Supplemental Material

Characterizing Racial Disparities in the Associations Between Early Life Phthalate Exposure and Child Cognition

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**eTable 1.** Study Sample Characteristics of Mother-Child Dyads With Follow-Up at Age 5 and/or 8 Years by Child Race, According to Covariates in the Full Cohort Sample Compared to the Analytic Sample, Stratified by Race: The HOME Study (2003-2006)

| Variable                          | Full Sample b | Black | White |
|-----------------------------------|---------------|-------|-------|
|                                   | Analytic Sample | Full Sample | Analytic Sample | Full Sample | Analytic Sample | Full Sample |
| Overall                           | N (%)          | N (%)  | N (%)  | N (%)         | N (%)         | N (%)        |
| Maternal Age                      | 253 (100)      | 389 (100) | 90 (36) | 123 (32) | 145 (57) | 242 (62) |
| <25 years                         | 57 (23)        | 96 (25)  | 45 (50) | 65 (53) | 8 (5) | 24 (10) |
| 25 - <35 years                    | 154 (61)       | 231 (59) | 40 (44) | 48 (39) | 104 (72) | 169 (70) |
| 35+ years                         | 42 (17)        | 62 (16)  | 5 (6) | 10 (8) | 33 (23) | 49 (20) |
| Maternal Education                |               |         |        |          |          |          |
| High School or less               | 62 (25)        | 95 (25)  | 51 (57) | 67 (57) | 7 (5) | 12 (5) |
| Some College                     | 71 (28)        | 93 (24)  | 31 (34) | 38 (32) | 37 (26) | 50 (21) |
| Completed College                 | 120 (47)       | 196 (51) | 8 (9) | 17 (14) | 101 (70) | 165 (70) |
| Annual Income                     |               |         |        |          |          |          |
| <$30,000                          | 82 (32)        | 124 (32) | 70 (78) | 95 (77) | 9 (6) | 23 (10) |
| $30,000 - $75,000                 | 77 (30)        | 121 (31) | 17 (19) | 22 (18) | 55 (38) | 93 (38) |
| ≥$75,000                          | 94 (37)        | 144 (37) | 3 (3) | 6 (5) | 81 (56) | 126 (52) |
| Maternal Smoking d                |               |         |        |          |          |          |
| Unexposed                         | 78 (31)        | 89 (31)  | 5 (6) | 5 (5) | 66 (56) | 76 (45) |
| Second-Hand Smoking               | 116 (46)       | 163 (58) | 40 (44) | 67 (72) | 71 (49) | 88 (52) |
| Active Smoking                    | 29 (11)        | 31 (11)  | 45 (50) | 21 (23) | 8 (6) | 5 (3) |
| Parity                            |               |         |        |          |          |          |
| 0                                 | 114 (45)       | 173 (45) | 29 (32) | 39 (32) | 73 (50) | 117 (49) |
| 1                                 | 79 (31)        | 126 (33) | 29 (32) | 43 (36) | 46 (32) | 79 (33) |
| 2+                                | 60 (24)        | 94 (24)  | 32 (36) | 43 (36) | 26 (18) | 48 (20) |
| Pre-pregnancy BMI (kg/m2)         |               |         |        |          |          |          |
| Normal/Underweight <25            | 125 (49)       | 142 (50) | 32 (36) | 32 (34) | 83 (57) | 98 (58) |
| Overweight ≥25 - <30              | 65 (26)        | 69 (24)  | 23 (25) | 32 (34) | 38 (26) | 42 (25) |
| Obese ≥30                         | 63 (25)        | 65 (23)  | 35 (39) | 36 (39) | 24 (17) | 25 (15) |
| Child Sex                         |               |         |        |          |          |          |
| Male                              | 113 (45)       | 181 (46) | 33 (37) | 45 (37) | 69 (48) | 122 (50) |
| Female                            | 140 (55)       | 208 (53) | 57 (63) | 78 (63) | 76 (52) | 120 (50) |

