**Supplementary materials**

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Table S6. Difference (95% credible interval) in predicted serum HMW-Adiponectin and sOB-R levels when the standardized concentrations of log-transformed urinary phenols and parabens were increased from their 25th to 75th percentile via Bayesian kernel machine regression (BKMR)

Figure S1. Flow diagram of study population

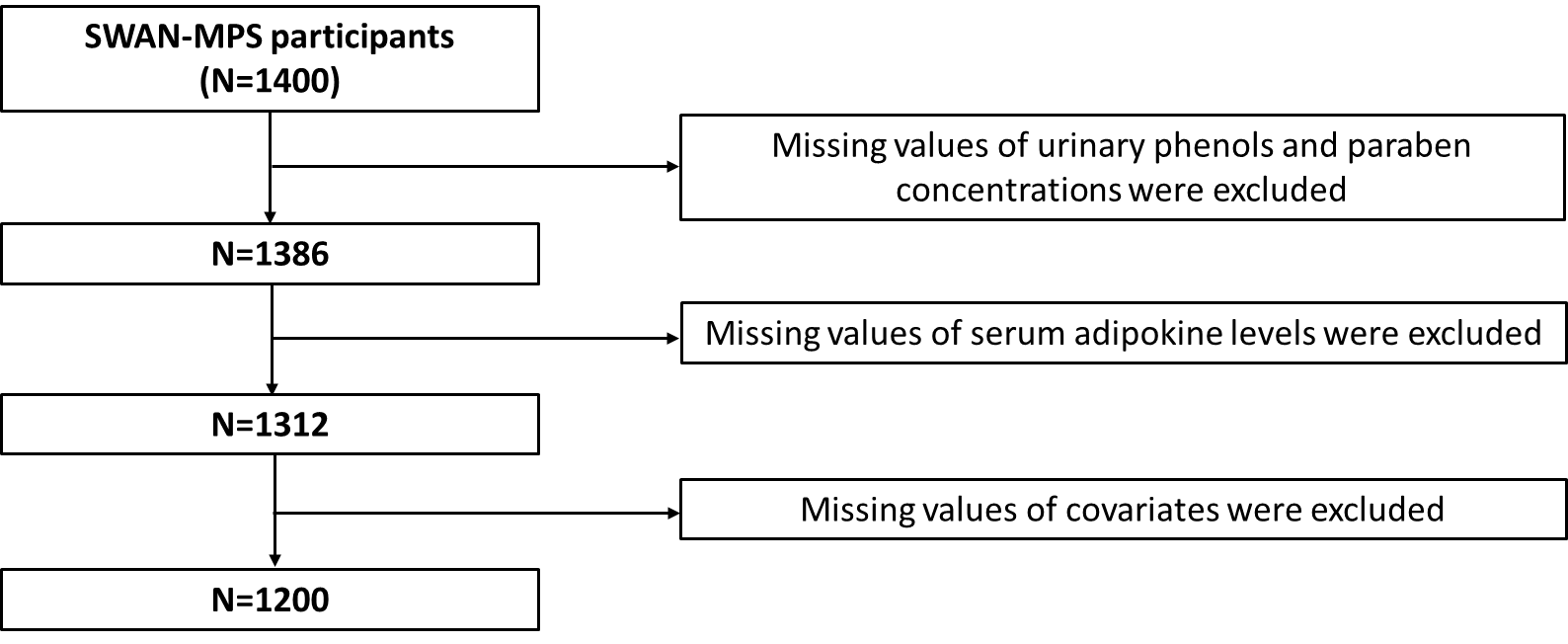
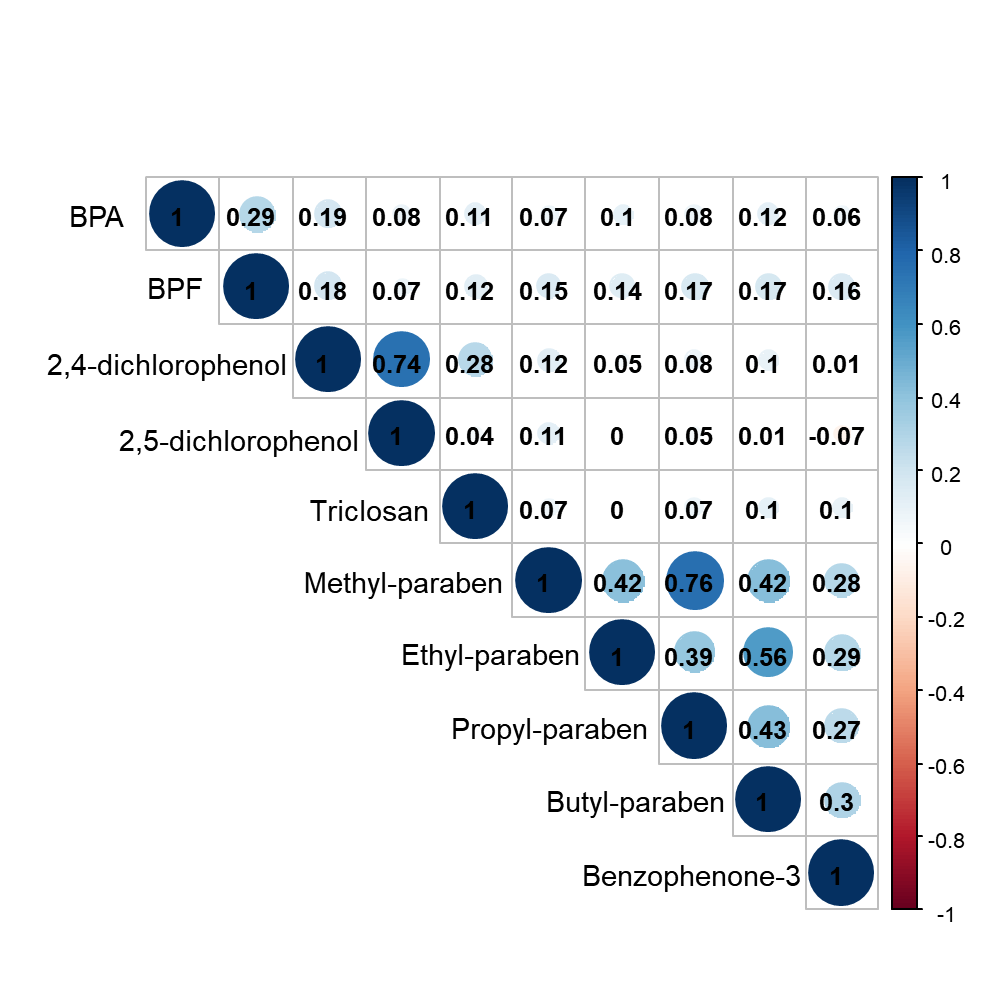


