# Australian and New Zealand Nutrient Reference Values for Sodium

**Support Document 3**

**Review of Dietary Modelling that supported for the Australian Dietary Guidelines**

This analysis was substantively conducted by Dorothy Mackerras for review by the Sodium Expert Working Group,

**March 2014**

**Sodium content of Dietary Models developed in support of 2012 Australian Dietary Guidelines.**

This supporting document describes the sodium content of the diet which conforms to a more restricted form of the serves of the five food groups, one ‘allowance’ and ‘discretionary’ foods as contained in the companion documents of the Australian Dietary Guidelines ( [www.eatforhealth.gov.au](http://www.eatforhealth.gov.au) ).

The modelling undertaken aimed to determine what the energy intake was that would allow a diet that met the RDI for the 10 nutrients used as drivers of the model and the other constraints determined by the Working Party. Separate modelling was done for life-stage groups with separate NRVs. The composition of the basic food composites used in the modelling were generally lower sodium options (and also lower in sugar etc). The discretionary group was a catch-all that included foods high in sodium, sugar etc. The model assumed that no discretionary salt would be added to cooking or at the table.

Because energy and sodium were output-only nutrients and not used as drivers, the results show the energy and sodium content of the Foundation diet. The Foundation diet includes only the five food groups and one allowance. It does not include any serves of the discretionary foods. Because the energy content of the Foundation diet did not meet the energy needs of most of the young adult population (and variable proportions of other life-stage groups), and people eat individual foods at meals (not a composite protein that is a mix of beef, lamb, chicken, fish etc), Monte Carlo simulations were done to examine the nutrient content of dietary patterns that adhered to the five food groups and one allowance but included additional serves of them to increase energy content to the energy requirements of the population.

Energy requirements vary by body size and activity level, therefore a range of scenarios were modelled. The average height of men and women in the 1995 National Nutrition Survey was used as was a tall height. Calculation of BMR also requires a weight to be set. The actual weight of the population was not used to calculate the BMR owing to the increasing levels of overweight in the population. Instead, all models were done for a weight that yielded a BMI of 22m/kg2 for the height being modelled. These are the BMR values shown in the energy chapter of NHMRC & NZ MoH 2006.

“In 2011-12, the average Australian man (18 years and over) was 175.6 cm tall and weighed 85.9 kg. The average Australian woman was 161.8 cm tall and weighed 71.1 kg.” Height has increased since 1995. “On average, Australians are growing taller and heavier over time. Between 1995 and 2011-12, the average height for men increased by 0.8 cm and for women by 0.4 cm, while the average weight for men increased by 3.9 kg and for women by 4.1 kg.”

(ABS 4364.0.55.001 - Australian Health Survey: First Results, 2011-12 . Available at <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/E11CED5FB86D178ACA257AA30014C059?opendocument> Accessed 25 March 2014

The energy content of the Foundation diets for 4 different cuisine styles was in the range of 8950kJ-9000kJ for men aged 19-30 and 6700-7400kJ form women of the same age. These were associated with sodium intakes ranging from 1000-1400mg/day in men and 900-1400mg/day in women.

However, although these plans achieve the nutrient targets, their energy content only achieves an energy level approximately equal to the mean energy requirement of a short man (160cm) and woman (150cm) who is not active. However these heights were at approximately the 1-2nd centile of height in the 1995 survey. This means that most (more than 95%) of the adult population needs to eat more food than is described in the Foundation diet owing to their taller height. If they are more active than a PAL of 1.4, then additional energy is required. In other words, the Foundation diets cannot be used as a ‘reality check’ owing to their inadequate energy content.

*Energy and sodium content of Foundation diets calculated from composite food groupings to meet the RDI of 10 nutrients for two age groups within the constraints set by the Dietary Guidelines Working Party, for 4 styles of cuisine (NHMRC & NZ MoH, 2011)*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Sex |  | Aged 19-30 years | | Aged 70 years and older | | Source (page) |
|  |  | Energy including fibre (kJ) | Sodium (mg) | Energy including fibre (kJ) | Sodium (mg) |  |
| M | Omnivore | 8944 | 1411 | 7305 | 1265 | 241 |
|  | Plant-based ovo-lacto vegetarian | 8958 | 1296 | 7354 | 1176 | 243 |
|  | Pasta-based | 8947 | 1338 | 7378 | 1208 | 247 |
|  | Rice-based | 9002 | 998 | 7224 | 980 | 244 |
| F | Omnivore | 7384 | 1405 | 6587 | 1178 | 239-40 |
|  | Plant-based ovo-lacto vegetarian | 6765 | 1188 | 6095 | 1071 | 242 |
|  | Pasta-based | 7253 | 1159 | 6554 | 988 | 246 |
|  | Rice-based | 7153 | 926 | 6596 | 1014 | 245 |

In 2012, the average height of young adult men was 177cm and women, 163cm. The table below shows the results of Monte-Carlo modelling of 7-day diets to achieve the energy requirements of men 175cm tall and women 165cm tall. Only patterns with no more than 7 serves of ‘extras’ per week were selected for presentation. There are a range of patterns because different assumptions can be made about the relative proportions of the five food groups for increasing to meet the additional energy requirement.

