2007 AUSTRALIAN NATIONAL
Children's Nutrition and Physical Activity Survey

VOLUME FIVE: PHYSICAL MEASURES

Australian Government

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CSIRO

The 2007 Australian National Children's Nutrition and Physical Activity Survey

Volume Five: Physical Measures

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Important Disclaimer

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FOREWORD AND ACKNOWLEDGEMENTS

Dietary intake is a key determinant of health and wellbeing, and overall intake is directly or indirectly related to many chronic diseases in the Australian population. Dietary intake in childhood and adolescence is particularly important not only because of its impact on immediate health, but also because of its impact on physiological development and possible influence on future dietary patterns.

Dietary behaviour is a complex activity encompassing what foods and drinks are consumed, how they are prepared, how much is consumed and with what, and where food and drinks are consumed. The meaning of dietary intake in terms of nutrients consumed is important to assess aspects of dietary adequacy and overconsumption. This description of how the population of Australian children and adolescents consume food and drink will be useful to the public and private sector in assessing how dietary intake is changing, and in working towards improving dietary intake. The information will be of practical use to government policy makers, health professionals, the food and beverage industry and health advocates. Healthy life-long eating habits are important for all Australians.

This publication is one of a series of eight publications which presents data on food and beverage consumption, nutrient intake and physical activity by the Australian population aged 2–16 years. The data are derived from the 2007 Australian National Children's Nutrition and Physical Activity Survey (ANCNPAS) which collected information on food and nutrition, body size and physical activity.

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1. BACKGROUND INFORMATION

1.1 Introduction

The 2007 Australian National Children's Nutrition and Physical Activity Survey (ANCNPAS) was conducted between February and September of 2007. Complete datasets from a total of 4487 children aged 2–16 years from across all Australian states and territories were obtained in the survey following parental consent, after being randomly selected to participate on a household basis. Children residing in very remote areas or in households without a fixed telephone line were not included in the survey.

This survey collected the following data:

- demographics, including sex, age, state/territory of residence, child's country of birth, parent(s)/carer(s) education level, household income and Indigenous status,
- dietary consumption, including all foods, beverages and dietary supplements consumed using two 24-hour three-pass dietary recalls,
- physical activity and sedentary behaviours using four 24-hour recalls,
- pedometer data measured over six days,
- anthropometric, including height, weight and waist measurements, and
- food habit information by questionnaire.

The physical measurements were taken during a computer assisted personal interview (CAPI) with a trained interviewer in the participant's home. A minimum of two measurements were taken for each anthropometric variable. A third measure was taken where the second measure was not within 5 mm for height, 0.1 kg for weight, and 10 mm for waist girth. The mean value was used as the final score if two measurements were taken. The median value was used as the final measure if three measurements were taken. Body mass index (BMI) was calculated as average weight in kilograms divided by the square of average height in metres, and is a commonly used index of weight for height in children. It is widely used as an estimate of body fatness.

Children were categorised by BMI (underweight, normal weight, overweight and obese) according to international standards of age- and sex- specific BMI cut offs (Cole et al. 2000, Cole et al. 2007). These cut offs, which are based on combined international population samples of children, are developed to correspond to adult values of 25 kg.m^{-2} (the lower limit for adult overweight) and 30 kg.m^{-2} (the lower limit for adult obesity). The proportion of children categorised into each BMI class was calculated. There are generally no agreed category cut offs for waist girth for children, but it has been suggested that abdominal fatness is excessive in school-aged children when the ratio of waist girth to height exceeds 50% (McCarthy and Ashwell 2006).

Comprehensive details of the survey methodology and procedures are provided in the 2007 User Guide (CSIRO et al. 2010), available for download from the Australian Social Sciences Data Archive (ASSDA) website (http://www.assda.edu.au/). The User Guide should be referred to in conjunction with this report.

This volume presents the results for physical measurements for each age and sex group as:

- mean, median and range for height and weight
- proportion of children classified as underweight, normal, overweight and obese, and
- mean, median and range for waist circumference and waist to height ratio.

Results are weighted to provide population estimates for the population of Australian children.

1.2 Related reports

The summary findings from the survey have been previously reported (CSIRO et al. 2008). This is the fifth report in a series of eight related volumes reporting detailed results from the 2007 ANCNPAS.

Collectively, the eight volumes provide extensive tabulations and analyses on children's current food and nutrient intakes (including supplement use); food, nutrition and physical activity practices; physical measures; demographic characteristics; together with significant linkages between these fields. Supplementary to this work, further analyses were conducted to explore children's estimated acute and chronic dietary exposure to food sourced chemicals.

Volumes one to eight are outlined below.

Volume 1: Foods Eaten

Volume one describes the reported consumption of food and beverages by children using one day 24-hour dietary recall, presented for males, females and all children by age group (2–3, 4–8, 9–13 and 14–16 years). Results are reported within food categories for mean intakes (all children and consumers only); proportion consuming; average portion size consumed; and intake by time of day, place of consumption and meal occasion.

Volume 2: Nutrient Intakes

Volume two describes the nutrient intake by children based on reported food and beverage consumption excluding dietary supplements. Results are presented for males, females and all children by age group (2–3, 4–8, 9–13 and 14–16 years). One day 24-hour dietary recall data is used to report mean and median nutrient intakes and nutrient density for direct comparison with foods consumed (volume 1 of this report series, CSIRO 2011), including the proportion of nutrient intake by food group, time of day, place of consumption and meal occasion. Usual nutrient intake was estimated using two days of 24-hour dietary recall to report the percentile distribution of daily nutrient intakes.

Volume 3: Dietary Supplements Consumed

Volume three describes the reported consumption of dietary supplements by children, presented for males, females and all children by age group (2–3, 4–8, 9–13 and 14–16 years). Data from two days of 24-hour dietary recall are presented in this report to describe the proportion of children consuming dietary supplements; the proportion of total nutrient intake from such supplement use; and the mean and median nutrient intakes for consumers versus non-consumers.

Volume 4: Physical Activity

Volume four describes the physical activity (PA) practices of children, presented for males, females and all children by age group (2–3, 4–8, 9–13 and 14–16 years). Physical activity practices were collected as four 24-hour recalls of PA and sedentary behaviours (9–16 year olds only) and six days of objective pedometer data (5–16 year olds only). Specifically, results include average PA level; average moderate and/or vigorous PA; time spent on non-sedentary, sedentary and screen based activities; and average number of steps and distance travelled.

Volume 5: Physical Measures (this volume)

Volume five describes children's physical measurements, presented for males, females and all children by age group (2–3, 4–8, 9–13 and 14–16 years). Physical measures reported include average height, weight and waist circumference, and the proportion of children by weight status (underweight, normal, overweight and obese) according to international standards of age- and sex- specific BMI cut offs.

Volume 6: Demography

Volume six describes children's reported consumption of food, beverages and dietary supplements, nutrient intakes, physical activity, and physical measures presented by demographic breakdown. Six demographic variables are presented in volume six, including state of residence; country of birth; highest education level of parent; household annual income grouping; remoteness indicator; and BMI classification. Results are presented for all children (not by age or sex sub-groupings due to small cell sizes for some of the demographic variables).

Volume 7: Data Linkages

Volume seven describes the relationship of body fatness with a range of variables measured in the survey including selected nutrient intakes, physical activity practices, and demographics.

Volume 8: Dietary exposure to food sourced chemicals

Volume eight describes children's estimated acute and chronic dietary exposure to food sourced chemicals from reported food and beverage consumption as well as the effects of seasonality on food intake and estimated chemical exposure since the last National Nutrition Survey in 1995. This information is presented by age, sex, demographic breakdown and BMI.

2. SUMMARY OF FINDINGS

2.1 Height and weight

For boys, the average height was 96.5 cm at 2–3 years old and 173.1 cm at 14–16 years (Table 3.1, Figure 2.1). For girls, the average height was 95.4 cm at 2–3 years old and 164.6 cm at 14–16 years (Table 3.1, Figure 2.1). There was a significant difference in mean height between boys and girls at age 14–16 years (boys taller by 8.5 cm, p≤0.01).