Figure S2. Spearman correlation coefficients matrix between log-transformed urinary phenols and parabens concentrations.



Note: The color intensity of circle in boxes indicates the magnitude of correlation. Blue and red color represents a positive and negative correlation, respectively. BPA, bisphenol A; BPF, bisphenol F.

Table S1. Least square geometric mean with 95% confidence intervals of serum adipokine levels stratified by race.

|  |  |  |  |
| --- | --- | --- | --- |
|  | White | Black | Asian |
| HMW adiponectin, μg/mL | 6.39 (5.76,7.09) | 3.70 (3.22,4.25) | 4.37 (3.81,5.01) |
| Leptin, ng/mL | 21.98 (20.17,23.95) | 25.06 (22.33,28.12) | 13.47 (12.02,15.09) |
| sOB-R, ng/mL | 30.02 (28.87,31.21) | 27.78 (26.37,29.27) | 29.45 (27.97,31.01) |

Abbreviation: HMW, High molecular weight; sOB-R, soluble leptin receptor.

All models were adjusted for age, site, education level, smoking status, menopausal status, physical activity score, total caloric intake (per day), and obesity status.

Table S2. Distribution of standardized concentrations of log-transformed urinary phenols and parabens

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Detection rate (%) | All subjects | White | Black | Asian |
| BPA | 82.98 | -0.02 (-0.54,0.56) | 0.04 (-0.46,0.58) | 0.10 (-0.46,0.65) | -0.25 (-0.71,0.4) |
| BPF | 73.32 | -0.08 (-0.67,0.57) | 0.02 (-0.58,0.63) | -0.05 (-0.67,0.66) | -0.29 (-0.82,0.27) |
| 2,4-dichlorophenol | 98.50 | -0.21 (-0.65,0.37) | -0.38 (-0.76,0.09) | 0.23 (-0.23,0.89) | -0.16 (-0.63,0.52) |
| 2,5-dichlorophenol | 99.79 | -0.22 (-0.71,0.45) | -0.5 (-0.84,0.06) | 0.42 (-0.08,1.08) | -0.15 (-0.70,0.69) |
| Triclosan | 80.83 | -0.13 (-0.73,0.57) | -0.2 (-0.75,0.53) | 0 (-0.53,0.55) | -0.17 (-0.82,0.73) |
| Methyl paraben | 99.71 | 0.14 (-0.61,0.67) | 0.01 (-0.79,0.53) | 0.54 (-0.03,1.13) | 0.10 (-0.59,0.56) |
| Ethyl paraben | 58.94 | -0.24 (-0.81,0.67) | -0.28 (-0.85,0.62) | -0.41 (-0.84,0.56) | -0.1 (-0.68,0.81) |
| Propyl paraben | 97.71 | 0.17 (-0.69,0.77) | 0.05 (-0.79,0.75) | 0.42 (-0.37,0.83) | 0.17 (-0.76,0.74) |
| Butyl paraben | 52.79 | -0.22 (-0.77,0.69) | -0.3 (-0.78,0.64) | -0.43 (-0.81,0.46) | 0.13 (-0.7,1.03) |
| Benzophenone-3 | 97.42 | -0.14 (-0.83,0.7) | 0.01 (-0.72,0.71) | -0.69 (-1.1, -0.1) | 0.09 (-0.75,1.01) |

Data are expressed as median (1st quartile, 3rd quartile).

Table S3. P-value for interaction between urinary phenols and parabens and race group.

|  |  |  |  |
| --- | --- | --- | --- |
|  | HMW-Adiponectin | Leptin | s-OB R |
| BPA | 0.226 | 0.476 | 0.510 |
| BPF | 0.536 | 0.412 | 0.680 |
| 2,4-dichlorophenol | 0.290 | 0.929 | 0.396 |
| 2,5-dichlorophenol | 0.508 | 0.952 | 0.287 |
| Triclosan | 0.029\* | 0.460 | 0.441 |
| Methyl paraben | 0.817 | 0.001\* | 0.626 |
| Ethyl paraben | 0.693 | 0.478 | 0.566 |
| Propyl paraben | 0.382 | 0.030\* | 0.291 |
| Butyl paraben | 0.541 | 0.628 | 0.866 |
| Benzophenone-3 | 0.696 | 0.169 | 0.770 |

Abbreviation: HMW, High molecular weight; sOB-R, soluble leptin receptor.

All models were adjusted for age, race, site, education level, smoking status, menopausal status, physical activity score, total caloric intake (per day), and obesity status.

Figure S3. Percent change (95% confidence interval) for serum adipokine levels of change in an inter-quantile range of standardized log-transformed average concentrations of urinary phenols and parabens**.** All models were adjusting for age, site, education level, smoking status, menopausal status, physical activity score, total caloric intake (per day), and obesity status. Abbreviation: HMW, High molecular weight; sOB-R, soluble leptin receptor.