BMI: Body Mass Index, HOME Study: Health Outcomes and Measures of the Environment Study

a Note that values may not sum to the full sample size due to missing information from subsets of the original full sample, percentages reflect columns (e.g., race) within each study sample characteristic

b Child race category Other for the analytic sample includes Hispanic (n=6, 33%), Native American (n=5, 28%), Asian and Pacific Islander (n=7, 38%)

c Maternal race/ethnicity category Other for the analytic sample includes Hispanic (n=7, 39%), Native American (n=2, 11%), Asian and Pacific Islander (n=3, 17%), Multiple/other race (n=6, 33%)

d Maternal smoking during pregnancy estimated based on maternal serum cotinine concentrations during pregnancy. Unexposed smoking exposure defined as having serum cotinine concentrations <0.015ng/mL, second-hand smoking exposure is defined by serum cotinine concentrations between 0.015 and <3.00 ng/mL, and active smoking includes those with serum cotinine concentrations ≥3.00 ng/mL.

c Pre-pregnancy BMI (kg/m2) was defined as normal/underweight <25, overweight ≥25-<30, and obese ≥ 30
**Table 2.** Univariate Statistics (median, Q1, Q3) of Error Corrected Repeated Maternal and Childhood Urinary Concentrations of Phthalate Metabolites (ng/mL)

| Phthalate Metabolite | Non-Hispanic Black (N=90) | Non-Hispanic White (N=145) | Percent Difference Between Non-Hispanic Black and Non-Hispanic White (95% CI) |
|----------------------|---------------------------|----------------------------|--------------------------------------------------------------------------|
|                      | Gestation                  | Childhood                  | Gestation                   | Childhood                  |
| MCPP                 | 1.8 (1.8, 3.5)             | 11.0 (10.0, 12.4)          | 2.4 (1.76, 3.5)             | 12.2 (10.4, 14.2)          | 7.2 (6.2, 8.3) | 9.1 (8.6, 9.6) |
| MiBP                 | 5.8 (3.7, 7.8)             | 17.4 (15.7, 19.9)          | 4.4 (2.51, 7.2)             | 15.6 (14.8, 19.7)          | 13 (11, 16)   | 10 (10, 11)    |
| MBzP                 | 13.0 (7.4, 20.7)           | 36.7 (28.5, 48.7)          | 7.8 (4.68, 14.0)            | 27.3 (21.7, 37.2)          | 16 (13, 21)   | 13 (12, 15)    |
| MBP                  | 25.0 (16.4, 43.7)          | 31.7 (27.5, 37.8)          | 23.9 (16.63, 35.1)          | 32.1 (26.8, 37.8)          | 10 (9.1, 13)  | 10 (9.3, 11)   |
| MCOP \( ^d \)        | --                        | 33.9 (30.9, 36.8)          | --                          | 35.4 (31.6, 38.3)          | --             | 9.6 (9.2, 10)  |
| MCNP \( ^d \)        | --                        | 10.8 (9.8, 12.5)           | --                          | 11.2 (9.8, 12.3)           | --             | 9.8 (9.3, 10)  |
| \( \Sigma \)DEHP \( ^e \) | 57.6 (39.3, 113.9)        | 197.9 (180.5, 223.4)       | 89.0 (52.8, 214.9)          | 194.1 (173.1, 213.2)       | 6.3 (5.0, 8.0) | 10 (9.8, 101)  |
| MEP                  | 138.3 (79.8, 397.8)        | 135.4 (104.3, 204.3)       | 122.28 (63.4, 242.1)        | 66.7 (50.9, 96.3)          | 15 (11, 19)   | 21 (19, 24)    |

Q1: 1\(^{st}\) quartile, Q3: 3\(^{rd}\) quartile

MCPP, mono(3-carboxypropyl) phthalate; MiBP, mono-isobutyl phthalate; MBzP, monobenzyl phthalate; MBP, mono-n-butyl phthalate; MCOP, monocarboxyoctyl phthalate; MCNP, monocarboxynonyl phthalate; \( \Sigma \)DEHP, summary di(2-ethylhexyl) phthalate metabolite measure; MEP, monoethyl phthalate