Figure 2.1 Mean height (cm) of children by age group and sex
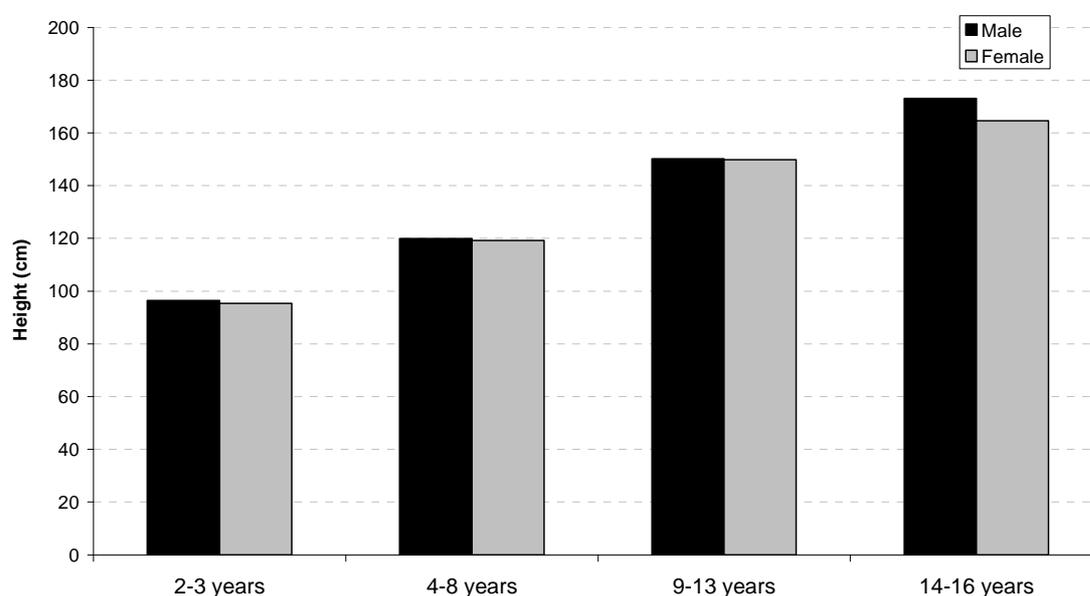
Figure generated from data in Table 3.1.

For boys, average weight was 15.8 kg at 2–3 years of age and 65.1 kg at 14–16 years old (Table 3.1, Figure 2.2). For girls, average weight was 15.2 kg at 2–3 years of age and 60.2 kg at 14–16 years old (Table 3.1, Figure 2.2). Mean weight was significantly higher for males amongst children aged 2–3 years and 14–16 years (both p≤0.01).

Figure 2.2 Mean weight (kg) of children by age group and sex
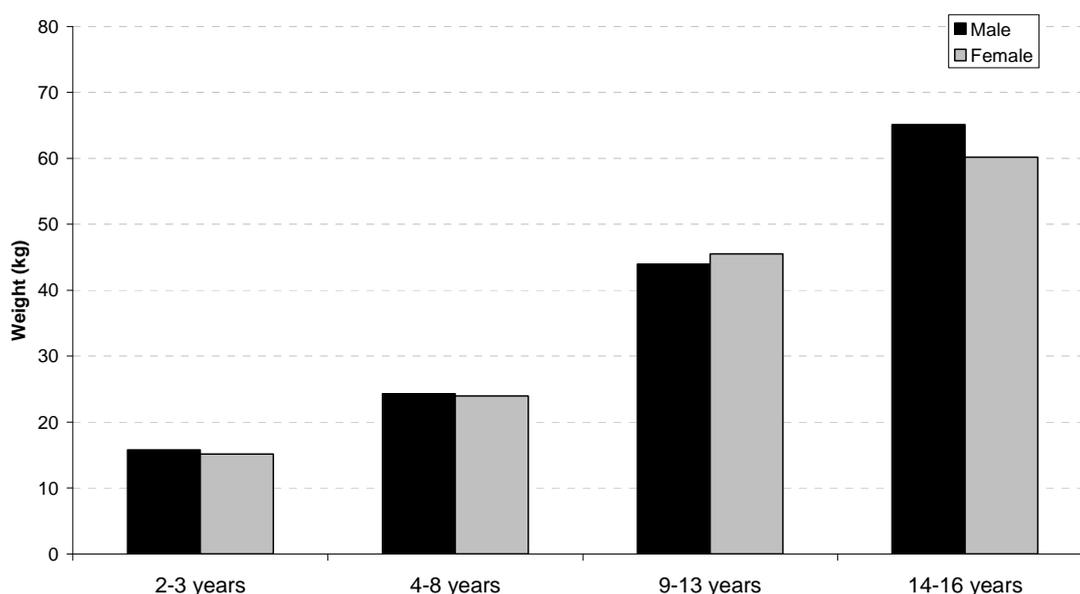
Figure generated from data in Table 3.1.

2.2 Overweight and obesity

Body mass index (BMI) was calculated as weight in kilograms divided by height in metres squared. Age- and sex-specific BMI cut offs for normal weight, overweight and obese among children and adolescents were applied to the data (using Table 4 of Cole et al. 2000). For underweight, Grade 3 thinness (corresponding to an adult BMI of 18.5 kg/m^2) was used as a cut off (Cole et al. 2007). Table 2.1 shows the BMI ranges for each weight classification, age group and sex. The largest range in BMI scores were for obese females aged 4–13 years.

Over 75% children aged 2–3 years and 4–8 years were classified as normal weight (Table 3.2). The proportion of normal weight children at 9–13 years and 14–16 years was 67% and 71% respectively (Table 3.2).

The proportion of children classified as overweight aged 2–3 years, 4–8 years, 9–13 years and 14–16 years was 16%, 14%, 20% and 18% respectively, and the proportion of children classified as obese aged 2–3 years, 4–8 years, 9–13 years and 14–16 years was 4%, 5%, 7% and 6% respectively (Table 3.2, Figure 2.3). Fewer than 6% of all children were classified as underweight.

Table 2.1 BMI range for children by age group, sex and weight classification (underweight, normal weight, overweight, obese)

		(range)			
		*The age group of the respondent**			
		2–3 years	*4–8 years*	*9–13 years*	*14–16 years*
Males	Underweight	13.1–14.8	12.8–14.4	12.9–15.7	13.5–17.8
	Normal	14.7–18.2	14.1–18.8	14.7–21.8	16.8–24.2
	Overweight	17.6–20.1	17.4–22.2	20.1–26.6	22.6–29.0
	Obese	19.4–24.8	19.8–33.6	24.7–33.6	28.0–39.5
Females	Underweight	13.8–14.7	11.1–14.0	13.1–16.8	14.9–18.2
	Normal	14.2–17.9	13.9–18.7	14.5–23.2	17.0–24.7
	Overweight	17.3–19.6	17.2–22.2	19.1–28.0	23.6–29.2
	Obese	19.3–25.0	19.3–42.7	23.2–47.1	28.9–38.1
Total	Underweight	13.1–14.8	11.1–14.4	12.9–16.8	13.5–18.2
	Normal	14.2–18.2	13.9–18.8	14.5–23.2	16.8–24.7
	Overweight	17.3–20.1	17.2–22.2	19.1–28.0	22.6–29.2
	Obese	19.3–25.0	19.3–42.7	23.2–47.1	28.0–39.5

