SUPPLEMENTARY MATERIALS
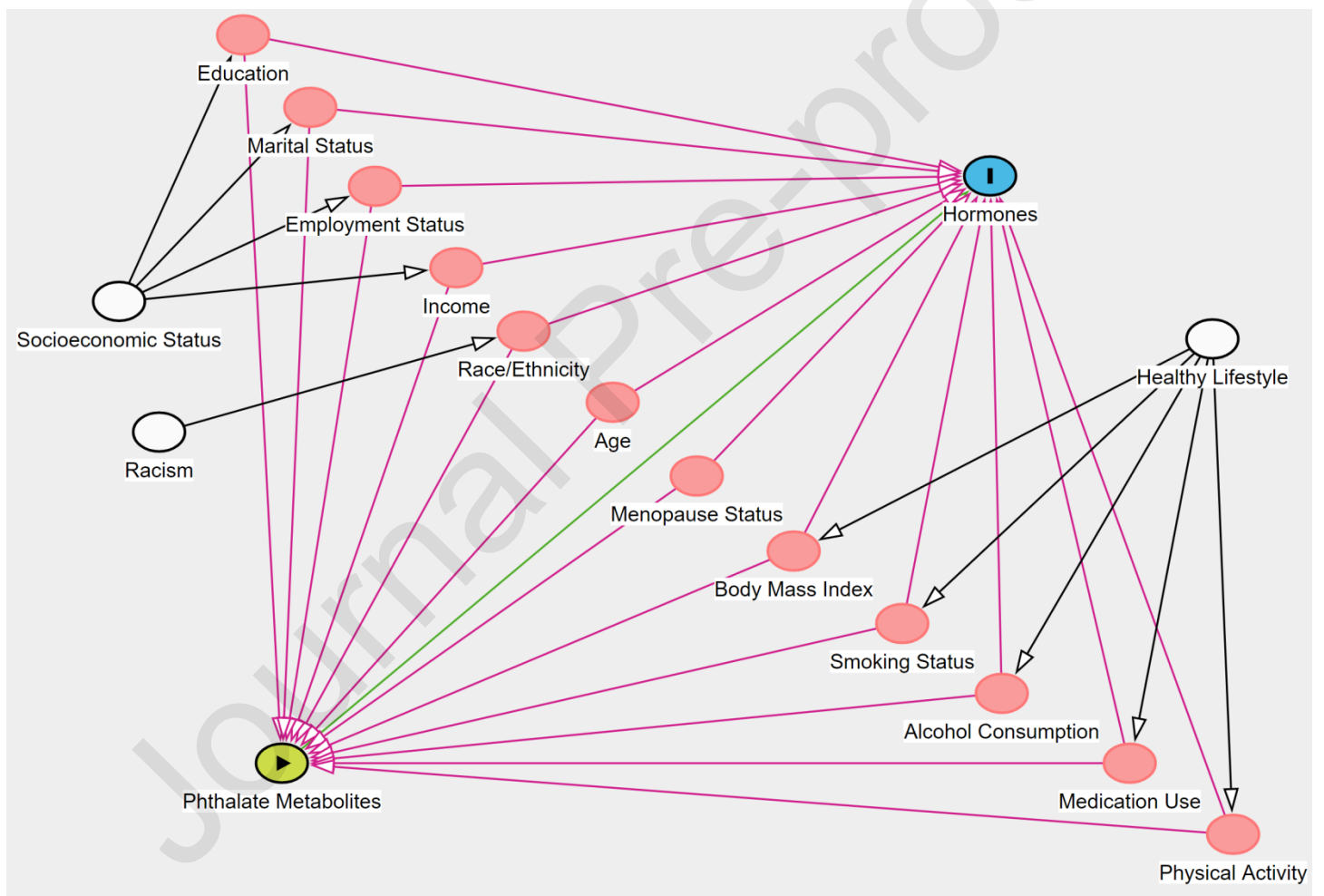

Supplemental Figure 1. Directed acyclic graph for associations of phthalates with hormones. Green circle represents the exposure (i.e. phthalates), while the blue circle represents the outcome (i.e. hormones). White circles represent latent variables (i.e. socioeconomic status, racism, and healthy lifestyle), while red circles

represent confounding variables that were measured in MWHS and included as covariates in final statistical

analyses.

Supplemental Table 1. Quartile associations of phthalate metabolites with hormones (n=718).

