
QUESTIONS AND ANSWERS

1. WHAT ARE NUTRIENT REFERENCE VALUES?

The Nutrient Reference Values (NRVs) are a set of recommended nutrient intakes used to assess dietary requirements of individuals and provide health-based guidance values for population groups in Australia and New Zealand.

2. WHO USES NUTRIENT REFERENCE VALUES AND WHAT ARE THEY USED FOR?

NRVs are used by health professionals/practitioners such as dietitians and doctors to assess the nutrient intake of individuals or groups of people; by university academics and nutrition researchers for teaching and research purposes; by food service managers for meal planning or large scale catering in places such as hospitals, the armed services, nursing homes etc.; and by the food industry in developing and evaluating new food products. They are also used by the government sector in food policy (e.g. dietary/eating and activity guidelines) and legislation related activities, such as in the development of food choice guides or food labelling standards to help the public make informed choices.

3. WHY WERE THE 1991 RECOMMENDED DIETARY INTAKES REVISED IN 2006?

The recommendations, which are used both in Australia and New Zealand, were first published in 1991, but for many of the nutrients, the assessment of needs took place many years before 1991. Since that time, scientific knowledge about nutrient needs had expanded greatly and there was new evidence on health implications for a range of nutrients for which it was not possible to estimate needs in the past. This included new knowledge of the nutritional implications in chronic disease risk. In recognition that chronic disease now affects large sectors of the population, it was felt necessary to introduce information on levels of intake that may help reduce chronic disease risk.

For each nutrient, values were set for the estimated average requirement (EAR) for people in different age and gender groups as well as for pregnancy and lactation. Given the variation in absorption and metabolism of nutrients, even within age/gender groups, a second NRV known as the Recommended Dietary Intake (RDI) was also derived from the EAR which covered the needs of nearly all people in that group. If the evidence was limited, instead of an EAR and RDI, another NRV known as an Adequate Intake (AI) was set either based on experimental data or median population intakes in an otherwise healthy population. A final NRV, the Upper Level of intake (UL), was set above a value at which regular consumption could lead to adverse effects. In the 2006 revision, for the first time, some guidance was also given for certain nutrients in relation to reduction of chronic disease risk, these were known as the Suggested Dietary Target (SDT).

4. WHY HAVE THERE BEEN SUBSEQUENT REVIEWS?

Priority NRVs are reviewed in an ongoing manner as resources allow. The National Health and Medical Research Council (NHMRC) approved the revised NRV recommendations for fluoride on 21 November 2016 and sodium on 13 July 2017 under Section 14A of the *National Health and Medical Research Council Act 1992*. The 2017 fluoride NRVs were published in March 2017 and 2017 sodium NRVs were published in September 2017.

Subsequent reviews (including the 2017 reviews) will be guided by the [Methodological Framework](#) for the Review of NRVs (the Methodological Framework). The Methodological Framework outlines the overarching principles, methodologies, and approaches to ensure consistency of application and transparency in the NRV reviews across all nutrients (including the 2017 reviews). The Methodological Framework was developed through multiple rounds of consultations with technical experts and relevant stakeholders in Australia and New Zealand.

5. WHO WAS INVOLVED IN UNDERTAKING THE REVISIONS?

The 2006 revision was undertaken by NHMRC in collaboration with the Australian Government Department of Health and Ageing and the New Zealand Ministry of Health. A wide range of nutrition experts and other users such as dietitians, the food industry and food legislators from the two countries were involved in developing the recommendations.

Subsequent revisions of priority nutrients have been the responsibility of the Australian Government Department of Health and the New Zealand Ministry of Health. Membership and governance arrangements of the expert working groups and committees involved in these revisions can be accessed from the [NRV website resources page](#).

Approval of updates to the guideline recommendations are provided to the Council of NHMRC, under Section 14A of the *National Health and Medical Research Council Act 1992*.

