

Supplemental Material for “Prenatal exposure to persistent and non-persistent chemical mixtures and associations with adverse birth outcomes in the Atlanta African American Maternal-Child Cohort”

Authors: Stephanie M. Eick¹, Youran Tan¹, Kaitlin R. Taib¹, P. Barry Ryan¹, Dana Boyd Barr¹, Anke Hüls^{1,2}, Jasmin A. Eatman¹, Parinya Panuwet¹, Priya E. D'Souza¹, Volha Yakimavets¹, Grace E. Lee¹, Patricia A. Brennan³, Elizabeth J. Corwin⁴, Anne L. Dunlop⁵, Donghai Liang¹

Affiliations:

¹Gangarosa Department of Environmental Health, Rollins School of Public Health, Emory University, Atlanta, GA, USA

²Department of Epidemiology, Rollins School of Public Health, Emory University, Atlanta, GA, USA

³Department of Psychology, Emory University, Atlanta, GA, USA

⁴School of Nursing, Columbia University, New York City, NY, USA

⁵Department of Gynecology and Obstetrics, School of Medicine, Emory University, Atlanta, GA, USA

Figure S1. Directed Acyclic Graph (DAG) for the associations between persistent and non-persistent chemicals and adverse pregnancy outcomes in the Atlanta African American Maternal-Child cohort.

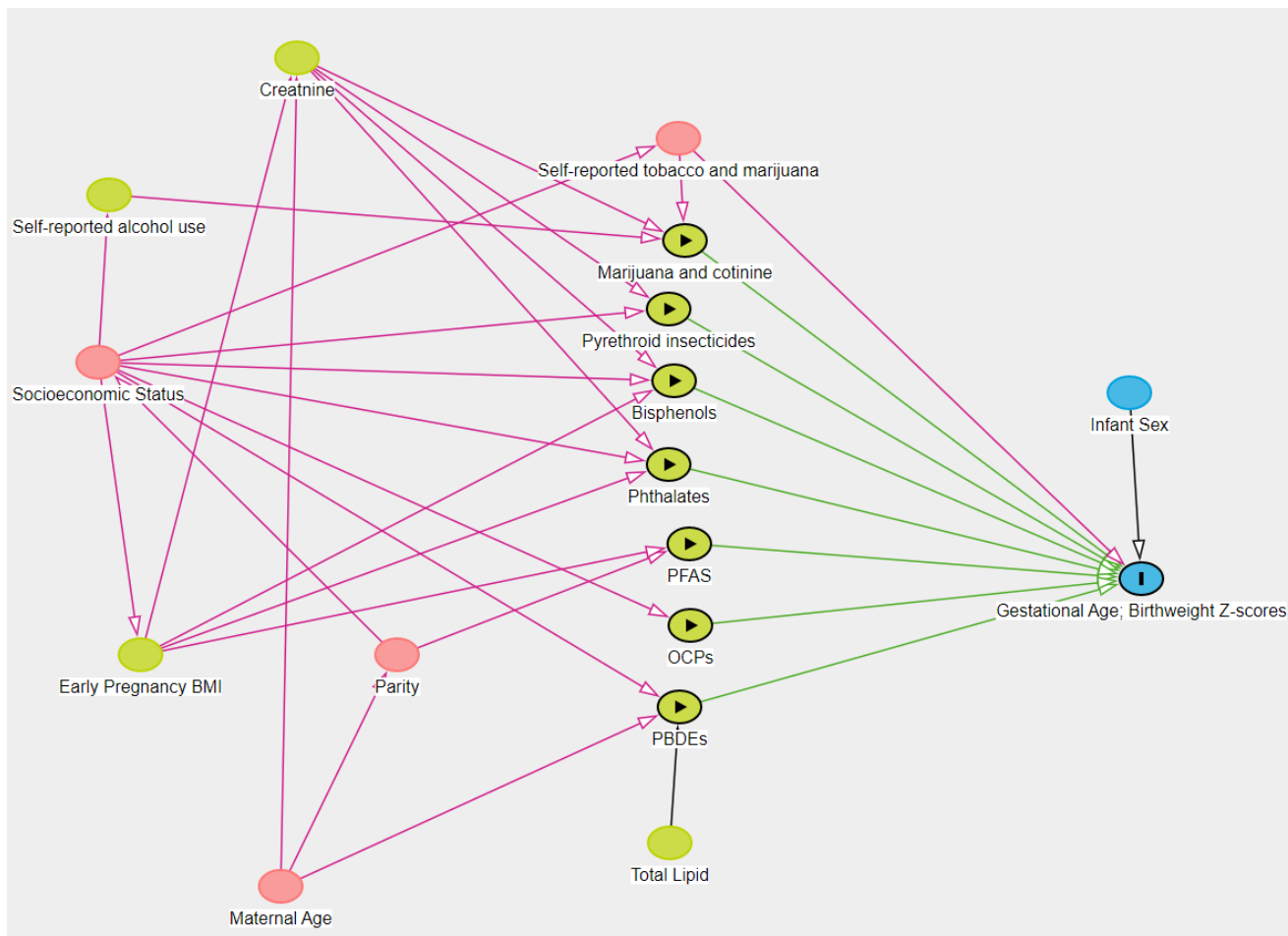


Table S1. Distribution of first trimester serum levels of environmental chemicals in the Atlanta African American Maternal-Child study population among the analytic sample retained in mixture models, 2016-2020.

	N	%Above LOD	Geometric Mean (Geometric SD)	5	25	Percentiles		
						50	75	95
Per-and polyfluoroalkyl substances (ng/mL)								
PFHxS	86	87.21	0.58 (2.21)	0.14	0.34	0.63	0.97	1.93
PFOS	86	95.35	1.48 (2.19)	0.37	1.14	1.72	2.32	4.52
PFOA	86	96.51	0.67 (2.45)	0.09	0.51	0.78	1.22	1.82
PFNA	86	94.19	0.31 (1.80)	0.08	0.24	0.31	0.46	0.75
Organochlorine pesticides (ng/mL)								
HCB	86	97.67	0.07 (1.43)	0.04	0.06	0.06	0.07	0.13
p,p'-DDE	86	100	0.20 (1.76)	0.09	0.14	0.2	0.28	0.56
Pyrethroid insecticides (µg/g creatinine)								
3-PBA	86	77.91	0.005 (4.333)	0.00	0.002	0.006	0.013	0.025
Polybrominated diphenyl ethers (PBDEs) (pg/mL serum)								
BDE-47	86	100	88.49 (2.03)	34.76	55.59	77.59	135.76	312.65
BDE-99	86	73.26	24.8 (2.46)	8.93	9.67	24.09	41.56	104.66
Tobacco (µg/g creatinine)								
3-OH-COT	86	75.58	0.17 (16.07)	0.004	0.02	0.14	1.35	12.63
COT	86	77.91	0.09 (11.97)	0.004	0.01	0.05	0.73	6.45
Phthalate metabolites (µg/g creatinine)								
MEP	86	100	0.68 (3.06)	0.16	0.3	0.54	1.52	5.28
MBP	86	83.72	0.06 (2.44)	0.01	0.03	0.07	0.11	0.25
MiBP	86	83.72	0.06 (2.57)	0.01	0.03	0.06	0.11	0.24
MBzP	86	100	0.04 (2.84)	0.01	0.02	0.04	0.08	0.27
MEHP	86	87.21	0.01 (4.27)	0.01	0.01	0.02	0.04	0.14
MEOHP	86	97.67	0.03 (2.66)	0.01	0.01	0.03	0.05	0.13
MEHHP	86	100	0.05 (2.72)	0.01	0.02	0.05	0.08	0.26
Bisphenols (µg/g creatinine)								
BPA	86	81.4	0.01 (2.55)	0.002	0.004	0.01	0.01	0.04

Abbreviations: LOD, limit of detection; SD, standard deviation.

Table S2. Unadjusted and adjusted linear regression coefficients and 95% confidence intervals for gestational age and birthweight z-scores with an increase in first trimester chemical exposures among the analytic sample retained in mixture models (N=86).