Figure 2.3 Proportion (%) of underweight, normal weight, overweight and obese children by age group
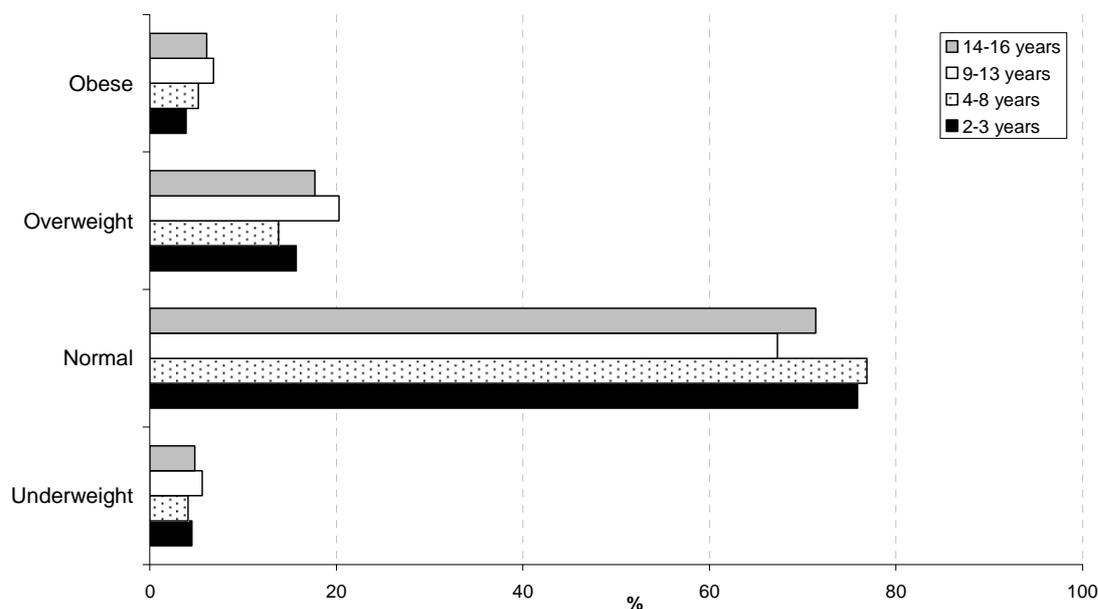
Figure generated from data in Table 3.2.

2.3 Waist circumference

The mean waist girth was higher for 14–16 year old boys compared to girls (Table 3.3, p≤0.01). There was a significant age and sex interaction for waist-to-height ratio (p≤0.05), however, post-hoc analyses indicated no significant difference between boys and girls in either age group. Figure 2.4 shows the proportion of school aged children (children aged five years and over only) whose ratio of waist girth to height exceeded 50%, and are considered to have excessive abdominal fatness using the McCarthy and Ashwell (2006) cut off. A greater proportion of children aged 9–13 years exceeded the 50% cut off (18% of males and females) compared to 14–16 year olds (13% of males and females) with children aged 5–8 year olds falling between this range (16% males, 14% females).

Figure 2.4: Proportion (%) of school aged children above the 50% cut off for waist to height ratio by age group and sex.

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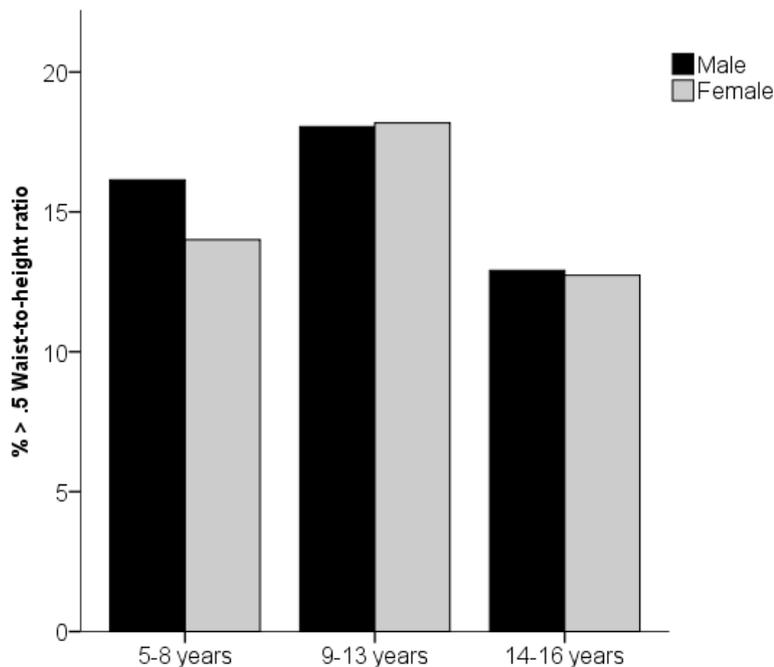
3.   TABULATIONS

3.1 Physical measures

Table 3.1 Height (cm) and weight (kg): by age group and sex (mean, median, range)

(average measurement per person including median and range)*

		The age group of the respondent											
		2–3 years			4–8 years			9–13 years			14–16 years		
		Mean	*Median*	*Range*	*Mean*	*Median*	*Range*	*Mean*	*Median*	*Range*	*Mean*	*Median*	*Range*
Males	Height (in cm)[1,2]	96.5	96.6	77.4–118.0	119.9	120.3	94.0–150.4	150.2	149.2	126.7–180.9	173.1	173.9	144.8–196.0
	Weight (in kg)[1,2]	15.8	15.7	10.7–24.4	24.3	23.3	14.3–61.5	44.0	41.8	23.4–90.3	65.1	63.8	28.3–120.3
Females	Height (in cm)[1,2]	95.4	95.6	76.4–108.8	119.2	118.5	91.0–146.5	149.8	150.4	123.9–176.2	164.6	164.5	147.1–182.5
	Weight (in kg)[1,2]	15.2	14.9	9.8–25.6	24.0	22.5	12.6–69.2	45.5	43.9	22.4–131.3	60.2	58.1	39.6–105.2
Total	Height (in cm)[1,3]	96.0	96.2	76.4–118.0	119.6	119.5	91.0–150.4	150.0	149.8	123.9–180.9	169.0	168.2	144.8–196.0
	Weight (in kg)[1,3]	15.5	15.3	9.8–25.6	24.1	22.9	12.6–69.2	44.7	42.5	22.4–131.3	62.7	60.6	28.3–120.3

*refer to appendix 1, Table A1.1 for cell counts
[1]=age by sex interaction, [2]=sex main effect, [3]=age group main effect (refer to appendix 2 for statistical results tables and guidance on interpretation)

Table 3.2 BMI classification: proportion of children classified as underweight, normal weight, overweight and obese by age group and sex

(percent)

| | | The age group of the respondent* | | | |
		2–3 years	*4–8 years*	*9–13 years*	*14–16 years*
Males	Underweight	5.4	4.0	6.2	4.7
	Normal	73.8	78.2	69.2	70.7
	Overweight	17.1	13.0	18.1	19.0
	Obese	3.7	4.9	6.5	5.6
Females	Underweight	3.5	4.3	5.1	4.8
	Normal	78.0	75.5	65.3	72.2
	Overweight	14.4	14.7	22.6	16.3
	Obese	4.1	5.5	7.0	6.8
Total	Underweight	4.5	4.1	5.6	4.8
	Normal	75.9	76.9	67.3	71.4
	Overweight	15.7	13.8	20.3	17.7
	Obese	3.9	5.2	6.8	6.1

*refer to appendix 1, Table A1.1 for cell counts

Table 3.3 Waist circumference: by age and sex (mean, median, range)

(average measurement per person including median and range)*

		The age group of the respondent										
		2–3 years			4–8 years			9–13 years			14–16 years		
		Mean	*Median*	*Range*	*Mean*	*Median*	*Range*	*Mean*	*Median*	*Range*	*Mean*	*Median*	*Range*
Males	The waist girth (in cm)[1,2]	50.5	50.5	38.0–60.5	56.7	55.7	44.3–99.1	68.2	66.2	48.0–109.4	76.4	74.5	55.6–125.2
	Waist-to-height ratio[1]	0.52	0.52	0.40–0.71	0.47	0.47	0.38–0.78	0.45	0.44	0.36–0.67	0.44	0.43	0.33–0.72
Females	The waist girth (in cm)[1,2]	50.2	50.0	35.1–73.4	55.7	54.5	44.4–88.3	68.2	66.3	44.8–133.5	73.8	72.2	58.4–110
	Waist-to-height ratio[1]	0.53	0.53	0.36–0.71	0.47	0.47	0.36–0.67	0.45	0.44	0.34–0.80	0.45	0.44	0.35–0.69
Total	The waist girth (in cm)[1,3]	50.3	50.2	35.1–73.4	56.2	55.2	44.3–99.1	68.2	66.2	44.8–133.5	75.1	73.4	55.6–125.2
	Waist-to-height ratio[1,3]	0.53	0.52	0.36–0.71	0.47	0.47	0.36–0.78	0.45	0.44	0.34–0.80	0.45	0.43	0.33–0.72

*refer to appendix 1, Table A1.1 for cell counts
[1]=age by sex interaction, [2]=sex main effect, [3]=age group main effect (refer to appendix 2 for statistical results tables and guidance on interpretation)

EXPLANATORY NOTES

Introduction

The 2007 Australian National Children's Nutrition and Physical Activity Survey (ANCNPAS) was commissioned by the Commonwealth Department of Health and Ageing, the Department of Agriculture, Fisheries and Forestry, and the Australian Food and Grocery Council.