Exposure	Estradiol	Testosterone	Progesterone	SHBG	FSH	AMH
	% change in hormones (95%CI)					
MCPP						
Q2 (ref = Q1)	4.0 (-8.5, 18.3)	2.9 (-10.0, 17.8)	-10.3 (-26.1, 8.8)	0.8 (-9.0, 11.8)	9.3 (-12.9, 37.1)	0.4 (-16.2, 20.4)
Q3 (ref = Q1)	3.9 (-8.6, 18.1)	2.2 (-10.7, 16.9)	1.1 (-16.7, 22.6)	-8.1 (-17.1, 1.8)	5.2 (-16.2, 31.9)	9.7 (-8.5, 31.4)
Q4 (ref = Q1)	7.1 (-5.8, 21.7)	3.3 (-9.7, 18.2)	4.7 (-13.7, 26.9)	-3.5 (-12.9, 7.0)	-1.6 (-21.5, 23.5)	16.3 (-3.0, 39.3)
P linear trend	0.97	0.76	0.86	0.28	0.24	0.85
MBzP						
Q2 (ref = Q1)	0.7 (-11.5, 14.7)	-7.5 (-19.3, 5.9)	-5.1 (-21.9, 15.3)	3.2 (-7.0, 14.5)	5.8 (-15.8, 33.0)	7.4 (-10.6, 29.0)
Q3 (ref = Q1)	11.6 (-1.9, 26.9)	-11.5 (-22.7, 1.3)	6.2 (-12.5, 29.0)	8.8 (-1.9, 20.7)	-11.1 (-29.2, 11.6)	6.8 (-11.0, 28.1)
Q4 (ref = Q1)	3.4 (-9.3, 17.9)	-3.1 (-15.5, 11.2)	5.2 (-13.7, 28.2)	5.1 (-5.4, 16.8)	-7.8 (-26.9, 16.3)	17.9 (-2.1, 41.9)
P linear trend	0.99	0.69	0.20	0.81	0.37	0.70
∑DEHP						
Q2 (ref = Q1)	-7.0 (-18.2, 5.7)	**-13.1 (-24.0, -0.5)**	-2.1 (-19.3, 18.9)	-7.0 (-16.1, 3.2)	4.0 (-17.2, 30.6)	9.8 (-8.5, 31.7)
Q3 (ref = Q1)	4.6 (-8.0, 18.9)	-8.0 (-19.6, 5.2)	-6.4 (-22.9, 13.5)	8.6 (-2.0, 20.4)	3.8 (-17.3, 30.2)	11.5 (-7.0, 33.8)
Q4 (ref = Q1)	9.8 (-3.6, 25.0)	-4.3 (-16.4, 9.7)	13.2 (-6.9, 37.7)	-1.3 (-11.0, 9.6)	-10.9 (-29.2, 12.2)	9.5 (-8.9, 31.7)
P linear trend	0.08	0.28	0.02	0.34	0.80	0.22
∑Plastics						
Q2 (ref = Q1)	3.0 (-9.4, 17.1)	-9.8 (-21.2, 3.2)	2.0 (-15.9, 23.7)	4.6 (-5.7, 16.0)	-4.4 (-23.8, 20.0)	-3.0 (-19.1, 16.3)
Q3 (ref = Q1)	0.9 (-11.2, 14.8)	-9.6 (-21.0, 3.4)	-3.8 (-20.7, 16.7)	9.0 (-1.7, 20.9)	6.7 (-14.9, 33.9)	11.2 (-7.3, 33.4)
Q4 (ref = Q1)	13.4 (-0.5, 29.2)	-4.7 (-16.9, 9.3)	21.3 (-0.3, 47.5)	2.7 (-7.6, 14.0)	-18.4 (-35.1, 2.8)	12.5 (-6.4, 35.3)
P linear trend	0.09	0.26	0.01	0.38	0.64	0.20
MEP						
Q2 (ref = Q1)	4.5 (-8.1, 18.9)	9.4 (-4.4, 25.2)	2.9 (-15.3, 24.9)	4.1 (-6.1, 15.5)	0.4 (-20.0, 26.0)	-8.9 (-24.1, 9.3)
Q3 (ref = Q1)	-8.1 (-19.4, 4.8)	**14.7 (0.0, 31.6)**	12.1 (-8.0, 36.7)	10.0 (-1.1, 22.2)	**31.3 (4.1, 65.5)**	-12.7 (-27.5, 5.2)
Q4 (ref = Q1)	-2.0 (-14.5, 12.4)	1.9 (-11.7, 17.6)	15.3 (-6.2, 41.6)	6.0 (-5.1, 18.3)	17.1 (-8.0, 48.9)	-7.8 (-24.0, 11.8)
P linear trend	0.58	0.81	0.10	0.86	0.88	0.86
MBP						
Q2 (ref = Q1)	-2.8 (-14.6, 10.6)	-5.7 (-17.6, 7.9)	-3.5 (-20.5, 17.3)	3.9 (-6.3, 15.3)	-3.7 (-23.3, 21.0)	**23.1 (2.6, 47.7)**
Q3 (ref = Q1)	-0.5 (-12.6, 13.2)	-1.0 (-13.5, 13.3)	3.4 (-14.8, 25.6)	-0.5 (-10.3, 10.4)	-4.6 (-24.1, 19.8)	10.5 (-7.9, 32.5)