	Gestational Age				Birthweight Z-Scores			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	N	Beta (95% CI)	N	Beta (95% CI)	N	Beta (95% CI)	N	Beta (95% CI)
Per-and polyfluoroalkyl substances (PFAS) (ng/mL)								
PFHxS	86	-0.06 (-0.51, 0.39)	86	-0.16 (-0.65, 0.32)	86	-0.23 (-0.53, 0.07)	86	-0.08 (-0.4, 0.23)
PFOS	86	-0.18 (-0.49, 0.13)	86	-0.22 (-0.55, 0.11)	86	-0.05 (-0.26, 0.16)	86	0.02 (-0.2, 0.23)
PFOA	86	-0.08 (-0.42, 0.25)	86	-0.15 (-0.52, 0.21)	86	-0.15 (-0.38, 0.07)	86	-0.06 (-0.29, 0.18)
PFNA	86	-0.13 (-0.52, 0.26)	86	-0.18 (-0.61, 0.25)	86	-0.32 (-0.58, -0.06)	86	-0.22 (-0.5, 0.05)
Organochlorine pesticides (ng/mL)								
HCB	86	-0.05 (-0.33, 0.23)	86	-0.04 (-0.34, 0.25)	86	-0.17 (-0.36, 0.02)	86	-0.15 (-0.34, 0.04)
p,p'-DDE	86	-0.17 (-0.6, 0.26)	86	-0.42 (-0.99, 0.16)	86	-0.2 (-0.49, 0.1)	86	-0.1 (-0.48, 0.27)
Pyrethroid insecticides (µg/g creatinine)								
3-PBA	86	0.04 (-0.38, 0.47)	86	0 (-0.46, 0.47)	86	-0.08 (-0.37, 0.21)	86	0.04 (-0.27, 0.34)
Polybrominated diphenyl ethers (PBDEs) (pg/mL)								
BDE-47	86	-0.29 (-0.72, 0.14)	86	-0.26 (-0.7, 0.19)	86	0.05 (-0.24, 0.35)	86	-0.02 (-0.31, 0.27)
BDE-99	86	-0.23 (-0.79, 0.33)	86	-0.16 (-0.75, 0.43)	86	0.07 (-0.31, 0.45)	86	-0.09 (-0.47, 0.29)
Tobacco (µg/g creatinine)								
3-OHCOT	86	0.64 (0.14, 1.13)	86	0.76 (0.23, 1.29)	86	-0.32 (-0.67, 0.02)	86	-0.36 (-0.72, -0.01)
COT	86	0.72 (0.16, 1.28)	86	0.83 (0.24, 1.43)	86	-0.41 (-0.79, -0.03)	86	-0.43 (-0.83, -0.04)
Phthalate metabolites (µg/g creatinine)								
MEP	86	-0.1 (-0.6, 0.41)	86	-0.1 (-0.63, 0.42)	86	-0.22 (-0.56, 0.12)	86	-0.18 (-0.52, 0.16)
MBP	86	-0.33 (-0.8, 0.14)	86	-0.3 (-0.81, 0.2)	86	0.12 (-0.2, 0.44)	86	0.05 (-0.28, 0.38)
MiBP	86	-0.34 (-0.76, 0.08)	86	-0.29 (-0.73, 0.16)	86	0.06 (-0.23, 0.34)	86	0.02 (-0.27, 0.32)
MBzP	86	-0.16 (-0.58, 0.25)	86	0 (-0.47, 0.48)	86	0.22 (-0.05, 0.5)	86	0.05 (-0.25, 0.36)
MEHP	86	-0.07 (-0.48, 0.35)	86	0.03 (-0.41, 0.48)	86	0.15 (-0.14, 0.43)	86	0.02 (-0.27, 0.31)
MEOHP	86	-0.16 (-0.61, 0.28)	86	-0.07 (-0.56, 0.43)	86	0.33 (0.03, 0.63)	86	0.18 (-0.14, 0.5)
MEHHP	86	-0.13 (-0.56, 0.3)	86	-0.05 (-0.53, 0.44)	86	0.21 (-0.08, 0.5)	86	0.04 (-0.28, 0.35)
Bisphenols (µg/g creatinine)								
BPA	86	-0.06 (-0.49, 0.37)	86	-0.04 (-0.48, 0.4)	86	-0.03 (-0.32, 0.26)	86	-0.07 (-0.36, 0.22)

Note: Models are adjusted for maternal education, maternal age, parity, alcohol consumption, and early pregnancy body mass index.

Table S3. Unadjusted and adjusted linear regression coefficients and 95% confidence intervals for gestational age and birthweight z-scores with an increase in first trimester chemical exposures in the overall study population.

	Gestational Age				Birthweight Z-Scores			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	N	Beta (95% CI)	N	Beta (95% CI)	N	Beta (95% CI)	N	Beta (95% CI)
Per-and polyfluoroalkyl substances (PFAS) (ng/mL)								
PFHxS	514	0.04 (-0.21, 0.28)	514	0.01 (-0.24, 0.26)	513	-0.05 (-0.15, 0.05)	513	-0.02 (-0.12, 0.08)
PFOS	514	-0.11 (-0.33, 0.1)	514	-0.15 (-0.37, 0.07)	513	-0.07 (-0.16, 0.02)	513	-0.04 (-0.13, 0.05)
PFOA	514	-0.04 (-0.27, 0.19)	514	-0.07 (-0.31, 0.16)	513	-0.08 (-0.17, 0.01)	513	-0.05 (-0.14, 0.04)
PFNA	514	0.05 (-0.23, 0.32)	514	-0.01 (-0.29, 0.27)	513	-0.12 (-0.23, 0)	513	-0.11 (-0.22, 0)
Organochlorine pesticides (ng/mL)								
HCB	98	-0.07 (-0.34, 0.19)	98	-0.07 (-0.34, 0.21)	98	-0.18 (-0.35, 0)	98	-0.14 (-0.32, 0.03)
p,p'-DDE	98	-0.18 (-0.59, 0.22)	98	-0.38 (-0.9, 0.14)	98	-0.21 (-0.48, 0.06)	98	-0.14 (-0.49, 0.2)
Pyrethroid insecticides (µg/g creatinine)								
3-PBA	242	0.39 (-0.04, 0.83)	242	0.29 (-0.17, 0.74)	241	-0.09 (-0.26, 0.08)	241	-0.01 (-0.18, 0.16)
Polybrominated diphenyl ethers (PBDEs) (pg/mL)								
BDE-47	299	0.7 (-0.1, 1.49)	299	0.74 (-0.11, 1.6)	286	-0.17 (-0.31, -0.02)	286	-0.2 (-0.35, -0.05)
BDE-99	299	0.93 (-0.03, 1.88)	299	0.86 (-0.13, 1.85)	286	-0.11 (-0.29, 0.07)	286	-0.15 (-0.33, 0.03)
Tobacco (µg/g creatinine)								
3-OHCOT	243	0.42 (-0.16, 0.99)	243	0.39 (-0.19, 0.97)	242	-0.06 (-0.28, 0.16)	242	-0.01 (-0.23, 0.2)
COT	243	0.4 (-0.19, 1)	243	0.39 (-0.21, 0.99)	235	-0.06 (-0.28, 0.17)	242	-0.02 (-0.24, 0.2)
Phthalate metabolites (µg/g creatinine)								
MEP	236	0.19 (-0.35, 0.72)	236	0.14 (-0.4, 0.69)	235	-0.18 (-0.38, 0.01)	235	-0.13 (-0.32, 0.07)
MBP	236	-0.13 (-0.58, 0.32)	236	0 (-0.48, 0.47)	235	0.04 (-0.13, 0.2)	235	-0.01 (-0.17, 0.16)
MiBP	236	0.06 (-0.43, 0.56)	236	0.19 (-0.33, 0.7)	235	0.01 (-0.17, 0.2)	235	-0.02 (-0.2, 0.16)
MBzP	236	-0.3 (-0.77, 0.17)	236	-0.18 (-0.67, 0.31)	235	0.04 (-0.13, 0.21)	235	-0.03 (-0.2, 0.15)
MEHP	236	-0.06 (-0.55, 0.42)	236	-0.03 (-0.53, 0.46)	235	-0.01 (-0.2, 0.17)	235	0.02 (-0.16, 0.19)
MEOHP	236	-0.08 (-0.51, 0.34)	236	0 (-0.43, 0.43)	235	0.08 (-0.08, 0.23)	235	0.06 (-0.09, 0.22)
MEHHP	236	-0.08 (-0.54, 0.39)	236	0 (-0.47, 0.47)	235	0.04 (-0.13, 0.21)	235	0.03 (-0.14, 0.2)
Bisphenols (µg/g creatinine)								
BPA	236	0.21 (-0.25, 0.66)	236	0.23 (-0.23, 0.68)	235	-0.05 (-0.22, 0.11)	235	-0.08 (-0.24, 0.09)

Note: Adjusted models are adjusted for maternal education, maternal age, parity, alcohol consumption, and early pregnancy body mass index.

Table S4. Adjusted linear regression coefficients and 95% confidence intervals for gestational age and birthweight z-scores with an increase in first trimester chemical exposures removing early pregnancy body mass index (BMI) in the Atlanta African American Maternal-Child cohort, 2016-2020.

