

# **Profile of nutritional status of children and adolescents**

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# **Profile of nutritional status of children and adolescents**

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# Abbreviations

ABS	Australian Bureau of Statistics
AGHE	Australian guide to healthy eating
AI	adequate intake
AIHW	Australian Institute of Health and Welfare
EAR	estimated average requirement
EER	estimated energy requirement
KEKP	Kids Eat, Kids Play
NDSHS	National Drug Strategy Household Survey
NHMRC	National Health and Medical Research Council
NHS	National Health Survey
NNS	National Nutrition Survey
NRVs	nutrient reference values
RDI	recommended dietary intake
WHO	World Health Organization

# Symbols

g	grams
kJ	kilojoule
mg	milligram
–	zero or rounded down to zero, includes null cells

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# Highlights

- This report compiles existing nutritional data for children and adolescents relevant to the dietary guidelines. These analyses form a baseline in preparation for the results of Kids Eat, Kids Play (KEKP) – a national children’s nutrition and physical activity survey which commenced in February 2007.
- Recent data suggest that some concerning behaviours are evident – in 2004–05, only one-quarter of adolescents reported usually eating the recommended three serves of fruit per day, and less than one-third the recommended four serves of vegetables. Less recent data suggests that children and adolescents are eating too much fat and sugar.
- Positive trends in breastfeeding rates appear to be continuing; 88% of children aged 3 years and under had ever been breastfed in 2004–05.
- The majority of children were consuming sufficient iron, calcium and zinc in 1995, when data are compared with the new nutrient reference values. However, for the older age groups, more than half had inadequate intakes of calcium, a high proportion of older males had inadequate zinc intakes, and more than 30% of older females had inadequate iron intakes.
- Relying on 1995 data for preparing baseline measures, this report highlights the lack of recent data on children’s nutritional status. The KEKP study will largely fill this gap.



# Introduction

## Background

This report provides a summary of existing food and nutrition data relating to children and adolescents, based on the dietary guidelines for children and adolescents in Australia (Box 1; NHMRC 2003) and incorporating recommendations from the new nutrient reference values (NHMRC 2006). It brings together the most recent national nutrition-related data for children and adolescents, and in doing so creates a baseline from which to assess the outcomes of the Kids Eat, Kids Play (KEKP) survey which, at time of writing, were due for release in December 2007.

## Dietary recommendations for Australians

Dietary recommendations for Australian children and adolescents come from three main sources: dietary guidelines, food guides, and nutrient reference values. The dietary guidelines for children and adolescents in Australia (NHMRC 2003) were revised in 2003 and provide guidelines relating to the total diet, focusing on food groups and lifestyle choices such as physical activity, breastfeeding and food storage. The Australian guide to healthy eating (AGHE) (Smith et al. 1998) is designed to help people implement the dietary guidelines, and is a food guide that gives more specific guidance relating to the number of serves for food groups. The nutrient reference values (NRVs) for Australia and New Zealand (NHMRC 2006) superseded the recommended dietary intakes for use in Australia (NHMRC 1991) and can be used to assess both individual and population dietary intake in relation to adequacy of macronutrient (e.g. protein) and micronutrient (e.g. iron, calcium) intakes. It should be noted that the food group servings recommended by the AGHE will require revision in line with the NRVs.

## Australian data

The most recent Australian nutrition-related data are from the 2004–05 National Health Survey (NHS), which collected information on usual fruit and vegetable consumption (for ages 12 years and over) and breastfeeding (for ages 3 years and under). Detailed data on food and nutrient intakes were most recently collected in the 1995 National Nutrition Survey (NNS) (see Appendix 1 for more detail on data sources). However, there are no Australian data for biochemical markers (for example, iron status), or for salt intakes.

Much of the data presented in this report are from the 24-hour recall component of the NNS. Median intake from a single 24-hour recall provides a reliable estimate of usual group food and nutrient intakes (Rutishauser 2000). However, it provides a better indication of the 'usual' intake for individuals when adjusted using a second recall, conducted on a sub-sample of the population (ABS 1998). The NNS data were adjusted for presentation in this report using the formula given in ABS (1998) (see Appendix 2 for detail). Nevertheless, estimates – particularly estimates of the proportion consuming less than the estimated average requirements (EAR) – should be interpreted with care.

### **Box 1: Dietary guidelines for children and adolescents in Australia**

*Encourage and support breastfeeding*

*Children and adolescents need sufficient nutritious foods to grow and develop normally*

- *Growth should be checked regularly for young children*
- *Physical activity is important for all children and adolescents*

*Enjoy a wide variety of nutritious foods*

*Children and adolescents should be encouraged to:*

- *eat plenty of vegetables, legumes and fruits*
- *eat plenty of cereals (including breads, rice, pasta and noodles), preferably wholegrain*
- *include lean meat, fish, poultry and/or alternatives*
- *include milks, yoghurts, cheese and/or alternatives*  
*(reduced fat milks are not suitable for children under 2 years, because of their high energy needs, but reduced-fat varieties should be encouraged for older children and adolescents)*
- *choose water as a drink*  
*(alcohol is not recommended for children)*

*and care should be taken to:*

- *limit saturated fat and moderate total fat intake*  
*(low-fat diets are not suitable for infants)*
- *choose foods low in salt*
- *consume only moderate amounts of sugars and foods containing added sugars*

*Care for your child's food: prepare and store it safely*

Source: NHMRC 2003.

# Nutritional status of children and adolescents

In this section, available data relevant to the dietary guidelines for children and adolescents in Australia (NHMRC 2003) are presented in relation to the recently published nutrient reference values (NRVs) (NHMRC 2006) and the Australian guide to healthy eating (AGHE) (Smith et al. 1998). From the NRVs, estimated average requirements (EARs) and adequate intakes (AIs) are used, where applicable, to assess nutrient intakes. EARs can be used at a population level to estimate the prevalence of inadequate intakes within a group. The usage of AIs is slightly different, with usual intakes at or above this level implying a low prevalence of inadequate intakes (NHMRC 2006:3).

It should be noted that the age groups presented here vary slightly due to differences in the age groups used for recommendations in the AGHE compared with the NRVs.