\( ^a \)Repeated maternal urinary phthalate metabolites assessed at 16 and 26 weeks gestation

\( ^c \)Repeated child urinary phthalate metabolites assessed at age 1, 2, 3, 4, 5, and 8 years, and average childhood values were based on error corrected average trajectories from ages 1,2,3,4 and 5. Note, phthalate concentrations at age 8 years were not included in average childhood values, and the main outcome of average child FSIQ includes values obtained at age 5 and 8 years.

\( ^d \)We did not measure MCNP or MCOP concentrations from maternal urine samples, as the method for these biomarkers had not yet been developed at the time of analysis.

\( ^e \)Concentrations of \( \Sigma \)DEHP (in ng/mL) were calculated using the following formula: \( \Sigma \)DEHP (ng/mL)=[MECPP (ng/mL) /278 g/mol + MEHHP (ng/mL) /294.3 g/mol + MEOHP (ng/mL) /292.2 g/mol + MEHP (ng/mL) /278.3 g/mol] *278 g/mol.
Table 3. Limits of Detection and Percent of Participants Below the Value of the Limit of Detection for Repeated Maternal and Childhood Urinary Concentrations of Phthalate Metabolites (ng/mL)

| Phthalate Metabolite | LOD | N  | %<LOD | N  | %<LOD | N  | %<LOD | N  | %<LOD | N  | %<LOD | N  | %<LOD | N  | %<LOD | N  | %<LOD |
|----------------------|-----|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|----|--------|
| MCPP                 | 0.20| 252| 1.6%   | 245| 3.3%   | 213| 0.0%   | 188| 0.0%   | 196| 1.5%   | 166| 0.6%   | 202| 0.0%   | 220| 0.0%   |
| MBP a                | 0.30| 252| 2.8%   | 245| 5.4%   | -- | --     | -- | --     | -- | --     | -- | --     | -- | --     | -- | --     |
| MBzP                 | 0.22| 252| 1.2%   | 245| 1.6%   | 213| 0.5%   | 188| 0.5%   | 196| 0.5%   | 166| 0.0%   | 202| 0.0%   | 220| 0.5%   |
| MBP a                | 0.60| 252| 0.0%   | 245| 0.0%   | -- | --     | -- | --     | -- | --     | -- | --     | -- | --     | -- | --     |
| MCOP b               | 0.50| --  | --     | --  | --     | 213| 0.0%   | 188| 0.5%   | 196| 1.5%   | 166| 0.0%   | 202| 1.5%   | 220| 0.0%   |
| MCNP b               | 0.50| --  | --     | --  | --     | 213| 1.4%   | 188| 0.0%   | 196| 4.1%   | 166| 0.0%   | 202| 0.0%   | 220| 0.0%   |
| ΣDEHP c              |     |     |        |     |        |     |        |     |        |     |        |     |        |     |        |     |        |
| MEP                  | 0.53| 252| 0.0%   | 245| 0.0%   | 213| 0.0%   | 188| 0.0%   | 196| 0.0%   | 166| 0.0%   | 202| 0.0%   | 220| 0.0%   |

LOD: Limit of detection
MCPP, mono(3-carboxypropyl) phthalate; MiBP, mono-isobutyl phthalate; MBzP, monobenzyl phthalate; MBP, mono-n-butyl phthalate; MCOP, monocarboxyoctyl phthalate; MCNP, monocarboxynonyl phthalate; ΣDEHP, summary di(2-ethylhexyl) phthalate metabolite measure; MEP, monoethyl phthalate

- We did not measure MiBP or MBP concentrations from childhood urinary samples at ages 1, 2, and 3 years
- We did not measure MCNP or MCOP concentrations from maternal urine samples, as the method for these biomarkers had not yet been developed at the time of analysis