The Commonwealth Scientific and Industrial Research Organisation (CSIRO) and the University of South Australia conducted the survey with I-view Pty Ltd undertaking the survey fieldwork. The project team acknowledges the contribution of Flinders University towards analysis of the dietary data.

The survey measured dietary intakes of food and beverages, use of supplements during the previous 24 hours, selected food habits, heights, weights and body mass index (BMI), waist circumference, time spent in physical activity and sedentary activity (screen time), number of daily steps taken and demographic characteristics. These data were gathered on children aged 2–16 years (n=4487) between 22 February 2007 and 30 August 2007. Ethics approval was obtained from the National Health and Medical Research Council registered Ethics Committees of CSIRO and University of South Australia.

The data were collected at a face-to-face home visit (computer-assisted personal interview, CAPI) and a subsequent telephone interview (computer-assisted telephone interview, CATI) conducted 7–21 days after the CAPI.

Food, beverage and supplement intakes were collected for all participants using a standardised, computer-based, three-pass 24-hour recall methodology during the CAPI and the CATI. In collaboration with Food Standards Australia New Zealand (FSANZ), the food and beverage intake data were translated to daily nutrient intake data using the most recent Australian nutrient composition database. Food habit questions were asked of each child and/or parent during the CAPI in relation to usual consumption of fruits, vegetables, type of milk, use of salt and earlier infant feeding practices.

Physical activity was measured in two ways. Time use was measured in children aged 9–16 years using a validated computerised 24-hour recall during the CAPI and the CATI. Children recalled a total of four days. Pedometers were also used to measure the average number of steps taken daily over six days by children aged 5–16 years.

Weight, height and waist circumference were measured for all participants during the CAPI.

Scope and coverage

The survey was conducted using a quota sampling scheme. The primary sampling units were postcodes (stratified by state/territory and capital city/rest of state, giving 13 regions in total). The number of postcodes selected in each region was proportional to the Australian Bureau of Statistics (ABS) population estimates for 2–16 year olds in each region.

There were 576 postcodes excluded from selection. Areas identified in the 2001 ABS Census as having very few eligible children and very remote areas were excluded from the survey sampling frame due to budgetary and time restrictions. Additionally this survey was not designed to obtain information from a sufficient number of Indigenous children to accurately estimate their intake and activity patterns. Using the 2001 ABS population data, postcodes covering areas where more than 50% of the population identified as Indigenous were excluded.

Remaining postcodes had an equal chance of initial selection within each region. The initial national selection of 50 postcode values was expanded to include postcodes in close geographical proximity, thus expanding the number of postcodes to a total of 230. This clustered sampling minimised travel time and costs for interviewers undertaking the face-to-face interviews.

Households (private dwellings) from selected postcodes were then recruited to the survey using random digit dialling (RDD). The telephone number prefix acted as a 'geographic indicator' that corresponded to postcode. Households with children aged 2–16 years were identified and asked if they would participate. One eligible child within the household was selected as the 'study child' for the purposes of the survey. In some cases recruitment of the study child did not proceed because the age and sex quota for that location was filled.

Using RDD resulted in more postcodes in the final sample than were sampled for recruitment because telephone number prefixes do not exactly follow postcode boundaries and some numbers may located be in adjacent suburbs, or some people may have taken advantage of telephone number portability (where they take an existing phone number with them when they move).

Interviewing was conducted on school and non-school days. The proportion of interviews conducted on weekdays, weekends, public holidays and school holidays was selected to reflect the proportions of these days across the fieldwork period.

Coverage rules were designed to ensure that, as far as possible, eligible persons had only one chance of being selected for interview. The child was deemed to be a resident of the household if they usually stayed at the selected household on average for four or more days per week in the case of shared care. Households with more than one fixed line telephone may have had a greater chance of selection; however, this was identified at the screening interview.

Telephone number prefixes cannot be relied upon to indicate geographic location, as an increasing number of people elected to take advantage of phone number portability. For this reason, access to a full listing of numbers with an effective geographic tag, such as an address, postcode or Census Collector District, was limited.

RDD allows for the inclusion of silent, unlisted and recently listed numbers in the sample which would not occur with a sample drawn from listed numbers (i.e. telephone white pages).

There are two situations where RDD cannot reach eligible households in a postcode:

- households where there is no fixed phone line; and
- households where the telephone prefix has been ported in from another area and is not a prefix allocated to the postcode they now reside in, or the survey sampling database.

Survey design

Sample design

The survey sample was randomly selected firstly by postcode (stratified by state/territory and capital city/rest of state), and secondly by households within selected postcodes using RDD of telephone numbers.

Households were contacted and those with children aged 2–16 years (eligible) were identified and asked to participate in the survey. One child within the household was selected as the "study child" for the purpose of the survey.

There was an agreed quota of 1000 children (50% boys and 50% girls) for the following age groups: 2–3 years, 4–8 years, 9–13 years and 14–16 years. The base national sample in South Australia was supplemented by 400 to allow more detailed estimates for that state. A total of 4487 children completed the entire survey. The sampling, selection and recruitment methodology are comprehensively reported in the User Guide (CSIRO et al. 2010) and should be considered when interpreting data.

Survey Response

Of the 16,598 eligible households that were contacted 10,109 agreed to participate in the study, which equalled a response rate of 61%. Of these 10,109 households, 3320 were subsequently not required to participate as the quota for children in their age group had already been filled. Therefore 6789 households were recruited. After initial recruitment, 1546 of the households were not interviewed as the relevant age quota had been met in their postcode cluster. Once recruited, 5.4% of the households withdrew, with the majority stating that they had insufficient time to commit to the survey or had lost interest in completing the survey. A further 2.1% of the sample did not complete all parts of the survey - 4837 completed the CAPI and 4695 participants completed the CATI. The final response rate for completed CAPI and CATI was 40% when calculated as a proportion of eligible households.

Complete data sets

A complete data set was defined as a participant who provided data for all aspects of the survey relevant for their age group (demography, dietary recall ± use of time). There were 4487 complete data sets included in the final database and analysed in this report. Pedometer data are reported from a subset of eligible participants.

Sample weights

Since stratified sampling with non-proportional samples was used, a weight was applied to each participant's record. The weight for each participant was proportional to the number of "similar" children in the Australian population, where "similar" is defined according to factors thought likely to influence nutrition and physical activity (age, sex and state of residence).

Data from the ABS 2006 Census on Postal Area and State by Capital/Rest-of-State for age and sex groups were used to estimate the number of "similar" children in the population. Data from the survey were used to estimate the sample numbers and hence the weights for each individual child. These weights enable the survey data to provide estimates for the whole population of Australian households with children in scope.

Methodology

The stratified quota approach was adopted to provide at least 500 boys and 500 girls from across Australia in each of the age and sex groups covered by the Nutrient Reference Values (NRVs) to allow sufficient numbers to make statistical comparisons of intakes with recommendations. The South Australian Department of Health contributed towards a booster sample (n = 400) for South Australian children.

The data were collected at a face-to-face home visit (CAPI) and a subsequent telephone interview (CATI) conducted 7–21 days after the CAPI. Intakes and activity can vary markedly over different types of days e.g. week days versus week-end days and school versus non-school days. In order to capture intakes and activity patterns that would represent all types of days, the CAPI and the CATI were collected on different day types when feasible. Attempts were made to collect information on school and non-school days (including holidays) in proportion to the number of such days that occurred over the sampling period.

