**Supplementary Material**

**Sensitivity analyses defining gestational age based on gestational week -1**

**Result**

### 25(OH)D3 and gestational age at birth

### The test of overall association indicated that the null hypothesis (the model including 25(OH)D is not better than the null model) could be rejected (p=0.02) and the likelihood ratio test of non-linearity indicated that the spline regression model did not fit the data better than the linear one (p=0.29). The linear model showed that there was an inverse association between 25(OH)D3 concentration and gestational age at birth with a decrease of 0.004 (95% -0.01; -0.001, p=0.01) weeks of gestation per 1 nmol/L increase in 25(OH)D3 concentration (Supplementary table 1).

### 25(OH)D3 and Birth weight

The test of overall association indicated that the null hypothesis could be rejected (p=0.02) and the likelihood ratio test of non-linearity indicated that the spline regression model fitted the data better than the linear one (p=0.01).

### 25(OH)D3 and Ponderal Index

The test of overall association indicated that the null hypothesis could be rejected (p=0.05) and the likelihood ratio test of non-linearity indicated that the spline regression model fitted the data better than the linear one (p=0.02).

### 25(OH)D3 and size for gestation age

The results from the multinomial regression analyses showed that the relative risk ratio of being SGA or LGA compared to AGA was not associated with 25(OH)D3 concentration(p=0.27) (Supplementary table 2).

**Supplemental table 1: Multivariate linear regression analyses of the association between 25(OH)D3 concentration in nmol/L and gestational age at birth in weeks among a random sample of infants born at term (weeks 37-44) in the years between 1981 and 2002 in Denmark (N = 2564)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Gestational age at birth |  | Coefficient | SE | 95% CI | p-value |
| 25(OH)D (nmol/l) | (continuous) | -0.004 | 0.001 | -0.01; -0.001 | 0.01 |
| Maternal education | School | (reference) |  |  |  |
|  | Unknown | 0.09 | 0.14 | -0.19; 0.36 | 0.53 |
|  | High school | 0.11 | 0.06 | 0.03; 0.27 | 0.01 |
|  | University | 0.22 | 0.06 | 0.001; 0.22 | 0.05 |
| Maternal age (years) | (continuous) | -0.01 | 0.01 | -0.02; 0.002 | 0.13 |
| Maternal smoking | Smoking | (reference) |  |  |  |
|  | Unknown | -0.04 | 0.09 | -0.22; 0.14 | 0.70 |
|  | Non-smoking | 0.02 | 0.07 | -0.16; 0.12 | 0.74 |
| Maternal ethnicity | European | (reference) |  |  |  |
|  | Non-European | -0.23 | 0.10 | -0.42; 0.04 | 0.02 |
| Season | Winter | (reference) |  |  |  |
|  | Spring | 0.12 | 0.07 | -0.01; 0.24 | 0.08 |
|  | Summer | 0.16 | 0.07 | 0.03; 0.29 | 0.02 |
|  | Autumn | 0.14 | 0.07 | 0.01; 0.27 | 0.04 |
| Year of birth | (continuous) | -0.01 | 0.01 | -0.02; 0.04 | 0.19 |

Analyses were performed after mutual adjustment for maternal place of origin, smoking, age, education, season and year of birth

**Supplemental table 2 Multinomial regression analyses of 25(OH)D3 concentration and size for gestational age among a random sample of infants born at term (weeks 37-44) in the years between 1981 and 2002 in Denmark (N=2534)**

|  |  |  |
| --- | --- | --- |
|  | Crude model | Adjusted Model\* |
| Categories of birth weight | RRR | SE | 95% CI | p-value | RRR | SE | 95% CI | p-value |
| SGA | 1.00 | 0.003 | 0.99; 1.00 | 0.41 | 1.00 | 0.004 | 0.99; 1.01  | 0.84 |
| AGA | (reference) |  |  |  | (reference) |  |  |  |
| LGA | 1.01 | 0.003 | 1.00; 1.01 | 0.04 | 1.00 | 0.004 | 1.00; 1.01 | 0.27 |
| \* Adjusted for maternal place of origin, smoking, age, education, season and year of birth |

RRR: relative risk ratio; SE: Standard error; AGA: appropriate for gestational age (GA); SGA: small for GA; LGA: large for GA.

