Supplemental Material

Associations of Mid-Childhood Bisphenol A and Bisphenol S Exposure with Mid-Childhood & Adolescent Obesity

Authors: Priya Gajjar, Yun Liu, Nan Li, Jessie P. Buckley, Aimin Chen, Bruce P. Lanphear, Heidi J. Kalkwarf, Kim Cecil, Kimberly Yolton, Joseph M. Braun

CONTENTS

	Page #
Table S1. Distribution of creatinine-standardized child urinary BPA and BPS concentrations in participants with and without covariate information at ages 8 and 12 years	2
Table S2. Demographic characteristics of HOME Study Participants with complete data for analysis at age 8 years and 12 years…….....	3
Table S3: Mean whole-body fat mass index z-score, visceral fat area, android fat percent, gynoid fat percent, geometric mean adiponectin, and geometric mean leptin in HOME Study participants at 12 years of age according to covariates……...	4
Table S4. Adjusted difference in measures of overall and regional adiposity for a 10-fold increase in creatinine-standardized child urinary BPA and BPS concentrations at ages 8 and 12 years from sex-stratified models and interaction models ……	6
Table S5. Results from models examining joint associations of BPA and BPS with measures of overall and regional adiposity at 8 and 12 years ……..	8
Table S6. Adjusted difference in whole-body FMI z-score[a], body fat percentage, and gynoid fat at age 12 years by terciles of creatinine standardized BPA and BPS with interaction term (BPA tercile*BPS tercile)…….....	10
Table S7. Unadjusted and adjusted difference in measures of overall and regional adiposity for a 10-fold increase in creatinine-standardized child urinary BPA and BPS concentrations with BPA and BPS included in the same model ……..	11
Table S8. Adjusted difference in measures of overall and regional adiposity for a 10-fold increase in creatinine-standardized child urinary BPA and BPS concentrations at age 12 years stratified by sex …….....	12
Figure S1. Chemical structure of BPA and BPS…….....	14
Figure S2. Flowchart of study participant selection…….....	15
Figure S3. Directed acyclic graph of potential confounders of the association between BPA/BPS and child adiposity……	16
Figure S4. Associations of creatinine-standardized BPA and BPS concentrations with adiposity measures at ages 8 and 12 years using covariate-adjusted natural cubic splines…...	17
Figure S5. Estimated differences and 95% CIs in BMI z-score, body fat percentage, waist circumference at age 12 years for a 10-fold increase in creatinine-standardized child BPA and BPS urinary concentrations by child sex……	19
Figure S6. Adjusted difference in measures of overall and regional adiposity for a 10-fold increase in creatinine-standardized child urinary BPA and BPS concentrations at age 12 years with and without adjustment for self-pubertal staging…….	20
References…….	22

Table S1: Distribution of creatinine-standardized child urinary BPA and BPS concentrations in participants with and without covariate information at ages 8 and 12 years: The HOME Study

	Age 8 years		Age 12 years	
	Complete cases (n=212)	Missing covariate information (n=7)	Complete cases (n=181)	Missing covariate information (n=5)
Median BPA μg/L (25th, 75th)	1.6 (1, 3.6)	1.5 (1.2, 2)	1.6 (1, 3.6)	1.3 (0.8, 3.4)
Median BPS μg/L (25th, 75th)	0.4 (0.2, 0.7)	0.6 (0.3, 0.8)	0.4 (0.2, 0.7)	0.2 (0.1, 0.4)

Table S2: Demographic characteristics of HOME Study Participants with complete data for analysis at ages 8 years and 12 years

Variable	8 years N (%)	12 years N (%)
Overall	212	181
Maternal age at delivery (years)		
< 25	56 (26.4)	47 (26.0)
25 - 35	125 (59.0)	108 (59.7)
> 35	31 (14.6)	26 (14.4)
Pre-pregnancy BMI		
Underweight-normal <25	111 (52.4)	94 (51.9)
Overweight (25-<30)	55 (25.9)	48 (26.5)
Obese (≥30)	46 (21.7)	39 (21.5)
Maternal Marital Status		
Married	141 (66.5)	116 (64.1)
Unmarried, cohabitating	27 (12.7)	25 (13.8)
Unmarried, living alone	44 (20.8)	40 (22.1)
Maternal Education		
High School or Less	36 (17.0)	27 (14.9)
Some college	70 (33.0	66 (36.5)
Bachelors or more	106 (50.0)	88 (48.6)
Insurance		
Private	140 (66.0)	117 (64.6)
Public/uninsured	72 (34.0)	64 (35.4)
Child Race		
Non-Hispanic Black & Other	89 (42.0)	78 (43.1)
Non-Hispanic White	123 (58.0)	103 (56.9)
Child Sex		
Female	116 (54.7)	102 (56.4)
Male	96 (45.3)	79 (43.6)

Table S3: Mean whole-body fat mass index z-score, visceral fat area, android fat percent, gynoid fat percent, geometric mean adiponectin, and geometric mean leptin in HOME Study participants at 12 years of age according to covariates

Variable	N (%)	Whole body fat mass index z-score (Mean ± SD)	Visceral fat area cm^2 (Mean ± SD)	Android fat % (Mean ± SD)	Gynoid fat % (Mean ± SD)	N (%)	Adiponectin ng/mL (Geometric Mean ± Geometric SD)	Leptin ng/ (Geometr Mean ± Geometr SD)
Overall	181	0.2 ± 0.8	45.9 ± 21.7	29.9 ± 8.5	36.5 ± 6.4	155	13119 ± 2	8.7 ± 3.
Maternal age at delivery (yrs)								
< 25	47 (26.0)	0.3 ± 0.9	46.9 ± 20.2	30.2 ± 9.4	35.8 ± 7.2	38 (24.5)	11837± 2	8.2 ± 3.
25 - 35	108 (59.7)	0.2 ± 0.8	44.1 ± 19.4	29.6 ± 7.7	36.7 ± 5.9	95 (61.3)	13683± 2	8.8 ± 3.
> 35	26 (14.4)	0.2 ± 0.9	51.3 ± 31.1	31.0 ± 10.3	37.3 ± 6.9	22 (14.2	13065± 2	8.8 ± 3.
Pre-pregnancy BMI								
Underweight-normal <25	94 (51.9)	0.0 ± 0.7	41.6 ± 18.4	28.1 ± 7.4	35.4 ± 5.7	80 (51.6)	12883 ± 2	6.8 ± 3.
Overweight (25-<30)	48 (26.5)	0.4 ± 0.8	48.7 ± 25.4	30.9 ± 8.6	37.4 ± 6.3	43 (27.7)	16069 ± 2	9.9 ± 3.
Obese (≥30)	39 (21.5)	0.7 ± 0.9	52.7 ± 22.2	33.0 ± 10.1	38.1 ± 7.6	32 (20.6)	10455 ± 2	13.2 ± 3.
Maternal Marital Status								
Married	116 (64.1)	0.1 ± 0.8	45.5 ± 22.8	29.2 ± 8.5	36.3 ± 6.4	100 (64.5)	13992 ± 2	7.4 ± 3.
Unmarried, cohabitating	25 (13.8)	0.4 ± 0.8	44.2 ± 16.2	30.7 ± 7.5	37.1 ± 6.4	22 (14.2)	12273 ± 2	10.8 ± 2.
Unmarried, living alone	40 (22.1)	0.5 ± 0.8	48.1 ± 21.5	31.5 ± 9.1	36.8 ± 6.6	33 (21.3)	11285 ± 2.	12.2 ± 2.
Maternal Education								
High School or Less	27 (14.9)	0.5 ± 0.8	45.8 ± 19.1	32.0 ± 9.0	37.3 ± 6.9	23 (14.8)	10247 ± 2	13.3 ± 2.
Some college	66 (36.5)	0.2 ± 0.9	45.6 ± 23.2	29.5 ± 9.1	36.0 ± 6.9	57 (36.8)	13604 ± 2	7.5 ± 3.
Bachelors or more	88 (48.6)	0.2 ± 0.7	46.1 ± 21.4	29.6 ± 7.9	36.7 ± 5.9	75 (48.4)	13767 ± 2	8.4 ± 3.
Insurance								
Private	117 (69.1)	0.1 ± 0.8	45.6 ± 22.8	29.4 ± 8.3	36.7 ± 6.0	101 (65.2)	14555 ± 2	7.8 ± 3.
Public/uninsured	64 (30.9)	0.4 ± 0.9	46.3 ± 19.6	30.9 ± 9.0	36.2 ± 7.1	54 (34.8)	10803 ± 2	10.6 ± 3.
Child Race								

