Supplemental Online Content

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This supplemental material has been provided by the authors to give readers additional information about their work.

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eFigure 1. Diagram of the participant selection process for the analysis (n=754)

1001 consecutive children enrolled and cord blood 25(OH)D levels measured

778 children had data on both cord blood 25(OH)D and blood pressure

754 children were included in the final analytical sample

223 children did not have blood pressure measured

24 children were excluded from the analytical sample:
- 2 had implausible 25(OH)D level
- 3 had missing maternal preeclampsia information
- 19 had blood pressure measured only before 3 years of age
eFigure 2. Forest plot of change in mean systolic blood pressure percentile per 5 ng/mL increment in cord blood 25(OH)D level among children born to preeclamptic mothers by child developmental stage, sex, race/ethnicity, preterm birth, low birthweight, and maternal pre-pregnancy weight status. Models adjusted for maternal age at delivery, race/ethnicity (if not stratified by race/ethnicity), educational achievement, smoking status during pregnancy, and maternal pre-pregnancy BMI (if not stratified by maternal BMI). BP indicates blood pressure; BMI, body mass index; CI, confidence interval.

| Groups                          | No. of children | Change in mean systolic blood pressure percentile per 5 ng/mL increment in cord blood 25(OH)D among children born to preeclamptic mothers | P for interaction |
|---------------------------------|-----------------|----------------------------------------------------------------------------------------------------------------|-------------------|
|                                 |                 | Adjusted $\beta^*$ (95% CI)                                                                                   | N/A               |
| Overall                         | 754             | -3.47 (-6.18, -0.77)                                                                                            |                   |
| Early childhood (3 to 5 years)  | 672             | -3.90 (-7.21, -0.60)                                                                                            | 0.01              |
| Middle childhood (6 to 12 years)| 650             | -2.84 (-5.77, 0.10)                                                                                            |                   |
| Adolescence (13 to 18 years)    | 143             | -7.80 (-12.30, -3.29)                                                                                            |                   |
| Female                          | 377             | -5.81 (-8.13, -2.49)                                                                                            | 0.05              |
| Male                            | 377             | 1.00 (-3.53, 5.54)                                                                                            |                   |
| Black                           | 469             | -3.82 (-6.84, -0.80)                                                                                            | 0.67              |
| Hispanic                        | 144             | -2.16 (-13.47, 9.14)                                                                                            |                   |
| Term birth                      | 614             | -4.71 (-8.34, -1.07)                                                                                            | 0.72              |
| Preterm birth                   | 140             | -1.95 (-5.92, 2.02)                                                                                            |                   |
| Normal birth weight             | 634             | -2.98 (-6.12, 0.17)                                                                                            | 0.81              |
| Low birth weight                | 120             | -4.89 (-10.02, 0.25)                                                                                            |                   |
| Maternal BMI 18.5-24.9 kg/m²    | 298             | -4.21 (-9.73, 1.31)                                                                                            | 0.55              |
| Maternal BMI ≥ 25 kg/m²         | 396             | -2.23 (-5.62, 1.15)                                                                                            |                   |
**eTable 1. Characteristics of the mother-child pairs in this analysis by maternal preeclampsia status (n=754)**

| Characteristic, n (%) | No Preeclampsia | Preeclampsia |
|----------------------|-----------------|--------------|
| N                    | 675             | 79           |

**Maternal characteristics**

| Characteristic                       | No Preeclampsia | Preeclampsia |
|--------------------------------------|-----------------|--------------|
| Age at delivery, years, mean (SD)    | 28.5 (6.7)      | 29.9 (6.6)   |
| Black                                | 415 (61.5%)     | 54 (68.4%)   |
| Married                              | 224 (33.2%)     | 27 (34.2%)   |
| Did not finish high school           | 198 (29.3%)     | 21 (26.6%)   |
| Smoked during pregnancy              | 64 (9.5%)       | 12 (15.2%)   |
| Pre-pregnancy body mass index, kg/m², mean (SD) | 26.6 (6.3) | 29.7 (6.3) |
| Overweight or obese                  | 339 (50.2%)     | 57 (72.2%)   |