Food and nutrients

Food, beverage and supplement intakes were collected for all participants using a standardised, computer-based, three-pass 24-hour recall methodology during the CAPI and the CATI. Dietary recall software from the Life in New Zealand survey (LINZ24[©]) was modified for the 2007 ANCNPAS to reflect the Australian food supply. Details of the modifications are included in the User Guide (CSIRO et al. 2010).

All interviewers received training in conducting the 24-hour recall. To assist with estimating the amounts of food and beverages consumed, standard measuring cups and spoons were provided, along with a Food Model Booklet that had life-size diagrams and drawings depicting different serving sizes of foods and different sized food containers to assist participants and interviewers during dietary recalls. The Food model booklet was then left with participants at the CAPI to assist in quantifying food consumed when the CAPI was conducted. Dietitians checked all of the 24-hour recalls for their content and whether or not there appeared to be a reasonable consumption pattern. Any unusual intakes were queried and modified if appropriate.

In collaboration with FSANZ, a food coding system was developed to reflect the current food supply and to maintain comparability with the food groups used in the 1995 National Nutrition Survey (ABS 1998). Additional food groups were added for infant foods and formulae and dietary supplements. In addition, food, beverage and supplement intake data were translated to daily nutrient intake data using the most recent Australian nutrient composition database. The User Guide provides more detailed information on this process (CSIRO et al. 2010).

Nutrient intake data estimated in the 2007 ANCNPAS include: energy, protein, total fat, saturated fat, monounsaturated fat, polyunsaturated fat, alpha-linolenic acid, linoleic acid, long chain omega-3 fatty acids, cholesterol, total carbohydrates, starch, sugars, dietary fibre, alcohol, total vitamin A, pre-formed and provitamin A, thiamin, riboflavin, total niacin equivalents, preformed niacin, vitamin C, D, E, total folate, dietary folate equivalents, potassium, sodium, phosphorus, calcium, magnesium, iron, zinc, iodine and caffeine.

Time and place of consumption of foods and drinks were also recorded. .

Physical activity

Physical Activity Recall

Participants aged 9–16 years used the Multimedia Activity Recall for Children and Adolescents (MARCA) (Ridley et al. 2006) to self-report 'use of time'. The MARCA is a computerised 24-hour recall which asks participants to recall everything they did on the previous day. The MARCA shows moderate to good validity when compared to accelerometry (Ridley et al. 2006). It uses a segmented-day format, with meal times and/or school bells as anchor points. Within each time-segment, time-sliders indicate the start and completion times for activities in time slices which can be as fine as five minutes. Users choose from about 250 activities listed in a compendium under seven categories (Inactivity, Transport, Sport and Play, School, Self-Care, Chores and Miscellaneous). If the activity required is not available in the activity compendium, the participant can enter the activity as "other" and enter a text description.

Each child recalled a total of four days; two days prior to the CAPI and two days prior to the CATI. During both the CAPI and CATI, the child recalled the two days in either order.

Pedometry

Pedometers were used to collect objective physical activity data for most participants aged 5–16 years. The pedometer used in this survey was the New Lifestyles-1000, which provides the number of steps a day, the distance covered and the number of minutes spent in moderate-to-vigorous physical activity (MVPA, >3 metabolic equivalents, METs).

The pedometer was worn for seven consecutive days by attaching to a belt or waistband in a position corresponding to mid-thigh on the right side of the body. A security strap and clip was used to secure the pedometer in place and to prevent loss of the pedometer if it slipped from its position.

At the CAPI, the participant or a parent was instructed on how to retrieve data from the pedometer and how to complete the log sheet. The participant was asked to wear the pedometer from when he or she got out of bed in the morning until going to bed at night. Those occasions when the pedometer was removed (e.g. showering, swimming or playing contact sports) were recorded on the log sheet along with the estimated duration of removal. The pedometer and log sheet were posted back to the survey team using a reply paid envelope.

Estimating stride length

Stride length was estimated during the CAPI using the ten steps method. A linear distance of approximately ten metres was marked out with a metal tape. The participant was asked to line up the toes of both feet with the zero on the tape, walk normally for ten steps and stop by bringing both feet together. Two trials were conducted after an initial familiarisation trial. The average distance covered in centimetres was divided by ten to provide stride length. This distance was programmed into the pedometer so that the daily distance covered was individualised. The default setting in the pedometer of 76 cm is based on adult data and was inappropriate for this survey.

Physical measurements

Height, weight and waist girth were measured on children aged 2–16 years, according to the protocols of the International Society for the Advancement of Kinanthropometry (Marfell-Jones et al. 2006).

Choice of measurement instruments was influenced by the need for interviewers to collect data in participants' homes and therefore conveniently transport equipment.

A minimum of two measurements were taken for each anthropometric variable. A third measure was taken where the second measure was not within 5 mm for height, 0.1 kg for weight, and 10 mm for waist girth. The mean value was used as the final score if two measurements were taken. The median value was used as the final measure if three measurements were taken (See User Guide for further details, CSIRO et al. 2010).

Body Mass Index

BMI was calculated as weight in kilograms divided by height in metres squared. Age- (at date of CAPI, rounded to nearest half year) and sex-specific BMI cut offs for normal weight, overweight and obese among children and adolescents were applied to the data (using Table 4 of Cole et al. 2000). For underweight, Grade 3 thinness (corresponding to an adult BMI of 18.5 kg/m^2) was used as a cut off (Cole et al. 2007).

Demographic data

Demographic data items relating to each participant and their household were collected at the CAPI. Responses were provided by the parent or care giver of the participant (see User Guide for detailed information, CSIRO et al. 2010).

Survey methodology issues

Sampling methodology

There are limitations to the use of postcodes as the primary sampling unit as postcodes can cover a wide geographic area (one postcode can include urban, rural and remote areas). However, postcodes do offer a degree of clustering to enable cost-effective face-to-face interviews to be conducted and allow a reasonable geographic distribution of the sample across Australia.

A potential sample design effect is the loss in statistical precision resulting from a clustered sample that does not fully cover the diversity of specific response variables evident in the entire population. The extent of loss in statistical precision largely depends on whether, and how much, the specific response variables have underlying geographic variations.

The potential design effect on the precision of estimates derived from a clustered sample is essentially related to the heterogeneity of the stratum (metropolitan or rural) population for their state. If the members of a cluster (of postcodes) are effectively no more like each other than they are to others within their state (rural or metropolitan area) population, then the intra-cluster correlation is zero and there is no design effect. However, where regional clusters result in cluster members being more like each other and less like other members of their regional population, then even where the intra-cluster correlation is quite small, there will be a design effect, the size of which is then dependent upon the size of the cluster.

Recruitment methodology

The RDD method is a time and cost effective approach to recruitment and has been previously used to generate survey samples for population health studies. However, when this method is combined with a quota system three important methodological issues should be considered.

Firstly, RDD with a quota affects the probability of selection of children. One child per eligible household was randomly selected to take part in this survey. It is desirable to have each child in the total sample frame have an equal chance of selection in the sample drawn. However, with RDD and household sampling, children who are the only child or who have fewer siblings aged 2–16 years have more chance of selection than children living with a larger number of siblings aged 2–16 years. Furthermore, application of the predetermined age quotas (1000 for each age group, i.e. 2–3 years, 4–8 years, 9–13 years and 14–16 years) were disproportionate to the population across each of these age groups. Consequently children aged 2–3 years and 14–16 years had a higher chance of selection, compared to those aged 4–8 years or 9–13 years.

Secondly, it was not possible to gather demographic information on those who refused to participate and those who were excluded because of the quota system. This information is needed to estimate any potential non-response bias. It is not possible to allow for non-response bias in this survey.

Thirdly, to obtain a representative sample of the population, the RDD method relies on accessing current telephone number information and should have as complete coverage as possible. It is estimated that at least 95% of Australian households have a land line (ABS 2003), with some households choosing to replace a land line connection with a mobile phone (ACMA 2008). Portability of telephone numbers as people move across geographic locations can result in recruitment outside the selected postcodes. An advantage of RDD is that silent, unlisted and recently listed numbers can be included by chance.