	Gestational Age		Birthweight Z-Scores	
	N	Beta (95% CI)	N	Beta (95% CI)
Per-and polyfluoroalkyl substances (PFAS) (ng/mL)				
PFHxS	514	0 (-0.24, 0.50)	513	-0.03 (-0.13, 0.35)
PFOS	514	-0.16 (-0.38, 0.47)	513	-0.07 (-0.15, 0.34)
PFOA	514	-0.08 (-0.31, 0.50)	513	-0.05 (-0.15, 0.35)
PFNA	514	-0.01 (-0.29, 0.50)	513	-0.11 (-0.23, 0.34)
Organochlorine pesticides (ng/mL)				
HCB	98	-0.07 (-0.35, 1.31)	98	-0.15 (-0.33, 0.02)
p,p'-DDE	98	-0.36 (-0.81, 1.22)	98	-0.19 (-0.49, -0.07)
Pyrethroid insecticides (µg/g)				
3-PBA	242	0.30 (-0.16, 1.49)	241	-0.04 (-0.21, 0.43)
Polybrominated diphenyl ethers (PBDEs) (ng/g)				
BDE-47	299	0.75 (-0.08, 1.05)	286	-0.14 (-0.29, 0.27)
BDE-99	299	0.88 (-0.10, 1.04)	286	-0.11 (-0.29, 0.29)
Marijuana and nicotine (µg/g)				
3-OHCOT	243	0.40 (-0.18, 1.49)	242	-0.04 (-0.26, 0.42)
COT	243	0.40 (-0.20, 1.50)	242	-0.04 (-0.26, 0.42)
Phthalate metabolites (ng/mL)				
MEP	236	0.14 (-0.40, 1.58)	235	-0.12 (-0.32, 0.38)
MBP	236	-0.02 (-0.49, 1.60)	235	0.05 (-0.12, 0.36)
MiBP	236	-0.20 (-0.68, 1.59)	235	0.03 (-0.14, 0.36)
MBzP	236	0.17 (-0.34, 1.58)	235	0.03 (-0.16, 0.36)
MEHP	236	0 (-0.43, 1.61)	235	0.07 (-0.09, 0.39)
MEOHP	236	-0.01 (-0.48, 1.60)	235	0.04 (-0.13, 0.37)
MEHHP	236	-0.03 (-0.52, 1.60)	235	0 (-0.19, 0.36)
Bisphenols (µg/g)				
BPA	236	0.22 (-0.23, 1.62)	235	-0.06 (-0.23, 0.35)

Note: Models are adjusted for maternal education, maternal age, parity, and alcohol consumption

Table S5. Adjusted linear regression coefficients and 95% confidence intervals for gestational age and birthweight z-scores with an increase in first trimester chemical exposures stratified by infant sex in the Atlanta African American Maternal-Child cohort, 2016-2020.

	Gestational Age				Birthweight Z-Scores			
	Male		Female		Male		Female	
	N	Beta (95% CI)	N	Beta (95% CI)	N	Beta (95% CI)	N	Beta (95% CI)
Per-and polyfluoroalkyl substances (ng/mL)								
PFHxS	252	-0.02 (-0.39, 0.35)	262	0.07 (-0.28, 0.42)	251	-0.03 (-0.18, 0.12)	262	0.02 (-0.11, 0.15)
PFOS	252	-0.26 (-0.58, 0.07)	262	-0.08 (-0.39, 0.23)	251	0.04 (-0.09, 0.17)	262	-0.1 (-0.22, 0.01)
PFOA	252	-0.18 (-0.5, 0.14)	262	-0.01 (-0.36, 0.35)	251	-0.02 (-0.15, 0.11)	262	-0.07 (-0.2, 0.06)
PFNA	252	-0.09 (-0.46, 0.29)	262	0.03 (-0.41, 0.47)	251	-0.08 (-0.24, 0.07)	262	-0.11 (-0.28, 0.05)
Organochlorine pesticides (ng/mL)								
HCB	46	-0.08 (-0.55, 0.38)	52	-0.08 (-0.43, 0.27)	46	-0.19 (-0.47, 0.08)	52	-0.13 (-0.38, 0.12)
p,p'-DDE	46	-0.37 (-1.4, 0.66)	52	-0.48 (-1.07, 0.11)	46	-0.33 (-0.95, 0.28)	52	0.02 (-0.41, 0.45)
Pyrethroid insecticides (µg/g creatinine)								
3-PBA	115	0.41 (-0.01, 0.84)	126	0.41 (-0.26, 1.08)	115	0.01 (-0.24, 0.25)	126	-0.02 (-0.26, 0.21)
Polybrominated diphenyl ethers (pg/mL)								
BDE-47	140	0.25 (-0.38, 0.88)	151	1.01 (-0.09, 2.1)	140	-0.26 (-0.47, -0.04)	146	-0.12 (-0.35, 0.11)
BDE-99	140	-0.02 (-0.78, 0.73)	151	1.31 (0.09, 2.52)	140	-0.23 (-0.49, 0.02)	146	-0.05 (-0.3, 0.21)
Tobacco (µg/g creatinine)								
3-OHCOT	116	0.66 (0.09, 1.24)	126	0.05 (-0.78, 0.87)	116	-0.22 (-0.56, 0.11)	126	0.14 (-0.15, 0.43)
COT	116	0.8 (0.22, 1.38)	126	-0.05 (-0.9, 0.8)	116	-0.25 (-0.59, 0.08)	126	0.17 (-0.12, 0.46)
Phthalate metabolites (µg/g creatinine)								
MEP	114	-0.09 (-0.6, 0.42)	121	0.35 (-0.47, 1.16)	114	-0.09 (-0.38, 0.2)	121	-0.14 (-0.41, 0.13)
MBP	114	-0.22 (-0.62, 0.18)	121	0.03 (-0.75, 0.82)	114	0.04 (-0.19, 0.27)	121	-0.08 (-0.34, 0.18)
MiBP	114	-0.13 (-0.61, 0.35)	121	0.46 (-0.3, 1.23)	114	-0.08 (-0.36, 0.19)	121	-0.01 (-0.27, 0.25)
MBzP	114	-0.03 (-0.51, 0.45)	121	-0.28 (-0.99, 0.44)	114	0 (-0.27, 0.27)	121	-0.07 (-0.31, 0.17)
MEHP	114	-0.19 (-0.64, 0.26)	121	0.28 (-0.49, 1.05)	114	0.17 (-0.09, 0.42)	121	-0.1 (-0.36, 0.16)
MEOHP	114	-0.22 (-0.61, 0.17)	121	0.05 (-0.62, 0.71)	114	0.17 (-0.05, 0.39)	121	-0.04 (-0.26, 0.18)
MEHHP	114	-0.26 (-0.69, 0.17)	121	0.13 (-0.58, 0.85)	114	0.18 (-0.06, 0.42)	121	-0.11 (-0.35, 0.12)
Bisphenols (µg/g creatinine)								
BPA	114	0.21 (-0.23, 0.64)	121	0.21 (-0.46, 0.87)	114	-0.02 (-0.27, 0.23)	121	-0.1 (-0.33, 0.12)

Note: Models are adjusted for maternal education, maternal age, parity, alcohol consumption and early pregnancy body mass index.

Table S6. Unadjusted and adjusted differences in gestational age and birthweight z-scores per a one quartile increase in the chemical exposure mixture estimated using quantile g-computation and per an interquartile range increase in maternal chemical concentration principal component scores among pregnant women in the Atlanta African American Maternal-Child cohort, 2016-2020 (N=86).

	Gestational Age				Birthweight z-scores			
	Unadjusted		Adjusted		Unadjusted		Adjusted	
	β	(95% CI)	β	(95% CI)	β	(95% CI)	β	(95% CI)
Quantile g-computation								
Overall mixture effect	-0.43	(-1.41, 0.54)	-0.47	(-1.56, 0.61)	-0.58	(-1.15, 0.0)	-0.49	(-1.14, 0.15)
Principal components								
PC1	0.03	(-0.14, 0.2)	-0.02	(-0.21, 0.16)	-0.12	(-0.24, -0.01)	-0.07	(-0.19, 0.06)
PC2	-0.13	(-0.31, 0.05)	-0.14	(-0.33, 0.05)	-0.05	(-0.17, 0.08)	-0.04	(-0.16, 0.09)
PC3	0.25	(0.04, 0.46)	0.26	(0.05, 0.47)	-0.08	(-0.22, 0.06)	-0.09	(-0.23, 0.06)
PC4	0.02	(-0.22, 0.27)	0.04	(-0.21, 0.29)	-0.14	(-0.31, 0.02)	-0.16	(-0.32, 0.01)
PC5	0.19	(-0.08, 0.46)	0.19	(-0.09, 0.47)	-0.16	(-0.34, 0.03)	-0.16	(-0.34, 0.03)

Abbreviations: CI, confidence interval; PC, principal component.

