Paper 2: Vitamin D

Windy Wang

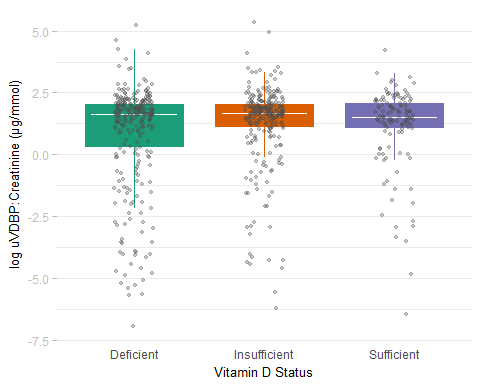
# PAPER 2: VITAMIN D RESULTS

### Subject Characteristics

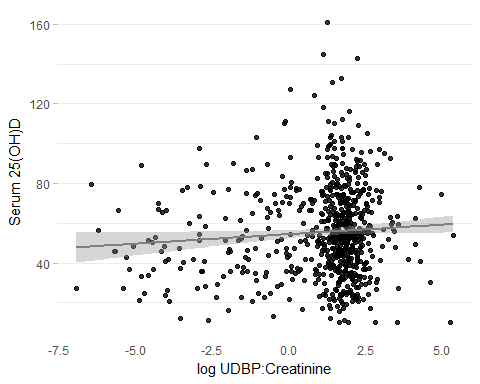
## [1] "Table 1: Subject characteristics across vitamin D status at baseline"  
## Stratified by vitdStatus  
## Deficient   
## n 291   
## Age (mean (sd)) 47.86 (9.37)   
## Sex = Male (%) 98 (33.7)   
## Ethnicity (%)   
## European 148 (50.9)   
## Latino/a 58 (19.9)   
## Other 51 (17.5)   
## South Asian 34 (11.7)   
## BMI (mean (sd)) 32.97 (6.76)   
## Waist (mean (sd)) 102.85 (15.44)   
## eGFR (mean (sd)) 97.74 (14.64)   
## ACR (median [IQR]) 0.56 [0.35, 0.95]   
## UrineCreatinine (mean (sd)) 12.56 (6.42)   
## UrineMicroalbumin (median [IQR]) 6.30 [3.00, 11.35]   
## UrinaryCalcium (mean (sd)) 2.36 (1.72)   
## UDBP (median [IQR]) 53.50 [10.45, 95.38]  
## udbpCrRatio (mean (sd)) 6.88 (14.21)   
## VitaminD (mean (sd)) 35.07 (9.93)   
## PTH (mean (sd)) 4.96 (1.91)   
## MET (mean (sd)) 43.66 (66.01)   
## Systolic (mean (sd)) 126.16 (15.53)   
## Diastolic (mean (sd)) 80.67 (10.32)   
## MeanArtPressure (mean (sd)) 95.83 (11.20)   
## OralContraceptive = 1 (%) 6 (5.9)   
## dmStatus (%)   
## NGT 238 (81.8)   
## PreDM 8 (2.7)   
## DM 45 (15.5)   
## Stratified by vitdStatus  
## Insufficient   
## n 263   
## Age (mean (sd)) 51.11 (10.31)   
## Sex = Male (%) 78 (29.7)   
## Ethnicity (%)   
## European 195 (74.1)   
## Latino/a 31 (11.8)   
## Other 21 (8.0)   
## South Asian 16 (6.1)   
## BMI (mean (sd)) 30.07 (5.28)   
## Waist (mean (sd)) 96.77 (14.89)   
## eGFR (mean (sd)) 92.60 (14.61)   
## ACR (median [IQR]) 0.57 [0.35, 0.93]   
## UrineCreatinine (mean (sd)) 11.39 (6.47)   
## UrineMicroalbumin (median [IQR]) 5.00 [2.10, 11.45]   
## UrinaryCalcium (mean (sd)) 2.29 (1.83)   
## UDBP (median [IQR]) 46.95 [16.84, 94.68]  
## udbpCrRatio (mean (sd)) 7.70 (16.52)   
## VitaminD (mean (sd)) 60.87 (7.34)   
## PTH (mean (sd)) 4.39 (1.56)   
## MET (mean (sd)) 53.95 (64.24)   
## Systolic (mean (sd)) 126.82 (15.08)   
## Diastolic (mean (sd)) 80.05 (10.20)   
## MeanArtPressure (mean (sd)) 95.64 (11.02)   
## OralContraceptive = 1 (%) 5 (6.6)   
## dmStatus (%)   
## NGT 219 (83.3)   
## PreDM 17 (6.5)   
## DM 27 (10.3)   
## Stratified by vitdStatus  
## Sufficient p test   
## n 128   
## Age (mean (sd)) 51.35 (10.32) <0.001   
## Sex = Male (%) 39 (30.5) 0.573   
## Ethnicity (%) <0.001   
## European 101 (78.9)   
## Latino/a 9 (7.0)   
## Other 14 (10.9)   
## South Asian 4 (3.1)   
## BMI (mean (sd)) 29.53 (5.59) <0.001   
## Waist (mean (sd)) 95.69 (14.32) <0.001   
## eGFR (mean (sd)) 92.95 (14.27) <0.001   
## ACR (median [IQR]) 0.46 [0.29, 0.77] 0.188 nonnorm  
## UrineCreatinine (mean (sd)) 11.38 (6.49) 0.064   
## UrineMicroalbumin (median [IQR]) 4.40 [2.07, 9.25] 0.028 nonnorm  
## UrinaryCalcium (mean (sd)) 2.25 (1.45) 0.797   
## UDBP (median [IQR]) 46.30 [19.69, 81.24] 0.805 nonnorm  
## udbpCrRatio (mean (sd)) 6.27 (7.35) 0.616   
## VitaminD (mean (sd)) 90.46 (15.59) <0.001   
## PTH (mean (sd)) 4.08 (1.31) <0.001   
## MET (mean (sd)) 55.71 (63.46) 0.095   
## Systolic (mean (sd)) 125.66 (18.81) 0.779   
## Diastolic (mean (sd)) 79.58 (10.73) 0.579   
## MeanArtPressure (mean (sd)) 94.94 (12.66) 0.760   
## OralContraceptive = 1 (%) 3 (8.3) 0.884   
## dmStatus (%) 0.016   
## NGT 112 (87.5)   
## PreDM 8 (6.2)   
## DM 8 (6.2)