Non-Hispanic Black & Other	78 (43.1)	0.4 ± 0.9	46.8 ± 20.1	30.5 ± 9.4	35.6 ± 7.3	69 (44.5)	11050 ± 2	9.5 ± 3.4
Non-Hispanic White	103 (56.9)	0.1 ± 0.8	45.2 ± 22.8	29.5 ± 7.8	37.3 ± 5.5	86 (55.5)	15056 ± 2	8.0 ± 3.1
Child Sex								
Female	102 (56.4)	0.3 ± 0.9	42.8 ± 25.7	32.5 ± 8.7	38.9 ± 5.3	85 (54.8)	13255 ± 2	13.6 ± 2.
Male	79 (43.6)	0.2 ± 0.7	49.9 ± 14.2	26.5 ± 7.1	33.5 ± 6.4	70 (45.2)	12957 ± 2	5.0 ± 3.2
Healthy Eating Index Score								
Tercile 1 <41	61 (33.7)	0.4 ± 0.9	49.6 ± 23.9	30.2 ± 9.4	36.5 ± 7.2	52 (33.5)	12918 ± 2	9.8 ± 3.2
Tercile 2 (41-<50)	60 (33.1)	0.1 ± 0.8	42.0 ± 16.3	29.8 ± 7.7	36.5 ± 6.3	52 (33.5)	12997 ± 2	8.1 ± 3.4
Tercile 3 (≥50)	60 (33.1)	0.2 ± 0.8	46.0 ± 23.5	29.8 ± 8.5	36.5 ± 5.7	51 (32.9)	13455 ± 2	8.2 ± 3.2
Physical Activity Score (1-5)								
Tercile 1 <2.3	61 (33.7)	0.5 ± 0.8	47.8 ± 19.9	31.2 ± 8.4	37.9 ± 6.1	52 (33.5)	13016 ± 2	13.1 ± 3.
Tercile 2 (2.3-<2.9)	60 (33.1)	0.2 ± 0.9	46.1 ± 27.0	31.7 ± 8.8	37.7 ± 6.3	52 (33.5)	13949 ± 2	9.5 ± 3.0
Tercile 3 (≥2.9)	60 (33.1)	0.0 ± 0.8	43.7 ± 17.0	26.9 ± 7.7	34.0 ± 6.1	51 (32.9)	12424 ± 2	5.2 ± 3.1
Pubertal Staging								
Stage 1	20 (11.0	0.1 ± 0.8	41.5 ± 14.3	27.9 ± 7.9	36.1 ± 6.3	16 (10.3)	14703 ± 1	6.7 ± 3.2
Stage 2	47 (26.0)	0.1 ± 0.8	44.3 ± 20.3	29.2 ± 8.2	36.9 ± 5.9	40 (25.8)	12891 ± 2	6.0 ± 3.0
Stage 3	57 (31.5)	0.2 ± 0.9	46.6 ± 24.8	30.3 ± 8.8	36.6 ± 6.4	48 (31.0)	14174 ± 2	8.9 ± 3.2
Stage 4	34 (18.8)	0.4 ± 0.8	48.1 ± 23.6	30.1 ± 8.7	36.0 ± 7.0	30 (19.4)	12113 ± 2	10.8 ± 3.
Stage 5	23 (12.7)	0.5 ± 0.8	47.9 ± 19.0	31.8 ± 8.9	36.9 ± 7.0	31 (13.5)	11683 ± 2	14.5 ± 3.

Table S4: Adjusted difference in measures of overall and regional adiposity for a 10-fold increase in creatinine-standardized child urinary BPA and BPS concentrations at ages 8 and 12 years from sex-stratified models and interaction models: The HOME Study

	Stratification		Sex-specific estimates from interaction model		
	Boys	Girls	Boys	Girls	p-value
8 Year Outcomes					
BMI z-score[a]					
BPA	0.0 (-0.7, 0.8)	-0.2 (-0.8, 0.4)	-0.1 (-0.7, 0.6)	-0.2 (-0.8, 0.4)	0.83
BPS	0.0 (-0.6, 0.5)	0.2 (-0.2, 0.6)	-0.1 (-0.7, 0.4)	0.1 (-0.2, 0.5)	0.40
Body fat (%)					
BPA	-1.0 (-3.6, 1.6)	-1.7 (-5.3, 1.8)	-0.9 (-4.2, 2.4)	-1.4 (-4.4, 1.5)	0.83
BPS	1.3 (-1.0, 3.5)	1.1 (-1.2, 3.5)	0.8 (-2.1, 3.7)	1.2 (-0.8, 3.2)	0.81
Waist circumference (cm)					
BPA	-0.6 (-4.6, 3.4)	-1.0 (-5.7, 3.6)	-0.5 (-5.1, 4)	-0.6 (-4.7, 3.5)	0.98
BPS	-1.2 (-4.8, 2.3)	1.4 (-1.6, 4.5)	-2.1 (-6.2, 1.9)	1.7 (-1, 4.4)	0.12
12 Year Outcomes					
BMI z-score [b]					
BPA	-0.4 (-1.2, 0.4)	-0.2 (-0.7, 0.4)	-0.3 (-1.0, 0.3)	-0.2 (-0.8, 0.4)	0.77
BPS	0.3 (-0.3, 1.0)	0.0 (-0.3, 0.4)	0.3 (-0.3, 0.9)	0 (-0.4, 0.4)	0.39
Body fat (%)					
BPA	-1.2 (-5.2, 2.7)	-2.1 (-5.6, 1.3)	-1.6 (-4.1, 0.9)	-1.6 (-4.1, 0.9)	0.28
BPS	1.9 (-1.3, 5.1)	-0.5 (-2.8, 1.8)	1.6 (-1.6, 4.7)	-0.6 (-2.7, 1.6)	0.27
Waist circumference (cm)					
BPA	-1.2 (-8.3, 5.9)	-5.0 (-12.0, 2.1)	-2.8 (-7.8, 2.1)	-2.8 (-7.8, 2.1)	0.58
BPS	3.3 (-2.4, 9.0)	0.0 (-4.7, 4.6)	2.5 (-3.9, 8.9)	0.3 (-4.0, 4.5)	0.56
FMI z-score					
BPA	-0.1 (-0.6, 0.3)	-0.3 (-0.7, 0.2)	-0.1 (-0.6, 0.4)	-0.2 (-0.6, 0.2)	0.69
BPS	0.3 (-0.1, 0.7)	0.0 (-0.3, 0.3)	0.2 (-0.2, 0.6)	0 (-0.3, 0.3)	0.38
Visceral fat area ($cm^{2)}$					
BPA	-1.0 (-10.5, 8.6)	-5.2 (-18.8, 8.4)	1.2 (-11.9, 14.4)	-5.1 (-16.4, 6.2)	0.47

