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VOLUME FOUR: PHYSICAL ACTIVITY

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

Volume Four: Physical Activity

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Contents

List of Figures

List of Tables

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.

The 2007 ANCNPAS was jointly funded by the Australian Food and Grocery Council, the Commonwealth Department of Health and Ageing and the Commonwealth Department of Agriculture, Fisheries and Forestry. The survey was conducted by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) through its Preventative Health National Research Flagship, and the University of South Australia. The survey fieldwork was undertaken by I-view Pty Ltd. In particular the following persons are thanked for their contribution:

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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 first two 24-hour physical activity recalls were provided during a computer assisted personal interview (CAPI) with a trained interviewer in the participant's home (recalling the two days prior to the interview day), the third and fourth 24-hour recall was provided 7–21days later during a computer assisted telephone interview (CATI). MARCA® software (Multimedia Activity Recall for Children and Adolescents) was used to assist in recording detail about physical activity and sedentary behaviour. MARCA recall data relating to physical activity practices were collected only for children aged 9–16 years and is presented by school days, non-school days and all days.

Specific physical activity level (PAL) data for a range of activities were used to calculate overall daily PAL (as a multiple of resting metabolic rate). Minutes of moderate to vigorous physical activity (MVPA), minutes of moderate physical activity (MPA), minutes of vigorous physical activity (VPA) and minutes of sedentary activities were also estimated from recalled information.

Children aged 5–16 years wore a pedometer (New Lifestyles-1000), a device which counts steps, estimated walking distance and minutes of MVPA (>3 metabolic equivalents (METs)) for up to seven consecutive days. Pedometer data was retained for analysis when a minimum of 6 days was provided and is presented by weekdays, weekends and all days. It is not known from the pedometer data if any of these days were public holidays, school days or school holidays.

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 website (http://www.assda.edu.au/). The User Guide should be referred to in conjunction with this report.

This volume describes physical activity and pedometer data by age group for males, females and all children as:

- mean and percentile distribution for number of steps, estimated walking distance and MVPA for weekdays, weekends and all days (pedometer).
- mean and percentile distribution for daily PAL, MVPA, MPA, VPA for school days, non-school days and all days (MARCA), and
- mean and percentile distribution for daily time in minutes spent in non-sedentary, sedentary and screen based activities for school days, non-school days and all days (MARCA).

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 fourth 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 (this volume)

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 estimated walking distance.

Volume 5: Physical Measures

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 body mass index (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 Pedometer steps

Overall, the mean daily number of steps decreased with increasingly older age groups, with all age groups significantly different from each other (all children all days 10,085–12,944 steps per day, p≤0.01). Males had a higher number of mean daily steps than females (p≤0.01). The same pattern was observed on weekdays and weekends (Tables 3.1 to 3.3).

On all days, the mean estimated walking distance varied by age group, with all age groups significantly different from each other (Table 3.6, p≤0.01). Mean walking distance was lowest for the 5–8 year old group (6.8 km), followed by the 14–16 year olds (7.0 km), and highest in the 9–13 year old group (7.5 km). Males had a greater mean walking distance than females (p≤0.01). The same pattern was also observed on weekdays.

On weekend days, mean walking distance was lower in 14–16 year olds compared with 9–13 year olds, but there were no other significant differences between age groups. Males had a greater distance than females on weekdays (p≤0.01).

Moderate-to-vigorous physical activities (MVPA) are those activities requiring three or more metabolic equivalents (METs). The New Lifestyles-1000 pedometer used as the measurement instrument in this survey records the minutes spent in MVPA.

Overall, the mean MVPA in minutes by pedometer decreased with the increasing age group, and all age groups were significantly different from each other (all children all days 33–46 minutes per day, p≤0.01). Males spent more time undergoing MVPA than females (Figure 2.1, p≤0.01). The same pattern was observed on weekdays and on weekends. Refer to Tables 3.7 to 3.9.

2.2 Other physical activity data

Measurements could compare physical activity on weekdays with physical activity on weekends, but could also categorise days as school days and non-school days. The difference is that some weekdays are non-school days because of public holidays, school holidays, and ‘pupil-free’ days. Different activities may be structured around school, but also structured by regular weekend activity or availability of other family members.