Concentrations of ΣDEHP (in ng/mL) were calculated using the following formula: ΣDEHP (ng/mL) = (MECPP (ng/mL) /278 g/mol + MEHHP (ng/mL) /294.3 g/mol + MEOHP (ng/mL) /292.2 g/mol + MEHP (ng/mL) /278.3 g/mol) *278 g/mol.
**Table 4.** Adjusted \(^a\) direct and indirect effects of the associations between race and child FSIQ at ages 5 or 8 per 10-fold increase in gestational and childhood urinary phthalate metabolite concentrations

| Metabolite | Visit | N (%) by Race | Direct Effect | Indirect Effect | P-value | P-value |
|------------|-------|---------------|---------------|-----------------|---------|---------|
|            |       | Black         | White         | \(\beta\) (95% CI) |         |         |
| MBzP       | 1 Year| 68 (76)       | 127 (88)     | -8.1 (-13.9, -2.3) | <0.01   | 0.7 (-0.2, 2.2) | 0.15 |
|            | 2 Years| 45 (50)       | 126 (87)     | -7.0 (-12.8, -1.4) | 0.01    | 0.4 (-0.7, 1.8) | 0.45 |
|            | 3 Years| 51 (57)       | 124 (86)     | -9.2 (-15.2, -3.4) | <0.01   | 0.6 (-0.5, 2.1) | 0.27 |
|            | 4 Years| 48 (53)       | 105 (72)     | -8.8 (-14.7, -2.9) | <0.01   | 0.3 (-0.5, 1.4) | 0.50 |
|            | 5 Years| 67 (74)       | 120 (83)     | -8.8 (-14.7, -3.0) | <0.01   | 0.3 (-0.3, 1.3) | 0.36 |
|            | 6 Years| 58 (72)       | 107 (85)     | -10.0 (-15.9, -4.4) | <0.01   | 0.3 (-0.6, 1.5) | 0.55 |
| MEP        | 1 Year| 68 (76)       | 127 (88)     | -5.8 (-11.6, 0.3) | 0.06    | -1.3 (-3.7, 0.8) | 0.18 |
|            | 2 Years| 45 (50)       | 126 (87)     | -4.9 (-11.5, 1.6) | 0.15    | -1.9 (-4.7, 0.7) | 0.16 |
|            | 3 Years| 51 (57)       | 124 (86)     | -7.9 (-14.4, -1.3) | 0.01    | -0.7 (-3.2, 1.9) | 0.58 |
|            | 4 Years| 48 (53)       | 105 (72)     | -8.1 (-14.6, -1.3) | 0.02    | -0.5 (-3.2, 2.2) | 0.71 |
|            | 5 Years| 67 (74)       | 120 (83)     | -7.0 (-13.2, -1.0) | 0.03    | -1.1 (-3.6, 1.1) | 0.34 |
|            | 6 Years| 58 (72)       | 107 (85)     | -8.2 (-14.9, -1.8) | 0.01    | -1.5 (-3.5, 0.3) | 0.14 |

MBzP, monobenzyl phthalate; MEP, monoethyl phthalate

\(^a\)Adjusted for maternal age (continuous), pre-pregnancy BMI (continuous), income (continuous), log-10 transformed average gestational cotinine concentration (continuous), and maternal FSIQ scores (continuous)
**Table 5.** Adjusted \(^a\) associations between average child FSIQ at ages 5 or 8 per 10-fold increase in gestational and childhood MEP urinary phthalate metabolite concentrations