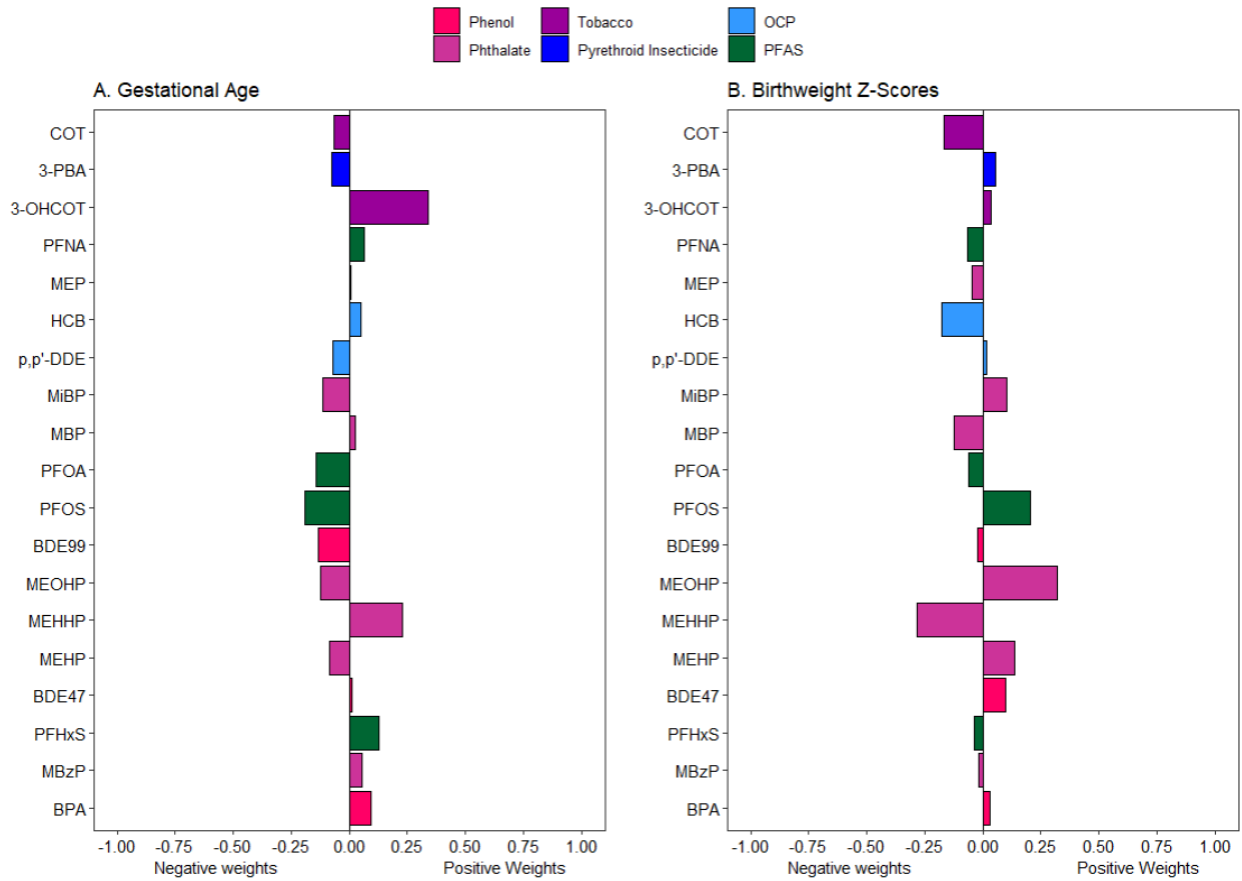
Note: Adjusted models are adjusted for maternal education, maternal age, parity, alcohol consumption, and early pregnancy body mass index.

Table S7. Quantile g-computation estimates and 95% confidence intervals for the change in gestational age and birthweight z-scores for a one quartile increase in the chemical exposure mixture, sensitivity analyses removing PBDEs and OCPs, in the Atlanta African American Maternal-Child study population, 2016-2020.

	β	(95% CI)
Removing PBDEs (N=86)		
Gestational age	-0.22	(-1.24, 0.79)
Birthweight z-scores	-0.53	(-1.13, 0.08)
Removing OCPs (N=230)		
Gestational age	-0.43	(-1.38, 0.53)
Birthweight z-scores	-0.19	(-0.8, 0.42)
Removing PBDEs and OCPs (N=230)		
Gestational age	-0.36	(-0.38, 1.1)
Birthweight z-scores	-0.11	(-0.42, 0.19)

Note: Models are adjusted for maternal education, maternal age, parity, alcohol consumption, and early pregnancy body mass index.

Figure S2. Weights representing the proportion of the positive and negative effects in the adjusted chemical exposure mixture in relation to (A) gestational age and (B) birthweight z-scores (N=86).



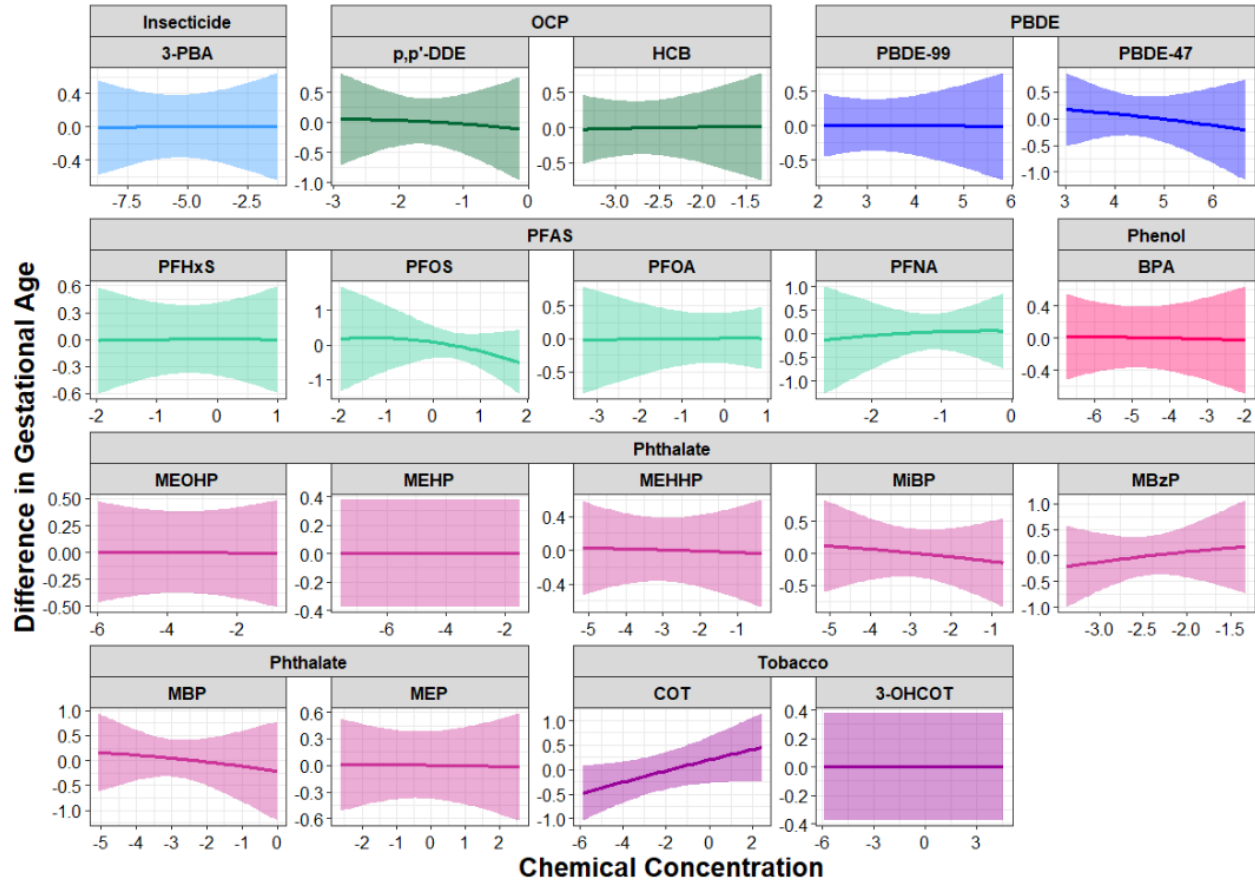
Note: Models are adjusted for maternal education, maternal age, parity, alcohol consumption, and early pregnancy body mass index.

Table S8. Posterior inclusion probabilities (PIPs) for environmental chemicals among 86 complete cases in the Atlanta African American Maternal-Child study population, 2016-2020, estimated using BKMR.

	Birthweight Z-scores		Gestational Age (weeks)	
	Conditional PIP	Group PIP	Conditional PIP	Group PIP
Persistent				
Per-and polyfluoroalkyl substances (PFAS) (ng/mL)				
PFHxS	0.09	0.68	0.02	0.27
PFOS	0.07	0.68	0.45	0.27
PFOA	0.07	0.68	0.01	0.27
PFNA	0.23	0.68	0.23	0.27
Organochlorine pesticides (OCPs) (ng/mL)				
HCB	0.27	0.68	0.05	0.27
p'p'-DDE	0.09	0.68	0.15	0.27
Pyrethroid insecticides (µg/g creatinine)				
3-PBA	0.07	0.68	0.01	0.27
Polybrominated diphenyl ethers (PBDEs) (ng/g)				
BDE-47	0.07	0.68	0.06	0.27
BDE-99	0.05	0.68	0.02	0.27
Non-persistent				
Marijuana and cotinine (µg/g creatinine)				
3-OHCOT	0.14	0.64	0	0.03
COT	0.25	0.64	0.11	0.03
Phthalate metabolites (µg/g creatinine)				
MEP	0.06	0.64	0.04	0.03
MBP	0.08	0.64	0.25	0.03
MiBP	0.07	0.64	0.14	0.03
MBzP	0.05	0.64	0.26	0.03
MEHP	0.08	0.64	0	0.03
MEOHP	0.14	0.64	0.03	0.03
MEHHP	0.07	0.64	0.06	0.03
Bisphenols (µg/g creatinine)				
BPA	0.06	0.64	0.11	0.03