Overall, mean physical activity level (PAL) was higher for males than females (1.8–1.6 METs per day compared to 1.5–1.6 respectively, p≤0.01), and lower for 14–16 year old children than 9–13 year old children (1.6 and 1.7 METs per day respectively, p≤0.01). The same pattern was observed for PAL on non-school days and on school days (Tables 3.10 to 3.12).

The mean time spent in MVPA as an average of all days was higher for males (116–159 minutes per day) than females (83–129 minutes per day) ($p \leq 0.01$) and in 9–13 year olds compared with 14–16 year olds (144 and 100 minutes per day respectively, $p \leq 0.01$) (Figure 2.2). The same pattern was observed for MVPA on non-school days and on school days (Tables 3.13 to 3.15).

Mean time spent in moderate physical activity (MPA) on all days and on non-school days was higher for 9–13 years olds than 14–16 year olds (88 compared to 60 minutes per day, $p \leq 0.01$), and was not significantly different by sex. On school days, there was also no significant difference in MPA by sex for those aged 9–13 years, however in 14–16 year olds, mean MPA was higher in males compared with females. Refer to Tables 3.16 to 3.18.

Figure 2.1:Mean time (minutes) spent in MVPA on all days according to pedometer steps in males and females aged 5–8 years, 9–13 years and 14–16 years

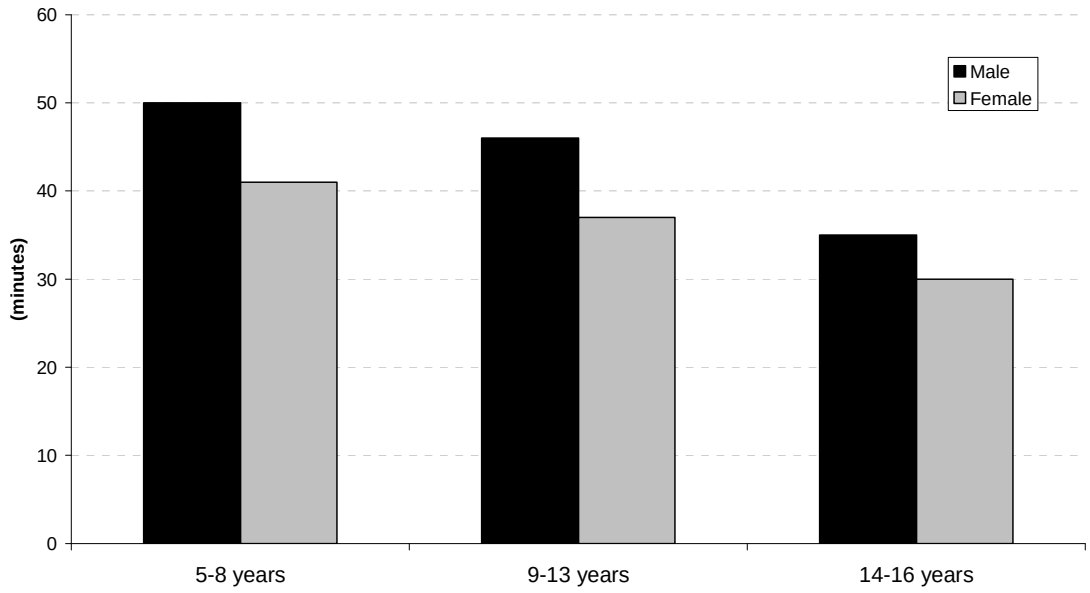

Figure generated from data in Table 3.9.

Figure 2.2: Mean time (minutes) spent in MVPA on all days by MARCA measurement in males and females aged 9–13 years and 14–16 years

