Supplemental Material

Prenatal Exposure to Perfluoroalkyl Substances: Infant Birth Weight and Early Life Growth

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Table 1. Adjusted rate of change in and repeated weight-for-age, length-for-age, weight-for-height, and BMI z-scores from 4 weeks to 2 years of age by tertile of PFAS serum concentrations (n=299)[1]

PFAS	Tertile range (ng/mL)	Weight for age z-score β (95% CI)	Length for age z-score β (95% CI)	Weight for length z-score β (95% CI)	BMI z-score β (95% CI)
PFOA					
T1	0.5-4.3	0.44 (0.21, 0.68)	-0.01 (-0.28, 0.26)	0.43 (0.17, 0.70)	0.62 (0.38, 0.85)
T2	4.4-6.7	0.54 (0.30, 0.77)	-0.18 (-0.45, 0.09)	0.83 (0.57, 1.10)	0.89 (0.66, 1.13)
T3	6.8-26.4	0.57 (0.34, 0.80)	0.19 (-0.07, 0.46)	0.39 (0.13, 0.65)	0.67 (0.44, 0.90)
p- value[2]		0.74	0.16	0.04	0.24
PFOS					
T1	0.4-10.8	0.65 (0.41, 0.88)	0.16 (-0.11, 0.43)	0.51 (0.24, 0.78)	0.74 (0.51, 0.98)
T2	10.9-16.5	0.31 (0.08, 0.54)	-0.22 (-0.49, 0.04)	0.54 (0.28, 0.80)	0.61 (0.38, 0.84)
T3	16.6-57.2	0.61 (0.37, 0.84)	0.07 (-0.20, 0.35)	0.60 (0.33, 0.87)	0.84 (0.60, 1.07)
p- value[2]		0.08	0.11	0.88	0.40
PFNA					
T1	0.1-0.7	0.50 (0.25, 0.75)	0.09 (-0.2,0 0.37)	0.46 (0.18, 0.75)	0.62 (0.38, 0.87)
T2	0.8-1.0	0.43 (0.20, 0.66)	-0.11 (-0.38, 0.15)	0.51 (0.25, 0.78)	0.73 (0.50, 0.96)
T3	1.1-2.9	0.62 (0.39, 0.84)	0.04 (-0.22, 0.30)	0.66 (0.40, 0.92)	0.81 (0.59, 1.04)
p- value[2]		0.53	0.55	0.57	0.57
PFHxS					
T1	0.1-1.0	0.65 (0.41, 0.88)	0.15 (-0.12, 0.41)	0.56 (0.29, 0.82)	0.78 (0.55, 1.02)
T2	1.1-1.9	0.57 (0.32, 0.82)	-0.10 (-0.39, 0.19)	0.71 (0.42, 1.00)	0.85 (0.60, 1.10)
T3	2.0-32.5	0.36 (0.14, 0.58)	-0.05 (-0.30, 0.21)	0.42 (0.17, 0.68)	0.58 (0.36, 0.81)
p- value[2]		0.24	0.50	0.34	0.27

[1] Children with 2 or more weight measurements between 4 weeks and 2 years

[2] EMM p-value for age*tertile

Adjusted for maternal age at delivery, race, marital status, insurance, income, education, parity, serum cotinine, depressive symptoms, mid pregnancy BMI, food security, fruit/vegetable and fish consumption during pregnancy, and prenatal vitamin use

Table 2. Sensitivity analyses examining impact of various adjustments and exclusions on difference in birth weight z-score per 2-fold increase in PFAS serum concentrations

Adjustments	PFOA	PFOS	PFNA	PFHxS
Adjusted Model[1]	-0.03 (-0.17, 0.10)	-0.06 (-0.16, 0.04)	-0.02 (-0.19, 0.15)	-0.06 (-0.16, 0.04)
Adjusted for all 4 PFAS	0.00 (-0.16, 0.18)	-0.06 (-0.26, 0.15)	0.05 (-0.17, 0.26)	-0.04 (-0.17, 0.08)
Excluding preterm births (n=30)	-0.04 (-0.18, 0.10)	-0.08 (-0.23, 0.07)	-0.01 (-0.20, 0.18)	-0.05 (-0.15, 0.05)
Restricted to those with serum collected at approx. 16 weeks (n=297)	-0.04 (-0.18, 0.10)	-0.06 (-0.20, 0.09)	-0.02 (-0.22, 0.17)	-0.03 (-0.15, 0.07)