6. WHAT WAS DIFFERENT ABOUT THE 2006 RECOMMENDATIONS?

The 2006 recommendations:

- covered a much wider range of nutrients than earlier recommendations (e.g. long chain omega 3 fats, dietary fibre, water, vitamin K);
- included a set of values for each nutrient (instead of a single value). These values addressed the daily needs of individuals or groups in the community for maintenance of normal function and prevention of deficiency (i.e. EAR; RDI or AD) or excess (UL);
- included additional recommendations on intakes of certain nutrients that may help reduce the risk of chronic disease such as heart disease, certain cancers or high blood pressure (i.e. SDT).

7. COMPARED TO THE 1991 RDIS, WHICH NUTRIENTS WERE SIGNIFICANTLY CHANGED IN THE 2006 RECOMMENDATIONS AND WHY?

In developing the 2006 recommendations, the reviewers were required to consider the evidence base of the relevant US:Canadian Dietary Reference Intakes (DRIs) and use NHMRC Levels of Evidence as a guide to assess the recommendations of other key bodies such as the World Health Organisation and the relevance of any new data that had been published since the release of the US:Canadian DRIs. This formed the basis for the reviewer's suggestion as to whether Australia and New Zealand adopt, adapt or reject the US:Canadian DRIs for use.

Noteworthy differences in moving from the 1991 to 2006 reference values included the revision of some nutrients which had not previously been assigned a recommended intake level and increases in nutrient recommended intakes notably for folate and other B vitamins (thiamin, niacin, riboflavin, vitamin B6 and B12) as well as calcium and magnesium.

The increase in the NRVs for B vitamins generally reflects the ways they were set in the earlier version. In the 1981-89 RDIs, the values for B vitamins were generally set in relation to energy or protein needs that, in turn, were set on figures recommended at that time by the FAO: WHO. The EARs for B vitamins in the 2006 set of reference values were set using results of metabolic studies with specific biochemical endpoints in blood, tissues or urine related to potential deficiency states or on the results of depletion-repletion studies.

The increased 2006 recommendations for folate were based on new data looking at dietary intake in relation to maintenance of plasma and red blood cell folate, and homocysteine level. Whilst the recommendation may appear at first glance to have been doubled, it was expressed in terms of “dietary folate equivalents”. This was in recognition of the difference in bioavailability between food folate and folic acid (the supplemental form, also used for food fortification), which is twice as well absorbed as food folate.

In relation to calcium, the difference between the 1991 RDI and the 2006 NRVs related almost entirely to the recognition that there were losses through sweat of some 60 mg/day not accounted for in previous estimates.

In the case of magnesium, the new EAR/RDIs were based on maintenance of whole body magnesium over time from balance studies mostly published since the 1991 RDIs were set. There were limited data at the time the 1991 Australian RDIs were set which gave a wide range of estimates of need.

One nutrient for which the value of the NRVs decreased substantially was sodium (salt). In the past, in recognition that the food supply included many valuable foods, which contained substantial amounts of salt, a generous allowance above actual physiological need was made in setting the RDI. In the 2006 revision, whilst some allowance was still made for the attainability of the recommendation in terms of the food supply in relation to adequate provision of other nutrients, the recommended range of intake was set based on the best available evidence at the time around physiological needs.

8. WHAT IS DIFFERENT ABOUT THE 2017 SODIUM NRVs?

The SDT and UL for sodium for adults were revised in 2017 using the new [Methodological Framework](#). The 2006 sodium NRVs: the AI for all age groups and the UL for children remain. The supporting material including the 2017 sodium technical report containing the literature review and evidence summaries can be found on the [NRV website resources page](#).

Sodium SDT for Adults

The 2017 SDT for sodium for adults was revised from 1600 mg/day to 2000 mg/day. The 2017 value is more realistic as it allows for a total diet that meets all nutritional requirements, given the current food supply. The average sodium intake of the Australian and New Zealand population at the time of this review was about 3600 mg/day (almost double the SDT).

The 2017 SDT is based on analysis of data indicating that if population sodium intake levels were to reduce from the current average of about 3600 mg/day to 2000 mg/day this would also support reductions in average population blood pressure.

Sodium UL for Adults

An analysis of data available during the review failed to determine an identifiable point at which the relationship between higher sodium intakes and higher blood pressure did not occur. This means that increased sodium intake was associated with increased blood pressure at all measured levels of intake. Thus, the UL for sodium for adults was revised from the 2006 UL of 2,300 mg/day to ‘*not determined*’ reflecting the inability to identify a single point below which there is low risk.

