

## Gestational Vitamin D and offspring fracture risk: The Vitamin D in Pregnancy Study

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### BACKGROUND AND AIM

- Vitamin D is important for bone health and strength by increasing intestinal absorption of calcium.<sup>1</sup>
- Maternal vitamin D *in utero* may be associated with offspring childhood bone measures including bone mineral density; however less is currently known about fracture outcomes.<sup>2,3</sup>
- Understanding when maternal vitamin D is most important during pregnancy is contentious.<sup>2</sup>
- Therefore this study aimed to determine the associations between maternal vitamin D status at two time-points and offspring fracture risk.

### METHOD



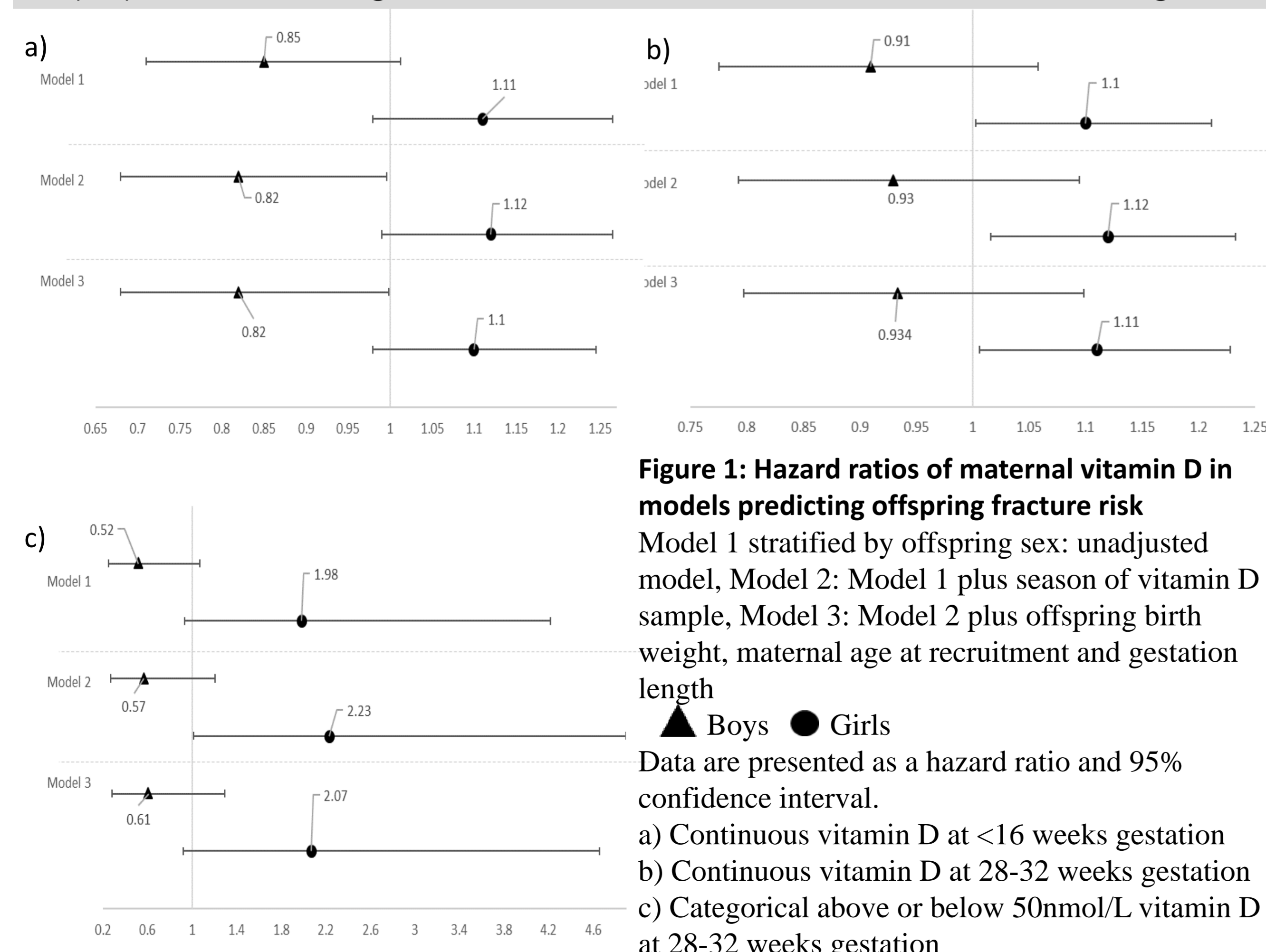
- Final Cox regression models included maternal age at recruitment, offspring sex, birth weight, gestation length and season.
- Vitamin D was analysed as both a continuous and categorical: above or below 28nmol/L, 50 nmol/L and 75 nmol/L.
- Data were analysed as per 10nmol/L of vitamin D.