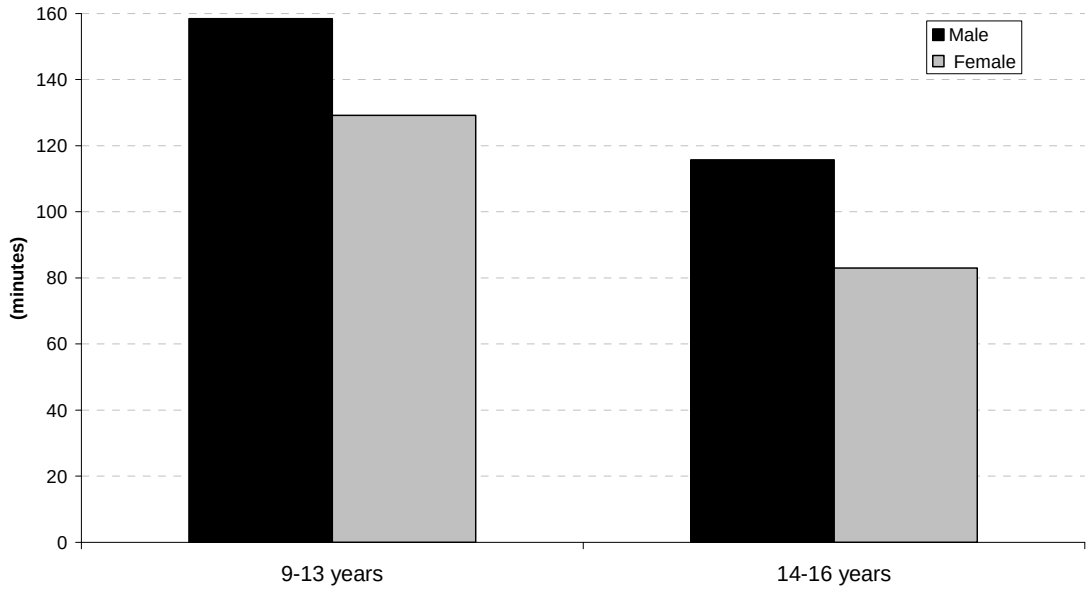

Figure generated from data in Table 3.15.

The mean number of minutes of vigorous physical activity (VPA) on all days and on non-school days was higher for males (72 minutes per day) compared with females (52 minutes per day) ($p \leq 0.01$) and higher in 9–13 year olds compared with 14–16 year olds (57 compared to 40 minutes per day, $p \leq 0.01$) (Tables 3.19 and 3.21).

Tables 3.22 to 3.24 show that the mean time spent in sedentary activities was higher for females compared with males (698–777 minutes per day for females compared to 673–747 minutes per day for males) and higher in 14–16 year olds compared with 9–13 year olds (762 compared to 685 minutes per day, $p \leq 0.01$). This is also illustrated in Figure 2.3. This was observed on all days, on school days and on non-school days. Mean time spent on screen-based activities was higher for males compared with females (232–270 compared to 193–206 minutes per day), however the difference was more pronounced in 14–16 year olds both overall and on non-school days (Tables 3.25 to 3.27, $p \leq 0.05$). On school days, time spent in screen-based activities was higher in males ($p \leq .01$).

Figure 2.3: Mean time (minutes) spent in sedentary activities (average of all days) by MARCA measurement in males and females aged 9–13 years and 14–16 years.

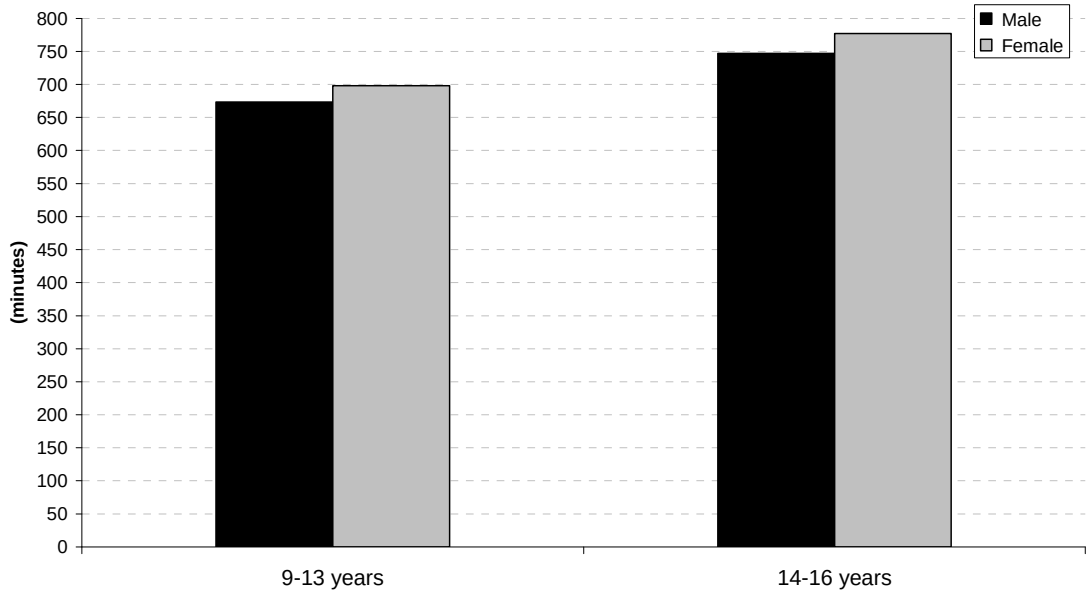

Figure generated from data in Table 3.24.