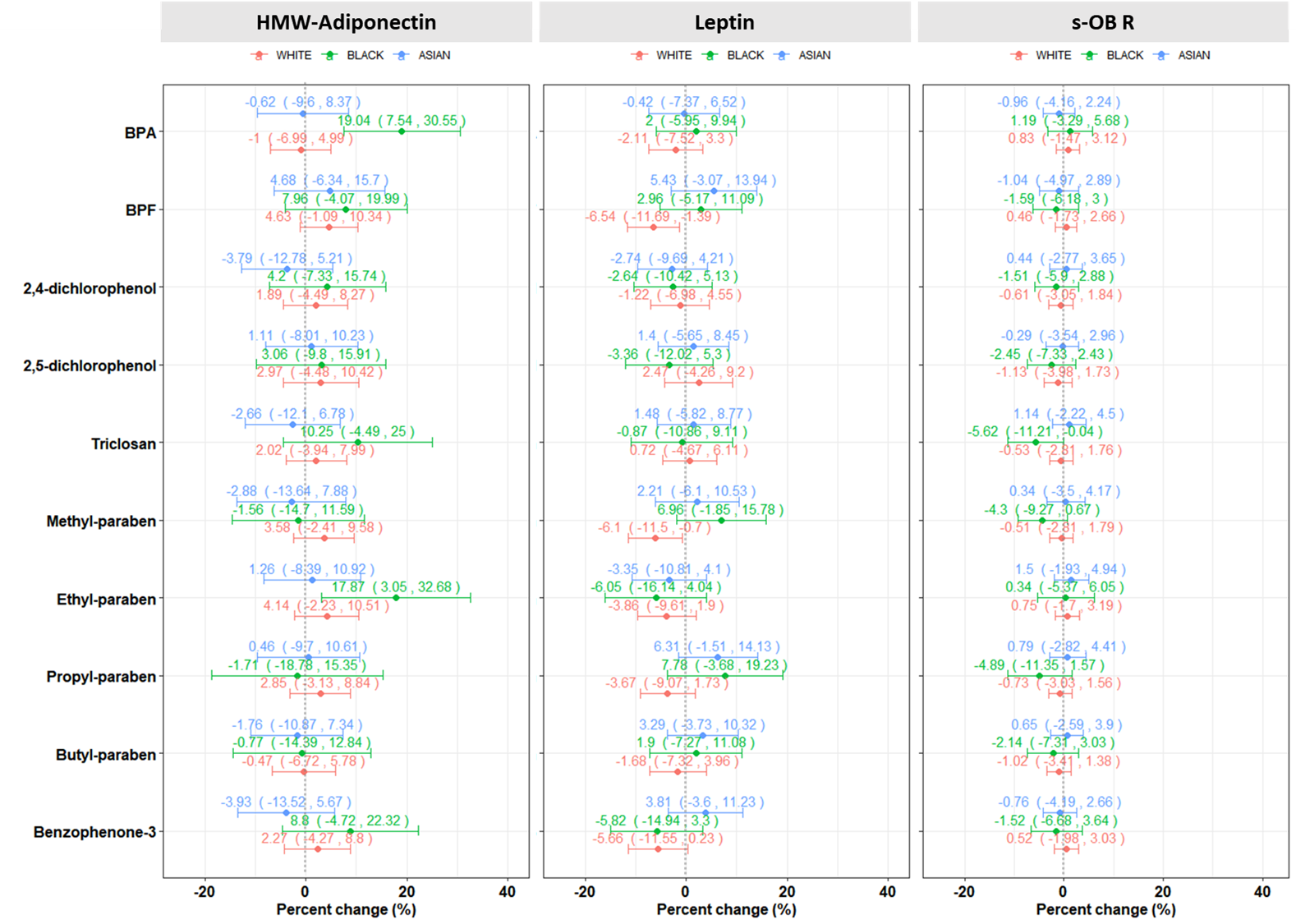


Figure S4. Boxplot of urinary methyl paraben stratified by race. Red circle represents the mean of urinary methyl paraben.