## [1] "Table 2: Subject characteristics across visit numbers"  
## Stratified by fVN  
## Baseline 3Year   
## n 729 636   
## Age (mean (sd)) 49.78 (10.03) 54.64 (9.97)   
## Sex = Male (%) 232 (31.8) 190 (29.9)   
## Ethnicity (%)   
## European 475 (65.2) 455 (71.5)   
## Latino/a 108 (14.8) 65 (10.2)   
## Other 89 (12.2) 65 (10.2)   
## South Asian 57 (7.8) 51 (8.0)   
## BMI (mean (sd)) 31.11 (6.18) 31.30 (6.35)   
## Waist (mean (sd)) 99.06 (15.30) 100.28 (15.21)   
## MET (mean (sd)) 50.32 (65.50) 48.24 (59.65)   
## VitaminD (mean (sd)) 55.42 (22.96) 74.00 (26.37)   
## PTH (mean (sd)) 4.56 (1.71) 4.99 (1.83)   
## UDBP (median [IQR]) 47.56 [15.30, 93.10] 39.96 [8.55, 89.91]  
## udbpCrRatio (median [IQR]) 5.17 [2.51, 7.74] 4.91 [0.95, 7.85]   
## Systolic (mean (sd)) 126.19 (16.00) 127.29 (14.98)   
## Diastolic (mean (sd)) 80.13 (10.32) 80.04 (10.05)   
## MeanArtPressure (mean (sd)) 95.48 (11.40) 95.79 (10.65)   
## OralContraceptive = 1 (%) 16 (7.1) 0 (NaN)   
## dmStatus (%)   
## NGT 601 (82.4) 380 (59.7)   
## PreDM 38 (5.2) 136 (21.4)   
## DM 90 (12.3) 120 (18.9)   
## Stratified by fVN  
## 6Year p test   
## n 487   
## Age (mean (sd)) 57.24 (9.66) <0.001   
## Sex = Male (%) 140 (28.7) 0.494   
## Ethnicity (%) 0.033   
## European 355 (72.9)   
## Latino/a 48 (9.9)   
## Other 47 (9.7)   
## South Asian 37 (7.6)   
## BMI (mean (sd)) 31.04 (6.37) 0.764   
## Waist (mean (sd)) 100.68 (15.36) 0.149   
## MET (mean (sd)) 45.81 (59.44) 0.462   
## VitaminD (mean (sd)) 84.50 (28.17) <0.001   
## PTH (mean (sd)) 4.66 (1.94) <0.001   
## UDBP (median [IQR]) 48.91 [12.04, 89.70] 0.135 nonnorm  
## udbpCrRatio (median [IQR]) 5.08 [1.56, 8.34] 0.447 nonnorm  
## Systolic (mean (sd)) 125.95 (15.03) 0.277   
## Diastolic (mean (sd)) 79.52 (9.37) 0.560   
## MeanArtPressure (mean (sd)) 95.00 (10.35) 0.483   
## OralContraceptive = 1 (%) 0 (NaN) NaN   
## dmStatus (%) <0.001   
## NGT 306 (62.8)   
## PreDM 90 (18.5)   
## DM 91 (18.7)