Tables 3.28 to 3.30 show the average sleep time for children aged 9–16 years by age and sex. Overall, children sleep an average of ten hours a day (570–608 minutes per day). Compared to school days, sleep duration on non-school days was greater (609–628 compared to 525–590 minutes per day) and children aged 9–13 years had slightly greater sleep duration than 14–16 year olds.

3 TABULATIONS

3.1 Pedometer data

Table 3.1 Mean and percentile distribution for number of steps per day: by sex and age group (weekdays)

(average number of steps per day)*

		The age group of the respondent		
		5–8 years	*9–13 years*	*14–16 years*
Males	Mean[2]	13974	13365	11330
	10%ile	10109	8554	6950
	25%ile	11824	10790	8848
	50%ile	13531	13256	11007
	75%ile	15905	15829	13530
	90%ile	18828	18246	16244
Females	Mean[2]	12137	11211	9619
	10%ile	8733	7603	5913
	25%ile	10340	9422	7622
	50%ile	12030	11061	9555
	75%ile	13824	12922	11609
	90%ile	15488	14817	13029
All children	Mean[3]	13059	12286	10472
	10%ile	9242	8033	6327
	25%ile	11067	9962	8185
	50%ile	12726	11963	10273
	75%ile	14723	14452	12354
	90%ile	17174	16826	14778

*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)
NB: Formal step count recommendations do not exist, however two common recommendations are that a) boys get ≥13,000 steps each day and girls ≥11,000 steps (President's Council on Fitness and Sports 2002), and b) boys get ≥15,000 steps each day and girls ≥12,000 steps (Tudor-Locke et al. 2004).

Table 3.2 Mean and percentile distribution for number of steps per day: by sex and age group (weekends)

(average number of steps per day)*

		The age group of the respondent		
		5–8 years	*9–13 years*	*14–16 years*
Males	Mean[2]	13334	11932	9702
	10%ile	7980	6314	3938
	25%ile	10374	8432	6312
	50%ile	12876	11056	8979
	75%ile	16008	14870	12719
	90%ile	19669	19015	16115
Females	Mean[2]	11925	10035	8568
	10%ile	7568	5748	4094
	25%ile	9498	7293	5968
	50%ile	11579	9820	8116
	75%ile	14047	12228	10818
	90%ile	16843	14795	12981
All children	Mean[3]	12629	10978	9132
	10%ile	7646	5891	4089
	25%ile	9873	7573	6079
	50%ile	12283	10379	8586
	75%ile	15161	13391	11474
	90%ile	18142	17091	15000

*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)
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Table 3.3 Mean and percentile distribution for number of steps per day: by sex and age group (all days)

(average number of steps per day)*

		The age group of the respondent		
		5–8 years	*9–13 years*	*14–16 years*
Males	Mean[2]	13815	12961	10864
	10%ile	10269	8840	6850
	25%ile	11574	10448	8455
	50%ile	13449	12680	10595
	75%ile	15843	14895	13106
	90%ile	18397	17738	15663
Females	Mean[2]	12075	10876	9313
	10%ile	8938	7449	5785
	25%ile	10452	9019	7395
	50%ile	11957	10844	9304
	75%ile	13593	12516	11102
	90%ile	15208	14447	12857
All children	Mean[3]	12944	11913	10085
	10%ile	9297	7955	6213
	25%ile	10959	9564	7818
	50%ile	12575	11614	9833
	75%ile	14672	13782	11941
	90%ile	16956	16174	14220

*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)
NB: Formal step count recommendations do not exist, however two common recommendations are that a) boys get ≥13,000 steps each day and girls ≥11,000 steps (President's Council on Fitness and Sports 2002), and b) boys get ≥15,000 steps each day and girls ≥12,000 steps (Tudor-Locke et al. 2004).

