Table 36d. Vitamin D and bone health: Results of observational studies published after the Ottawa EPC report (updated from original report)

| **Author Year Study Name [PMID]** | **Life Stage** | **Outcome** | **1°/2°** | **Mean Followup** | **Concentration, nmol/L** | **N Event** | **N Total** | **Outcome Metric (Comparison)** | **Result** | **95% CI** | **P Btw** | **Study Quality** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Radioimmunoassay** |  |  |  |  |  |  |  |  |  |  |
| Cauley, 2008[195](#_ENREF_195)WHI-OSnd  |  | hip fractures | 1° | 7.1 yrs | Quartile 1: 9.2-47.5 nmol/L | NR | 244 | OR | 1.71 | 1.05, 2.79 |  | A |
|  | Quartile 2: 47.6-70.6 nmol/L | NR | 195 | 1.09 | 0.70, 1.71 |  |  |
|  | Quartile 3: 60.2-70.6 nmol/L | NR | 167 | 0.82 | 0.51, 1.31 |  |  |
|  | Quartile 4: 70.7-121.5 nmol/L | NR | 193 | 1.00 | **Reference** |  |  |
|  | per 2.5 nmol/L decrease | NR | 799 | 1.03 | 1.01, 1.05 | 0.015 |  |
|   | per 25 nmol/L decrease | NR | 799 | 1.33 | 1.06, 1.68 |   |   |
| Barbour, 2012[194](#_ENREF_194)US Pittsburgh, PA and Memphis, TN  | age 70-79 | Hip fracture | 1° | 2 yrs | Quartile 1: ≤44.5 nmol/L | 84 | 2501 | HR | 1.92 | 0.97, 3.83 | 0.217 |  B |
| Quartile 2: 44.5-60.9 nmol/L |   |   | 0.75 | 0.32, 1.72 |  |  |
|  | Quartile 3: 60.9-79.9 nmol/l |   |   | 1.86 | 1.00, 3.45 |  |  |
|  | Quartile 4: >79.9 nmol/l |   |   | 1.00 | **Reference** |   |   |
|  | nonspine fracture | 1° | 2 yrs | Quartile 1: ≤44.5 nmol/L | 247 | 2494 | HR | 1.21 | 0.83, 1.75 | 0.752 |  |
|  | Quartile 2: 44.5-60.9 nmol/L |   |   | 1.01 | 0.68, 1.49 |  |  |
|  | Quartile 3: 60.9-79.9 nmol/l |   |   | 1.12 | 0.78, 1.60 |  |  |
|   | Quartile 4: >79.9 nmol/l |   |   | 1.00 | **Reference** |   |   |
| Burgi 2011[203](#_ENREF_203)US  | 9-50 yrs | stress fracture | 1° | NR | 3.75-49.25 nmol/L | 600 | 1200 | OR | 1.00 | **Reference** | 0.02 | B |
| 49.5-66.5 nmol/L |   |   | 0.77 | 0.54, 1.11 |  |  |
|  | 66.8-82 nmol/L |   |   | 0.76 | 0.52, 1.10 |  |  |
|  | 82.3-99.5 nmol/L |   |   | 0.61 | 0.42, 0.91 |  |  |
|   | 99.75-281.25 nmol/L |   |   | 0.51 | 0.34, 0.78 |   |   |
| Cauley 2011[199](#_ENREF_199)WHI OSUS | Post-menopausal women | fractures | 1° | 8.6 yrs | <50 nmol/L  | 150 | 270 | OR | 1.00 | **Reference** | 0.02 | A |
| whites | 50- <75 nmol/L | 156 | 321 | 0.82 | 0.58, 1.16 |  |  |
|  | ≥75 nmol/L  | 84 | 189 | 0.56 | 0.35, 0.90 |   |   |
|  | <50 nmol/L  | 241 | 508 | OR | 1.00 | **Reference** | 0.043 |  |
| blacks |  | 50- <75 nmol/L | 108 | 193 | 1.48 | 1.05, 2.10 |  |  |
|  |  | ≥75 nmol/L | 30 | 57 | 1.33 | 0.73, 2.43 |   |   |
|  |  | <50 nmol/L | 89 | 182 | OR | 1.00 | **Reference** | 0.72 |  |