## Encourage and support breastfeeding

Breastfeeding has nutritional, health, social and economic benefits. Evidence is mounting of the protective role breastfeeding may have in several chronic diseases including Type 1 diabetes, inflammatory bowel disease and allergic diseases (NHMRC 2003:6). Breastfeeding has also been seen to play an important role in the prevention of obesity in children, attributed to physiological factors in human milk as well as feeding and patterns (extent and duration) associated with breastfeeding (Krebs et al. 2003).

Based on a conservative estimate, a minimum of \$11.5 million could be saved each year in Australia if the prevalence of breastfeeding at 3 months was increased from the (then) current level of less than 60% to 80% (Drane 1997 in NHPAC 2005:17). The dietary guidelines suggest that an achievable goal is an initiation rate in excess of 90%, with 80% of mothers still breastfeeding at 6 months (NHMRC 2003:2)

In 2004–05, 88% of infants aged 3 years and under had ever been breastfed. This is similar to the proportions reported in 2001 and 1995 (Table 1). From the 2001 NHS, the proportion of infants breastfed at 6 months was 48%, and at 12 months was 23%. Fifty-four per cent of infants aged 3 months or less were fully breastfed, and 32% at age 6 months or less (ABS 2003). These data are similar to those reported in 1995. 'Fully breastfed' refers to infants who receive only breastmilk on a regular basis, which the World Health Organization recommends for infants up to 6 months of age (WHO 2002).

**Table 1: Proportion of infants ever breastfed by year (per cent)**

	1995	2001	2004–05
<b>Proportion ever breastfed</b>	86	87	88

*Note:* Infants aged 3 years and under.

*Source:* ABS 2003; AIHW analysis of the 2004–05 NHS.

## Children and adolescents need sufficient nutritious foods to grow and develop normally

Growth and development are an important part of childhood and adolescence, and weight gain and increasing body size are normal components of this process. Children need sufficient nutritious food, and in particular sufficient energy, to enable this growth (NHMRC 2003:22). However, it is also important to avoid over-nutrition.

The median reported energy intakes for children and adolescents from the 1995 NNS were largely within the estimated energy requirement (EER) ranges (Table 2). However, there was a significant proportion of children and youth who reported consuming less than the EER range (particularly females aged 13 years and over). This may be due to the under-reporting of intake. It has been suggested that up to one-third of the population under-report their energy intake by up to 25% (Schoeller 2002).

**Table 2: Median daily energy intake (kJ), 1995**

Age	Estimated energy requirement <sup>(a)</sup> (kJ)		Median usual intake (kJ)		Proportion consuming less than the lower end of the EAR range (%)	
	Males	Females	Males	Females	Males	Females
3	4,900–6,900	4,500–6,400	6,598	6,542	11	16
4	5,200–7,300	4,800–6,800	7,182	6,172	13	17
5	5,500–7,800	5,100–7,200	7,762	6,728	15	19
6	5,800–8,200	5,400–7,600	7,659	7,018	16	18
7	6,100–8,700	5,700–8,100	8,360	7,340	6	21
8	6,400–9,200	6,000–8,600	8,921	7,795	9	13
9	6,800–9,700	6,400–9,100	9,031	7,647	14	34
10	7,300–10,400	6,700–9,500	9,528	7,655	14	33
11	7,700–11,000	7,000–10,000	9,827	8,688	19	35
12	8,200–11,600	7,400–10,600	11,180	8,168	26	38
13	8,700–12,400	7,800–11,100	10,699	8,012	30	50
14	9,300–13,200	8,100–11,500	10,858	7,758	35	55
15	9,900–14,000	8,200–11,700	11,099	7,419	36	55
16	10,300–14,700	8,400–11,900	12,995	7,853	33	63
17	10,700–15,200	8,400–12,000	11,828	8,127	34	52
18	10,900–15,600	8,500–12,100	13,018	7,615	34	53

(a) NHMRC 2006.

### Notes

1. Data from the 1995 NNS, adjusted using formula in ABS (1998).
2. Estimated energy requirement (EER) ranges are calculated based on basal metabolic rate, predicted from weight, height and age, using different physical activity levels (PALs) which incorporate relevant growth factors for age. The PALs included in these ranges correspond to the following activities: very sedentary (1.4); light activity (1.6); moderate activity (1.8); heavy activity (2.0). Bed rest (1.2) and vigorous activity (2.2) were excluded in order to show a more realistic range. See the NRVs for further information (NHMRC 2006).

Source: AIHW analysis of the 1995 NNS.

Physical activity is also important for physical growth and development of skills during childhood. It also has benefits for health in later life (NHMRC 2003:25) as good physical

activity patterns developed in early life carry on to adult life and have a positive effect on many aspects of health. Physical activity guidelines for children and adolescents recommend 1 hour of moderate to vigorous physical activity every day for 5–18 year olds (DoHA 2004a, 2004b). There are currently no national data available for reporting against this guideline.

## Eat plenty of vegetables, legumes and fruits

People who consume diets high in vegetables, fruit and legumes (also called ‘pulses’) have a substantially lower risk of coronary heart disease, stroke, some cancers, hypertension, Type 2 diabetes mellitus, cataracts and macular degeneration of the eye (NHMRC 2003:68). In 1996 it was estimated that inadequate fruit and vegetable consumption (less than five serves per day) was responsible for 3% of the total burden of disease and 11% of the total cancer burden in Australia (AIHW: Mathers et al. 1999). It is likely that the protective effect of these foods against disease in later life begins at an early age (NHMRC 2003:73).

Data from the 2004–05 NHS shows that only around one-quarter to one-third of young people report usually consuming adequate serves of fruit and vegetables (Table 3). The AGHE recommendations for children and adolescents are outlined in Table 4. From the 1995 NNS, average fruit and vegetable consumption among children and adolescents, measured by the 24-hour recall method, appears to be below the recommended number of serves for almost all age groups. However, it should be noted that this analysis excludes fruit juice, and that the allocation of mixed foods to different food groups based on weight (for example, only if the fruit part of a mixed food constituted the major ingredient of the food was it classified under fruit products) may affect these findings (McLennan & Podger 1998:48). Consumption of fruit among Australian children and adolescents declined with age among both males and females, while vegetable consumption increased (Table 4). In addition, one quarter of children and adolescents did not consume fruit on the day prior to the survey, and one-fifth did not consume vegetables (Magarey et al. 2001).