**Child characteristics**

| Characteristic                       | No Preeclampsia | Preeclampsia |
|--------------------------------------|-----------------|--------------|
| Number of blood pressure measurements, median (IQR) | 7.0 (4.0-11.0) | 8.0 (3.0-11.0) |
| Cord blood 25(OH)D concentration, ng/mL, median (IQR) | 12.2 (7.9-17.2) | 12.1 (8.1-17.2) |
| Female                               | 334 (49.5%)     | 43 (54.4%)   |
| Gestational age, weeks, mean (SD)    | 38.7 (2.3)      | 36.8 (2.8)   |
| Preterm birth                        | 102 (15.1%)     | 38 (48.1%)   |
| Birthweight, grams, mean (SD)        | 3151.9 (610.1)  | 2692.8 (825.4) |
| Low birth weight                     | 86 (12.7%)      | 34 (43.0%)   |

* Unless otherwise indicated

SD indicates standard deviation; IQR, interquartile range.
**eTable 2. Characteristics of the mother-child pairs in this analysis by quartiles of cord blood 25(OH)D level (n=754)**

| Variable, n (%) | Quartile 1 (1.4-7.9 ng/mL) | Quartile 2 (8.0-12.2 ng/mL) | Quartile 3 (12.3-17.1 ng/mL) | Quartile 4 (17.2-73.5 ng/mL) |
|-----------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| N               | 190                         | 187                         | 188                         | 189                         |
| **Maternal characteristics** |                             |                             |                             |                             |
| Age at delivery, years, mean (SD) | 27.2 (6.5)                 | 28.9 (6.5)                 | 29.0 (6.7)                 | 29.5 (7.0)                 |
| Black           | 146 (76.8%)                 | 119 (63.6%)                 | 115 (61.2%)                 | 89 (47.1%)                 |
| Married         | 44 (23.2%)                  | 74 (39.6%)                  | 65 (34.6%)                  | 68 (36.0%)                 |
| Did not finish high school | 54 (28.4%)                | 50 (26.7%)                  | 55 (29.3%)                  | 60 (31.7%)                 |
| Smoked during pregnancy | 25 (13.2%)                  | 12 (6.4%)                   | 18 (9.6%)                   | 21 (11.1%)                 |
| Pre-pregnancy body mass index, kg/m², mean (SD) | 27.5 (6.6)               | 27.4 (7.2)                  | 26.6 (5.9)                  | 26.1 (5.4)                 |
| Overweight or obese | 104 (54.7%)               | 106 (56.7%)                 | 97 (51.6%)                  | 89 (47.1%)                 |
| **Child characteristics** |                             |                             |                             |                             |
| Number of blood pressure measurements, median (IQR) | 8.0 (4.0-11.0)          | 7.0 (4.0-12.0)             | 6.0 (3.0-11.0)             | 7.0 (4.0-11.0)             |
| Cord blood 25(OH)D concentration, ng/mL, median (IQR) | 5.8 (4.7-6.8)            | 9.9 (8.9-11.2)             | 14.5 (13.4-15.9)           | 22.3 (19.2-26.4)           |
| Female          | 95 (50.0%)                  | 87 (46.5%)                  | 93 (49.5%)                  | 102 (54.0%)                |
| Gestational age, weeks, mean (SD) | 38.6 (2.1)                | 38.6 (2.4)                 | 38.2 (2.7)                 | 38.6 (2.7)                 |
| Preterm birth   | 29 (15.3%)                  | 34 (18.2%)                  | 38 (20.2%)                  | 39 (20.6%)                 |
| Birthweight, grams, mean (SD) | 3116.2 (595.9)           | 3100.0 (613.4)             | 3038.1 (702.4)             | 3160.6 (684.7)             |
| Low birth weight| 24 (12.6%)                  | 25 (13.4%)                  | 38 (20.2%)                  | 33 (17.5%)                 |

