

Supplementary Materials: Combined Effects of Prenatal Exposures to Environmental Chemicals on Birth Weight

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Table S1. Pearson correlation matrix of the exposure data.

	PCB 180	PCB 153	PCB 138	p,p'-DDE	CALUX	PFOS	PFOA	Lead	Cadmium	Manganese	Thallium	Arsenic	MECPP	PM _{2.5}	Copper	Methylmercury
PCB 180	1; 1															
PCB 153	0.9; <0.001	1; 1														
PCB 138	0.77; <0.001	0.8; <0.001	1; 1													
p,p'-DDE	0.46; <0.001	0.54; <0.001	0.48; <0.001	1; 1												
CALUX	0.21; 0.002	0.15; 0.022	0.1; 0.152	0.09; 0.155	1; 1											
PFOS	0.13; 0.053	0.22; 0.001	0.14; 0.045	0.2; 0.004	0.02; 0.816	1; 1										
PFOA	0.16; 0.018	0.19; 0.005	0.06; 0.414	0.07; 0.307	0.09; 0.205	0.5; <0.001	1; 1									
Lead	0.24; <0.001	0.24; <0.001	0.17; 0.011	0.22; <0.001	-0.02; 0.777	0.1; 0.159	0.16; 0.019	1; 1								
Cadmium	0.17; 0.01	0.11; 0.085	0.09; 0.156	0.01; 0.901	0.1; 0.164	-0.17; 0.014	0.03; 0.718	0.14; 0.035	1; 1							
Manganese	0.13; 0.053	0.08; 0.203	0.15; 0.023	-0.06; 0.326	-0.09; 0.172	-0.2; 0.003	-0.09; 0.221	0.2; 0.002	-0.03; 0.62	1; 1						
Thallium	-0.11; 0.097	-0.09; 0.163	-0.14; 0.036	-0.03; 0.624	-0.09; 0.196	0.02; 0.795	0.07; 0.291	0.13; 0.047	0.03; 0.659	0.14; 0.026	1; 1					
Arsenic	0.26; <0.001	0.27; <0.001	0.17; 0.01	0.03; 0.7	0.05; 0.503	0.09; 0.216	0.1; 0.134	0.21; 0.001	-0.05; 0.492	0.15; 0.02	0.05; 0.446	1; 1				
MECPP	-0.03; 0.617	-0.07; 0.343	-0.09; 0.209	0.01; 0.859	-0.02; 0.827	0.07; 0.315	0.11; 0.126	0.01; 0.884	-0.08; 0.238	-0.07; 0.34	0.13; 0.053	-0.07; 0.328	1; 1			
PM_{2.5}	0.19; 0.003	0.16; 0.017	0.21; <0.001	0.09; 0.15	0.18; 0.008	0.07; 0.339	0.07; 0.29	0.05; 0.48	0.17; 0.01	-0.01; 0.921	-0.06; 0.394	-0.05; 0.455	-0.15; 0.028	1; 1		
Copper	0.06; 0.339	0.02; 0.818	0.03; 0.659	0.01; 0.821	-0.1; 0.138	-0.1; 0.133	-0.07; 0.351	0.15; 0.018	-0.04; 0.553	0.38; <0.001	0.29; <0.001	0.08; 0.192	0.2; 0.004	-0.11; 0.102	1; 1	
Methyl-mercury	0.29; <0.001	0.3; <0.001	0.15; 0.018	0.11; 0.094	0.07; 0.319	0.35; <0.001	0.23; 0.001	0.15; 0.019	-0.09; 0.176	0.11; 0.082	0.02; 0.786	0.46; <0.001	-0.01; 0.845	-0.05; 0.46	0.06; 0.369	1; 1

Note: Pearson correlation coefficient followed by corresponding p-value.

Table S2. Results of the Principal Component Analysis (PCA): component loading weights for the exposures.

Exposure	Whole PCA (All 16 Exposures)						Subset PCA (Subset of 12 Exposures)			
	PC1	PC2	PC3	PC4	PC5	PC6	PC1	PC2	PC3	PC4
Principal Component	PC1	PC2	PC3	PC4	PC5	PC6	PC1	PC2	PC3	PC4
Explained variance (%)	22%	11%	10%	8%	8%	6%	28%	15%	11%	9%
PCB 138	0.80	0.08	-0.27	0.02	-0.26	-0.09	0.85	-0.20	0.07	-0.17
PCB 153	0.92	0.04	-0.19	0.03	-0.11	0.03	0.93	-0.12	-0.03	-0.07
PCB 180	0.88	0.08	-0.17	0.05	-0.05	0.13	0.92	-0.09	0.01	-0.03
p,p'-DDE	0.56	-0.06	-0.05	0.15	-0.39	0.02	0.62	-0.19	0.09	-0.33
CALUX	0.23	-0.27	-0.15	0.16	0.27	0.65	/	/	/	/
PFOS	0.40	-0.57	0.43	-0.11	-0.08	-0.28	/	/	/	/
PFOA	0.31	-0.42	0.52	0.16	0.21	-0.14	/	/	/	/
Lead	0.41	0.27	0.27	0.30	0.16	-0.35	0.37	0.33	0.24	0.31
Cadmium	0.10	0.13	-0.08	0.64	0.54	0.12	0.15	-0.19	0.50	0.63
Manganese	0.13	0.70	-0.07	-0.07	-0.01	-0.20	0.19	0.57	0.29	-0.12
Thallium	-0.07	0.34	0.57	0.29	0.02	0.01	-0.09	0.51	0.41	0.01
Arsenic	0.47	0.25	0.13	-0.36	0.48	0.06	0.37	0.46	-0.45	0.43
Copper	0.05	0.57	0.36	0.15	-0.25	0.20	0.10	0.64	0.38	-0.31
MECPP	0.01	-0.12	0.49	0.17	-0.45	0.41	/	/	/	/
PM _{2.5}	0.10	-0.35	-0.25	0.47	0.05	-0.27	0.20	-0.38	0.37	0.27
Methylmercury	0.50	-0.03	0.31	-0.52	0.29	0.11	0.40	0.40	-0.56	0.19