**Table 3: Usual daily fruit and vegetable intake, 12–19 year olds, 2004–05 (per cent)**

Measure	12–14 years		15–19 years	
	Males	Females	Males	Females
Proportion usually consuming at least 3 serves or more of fruit per day	22.8	29.1	26.7	26.0
Proportion usually consuming at least 4 serves or more of vegetables per day	27.3	28.5	27.1	24.7

Source: AIHW analysis of the 2004–05 NHS.

**Table 4: Average daily fruit, vegetable and legume intakes, 1995**

Measure	2–3 years	4–7 years	8–11 years	12–15 years	16–18 years
Recommended number of serves of fruit <sup>(a)</sup>	—	1–2	1–2	3–4	3–4
Recommended number of serves of vegetables <sup>(a)</sup>	—	2–4	3–5	4–9	4–9
<b>Males (g/person/day) (no. of serves)</b>					
Average intake of fruit products and dishes <sup>(b)</sup>	153.8 (1.0)	146.1 (1.0)	131.4 (0.9)	122.0 (0.8)	97.1 (0.6)
Average intake of vegetable products and dishes <sup>(c)</sup>	99.7 (0.7)	111.1 (0.7)	162.8 (1.1)	233.5 (1.6)	298.8 (2.0)
Average intake of fruit and vegetable juices and drinks	319.2	296.6	274.7	338.2	317.6
<b>Females (g/person/day) (no. of serves)</b>					
Average intake of fruit products and dishes <sup>(b)</sup>	137.0 (0.9)	141.3 (0.9)	115.5 (0.8)	130.6 (0.9)	118.0 (0.8)
Average intake of vegetable products and dishes <sup>(c)</sup>	95.5 (0.6)	119.8 (0.8)	159.5 (1.1)	192.4 (1.3)	201.8 (1.3)
Average intake of fruit and vegetable juices and drinks	250.6	329.8	281.5	256.7	236.1

(a) Smith et al. 1998.

(b) Excludes fruit juice.

(c) Includes potatoes, and legumes and pulse products and dishes.

#### Notes

1. Data from the 1995 NNS, from a single 24-hour recall.
2. One serve of fruit equals 150 g, or one medium piece (e.g. apple, orange), or two small pieces (e.g. apricots, plums) or 1 cup diced pieces, or one half cup juice. One serve of vegetables equals 75 g, or one half cup cooked vegetables, or one half cup cooked dried beans, peas or lentils, or one cup salad vegetables or one potato.

Source: ABS & DHAC 1999.

## Eat plenty of cereals (including breads, rice, pasta and noodles), preferably wholegrain

Eating plenty of cereals is a key component of the dietary guidelines, as they are an important source of carbohydrate, dietary fibre and protein. They are also mostly low in fat and are a good source of vitamins (particularly B vitamins and vitamin E) and minerals (including iron, zinc, magnesium and phosphorus) (NHMRC 2003:83). It is recommended that breads, cereals, rice, pasta and noodles form the basis of a healthy diet, with 3–7 serves recommended for children aged 4–8 years, 4–9 for those aged 9–13 years and 4–11 for those aged 14–18 years. One serving is equivalent to two slices of bread; one cup of cooked rice, pasta or noodles; one cup of prepared porridge; one-and-one-third cups of breakfast cereal; or half a cup of muesli (Smith et al. 1998). Cereal-based foods with high levels of added fat and sugar (e.g. cakes, biscuits, pastries) are not included in this recommendation.

Intake of cereals increases with age, as expected (see Table A1 for details on cereal consumption by age). Median dietary fibre intake also increases with age. Due to the current lack of scientific evidence, the NRVs specify an adequate intake of fibre based on median

consumption reported in the 1995 NNS, but including some additional resistant starch (approx 2–4 g) (Table 5).

**Table 5: Adequate intake of fibre, based on median intakes from the 1995 NNS 24-hour recall**

Measure	2–3 years	4–8 years	9–13 years	14–18 years
<b>Males (g/person/day)</b>				
Adequate intake	14	18	24	28
<b>Females (g/person/day)</b>				
Adequate intake	14	18	20	22

*Note:* NRV recommendations are not differentiated by gender for children aged 2–8 years.

*Source:* NHMRC 2006.

## Include lean meat, fish, poultry and/or alternatives

Lean meat, fish, poultry and alternatives are important sources of protein, iron, zinc and vitamin B12 for children and adolescents (NHMRC 2003:100). ‘Alternatives’ highlighted by the dietary guidelines include eggs, liver, kidney, shellfish, legumes and nuts. The recommended number of serves is ½–1 for children aged 4–8 years, 1–1½ for those aged 9–13 years and 1–2 for those aged 14–18 years. A serve equates to 65–100 g of cooked meat or chicken, half a cup (cooked) of dried beans, lentils, chick peas, split peas or canned beans, 80–120 g of cooked fish fillet, two small eggs, one-third of a cup of almonds or peanuts, or a quarter of a cup of sunflower or sesame seeds.

Average intakes of meat, fish, poultry and alternatives increase with age (see Table A2 for details on consumption by age), as do median intakes of protein, iron and zinc (Tables 6, 7, 9). Protein is important for growth and development, and from the 1995 NNS it can be seen that Australian children were generally consuming much more protein than the estimated average requirement (EAR). Iron is essential in brain development in infancy and very early childhood. It continues to be important for brain function in later life, and iron deficiency is associated with fatigue. The most recent data for the prevalence of iron deficiency among children and adolescents in Australia (the 1985 National Dietary Survey of Schoolchildren) found that iron status was generally satisfactory in boys aged 9, 12 and 15 years and in girls aged 9 and 12, but that 9.2% of 15-year-old girls were iron deficient (English & Bennett 1990). Zinc is also essential for growth and development and plays a role in many metabolic processes, as well as in immune function and cell growth and repair (NHMRC 2003:107).

In 1995, the main sources of iron were cereals and cereal products, and meat, poultry and game products and dishes (Table 8). The main sources of zinc were meat, poultry and game products and dishes, and milk products and dishes (Table 10).