| Hispanics |  | 50- <75 nmol/L | 71 | 140 | 1.02 | 0.69, 1.79 |  |  |
|  |  | ≥75 nmol/L | 31 | 60 | 1.09 | 0.50, 2.37 |   |   |
|  |  | <50 nmol/L | 37 | 80 | OR | 1.00 | **Reference** | 0.22 |  |
| Asians |  | 50- <75 nmol/L | 45 | 85 | 1.49 | 0.76, 2.93 |  |  |
|  |  | ≥75 nmol/L | 30 | 59 | 1.66 | 0.68, 4.02 |   |   |
|  |  | <50 nmol/L | 29 | 55 | OR | 1.00 | **Reference** | 0.29 |  |
| native Americans |  | 50- <75 nmol/L | 9 | 18 | 0.64 | 0.15, 2.79 |  |  |
|   |   | ≥75 nmol/L | 6 | 15 | 0.43 | 0.09, 2.08 |   |   |
| Looker 2013[196](#_ENREF_196)NHANES III |  | major osteoporotic fracture | 1° | 7 yrs | per 1 SD unit decline in serum 25OHD | 400 | 4749 | RR | 1.27 | 1.12, 1.44 |  | A |
| 212 | NR | 1.14 | 0.97, 1.34 |
| 188 | NR | 1.40 | 1.13, 1.74 |
| **Chemiluminescence Assay** |
| Rouzi, 2012[200](#_ENREF_200)Jeddah, Saudi Arabia  |  | fragility fractures | 1° | 5.2 yrs | <17.90 nmol/L | 138 | 707 | OR | 1.25 | 0.91, 1.70 |  | A |
|   | >45.1 nmol/L |   |   | 1.00 | **Reference** |   |   |
| Menant, 2012[193](#_ENREF_193)Sydney, Australia |  | Primary— Falls in men | 1° | 1 y | ≤ 50nmol/l | 94 | 215 | IRR | 1.93 | 1.19, 3.15 | 0.008 | B |
|  | > 50nmol/l | IRR | 1.00 | **Reference** |   |  |
|  | Primary—Falls in women | ≤ 50nmol/l | 115 | 248 | IRR | 0.83 | 0.56, 1.23 | 0.362 |  |
|   |   | > 50nmol/l | IRR | 1.00 | **Reference** |   |   |
| Michael, 2011[189](#_ENREF_189)US(various) |  | Primary—Physical performance summary score | 1° | 6 y | ≥ 75 nmol/l | NR | 64 | RR | 3.66 | 1.88, 5.45 | <0.001 | A |
|  |  |  |  |  | 50-74nmol/l | NR | 148 | RR | 2.32 | 0.89, 3.75 |   |  |
|  |  |  |  |  | 25-49 nmol/l | NR | 255 | RR | 1.64 | 0.28, 3.01 |   |  |
|  |  |  |  |  | ≤ 25 nmol/l | NR | 67 | RR | 1 | **Reference** |   |   |
| **HPLC Tandem Mass Spectrometry** |
| Barrett-Connor, 2012[198](#_ENREF_198)US(various) | 51-70 yrs; ≥71 yrs | nonspine fracture | 1° | 4.6 yrs | Normal level | 100 | 594 | HR | 1.2 | 0.8, 1.8 |  | A |
| Low vit D | 34 | 183 | 1.00 | **Reference** |   |   |
| de Boer 2012[87](#_ENREF_87)Cardiovascular Health StudyUS(various)  |   | Hip fracture | 1° | 11 yrs | Normal level | 118 | 1126 | HR | 1.00 | Reference | NR | A |
| Low level (season specific, ranges 43-61 nmol/L) | 72 | 495 | 1.34 | 0.97, 1.84 |   |   |
| Holvik 2013[197](#_ENREF_197)Norwegian Epidemiologic Osteoporosis Studies (NOREPOS) |  | hip fracture | 1° | 10.7 yrs | Q1: 4.5-42.1 | 317 | 256 | HR | 1.34 | 1.05, 1.70 |  | A |
| Q2: 42.2-53.5 | 294 | 255 | 1.13 | 0.90, 1.44 |
| Q3: 53.5-67.8 | 272 | 255 | 1.10 | 0.87, 1.39 |
| Q4: 67.9-250.0 | 279 | 256 | 1.00 | **Reference** |