*Unless otherwise indicated

SD indicates standard deviation; IQR, interquartile range.
eTable 3. Associations of maternal preeclampsia and child systolic blood pressure percentile, overall and by child developmental stage, sex, race/ethnicity, preterm birth, low birthweight, and maternal pre-pregnancy weight status ($n=754$)

| Groups | No. of children | No. of blood pressure observations | Average child systolic blood pressure percentile comparing those born to preeclamptic mothers vs. non-preeclamptic mothers | Adjusted β (95% confidence interval) | Adjusted for confounders$^1$ | Additionally adjusted for season of delivery$^2$ | Applied SIPW weight$^1$ | Applied MICE method$^1$ |
|--------|----------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------------------------------|------------------------------------------------|--------------------------------|--------------------------------|
| Overall| 754            | 6,669                             | 5.75 (1.78, 9.71)                                                                                     | 5.34 (1.37, 9.30)                     | 5.32 (1.35, 9.28)                     | 5.78 (1.99, 9.58)                                 | 5.41 (1.43, 9.39)                     |
| Developmental stage | | | | | | | | |
| Early childhood (3 to 5 years) | 672 | 1,753 | 3.60 (-1.26, 8.47) | 3.25 (-1.62, 8.12) | 3.20 (-1.66, 8.07) | 3.79 (-0.91, 8.48) | 3.31 (-1.57, 8.19) |
| Middle childhood (6 to 12 years) | 650 | 4,265 | 6.52 (2.19, 10.85) | 6.15 (1.82, 10.47) | 6.14 (1.81, 10.46) | 6.70 (1.87, 11.53) | 6.19 (1.85, 10.53) |
| Adolescent (13 to 18 years) | 143 | 651 | 11.11 (2.84, 19.37) | 10.81 (2.55, 19.08) | 10.84 (2.57, 19.10) | 10.87 (-3.14, 24.87) | 10.95 (2.68, 19.22) |
| Child sex | | | | | | | | |
| Female | 377 | 3,023 | 6.68 (1.22, 12.15) | 6.64 (1.21, 12.08) | 6.61 (1.17, 12.05) | 6.79 (1.10, 12.49) | 6.65 (1.20, 12.10) |
| Male | 377 | 3,646 | 4.56 (-1.19, 10.30) | 3.77 (-1.96, 9.50) | 3.77 (-1.96, 9.50) | 4.55 (-0.20, 9.30) | 3.90 (-1.85, 9.64) |
| Race/Ethnicity | | | | | | | | |
| Black | 469 | 4,057 | 4.23 (-0.56, 9.01) | 3.70 (-1.07, 8.47) | 3.77 (-1.00, 8.54) | 4.11 (-0.38, 8.61) | 3.76 (-1.02, 8.55) |
| Hispanic | 144 | 1,342 | 17.42 (6.08, 28.77) | 16.46 (5.11, 27.81) | 15.89 (4.51, 27.26) | 16.59 (8.91, 24.27) | 16.87 (5.53, 28.22) |
| Preterm birth | | | | | | | | |
| Term birth | 614 | 5,169 | 5.37 (0.02, 10.71) | 4.89 (-0.41, 10.19) | 4.70 (-0.61, 10.01) | 5.11 (-0.05, 10.27) | 4.74 (-0.58, 10.06) |
| Preterm birth | 140 | 1,500 | 3.43 (-2.90, 9.77) | 3.07 (-3.27, 9.40) | 3.28 (-3.06, 9.62) | 4.12 (-1.87, 10.11) | 3.40 (-2.93, 9.73) |

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| Low birth weight | 634 | 5,381 | 4.95 (-0.18, 10.08) | 4.77 (-0.34, 9.87) | 4.74 (-0.36, 9.84) | 5.47 (0.56, 10.38) | 4.74 (-0.39, 9.87) |
|------------------|-----|-------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Low birthweight   | 120 | 1,288 | 4.16 (-2.58, 10.91) | 3.41 (-3.28, 10.09) | 3.50 (-3.19, 10.18) | 3.74 (-2.49, 9.97) | 3.66 (-3.02, 10.34) |

| Maternal overweight or obese | 298 | 2,558 | 8.35 (0.39, 16.32) | 8.30 (0.41, 16.20) | 8.35 (0.46, 16.24) | 8.76 (0.88, 16.63) | 8.16 (0.26, 16.06) |
| Maternal BMI ≥ 25 kg/m² | 396 | 3,509 | 4.93 (0.16, 9.71) | 4.91 (0.18, 9.64) | 4.86 (0.14, 9.58) | 5.35 (0.96, 9.74) | 4.89 (0.16, 9.63) |

1 Models adjusted for maternal age at delivery, race/ethnicity, educational achievement, smoking status during pregnancy, and maternal pre-pregnancy body mass index.
2 Models adjusted for maternal age at delivery, race/ethnicity, educational achievement, smoking status during pregnancy, maternal pre-pregnancy body mass index, and season of delivery.