Q4 (ref = Q1)	-0.6 (-12.6, 13.1)	7.6 (-5.9, 23.1)	9.4 (-9.8, 32.8)	6.7 (-3.8, 18.3)	-12.4 (-30.2, 9.9)	**19.9 (0.1, 43.7)**
P linear trend	0.78	0.14	0.90	0.80	0.37	0.09
MiBP						
Q2 (ref = Q1)	8.6 (-4.4, 23.5)	**18.5 (3.7, 35.5)**	10.0 (-9.3, 33.4)	5.1 (-5.2, 16.5)	-4.0 (-23.5, 20.3)	10.0 (-8.2, 31.9)
Q3 (ref = Q1)	2.0 (-10.4, 16.2)	8.8 (-4.9, 24.5)	11.8 (-8.0, 35.9)	-2.5 (-12.2, 8.2)	-15.4 (-32.7, 6.4)	11.5 (-7.2, 33.9)
Q4 (ref = Q1)	9.2 (-4.2, 24.5)	**23.0 (7.3, 41.0)**	14.4 (-6.1, 39.3)	8.6 (-2.2, 20.7)	-3.1 (-23.1, 22.2)	6.7 (-11.3, 28.5)
P linear trend	0.02	0.05	0.24	0.50	0.66	0.22
∑PCP						
Q2 (ref = Q1)	-3.0 (-14.7, 10.4)	3.2 (-9.8, 18.1)	6.3 (-12.5, 29.0)	5.1 (-5.2, 16.6)	3.0 (-18.0, 29.3)	-7.8 (-23.2, 10.6)
Q3 (ref = Q1)	-4.7 (-16.3, 8.6)	13.2 (-1.2, 29.7)	12.5 (-7.5, 36.8)	10.3 (-0.6, 22.5)	11.8 (-11.1, 40.6)	-6.5 (-22.2, 12.3)
Q4 (ref = Q1)	-0.6 (-13.2, 13.8)	2.0 (-11.5, 17.6)	21.6 (-0.9, 49.1)	8.3 (-2.9, 20.8)	20.6 (-5.1, 53.2)	-6.1 (-22.5, 13.8)
P linear trend	0.52	0.74	0.10	0.85	0.80	0.98
∑Phthalates						
Q2 (ref = Q1)	3.2 (-9.2, 17.5)	7.8 (-5.9, 23.4)	14.3 (-5.9, 38.7)	0.8 (-9.2, 11.8)	-5.9 (-25.1, 18.2)	2.4 (-14.7, 23.0)
Q3 (ref = Q1)	-4.2 (-15.8, 9.0)	6.4 (-7.1, 21.8)	4.1 (-14.3, 26.4)	4.4 (-6.0, 15.8)	-5.8 (-25.0, 18.4)	5.6 (-12.1, 26.8)
Q4 (ref = Q1)	9.3 (-4.3, 24.9)	3.7 (-9.8, 19.2)	**24.4 (1.8, 51.9)**	3.6 (-6.9, 15.3)	7.1 (-15.4, 35.4)	5.3 (-12.8, 27.1)
P linear trend	0.39	0.85	0.05	0.94	0.76	0.85
∑AA						
Q2 (ref = Q1)	5.2 (-7.4, 19.5)	-6.3 (-18.0, 7.1)	1.8 (-16.0, 23.3)	-0.4 (-10.1, 10.4)	-7.0 (-25.8, 16.6)	15.9 (-3.3, 38.8)
Q3 (ref = Q1)	12.2 (-1.2, 27.5)	-1.3 (-13.7, 12.8)	15.0 (-5.1, 39.3)	6.1 (-4.3, 17.6)	-16.3 (-33.2, 4.9)	**20.7 (0.7, 44.6)**
Q4 (ref = Q1)	**18.7 (4.3, 35.0)**	4.2 (-9.0, 19.3)	**26.1 (3.8, 53.2)**	7.1 (-3.5, 18.8)	-17.3 (-34.2, 4.0)	12.5 (-6.3, 35.1)
P linear trend	0.07	0.79	0.04	0.50	0.36	0.03

Data are presented as the % change in hormones in phthalate quartile 2 (Q2), 3 (Q3), and 4 (Q4) compared to quartile 1. Linear regression models adjusted for age, race/ethnicity employment status, education, income, marital status, alcohol consumption, smoking status, physical activity, medication use, menopausal status, and BMI. CI, confidence interval; AMH, anti-Mullerian hormone; BMI, body mass index; FSH, follicle stimulating hormone; SHBG, sex hormone binding globulin.