9. HOW SHOULD THE 2017 SODIUM NRVS BE APPLIED?

Application of the Sodium SDT for adults

The sodium SDT is a target for daily average intake at a population level. SDTs are a set of values for nutrients that may help in the prevention of chronic disease in the population. To achieve the SDT for Australia and New Zealand most individuals need to reduce their sodium intake.

For individual assessments, sodium intake should be evaluated by health professionals/practitioners on a case-by-case basis.

Application of the sodium UL for adults

The recommendation of '*not determined*' reflects the inability to identify a single point below which there is low risk. This should be interpreted by health professionals/practitioners as a need for the general population to reduce sodium intake, as there was no identifiably safe upper limit.

10. WHAT IS DIFFERENT ABOUT THE 2017 FLUORIDE NRVS

The UL and AI for fluoride for infants and children were revised in 2017 using the new [Methodological Framework](#). The 2006 fluoride NRVs: the UL and AI for children and adolescents over 8 years of age and the UL and AI for adults, pregnant and lactating women remain. The supporting material including the 2017 fluoride technical report containing the literature review and evidence summaries can be found on the [NRV website resources page](#).

Fluoride AI for infants and children 0 – 8 years

The AI for fluoride for children aged 7 months to 8 years was reaffirmed to be 0.05 milligrams per kilogram of bodyweight per day (mg/kg bw/day), an intake associated with appreciably reduced rates of tooth decay (dental caries). Updated bodyweight information resulted in changes to the AI values by age-group when presented as an amount of fluoride intake per day, when compared with the 2006 values.

An AI was not established for infants less than six months of age as a review of evidence for breastfed and formula fed infants found that a preventive effect of fluoride intake in this age group could not be established. This is in line with international recommendations. Therefore the 2006 AI for 0-6 months has been *withdrawn* and there is no AI for this age group.

Fluoride UL for infants and children 0 – 8 years

The UL for fluoride for infants and children up to 8 years has been revised from 0.10 mg/kg bw/day to 0.20 mg/kg bw/day, based on evidence that at this level of intake the risk of an adverse effect, in this case severe dental fluorosis, is reduced to an acceptable level. Updated bodyweight information was used to present the UL as an amount of fluoride intake per day. The UL is based on the 95th percentile of fluoride intake (representative of high consumers) and a theoretical water fluoridation level of drinking water of 1.9 mg fluoride/litre (beyond which severe enamel fluorosis is likely to appear). Beyond 8 years of age, when the enamel forms on permanent teeth, the ingestion of fluoride does not cause further developmental changes to teeth.

II. HOW SHOULD THE 2017 FLUORIDE NRVS BE APPLIED

The fluoride recommendations refer to habitual intake of fluoride and are used to assess fluoride intakes at a population level. They apply to the generally well population of children aged 7 months to 8 years (AI) and children aged 0 to 8 years (UL) and are not intended to be guidelines on dental/oral health or clinical practice guidelines used by dental and health professionals/practitioners treating individuals. They are designed to be used as reference standards by dietitians and other health professionals/practitioners working in different settings when developing clinical practice guidelines, assessing dietary requirements of populations and as the

basis for public health policy initiatives. They can provide a benchmark for activities that involve monitoring and assessing population fluoride intake and fluoride levels in the food supply.

The purpose of the AI for infants and young children is to provide information on the level of intake that provides protection from inadequate intake, which in the case of fluoride results in increased risk of dental caries.

The purpose of the UL is to provide information on the upper level of intake above which the risk of an adverse effect increases, in the case of fluoride, severe dental fluorosis.

12. WHAT ABOUT THE 2006 NRVS FOR SODIUM AND FLUORIDE THAT HAVE NOT BEEN REVIEWED

Sodium

The 2006 NRVs remain for the:

- AI for all age groups; and
- UL for children.

The 2017 interim position on the UL for lactation and pregnancy is *'not determined'* aligning with the recommendation of *'not determined'* for adults. It is recognised that this is an interim position and requires further analysis in a future review of the sodium NRVs.

The 2017 sodium NRV review report recommends that the remaining NRVs for sodium be reviewed.