BPS	3.7 (-4.0, 11.4)	0.3 (-8.7, 9.2)	2.6 (-8.5, 13.7)	0.0 (-7.5, 7.4)	0.70
Android fat (%)					
BPA	-2.1 (-6.7, 2.6)	-2.6 (-7.2, 1.9)	-1.8 (-6.6, 3.0)	-2.5 (-6.6, 1.6)	0.83
BPS	2.2 (-1.6, 5.9)	-0.1 (-3.1, 2.8)	1.6 (-2.5, 5.7)	-0.2 (-3.0, 2.5)	0.46
Gynoid fat (%)					
BPA	-1.2 (-5.1, 2.6)	-1.5 (-4.4, 1.3)	-1.4 (-4.8, 2.0)	-1.5 (-4.4, 1.5)	0.99
BPS	1.6 (-1.6, 4.8)	-0.3 (-2.2, 1.6)	1.4 (-1.5, 4.3)	-0.5 (-2.4, 1.5)	0.29
Adiponectin					
BPA	30 (-13, 94)	25 (-15, 83)	23 (-15, 80)	24 (-14, 78)	0.99
BPS	-5 (-32, 33)	21 (-4, 52)	-3 (-30, 35)	22 (-2, 53)	0.26
Leptin					
BPA	-37 (-71, 37)	-3 (-45, 73)	-32 (-65, 30)	-1 (-47. 87)	0.41
BPS	15 (-40, 121)	-19 (-43, 14)	14 (-35, 103)	-21 (-47, 16)	0.28

[a] Age 8 year outcomes adjusted for child race (Black and other, Non-Hispanic White), maternal education (high school or less, some college, bachelor's or more) at the 8-year visit, maternal marital status (married, unmarried and cohabitating, unmarried and living alone) at the 8-year visit, insurance (public/uninsured, private) at the 8-year visit, maternal age (continuous, years) at delivery, maternal pre-pregnancy BMI (continuous, kg/m^2), fresh fruit and vegetable consumption at the 8-year visit (daily, weekly, monthly). Body fat percentage and waist circumference further adjusted for child sex (boys, girls) and age (continuous, years).

[b] Age 12 year outcomes adjusted for child race, maternal education at the 8-year visit, maternal marital status at the 8-year visit, insurance at the 8-year visit, maternal age at delivery, maternal pre-pregnancy BMI (kg/m^2), total healthy eating scores (continuous), and physical activity scores (continuous). Body fat percentage, waist circumference, visceral fat area, android fat, and gynoid fat were further adjusted for child sex and age.

Table S5: Results from models examining joint associations of BPA and BPS with measures of overall and regional adiposity at ages 8 and 12 years (model terms are 10-fold differences in BPA or BPS): The HOME Study

Variable	β (95% CI)	P-value
Age 8 year (n=212)		
BMI z-score [a]		
BPA	-0.2 (-0.7, 0.2)	
BPS	0.2 (-0.2, 0.7)	
BPA*BPS	-0.3 (-1, 0.4)	0.38
Body fat (%)		
BPA	-1.9 (-4.2, 0.4)	
BPS	2.1 (-0.2, 4.4)	
BPA*BPS	-1.7 (-5.1, 1.6)	0.32
Waist circumference (cm)		
BPA	-0.6 (-3.9, 2.6)	
BPS	0.4 (-3.8, 3.6)	
BPA*BPS	0.4 (-4.3, 5.1)	0.86
Age 12 year (n=181)		
BMI z-score[b]		
BPA	-0.4 (-0.8, 0.1)	
BPS	0.4 (-0.0, 0.9)	
BPA*BPS	-0.5 (-1.2, 0.1)	0.11
Body Fat (%)		
BPA	-2.4 (-5.0, 01)	
BPS	2.3 (-0.2, 4.8)	
BPA*BPS	-4.2 (-7.8, -0.6)	0.03
Waist circumference		
BPA	-3.5 (-8.7, 1.6)	
BPS	3.1 (-1.9, 8.1)	
BPA*BPS	-3.7 (-11.1, 3.6)	0.32
Whole body FMI z-score [b]		
BPA	-0.3 (-0.6, 0.0)	
BPS	0.3 (0.0, 0.7)	
BPA*BPS	-0.5 (-1.0, -0.1)	0.02
Visceral fat Area (cm^2)		
BPA	-4.3 (-13.3, 4.7)	
BPS	5.2 (-3.6, 14.1)	
BPA*BPS	-8.6 (-21.6, 4.3)	0.19
Android fat (%)		
BPA	-3.1 (-6.4, 0.2)	

BPS	2.5 (-0.7, 5.7)	
BPA*BPS	-3.9 (-8.6, 0.9)	0.11
Gynoid fat (%)		
BPA	-2.3 (-4.6, -0.0)	
BPS	2.4 (0.2, 4.7)	
BPA*BPS	-4.4 (-7.8, -1.1)	0.01
Adiponectin (% difference)		
BPA	17 (-11, 60)	
BPS	22 (-6, 60)	
BPA*BPS	-19 (-45, 20)	0.30
Leptin (% difference)		
BPA	-17 (-48, 60)	
BPS	0 (-38, 60)	
BPA*BPS	-18 (-58, 61)	0.57

[a] Age 8 year outcomes adjusted for child race (Black and other, Non-Hispanic White), maternal education (high school or less, some college, bachelor's or more) at the 8-year visit, maternal marital status (married, unmarried and cohabitating, unmarried and living alone) at the 8-year visit, insurance public/uninsured) at the 8-year visit, maternal age (continuous, years) at delivery, maternal pre-pregnancy BMI (continuous, kg/m^2), fresh fruit and vegetable consumption at the 8-year visit (daily, weekly, monthly). Body fat percentage and waist circumference further adjusted for child sex (boys, girls) and age (continuous, years).

[b] Age 12 year outcomes adjusted for child race, maternal education at the 8-year visit, maternal marital status at the 8-year visit, insurance at the 8-year visit, maternal age at delivery, maternal pre-pregnancy BMI, total healthy eating scores (continuous), and physical activity scores (continuous). Body fat percentage, waist circumference, visceral fat area, android fat, and gynoid fat were further adjusted for child sex and age.