| Time Period | N (%) by Race | Average Adjusted Total Effect (95% CI) | Direct Effect (95% CI) | P-value | Indirect Effect (95% CI) | P-value |
|-------------|---------------|----------------------------------------|------------------------|---------|--------------------------|---------|
|             |               | Black | White |                  |          |                         |         |
| Primary Analysis |               |        |        |                  |          |                         |         |
| Gestation   | 90 (100)      | 145 (100) | -7.0 (-12.1, -1.8) | -7.0 (-12.1, -2.0) | <0.01 | 0.1 (-0.4, 0.8) | 0.78 |
| 1 Year      | 68 (76)       | 127 (88) | -7.0 (-12.1, -1.8) | -5.8 (-11.6, 0.3) | 0.06 | -1.3 (-3.7, 0.8) | 0.18 |
| 2 Years     | 45 (50)       | 126 (87) | -7.0 (-12.1, -1.8) | -4.9 (-11.5, 1.6) | 0.15 | -1.9 (-4.7, 0.7) | 0.16 |
| 3 Years     | 51 (57)       | 124 (86) | -7.0 (-12.1, -1.8) | -7.9 (-14.4, -1.3) | 0.01 | -0.7 (-3.2, 1.9) | 0.58 |
| 4 Years     | 48 (53)       | 105 (72) | -7.0 (-12.1, -1.8) | -8.1 (-14.6, -1.3) | 0.02 | -0.5 (-3.2, 2.2) | 0.71 |
| 5 Years     | 67 (74)       | 120 (83) | -7.0 (-12.1, -1.8) | -7.0 (-13.2, -1.0) | 0.03 | -1.1 (-3.6, 1.1) | 0.34 |
| 8 Years     | 58 (72)       | 107 (85) | -9.6 (-15.5, -3.7) | -8.2 (-14.9, -1.8) | 0.01 | -1.5 (-3.5, 0.3) | 0.14 |
| Adjusted for child sex |               |        |        |                  |          |                         |         |
| Gestation   | 90 (100)      | 145 (100) | -7.0 (-12.1, -1.9) | -7.0 (-12.2, -1.9) | 0.01 | 0.1 (-0.4, 0.7) | 0.79 |
| 1 Year      | 68 (76)       | 127 (88) | -7.0 (-12.1, -1.9) | -6.0 (-12.0, 0.4) | 0.07 | -1.5 (-3.5, 0.4) | 0.13 |
| 2 Years     | 45 (50)       | 126 (87) | -7.0 (-12.1, -1.9) | -4.0 (-10.4, 2.6) | 0.23 | -2.2 (-5.1, 0.4) | 0.09 |
| 3 Years     | 51 (57)       | 124 (86) | -7.0 (-12.1, -1.9) | -6.9 (-13.3, -0.6) | 0.03 | -1.3 (-3.9, 1.2) | 0.33 |
| 4 Years     | 48 (53)       | 105 (72) | -7.0 (-12.1, -1.9) | -7.7 (-14.5, -1.0) | 0.03 | -0.7 (-3.6, 1.8) | 0.65 |
| 5 Years     | 67 (74)       | 120 (83) | -7.0 (-12.1, -1.9) | -6.8 (-12.7, -0.1) | 0.02 | -1.5 (-3.9, 0.8) | 0.20 |
| 8 Years     | 58 (72)       | 107 (85) | -9.6 (-15.5, -3.8) | -9.7 (-15.4, -3.8) | <0.01 | 0.1 (-0.4, 0.8) | 0.75 |
| Adjusted for HOME scores \(^b\) |               |        |        |                  |          |                         |         |
| Gestation   | 90 (100)      | 145 (100) | -6.7 (-12.1, -1.3) | -6.8 (-12.8, -1.3) | 0.02 | 0.1 (-0.4, 0.8) | 0.76 |
| 1 Year      | 68 (76)       | 127 (88) | -6.7 (-12.1, -1.3) | -5.6 (-11.7, 0.6) | 0.08 | -1.5 (-4.0, 0.7) | 0.19 |
| 2 Years     | 45 (50)       | 126 (87) | -6.7 (-12.1, -1.3) | -4.3 (11.4, 2.1) | 0.22 | -2.0 (-4.8, 0.6) | 0.13 |
| 3 Years     | 51 (57)       | 124 (86) | -6.7 (-12.1, -1.3) | -6.8 (-13.4, -0.2) | 0.05 | -0.9 (-3.7, 1.6) | 0.49 |
| 4 Years     | 48 (53)       | 105 (72) | -6.7 (-12.1, -1.3) | -4.8 (-12.4, 2.3) | 0.19 | -0.4 (-3.1, 2.3) | 0.76 |
| 5 Years     | 67 (74)       | 120 (83) | -6.7 (-12.1, -1.3) | -6.4 (-13.1, -0.2) | 0.04 | -1.3 (-3.7, 1.1) | 0.33 |
| 8 Years     | 58 (72)       | 107 (85) | -9.1 (-15.3, -2.9) | -9.2 (-15.5, -2.8) | <0.01 | 0.1 (-0.4, 0.8) | 0.70 |
| Adjusted for neighborhood socioeconomic position \(^c,d\) |               |        |        |                  |          |                         |         |
| Gestation   | 88 (100)      | 142 (100) | -6.1 (-11.7, -0.6) | -6.3 (-11.9, -1.0) | 0.03 | 0.1 (-0.4, 0.7) | 0.72 |
| 1 Year      | 67 (76)       | 124 (87) | -6.1 (-11.7, -0.6) | -6.1 (-12.3, 0.3) | 0.06 | -0.9 (-2.9, 1.0) | 0.35 |
| 2 Years     | 45 (51)       | 123 (87) | -6.1 (-11.7, -0.6) | -4.1 (-10.6, 2.4) | 0.21 | -1.2 (-3.9, 1.3) | 0.32 |
| 3 Years     | 50 (57)       | 121 (85) | -6.1 (-11.7, -0.6) | -8.6 (-15.7, -1.6) | <0.01 | -0.2 (-2.9, 2.7) | 0.90 |
| 4 Years     | 47 (53)       | 102 (72) | -6.1 (-11.7, -0.6) | -9.0 (-16.4, -1.9) | <0.01 | 0.2 (-2.5, 2.9) | 0.89 |
| 5 Years     | 66 (75)       | 117 (82) | -6.1 (-11.7, -0.6) | -7.1 (-13.3, -0.8) | 0.02 | -0.5 (-2.6, 1.5) | 0.63 |
| 8 Years     | 58 (72)       | 107 (85) | -10.3 (-16.8, -3.7) | -9.2 (-16.0, -1.9) | 0.01 | -1.2 (-3.5, 0.5) | 0.19 |
### Adjusted for blood lead levels

