



Important New Evidence Service

In Partnership with The Centre for Medicines
Optimisation at Keele University

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Public Health England guidance on vitamin D

In July 2016, Public Health England (PHE) issued [new advice on vitamin D supplementation](#), recommending that an average daily dietary intake of **10 micrograms** of vitamin D is required to maintain and protect bone and muscle health.

To meet this requirement PHE advised that a daily supplement containing 10 micrograms of vitamin D **should be taken all year round** by:

- groups at risk of vitamin D deficiency, including frail or housebound people, those in institutions such as care homes, and people who wear clothes that cover most of their skin when outdoors
- by all children aged 1 to 4 years

Breastfed babies from birth to 1 year **should have a daily intake (year round) of 8.5 to 10 micrograms**. Babies fed infant formula do not need to be given a supplement unless they take less than 500 ml of infant formula a day.

People from minority ethnic groups with dark skin, such as those of African, African-Caribbean or South Asian origin, might not get enough vitamin D from sunlight, so they should **consider** taking a daily supplement containing 10 micrograms of vitamin D **all year round**.

For adults and children aged over 4 years, PHE advice is that in spring and summer, the majority of the population will get enough vitamin D through sunlight on the skin and a healthy balanced diet. During autumn and winter, everyone will need to rely on dietary sources of vitamin D. Since it is difficult for people to meet the 10 microgram recommendation from consuming foods naturally containing or fortified with vitamin D, people should **consider** taking a daily supplement containing 10 micrograms of vitamin D **in autumn and winter**.

These new recommendations were informed by the [Scientific Advisory Committee on Nutrition's \(SACN\) report on Vitamin D and health](#). Below, we discuss some of the key findings in this report, and the rationale behind some of the new advice.

For people who are considering the use of supplements, NHS Choices has published lay summaries discussing the [new guidelines](#) and providing more [detailed advice on vitamin D](#), including possible harms from high intake (hypercalcaemia) and the maximum recommended doses (100 micrograms/day for adults and children 11 years and above; 50 micrograms/day for children aged 1 to 10 years and 25 micrograms/day for infants under 12 months [*unless an individual has a medical condition predisposing them to hypercalcaemia*]).

Reference: Vitamin D and Health. Scientific Advisory Committee on Nutrition (SACN). July 2016. Available at https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/537616/SACN_Vitamin_D_and_Health_report.pdf

What do we know already?

- In 1991, Reference Nutrient Intake (RNIs)* for vitamin D of 7-10 micrograms were set for groups considered to be at risk of deficiency, based on the evidence for the prevention of rickets in children and osteomalacia in adults. At that time, it was considered dietary intake of vitamin D was not necessary for most of the UK population, as it was assumed skin synthesis during the spring and summer would be enough to cover vitamin D requirements over the winter period.
- Since then, new evidence on vitamin D has accumulated and public health advice now encourages people to limit sun exposure and to wear sunscreen (e.g. recommendations from [Cancer Research UK](#), the [British Photodermatology Group](#), [NICE](#) and [WHO](#)).

- In 2012, the Chief Medical Officer wrote to healthcare professionals to [raise awareness](#) of the risk of vitamin D deficiency in at risks groups. Subsequently, NICE published [guidance](#) in 2014 aimed at increasing vitamin D supplement use in these groups.

What does this evidence add?

- The new [SACN report on vitamin D](#) aimed to establish whether the dietary reference values (DRVs**) for vitamin D, that had been in place since 1991, were still adequate in view of current lifestyles, sun safety advice, and the availability of new evidence on vitamin D and health outcomes. Based on these findings, SACN now recommends an RNI of 10 micrograms daily (400 IU/day) for all adults and children ≥ 4 years throughout the year. In the absence of data to inform RNIs, Safe Intakes*** have been recommended for children up to 4 years of age.
- The new RNI of 10 micrograms daily was based on the average daily intake required by the majority (97.5%) of the population to maintain a serum concentration ≥ 25 nmol/L of 25-hydroxy vitamin D (25(OH)D), the major circulating metabolite of vitamin D. This level was based on musculoskeletal health outcomes, and while there were many uncertainties in the evidence, this ' ≥ 25 nmol/L threshold', was suggestive, overall, as having beneficial effects in preventing rickets, osteomalacia, falls, and improving muscle strength and function. The report comments that this level should not be seen as a threshold that is diagnostic of disease, but a concentration below which the risk of poor musculoskeletal health is increased at a population level.
- Sunlight exposure to UVB has not been taken into account in setting this RNI because the SACN considered it was not possible to quantify the contribution it makes to serum 25(OH)D in the general population.
- The review found insufficient data for the effects of vitamin D on non-musculoskeletal outcomes, e.g. reproductive health, cardiovascular disease (CVD), immune modulation, to inform the setting of RNIs.