Table S6: Adjusted difference in whole-body FMI z-score[a], body fat percentage, and gynoid fat at age 12 years by terciles of creatinine standardized BPA and BPS with interaction term (BPA tercile*BPS tercile): The HOME Study

	BPA Low	BPA Medium	BPA High
FMI z-score [b]			
BPS Low	Ref	0.3 (-0.1, 0.8)	0.2 (-0.3, 0.7)
BPS Medium	0.2 (-0.3, 0.7)	0.0 (-0.7, 0.6)	0.0 (-0.7, 0.7)
BPS High	0.5 (0.0, 0.9)	-0.4 (-1.0, 0.3)	-0.5 (-1.1, 0.2)
Body fat (%)[c]			
BPS Low	Ref	3.9 (0.4, 7.4)	1.1 (-2.7, 0.5)
BPS Medium	2.0 (-1.8, 5.8)	-2.7 (-8.0, 2.5)	-1.0 (-6.6, 4.6)
BPS High	3.0 (-0.6, 6.7)	-2.9 (-8.3, 2.5)	-3.2 (-8.5. 2.2)
Gynoid fat (%)[d]			
BPS Low	Ref	3.5 (0.3, 6.7)	1.2 (-2.3, 4.7)
BPS Medium	1.8 (-1.6, 5.3)	-2.1 (-6.8, 2.6)	-1.1 (-6.1, 3.9)
BPS High	2.6 (-0.7, 5.9)	-1.6 (-6.5, 3.2)	-3.5 (-8.3, 1.3)

[a] Adjusted for child race (Black and other, Non-Hispanic White), maternal education (high school or less, some college, bachelor's or more) at the 8-year visit, maternal marital status (married, unmarried and cohabitating, unmarried and living alone) at the 8-year visit, insurance (public/uninsured, private) at the 8-year visit, maternal age (years, continuous) at delivery, maternal pre-pregnancy BMI (continuous, kg/m^2), total healthy eating scores (continuous), and physical activity scores (continuous). Body fat percentage and gynoid fat further adjusted for child sex (boys, girls) and age (continuous, years). BPA terciles: 1st tercile: 0.1 – 1.5 μg/g creatinine; 2nd tercile: 1.5 – 2.7 μg/g creatinine; 3rd tercile. 2.7-121.3 μg/g creatinine; BPS terciles: 1st tercile: 0.1-0.3 μg/g creatinine 2nd tercile: 0.3-0.6 μg/g creatinine 3rd tercile: 0.6-51.7 μg/g creatinine .

[b] P-value for interaction = 0.26

[c] P-value for interaction = 0.27

[d] P-value for interaction = 0.13

Table S7: Unadjusted and adjusted difference in measures of overall and regional adiposity for a 10-fold increase in creatinine-standardized child urinary BPA and BPS concentrations with BPA and BPS included in the same model: The HOME Study

Outcome	Unadjusted		Adjusted	
	BPA	BPS	BPA	BPS
	β (95% CI)	β (95% CI)	β (95% CI)	β (95% CI)
Age 8 Year (n=212)				
BMI z-score [a]	-0.2 (-0.6, 0.3)	0.1 (-0.2, 0.5)	-0.2 (-0.6, 0.3)	0.1 (-0.2, 0.4)
Body Fat (%)	-1.6 (-3.9, 0.7)	1.3 (-0.5, 3.1)	-1.5 (-3.7, 0.7)	1.3 (-0.4, 3.0)
Waist circumference (cm)	-1.3 (-4.5, 1.9)	0.5 (-1.9, 2.9)	-0.7 (-3.8, 2.4)	0.6 (-1.7, 2.9)
Age 12 Year DXA (n=181)				
BMI z-score [b]	-0.2 (-0.7, 0.2)	0.2 (-0.1, 0.6)	-0.3 (-0.7, 0.2)	0.2 (-0.2, 0.5)
Body Fat (%)	-1.3 (-3.9, 1.3)	0.6 (-1.4, 2.5)	-1.6 (-4.1, 0.8)	0.3 (-1.5, 2.1)
Waist circumference (cm)	-2.2 (-7.4, 3.1)	1.4 (-2.5, 5.2)	-2.9 (-7.8, 2.1)	1.3 (-2.3, 4.9)
Whole body FMI z-score [b]	-0.2 (-0.5, 0.2)	0.1 (-0.1, 0.4)	-0.2 (-0.5, 0.1)	0.1 (-0.1, 0.3)
Visceral fat Area (cm^2)	-2.7 (-11.4, 5.9)	1.0 (-5.4, 7.4)	-2.7 (-11.4, 6.0)	1.1 (-5.2, 7.5)
Android fat (%)	-2.0 (-5.2, 1.2)	0.9 (-1.5, 3.3)	-2.4 (-5.5, 0.8)	0.6 (-1.7, 3.0)
Gynoid fat (%)	-1.3 (-3.7, 1.0)	0.6 (-1.2, 2.3)	-1.5 (-3.8, 0.7)	0.3 (-1.4, 1.9)
Adiponectin (% difference)	13 (-13, 46)	9 (-10, 32)	20 (-8, 57)	11 (-9, 34))
Leptin (% difference)	-2 (-39, 59)	-4 (-33, 37)	-15 (-47, 35)	-9 (-35, 27)

[a] Age 8 year outcomes adjusted for child race (Black and other race, Non-Hispanic White), maternal education (high school or less, some college, bachelor's or more) at the 8-year visit, maternal marital status (married, unmarried and cohabitating, unmarried and living alone) at the 8-year visit, insurance public/uninsured, private) at the 8-year visit, maternal age (continuous, years) at delivery, maternal pre-pregnancy BMI (kg/m^2), fresh fruit and vegetable consumption at 8-year visit (daily, weekly, monthly). Body fat percentage and waist circumference further adjusted for child sex (boys, girls) and age (continuous, years)

[b] Age 12 year outcomes adjusted for child race, child age, maternal education at 8-year visit, maternal marital status at 8-year visit, insurance at 8-year visit, maternal age at delivery, maternal pre-pregnancy BMI, total healthy eating scores (continuous), and physical activity scores (continuous). Body fat percentage, waist circumference, visceral fat area, android fat, and gynoid fat were further adjusted for child sex and age.

Table S8: Adjusted difference in measures of overall and regional adiposity for a 10-fold increase in creatinine-standardized child urinary BPA and BPS concentrations at age 12 years stratified by sex: The HOME Study