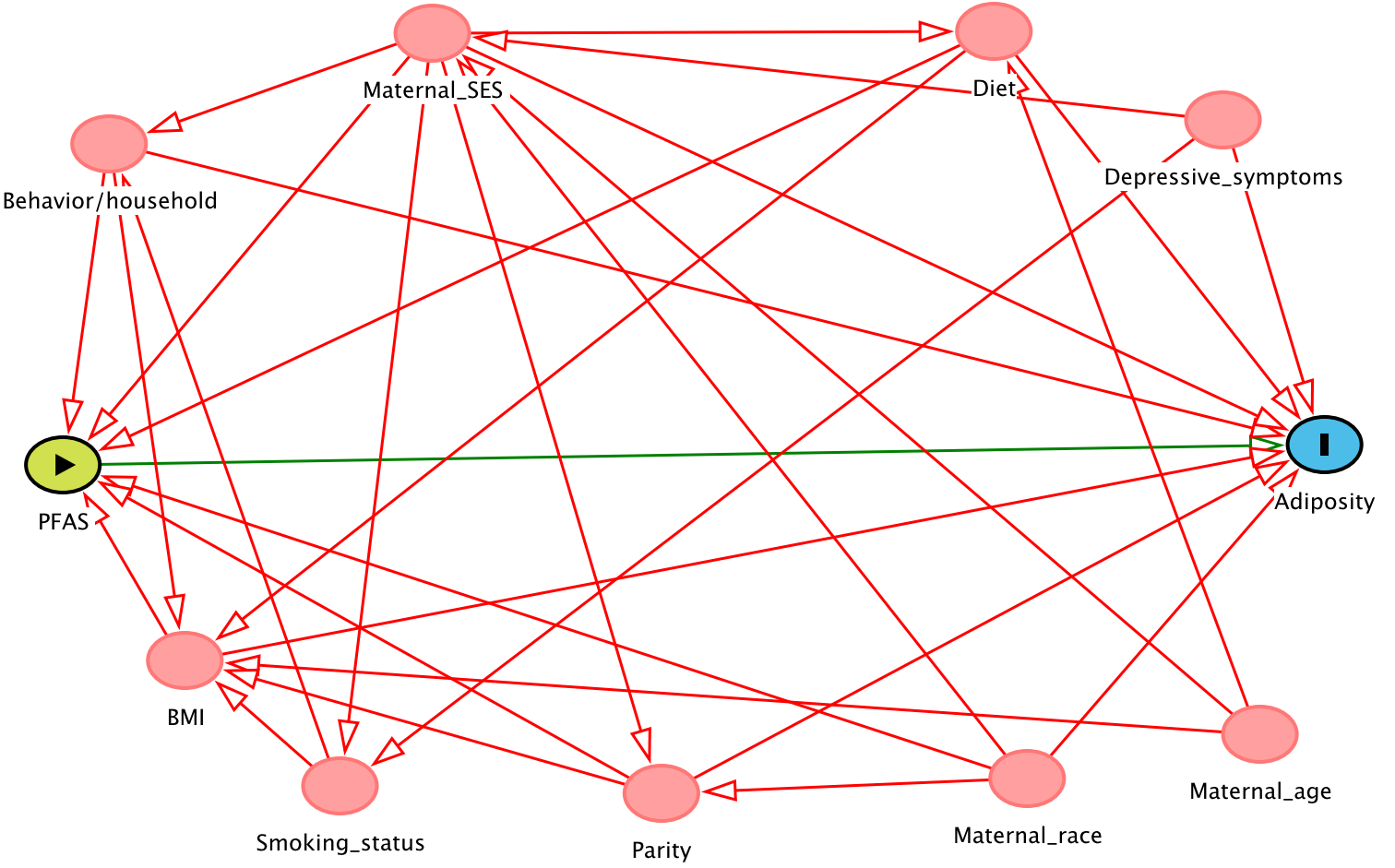
[1]Adjusted for maternal age at delivery, race, marital status, insurance, income, education, parity, serum cotinine, depressive symptoms, mid pregnancy BMI, food security, fruit/vegetable and fish consumption during pregnancy, and prenatal vitamin use

Table 3. Sensitivity analyses examining impact of various adjustments and exclusions on difference in BMI z-score per 2-fold increase in PFAS serum concentrations

Adjustments	PFOA	PFOS	PFNA	PFHxS
Adjusted Model [1]	-0.12 (-0.25, 0.01)	-0.09 (-0.22, 0.04)	-0.04 (-0.21, 0.13)	-0.08 (-0.18, 0.01)
Adjusted for all 4 PFAS	-0.13 (-0.28, 0.03)	0.01 (-0.19, 0.20)	0.06 (-0.15, 0.26)	-0.05 (-0.17, 0.06)
Adjusted for birth weight	-0.09 (-0.19, 0.02)	-0.05 (-0.15, 0.06)	-0.03 (-0.17, 0.10)	-0.05 (-0.13, 0.03)
Adjusted for breastfeeding [b]	-0.11 (-0.24, 0.02)	-0.08 (-0.21, 0.05)	-0.03 (-0.20, 0.13)	-0.08 (-0.18, 0.01)
Excluding preterm births (n=29)	-0.08 (-0.19, 0.03)	-0.05 (-0.16, 0.07)	-0.05 (-0.20, 0.10)	-0.06 (-0.13, 0.02)
Restricted to those with serum collected at approx. 16 weeks (n=286)	-0.15 (-0.29, -0.02)	-0.08 (-0.22, 0.07)	-0.03 (-0.22, 0.16)	-0.07 (-0.18, 0.03)

[1]Adjusted for maternal age at delivery, race, marital status, insurance, income, education, parity, serum cotinine, depressive symptoms, mid pregnancy BMI, food security, fruit/vegetable and fish consumption during pregnancy, and prenatal vitamin use

Figure 1. Directed Acyclic Graph of confounding structure between prenatal PFAS exposure and early growth


Maternal_SES
Diet
Behavior/household
Depressive_symptoms
PFAS
Adiposity
BMI
Smoking_status
Parity
Maternal_race
Maternal_age

[a]Socio-demographic factors included maternal education, income, marital status, and insurance status were assessed using standardized interviews administered by trained research assistants. Nutritional factors were assessed during the 2nd or 3rd trimester of pregnancy using standardized interviews and included maternal food security, prenatal vitamin use, and frequency of fruit, vegetable, and fish consumption. Serum cotinine, a sensitive and specific marker of active and secondhand tobacco smoke exposure, was measured using previously described methods (Bernert et al. 1997; Braun et al. 2010). Parity and maternal mid pregnancy body mass index (BMI) at ~16 weeks gestation were abstracted from medical records. Depressive symptoms at 20 weeks gestation were assessed using the Beck Depression Inventory-II (Beck 1996).