| Gestation | 90 (100) | 145 (100) | -6.9 (-12.1, -1.6) | -7.0 (-12.3, -2.0) | <0.01 | 0.12 (-0.5, 0.8) | 0.68 |
|-----------|----------|-----------|---------------------|---------------------|-------|-----------------|------|
| 1 Year    | 62 (69)  | 118 (81)  | -6.4 (-12.4, -0.4)  | -4.7 (-11.5, 2.4)  | 0.16  | -1.8 (-4.2, 0.2) | 0.08 |
| 2 Years   | 43 (48)  | 111 (77)  | -6.3 (-12.7, 0.0)   | -4.6 (-11.7, 2.6)  | 0.24  | -2.2 (-5.4, 0.8) | 0.16 |
| 3 Years   | 47 (52)  | 105 (72)  | -7.0 (-13.3, -0.8)  | -7.8 (-14.6, -0.7) | 0.03  | -0.4 (-3.1, 2.2) | 0.77 |
| 4 Years   | 47 (52)  | 90 (62)   | -7.8 (-14.4, -1.2)  | -7.0 (-14.0, 0.6)  | 0.08  | -1.1 (-4.5, 2.2) | 0.51 |
| 5 Years   | 61 (68)  | 98 (68)   | -6.9 (-13.3, -0.4)  | -5.7 (-12.4, 1.0)  | 0.12  | -1.2 (-4.2, 1.5) | 0.37 |
| 8 Years   | 54 (67)  | 83 (66)   | -7.7 (-14.0, -1.4)  | -6.4 (-12.9, 0.4)  | 0.07  | -1.4 (-3.9, 0.6) | 0.19 |