Cluster Sample Size

The target sample size was achieved for each region. There was no set quota by cluster of postcodes. Some clusters were skewed with either more postcodes or postcodes with higher populations of children 2–16 years. There were some postcodes where no children were selected as all numbers were exhausted with no recruitment (high industrial/commercial areas), and there were other postcodes included that were not part of the initial selection ("phone number transportability") but the family was still recruited.

Seasonality

Data were collected between February and August 2007, resulting in limited information on different intake with changing seasons. The survey collection period should be considered when interpreting the results.

Dietary recall

The 24-hour recall methodology relies on the participant's ability to recall the details of all food, beverages and supplements consumed over a 24-hour period. This method is associated with misreporting of foods and beverages consumed, along with inaccuracies in portion size estimation and level of detail to describe the items. Interviewers were trained in various techniques to minimise this source of error, but it remains unavoidable. Despite detailed scrutinizing of the nutrient data by trained staff there may still be some unusual intakes of individual foods.

In recognition of the varying age groups of the participants, the interviews were conducted with the primary care-giver for all children below the age of nine years and with the study child for children aged nine years and over. Primary care-givers were encouraged to be present for all interviews.

One 24-hour recall is considered appropriate to estimate the mean and median for the usual intake of a group. It is not suitable for assessing the usual intake of individuals because of the considerable day-to-day variability in food, beverage and supplement intake within individuals. For this reason, the present survey obtained a second 24-hour recall of intake by CATI for all participants, with 99% of these completed on a non-consecutive day. Provided there are no systematic differences between the CAPI and CATI data, the two days of intake data for each individual can be used to estimate the distribution of usual intake for the population.

Physical activity recall

The 24-hour recall methodology imposes the discipline of fitting all activities into a 24-hour time-frame, and exploits innate chronological narrative data storage and retrieval methods. However, all recalls are subject to the limitations of memory, social desirability effects, and inaccurate estimation of time - all of which vary with age, sex and individual characteristics. Children aged less than nine years are not able to accurately recall what they did the day before and place events into a temporal frame. Therefore, the MARCA was administered only to children aged nine years and over.

Pedometry

The data are based on 'complete' days, defined by at least 1000 steps and the pedometer was removed for no more than 240 minutes. Assuming that the sleep duration for most respondents in this survey is between eight and ten hours, allowing four hours of pedometer removal still gives at least ten to twelve hours in which data were collected. This aligns with recent accelerometer studies that include measurement days on which at least ten hours of data are recorded.

Several studies discard days on which the pedometer was removed for more than 60 minutes. This is an issue, as disregarding days when subjects participated in long periods of swimming or contact sports will lead to spurious estimates of daily physical activity. In the survey, seasonal differences in activity choices will impact on the measurement periods, with aquatic activities more likely in the summer. The vast majority of reasons for pedometer removal during the waking hours, as recorded on the log sheets, related to unavoidable circumstances such as exposure to water and engagement in contact sports. Relatively few were due to forgetting or refusing to wear the pedometer.

As pedometers are most sensitive to activities involving running and walking, and are removed for aquatic activities and contact sports, caution is advised when using pedometer data to assess compliance with physical activity guidelines. It is recommended that engagement in 'sufficient' physical activity also be assessed using criterion-referenced step counts (currently 11,000–12,000 and 13,000–15,000 per day, for girls and boys respectively). Having these cut off points, established in accordance with weight categories (normal vs. overweight/obese), avoids the issue associated with inferring 'daily' MVPA from pedometer data.

It should also be noted that Day Type (weekday versus weekend), in the pedometer data tables, should not be interpreted as 'school day' and 'weekend'. The weekdays in these tables include school holidays, long weekends and pupil-free school days.

Physical Measures

The methodology of performing physical measurements on participants was designed to minimise errors and be consistent. Normally, measurements should not be taken after training or competition, sauna, swimming or showering, since exercise, warm water and heat can produce dehydration and/or increased blood flow. Those circumstances have the potential to affect body mass and girth measurements. To counter this potential issue, physical measurements were taken part way through the interview, when the participant had been sitting for at least 30 minutes.

Measurement of weight was taken with light clothing on, possibly slightly inflating the weight and BMI results. Waist girth was occasionally taken over light clothing, when requested by the subject, and this could also increase the waist girth results. The difference associated with wearing light clothing would be small in each of these measurements.

Comparison with previous dietary surveys

Dietary information recorded in this survey may differ from data obtained using a different method to assess food and nutrient intake (such as a food record or a semi-quantitative food frequency questionnaire), a different food composition database, or if different age groups were assessed.

The methodology used in this survey is broadly comparable to that used in the 1995 National Nutrition Survey (NNS). Differences between the two surveys include the:

- sampling frame;
- age groups used for reporting. The 1995 NNS reported intakes for 2–3 years, 4–7 years, 8–11 years, 12–15 years and 16–18 years;
- use of repeat 24-hour recalls on all survey participants whereas the 1995 NNS collected repeat 24-hour recalls on only 10% of the sample and adjusted for within person variation based on this sub-sample;
- use of CATI for repeat 24-hour recalls, whereas the 1995 NNS repeat 24-hour recall took place in the form of a personal interview;
- food/nutrient composition database – this survey utilised the 2007 AUSNUT database and the 1995 NNS utilised the AUSNUT 1995 database. Both of these food composition databases reflect the composition of foods at the time the survey was completed; and
- the number of major food groups used to report food intake, which was increased to include categories for dairy substitutes and supplements. Some additional sub-groups have also been created to better reflect the current food supply.

Comparison with dietary recommendations

The *Nutrient Reference Values for Australia and New Zealand* (NHMRC 2006) provides Nutrient Reference Values (NRVs) for a range of macro- and micronutrients, including the estimated average requirement (EAR), recommended dietary intake (RDI) and/or adequate intake; generally for 2–3 years, 4–8 years, 9–13 years and 14–16 years. For those aged 14 years and above, the acceptable macronutrient distribution range and suggested dietary targets are set for certain nutrients that may help in prevention of chronic disease.

The *Core Food Groups* (NHMRC 1994) recommends quantities of cereals, fruits, vegetables, meat and meat alternatives, and dairy products which were designed to meet 70% of the RDIs for all nutrients except energy (NHMRC 1991). The Core Food Group recommendations were under review at the time of this publication.

The *Dietary Guidelines for Children and Adolescents in Australia* (NHMRC 2003) provides general recommendations for dietary intake without specifying the amounts recommended for consumption. These dietary guidelines were also being reviewed by the National Health and Medical Research Council at the time of this publication.

The *Australian Guide to Healthy Eating* provides consumers with recommendations about the daily amounts and kinds of food that should be eaten for good health and well-being. The Guide aims to encourage the consumption of a variety of foods from each of five food groups every day in proportions that are consistent with the suite of Australian dietary guidelines. The Guide also provides information on the number of serves required from the five food groups and offers practical examples.

Comparison with physical activity recommendations

The *National Physical Activity Guidelines*, issued by the Department of Health and Ageing in 2005, recommends levels of physical activity and sedentary behaviour for children aged 5–18 years. These guidelines recommend that children get at least 60 minutes of moderate-to-vigorous physical activity and accumulate no more than 120 minutes of screen time (television, videogames and computer) each day, especially during daylight hours.

The definition of "compliance" with the guidelines is unclear (Olds et al. 2007). Compliance can be defined as:

- the child satisfies the guidelines on all days of the survey period (the "all days" method);
- the child satisfies the guidelines on most days of the survey period (the "most days" method);
- the child satisfies the guidelines when MVPA and screen time are averaged across the survey period (the "average" method); and
- the level of compliance can be understood as the probability that a randomly chosen child on a randomly chosen day will satisfy the guidelines (the "child x day" method).