		Adjusted for puberty		No adjustment for puberty	
Outcome	Sex	β (95% CI)	p-for interaction	β (95% CI)	p-for interaction
BMI z-score [a]					
BPA	Boys	-0.5 (-1.3, 0.2)	0.55	-0.4 (-1.2, 0.4)	0.77
	Girls	-0.2 (-0.7, 0.3)		-0.2 (-0.7, 0.4)	
BPS	Boys	0.3 (-0.4, 0.9)	0.47	0.3 (-0.3, 1.0)	0.39
	Girls	0.1 (-0.3, 0.4)		0.0 (-0.3, 0.4)	
Body Fat (%)					
BPA	Boys	-1.2 (-5.3, 2.9)	0.26	-1.2 (-5.2, 2.7)	0.28
	Girls	-2.1 (-5.6, 1.4)		-2.1 (-5.6, 1.3)	
BPS	Boys	2.3 (-1.0, 5.7)	0.26	1.9 (-1.3, 5.1)	0.27
	Girls	-0.5 (-2.9, 1.9)		-0.5 (-2.8, 1.8)	
Waist circumference (cm)					
BPA	Boys	-1.3 (-8.2, 5.6)	0.70	-1.2 (-8.3, 5.9)	0.58
	Girls	-4.8 (-11.8, 2.3)		-5.0 (-12.0, 2.1)	
BPS	Boys	2.2 (-3.4, 7.9)	0.68	3.3 (-2.4, 9.0)	0.56
	Girls	0.5 (-4.3, 5.3)		0.0 (-4.7, 4.6)	
Whole body FMI z-score					
BPA	Boys	-0.2 (-0.6, 0.3)	0.78	-0.1 (-0.6, 0.3)	0.69
	Girls	-0.3 (-0.7, 0.2)		-0.3 (-0.7, 0.2)	
BPS	Boys	0.3 (-0.1, 0.6)	0.42	0.3 (-0.1, 0.7)	0.38
	Girls	0.0 (-0.3, 0.3)		0.0 (-0.3, 0.3)	
Visceral fat Area (cm^2)					
BPA	Boys	-0.7 (-10.2, 8.9)	0.50	-1.0 (-10.5, 8.6)	0.47
	Girls	-4.8 (-18.6, 9.1)		-5.2 (-18.8, 8.4)	
BPS	Boys	3.0 (-4.8, 10.7)	0.71	3.7 (-4.0, 11.4)	0.70
	Girls	0.6 (-8.7, 10.0)		0.3 (-8.7, 9.2)	
Android fat (%)					
BPA	Boys	-2.1 (-6.9, 2.8)	0.83	-2.1 (-6.7, 2.6)	0.83
	Girls	-2.6 (-7.2, 2.0)		-2.6 (-7.2, 1.9)	
BPS	Boys	2.5 (-1.4, 6.5)	0.43	2.2 (-1.6, 5.9)	0.46
	Girls	-0.1 (-3.2, 3.0)		-0.1 (-3.1, 2.8)	
Gynoid fat (%)					
BPA	Boys	-1.2 (-5.1, 2.8)	0.93	-1.2 (-5.1, 2.6)	0.99

	Girls	-1.5 (-4.4, 1.4)		-1.5 (-4.4, 1.3)	
BPS	Boys	2.4 (-0.9, 5.6)	0.25	1.6 (-1.6, 4.8)	0.29
	Girls	-0.3 (-2.3, 1.6)		-0.3 (-2.2, 1.6)	
Adiponectin (% difference)					
BPA	Boys	23 (-18, 86)	0.96	30 (-13, 94)	0.99
	Girls	23 (-17, 81)		25 (-15, 83)	
BPS	Boys	1 (-28, 42)	0.27	-5 (-32, 33)	0.26
	Girls	20 (-5, 53)		21 (-4, 52)	
Leptin (% difference)					
BPA	Boys	-41 (-74, 33)	0.32	-37 (-71, 37)	0.41
	Girls	-5 (-47, 69)		-3 (-45, 73)	
BPS	Boys	15 (-42, 127)	0.33	15 (-40, 121)	0.28
	Girls	-16 (-41, 20)		-19 (-43, 14)	

[a] Age 12 years outcomes adjusted for child race, child age, maternal education at 8-year visit, maternal marital status at 8-year visit, insurance at 8-year visit, maternal age at delivery (continuous, years), maternal pre-pregnancy BMI, total healthy eating scores (continuous), and physical activity scores (continuous). Body fat percentage, waist circumference, visceral fat area, android fat, gynoid fat, adiponectin, and leptin were further adjusted for child sex and age. The number of participants for boys was 79 and 102 for girls.

Figure S1: Chemical structure of BPA and BPS (Russo et al., 2017, p.68).

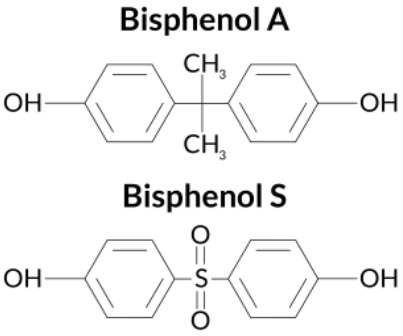
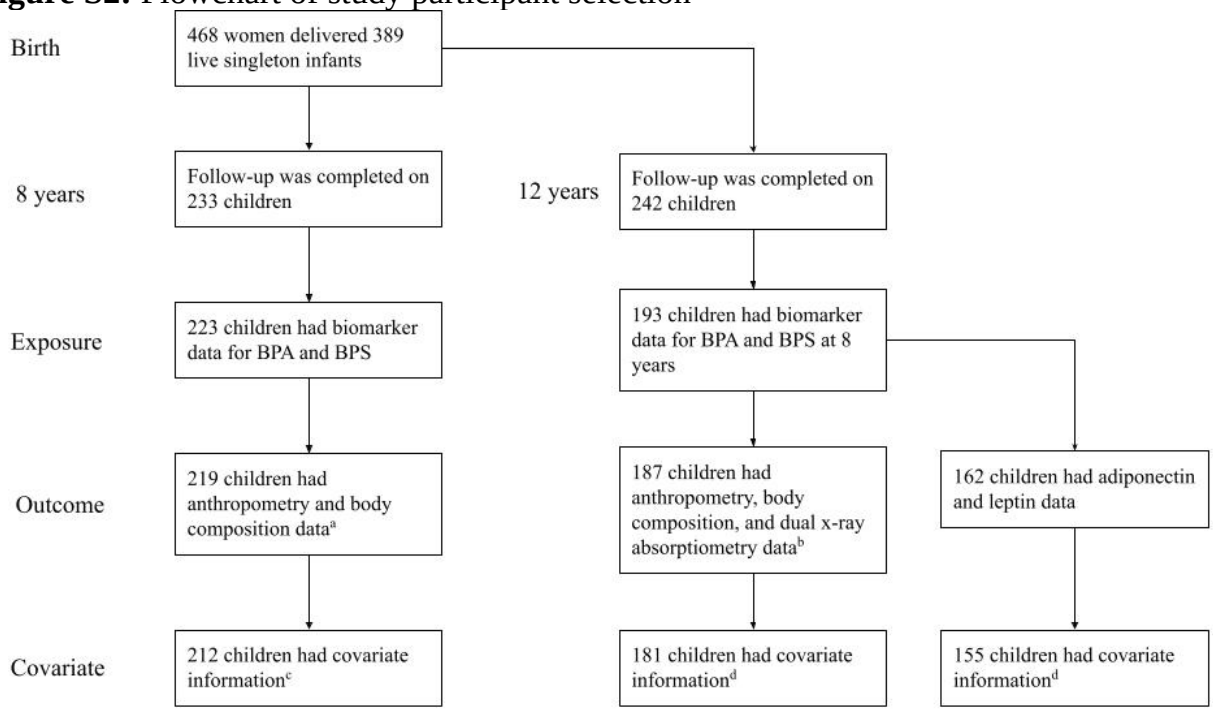


Figure S2: Flowchart of study participant selection



[a] Body mass index z-score, body fat percentage, waist circumference
[b] BMI z-score, body fat percentage, waist circumference, whole body FMI z-score, visceral fat area, android fat, gynoid fat
[c] Child race, maternal education, maternal marital status at the 8-year visit, insurance, maternal age at delivery, maternal pre-pregnancy, fresh fruit and vegetable consumption
[d] Child race, maternal education, maternal marital status, insurance, maternal age at delivery, maternal pre-pregnancy BMI, total healthy eating scores, physical activity scores, child sex and age