Abbreviations: PC: Principal Component.

Table S3. Mixture regression models with significant negative associations between maternal exposure and birth weight.

N Exposures	p-Value	Estimate (95% CI) *	R ² Adj.	MSE	N	sum(PCB) *	P,p'-DDE	CALUX	PFOS	PFOA	Lead	Cadmium	Manganese	Thallium	Arsenic	MECPP	PM _{2.5}	Copper	Methylmercury
1	0.0156	-90.59 (-163.83; -17.35)	0.35	148,758	228														
2	0.0045	-95.92 (-161.77; -30.08)	0.37	145,897	217							■							
2	0.0083	-108.69 (-189.04; -28.33)	0.34	138,750	201							■							
3	0.0030	-120.97 (-200.37; -41.57)	0.36	135,197	190							■							
3	0.0054	-108.84 (-185.19; -32.49)	0.35	138,201	201							■		■					
4	0.0025	-130.32 (-214.13; -46.51)	0.38	127,503	162					■		■		■					
4	0.0036	-115.78 (-193.16; -38.4)	0.36	135,427	190					■		■		■					
5	0.0019	-135.14 (-219.7; -50.59)	0.38	127,083	162					■		■		■					
5	0.0021	-129.75 (-211.89; -47.61)	0.36	134,989	189					■		■		■					■

Notes: * The estimate is calculated for an increase of the mixture Z-score with the interquartile range. The model is adjusted for gestational age, child's sex, smoking of the mother during pregnancy, parity and maternal prepregnancy BMI. The black rectangles indicate the exposure biomarkers that are included in the model. MSE: Mean squared error. * 3 marker PCB's (i.e., PCB 180, PCB 153, and PCB 138) were summed prior to analysis.

Table S4. Cont.

N Chemicals	p _{Interaction}	p _{Girls}	Estimate (95% CI) _{Girls} *	p _{Boys}	Estimate (95% CI) _{Boys} *	R ² Adj.	MSE	N Samples	Sum(PCB) *	p,p'-DDE	CALUX	PFOS	PFOA	Lead	Cadmium	Manganese	Thallium	Arsenic	MECPP	PM _{2.5}	Copper	Methylmercury	
6	0.0032	0.0006	-235.45 (-368.62; -102.29)	0.6698	24 (-86.89; 134.88)	0.36	141,171	183															
6	0.0140	0.0007	-217.71 (-342.6; -92.83)	0.8211	-12.43 (-120.77; 95.91)	0.36	141,619	183															

Notes: * The estimate is calculated for an increase of the mixture Z-score with the interquartile range. The model is adjusted for gestational age, smoking of the mother during pregnancy, parity and maternal prepregnancy BMI. The black rectangles indicate the exposure biomarkers that are included in the model. MSE: Mean squared error. * 3 marker PCB's (i.e., PCB 180, PCB 153, and PCB 138) were summed prior to analysis.

Table S5. Mixture regression models with significant negative associations between maternal exposure and birth weight in boys but not in girls.

N Chemicals	p _{Interaction}	p _{Girls}	Estimate (95% CI) _{Girls} *	p _{Boys}	Estimate (95% CI) _{Boys} *	R ² Adj.	MSE	N Samples	sum(PCB) *	p,p'-DDE	CALUX	PFOS	PFOA	Lead	Cadmium	Manganese	Thallium	Arsenic	MECPP	PM _{2.5}	Copper	Methylmercury	
1	0.0458	0.3186	61.47 (-59.77; 82.71)	0.0646	-101.22 (-208.64; 6.19)	0.34	141126	207															
2	0.0145	0.4902	34.82 (-64.55; 134.2)	0.0061	-128.65 (-220.05; -37.25)	0.37	136225	196															

Notes: * The estimate is calculated for an increase of the mixture Z-score with the interquartile range. The model is adjusted for gestational age, smoking of the mother during pregnancy, parity, and maternal prepregnancy BMI. The black rectangles indicate the exposure biomarkers that are included in the model. MSE: Mean squared error. * 3 marker PCB's (i.e., PCB 180, PCB 153, and PCB 138) were summed prior to analysis.