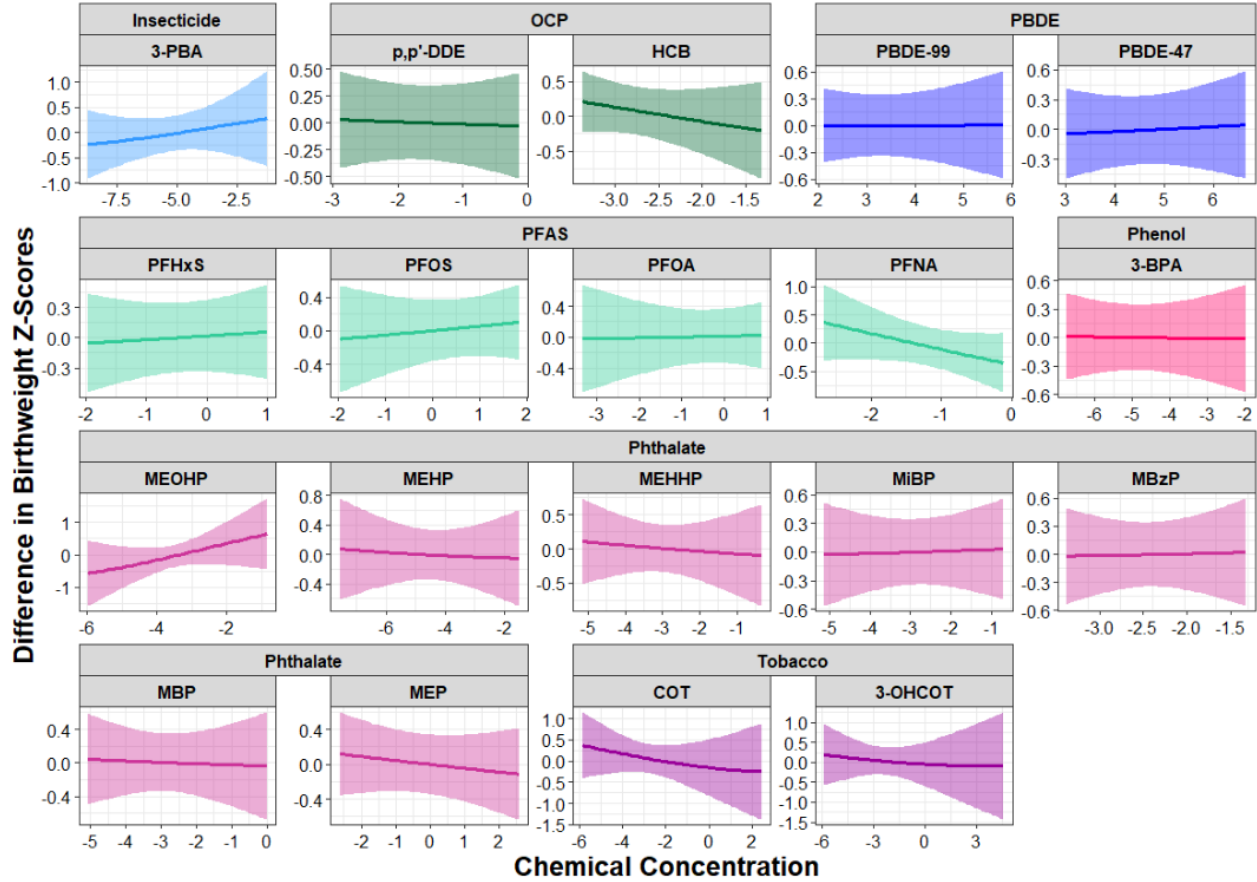
Note: Models are adjusted for maternal education, maternal age, parity, alcohol consumption, and early pregnancy body mass index.

Figure S3. Univariate exposure-response functions indicating change in gestational age resulting from individual environmental chemicals while fixing remaining exposures in the mixture at their 50th percentiles, estimated using BKMR in the Atlanta African American Maternal-Child study population, 2016-2020 (N=86).



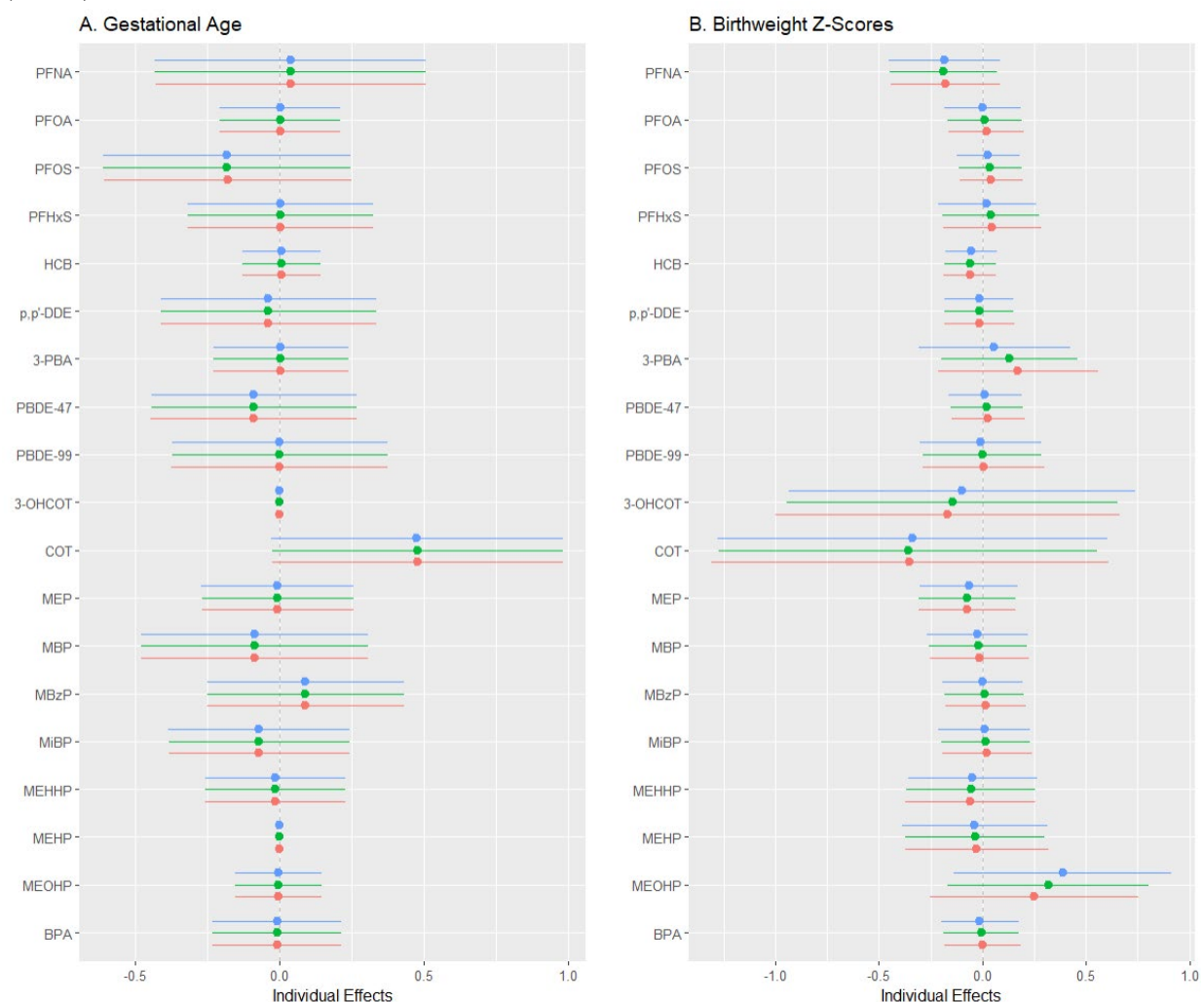
Note: Models are adjusted for maternal education, maternal age, parity, alcohol consumption, and early pregnancy body mass index.

Figure S4. Univariate exposure-response functions indicating change in birthweight z-scores resulting from individual environmental chemicals while fixing remaining exposures in the mixture at their 50th percentiles, estimated using BKMR in the Atlanta African American Maternal-Child study population, 2016-2020 (N=86).