Figure S3: Directed acyclic graph of potential confounders of the association between BPA/BPS and child adiposity[2]

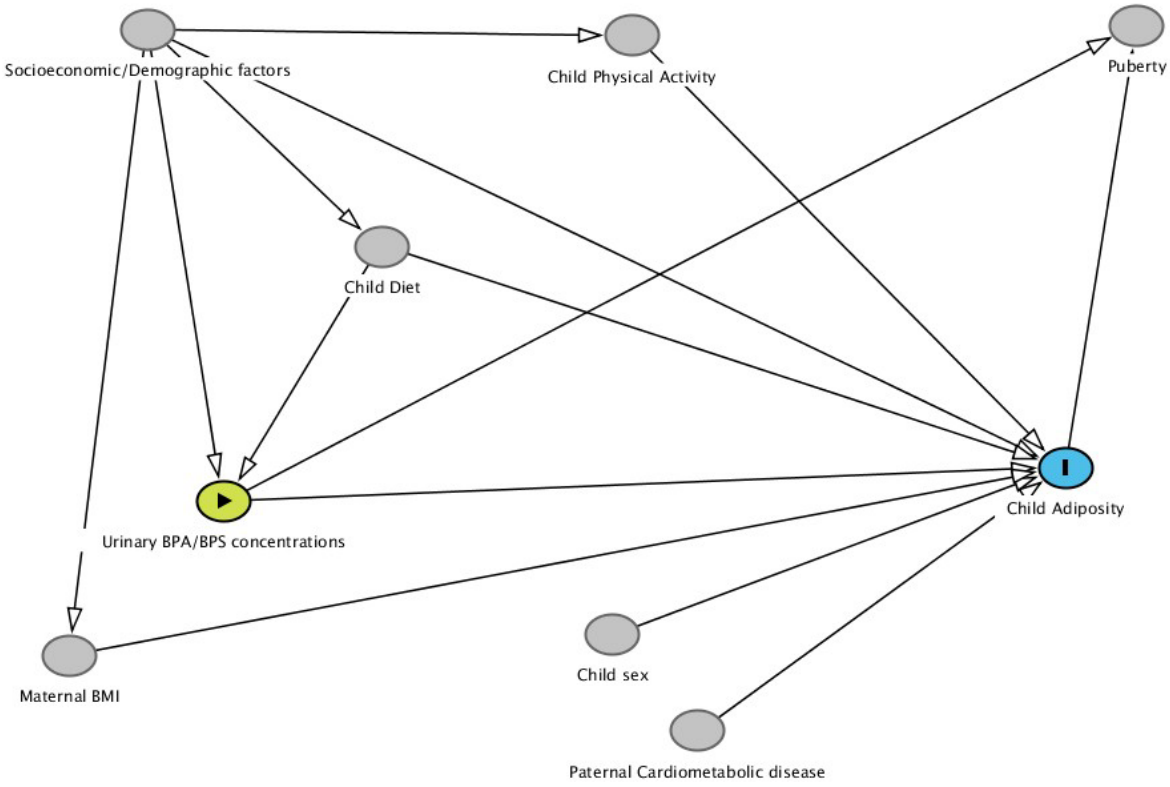
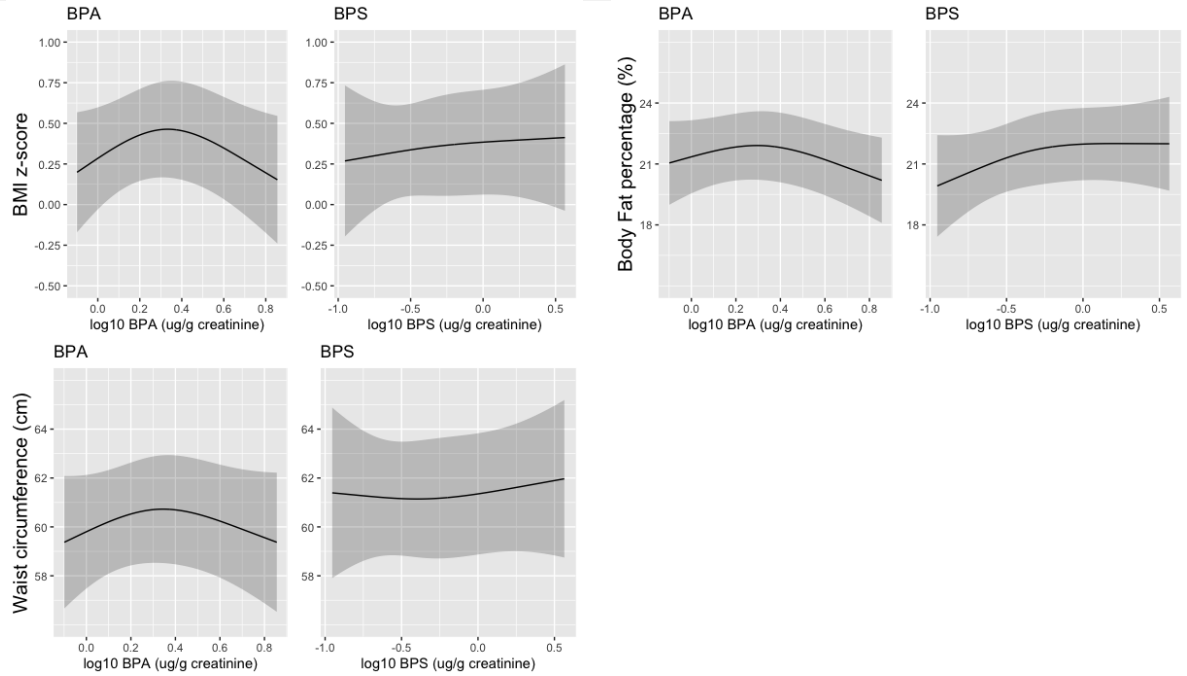
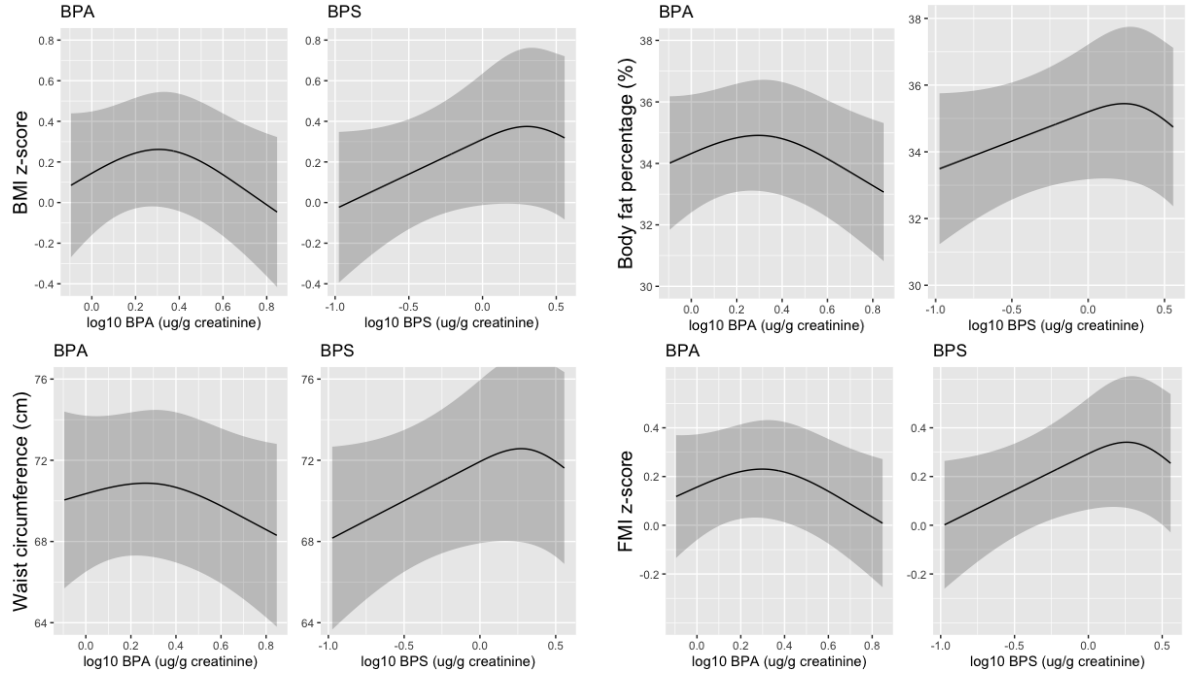