**Sensitivity analysis adjusted for maternal place of origin, maternal smoking, maternal age, maternal education, year of birth, season of birth and parity**

**Result**

### 25(OH)D3 and gestational age at birth

### The test of overall association indicated that the null hypothesis (the model including 25(OH)D is not better than the null model) could be rejected (p=0.0002) and the likelihood ratio test of non-linearity indicated that the spline regression model did not fit the data better than the linear one (p=0.66). The linear model showed that there was an inverse association between 25(OH)D3 concentration and gestational age at birth with a decrease of 0.01 (95%-0.01; -0.003, p<0.001) weeks of gestation per 1 nmol/L increase in 25(OH)D3 concentration (Supplementary table 3).

### 25(OH)D3 and Birth weight

The test of overall association indicated that the null hypothesis could be rejected (p=0.01) and the likelihood ratio test of non-linearity indicated that the spline regression model fitted the data better than the linear one (p=0.03).

### 25(OH)D3 and Ponderal Index

The test of overall association indicated that the null hypothesis could be rejected (p=0.03) and the likelihood ratio test of non-linearity indicated that the spline regression model fitted the data better than the linear one (p=0.02).

### 25(OH)D3 and size for gestation age

The results from the multinomial regression analyses showed that the relative risk ratio of being SGA or LGA compared to AGA was not associated with 25(OH)D3 concentration(p=0.4) (Supplementary table 4).

**Supplemental table 3: Multivariate linear regression analyses of the association between 25(OH)D3 concentration in nmol/L and gestational age at birth in weeks among a random sample of infants born at term (weeks 37-44) in the years between 1981 and 2002 in Denmark (N=2686)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Gestational age at birth |  | Coefficient | SE | 95% CI | p-value |
| 25(OH)D (nmol/l) | (continuous) | -0.01 | 0.001 | -0.01; -0.003 | <0.001 |
| Maternal education | School | (reference) |  |  |  |
|  | Unknown | 0.07 | 0.15 | -0.23; 0.37 | 0.64 |
|  | High school | 0.14 | 0.06 | 0.02; 0.26 | 0.02 |
|  | University | 0.21 | 0.08 | 0.06; 0.36 | 0.01 |
| Maternal age (years) | (continuous) | -0.003 | 0.01 | -0.02; 0.01 | 0.58 |
| Maternal smoking | Smoking | (reference) |  |  |  |
|  | Unknown | -0.09 | 0.10 | -0.29; 0.11 | 0.36 |
|  | Non-smoking | 0.013 | 0.08 | -0.14; 0.17 | 0.87 |
| Maternal ethnicity | European | (reference) |  |  |  |
|  | Non-European | -0.17 | 0.11 | -0.37; 0.04 | 0.12 |
| Season | Winter | (reference) |  |  |  |
|  | Spring | 0.14 | 0.07 | -0.001; 0.28 | 0.05 |
|  | Summer | 0.23 | 0.07 | 0.09; 0.37 | 0.002 |
|  | Autumn | 0.22 | 0.07 | 0.08; 0.36 | 0.003 |
| Year of birth | (continuous) | -0.02 | 0.01 | -0.03; -0.001 | 0.04 |
| Parity | Primiparous | (reference) |  |  |  |
|  | Multiparous | -0.05 | 0.06 | -0.16; 0.06 | 0.38 |

Analyses were performed after mutual adjustment for maternal place of origin, smoking, age, education, parity, season and year of birth

**Supplemental table 4: Multinomial regression analyses of 25(OH)D3 concentration and size for gestational age among a random sample of infants born at term (weeks 37-44) in the years between 1981 and 2002 in Denmark (N=2656)**

|  |  |  |
| --- | --- | --- |
|  | Crude model | Adjusted model\* |
| Categories of birth weight | RRR | SE | 95% CI | p-value | RRR | SE | 95% CI | p-value |
| SGA | 1.00 | 0.003 | 0.99; 1.00 | 0.38 | 1.00 | 0.004 | 0.99; 1.01  | 0.73 |
| AGA | (reference) |  |  |  | (reference) |  |  |  |
| LGA | 1.006 | 0.003 | 1.00; 1.01 | 0.08 | 1.00 | 0.003 | 1.00; 1.01 | 0.40 |
| \*Adjusted for maternal place of origin, smoking, age, education, parity, season and year of birth |

RRR: relative risk ratio; SE: Standard error; AGA: appropriate for gestational age (GA); SGA: small for GA; LGA: large for GA.