### Cross-Sectional



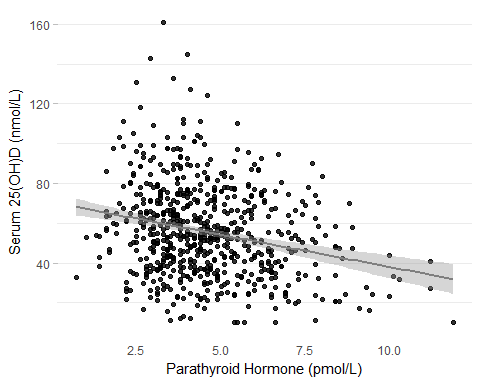
## # A tibble: 3 x 3  
## vitdStatus Median IQR  
## <ord> <dbl> <dbl>  
## 1 Deficient 1.623980 1.7037682  
## 2 Insufficient 1.679041 0.8999910  
## 3 Sufficient 1.522713 0.9956881  
## # A tibble: 3 x 2  
## vitdStatus n  
## <ord> <int>  
## 1 Deficient 291  
## 2 Insufficient 262  
## 3 Sufficient 128  
## Df Sum Sq Mean Sq F value Pr(>F)   
## vitdStatus 2 25 12.524 3.653 0.0264 \*  
## Residuals 678 2324 3.428   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
## Tukey multiple comparisons of means  
## 95% family-wise confidence level  
##   
## Fit: aov(formula = log(udbpCrRatio) ~ vitdStatus, data = vitd)  
##   
## $vitdStatus  
## diff lwr upr p adj  
## Insufficient-Deficient 0.41036210 0.03998157 0.7807426 0.0255885  
## Sufficient-Deficient 0.32715417 -0.13409782 0.7884062 0.2191109  
## Sufficient-Insufficient -0.08320793 -0.55219341 0.3857775 0.9087354



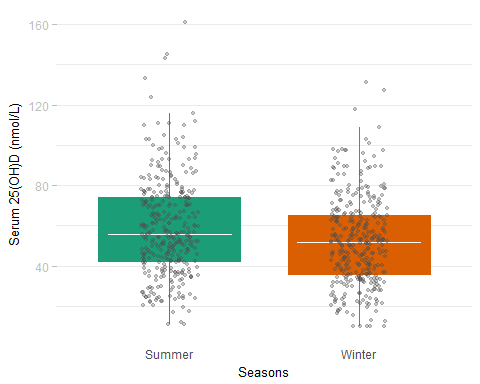
##   
## Spearman's rank correlation rho  
##   
## data: VitaminD and udbpCrRatio  
## S = 51002000, p-value = 0.4183  
## alternative hypothesis: true rho is not equal to 0  
## sample estimates:  
## rho   
## 0.03106497

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Yterms | Xterms | term | estCI | p |
| VitaminD | logudbpCrRatio | <-Xterm | 0.96 (0.03, 1.88) | 0.04 |
| VitaminD | logudbpCrRatio | <-Xterm | 0.32 (-0.53, 1.17) | 0.46 |
| VitaminD | logudbpCrRatio | ageBase | 0.25 (0.09, 0.41) | <0.001 |
| VitaminD | logudbpCrRatio | SexMale | 1.51 (-1.95, 4.96) | 0.39 |
| VitaminD | logudbpCrRatio | EthnicityEuropean | 14.83 (11.39, 18.26) | <0.001 |
| VitaminD | logudbpCrRatio | BMI | -1.2 (-1.46, -0.94) | <0.001 |
| VitaminD | logudbpCrRatio | MET | 0.01 (-0.01, 0.03) | 0.4 |
| VitaminD | logudbpCrRatio | fDMDM | -9.59 (-14.54, -4.65) | <0.001 |