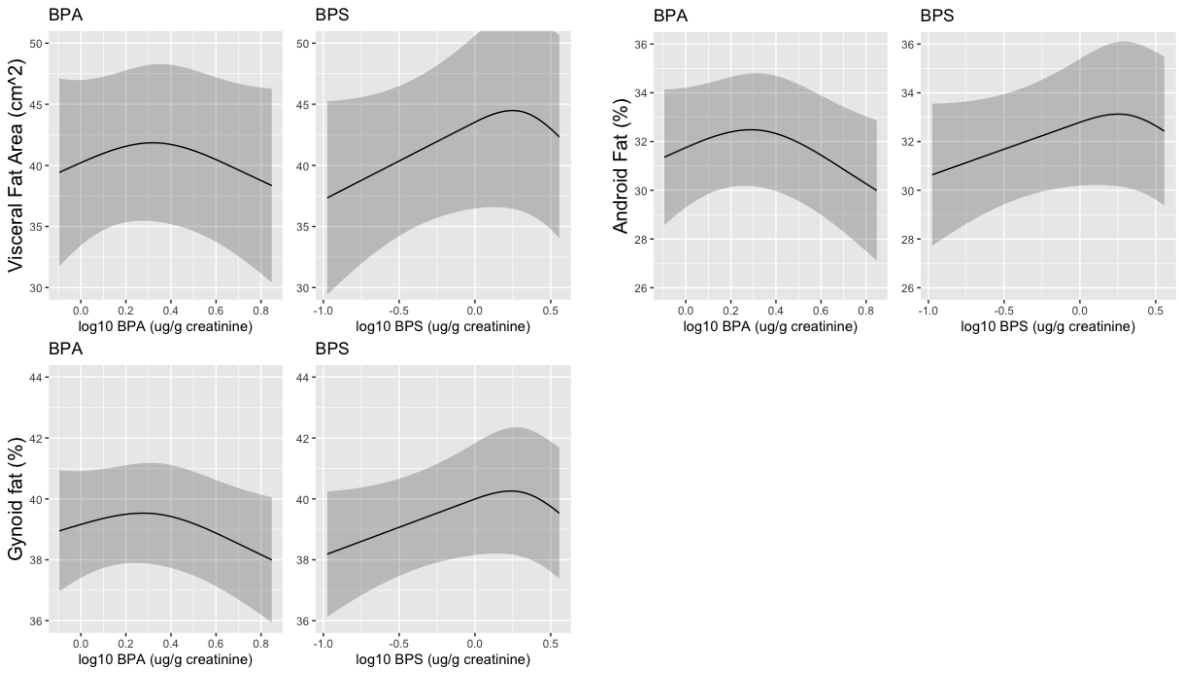
Figure S4: Associations of creatinine-standardized BPA and BPS concentrations with adiposity measures at ages 8 and 12 years using covariate-adjusted natural cubic splines: The HOME Study

8 Year Outcomes[a]



12 Year Outcomes[b]





[a] Adjusted for child race (Black and other race, Non-Hispanic White), maternal education (high school or less, some college, bachelor's or more) at the 8-year visit, maternal marital status (married, unmarried and cohabitating, unmarried and living alone) at the 8-year visit, insurance public/uninsured) at the 8-year visit, maternal age (continuous, years) at delivery, maternal pre-pregnancy BMI (continuous, kg/m^2), fresh fruit and vegetable consumption at 8-year visit (daily, weekly, monthly). Body fat percentage and waist circumference further adjusted for child sex (boys, girls) and age (continuous, years)

[b] Adjusted for child race, maternal education at 8-year visit, maternal marital status at 8-year visit, insurance at 8-year visit, maternal age at delivery, maternal pre-pregnancy BMI, total healthy eating scores (continuous) and physical activity scores (continuous). Body fat percentage, waist circumference, visceral fat area, android fat, and gynoid fat were further adjusted for child sex and age.