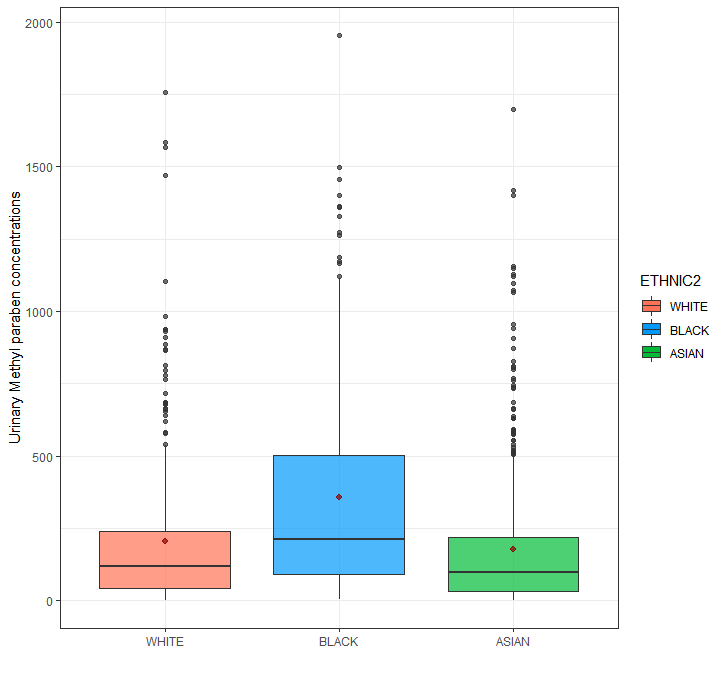


Figure S5. Relationship between log-transformed exposures at MPS baseline (1999-2000) and MPS Follow-up visit (2002-2003).

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Note: The solid blue line and grey scales represent the smooth lines and 95% confidence interval, respectively. MPS, multi-pollutant study; BPA, bisphenol A; BPF, bisphenol F; 2,4-DCP, 2,4-dichlorophenol; 2,4-DCP, 2,5-dichlorophenol; TCS, triclosan; METB, methyl-paraben; ETPB, ethyl-paraben; PRPB, propyl paraben; BUPB, butyl paraben; BP3, benzophenone-3; ICC, intra-class correlation

Table S4. Percent change (95% confidence interval) in serum adipokine levels for an inter-quartile range increase in standardized log-transformed urinary concentrations of phenols and parabens with additional adjustment for urinary monoethyl phthalate (MEP).

|  |  |  |  |
| --- | --- | --- | --- |
| Phenols and parabensa | Additional adjustment for MEP | | |
| HMW-Adiponectinb | Leptinb | sOB-Rb |
| BPA | 1.05 (-3.97, 6.06) | 0.23 (-3.93, 4.39) | 0.76 (-1.12, 2.63) |
| BPF | 8.10 (-0.06, 16.3) | -2.79 (-7.49, 1.90) | **2.46 (0.35, 4.58)** |
| 2,4-dichlorophenol | **6.03 (1.20, 10.9)** | -1.81 (-5.83, 2.22) | 1.28 (-0.54, 3.09) |
| 2,5-dichlorophenol | 5.07 (-0.68, 10.8) | -0.16 (-4.94, 4.61) | 0.64 (-1.52, 2.79) |
| Triclosan | 1.24 (-4.70, 7.18) | 2.07 (-2.86, 7.00) | 2.06 (-0.16, 4.28) |
| Methyl paraben | 1.70 (-4.70, 8.09) | **-6.60 (-11.9, -1.31)** | **2.51 (0.12, 4.90)** |
| Ethyl paraben | 5.08 (-1.85, 12.0) | -5.15 (-10.9, 0.60) | **2.81 (0.22, 5.40)** |
| Propyl paraben | 4.51 (-2.57, 11.6) | -5.41 (-11.3, 0.46) | 2.44 (-0.21, 5.08) |
| Butyl paraben | 3.55 (-3.33, 10.4) | -2.86 (-8.57, 2.86) | 0.98 (-1.60, 3.56) |
| Benzophenone-3 | 1.17 (-6.14, 8.48) | -5.10 (-11.2, 0.96) | 1.47 (-1.27, 4.20) |