It is evident that the Foundation diet meets only about 75% of the energy needs of a young adult of average activity. This is associated with an average sodium intake ranging 1900-2700mg, depending on which of the five food groups in increased to what extent. A tall active young man needs to eat an additional 6000kJ per day compared to the Foundation diet and this increases the associated sodium content of the diet to around 2300-2800mg/day. The energy requirement of an older man of average activity are about 2200kJ higher than the Foundation diet for this person. Sodium content is higher in proportion, an average of 1500-2000mg across the models The maximum and minimum of the 100 Monte-Carlo simulations for each of 7-day diets is also shown.

A similar pattern is seen for women. The average sodium content of diets for a young adult of average activity ranged from 1700mg-2000mg/day. The Appendix did not list any 7-day diets that contained as few as 7 serves of extras per week for tall very active young women. The average sodium content of diets for an elderly women ranged from 1450-1600mg/day.

Using foods which do not contain excess sodium sugar or saturated fat, and excluding alcohol and discretionary salt use and which also meet micronutrient and energy requirements of the population as recommended in the Australian Dietary Guidelines, lead to average sodium intakes in the order of 1900-2200mg in young men and 1700-2000mg in young women of average activity. Few of the minima are as low as the 2006 SDT of 1600mg.

*Average, maximum and minimum daily energy and sodium content of Total Omnivore diets containing not more than 7 serves of extra foods per week, models for the average young adult man and woman, an active young adult and an elderly adult of average activity (NHMRC & NZ MoH, 2011)*

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sex | Age (years) | Height (cm) | PAL | N serves of ‘extras’ per week | Energy (including fibre) content of 7-day total diets (kJ/day)\* | | | Sodium content of 7-day total diets (mg/day) | | | Source (page) |
|  |  |  |  | Average\* | Min | Max | Average | Min | Max |  |
| M | 19-30 | 175 | 1.7 | 7 | 12384 | 11941 | 12705 | 1893 | 1634 | 2148 | 316 |
|  |  | 175 | 1.7 | 7 | 12483 | 12107 | 13040 | 2149 | 1770 | 2914 | 318 |
|  |  | 175 | 1.7 | 7 | 12350 | 11851 | 13200 | 2213 | 1859 | 3073 | 320 |
|  | 19-30 | 190 | 2 | 7 | 15731 | 15314 | 16130 | 2278 | 1956 | 3102 | 323 |
|  |  | 190 | 2 | 7 | 15847 | 15328 | 16388 | 2772 | 2290 | 3766 | 325 |
|  | 70+ | 175 | 1.7 | 3.5 | 9822 | 9473 | 10196 | 1507 | 1147 | 2214 | 358 |
|  |  | 175 | 1.7 | 7 | 9929 | 9558 | 10332 | 1724 | 1447 | 2589 | 359 |
|  |  | 175 | 1.7 | 7 | 9842 | 9519 | 10213 | 1817 | 1550 | 2714 | 360 |
|  |  | 175 | 1.7 | 0 | 9816 | 9519 | 10334 | 2025 | 1715 | 2811 | 361 |
|  |  | 175 | 1.7 | 0 | 9799 | 9398 | 10248 | 1891 | 1593 | 2811 | 362 |
| F | 19-30 | 165 | 1.7 | 7 | 9837 | 9419 | 10234 | 1870 | 1439 | 3221 | 371 |
|  |  | 165 | 1.7 | 3.5 | 9876 | 9496 | 10459 | 1711 | 1479 | 2860 | 372 |
|  |  | 165 | 1.7 | 7 | 9819 | 9433 | 10306 | 1821 | 1491 | 2733 | 373 |
|  |  | 165 | 1.7 | 7 | 9878 | 9503 | 10381 | 1857 | 1523 | 2688 | 374 |
|  |  | 165 | 1.7 | 3.5 | 9856 | 9419 | 10377 | 1986 | 1622 | 2909 | 375 |
|  |  | 165 | 1.7 | 0 | 9840 | 9442 | 10245 | 1728 | 1484 | 2612 | 376 |
|  | 19-30 | 180 | 2 | 7 | No diets with few extras | | |  |  |  |  |
|  | 70+ | 165 | 1.7 | 3.5 | 8580 | 8247 | 9083 | 1602 | 1398 | 2479 | 413 |
|  |  | 165 | 1.7 | 3.5 | 8661 | 8310 | 9077 | 1444 | 1223 | 2221 | 414 |
|  |  | 165 | 1.7 | 0 | 8548 | 8253 | 9104 | 1602 | 1399 | 1780 | 415 |
|  |  | 165 | 1.7 | 3.5 | 8607 | 8262 | 9038 | 1587 | 1358 | 2464 | 416 |
|  |  | 165 | 1.7 | 7 | 8486 | 8140 | 8916 | 1507 | 1283 | 2412 | 417 |
|  |  | 165 | 1.7 | 7 | 8696 | 8350 | 9127 | 1555 | 1322 | 2381 | 418 |

\* There is little variation in energy content of the dietary patterns because the model was constrained to meet the average energy requirement of the age-sex group.