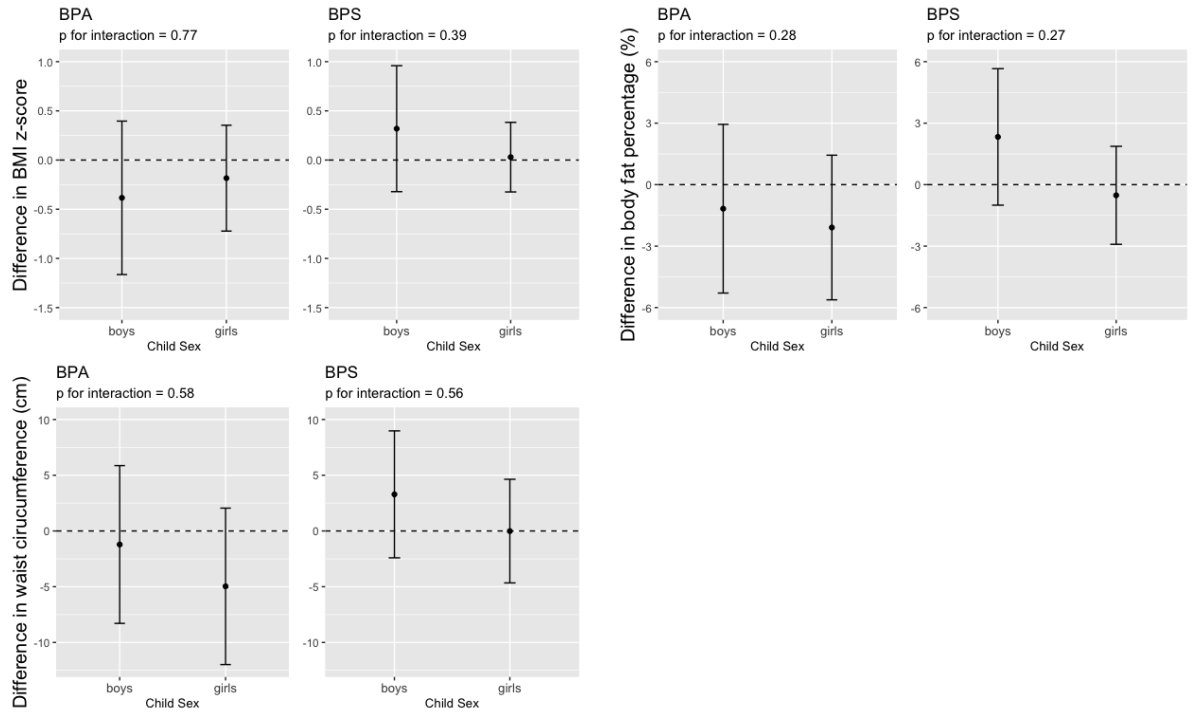
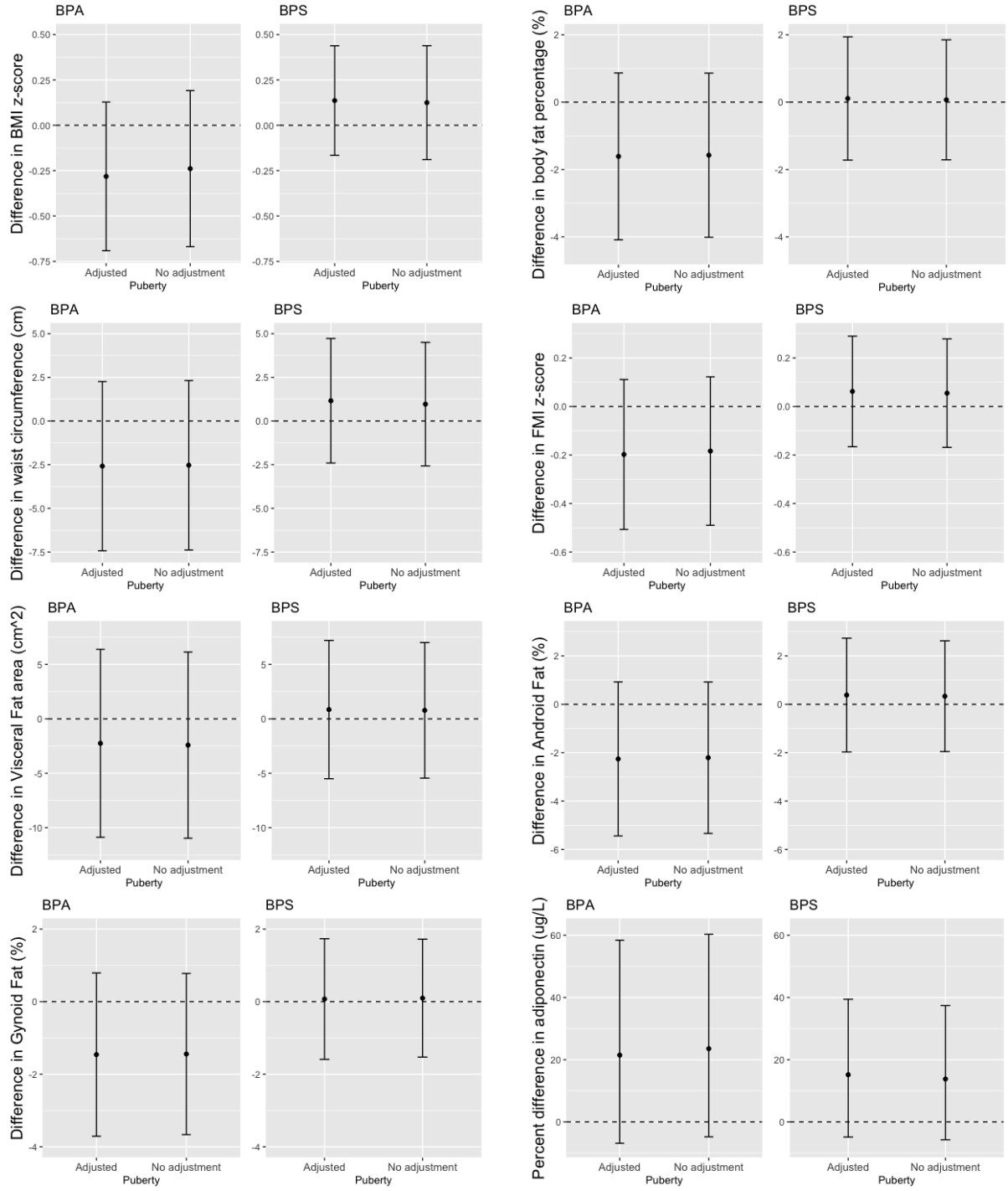
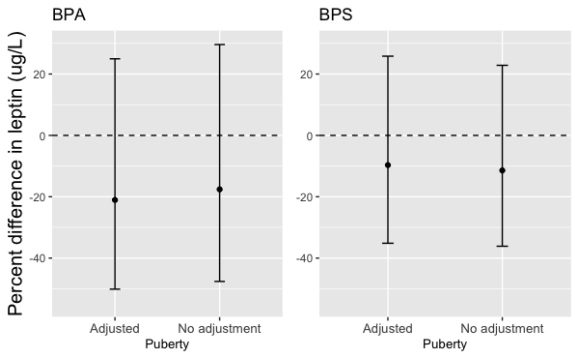


Figure S5: Estimated differences and 95% CIs in BMI z-score, body fat percentage, waist circumference at age 12 years for a 10-fold increase in creatinine-standardized child BPA and BPS urinary concentrations by child sex.

BMI z-score was adjusted for child race (Black and other, Non-Hispanic White), maternal education (high school or less, some college, bachelor's or more) at the 8-year visit, maternal marital status (married, unmarried and cohabitating, unmarried and living alone) at the 8-year visit, insurance (public/uninsured, private) at the 8-year visit, maternal age (continuous, years) at delivery, maternal pre-pregnancy BMI (continuous, kg/m^2), total healthy eating scores (continuous), and physical activity scores (continuous). Body fat percentage and waist circumference were further adjusted for child age (continuous, years).

Figure S6: Adjusted difference in measures of overall and regional adiposity[a] for a 10-fold increase in creatinine-standardized child urinary BPA and BPS concentrations at age 12 years with and without adjustment for self-pubertal staging: The HOME Study





[a] Age 12 year outcomes adjusted for child race (Black and other, Non-Hispanic White), child age (continuous years), maternal education at 8-year visit (high school or less, some college, bachelor's or more), maternal marital status at 8-year visit (married, unmarried and cohabitating, unmarried and living alone), insurance at 8-year visit (public/uninsured, private), maternal age at delivery (continuous, years), maternal pre-pregnancy BMI (continuous, kg/m^2), total healthy eating scores (continuous), and physical activity scores (continuous). Body fat percentage, waist circumference, visceral fat area, android fat, and gynoid fat, adiponectin, and leptin were further adjusted for child sex and age.

References

1. Russo, G., Barbato, F. & Grumetto, L. Monitoring of bisphenol A and bisphenol S in thermal paper receipts from the Italian market and estimated transdermal human intake: A pilot study. *Sci. Total Environ.* **599–600**, 68–75 (2017).
2. Textor, J., van der Zander, B., Gilthorpe, M. S., *et al.* Robust causal inference using directed acyclic graphs: the R package 'dagitty'. *Int. J. Epidemiol.* **45**, 1887–1894 (2016).