BMI indicates body mass index; SIPW, stabilized inverse probability weighting; MICE, multiple imputation by chained equation.
eTable 4. **Associations of maternal preeclampsia and child systolic blood pressure percentile from 3 to 18 years of age by cord blood 25(OH)D concentrations (n=754)**

| Groups | No. of children | No. of blood pressure observations | Average child systolic blood pressure percentile comparing those born to preeclamptic mothers vs. non-preeclamptic mothers |
|--------|-----------------|-----------------------------------|-------------------------------------------------------------------------------------------------|
|        |                 |                                   | **Crude β (95% CI)** | **Adjusted β (95% confidence interval)** | **Adjusted for confounders**¹ | **Additionally adjusted for season of delivery**² | **Applied SIPW weight**¹ | **Applied MICE method**¹ |
| Overall| 754             | 6,669                             | 5.75 (1.78, 9.71)    | 5.34 (1.37, 9.30) | 5.32 (1.35, 9.28) | 5.78 (1.99, 9.58) | 5.41 (1.43, 9.39) |
| By Vitamin D deficiency (cord blood 25(OH)D < 11 ng/mL) | | | | | | | |
| No     | 324             | 3,618                             | 4.32 (-0.84, 9.48)   | 3.71 (-1.46, 8.87) | 3.70 (-1.46, 8.87) | 4.17 (-1.04, 9.37) | 3.69 (-1.49, 8.87) |
| Yes    | 430             | 3,051                             | 7.80 (1.61, 14.00)   | 7.73 (1.60, 13.86) | 7.70 (1.57, 13.83) | 8.18 (2.93, 13.43) | 7.94 (1.80, 14.09) |
| By Vitamin D deficiency (sensitivity analysis: cord blood 25(OH)D < 20 ng/mL) | | | | | | | |
| No     | 128             | 1,066                             | -3.98 (-13.07, 5.12) | -4.19 (-13.26, 4.88) | -4.18 (-13.24, 4.88) | -3.76 (-13.81, 6.28) | -4.38 (-13.47, 4.71) |
| Yes    | 626             | 5,603                             | 7.80 (3.61, 12.38)   | 7.49 (3.13, 11.85)  | 7.47 (3.12, 11.82)  | 7.92 (4.11, 11.73) | 7.63 (3.26, 12.00) |
| By quartiles of cord blood 25(OH)D concentration | | | | | | | |
| Quartile 1 (1.4 to 7.9 ng/mL) | 190 | 1,819 | 10.67 (2.56, 18.78) | 10.56 (2.55, 18.56) | 10.53 (2.53, 18.53) | 11.01 (4.57, 17.46) | 10.68 (2.65, 18.71) |
| Quartile 2 (8.0 to 12.2 ng/mL) | 187 | 1,747 | 7.36 (-0.20, 14.92) | 7.36 (-0.17, 14.88) | 7.21 (-0.32, 14.74) | 7.66 (0.92, 14.39) | 7.55 (0.03, 15.08) |
| Quartile 3 (12.3 to 17.1 ng/mL) | 188 | 1,546 | 6.04 (-2.03, 14.11) | 4.94 (-3.07, 12.96) | 4.98 (-3.05, 13.01) | 5.40 (-1.69, 12.49) | 5.00 (-3.03, 13.04) |
| Quartile 4 (17.2 to 73.5 ng/mL) | 189 | 1,557 | -1.22 (-9.04, 6.59) | -1.87 (-9.71, 5.96) | -1.80 (-9.63, 6.03) | -1.34 (-9.83, 7.15) | -2.00 (-9.85, 5.85) |

¹ Models adjusted for maternal age at delivery, race/ethnicity, educational achievement, smoking status during pregnancy, and maternal pre-pregnancy body mass index.

² Models adjusted for maternal age at delivery, race/ethnicity, educational achievement, smoking status during pregnancy, maternal pre-pregnancy body mass index, and season of delivery.