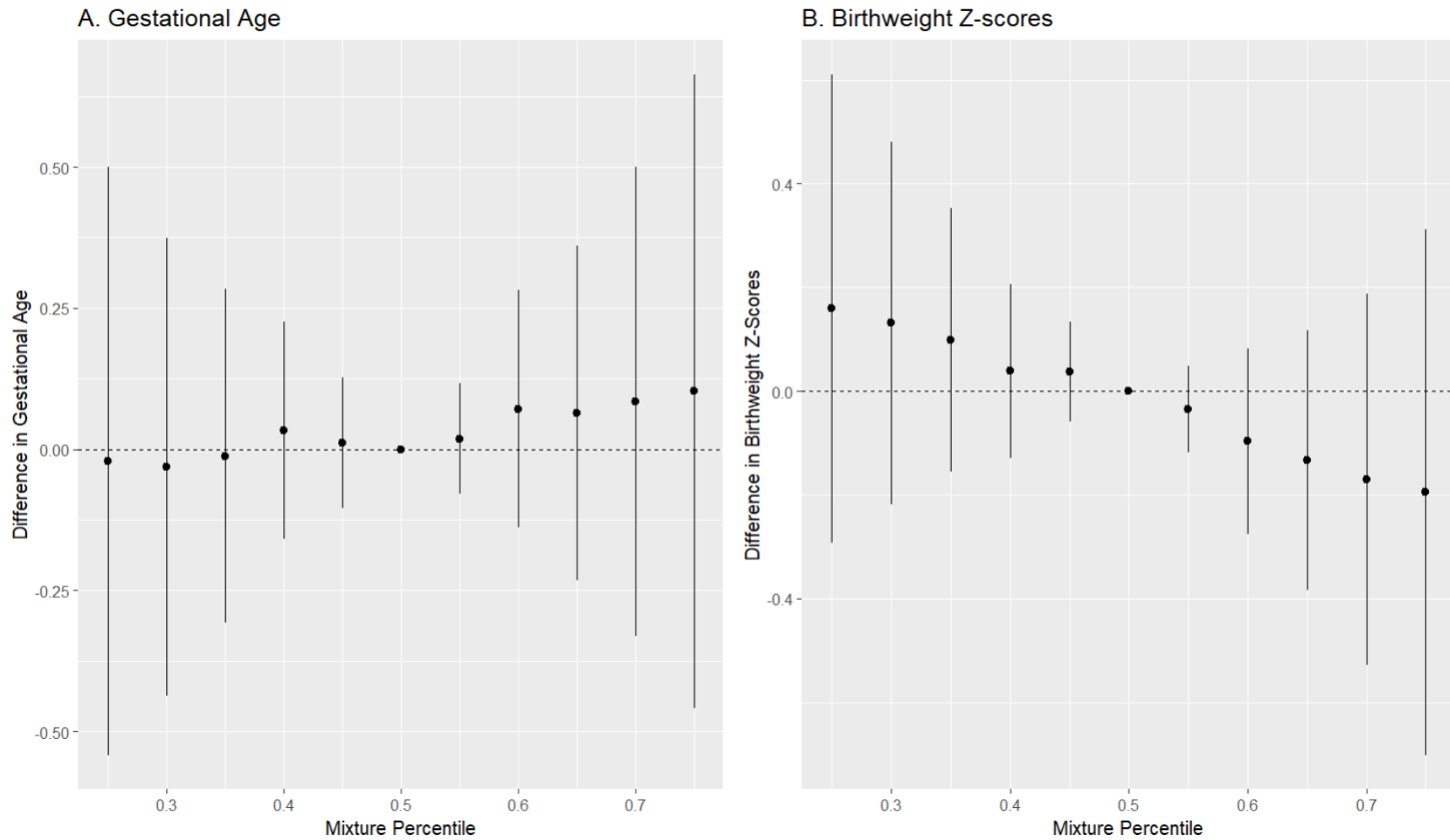
Note: Models are adjusted for maternal education, maternal age, parity, alcohol consumption, and early pregnancy body mass index.

Figure S5. Individual effect of a single chemical on gestational age and birthweight z-scores when all other chemicals are fixed at the 25th, 50th, or 75th percentile, estimated using BKMR in the Atlanta African American Maternal-Child study population, 2016-2020 (N=86).



Note: Models are adjusted for maternal education, maternal age, parity, alcohol consumption, and early pregnancy body mass index.

Figure S6. Overall effect of the environmental chemical mixture on gestational age and birthweight z-scores, estimated using BKMR in the Atlanta African American Maternal-Child study population, 2016-2020 (N=86).



Note: Models are adjusted for maternal education, maternal age, parity, alcohol consumption, and early pregnancy body mass index

Corresponding Author name: _____

Manuscript Number: _____

Reporting Checklist

This checklist is used to ensure the quality, transparency, and reproducibility of published results. We require authors attest that these components have been considered and addressed.

Exposure Assessment Guiding Principle	Yes/No/Not Applicable
Has the method to estimate exposure been described clearly?	
Has the exposure assessment method been validated/evaluated as a proxy for exposure and is its validity or agreement with other methods described?	
Is the time period over which the exposure assessment method is considered to be a proxy for exposure appropriate for the research question?	
If exposure is modeled or measured, were all critical potential routes and sources of exposure considered?	
If exposure is modeled, how does it vary over space and time and are necessary historical data incorporated?	
If biomarkers are used as indicators of exposure, could the biomarker measurement have been affected by the outcome (i.e., reverse causality)?	
Are the strengths and weaknesses of the exposure approach detailed and discussed?	

From: [Panuwet, Parinya](#)
To: [Liang, Donghai](#)
Cc: [Taibl, Kaitlin](#); [Corwin, Elizabeth](#); [Eick, Stephanie M.](#); [Tan, Youran](#); [Barr, Dana Boyd](#); [Ryan, Peter Barry](#); [Huels, Anke](#); [Eatman, Jasmin](#); [D'Souza, Priya Esilda](#); [Yakimavets, Volha](#); [Lee, Grace E.](#); [Brennan, Patricia](#); [Dunlop, Anne Lang](#)
Subject: Re: [EXTERNAL] JESEE paper - please respond to this email
Date: Wednesday, February 1, 2023 12:19:11 PM

I am supportive of adding Jasmin as a coauthor.

Sent lovingly from Prinn's iPhone

On Feb 1, 2023, at 10:20 AM, Liang, Donghai <donghai.liang@emory.edu> wrote:

Same here! Jasmin makes great contribution to our manuscript and I fully support her being added to the author list.

Cheers,
Donghai

From: Taibl, Kaitlin <kaitlin.rene.taibl@emory.edu>
Sent: Wednesday, February 1, 2023 10:19 AM
To: Corwin, Elizabeth <ejc2202@cumc.columbia.edu>; Eick, Stephanie M. <stephanie.marie.eick@emory.edu>; Tan, Youran <youran.tan@emory.edu>; Barr, Dana Boyd <dbbarr@emory.edu>; Ryan, Peter Barry <bryan@emory.edu>; Huels, Anke <anke.huels@emory.edu>; Eatman, Jasmin <jasmin.eatman@emory.edu>; Panuwet, Parinya <parinya.panuwet@emory.edu>; D'Souza, Priya Esilda <pdsouza@emory.edu>; Yakimavets, Volha <volha.yakimavets@emory.edu>; Lee, Grace E. <grace.lee@emory.edu>; Brennan, Patricia <pbren01@emory.edu>; Dunlop, Anne Lang <amlang@emory.edu>; Liang, Donghai <donghai.liang@emory.edu>
Subject: Re: [EXTERNAL] JESEE paper - please respond to this email

I also fully support adding Jasmin to the author list.

<Outlook-q2tbra0m.jpg> **Kaitlin R. Taibl, MSPH**
Environmental Health Sciences PhD Student
Gangarosa Department of Environmental Health
kaitlin.rene.taibl@emory.edu

From: Corwin, Elizabeth <ejc2202@cumc.columbia.edu>
Sent: Wednesday, February 1, 2023 10:05 AM
To: Eick, Stephanie M. <stephanie.marie.eick@emory.edu>; Tan, Youran

<youran.tan@emory.edu>; Taibl, Kaitlin <kaitlin.rene.taibl@emory.edu>; Barr, Dana Boyd <dbbarr@emory.edu>; Ryan, Peter Barry <bryan@emory.edu>; Huels, Anke <anke.huels@emory.edu>; Eatman, Jasmin <jasmin.eatman@emory.edu>; Panuwet, Parinya <parinya.panuwet@emory.edu>; D'Souza, Priya Esilda <pdsouza@emory.edu>; Yakimavets, Volha <volha.yakimavets@emory.edu>; Lee, Grace E. <grace.lee@emory.edu>; Brennan, Patricia <pbren01@emory.edu>; Dunlop, Anne Lang <amlang@emory.edu>; Liang, Donghai <donghai.liang@emory.edu>

Subject: Re: [EXTERNAL] JESEE paper - please respond to this email

I fully support adding Jasmine as a co-author.

From: "Eick, Stephanie M." <stephanie.marie.eick@emory.edu>

Date: Wednesday, February 1, 2023 at 7:50 AM

To: "Tan, Youran" <youran.tan@emory.edu>, "Taibl, Kaitlin" <kaitlin.rene.taibl@emory.edu>, "Barr, Dana Boyd" <dbbarr@emory.edu>, "Ryan, Peter Barry" <bryan@emory.edu>, "Huels, Anke" <anke.huels@emory.edu>, "Eatman, Jasmin" <jasmin.eatman@emory.edu>, "Panuwet, Parinya" <parinya.panuwet@emory.edu>, "D'Souza, Priya Esilda" <pdsouza@emory.edu>, "Yakimavets, Volha" <volha.yakimavets@emory.edu>, "Lee, Grace E." <grace.lee@emory.edu>, Patricia Brennan <pbren01@emory.edu>, "Dunlop, Anne Lang" <amlang@emory.edu>, "Liang, Donghai" <donghai.liang@emory.edu>, "Corwin, Elizabeth" <ejc2202@cumc.columbia.edu>

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JESEE is asking that we co-authors with the change, and ask them to reply to this email confirming that they agree to these changes, combine all of the co-authors' email responses in one document and upload this file to the submission.