Fluoride

The 2006 NRVs remain for the:

- AI for children and adolescents over 8 years of age and AI for adults, pregnant and lactating women; and
- UL for children and adolescents over 8 years of age and UL for adults, pregnant and lactating women.

The 2017 fluoride NRV review report recommends that the remaining NRVs for fluoride be reviewed.

13. IN AUSTRALIA AND NEW ZEALAND WHAT NUTRIENTS ARE NOT CONSUMED IN SUFFICIENT QUANTITIES?

Australia and New Zealand have concerns about inadequate intakes of nutrients, such as iodine and folate. Mandatory fortification of bread-making flour with folic acid introduced in 2009 in Australia aims to reduce the incidence of neural tube defects in the Australian population by increasing the folic acid intake of women of child bearing age. Folic acid fortification remains voluntary in New Zealand. Mandatory fortification of bread with iodised salt in Australia and New Zealand introduced in 2009, aims to address the re-emergence of iodine deficiency in the general population of both Australia and New Zealand. As expected, folic acid and iodine intakes for pregnant women remain inadequate to meet their increased requirements during pregnancy and breastfeeding; hence folic acid and iodine tablets/supplements for this population group continue to be recommended. Women in particular are unlikely to consume sufficient quantities of iron and calcium in their diets.

14. IS IT REALLY POSSIBLE TO GET ALL THOSE NUTRIENTS IN A “NORMAL” DIET?

Yes, meeting your nutritional requirements is attainable by following the recommended intakes from the five food groups. The *2013 Australian Dietary Guidelines* are underpinned by extensive reviews of the best available research evidence as well as significant dietary modelling to ensure that nutrient and energy requirements are met for each age and gender group. The advice focuses on dietary patterns that promote

health and wellbeing rather than recommending that you eat – or completely avoid – specific foods. The modelling also showed that flexibility of food choice increased as energy requirements increased, thus emphasising the importance of also being physically active to help maintain a healthy body weight. Further information is available on the [NHMRC Eat for Health website](#).

15. DO I HAVE TO TAKE VITAMIN AND MINERAL SUPPLEMENTS TO GET WHAT I NEED?

No, as mentioned above, dietary modelling showed that it is possible to get all the nutrients required from eating plenty (and a variety) of vegetables and fruit including some nuts and seeds, wholegrain cereal foods, reduced-fat dairy foods and lean meats, fish (particularly those rich in omega-3 fats) or poultry, as well as small amounts of poly or monounsaturated fats and oils. There is also strong evidence that it is better for health and reducing risk of chronic diseases to meet your nutrient needs from whole foods rather than supplements. These recommendations are for generally healthy people in the population, so there are some individuals or sub-populations, who as a result of specific dietary patterns, lifestyles or medical conditions, may need supplementation with some specific nutrients.

Examples where supplementation may be indicated:

- Strict vegetarians who consume no animal foods may need supplements of vitamin B12 and omega-3 fats. As well, they will need to take care that they eat sufficient iron and zinc-rich foods as these nutrients are less available from plant sources, so intake needs to be much higher than for non-vegetarians.
- There may be some other people such as the very elderly or those with specific lifestyles and/or medical conditions who require specific supplementation.
- Vitamin D supplements may also be needed by the elderly with little exposure to sunlight, and by veiled women.
- A periconceptional folic acid supplement is recommended for women planning a pregnancy and during the first three months of pregnancy in addition to eating foods naturally rich in folate. Similarly, pregnant and breastfeeding women have increased iodine requirements and may require supplementation.

Advice from an appropriate health professional should always be sought before commencing supplementation.

16. IS THERE A WAY OF CALCULATING THE NEW VALUES FROM THE OLD VALUES?

No, there is no way of calculating the new values from the old. There has been a great deal of new information produced since the last revision. For some nutrients this has led to only minor changes in the recommendations; for others, the changes are more substantial.

All revisions since 2006 have been guided by the [Methodological Framework](#). This outlines the overarching principles, methodologies, and approaches to ensure consistency of application and transparency in the NRV reviews across all nutrients.