ABBREVIATIONS

ANCNPAS	Australian National Children's Nutrition and Physical Activity Survey
ABS	Australian Bureau of Statistics
ASSDA	Australian Social Sciences Data Archive
BMI	Body Mass Index
CAPI	Computer Assisted Personal Interview
CATI	Computer Assisted Telephone Interview
cm	centimetre(s)
CSIRO	Commonwealth Scientific and Industrial Research Organisation
EAR	Estimated Average Requirement
FSANZ	Food Standards Australia New Zealand
kg	kilogram(s)
LINZ24$^{©}$	Life In New Zealand 24-hour diet recall software
MARCA	Multimedia Activity Recall for Children and Adolescents
METs	Metabolic Equivalents
ml	millilitre(s)
mm	millimetre(s)
MVPA	Moderate to Vigorous Physical Activity
NNS	National Nutrition Survey
NRVs	Nutrient Reference Values
PA	Physical Activity
RDD	Random Digit Dialling
RDI	Recommended Dietary Intake
SPSS	Statistical Package for the Social Sciences

APPENDIX 1: UNWEIGHTED CELL COUNTS

Table A1.1 Cell counts for children by age group and sex

| | Age group | | | | |
	2–3 years	4–8 years	9–13 years	14–16 years	All children
Males	550	613	525	561	2249
Females	521	603	585	529	2238
Total	1071	1216	1110	1090	4487

APPENDIX 2: STATISTICAL ANALYSES

Interpreting the statistical tables

The statistical tables provided in this section, Appendix 2, provide guidance to interpreting comparisons of population estimates in the main tabulations. There will generally be some differences between age groups appearing in these tables, but some of these will be purely due to "sampling error" – not really an "error" but reflecting the reality that one particular child was chosen rather than another to participate in the study. Statistical significance tells us whether the differences we see are bigger than would be expected by chance. Significance is measured by the "p value" which is the probability that a difference as big as that seen could have come about just from sampling error. A *small* p value indicates that the difference is likely to represent a true difference in the population. Values of 0.01 or 0.05 are commonly taken as thresholds for suggesting that an observed difference is real. A p value less than the threshold indicates statistical significance.

There are three different aspects to a tabulation of consumption by age and sex:

1. Are the differences between boys and girls the same at every age? This is called the "age by sex interaction".

2. Is there an overall difference in consumption between boys and girls? This is called the "sex main effect".

3. Is there an overall difference between children of different age groups? This is the "age group main effect".

As an example, excerpts from Tables 3.4, 3.5, A3.1, A3.2 and A3.3 in volume 1 of this report series are reproduced here (CSIRO 2011). These are for the consumption of Berry Fruit, Citrus Fruit and Non-alcoholic beverages (for consumers only).

Excerpt from volume 1 (CSIRO 2011), Table 3.4: Mean intake of selected major and sub major food groups (consumers only): males by age group

| | Age group | | | |
MALES	2–3 years	4–8 years	9–13 years	14–16 years
FRUIT PRODUCTS AND DISHES				
Berry Fruit	85.5	93.7	99.9	77.9
Citrus Fruit	93.6	119.3	138.9	143.2
NON-ALCOHOLIC BEVERAGES	718.6	1006.5	1447.0	1674.8

Excerpt from volume 1 (CSIRO 2011), Table 3.5: Mean intake of selected major and sub major food groups (consumers only): females by age group

| | Age group | | | |
FEMALES	2–3 years	4–8 years	9–13 years	14–16 years
FRUIT PRODUCTS AND DISHES[2]				
Berry Fruit	75.0	64.4	84.8	65.3
Citrus Fruit	81.0	118.4	124.6	138.3
NON-ALCOHOLIC BEVERAGES	694.6	881.8	1234.6	1459.2

Excerpt from volume 1 (CSIRO 2011), Table A3.1: Post-hoc comparisons used for tests of age and sex interaction on food intake

Contrast number	Comparison	Males				Females			
		2–3 yrs	4–8 yrs	9–13 yrs	14–16 yrs	2–3 yrs	4–8 yrs	9–13 yrs	14–16 yrs
L1	2–3yrs M vs F	1	0	0	0	-1	0	0	0
L2	4–8yrs M vs F	0	1	0	0	0	-1	0	0
L3	9–13yrs M vs F	0	0	1	0	0	0	-1	0
L4	14–16yrs M vs F	0	0	0	1	0	0	0	-1

Excerpt from volume 1 (CSIRO 2011), Table A3.2: Post-hoc comparisons used for tests of main effects of age group on food intake

Contrast number	Comparison	2–3 yrs	4–8 yrs	9–13 yrs	14–16 yrs
L1	2–3yrs vs 4–8yrs	1	-1	0	0
L2	2–3yrs vs 9–13yrs	1	0	-1	0
L3	2–3yrs vs 14–16yrs	1	0	0	-1
L4	4–8yrs vs 9–13yrs	0	1	-1	0
L5	4–8yrs vs 14–16yrs	0	1	0	-1
L6	9–13yrs vs 14–16yrs	0	0	1	-1

Excerpt from volume 1 (CSIRO 2011), Table A3.3: Results for statistical analysis of differences in mean intake for each food group (consumers only). Age and sex interactions with post-hoc comparisons, followed by sex then age group main effects and post-hoc comparisons

FOOD GROUP	Tests for age and sex interactions					Tests for sex main effects (in absence of interaction effect)		Tests for age group main effects (in absence of interaction effect)							Notes
	p value	Post-hoc comparisons				p value	Result	p value	Post-hoc comparisons						
		L1	L2	L3	L4				L1	L2	L3	L4	L5	L6	
FRUIT PRODUCTS AND DISHES															
Berry Fruit	0.94					0.15		0.80							
Citrus Fruit	0.80					0.19		<0.01	**	**	**				
NON-ALCOHOLIC BEVERAGES	<0.01	**	**	**		<0.01	m>f	<0.01	**	**	**	**	**	**	

For berry fruit, we see that there is some difference in the estimated mean intake between sexes in each age group (table excerpt 3.4 and 3.5). Could these differences have come about by chance and not reflect a real difference in the population? The excerpt from table A3.3 shows that they could: all of the p values for berry fruit are large (above 0.05), so there is no significant evidence of population differences in the amount of berry fruit consumption by those who consumed on the day of the survey.

For citrus fruit, on the other hand, the p value for age group is <0.01, indicating that there is a real difference present (refer to table excerpt A3.3). It can be seen from excerpts 3.4 and 3.5 that the estimated mean intake of citrus fruit increases with age group. While there appears to be some differences between the sexes in these tables, they are not large and there is no significant statistical evidence of a real population difference between boys and girls. The symbols in the post-hoc comparisons column, labelled L1 to L6, allow us to see which age group differences are significant. For citrus fruit, L1 to L3 have p values of 0.01 or smaller, indicated by the "**" symbol. Table excerpt A3.2 allows us to interpret these: there are differences in citrus fruit consumption between 2–3 year olds compared to all other age groups, but no evidence of any difference between the three oldest age groups.

The situation for non-alcoholic beverages is more complex. All three of the p values in table excerpt A3.3 are <0.01, indicating statistical significance. In table excerpts 3.4 and 3.5 it can be seen that there are large differences in the estimated mean intake between age groups and, in the older age groups, much higher consumption by boys than girls. This is confirmed by table excerpt A3.3. Overall, male consumption figures are higher than for females (m>f) and all age groups comparisons (L1 to L6) are significantly different. In addition, the differences between the sexes vary with age (age by sex interaction), being nonsignificant for 2–3 year olds (L1) but significant for the older age groups (L2 to L4). For children that consumed non-alcoholic beverages, boys had more than girls, older children had more than younger children, and the difference in amount consumed between boys and girls varies with age group.

This approach can be applied to all of the tables where statistical significance can be assessed to see which of the differences seen in the tables are likely to be due to a real population difference and which may have come about by chance arising from sampling.

Statistical tables

Statistical tests for differences between group means were conducted using SPSS Version 19. A two-way between-groups analysis of variance was conducted to test whether there was a main effect of age group or sex on physical measures or whether there was a significant interaction between the factors age group and sex on physical measures. Where a significant interaction between factors was evident, main effects were not explored, however a post-hoc comparison of mean difference between boys and girls within each age group was conducted using Bonferroni adjustment to significance levels.