### RESULTS

- There were 81 fractures from 68 children, 31 (45.6%) were male and 37 (54.4%) were female (Table 1).
- At early gestation, continuous 25(OH)D was associated with decreased fracture risk in boys (HR 0.82; 95% CI 0.68, 0.99; p=0.045) but not in girls (HR 1.12; 95% CI 0.99, 1.27; p=0.067) (Figure 1 A).
- At late gestation, continuous 25(OH)D was associated with increased fracture risk in girls (HR 1.12; 95% CI 1.02, 1.23; p=0.022) but not in boys (HR 0.93; 95% CI 0.79, 1.10; p=0.390) (Figure 1 B).
- Categorical Vitamin D at recruitment was not associated with fracture risk when analysed at any category (p=0.071-0.294).
- Categorical vitamin D at 28-32 weeks gestation had a trend for significance when categorised as above or below 50nmol/L in girls (HR 2.07; 95% CI 0.92, 4.66; p=0.079) but not boys (HR 0.61; 95% CI 0.28, 1.30; p=0.196) which was attenuated after adjustment for maternal and offspring characteristics (p=0.079) (Figure 1 C).<sup>8</sup>

### DISCUSSION

- Contrary to previous studies, the study in this cohort reported contradicting fracture risk profiles in early life associated with maternal vitamin D status at two time-points according to offspring sex.<sup>4,5</sup>
- These findings suggest that maternal vitamin D concentrations during pregnancy may influence bone development, *in utero*, and therefore fracture risk in childhood.
- A potential reason for the differing risk profiles may be due to sexual dimorphism of genes for vitamin D metabolism in the placenta.<sup>6,7</sup>
- Future work in this area could explore larger cohort sizes and other maternal factors important in bone health such as calcium and parathyroid hormone levels.
- In conclusion, there is some evidence that higher maternal 25(OH)D at recruitment was associated with lower fracture risk in boys, while higher maternal 25(OH)D at 28-32 weeks gestation was associated with an increased fracture risk in girls



CHARACTERISTICS	NO FRACTURE (n=332)	FRACTURE (n=68)	P-VALUE
<b>MATERNAL- RECRUITMENT</b>	n (%) or median (IQR)	n (%) or median (IQR)	
WEIGHT (KG)	70 (61.35-80.60)	65 (59.69-80.45)	0.14
HEIGHT (CM)	165 (161-172)	165 (160-172)	0.48
AGE AT RECRUITMENT (YR)	28.9 (25.3-32.5)	29.7 (26.6-32.9)	0.38
VITAMIN D CONCENTRATION (NMOL/L)	54.8 (41.15-69.30)	55.9 (40.05-71.20)	0.95
<b>MATERNAL-28-32 WEEKS' GESTATION</b>			
WEIGHT (KG)	77.5 (68.65-88.70)	72.45(68.00-87.38)	0.30
VITAMIN D CONCENTRATION	56.1 (40.8-79.1)	56.1 (44.4-85.1)	0.55
<b>OFFSPRING</b>			
GESTATION LENGTH (WEEKS)	40 (32-42)	40 (35-45)	0.32
SEX N (% MALE)	164 (49.4)	31 (45.6)	0.57
BIRTH WEIGHT (KG)	3.54 (3.21-3.90)	3.55 (3.20-3.83)	0.96
BIRTH LENGTH (CM)	50.5 (48.8-52.0)	50.1 (48.6-51.5)	0.24
PUBERTAL STAGE N (% HIGH)	18 (11.1)	10 (29.4)	0.006
AGE AT END OF STUDY PERIOD (YR)	9.54 (9.20-9.93)	9.52 (9.25-9.96)	0.59
HEIGHT (CM)	147.40(143.38-153.50)	148.9 (145.25-155.88)	0.16
WEIGHT (KG)	39.75 (35.00-48.33)	40.6 (34.95-47.73)	0.76

**Table 1:** Characteristics of those who did and did not sustain a fracture

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