17. WHY ARE THERE DIFFERENT VALUES FOR SOME NUTRIENTS FOR DEFICIENCY STATES AND CHRONIC DISEASE?

The shift in scope from deficiency to chronic disease prevention across revisions of the NRVs has been driven by: (i) gains in scientific knowledge regarding links between nutrition, chronic disease and optimum health; and (ii) the low prevalence of nutrient deficiency and changing dietary patterns in developed countries. Since 2006, different values have been set for some nutrients for prevention of “deficiency” states versus prevention of chronic disease because the nature and certainty of the evidence for these two end points differs.

Physiological needs for the prevention of deficiency states in humans can generally be more clearly defined than physiological needs for chronic disease prevention. It is possible to design controlled experiments in humans to determine levels of daily intake required to maintain a certain level of the nutrient in the blood or body tissues and/or to prevent signs of a specific clinical deficiency disease (e.g. scurvy in the case of Vitamin C).

Data exposing the relationship between diet and chronic disease usually derive from population or epidemiological studies of food or nutrient intake and their association with increased risk of disease incidence or events. There are limited nutrient intervention trials and these generally use only one dosage level, so it is difficult to be precise about actual needs. Thus, there is much less precision about the daily intake of a nutrient required to “prevent” the chronic disease. Lowering of risk for these diseases is also often related to several nutrients, some of which appear to increase risk whilst others decrease it. For chronic disease, there may also be other influences on outcome such as genetic background and other environmental factors that are not always taken into account sufficiently.

For this reason, it seemed more reasonable to provide separate recommendations for prevention of deficiency states and for prevention of chronic disease, although both need to be taken into consideration when developing dietary recommendations for the population.

18. WHY ARE THERE TWO SORTS OF RECOMMENDATIONS FOR CHRONIC DISEASE PREVENTION?

There are two types of recommendations for chronic disease. One set addresses the balance of protein, fat and carbohydrate in the diet in terms of their relative contribution to dietary energy. These are the Acceptable Macronutrient Distribution Ranges (AMDR) and as the title suggests recommend a range of intake for a particular macronutrient that is consistent with good health (e.g. protein from 15-25% of energy in the diet). The other set addresses specific nutrients such as antioxidants, dietary fibre or long chain omega-3 fats for which there is some evidence of benefit for chronic disease prevention at higher than RDI levels when consumed in foods. These are generally set at the 90th percentile of current population dietary intake from foods which are associated with better health, lower rates of chronic disease and without long-term risk.

19. HOW SHOULD THE ENERGY TABLES BE USED TO DETERMINE ENERGY NEEDS FOR A PARTICULAR PERSON?

The energy tables give recommendations for energy intake for maintenance of body weight across a range of ages, gender and body size. They also show the requirements within these groups for different physical activity levels (PALs) because activity affects energy needs.

It is generally accepted that a PAL above 1.75 is consistent with good health, but many people will have physical activity levels below this. The tables can thus be used to indicate what the energy needs for a particular person should be if they were doing adequate physical activity and what level they will need to restrict themselves to in order to prevent weight gain if doing inadequate physical activity.

An interactive energy requirements calculator, which is based on the NRV recommendations, is available on the [NHMRC Eat for Health website](#).

20. WHY DO PREGNANT AND LACTATING WOMEN NEED MORE NUTRIENTS THAN OTHER WOMEN OF THE SAME AGE?

In pregnancy, there are increased needs for many (but not all) nutrients to cover additional needs of both the mother, whose own body increases in size during pregnancy, as well as for the foetus. Similarly, when a mother is breastfeeding, requirements are often increased to account for the amount required to produce breast milk. The increased needs can vary across nutrients as the mother’s body can sometimes compensate for the additional needs by increasing things such as the absorption of a particular nutrient especially minerals.

21. WHY DO OLDER PEOPLE NEED MORE OF SOME NUTRIENTS THAN YOUNGER ADULTS?

Older people often have higher requirements than younger adults for intake of nutrients as their bodies are not as efficient at absorbing the nutrients from food or from processing the nutrient once it enters the body. The reverse is however true for energy requirements because the body chemistry slows down with age, and older people may be less active.

Thus it is particularly important that older adults have a high quality, nutrient-rich diet.