### Adjusted for parity

| Gestation | 90 (100) | 145 (100) | -6.5 (-11.7, -1.3) | -6.5 (-11.5, -1.28) | 0.02  | 0.1 (-0.6, 0.9) | 0.73 |
|-----------|----------|-----------|---------------------|---------------------|-------|-----------------|------|
| 1 Year    | 68 (76)  | 127 (88)  | -6.5 (-11.7, -1.3)  | -5.5 (-11.8, 0.5)  | 0.09  | -1.5 (-3.9, 0.8) | 0.19 |
| 2 Years   | 45 (50)  | 126 (87)  | -6.5 (-11.7, -1.3)  | -4.3 (-10.5, 2.3)  | 0.20  | -2.1 (-4.9, 0.3) | 0.10 |
| 3 Years   | 51 (57)  | 124 (86)  | -6.5 (-11.7, -1.3)  | -6.8 (-13.4, 0.1)  | 0.05  | -1.0 (-4.0, 1.8) | 0.46 |
| 4 Years   | 48 (53)  | 105 (72)  | -6.5 (-11.7, -1.3)  | -7.4 (-14.0, -0.5) | 0.04  | -0.6 (-3.5, 2.2) | 0.66 |
| 5 Years   | 67 (74)  | 120 (83)  | -6.5 (-11.7, -1.3)  | -6.7 (-13.1, -0.8) | 0.02  | -1.2 (-3.7, 1.2) | 0.35 |
| 8 Years   | 58 (72)  | 107 (85)  | -9.3 (-15.3, -3.4)  | -9.4 (-15.0, -3.2) | <0.01 | 0.12 (-0.5, 0.9) | 0.71 |

### Adjusted for maternal educational attainment

| Gestation | 90 (100) | 145 (100) | -6.3 (-11.5, -1.1) | -6.3 (-11.3, -1.3) | 0.02  | 0.1 (-0.4, 0.7) | 0.74 |
|-----------|----------|-----------|---------------------|---------------------|-------|-----------------|------|
| 1 Year    | 68 (76)  | 127 (88)  | -6.3 (-11.5, -1.1)  | -5.6 (-11.7, 0.6)  | 0.08  | -1.0 (-3.0, 0.8) | 0.26 |
| 2 Years   | 45 (50)  | 126 (87)  | -6.3 (-11.5, -1.1)  | -4.2 (-10.7, 1.7)  | 0.19  | -1.7 (-4.4, 0.9) | 0.22 |
| 3 Years   | 51 (57)  | 124 (86)  | -6.3 (-11.5, -1.1)  | -6.9 (-13.7, -0.5) | 0.04  | -0.6 (-3.0, 1.8) | 0.64 |
| 4 Years   | 48 (53)  | 105 (72)  | -6.3 (-11.5, -1.1)  | -7.0 (-13.8, -0.6) | 0.03  | -0.2 (-2.7, 2.4) | 0.85 |
| 5 Years   | 67 (74)  | 120 (83)  | -6.3 (-11.5, -1.1)  | -6.8 (-12.7, -1.0) | 0.03  | -0.9 (-3.3, 1.2) | 0.41 |
| 8 Years   | 58 (72)  | 107 (85)  | -8.8 (-14.7, -2.8)  | -8.6 (-14.5, -2.6) | 0.01  | 0.1 (-0.5, 0.9) | 0.78 |