Please respond to this email confirming that you agree to add Jasmin as a co-author.

Thank you!

Stephanie

Stephanie Eick, PhD, MPH (she/her)

Assistant Professor

Gangarosa Department of Environmental Health

Emory University Rollins School of Public Health

stephanie.marie.eick@emory.edu

From: [Lee, Grace E.](#)
To: [Yakimavets, Volha](#); [Huels, Anke](#); [Brennan, Patricia](#); [Tan, Youran](#); [Liang, Donghai](#); [Taibl, Kaitlin](#); [Corwin, Elizabeth](#); [Eick, Stephanie M.](#); [Barr, Dana Boyd](#); [Ryan, Peter Barry](#); [Eatman, Jasmin](#); [Panuwet, Parinya](#); [D'Souza, Priya Esilda](#); [Dunlop, Anne Lang](#)
Subject: RE: [EXTERNAL] JESEE paper - please respond to this email
Date: Wednesday, February 1, 2023 11:06:31 AM

I support adding Jasmin to the author list.

Thanks,
Grace Lee

From: Yakimavets, Volha
Sent: Wednesday, February 1, 2023 10:58 AM
To: Huels, Anke <anke.huels@emory.edu>; Brennan, Patricia <pbren01@emory.edu>; Tan, Youran <youran.tan@emory.edu>; Liang, Donghai <donghai.liang@emory.edu>; Taibl, Kaitlin <kaitlin.rene.taibl@emory.edu>; Corwin, Elizabeth <ejc2202@cumc.columbia.edu>; Eick, Stephanie M. <stephanie.marie.eick@emory.edu>; Barr, Dana Boyd <dbbarr@emory.edu>; Ryan, Peter Barry <bryan@emory.edu>; Eatman, Jasmin <jasmin.eatman@emory.edu>; Panuwet, Parinya <parinya.panuwet@emory.edu>; D'Souza, Priya Esilda <pdsouza@emory.edu>; Lee, Grace E. <grace.lee@emory.edu>; Dunlop, Anne Lang <amlang@emory.edu>
Subject: Re: [EXTERNAL] JESEE paper - please respond to this email

I support adding Jasmin to the author list.

Best,
Volha

From: Huels, Anke <anke.huels@emory.edu>
Sent: Wednesday, February 1, 2023 10:46:06 AM
To: Brennan, Patricia <pbren01@emory.edu>; Tan, Youran <youran.tan@emory.edu>; Liang, Donghai <donghai.liang@emory.edu>; Taibl, Kaitlin <kaitlin.rene.taibl@emory.edu>; Corwin, Elizabeth <ejc2202@cumc.columbia.edu>; Eick, Stephanie M. <stephanie.marie.eick@emory.edu>; Barr, Dana Boyd <dbbarr@emory.edu>; Ryan, Peter Barry <bryan@emory.edu>; Eatman, Jasmin <jasmin.eatman@emory.edu>; Panuwet, Parinya <parinya.panuwet@emory.edu>; D'Souza, Priya Esilda <pdsouza@emory.edu>; Yakimavets, Volha <volha.yakimavets@emory.edu>; Lee, Grace E. <grace.lee@emory.edu>; Dunlop, Anne Lang <amlang@emory.edu>
Subject: RE: [EXTERNAL] JESEE paper - please respond to this email

Same. I also support including Jasmin as co-author.

Best wishes,
Anke

From: Brennan, Patricia <pbren01@emory.edu>

Sent: Wednesday, February 1, 2023 10:32 AM

To: Tan, Youran <youran.tan@emory.edu>; Liang, Donghai <donghai.liang@emory.edu>; Taibl, Kaitlin <kaitlin.rene.taibl@emory.edu>; Corwin, Elizabeth <ejc2202@cumc.columbia.edu>; Eick, Stephanie M. <stephanie.marie.eick@emory.edu>; Barr, Dana Boyd <dbbarr@emory.edu>; Ryan, Peter Barry <bryan@emory.edu>; Huels, Anke <anke.huels@emory.edu>; Eatman, Jasmin <jasmin.eatman@emory.edu>; Panuwet, Parinya <parinya.panuwet@emory.edu>; D'Souza, Priya Esilda <pdsouza@emory.edu>; Yakimavets, Volha <volha.yakimavets@emory.edu>; Lee, Grace E. <grace.lee@emory.edu>; Dunlop, Anne Lang <amlang@emory.edu>

Subject: Re: [EXTERNAL] JESEE paper - please respond to this email

I also support adding Jasmin to the coauthor list for this paper.

cheers,

Patricia Brennan, Ph.D.
Samuel Candler Dobbs Professor
Department of Psychology
Emory University
Atlanta, GA 30322

Office Phone: 404-727-7458

From: Tan, Youran <youran.tan@emory.edu>

Sent: Wednesday, February 1, 2023 10:26 AM

To: Liang, Donghai <donghai.liang@emory.edu>; Taibl, Kaitlin <kaitlin.rene.taibl@emory.edu>; Corwin, Elizabeth <ejc2202@cumc.columbia.edu>; Eick, Stephanie M. <stephanie.marie.eick@emory.edu>; Barr, Dana Boyd <dbbarr@emory.edu>; Ryan, Peter Barry <bryan@emory.edu>; Huels, Anke <anke.huels@emory.edu>; Eatman, Jasmin <jasmin.eatman@emory.edu>; Panuwet, Parinya <parinya.panuwet@emory.edu>; D'Souza, Priya Esilda <pdsouza@emory.edu>; Yakimavets, Volha <volha.yakimavets@emory.edu>; Lee, Grace E. <grace.lee@emory.edu>; Brennan, Patricia <pbren01@emory.edu>; Dunlop, Anne Lang <amlang@emory.edu>

Subject: 回复: [EXTERNAL] JESEE paper - please respond to this email

I fully support adding Jasmine as a co-author to the manuscript!

Best,
Youran

发件人: Liang, Donghai <donghai.liang@emory.edu>

发送时间: 2023年2月1日 10:20

收件人: Taibl, Kaitlin <kaitlin.rene.taibl@emory.edu>; Corwin, Elizabeth <ejc2202@cumc.columbia.edu>; Eick, Stephanie M. <stephanie.marie.eick@emory.edu>; Tan, Youran <youran.tan@emory.edu>; Barr, Dana Boyd <dbbarr@emory.edu>; Ryan, Peter Barry <bryan@emory.edu>; Huels, Anke <anke.huels@emory.edu>; Eatman, Jasmin <jasmin.eatman@emory.edu>; Panuwet, Parinya <parinya.panuwet@emory.edu>; D'Souza, Priya

Esilda <pdsouza@emory.edu>; Yakimavets, Volha <volha.yakimavets@emory.edu>; Lee, Grace E. <grace.lee@emory.edu>; Brennan, Patricia <pbren01@emory.edu>; Dunlop, Anne Lang <amlang@emory.edu>

主题: Re: [EXTERNAL] JESEE paper - please respond to this email

Same here! Jasmin makes great contribution to our manuscript and I fully support her being added to the author list.

Cheers,
Donghai

From: Taibl, Kaitlin <kaitlin.rene.taibl@emory.edu>

Sent: Wednesday, February 1, 2023 10:19 AM

To: Corwin, Elizabeth <ejc2202@cumc.columbia.edu>; Eick, Stephanie M. <stephanie.marie.eick@emory.edu>; Tan, Youran <youran.tan@emory.edu>; Barr, Dana Boyd <dbbarr@emory.edu>; Ryan, Peter Barry <bryan@emory.edu>; Huels, Anke <anke.huels@emory.edu>; Eatman, Jasmin <jasmin.eatman@emory.edu>; Panuwet, Parinya <parinya.panuwet@emory.edu>; D'Souza, Priya Esilda <pdsouza@emory.edu>; Yakimavets, Volha <volha.yakimavets@emory.edu>; Lee, Grace E. <grace.lee@emory.edu>; Brennan, Patricia <pbren01@emory.edu>; Dunlop, Anne Lang <amlang@emory.edu>; Liang, Donghai <donghai.liang@emory.edu>

Subject: Re: [EXTERNAL] JESEE paper - please respond to this email

I also fully support adding Jasmin to the author list.



Kaitlin R. Taibl, MSPH

Environmental Health Sciences PhD Student
Gangarosa Department of Environmental Health
kaitlin.rene.taibl@emory.edu

From: Corwin, Elizabeth <ejc2202@cumc.columbia.edu>

Sent: Wednesday, February 1, 2023 10:05 AM

To: Eick, Stephanie M. <stephanie.marie.eick@emory.edu>; Tan, Youran <youran.tan@emory.edu>; Taibl, Kaitlin <kaitlin.rene.taibl@emory.edu>; Barr, Dana Boyd <dbbarr@emory.edu>; Ryan, Peter Barry <bryan@emory.edu>; Huels, Anke <anke.huels@emory.edu>; Eatman, Jasmin <jasmin.eatman@emory.edu>; Panuwet, Parinya <parinya.panuwet@emory.edu>; D'Souza, Priya Esilda <pdsouza@emory.edu>; Yakimavets, Volha <volha.yakimavets@emory.edu>; Lee, Grace E. <grace.lee@emory.edu>; Brennan, Patricia <pbren01@emory.edu>; Dunlop, Anne Lang <amlang@emory.edu>; Liang, Donghai <donghai.liang@emory.edu>

Subject: Re: [EXTERNAL] JESEE paper - please respond to this email

I fully support adding Jasmine as a co-author.