Table 3.4 Mean and percentile distribution for estimated walking distance per day in km: by sex and age group (weekdays)

(average walking distance in kilometres per day)*

		The age group of the respondent		
		5–8 years	*9–13 years*	*14–16 years*
Males	Mean[2]	7.39	8.39	8.05
	10%ile	4.60	5.10	4.80
	25%ile	5.90	6.60	6.20
	50%ile	7.10	8.20	8.00
	75%ile	8.60	10.00	9.70
	90%ile	10.40	11.90	11.80
Females	Mean[2]	6.24	7.05	6.50
	10%ile	4.30	4.50	3.80
	25%ile	4.90	5.70	5.20
	50%ile	6.00	7.10	6.40
	75%ile	7.20	8.10	8.00
	90%ile	8.70	9.20	9.20
All children	Mean[3]	6.82	7.72	7.27
	10%ile	4.40	4.80	4.20
	25%ile	5.40	6.10	5.50
	50%ile	6.60	7.40	7.00
	75%ile	8.00	9.00	8.70
	90%ile	9.60	10.80	10.60

*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 3.5 Mean and percentile distribution for estimated walking distance per day in km: by sex and age group (weekends)

(average walking distance in kilometres per day)*

		The age group of the respondent		
		5–8 years	*9–13 years*	*14–16 years*
Males	Mean[2]	7.06	7.47	6.98
	10%ile	3.80	3.80	2.60
	25%ile	5.10	5.20	4.30
	50%ile	6.70	7.10	6.70
	75%ile	8.60	9.40	9.20
	90%ile	10.50	11.90	11.90
Females	Mean[2]	6.13	6.24	5.81
	10%ile	3.70	3.50	3.00
	25%ile	4.70	4.50	4.00
	50%ile	5.80	6.00	5.50
	75%ile	7.50	7.70	7.50
	90%ile	9.20	9.10	8.80
All children	Mean[3]	6.59	6.85	6.39
	10%ile	3.70	3.60	2.90
	25%ile	4.90	4.80	4.10
	50%ile	6.20	6.50	5.90
	75%ile	8.10	8.40	8.10
	90%ile	9.90	10.50	10.30

*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 3.6 Mean and percentile distribution for estimated walking distance per day in km: by sex and age group (all days)

(average walking distance in kilometres per day)*

		The age group of the respondent		
		5–8 years	*9–13 years*	*14–16 years*
Males	Mean[2]	7.31	8.13	7.74
	10%ile	4.80	5.40	4.60
	25%ile	5.80	6.40	5.90
	50%ile	7.00	7.80	7.60
	75%ile	8.60	9.80	9.30
	90%ile	10.20	11.40	11.40
Females	Mean[2]	6.19	6.81	6.29
	10%ile	4.30	4.40	3.80
	25%ile	5.00	5.40	4.90
	50%ile	6.00	6.80	6.20
	75%ile	7.10	8.00	7.60
	90%ile	8.50	8.90	8.80
All children	Mean[3]	6.75	7.47	7.01
	10%ile	4.50	4.70	4.00
	25%ile	5.30	5.90	5.30
	50%ile	6.40	7.20	6.70
	75%ile	7.90	8.70	8.40
	90%ile	9.60	10.50	10.20

*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 3.7 Mean and percentile distribution for pedometer MVPA: by sex and age group (weekdays)

(average pedometer MVPA in minutes per day)*

		The age group of the respondent		
		5–8 years	*9–13 years*	*14–16 years*
Males	Mean[2]	51	48	38
	10%ile	31	24	15
	25%ile	38	35	25
	50%ile	48	47	35
	75%ile	61	58	46
	90%ile	77	74	63
Females	Mean[2]	42	38	32
	10%ile	27	21	13
	25%ile	33	28	21
	50%ile	41	37	29
	75%ile	49	46	39
	90%ile	60	57	52
All children	Mean[3]	47	43	35
	10%ile	28	22	14
	25%ile	35	31	23
	50%ile	44	41	32
	75%ile	54	53	43
	90%ile	68	66	59

*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)

NB: the Department of Health and Ageing (DoHA 2004a and DoHA 2004b) recommend that children aged 5–18 years accumulate at least 60 minutes (and up to several hours) of MVPA every day.