Among all children and adolescents surveyed in the 1995 NNS, very few did not meet the EAR for protein on the day prior to the 24-hour recall – 10% of males and females aged 14–18 years (Table 6). However, in relation to iron, 10% of 2–3 year olds, around 14% of females aged 9–13, and over 30% of females and 13% of males aged 14–18 years reported that they did not consume enough to meet the EAR (Table 7). Thirteen per cent of females aged 9–13, 44% of males and 25% of females aged 14–16, and 28% of males and 21% of females aged 17–18 did not meet the EAR for zinc.

**Table 6: Median daily protein intakes, 1995**

Measure	2–3 years	4–8 years	9–13 years	14–18 years
<b>Males (g/person/day)</b>				
Estimated average requirement <sup>(a)</sup>	12	16	31	49
Median usual intake (g)	54	65	82	104
<b>Per cent</b>				
Proportion consuming less than the EAR	1	1	1	10
<b>Females (g/person/day)</b>				
Estimated average requirement <sup>(a)</sup>	12	16	24	35
Median usual intake (g)	47	55	64	72
<b>Per cent</b>				
Proportion consuming less than the EAR	1	—	7	20

(a) NHMRC 2006.

*Notes*

1. Data from the 1995 NNS, from a single 24-hour recall.
2. NRV recommendations are not differentiated by gender for children aged 2–8 years.
3. Since separate day-2-adjustment figures are applied to protein, the resulting calculated percentage of protein can vary slightly from unadjusted mean % energy values.

Source: AIHW analysis of the 1995 NNS.

**Table 7: Median daily iron intakes, 1995**

Measure	2–3 years	4–8 years	9–13 years	14–18 years
<b>Males (g/person/day)</b>				
Estimated average requirement <sup>(a)</sup>	4	4	6	8
Median usual intake (g)	7	10	13	15
<b>Per cent</b>				
Proportion consuming less than the EAR	10	2	6	13
<b>Females (g/person/day)</b>				
Estimated average requirement <sup>(a)</sup>	4	4	6	8
Median usual intake (g)	7	9	10	10
<b>Per cent</b>				
Proportion consuming less than the EAR	9	3	14	34

(a) NHMRC 2006.

*Notes*

1. Data from the 1995 NNS, from a single 24-hour recall.
2. NRV recommendations are not differentiated by gender for children aged 2–8 years.
3. Since separate day-2-adjustment figures are applied to iron, the resulting calculated percentage of iron can vary slightly from unadjusted mean % energy values.

Source: AIHW analysis of the 1995 NNS.



**Table 8: Proportion of iron from selected food groups**

Food source	2–11 years		12–18 years	
	Males	Females	Males	Females
	<b>Per cent</b>			
Cereals and cereal products	40.8	38.1	39.8	32.1
Cereal-based products and dishes	12.7	11.6	12.9	13.4
Fruit products and dishes	4.2	4.5	2.0	3.3
Vegetable products and dishes	8.4	9.5	10.8	11.9
Legume and pulse products and dishes	1.0	0.8	1.5	1.2
Milk products and dishes	4.8	4.9	3.3	3.0
Meat, poultry and game products and dishes	14.2	14.8	16.9	19.1
Fish and seafood products and dishes	1.0	1.3	1.1	1.5
Egg products and dishes	1.2	1.4	1.3	1.0
Snack foods	1.9	2.2	1.7	2.0
Confectionary	2.2	2.9	1.8	2.5
Soup	0.8	0.7	0.6	0.7
Non-alcoholic beverages	2.3	2.7	1.9	3.5
Beverage flavourings	1.9	2.0	1.8	1.9

*Note:* Data from the 1995 NNS, from a single 24-hour recall.

*Source:* ABS & DHAC 1999.

**Table 9: Median daily zinc intakes, 1995**

Measure	2–3 years	4–8 years	9–13 years	14–18 years
<b>Males (g/person/day)</b>				
Estimated average requirement <sup>(a)</sup>	2.5	3.0	5.0	11.0
Median usual intake (g)	6.9	7.9	10.0	12.5
<b>Per cent</b>				
Proportion consuming less than the EAR	—	—	12.5	43.0
<b>Females (g/person/day)</b>				
Estimated average requirement <sup>(a)</sup>	2.5	3.0	5.0	6.0
Median usual intake (g)	6.1	6.9	7.9	8.0
<b>Per cent</b>				
Proportion consuming less than the EAR	—	—	19.5	30.1

(a) NHMRC 2006.

**Notes**

1. Data from the 1995 NNS, from a single 24-hour recall.
2. NRV recommendations are not differentiated by gender for children aged 2–8 years.
3. Since separate day-2-adjustment figures are applied to zinc, the resulting calculated percentage of zinc can vary slightly from unadjusted mean % energy values.

Source: AIHW analysis of the 1995 NNS.

**Table 10: Proportion of zinc from selected food groups**

Food source	2–11 years		12–18 years	
	Males	Females	Males	Females
<b>Per cent</b>				
Cereals and cereal products	14.8	14.0	13.2	13.3
Cereal-based products and dishes	12.9	11.0	14.1	12.4
Fruit products and dishes	2.6	2.7	1.2	2.1
Vegetable products and dishes	6.8	7.8	8.8	9.0
Milk products and dishes	24.2	24.3	19.4	17.5
Meat, poultry and game products and dishes	27.5	27.6	33.4	34.5
Fish and seafood products and dishes	1.1	1.9	1.0	1.7
Snack foods	1.6	1.8	1.3	1.5
Confectionary	1.6	1.9	1.4	1.8
Soup	0.9	0.9	0.8	0.6
Non-alcoholic beverages	1.4	1.4	1.0	1.6

Note: Data from the 1995 NNS, from a single 24-hour recall.

Source: ABS & DHAC 1999.

## Include milks, yoghurts, cheese and/or alternatives

Milk and milk products or alternatives are good sources of nutrients – particularly calcium, but also protein, riboflavin, zinc, vitamin A and vitamin B12. The scientific basis for this guideline centres on the role of milk foods as a key source of calcium, which is important in attaining peak bone mass (thus preventing osteoporosis). It should be noted that many types of milk and milk products are fortified with calcium. However, milk foods also provide about one-third of the saturated fat in the diet of children and adolescents (NHMRC 2003:124–7).

