	0.75 (0.70, 0.81)	<.0001
Whole pregnancy	CO	1.10 (1.04, 1.16)*	<.0001	1.28 (1.02, 1.61)*	0.103	0.75 (0.70, 0.80)	<.0001
	NO _x	1.01 (0.93, 1.1)	<.0001	1.09 (0.73, 1.64)	<.0001	1.40 (1.26, 1.56)*	<.0001
	O ₃	0.97 (0.89, 1.05)	<.0001	1.73 (1.24, 2.42)*	<.0001	1.16 (1.05, 1.29)*	<.0001
	PM ₁₀	1.01 (0.95, 1.07)	0.0012	0.71 (0.57, 0.9)	0.0631	1.02 (0.95, 1.09)	0.9384
	PM _{2.5}	1.17 (1.05, 1.30)*	<.0001	1.84 (1.17, 2.9)*	<.0001	0.89 (0.79, 1.01)	<.0001
	SO ₂	0.72 (0.67, 0.77)	0.0208	0.5 (0.37, 0.68)*	<.0001	0.74 (0.69, 0.81)	<.0001

Bolded-italics indicate when the relative risks remain significant after the Benjamini-Hochberg procedure.

Bold text indicates statistical significance.

* Indicates when the increased risks remain significant after the Benjamini-Hochberg procedure.

† Multipollutant model adjusted for region, marital status, parity, maternal age, maternal race, caesarean delivery, type of insurance, maternal BMI, smoking/alcohol, comorbidities (HIV, hypertension, diabetes, thyroid disease), season of conception, and asthma.

Supplemental Table 7

Associations between whole-pregnancy exposures criteria air pollutants and neonatal respiratory outcomes

Gestational age categories	Pollutants	TTN (<i>n</i> = 8007) [†] (RR, 95% CI)	Asphyxia (<i>n</i> = 590) [†] (RR, 95% CI)	RDS (<i>n</i> = 7328) [†] (RR, 95% CI)
Early preterm (gestational weeks 23–34)		(<i>n</i> = 1467, 18.3%)	(<i>n</i> = 187, 31.7%)	(<i>n</i> = 5027, 68.6%)
	CO	1.04 (0.98, 1.10)	1.25 (0.99, 1.58)	0.71 (0.66, 0.76)
	NO _x	1.07 (0.97, 1.18)	0.99 (0.64, 1.51)	1.45 (1.29, 1.62)*
	O ₃	0.99 (0.91, 1.07)	1.72 (1.32, 2.26)*	1.24 (1.14, 1.34)*
	PM ₁₀	1.05 (0.99, 1.11)	0.69 (0.55, 0.87)	1.06 (0.99, 1.13)
	PM _{2.5}	1.08 (0.99, 1.18)	1.65 (1.10, 2.47)*	0.90 (0.81, 0.99)
Preterm and early term (gestational weeks 35–38)		(<i>n</i> = 3374, 42.1%)	(<i>n</i> = 212, 35.9%)	(<i>n</i> = 1678, 22.9%)
	CO	1.11 (1.04, 1.18)*	1.44 (1.09, 1.91)*	0.66 (0.58, 0.75)
	NO _x	1.02 (0.93, 1.13)	1.08 (0.66, 1.78)	1.55 (1.27, 1.90)*
	O ₃	1.03 (0.94, 1.12)	2.42 (1.63, 3.61)*	1.28 (1.11, 1.49)*
	PM ₁₀	1.05 (0.99, 1.13)	0.84 (0.64, 1.10)	1.00 (0.89, 1.13)
	PM _{2.5}	1.14 (1.02, 1.28)*	1.66 (0.99, 2.77)	1.02 (0.84, 1.24)
Term (gestational weeks 38–42)		(<i>n</i> = 3166, 39.5%)	(<i>n</i> = 191, 32.4%)	(<i>n</i> = 623, 8.5%)
	CO	1.18 (1.07, 1.29)*	N/A [‡]	0.58 (0.43, 0.77)
	NO _x	0.96 (0.83, 1.12)	N/A [‡]	1.94 (1.26, 3.00)*
	O ₃	1.02 (0.89, 1.18)	N/A [‡]	1.13 (0.79, 1.61)
	PM ₁₀	1.14 (1.03, 1.27)*	N/A [‡]	0.62 (0.45, 0.84)
	PM _{2.5}	1.19 (1.00, 1.43)	N/A [‡]	1.40 (0.88, 2.23)
	SO ₂	0.68 (0.60, 0.78)	N/A [‡]	0.48 (0.34, 0.69)

Whole pregnancy length was truncated among ongoing pregnancy during each window to ensure equal length of exposure.

Bold text indicates statistical significance.

* Indicates a significant increase in risk of the neonatal respiratory outcomes.

† Multipollutant model adjusted for region, marital status, parity, maternal age, maternal race, caesarean delivery, type of insurance, maternal BMI, smoking/alcohol, comorbidities (HIV, hypertension, diabetes, thyroid disease), season of conception, and asthma. Relative risks are estimated for an IQR increase in pollutants.

‡ Term asphyxia was not assessed due to an insufficient number of cases.