Table 3.8 Mean and percentile distribution for pedometer MVPA: by sex and age group (weekends)

(average pedometer MVPA in minutes per day)*

		The age group of the respondent		
		5–8 years	*9–13 years*	*14–16 years*
Males	Mean[2]	47	40	30
	10%ile	20	14	6
	25%ile	30	22	14
	50%ile	42	34	25
	75%ile	60	50	44
	90%ile	80	68	63
Females	Mean[2]	39	32	26
	10%ile	19	12	8
	25%ile	28	19	14
	50%ile	37	28	22
	75%ile	48	43	35
	90%ile	60	54	47
All children	Mean[3]	43	36	28
	10%ile	19	13	7
	25%ile	29	20	14
	50%ile	39	32	24
	75%ile	52	46	38
	90%ile	72	63	54

*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)

NB: the Department of Health and Ageing (DoHA 2004a and DoHA 2004b) recommend that children aged 5–18 years accumulate at least 60 minutes (and up to several hours) of MVPA every day.

Table 3.9 Mean and percentile distribution for pedometer MVPA: by sex and age group (all days)

(average pedometer MVPA in minutes per day)*

		The age group of the respondent		
		5–8 years	*9–13 years*	*14–16 years*
Males	Mean[2]	50	46	35
	10%ile	30	23	15
	25%ile	38	32	23
	50%ile	47	44	32
	75%ile	58	55	44
	90%ile	74	68	61
Females	Mean[2]	41	37	30
	10%ile	27	20	13
	25%ile	33	27	21
	50%ile	40	36	28
	75%ile	48	45	38
	90%ile	56	54	47
All children	Mean[3]	46	41	33
	10%ile	28	21	14
	25%ile	35	29	22
	50%ile	43	39	30
	75%ile	53	50	41
	90%ile	66	60	54

*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)

NB: the Department of Health and Ageing (DoHA 2004a and DoHA 2004b) recommend that children aged 5─18 years accumulate at least 60 minutes (and up to several hours) of MVPA every day.

3.2 MARCA data

Table 3.10 Mean and percentile distribution for PAL: by sex and age group (non-school days)

(average PAL in METs per day)*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean[2]	1.71	1.61
	10%ile	1.28	1.28
	25%ile	1.46	1.39
	50%ile	1.65	1.56
	75%ile	1.95	1.79
	90%ile	2.19	2.04
Females	Mean[2]	1.60	1.50
	10%ile	1.27	1.27
	25%ile	1.39	1.35
	50%ile	1.56	1.46
	75%ile	1.77	1.62
	90%ile	1.97	1.81
All children	Mean[3]	1.66	1.56
	10%ile	1.28	1.27
	25%ile	1.42	1.36
	50%ile	1.60	1.51
	75%ile	1.85	1.68
	90%ile	2.09	1.93

*refer to appendix 1, Table A1.2 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 3.11 Mean and percentile distribution for PAL: by sex and age group (school days)

(average PAL in METs per day)*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean[2]	1.79	1.69
	10%ile	1.45	1.39
	25%ile	1.61	1.48
	50%ile	1.77	1.63
	75%ile	1.96	1.85
	90%ile	2.17	2.06
Females	Mean[2]	1.67	1.61
	10%ile	1.41	1.34
	25%ile	1.50	1.43
	50%ile	1.64	1.55
	75%ile	1.78	1.72
	90%ile	1.97	1.94
All children	Mean[3]	1.73	1.65
	10%ile	1.43	1.36
	25%ile	1.54	1.45
	50%ile	1.70	1.60
	75%ile	1.90	1.80
	90%ile	2.09	2.02

*refer to appendix 1, Table A1.2 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 3.12 Mean and percentile distribution for PAL: by sex and age group (average of all days)

(average PAL in METs per day)*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean[2]	1.76	1.64
	10%ile	1.44	1.35
	25%ile	1.56	1.47
	50%ile	1.73	1.61
	75%ile	1.94	1.79
	90%ile	2.11	1.98
Females	Mean[2]	1.64	1.55
	10%ile	1.39	1.33
	25%ile	1.48	1.41
	50%ile	1.61	1.50
	75%ile	1.76	1.65
	90%ile	1.92	1.81
All children	Mean[3]	1.70	1.60
	10%ile	1.41	1.34
	25%ile	1.51	1.43
	50%ile	1.67	1.55
	75%ile	1.84	1.73
	90%ile	2.03	1.92

*refer to appendix 1, Table A1.2 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 3.13 Mean and percentile distribution for MVPA: by sex and age group (non-school days)