The AGHE (Smith et al. 1998) recommends 2 serves for children aged 4–13 years and 2–2½ for those aged 14–18 years. A serve is equivalent to a cup of milk, half a cup of evaporated milk, 40 g of cheese, or 200 g of yoghurt. For ‘alternatives’, a serve equals a cup of calcium- and vitamin B12-fortified soy beverage, a cup of almonds, five sardines or half a cup of pink salmon (with bones) or a cup of calcium-fortified breakfast cereal (NHMRC 2003:123).

Intakes of milk decreased with age, with a corresponding increase in consumption of cheese, frozen milk products and flavoured milks (see Table A3 for details on consumption of milk and milk products by age). In 1995, median intakes of calcium were within or above the EAR for all age groups except females aged 14–18 (Table 11), and most of the calcium consumed was from milk and milk products (Table 12). Of the children and adolescents surveyed in the 1995 NNS, the older age groups had high proportions of both boys and girls who did not meet the EAR for calcium on the day prior to the 24-hour recall (AIHW analysis). Most notably, 50% of males and nearly 80% of females aged 14–18 years did not meet the EAR.

**Table 11: Median daily calcium intakes, 1995**

Measure	2–3 years	4–8 years	9–13 years	14–18 years
<b>Males (g/person/day)</b>				
Estimated average requirement <sup>(a)</sup>	360	520	800–1,050	1,050
Median usual intake (g)	830	786	882	1,047
<b>Per cent</b>				
Proportion consuming less than the EAR	6	22	43	50
<b>Females (g/person/day)</b>				
Estimated average requirement <sup>(a)</sup>	360	520	800–1,050	1,050
Median usual intake (g)	730	652	734	679
<b>Per cent</b>				
Proportion consuming less than the EAR	5	30	56	77

(a) NHMRC 2006.

*Notes*

1. Data from the 1995 NNS, from a single 24-hour recall.
2. NRV recommendations are not differentiated by gender for children aged 2–8 years.
3. Since separate day-2-adjustment figures are applied to calcium, the resulting calculated percentage of calcium can vary slightly from unadjusted mean % energy values.

Source: AIHW analysis of the 1995 NNS.

**Table 12: Proportion of calcium from selected food groups**

Food source	2–11 years		12–18 years	
	Males	Females	Males	Females
	<b>Per cent</b>			
Cereals and cereal products	11.0	10.4	11.6	12.0
Cereal-based products and dishes	8.3	7.3	9.0	9.4
Fruit products and dishes	1.5	1.7	1.0	1.4
Vegetable products and dishes	2.3	2.9	3.4	4.1
Milk products and dishes	66.3	66.6	63.1	58.3
Meat, poultry and game products and dishes	1.5	1.5	2.0	2.2
Fish and seafood products and dishes	0.6	0.9	0.8	1.2
Confectionary	2.1	2.9	2.5	3.2
Non-alcoholic beverages	1.9	2.0	2.0	3.2

Source: ABS & DHAC 1999.

## Choose water as a drink

Water intake is required for digestion, absorption and transportation of nutrients, for elimination of waste products and thermoregulation (NHMRC 2003:145). Dehydration is linked to an increased risk of kidney stones, increased risk of urinary tract and colon cancer, increased risk of childhood obesity, and diminished physical and mental performance. In the Australian climate, very young children are particularly vulnerable to dehydration.

A child's fluid needs are best met by water and milk, with fruit juice taken in more limited quantities. Fruit juice and soft drinks have high levels of sugar and energy, and may displace other nutrients in the diet and contribute to dental caries; excessive consumption should be discouraged (NHMRC 2003:145). Consumption of alcohol is not recommended.

In the NRVs, an AI (see Glossary) is given, based on median population intakes (Table 13). Despite alcohol consumption not being recommended, 40% of adolescents aged 14–19 years were at risk of short-term harm due to risky and high-risk alcohol consumption and 10% were at risk of long-term harm (Table 14).

**Table 13: Adequate intake of total moisture and fluids, based on median intakes from the 1995 NNS 24-hour recall**

Measure	2–3 years	4–8 years	9–13 years	14–18 years
	<b>Males (g/person/day)</b>			
Adequate intake	1,400	1,600	2,200	2,700
Adequate intake (fluid component) <sup>(a)</sup>	1,000	1,200	1,600	1,900
	<b>Females (g/person/day)</b>			
Adequate intake	1,400	1,600	1,900	2,200
Adequate intake (fluid component) <sup>(a)</sup>	1,000	1,200	1,400	1,600

(a) Includes water.

Note: NRV recommendations are not differentiated by gender for children aged 2–8 years.

Source: NHMRC 2006.

**Table 14: Risky and high-risk alcohol consumption (short and long term) among 14–19 year olds, 2004**

Alcohol use	Males	Females
	Per cent	
Proportion consuming at risky and high-risk levels (short-term harm)		
At least yearly	10.9	12.9
At least monthly	15.1	18.8
At least weekly	10.9	10.5
Total short-term risk	36.9	42.3
Proportion consuming at risky and high-risk levels (long-term harm)		
	7.7	12.3

Note: Data from the 2004 NDSHS.

Source: AIHW 2005a.

## Limit saturated fat and moderate total fat intake (low-fat diets are not suitable for infants)

Fats are essential in the diet, as fatty acids are an important component of body cells, and fats supply fat-soluble vitamins in the diet. Fats are important for growth and development – especially neurological development – and are the most concentrated form of all the energy sources (NHMRC 2003:162). The three main types of fats are saturated, mono-unsaturated and polyunsaturated.

However, high fat intakes in childhood and adolescence have been linked to the development of overweight and obesity, and it is important that good dietary habits be instilled early in life (NHMRC 2003:162). Saturated fat intake is associated with increased plasma low-density lipoprotein (LDL) cholesterol levels – the ‘bad’ cholesterol linked to heart and vascular disease (AIHW 2004). The NHMRC recommends that children and adolescents consume approximately 30% of total energy as fat, with no more than 10% from saturated fat (NHMRC 2003:170). The NRVs include recommendations only for certain fatty acids: linoleic acid, alpha-linolenic acid and total long-chain n-3 fatty acids (Table 15). Intakes of these fatty acids have not been reported from the 1995 NNS.