Results are presented in the following summary tables. An interaction between age group and sex was considered to be statistically significant if p value ≤ 0.05. If a significant interaction was found, the statistical significance of post-hoc comparisons of means are indicated using symbols (* for p≤0.05 and ** for p≤0.01). Tests for main effects for sex or age group were conducted individually if no age group and sex interaction was found. A p value ≤ 0.05 was taken to indicate statistical significance. The direction of the relationship is indicated for a significant effect of sex, and post-hoc testing was conducted for a significant effect of age group. The significance of post-hoc testing is indicated as * for p≤0.05 and ** for p≤0.01.

Table A2.1 gives the key to the contrasts for post-hoc testing following a finding of interaction, while Table A2.2 gives the key to post-hoc comparisons where a significant main effect of age group was found.

Table A2.1 Post-hoc comparisons used for tests of age and sex interaction on physical measures

Contrast number	Comparison	Males				Females			
		2–3 yrs	4–8 yrs	9–13 yrs	14–16 yrs	2–3 yrs	4–8 yrs	9–13 yrs	14–16 yrs
L1	2–3yrs M vs F	1	0	0	0	-1	0	0	0
L2	4–8yrs M vs F	0	1	0	0	0	-1	0	0
L3	9–13yrs M vs F	0	0	1	0	0	0	-1	0
L4	14–16yrs M vs F	0	0	0	1	0	0	0	-1

Table A2.2 Post-hoc comparisons used for tests of main effects of age group on physical measures

Contrast number	Comparison	2–3 yrs	4–8 yrs	9–13 yrs	14–16 yrs
L1	2–3yrs vs 4–8yrs	1	-1	0	0
L2	2–3yrs vs 9–13yrs	1	0	-1	0
L3	2–3yrs vs 14–16yrs	1	0	0	-1
L4	4–8yrs vs 9–13yrs	0	1	-1	0
L5	4–8yrs vs 14–16yrs	0	1	0	-1
L6	9–13yrs vs 14–16yrs	0	0	1	-1

Table A2.3 Results for statistical analysis of differences in height, weight and waist circumference of children. Age and sex interactions with post-hoc comparisons, followed by sex then age group main effects with post-hoc comparisons

	Tests for age and sex interactions					Tests for sex main effects (in absence of interaction effect)		Tests for age group main effects (in absence of interaction effect)						
		Post-hoc Comparisons[1]							Post-hoc comparisons[3]					
	p value	L1	L2	L3	L4	p value	Result[2]	p value	L1	L2	L3	L4	L5	L6
Height	<0.01				**	<0.01	m > f	<0.01	**	**	**	**	**	**
Weight	<0.01	**			**	<0.01	m > f	<0.01	**	**	**	**	**	**
Waist circumference	<0.01				**	<0.01	m > f	<0.01	**	**	**	**	**	**
Waist-to-height ratio	0.03					0.37		<0.01	**	**	**	**	**	**

[1] see Table A2.1 for key to post-hoc comparisons
[2] m=males; f=females
[3] see Table A2.2 for key to post-hoc comparisons
* p value =≤0.05
** p value =≤0.01

GLOSSARY

Anthropometry	The science of measuring the size, weight and proportions of the human body. In this study height, weight and waist circumference were measured from which BMI, waist circumference and weight-to-height ratio were calculated.
AUSNUT2007	A nutrient database developed by FSANZ in collaboration with CSIRO specifically for those foods and supplements consumed during the survey. AUSNUT2007 contains data for 37 nutrients that are expressed per 100 g edible portion (food) or per 100 dosage units (supplements). *One dosage unit = 1 tablet or capsule, or 1 ml or 1 g for those liquid or powder supplements.*
Body Mass Index (BMI)	An indicator of weight status calculated from a child's average weight and height (formula weight/height^2 or kg/m^2). Age- (at date of CAPI, rounded to nearest half year) and sex-specific BMI cut offs for normal weight, overweight and obese among children and adolescents were applied to the data (using Table 4 of Cole et al. 2000). For underweight, Grade 3 thinness (corresponding to an adult BMI of 18.5 kg/m2) was used as a cut off (Cole et al. 2007).
Complete dataset	The sub-set of participants who completed all tasks, specifically: • <u>children aged 2–8 years</u> - waist circumference, height, weight, 2 days diet recall, and demography, • <u>children aged 9–16 years</u> - waist circumference, height, weight, 2 days diet recall, demography, and 4 days of physical activity recall.
Computer assisted personal interview (CAPI)	A face-to-face computer assisted interview in the home that gathered household demographic data, 24-hour dietary recall, food habits, weight, height and waist circumference measurements, and physical activity recall over 48-hours (children ≥ 9 years). Pedometers were also fitted for children ≥ 5 years.
Computer assisted telephone interview (CATI)	A telephone computer assisted interview conducted 7–21 days after the CAPI. The purpose of the CATI was to gather a second 24-hour dietary recall and a second 48 hour physical activity recall.
Consumer	Refers to only those children who actually consumed the food/beverage specified (excludes children with zero values).
Country of birth	The country in which the respondent was born.
Food habit questionnaire	A questionnaire (15 questions long) relating to food habits such as usual consumption of fruits, vegetables, type of milk, use of salt, food security, and earlier infant feeding practices (administered during the CAPI).

Height	The perpendicular distance (in centimetres) between the transverse plane of the vertex and the inferior aspects of the feet with the head in the Frankfort plane. Height was measured without shoes or thick socks and no stretch was applied. A minimum of two measurements were taken. A third measure was taken where the second measure was not within 5 mm for height. The mean value was used as the final score if two measurements were taken (median value used if three measurements were taken).
Household income	The annual income of both parents/carers combined (where applicable) before income tax is taken out.
Indigenous status	Of Aboriginal or Torres Strait Islander origin.
Mean	The mathematical average of a set of values, equal to the sum of the scores divided by the number of scores.
Median	The score located at the centre of a distribution (middle value of numerically ordered data).
Parent/carer education level	The highest year of primary or secondary school completed by parent(s)/carer(s) and the highest qualification ever completed (e.g. A postgraduate diploma, or higher, Bachelor degree or Grad Dip, Advanced diploma, diploma, Certificate III/IV (including trade certificate).
Portion size	The amount consumed in grams of a particular food in one eating occasion.
Population estimates	The descriptive statistics generated (estimated mean, medians, and proportions) after applying population weights to each individual's data to more closely reflect the whole Australian child population (based on age, sex and region). This weighting corrects for the stratified sampling with non-proportionate sampling used in recruitment.
Place of consumption	This is a description of the location where children consumed particular foods. This information was collected during the 24-hour dietary recall for each food recalled (e.g. at home, in an institution such as school, during transport).
Range	An indicator of statistical dispersion calculated by subtracting the smallest value from the largest (maximum minus minimum).
State/territory of residence	The State or Territory in which the respondent currently lives.

24-hour dietary recall An individual's recall of everything eaten and drunk, including water and supplements over a 24-hour period. In this survey it was taken from midnight to midnight.

Waist circumference The measurement of girth of the waist using a metal measuring tape (Lufkin W606PM) against the skin, or over light clothing. The tape was positioned mid-way between the lower costal (10th rib) border and the top of the iliac crest, in the mid-axillary line, perpendicular to the long axis of the trunk. The measurement was taken at the end of a normal expiration (end-tidal) in a relaxed standing position. A minimum of two measurements were taken. A third measure was taken where the second measure was not within 10 mm for waist girth. The mean value was used as the final score if two measurements were taken (median value if three measurements were taken).

Waist-to-height ratio The relative magnitude of waist girth to height, calculated by dividing the average waist measurement in centimetres by the average height measurement in centimetres.

Weight The force the body exerts in a standard gravitational field. Weight was measured in light indoor clothing (shoes, coats and jumpers removed) using Tanita HD332 portable electronic scales. The participant stood still on the centre of the scales without support and with the weight distributed evenly on both feet. A minimum of two measurements were taken. A third measure was taken where the second measure was not within 0.1 kg for weight. The mean value was used as the final score if two measurements were taken (median value if three measurements were taken).

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