#### Possible Effect Modifiers

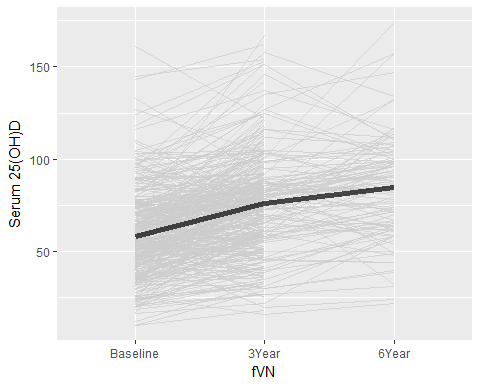
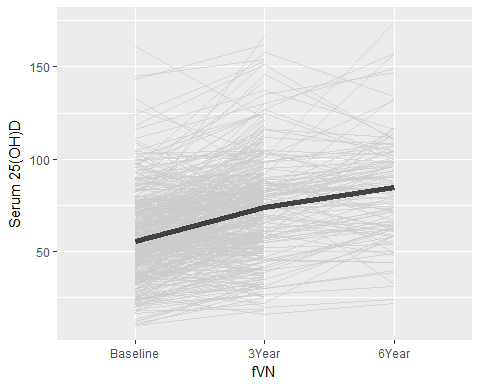


|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Yterms | Xterms | term | estCI | p |
| VitaminD | PTH | <-Xterm | -3.24 (-4.23, -2.24) | <0.001 |



## # A tibble: 2 x 2  
## Season n  
## <chr> <int>  
## 1 Summer 358  
## 2 Winter 371  
## Df Sum Sq Mean Sq F value Pr(>F)   
## Season 1 7047 7047 13.61 0.000243 \*\*\*  
## Residuals 680 352038 518   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
## 47 observations deleted due to missingness  
## Tukey multiple comparisons of means  
## 95% family-wise confidence level  
##   
## Fit: aov(formula = VitaminD ~ Season, data = dsBase)  
##   
## $Season  
## diff lwr upr p adj  
## Winter-Summer -6.428891 -9.850274 -3.007507 0.0002427

### Progression

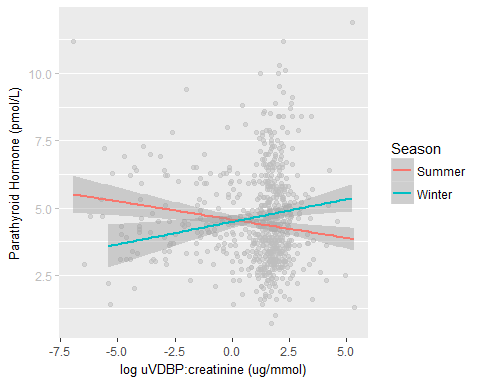
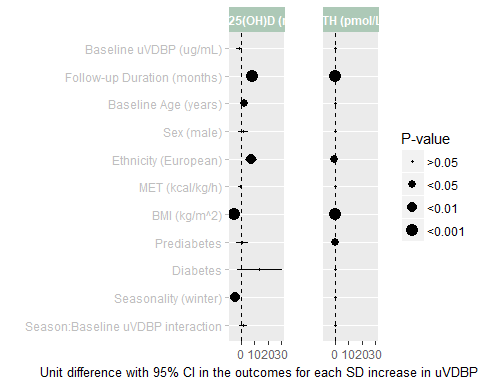


## Df Sum Sq Mean Sq F value Pr(>F)   
## fVN 2 95369 47684 74.93 <2e-16 \*\*\*  
## Residuals 864 549807 636   
## ---  
## Signif. codes: 0 '\*\*\*' 0.001 '\*\*' 0.01 '\*' 0.05 '.' 0.1 ' ' 1  
## 372 observations deleted due to missingness  
## Tukey multiple comparisons of means  
## 95% family-wise confidence level  
##   
## Fit: aov(formula = VitaminD ~ fVN, data = dsComplete)  
##   
## $fVN  
## diff lwr upr p adj  
## 3Year-Baseline 18.332555 14.025870 22.63924 0.0000000  
## 6Year-Baseline 26.955529 20.519697 33.39136 0.0000000  
## 6Year-3Year 8.622974 2.089293 15.15665 0.0056913

### Generalized Estimating Equations

## [1] "Table 3: GEE results for uVDBP at baseline (predictor) with 25(OH)D and (outcomes), adjusted for follow-up duration (in months), baseline age, sex, ethnicity, physical activity (MET), BMI, diabetes status, and seasonality; subjects with deficient vitamin D status at baseline excluded (n = 713)."