**Table 15: Recommendations for intakes of fatty acids**

Measure	1–3 years	4–8 years	9–13 years	14–18 years
	<b>Males</b>			
Linoleic acid (g/day)	5.0	8.0	10.0	12.0
Alpha-linolenic acid (g/day)	0.5	0.8	1.0	1.2
Total long-chain n-3 fatty acids (mg/day)	40.0	55.0	70.0	125.0
	<b>Females</b>			
Linoleic acid (g/day)	5.0	8.0	8.0	8.0
Alpha-linolenic acid (g/day)	0.5	0.8	0.8	0.8
Total long-chain n-3 fatty acids (mg/day)	40.0	55.0	70.0	85.0

Source: NHMRC 2006.

Data from the 1995 NNS showed that median fat intakes increased with age, as would be expected given increasing energy requirements, but at a markedly slower rate for females compared with males (Table 16). Total fat and saturated fat as a proportion of energy intake, however, remained fairly stable around 33–34% and 14% respectively (Table 17), which is higher than the recommended contribution.

**Table 16: Median fat intakes, 1995**

Measure	2–3 years	4–8 years	9–13 years	14–18 years
<b>Males (g/person/day)</b>				
Total fat <sup>(a)</sup>	58	71	89	106
Saturated fat	27	30	38	44
Monounsaturated fat	19	24	31	37
Polyunsaturated fat	7	9	11	13
<b>Females (g/person/day)</b>				
Total fat <sup>(a)</sup>	54	63	72	67
Saturated fat	25	28	31	28
Monounsaturated fat	17	21	24	23
Polyunsaturated fat	6	8	9	9

(a) Also includes fats other than saturated, monounsaturated and polyunsaturated.

*Notes*

1. Data from the 1995 NNS, from a single 24-hour recall.
2. Since separate day-2-adjustment figures are applied to fat, the resulting calculated percentage of fat can vary slightly from unadjusted mean % energy values.

Source: AIHW analysis of the 1995 NNS.

**Table 17: Fat as a proportion of energy intake (median), 1995**

Measure	2–3 years	4–8 years	9–13 years	14–18 years
<b>Males (per cent)</b>				
Energy from fat	33	33	33	34
Energy from saturated fat	15	14	14	14
<b>Females (per cent)</b>				
Energy from fat	34	33	34	33
Energy from saturated fat	16	14	14	14

Note: Data from the 1995 NNS, from a single 24-hour recall.

Source: AIHW analysis of the 1995 NNS.

## Choose foods low in salt

Little is known about current intakes of salt in Australian children and adolescents. However, salt intakes are likely to be high (NHMRC 2003:187), which is of concern because early exposure to dietary sodium may have lasting effects on blood pressure (NHMRC 2003: 179). Recommendations for sodium intake are outlined in Table 18. One gram of salt contains 390 mg of sodium.

The main dietary source of salt is processed food and food prepared away from home, rather than discretionary salt use. Because of this, the dietary guidelines recommend that children and adolescents consume fresh food, foods normally processed without salt, and low-salt or no-added-salt groceries, and they should avoid adding salt to food (NHMRC 2003:187).

**Table 18: Recommendations for sodium intake for children and adolescents**

Age	1–3 years	4–8 years	9–13 years	14–18 years
	(mg/person/day)			
Adequate intake	200–400	300–600	400–800	460–920

Source: NHMRC 2006.

There are currently no national data available for reporting salt intakes of Australian children and adolescents.

## Consume only moderate amounts of sugars and foods containing added sugars

Sugar intake among children has been linked to dental caries, which remains a significant public health problem in Australia (NHMRC 2003:205–208). The dietary guidelines report that there is no evidence that consumption of up to 15–20% of energy as sugars is incompatible with a healthy diet. However, consumption of greater amounts than this may decrease nutrient density of the diet (NHMRC 2003:210).

From the 1995 NNS, it is evident that Australian children consumed more than 15–20% of their energy intake as sugar (Table 19). Proportionately more added sugar than natural sugar was consumed by children as their age increased. Males and females consumed similar proportions of their energy intake as sugar, although males consumed a higher absolute amount of sugar (Table 20).

**Table 19: Sugar as a proportion of energy intake, 1995**

Measure	2–3 years	4–7 years	8–11 years	12–15 years	16–18 years	Total
	<b>Males (per cent)</b>					
Energy from added sugar	14.3	15.3	14.8	15.4	16.4	<b>15.3</b>
Energy from natural sugar	16.0	12.2	10.5	9.7	8.7	<b>11.0</b>
<i>Energy from total sugars</i>	<i>30.3</i>	<i>27.4</i>	<i>25.3</i>	<i>25.1</i>	<i>25.1</i>	<i><b>26.3</b></i>
	<b>Females (per cent)</b>					
Energy from added sugar	12.8	15.1	14.9	14.8	14.2	<b>14.6</b>
Energy from natural sugar	15.3	13.2	10.4	11.1	10.4	<b>11.8</b>
<i>Energy from total sugars</i>	<i>28.1</i>	<i>28.3</i>	<i>25.3</i>	<i>25.9</i>	<i>24.6</i>	<i><b>26.4</b></i>

*Notes*

1. Data from the 1995 NNS, from a single 24-hour recall.
2. Percentages may not add up due to rounding.
3. Since separate day-2-adjustment figures are applied to sugars and to energy, the resulting calculated percentage of energy can vary slightly from unadjusted mean % energy values.

Source: Cobiac et al. 2003.

**Table 20: Average daily sugar intakes, 1995**

Measure	2–3 years	4–7 years	8–11 years	12–15 years	16–18 years	Total
<b>Males (g/person/day)</b>						
Mean added sugar intake	59	75	90	113	140	<b>97</b>
Mean natural sugar intake	65	59	62	69	72	<b>65</b>
<i>Mean total sugar intake</i>	<i>124</i>	<i>134</i>	<i>152</i>	<i>181</i>	<i>212</i>	<b>161</b>
<b>Females (g/person/day)</b>						
Mean added sugar intake	49	67	79	80	79	<b>73</b>
Mean natural sugar intake	58	57	53	58	54	<b>56</b>
<i>Mean total sugar intake</i>	<i>106</i>	<i>124</i>	<i>132</i>	<i>137</i>	<i>133</i>	<b>128</b>

*Notes*

1. Data from the 1995 NNS, from a single 24-hour recall.
2. Numbers may not add up due to rounding.

Source: Cobiac et al. 2003.