### Fully adjusted model

| Gestation | 88 (100) | 142 (100) | -5.2 (-11.2, 0.9)  | -5.4 (-11.3, 0.4)  | 0.07  | 0.02 (-0.4, 1.1) | 0.66 |
|-----------|----------|-----------|---------------------|---------------------|-------|-----------------|------|
| 1 Year    | 63 (72)  | 114 (80)  | -5.1 (-11.8, 1.7)   | -4.5 (-11.9, 3.2)  | 0.25  | -1.4 (-4.4, 1.1) | 0.31 |
| 2 Years   | 43 (49)  | 107 (75)  | -3.4 (-10.5, 3.7)   | -2.2 (-9.8, 5.7)   | 0.57  | -1.6 (-5.2, 1.6) | 0.30 |
| 3 Years   | 45 (51)  | 102 (72)  | -4.7 (-11.7, 2.4)   | -5.9 (-14.0, 2.5)  | 0.16  | -0.2 (-2.9, 2.7) | 0.88 |
| 4 Years   | 45 (51)  | 87 (61)   | -5.5 (-13.2, 2.2)   | -4.7 (-12.8, 4.0)  | 0.26  | -0.2 (-3.4, 3.2) | 0.90 |
| 5 Years   | 59 (67)  | 95 (67)   | -6.1 (-13.3, 1.1)   | -5.2 (-12.6, 2.6)  | 0.19  | -0.9 (-4.0, 2.0) | 0.54 |
| 8 Years   | 71 (90)  | 105 (85)  | -7.7 (-15.2, -0.3)  | -6.6 (-14.9, 1.1)  | 0.09  | -1.2 (-3.5, 0.7) | 0.25 |

**FSIQ:** Full Scale IQ, **HOME Scores:** Home Observation for Measurement of the Environment

**MEP:** monoethyl phthalate

a Adjusted for maternal age (continuous), pre-pregnancy BMI (continuous), income (continuous), log-10 transformed average gestational cotinine concentration (continuous), and maternal FSIQ scores (continuous)

b Assessment of caregiving environment (Caldwell et al. 1978)
Neighborhood socioeconomic status was assessed using data from the 2000 U.S. Census (Diez Roux et al., 2001). For the census tract of each participant’s residence at 20 weeks gestation, a z-score was calculated for the log transformed median household income; percent of households with interest, dividend, or rental income; log transformed median value of housing unit; percent of residents who completed high school; percent of residents who completed college; and percent of residents employed with executive, managerial, or professional occupations. The z-scores for each measure were summed and categorized into terciles, with lower scores representing lower neighborhood socioeconomic status (Diez Roux et al., 2001).

Note that neighborhood SES was only available for a subset of participants (n=230)

Maternal and childhood concentrations of blood lead levels have been log_{10} transformed to satisfy normality assumptions

Maternal educational attainment was evaluated categorically based on the highest level of educational attainment (high school or less, some college, or completed college)

The fully adjusted model included all covariates from primary models: Adjusted for maternal age (continuous), pre-pregnancy BMI (continuous), income (continuous), log-10 transformed average gestational cotinine concentration (continuous), and maternal FSIQ scores (continuous), as well as all covariates considered in sensitivity analyses, including: child sex (boys v girls), HOME scores (continuous), socioeconomic position (terciles), log_{10} transformed time varying blood lead levels (continuous), parity (continuous), and maternal educational attainment (high school or less, some college, or completed college)

Note that neighborhood SES was only available for a subset of participants (n=230)
eFigure 1. Flow Chart of Participant Selection to Final Sample Size

- Total Eligible women: N = 1,263 - 795
- Enrolled: N = 468 - 79
- Live, singleton births delivered: N = 389 - 106
- Covariate information available: N = 283 - 7
- At least one measure of IQ at ages 5 or 8: N = 276 - 17
- At least one measure of phthalate metabolite concentration during gestation and childhood: N = 259 - 6
- Final sample size: N = 253
Figure 2: Directed Acyclic Graph used to Select Covariates in the Association Between Race and Child FSIQ Scores Through Maternal Urinary Phthalate Concentrations
**eFigure 3**: Directed Acyclic Graph used to Select Covariates in the Association Between Race and Child FSIQ Scores Through Childhood Urinary Phthalate Concentrations, Including all Covariates Assessed in Sensitivity Analyses
**eFigure 4**: Overview of mediation approach, distinguishing between total, controlled direct, and natural indirect effects

![Diagram](image)

**KEY**
- Green arrow: Total Effect
- Orange arrow: Controlled Direct Effect
- Purple arrow: Natural Indirect Effect