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Yterms | Xterms | term | estCI | p |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | Baseline uVDBP (ug/mL) | 0.03 (-0.13, 0.19) | 0.72 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | Baseline uVDBP (ug/mL) | -1.43 (-3.1, 0.23) | 0.09 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | Baseline uVDBP (ug/mL) | 0.04 (-0.11, 0.19) | 0.59 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | Follow-up Duration (months) | 0.26 (0.14, 0.38) | <0.001 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | Baseline Age (years) | 0.12 (-0.02, 0.27) | 0.1 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | SexMale | -0.02 (-0.32, 0.29) | 0.91 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | EthnicityEuropean | -0.34 (-0.65, -0.02) | 0.04 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | MET (kcal/kg/h) | -0.05 (-0.15, 0.05) | 0.34 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | BMI (kg/m^2) | 0.35 (0.18, 0.51) | <0.001 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | dmStatusPreDiabetes | -0.3 (-0.58, -0.02) | 0.03 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | dmStatusDiabetes | 0.09 (-0.84, 1.02) | 0.85 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | SeasonWinter | 0.11 (-0.11, 0.33) | 0.34 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | Baseline uVDBP (ug/mL) | -0.98 (-2.31, 0.36) | 0.15 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | Follow-up Duration (months) | 8.36 (6.72, 10) | <0.001 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | Baseline Age (years) | 2.02 (0.14, 3.9) | 0.04 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | SexMale | 1.62 (-2.36, 5.6) | 0.42 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | EthnicityEuropean | 7.49 (2.91, 12.07) | <0.001 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | MET (kcal/kg/h) | -0.91 (-2.2, 0.37) | 0.16 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | BMI (kg/m^2) | -5.15 (-7.31, -2.99) | <0.001 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | dmStatusPreDiabetes | 0.79 (-3.58, 5.17) | 0.72 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | dmStatusDiabetes | 13.47 (-3.42, 30.36) | 0.12 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | SeasonWinter | -4.59 (-7.52, -1.65) | <0.001 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | Baseline uVDBP (ug/mL) | -0.03 (-0.22, 0.16) | 0.73 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | Follow-up Duration (months) | 0.26 (0.15, 0.38) | <0.001 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | Baseline Age (years) | 0.12 (-0.03, 0.27) | 0.11 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | SexMale | -0.02 (-0.33, 0.28) | 0.87 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | EthnicityEuropean | -0.34 (-0.66, -0.03) | 0.03 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | MET (kcal/kg/h) | -0.05 (-0.15, 0.05) | 0.32 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | BMI (kg/m^2) | 0.34 (0.18, 0.51) | <0.001 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | dmStatusPreDiabetes | -0.32 (-0.6, -0.03) | 0.03 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | dmStatusDiabetes | 0.09 (-0.83, 1.02) | 0.85 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | SeasonWinter | 0.12 (-0.1, 0.34) | 0.3 |
| PTH (pmol/L) | Baseline uVDBP (ug/mL) | Baseline uVDBP (ug/mL):SeasonWinter | 0.12 (-0.11, 0.35) | 0.32 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | Baseline uVDBP (ug/mL) | -1.85 (-4.03, 0.33) | 0.1 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | Follow-up Duration (months) | 8.38 (6.73, 10.03) | <0.001 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | Baseline Age (years) | 1.99 (0.11, 3.87) | 0.04 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | SexMale | 1.53 (-2.48, 5.55) | 0.45 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | EthnicityEuropean | 7.43 (2.85, 12.01) | <0.001 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | MET (kcal/kg/h) | -0.93 (-2.22, 0.36) | 0.16 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | BMI (kg/m^2) | -5.19 (-7.39, -3) | <0.001 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | dmStatusPreDiabetes | 0.64 (-3.75, 5.04) | 0.78 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | dmStatusDiabetes | 13.51 (-3.37, 30.4) | 0.12 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | SeasonWinter | -4.49 (-7.39, -1.6) | <0.001 |
| Serum 25(OH)D (nmol/L) | Baseline uVDBP (ug/mL) | Baseline uVDBP (ug/mL):SeasonWinter | 1.37 (-1.55, 4.29) | 0.36 |