## Care for your child’s food: prepare and store it safely

Children are particularly vulnerable to foodborne illness because of their underdeveloped immune systems and dependence on others for provision of food. Foodborne illness can have significant health consequences, including dehydration, trouble with swallowing or breathing, paralysis, kidney failure and death (NHMRC 2003:219). Information on foodborne illness is not available by age, but recently there has been an increase in the number of outbreaks reported (OzFoodNet Working Group 2004, 2005). However, this may be due to improved monitoring and surveillance rather than an actual increase in incidence. See AIHW (2006) for further detail on available food safety-related data.



# Discussion

By compiling existing data, this report provides a baseline regarding children's nutrition, in preparation for the planned Kids Eat, Kids Play (KEKP) survey. The KEKP (the national children's nutrition and physical activity survey) commenced in February 2007. This report can also be used to inform the analysis and presentation of data from the KEKP by illustrating the data requirements for reporting against the dietary guidelines. For example, the benefit (and current lack) of data analysis relating to the number of serves consumed for the cereal, meat and dairy food groups, which would allow data to be compared with recommendations.

The data presented highlight some positive nutrition-related behaviours – for example, the proportion of mothers initiating breastfeeding is edging closer to 90%. In addition, the median intakes of many nutrients are close to the estimated average requirements (EAR).

However, there are some concerning dietary behaviours that are apparent when the data are presented alongside the dietary guidelines and aligned to the new nutrient reference values (NHMRC 2006). In 1995, Australia's children and adolescents reported consuming a high proportion of energy as fat and sugar, and not enough fruit and vegetables. This is of concern, as consumption patterns similar to this have been linked to a high risk of chronic disease (Jacobs & Steffen 2003; Hu et al. 2000). In addition, there was a high proportion of adolescents who did not meet the EAR for iron, zinc and calcium.

This report can inform the preparation for analysis and reporting of the data from the KEKP in a couple of ways. First, it suggests that data available from the 1995 NNS cannot be easily compared with the current NRVs and dietary guidelines without re-analysis. The new analysis undertaken for this report relate to the new NRVs; calculating median intakes for different age groups to those reported previously and the proportion not meeting the estimated average requirement (EAR). However, in relation to the dietary guidelines, extensive analysis would be required for assessing 1995 NNS intakes against the serves recommended in the AGHE for cereal, meat and dairy food groups, which was outside the scope for this report. Second, in the data published by the ABS (ABS & DHAC 1999), foods are grouped according to the primary component of each food (for example, if the cereal component of a food comprised more than 50% then it was classified under cereal-based products and dishes). However, a food might contribute to more than one food group (for example, both cereals and fruits) and in order to determine the number of serves consumed from each food group (for example, in order to compare against recommendations) additional analysis would be required. Future work – for example, analysis of the upcoming KEKP – should ensure that assessment against food group recommendations can be made.

While this report highlights the lack of recent data relating to children's nutrition, this should be largely remedied by the planned KEKP. This survey will collect information relating to food and supplement intake, and data on macro- and micronutrient intakes will be reported. However, there is also a lack of data relating to food safety among children, and ways to fill this data gap should be investigated.

It should also be noted that in order to make appropriate comparisons, there may be a need to adjust 1995–2007 data to compensate for differences in data collection periods (for example, months of the year, days of the week), and possibly also to ascertain the extent to which changes in intake are due to differences in the food databases used (which may not reflect 'real' changes in food composition).

# Glossary

**adequate intake (AI)** the average daily nutrient intake level based on observed or experimentally-determined approximations or estimates of nutrient intake by a group (or groups) of apparently healthy people that are assumed to be adequate. Used when an RDI cannot be determined.

**estimated average requirement (EAR)** a daily nutrient level estimated to meet the requirements of half the healthy individuals in a particular life stage and gender group (used to estimate the prevalence of inadequate intakes within a group).

**recommended dietary intake (RDI)** the average daily dietary intake level that is sufficient to meet the nutrient requirements of nearly all (97-98%) healthy individuals in a particular life stage and gender group.

# Appendix 1—Data sources

## **National Drug Strategy Household Survey (NDSHS), 2004**

The NDSHS includes data on Australians aged 12 years and older. The 2004 survey was the eighth survey in a series that began in 1985. Respondents were asked about their knowledge of drugs, attitudes towards drugs, drug consumption histories and related behaviours. Data on alcohol use (people aged 14 years and over) were used for this report.

## **National Health Survey (NHS), 2004–05**

The 2004–05 NHS, one in a series of surveys conducted by the ABS, was designed to obtain national information on the health status of Australians, their use of health services and facilities, and health-related aspects of their lifestyle. The survey collected information from a sample of 25,900 people. The 2004–05 NHS included short questions on usual fruit and vegetable consumption. These data provide a valid estimate of different intakes (e.g. among those who reported two to three serves compared with those who reported four or more serves) but are not indicative of the average daily quantity of fruit and vegetables consumed (Marks et al. 2001). These data provide valuable trend data in the interim years between the more detailed dietary surveys. Data on breastfeeding were also collected in the 2004–05 NHS. This data collection relates to current (rather than retrospective) breastfeeding practices for children aged 3 years or less, which is recommended by WHO (2002).

## **National Nutrition Survey (NNS), 1995**

The NNS, conducted by the ABS and the Commonwealth Department of Health, was the first nationally representative Australian survey of food and nutrient intake, dietary habits and body measurements. The survey collected information from a subsample of respondents from the 1995 NHS, approximately 13,800 people from urban and rural areas of Australia. The NNS was conducted over a 13-month period from February 1995 to March 1996 (McLennan & Podger 1998).

The NNS included a detailed 24-hour dietary recall (which provided a valid estimate of mean and median population food and nutrient intakes), questions on food habits and attitudes, and a food frequency questionnaire. In addition, blood pressure (of those aged 16 years and over), height, weight, and waist and hip circumferences were measured by trained interviewers.