Abbreviation: MEP, Monoethyl phthalate, HMW, High molecular weight; sOB-R, soluble leptin receptor.

aAll urinary phenols, parabens, and phthalatesconcentrations were log-transformed and standardized.

bAll models were adjusted for age, race, site, education level, smoking status, menopausal status, physical activity score, and total caloric intake (per day).

Table S5. Percent change (95% confidence interval) in serum adipokine levels for an inter-quartile range increase in standardized log-transformed urinary concentrations of phenols and parabens stratified by obesity status.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Phenols and parabensa | Normal and overweight group  (N=749) | | | Obese group  (N=451) | | |
| HMW-Adiponectinb | Leptinb | sOB-Rb | HMW-Adiponectinb | Leptinb | sOB-Rb |
| BPA | 6.11 (-0.09,12.31) | 0.91 (-5.33,7.14) | 1.8 (-0.66,4.26) | -5.53 (-13.98,2.92) | 0.12 (-4.42,4.67) | -1.14 (-4.06,1.78) |
| BPF | **12.43 (2.54,22.32)** | -3.31 (-10.21,3.58) | 2.65 (-0.07,5.38) | -0.12 (-14.2,13.96) | -1.17 (-6.41,4.06) | 1.88 (-1.48,5.25) |
| 2,4-dichlorophenol | **9.71 (3.79,15.62)** | -2.1 (-8.07,3.87) | 1.27 (-1.09,3.63) | 1.43 (-6.89,9.74) | -1.46 (-5.92,3.00) | 0.88 (-1.99,3.75) |
| 2,5-dichlorophenol | **10.31 (3.35,17.26)** | 0.26 (-6.75,7.27) | 0.38 (-2.4,3.15) | -2.78 (-12.9,7.35) | -1.4 (-6.84,4.03) | 0.59 (-2.9,4.09) |
| Triclosan | 1.64 (-5.21,8.48) | 2.68 (-4.18,9.54) | 2.16 (-0.55,4.87) | 1.41 (-9.68,12.5) | 1.43 (-4.52,7.39) | 1.83 (-2,5.65.00) |
| Methyl paraben | 2.38 (-5.22,9.99) | -7.02 (-14.63,0.59) | 1.77 (-1.24,4.78) | -1.7 (-12.09,8.69) | -2.85 (-8.42,2.72) | 3.09 (-0.48,6.67) |
| Ethyl paraben | 5.23 (-2.71,13.16) | -1.36 (-9.33,6.61) | **3.47 (0.33,6.61)** | 2.3 (-10.76,15.35) | **-8.73 (-15.69,-1.77)** | -0.11 (-4.62,4.40) |
| Propyl paraben | 6.76 (-1.41,14.93) | -2.71 (-10.91,5.49) | 2.58 (-0.66,5.81) | -3.55 (-15.62,8.52) | -6.23 (-12.69,0.22) | 1.89 (-2.27,6.06) |
| Butyl paraben | 5.79 (-2.11,13.7) | -1.56 (-9.49,6.38) | 1.52 (-1.61,4.66) | -2.72 (-15.62,10.18) | -3.73 (-10.65,3.19) | -0.61 (-5.07,3.84) |
| Benzophenone-3 | -1.51 (-10.09,7.06) | -5.86 (-14.44,2.73) | 1.69 (-1.71,5.08) | 5.13 (-8.42,18.68) | -1.14 (-8.42,6.13) | 0.43 (-4.25,5.11) |

Abbreviation: HMW, High molecular weight; sOB-R, soluble leptin receptor.

aAll urinary phenols and parabensconcentrations were log-transformed and standardized.

bAll models were adjusted for age, race, site, education level, smoking status, menopausal status, physical activity score, and total caloric intake (per day).