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Yterms | Xterms | term | estCI | p |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | Baseline uVDBP (ug/mL) | 0.01 (-0.05, 0.07) | 0.78 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | Baseline uVDBP (ug/mL) | 0.17 (-0.81, 1.15) | 0.73 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | Baseline uVDBP (ug/mL) | 0.02 (-0.04, 0.07) | 0.51 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | Follow-up Duration (months) | 0.26 (0.14, 0.38) | <0.001 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | Baseline Age (years) | 0.12 (-0.03, 0.27) | 0.11 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | SexMale | -0.01 (-0.32, 0.29) | 0.92 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | EthnicityEuropean | -0.34 (-0.65, -0.02) | 0.04 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | MET (kcal/kg/h) | -0.05 (-0.15, 0.05) | 0.34 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | BMI (kg/m^2) | 0.35 (0.18, 0.51) | <0.001 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | dmStatusPreDiabetes | -0.3 (-0.57, -0.02) | 0.04 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | dmStatusDiabetes | 0.09 (-0.85, 1.02) | 0.86 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | SeasonWinter | 0.11 (-0.11, 0.33) | 0.34 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | Baseline uVDBP (ug/mL) | 0.35 (-0.43, 1.12) | 0.38 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | Follow-up Duration (months) | 8.38 (6.74, 10.02) | <0.001 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | Baseline Age (years) | 2.08 (0.19, 3.96) | 0.03 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | SexMale | 1.58 (-2.42, 5.58) | 0.44 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | EthnicityEuropean | 7.48 (2.89, 12.07) | <0.001 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | MET (kcal/kg/h) | -0.91 (-2.2, 0.39) | 0.17 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | BMI (kg/m^2) | -5.16 (-7.33, -2.99) | <0.001 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | dmStatusPreDiabetes | 0.64 (-3.73, 5) | 0.78 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | dmStatusDiabetes | 13.4 (-3.46, 30.26) | 0.12 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | SeasonWinter | -4.79 (-7.77, -1.81) | <0.001 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | Baseline uVDBP (ug/mL) | 0.03 (-0.09, 0.16) | 0.59 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | Follow-up Duration (months) | 0.26 (0.14, 0.38) | <0.001 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | Baseline Age (years) | 0.12 (-0.03, 0.27) | 0.1 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | SexMale | -0.01 (-0.32, 0.29) | 0.93 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | EthnicityEuropean | -0.34 (-0.65, -0.02) | 0.04 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | MET (kcal/kg/h) | -0.05 (-0.15, 0.05) | 0.34 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | BMI (kg/m^2) | 0.35 (0.18, 0.52) | <0.001 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | dmStatusPreDiabetes | -0.3 (-0.57, -0.02) | 0.04 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | dmStatusDiabetes | 0.08 (-0.86, 1.01) | 0.87 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | SeasonWinter | 0.11 (-0.11, 0.32) | 0.34 |
| PTH (pmol/L) | Urinary VDBP (ng/mL) | Baseline uVDBP (ug/mL):SeasonWinter | -0.02 (-0.16, 0.12) | 0.75 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | Baseline uVDBP (ug/mL) | 0.05 (-1.78, 1.87) | 0.96 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | Follow-up Duration (months) | 8.38 (6.74, 10.03) | <0.001 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | Baseline Age (years) | 2.05 (0.16, 3.95) | 0.03 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | SexMale | 1.55 (-2.46, 5.57) | 0.45 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | EthnicityEuropean | 7.49 (2.89, 12.09) | <0.001 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | MET (kcal/kg/h) | -0.91 (-2.21, 0.39) | 0.17 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | BMI (kg/m^2) | -5.17 (-7.35, -3) | <0.001 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | dmStatusPreDiabetes | 0.64 (-3.73, 5.01) | 0.77 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | dmStatusDiabetes | 13.54 (-3.34, 30.42) | 0.12 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | SeasonWinter | -4.79 (-7.76, -1.81) | <0.001 |
| Serum 25(OH)D (nmol/L) | Urinary VDBP (ng/mL) | Baseline uVDBP (ug/mL):SeasonWinter | 0.41 (-1.56, 2.38) | 0.68 |