22. DO THESE RECOMMENDATIONS APPLY TO EVERY INDIVIDUAL OR ARE THEY FOR HEALTHY PEOPLE ONLY?

The recommendations are for generally healthy people. Many people in the community suffer from conditions such as diabetes, high blood pressure or heart disease and generally speaking these recommendations would also be applicable to most people in these groups and for people with many other conditions. However, requirements can be affected by a number of clinical conditions and some medications, so if in doubt, advice should be sought from health professionals/practitioners such as dietitians in these special cases.

23. ARE THERE OTHER FACTORS SUCH AS NUTRIENT INTERACTIONS, MEDICATION AND PHYSICAL ACTIVITY THAT MAY HELP OR HINDER ACHIEVING THESE RECOMMENDATIONS?

There are a number of nutrients that can interact with other nutrients in a positive or negative way. For example, very high intakes of one nutrient such as iron may interfere with the absorption of another nutrient such as zinc, which uses the same absorption mechanism. This is one of the potential problems with supplement use. Other nutrients such as vitamin C can help in the absorption of nutrients such as iron if consumed at the same time. Some of these interactions have been taken into account in setting upper levels of intake; others are better addressed when discussing food intake patterns in dietary/eating and activity guidelines. Some medications can affect the body's ability to absorb and use nutrients, so advice should be sought especially with multiple medications. Physical activity levels can affect the requirements for a number of nutrients involved in energy metabolism such as certain B vitamins (and of course energy) but increased physical activity allows for greater food intake, thus making it easier to meet nutrient requirements.

24. WOULD CONSUMERS ACHIEVE EVEN GREATER BENEFIT FROM CONSUMING ABOVE THE UPPER LEVEL OF INTAKE?

No, quite the contrary. The Upper Level of Intake has been set as the safe upper level for regular use above which there is a likelihood of adverse effects.

25. WHAT DOES THE TERM "EQUIVALENT" MEAN (E.G. DIETARY FOLATE EQUIVALENTS)?

For some of the nutrients, the term "equivalent" has been used to express the recommendations (e.g. Vitamin A is expressed in Retinol Equivalents and Folate in Dietary Folate Equivalents; alpha-tocopherol equivalent for vitamin E). This reflects the fact that for some nutrients there is more than one chemical form in the food supply that provides a benefit. For example, for folate, there is naturally occurring food folate as well as folic acid used for food fortification and supplementation. Folic acid is twice as active as food folate so not as much is needed to get the same biological benefit. The overall requirement may be met by a mixture of these so is expressed as dietary folate equivalents.

26. HOW DO THESE RECOMMENDATIONS RELATE TO THE NATIONAL DIETARY GUIDELINES?

These nutrient requirement recommendations form the basis of the Dietary Guidelines which are qualitative guidelines about the types and amounts of foods required to get the required nutrients. These 2006 nutrient recommendations have been used to update the Dietary Guidelines where necessary.

27. WHY DO FOOD LABEL REQUIREMENTS USE DIFFERENT NRVS?

At this time, the reference values cited in the Australia New Zealand Food Standards Code have not been updated to reflect changes in NRVs since 1991, hence the differences in values.

All health professionals should be using the current NHMRC NRVs. However for labelling requirements, food manufacturers should be meeting the legislated standards in the Australia New Zealand Food Standards Code.

Food Standards Australia New Zealand (FSANZ) is continuing to monitor this work and is considering using the 2006 NRVs as the basis of a revision of the current regulatory NRVs in the Code. Further information is available at the [FSANZ website](#).

28. WHEN WILL THESE RECOMMENDATIONS BE REVIEWED AGAIN?

The NRVs will be reviewed in an ongoing manner as public health priorities arise and resources allow.

The [Methodological Framework](#) for the review of NRVs states criteria for triggering reviews of the NRVs, allowing for a responsive updating of targeted priority nutrients. Supporting materials including any literature reviews and evidence summaries will accompany each revision and detail the processes for preparing NRVs.

29. WHERE CAN I FIND THE NUTRIENT REFERENCE VALUES FOR AUSTRALIA AND NEW ZEALAND?

Both the main document, details regarding updates and summary documents are available from the [NRV website resources page](#).