Review details

Eligible studies:

- In establishing DRVs for vitamin D, SACN firstly considered evidence from RCTs, followed by prospective studies. In the absence of such studies, evidence from case-control, cross-sectional studies and case reports was considered.
- Studies were included if they examined the relationship between the serum 25(OH)D and health outcomes. Studies evaluating only the effects of vitamin D intake on health outcomes were not considered.
- Outcomes of public health interest were considered, i.e. whether vitamin D reduced the risk or incidence of musculoskeletal or non-musculoskeletal outcomes in the general health population. The review also sought to identify the 25(OH)D concentration(s) that were associated with beneficial effects.
- The main source of data for the SACN review was a 2011 Institute of Medicine (IOM) report (USA) on [Dietary Reference Intakes for Calcium and Vitamin D](#). The IOM report was informed by two systematic reviews conducted by the Agency for Healthcare Research and Quality (AHRQ) ([ref 1](#) and [2](#)). Studies published since the IOM report, including an [AHRQ 2014 evidence update](#), were also considered in the SACN report. A systematic approach to search for updated evidence was *not* used, but rather members of the SACN working group prepared position papers on vitamin D and specific health outcomes according to their expertise. UK nutrition or health survey data were used to assess the vitamin D status of the UK population. The Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) provided advice to SACN on the [adverse effects of high vitamin D intakes](#).

Outcomes and results as reported in the SACN report:

Musculoskeletal outcomes

- Evidence on vitamin D and musculoskeletal outcomes was considered by life stage because different musculoskeletal health measures are appropriate for specific age groups. The evidence generally suggests that risk of poor musculoskeletal health increases at serum 25(OH)D below about 20-30 nmol/L.
- The risk of **rickets** was increased in infants and children at serum 25(OH)D < 25 nmol/L but mean serum concentrations varied widely. Confounding is possible, as most studies do not consider calcium intake.
- **Osteomalacia** (all age groups) was associated with serum 25(OH)D < 20 nmol/L in all the studies that were considered (mainly case reports).
- There was a possible positive association between maternal serum 25(OH)D during pregnancy and foetal/newborn **bone health indices** (e.g., bone mineral content/density; markers of bone turnover), and also beneficial effects of vitamin D supplementation on bone health indices at some skeletal sites in adults aged ≥ 50 years. The evidence in younger populations was inconsistent or insufficient to draw conclusions.

- Overall, evidence from RCTs suggests that vitamin D supplementation may improve **muscle strength and function** in adults < 50 years with mean serum 25(OH)D < 30 nmol/L. Evidence was less clear in older adults, but beneficial effects were suggested across a range of baseline 25(OH)D values.
- RCT evidence shows no effect of vitamin D on **fracture risk** in adults ≥ 50 years. There was insufficient evidence in younger age groups to draw conclusions.
- Overall, evidence suggests that vitamin D supplementation in adults ≥ 50 years reduces the risk of **falls**.

Deriving the RNI

- The RNI was estimated by modelling data from individual RCTs conducted in winter with adults (aged 20 to 40 and ≥ 64 years) and adolescent girls (11 years). The average daily vitamin D intake required to maintain serum 25(OH)D ≥ 25 nmol/L in winter by the majority (97.5%) of the population was estimated to be around 10 micrograms/day (400 IU/day). For younger age groups, data were extrapolated from these RCTs. Data were not available to relate serum 25(OH)D concentration in the infant clearly to current or long term health, therefore 'Safe Intakes' rather than RNIs were recommended for infants and children aged under 4 years, in the range of 8.5 to 10 micrograms/day (340-400 IU/d).

Non-musculoskeletal outcomes

- Overall, there was insufficient evidence to draw conclusions on the effects of vitamin D on: reproductive health (maternal and newborn outcomes), cancers, CVD, hypertension, all-cause mortality, immune modulation, infectious diseases, neuropsychological functioning, age-related macular degeneration and oral health.

Harms

- Tolerable upper intake levels (UL) for vitamin D were based on hypercalcaemia as an endpoint. Recommended ULs are 100 micrograms/day (4,000 IU/day) for adults and children aged 11 to 17 years, 50 micrograms/day (children 1 to 10 years), and 25 micrograms/day (infants). These ULs may not be appropriate for individuals with medical disorders that pre-dispose them to hypercalcaemia.

Level of evidence:

Level 3 (other evidence) according to the [SORT criteria](#)

Study funding:

SACN is a committee of independent experts that advises government on matters relating to diet, nutrition and health.

***Reference nutrient intake (RNI):** the amount needed by 97.5% of the population to maintain serum 25(OH)D ≥ 25 nmol/L, when UVB sunshine exposure is minimal. It refers to average intake over a period of time (e.g., a week) and takes account of day-to-day variations in vitamin D intake. The RNI is not a minimum target that all people need to achieve, but the risk of deficiency is minimised if the average population intake exceeds it.

****Dietary reference value (DRV):** a collective term for reference nutrient intake, estimated average requirement and lower reference nutrient intakes. Dietary reference values reflect the amount of energy and nutrients needed by healthy people according to their age and gender. For certain nutrients, set increments reflect the increased demands associated with pregnancy and lactation.

*****Safe Intake:** an intake judged to be a level or range of intake at which there is no risk of deficiency, and below a level of where there is a risk of undesirable effects (Department of Health, 1991).