From: "Eick, Stephanie M." <stephanie.marie.eick@emory.edu>

Date: Wednesday, February 1, 2023 at 7:50 AM

To: "Tan, Youran" <youran.tan@emory.edu>, "Taibl, Kaitlin" <kaitlin.rene.taibl@emory.edu>, "Barr, Dana Boyd" <dbbarr@emory.edu>, "Ryan, Peter Barry" <bryan@emory.edu>, "Huels, Anke" <anke.huels@emory.edu>, "Eatman, Jasmin" <jasmin.eatman@emory.edu>, "Panuwet, Parinya" <parinya.panuwet@emory.edu>, "D'Souza, Priya Esilda" <pdsouza@emory.edu>, "Yakimavets, Volha" <volha.yakimavets@emory.edu>, "Lee, Grace E." <grace.lee@emory.edu>, Patricia Brennan <pbren01@emory.edu>, "Dunlop, Anne Lang" <amlang@emory.edu>, "Liang, Donghai" <donghai.liang@emory.edu>, "Corwin, Elizabeth" <ejc2202@cumc.columbia.edu>

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JESEE is asking that we co-authors with the change, and ask them to reply to this email confirming that they agree to these changes, combine all of the co-authors' email responses in one document and upload this file to the submission.

Please respond to this email confirming that you agree to add Jasmin as a co-author.

Thank you!
Stephanie

Stephanie Eick, PhD, MPH (she/her)

Assistant Professor

Gangarosa Department of Environmental Health

Emory University Rollins School of Public Health

stephanie.marie.eick@emory.edu

Eick, Stephanie M.

From: Barr, Dana Boyd
Sent: Wednesday, February 1, 2023 10:31 AM
To: Eick, Stephanie M.; Tan, Youran; Taibl, Kaitlin; Ryan, Peter Barry; Huels, Anke; Eatman, Jasmin; Panuwet, Parinya; D'Souza, Priya Esilda; Yakimavets, Volha; Lee, Grace E.; Brennan, Patricia; Dunlop, Anne Lang; Liang, Donghai; Corwin, Elizabeth
Subject: RE: JESEE paper - please respond to this email

I definitely agree that Jasmin should be a coauthor.

From: Eick, Stephanie M. <stephanie.marie.eick@emory.edu>
Sent: Wednesday, February 1, 2023 9:51 AM
To: Tan, Youran <youran.tan@emory.edu>; Taibl, Kaitlin <kaitlin.rene.taibl@emory.edu>; Barr, Dana Boyd <dbbarr@emory.edu>; Ryan, Peter Barry <bryan@emory.edu>; Huels, Anke <anke.huels@emory.edu>; Eatman, Jasmin <jasmin.eatman@emory.edu>; Panuwet, Parinya <parinya.panuwet@emory.edu>; D'Souza, Priya Esilda <pdsouza@emory.edu>; Yakimavets, Volha <volha.yakimavets@emory.edu>; Lee, Grace E. <grace.lee@emory.edu>; Brennan, Patricia <pbren01@emory.edu>; Dunlop, Anne Lang <amlang@emory.edu>; Liang, Donghai <donghai.liang@emory.edu>; Corwin, Elizabeth <ejc2202@cumc.columbia.edu>
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Stephanie Eick, PhD, MPH (she/her)

Assistant Professor
Gangarosa Department of Environmental Health
Emory University Rollins School of Public Health
stephanie.marie.eick@emory.edu

From: [Dunlop, Anne Lang](#)
To: [Eick, Stephanie M.](#); [Tan, Youran](#); [Taibl, Kaitlin](#); [Barr, Dana Boyd](#); [Ryan, Peter Barry](#); [Huels, Anke](#); [Eatman, Jasmin](#); [Panuwet, Parinya](#); [D'Souza, Priya Esilda](#); [Yakimavets, Volha](#); [Lee, Grace E.](#); [Brennan, Patricia](#); [Liang, Donghai](#); [Corwin, Elizabeth](#)
Subject: RE: JESEE paper - please respond to this email
Date: Wednesday, February 1, 2023 9:59:49 AM

I am fully in support of Jasmin Eatman serving as a co-author for this manuscript submission.

Thank you,

Anne Dunlop

From: Eick, Stephanie M. <stephanie.marie.eick@emory.edu>
Sent: Wednesday, February 1, 2023 9:51 AM
To: Tan, Youran <youran.tan@emory.edu>; Taibl, Kaitlin <kaitlin.rene.taibl@emory.edu>; Barr, Dana Boyd <dbbarr@emory.edu>; Ryan, Peter Barry <bryan@emory.edu>; Huels, Anke <anke.huels@emory.edu>; Eatman, Jasmin <jasmin.eatman@emory.edu>; Panuwet, Parinya <parinya.panuwet@emory.edu>; D'Souza, Priya Esilda <pdsouza@emory.edu>; Yakimavets, Volha <volha.yakimavets@emory.edu>; Lee, Grace E. <grace.lee@emory.edu>; Brennan, Patricia <pbren01@emory.edu>; Dunlop, Anne Lang <amlang@emory.edu>; Liang, Donghai <donghai.liang@emory.edu>; Corwin, Elizabeth <ejc2202@cumc.columbia.edu>
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Stephanie Eick, PhD, MPH (she/her)
Assistant Professor

Gangarosa Department of Environmental Health
Emory University Rollins School of Public Health
stephanie.marie.eick@emory.edu

From: [Ryan, Peter Barry](#)
To: [Eick, Stephanie M.](#)
Cc: [Tan, Youran](#); [Taibl, Kaitlin](#); [Barr, Dana Boyd](#); [Huels, Anke](#); [Eatman, Jasmin](#); [Panuwet, Parinya](#); [D'Souza, Priya Esilda](#); [Yakimavets, Volha](#); [Lee, Grace E.](#); [Brennan, Patricia](#); [Dunlop, Anne Lang](#); [Liang, Donghai](#); [Corwin, Elizabeth](#)
Subject: Re: JESEE paper - please respond to this email
Date: Wednesday, February 1, 2023 9:58:25 AM

I am fine with Jasmin as a co-author.

Barry

Sent from my iPhone

On Feb 1, 2023, at 09:50, Eick, Stephanie M. <stephanie.marie.eick@emory.edu> wrote:

Hi co-author team,

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Stephanie

Stephanie Eick, PhD, MPH (she/her)

Assistant Professor
Gangarosa Department of Environmental Health
Emory University Rollins School of Public Health
stephanie.marie.eick@emory.edu

From: [D'Souza, Priya Esilda](#)
To: [Eick, Stephanie M.](#)
Subject: Re: JESEE paper - please respond to this email
Date: Wednesday, February 1, 2023 9:53:03 AM

I absolutely agree to add Jasmin Eatman as a co-author.

Priya

From: Eick, Stephanie M. <stephanie.marie.eick@emory.edu>
Sent: Wednesday, February 1, 2023 9:50 AM
To: Tan, Youran <youran.tan@emory.edu>; Taibl, Kaitlin <kaitlin.rene.taibl@emory.edu>; Barr, Dana Boyd <dbbarr@emory.edu>; Ryan, Peter Barry <bryan@emory.edu>; Huels, Anke <anke.huels@emory.edu>; Eatman, Jasmin <jasmin.eatman@emory.edu>; Panuwet, Parinya <parinya.panuwet@emory.edu>; D'Souza, Priya Esilda <pdsouza@emory.edu>; Yakimavets, Volha <volha.yakimavets@emory.edu>; Lee, Grace E. <grace.lee@emory.edu>; Brennan, Patricia <pbren01@emory.edu>; Dunlop, Anne Lang <amlang@emory.edu>; Liang, Donghai <donghai.liang@emory.edu>; Corwin, Elizabeth <ejc2202@cumc.columbia.edu>
Subject: JESEE paper - please respond to this email

Hi co-author team,

I submitted the final file for our in press JESEE paper "Prenatal exposure to persistent and non-persistent chemical mixtures and associations with adverse birth outcomes in the Atlanta African American Maternal-Child Cohort," and the journal just came back to me regarding the author list.

During the first revision, reviewer 2 had a few comments that essentially asked for a detailed description in the intro/discussion about the role that structural racism may play in our findings. Donghai and I asked Jasmin Eatman to help with the respond to this, and we included her as a co-author in the re-submission.

JESEE is asking that we co-authors with the change, and ask them to reply to this email confirming that they agree to these changes, combine all of the co-authors' email responses in one document and upload this file to the submission.

Please respond to this email confirming that you agree to add Jasmin as a co-author.

Thank you!
Stephanie

Stephanie Eick, PhD, MPH (she/her)

Assistant Professor
Gangarosa Department of Environmental Health
Emory University Rollins School of Public Health
stephanie.marie.eick@emory.edu