SIPW indicates stabilized inverse probability weighting; MICE, multiple imputation by chained equation.
eTable 5. Sensitivity analyses examining if child postnatal 25(OH)D confounded and/or modified the association of maternal preeclampsia and child blood pressure \((n=586)\) Estimates show the average child systolic blood pressure percentile comparing those born to preeclamptic mothers vs. non-preeclamptic mothers (reference).

**Does postnatal 25(OH)D confound the association of maternal preeclampsia and child blood pressure?**

|                         | Overall sample \((n=754)\) | Subsample with postnatal 25(OH)D measurement \((n=586)\) | Adjusted for confounders\(^1\) | Adjusted for confounders\(^1\) | Additionally adjusted for postnatal 25(OH)D\(^1\) |
|-------------------------|-----------------------------|----------------------------------------------------------|--------------------------------|--------------------------------|---------------------------------------------|
|                         |                             |                                                          |                                |                                |                                             |
| Adjusted for confounders\(^1\) |                             |                                                          |                                |                                |                                             |
|                         | 5.34 (1.37, 9.30)           | 6.69 (2.22, 11.16)                                       | 6.73 (2.26, 11.19)            |                                |                                             |

**Does postnatal 25(OH)D modify the association of maternal preeclampsia and child blood pressure?**

| Quartiles of postnatal 25(OH)D | Adjusted for confounders\(^1\) | \(P\) for interaction |
|--------------------------------|--------------------------------|------------------------|
| Overall Sample \((n=754)\)     | 5.34 (1.37, 9.30)               | N/A                    |
| Quartile 1: 3.5 to 25.4 ng/mL \((n=145)\) | 12.76 (3.85, 21.69)               |                         |
| Quartile 2: 25.6 to 32.6 ng/mL \((n=148)\) | -0.05 (-8.44, 8.34)               | 0.136                  |
| Quartile 3: 32.7 to 39.0 ng/mL \((n=147)\) | 12.02 (3.24, 20.80)               |                         |
| Quartile 4: 39.1 to 71.7 ng/mL \((n=146)\) | 4.52 (-6.64, 13.68)               |                         |

\(^1\) Models adjusted for maternal age at delivery, race/ethnicity, educational achievement, smoking status during pregnancy, and maternal pre-pregnancy body mass index.

\(^2\) Models adjusted for maternal age at delivery, race/ethnicity, educational achievement, smoking status during pregnancy, maternal pre-pregnancy body mass index, and child postnatal 25(OH)D.
**eTable 6. Characteristics of the mother-child pairs included this analysis (n=754) vs. excluded from this analysis (n=223)**

| Variable, n (%) | Included | Excluded |
|-----------------|----------|----------|
| N               | 754      | 223      |

**Maternal characteristics**

| Variable                                | Included  | Excluded |
|-----------------------------------------|-----------|----------|
| Age at delivery, years, mean (SD)       | 28.7 (6.7)| 28.0 (5.8)|
| Black                                   | 469 (62.2%)| 86 (38.6%)|
| Married                                 | 251 (33.3%)| 77 (34.5%)|
| Did not finish high school              | 219 (29.0%)| 63 (28.3%)|
| Smoked during pregnancy                 | 76 (10.1%) | 29 (13.0%)|
| Pre-pregnancy body mass index, kg/m², mean (SD) | 26.9 (6.3) | 24.9 (5.3) |
| Overweight or obese                     | 396 (52.5%)| 85 (38.1%)|

**Child characteristics**

| Variable                                | Included      | Excluded      |
|-----------------------------------------|---------------|---------------|
| Cord blood 25(OH)D concentration, ng/mL, median (IQR) | 12.2 (7.9-17.2)| 14.0 (9.3-19.1)|
| Female                                  | 377 (50.0%)   | 106 (47.5%)   |
| Gestational age, weeks, mean (SD)       | 38.5 (2.5)    | 38.2 (3.1)    |
| Preterm birth                           | 140 (18.6%)   | 58 (26.0%)    |
| Birthweight, grams, mean (SD)           | 3103.8 (650.8)| 3030.0 (715.1)|
| Low birth weight                        | 120 (15.9%)   | 44 (19.7%)    |

* Unless otherwise indicated

SD indicates standard deviation; IQR, interquartile range.