## Appendix 2—Adjusting the National Nutrition Survey data

The NNS nutrient intake data from the 24-hour recall were adjusted using the formula in ABS (1998:123).

*Individual adjusted value = group mean + (individual value – group mean) x ( $S_b/S_{obs}$ )*

*Where:*

*$S_b$  is the between-person standard deviation estimated from the replicate sample (Day 2 sample) and*

*$S_{obs}$  is the observed standard deviation for Day 1 intakes for the age groups.*

*$S_b$  was calculated using the age groups 2–8 years and 9–18 years, as ABS (1998:123) notes that collapsed age groups were used because some cells had insufficient sample for the final age groups.*

*Means within each group were calculated using the total weighted Day 1 sample.*

*Note that pregnant and breastfeeding respondents were excluded.*

# Appendix 3—Additional tables

**Table A1: Average daily cereal intakes, 1995**

Measure	2–3 years	4–7 years	8–11 years	12–15 years	16–18 years
<b>Males (g/person/day)</b>					
Average intake of cereals and cereal products	136.1	168.1	208.1	250.0	269.9
Average intake of cereal-based products and dishes	68.1	111.3	154.5	159.2	199.8
<b>Females (g/person/day)</b>					
Average intake of cereals and cereal products	132.0	140.4	175.7	175.7	194.6
Average intake of cereal-based products and dishes	67.7	83.4	116.2	120.7	134.9

*Notes*

1. Data from the 1995 NNS, from a single 24-hour recall.
2. 'Cereals and cereal products' refers to basic cereals, such as rice, and cereal products, such as pasta or bread. 'Cereal-based products and dishes' refers to foods for which a cereal or product is the major component, such as cakes, fruit tarts or pizza (Cook et al. 2001).
3. It is not possible to directly compare intakes in grams (as published) with AGHE recommendations due to the variety of food types and composite foods in the above categories.

Source: ABS & DHAC 1999.

**Table A2: Average daily intakes of lean meat, fish, poultry and alternatives, 1995**

Measure	2–3 years	4–7 years	8–11 years	12–15 years	16–18 years
<b>Males (g/person/day)</b>					
Muscle meat	11.3	19.2	26.8	48.4	51.5
Poultry	9.0	9.0	12.1	17.7	37.8
Organ meats and offal, products and dishes	—	**0.1	**0.1	**0.6	—
Sausages, frankfurts and saveloys	*8.3	8.6	16.4	15.1	*8.5
Processed meats	*6.8	*2.9	*6.2	*4.7	*6.9
Mixed dishes (beef/veal)	*17.3	20.9	23.4	35.0	55.2
Mixed dishes (lamb/pork/bacon/ham)	—	*3.4	*13.6	*5.5	*4.0
Mixed dishes (poultry/game)	*8.9	17.3	17.9	17.6	*27.7
Fish and seafood products and dishes	*6.9	10.6	14.5	19.5	13.8
Legumes and pulse products and dishes	*7.1	*8.9	*5.3	*13.6	*16.2
Seed and nut products and dishes	*1.9	*3.3	*2.9	*3.1	*1.4
Egg products and dishes	*5.9	7.1	9.9	11.4	14.9
<b>Females (g/person/day)</b>					
Muscle meat	8.8	12.58	23.6	29.4	32.3
Poultry	6.8	12.2	9.6	18.6	23.8
Organ meats and offal, products and dishes	—	—	—	—	—
Sausages, frankfurts and saveloys	*8.1	10.5	8.8	10.4	*8.2
Processed meats	*3.5	*3.7	*2.3	*2.3	*3.2
Mixed dishes (beef/veal)	*21.0	29.8	24.4	31.5	37.8
Mixed dishes (lamb/pork/bacon/ham)	—	*2.8	*7.5	—	*5.3
Mixed dishes (poultry/game)	*6.9	8.5	21.8	16.5	*17.9
Fish and seafood products and dishes	*6.5	13.6	12.8	16.4	17.8
Legumes and pulse products and dishes	*6.7	*5.6	*2.8	*6.7	*9.0
Seed and nut products and dishes	*2.8	*3.5	*3.9	*2.3	*3.8
Egg products and dishes	*7.4	7.9	9.0	6.4	8.4

\* Relative standard error 25–50%.

\*\* Relative standard error >50%.

*Notes*

1. Data from the 1995 NNS, from a single 24-hour recall.
2. It is not possible to directly compare intakes in grams (as published) with AGHE recommendations due to the variety of food types and composite foods in the above categories.

Source: ABS & DHAC 1999.

**Table A3: Average daily intakes of milks, yoghurt, cheese and alternatives, 1995**

Measure	2–3 years	4–7 years	8–11 years	12–15 years	16–18 years
<b>Males (g/person/day)</b>					
Dairy milk	504.9	308.7	311.1	349.9	403.5
Yoghurt	*18.1	13.0	11.5	10.2	*16.9
Cream	*0.2	*0.1	*0.7	*1.7	*0.9
Cheese	10.9	12.2	12.2	16.9	20.4
Frozen milk products	17.8	36.7	51.6	68.4	57.0
Other dishes where milk or a milk product is the major component	*25.8	*23.2	*11.7	*13.9	11.7
Milk substitutes	**19.7	*4.2	*4.8	—	—
Flavoured milks	*9.3	*19.5	*23.3	*38.0	*38.3
<b>Females (g/person/day)</b>					
Dairy milk	369.1	245.0	254.0	233.4	167.8
Yoghurt	*19.0	15.4	12.3	*20.5	*19.2
Cream	*0.9	*0.8	*1.2	*0.9	*3.4
Cheese	10.7	9.8	12.7	11.9	17.0
Frozen milk products	*15.9	27.7	44.2	48.6	26.4
Other dishes where milk or a milk product is the major component	*23.3	*21.6	*15.7	*8.9	*4.1
Milk substitutes	**13.0	*3.1	*3.8	*0.4	—
Flavoured milks	*15.2	*19.7	*15.6	*12.1	*39.6

\* Relative standard error 25–50%.

\*\* Relative standard error >50%

*Notes*

1. Data from the 1995 NNS, from a single 24-hour recall.
2. It is not possible to directly compare intakes in grams (as published) with AGHE recommendations due to the variety of food types and composite foods in the above categories.

Source: ABS & DHAC 1999.

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