Table S6. Difference (95% credible interval) in predicted serum HMW-Adiponectin and sOB-R levels when the standardized concentrations of log-transformed urinary phenols and parabens were increased from their 25th to 75th percentile via Bayesian kernel machine regression (BKMR)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | HMW-Adiponectin | | | sOB-R | | |
|  | Whitea  (N=630) | Blacka  (N=232) | Asiana  (N=338) | Whitea  (N=630) | Blacka  (N=232) | Asiana  (N=338) |
| BPA | -2.02 (-15.52,11.47) | 0.44 (-3.11,4.00) | 0.08 (-1.88,2.04) | 1.65 (-16.12,19.43) | -0.34 (-2.79,2.11) | -0.16 (-6.84,6.52) |
| BPF | 0.11 (-3.81,4.04) | -0.73 (-8.06,6.61) | -1.4 (-8.65,5.85) | -0.49 (-10.58,9.60) | -0.25 (-2.74,2.24) | -0.23 (-3.77,3.31) |
| 2,4-dichlorophenol | 0.07 (-2.77,2.91) | -1.20 (-9.03,6.62) | 0.86 (-5.75,7.47) | -0.1 (-5.09,4.88) | 0.06 (-1.92,2.04) | 0.64 (-4.59,5.87) |
| 2,5-dichlorophenol | 0.37 (-7.40,8.15) | -0.07 (-1.75,1.60) | 0.24 (-2.15,2.63) | 0.1 (-14.78,14.97) | 0.05 (-2.21,2.31) | 0.09 (-2.95,3.14) |
| Triclosan | 0.86 (-11.8,13.51) | -0.12 (-2.00,1.77) | -0.17 (-3.04,2.7) | 3.49 (-12.03,19.00) | 1.09 (-6.18,8.37) | 2.9 (-5.81,11.62) |
| Methyl paraben | -0.54 (-13.58,12.5) | -1.87 (-8.24,4.50) | -0.16 (-6.88,6.56) | -0.07 (-4.42,4.28) | -1.02 (-5.69,3.64) | 0.1 (-2.68,2.87) |
| Ethyl paraben | 1.95 (-10.45,14.36) | 0.07 (-2.07,2.22) | -0.29 (-3.06,2.48) | 0.32 (-18.48,19.13) | 0.31 (-6.85,7.48) | 0.53 (-4.46,5.53) |
| Propyl paraben | 0.17 (-7.72,8.07) | -0.14 (-2.20,1.93) | -0.03 (-2.92,2.85) | 2.12 (-13.09,17.33) | -0.04 (-2.42,2.34) | -0.74 (-6.59,5.10) |
| Butyl paraben | 0.51 (-8.42,9.44) | -0.81 (-8.57,6.94) | -0.78 (-7.52,5.96) | -0.33 (-7.37,6.71) | 0.12 (-1.97,2.21) | -0.2 (-3.38,2.99) |
| Benzophenone-3 | 0.62 (-7.05,8.29) | -0.11 (-2.65,2.43) | -0.03 (-2.46,2.41) | -0.25 (-8.43,7.93) | 0.29 (-2.33,2.92) | 0.35 (-4.73,5.42) |
| Overall | -1.09 (-13.27,11.08) | -0.01 (-0.01, 3.76) | 0.95 (-6.5,8.41) | -0.45 (-17.87,16.98) | 0.75 (-0.94,3.69) | 2.38 (-6.63,11.4) |

Abbreviation: HMW, High molecular weight; sOB-R, soluble leptin receptor.

aAll models were adjusted for age, site, education level, smoking status, menopausal status, physical activity score, total caloric intake (per day), and obesity status.