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# Vitamin D status and risk of all-cause and cause-specific mortality in a large cohort: results from the UK Biobank

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## Abstract

**Context:** Although an inverse association between vitamin D status and mortality has been reported in observational studies, the precise association shape and optimal vitamin D status remain undetermined.

**Objective:** To investigate the association between vitamin D status and risk of all-cause and cause-specific mortality, and estimate optimal serum 25-hydroxyvitamin D [25(OH)D] concentrations.

**Design:** Prospective cohort study.

**Setting:** UK Biobank.

**Participants:** 365,530 participants who had serum 25(OH)D measurements and no history of cardiovascular disease (CVD), cancer, or diabetes at baseline (2006-2010).

**Main outcome measures:** All-cause and cause-specific mortality.

**Results:** During a median follow-up of 8.9 (interquartile range: 8.3–9.5) years, 10,175 deaths occurred, including 1841 (18.1%) due to CVD and 5737 (56.4%) due to cancer. The multivariate analyses revealed non-linear inverse associations, with a decrease in mortality risk appearing to level off at 60 nmol/L of 25(OH)D for all-cause and CVD deaths, and at 45 nmol/L for cancer deaths. Compared to participants with 25(OH)D concentrations below the cutoffs, those with higher concentrations had a 17% lower risk for all-cause mortality (HR: 0.83, 95% CI: 0.79–0.86), 23% lower risk for CVD mortality (HR: 0.77, 95% CI: 0.68–0.86), and 11% lower risk for cancer mortality (HR: 0.89, 95% CI: 0.84–0.95).

**Conclusions:** Higher 25(OH)D concentrations are non-linearly associated with lower risk of all-

cause, CVD, and cancer mortality. The thresholds of 45-60 nmol/L might represent an intervention target to reduce the overall risk of premature death, which needs further confirmation in large clinical trials.

**Keywords:** 25-hydroxyvitamin D; cancer; cardiovascular disease; mortality; vitamin D.

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