Supplementary Table 1 S1. Weighted Mean or Proportion for Covariates by Levels of Serum Vitamin D in the U.S. population ages 50 years and older in NHANES 2001-2004, N=1012

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|  | Serum Vitamin D  |  |
| Covariate | Severe deficiency (<10ng/mL) n= 61 | Deficiency (10-19.9ng/mL) n=326 | Insufficiency (20-29.9ng/mL) n=437 | Normal (≥30ng/mL) n= 188 | P-value1 |
| Weighted Mean |
| Age | 62.9 (60.1, 65.7) | 63.8 (62.5, 65.2) | 62.9 (61.8, 65.2) | 62.6 (60.8, 64.3) | 0.56 |
| BMI (kg/m2) | 29.9 (27.1, 32.7) | 29.6 (28.7, 30.5) | 28.2 (27.7, 28.8) | 27.6 (26.9, 28.3) | **<0.0001** |
| Weighted Proportion |
| Sex |  |  |  |  | 0.34 |
| Female | 65.6 (48.5, 82.6) | 55.8 (47.8, 63.9) | 50.7 (45.5, 56.0) | 49.9 (42.5, 57.3) |  |
| Male | 34.4 (17.4, 51.5) | 44.2 (36.1, 52.2) | 49.3 (44.0, 54.5) | 50.1 (42.7, 57.5) |  |
| Race/ethnicity |  |  |  |  | **<0.0001** |
| Non-Hispanic White | 39.9 (23.2, 56.7) | 72.0 (64.6, 79.4) | 82.9 (78.0, 87.8) | 92.8 (87.7, 97.9) |  |
| Non-Hispanic Black | 46.9 (32.1, 61.8) | 14.5 (8.9, 20.2) | 6.2 (3.3, 9.1) | 0.6 (0.0, 1.4) |  |
| Other | 13.1 (4.0, 22.2) | 13.4 (7.8, 19.1) | 10.9 (6.4, 15.4) | 6.6 (1.6, 11.6) |  |
| Education |  |  |  |  | **0.04** |
| < High school | 39.8 (21.7, 57.9) | 28.1 (21.8, 34.3) | 20.8 (16.6, 25.1) | 16.4 (11.2, 21.6) |  |
| High school | 20.5 (5.3, 35.8) | 25.1 (18.4, 31.9) | 23.9 (17.8, 29.9) | 25.4 (19.0, 32.0) |  |
| >High school | 39.7 (19.7, 59.6) | 46.8 (39.8, 53.7) | 55.3 (49.3, 61.4)  | 59.1 (52.0, 64.2) |  |
| Physical Activity |  |  |  |  | **<0.0001** |
| Any moderate or vigorous | 27.2 (14.1, 40.3) | 41.5 (33.2, 49.9) | 54.8 (49.0, 60.6) | 75.3 (68.1, 82.5) |  |
| No moderate or vigorous | 63.5 (48.6, 78.5) | 46.9 (38.2, 55.5) | 39.9 (35.2, 44.7) | 20.3 (14.4, 26.3) |  |
| Unable | 9.2 (0.0, 18.9) | 11.6 (7.9, 15.3) | 5.2 (2.4, 8.1) | 4.4 (0.8, 7.9) |  |
| Season of blood collection |  |  |  |  | 0.06 |
| Summer  | 45.0 (23.9, 66.0) | 61.6 (52.7, 70.6) | 69.2 (60.6, 77.9) | 69.4 (57.2, 81.5) |  |
| Winter  | 55.0 (34.0, 76.1) | 38.4 (29.4, 47.3) | 30.8 (22.1, 39.4) | 30.6 (18.5, 42.8) |  |
| NHANES Cycle |  |  |  |  | **0.02** |
| 2001-2002 | 47.1 (27.4, 66.8) | 52.3 (43.5, 61.1) | 44.2 (35.7, 52.7) | 33.7 (20.2, 47.3) |  |
| 2003-2004 | 52.9 (33.2, 72.6) | 47.7 (38.9, 56.5) | 55.8 (47.3, 64.3) | 66.3 (52.7, 79.8) |   |
| 1 Rao-Scott Chi-Square for categorical variables, Wald F-statistic for continuous variables |  |
| **Bold** is statistically significant at p = 0.05BMI: body mass index |  |  |  |  |

Supplementary Table 2 S2. Weighted prevalence odds ratios (95% CI) of ANA by serum vitamin D level in the U.S. population aged 50+, NHANES 2001-2004 (N=1,012)

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|  | **Total U.S. Population 50 years +** |
| **Vitamin D** | **Model 1** | **Model 2** | **Model 3** |
| Severe deficiency | 4.17 (1.83, 9.51) | 3.04 (1.25, 7.40) | 2.77 (1.12, 6.86) |
| Deficiency | 2.35 (1.38, 4.02) | 2.04 (1.16, 3.56) | 1.84 (1.01, 3.38) |
| Insufficiency | 2.25 (1.24, 4.08) | 2.11 (1.15, 3.86) | 1.99 (1.08, 3.70) |
| Normal | Reference | Reference | Reference |

Model 1: unadjusted

Model 2: adjusted for gender, age, education, ethnicity/race, season of blood collection, NHANES cycle

Model 3: adjusted for Model 2 covariates + BMI, moderate physical activity