(average MVPA in minutes per day) †*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean[2]	161.4	116.3
	10%ile	25.0	5.0
	25%ile	75.0	45.0
	50%ile	150.0	100.0
	75%ile	225.0	155.0
	90%ile	320.0	255.0
Females	Mean[2]	132.6	79.0
	10%ile	15.0	0.0
	25%ile	55.0	25.0
	50%ile	110.0	60.0
	75%ile	195.0	120.0
	90%ile	280.0	180.0
All children	Mean[3]	147.5	97.6
	10%ile	18.8	1.3
	25%ile	63.8	30.0
	50%ile	131.7	77.5
	75%ile	208.8	137.5
	90%ile	303.8	215.0

† MVPA = non-sedentary physical activity
*refer to appendix 1, Table A1.2 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)

NB: the Department of Health and Ageing (DoHA 2004a and DoHA 2004b) recommend that children aged 5─18 years accumulate at least 60 minutes (and up to several hours) of MVPA every day.

Table 3.14 Mean and percentile distribution for MVPA: by sex and age group (school days)

(average MVPA in minutes per day) †*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean[2]	154.4	117.4
	10%ile	68.3	25.0
	25%ile	108.3	65.0
	50%ile	150.0	110.0
	75%ile	201.7	160.0
	90%ile	242.5	220.0
Females	Mean[2]	125.4	86.9
	10%ile	42.5	10.0
	25%ile	70.0	35.0
	50%ile	117.5	75.0
	75%ile	168.3	130.0
	90%ile	222.5	182.5
All children	Mean[3]	140.3	102.8
	10%ile	51.3	15.0
	25%ile	85.0	45.0
	50%ile	135.0	90.0
	75%ile	185.0	145.0
	90%ile	235.0	202.5

† MVPA = non-sedentary physical activity
*refer to appendix 1, Table A1.2 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)

NB: the Department of Health and Ageing (DoHA 2004a and DoHA 2004b) recommend that children aged 5─18 years accumulate at least 60 minutes (and up to several hours) of MVPA every day.

Table 3.15 Mean and percentile distribution for MVPA: by sex and age group (average of all days)

(average MVPA in minutes per day) †*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean[2]	158.5	115.7
	10%ile	69.2	20.8
	25%ile	107.5	63.8
	50%ile	148.3	106.3
	75%ile	206.7	158.8
	90%ile	255.8	213.8
Females	Mean[2]	129.2	83.0
	10%ile	45.0	18.8
	25%ile	71.3	38.8
	50%ile	117.5	72.5
	75%ile	170.0	113.8
	90%ile	229.2	166.7
All children	Mean[3]	144.1	99.8
	10%ile	54.2	20.0
	25%ile	87.5	46.3
	50%ile	137.5	87.5
	75%ile	190.0	136.3
	90%ile	245.0	195.8

† MVPA = non-sedentary physical activity
*refer to appendix 1, Table A1.2 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)

NB: the Department of Health and Ageing (DoHA 2004a and DoHA 2004b) recommend that children aged 5─18 years accumulate at least 60 minutes (and up to several hours) of MVPA every day.

Table 3.16 Mean and percentile distribution for MPA: by sex and age group (non-school days)

(average MPA in minutes per day)*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean	102.0	66.1
	10%ile	0.0	0.0
	25%ile	30.0	7.5
	50%ile	80.0	45.0
	75%ile	145.0	95.0
	90%ile	230.0	167.5
Females	Mean	101.8	58.8
	10%ile	0.0	0.0
	25%ile	31.7	8.3
	50%ile	80.0	36.3
	75%ile	145.0	85.0
	90%ile	226.3	137.5
All children	Mean[3]	101.9	62.5
	10%ile	0.0	0.0
	25%ile	30.0	8.3
	50%ile	80.0	41.7
	75%ile	145.0	90.0
	90%ile	226.3	150.0

*refer to appendix 1, Table A1.2 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 3.17 Mean and percentile distribution for MPA: by sex and age group (school days)

(average MPA in minutes per day)*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean[1]	72.9	63.4
	10%ile	10.0	0.0
	25%ile	35.0	17.5
	50%ile	67.5	51.7
	75%ile	100.0	97.5
	90%ile	135.0	131.3
Females	Mean[1]	76.0	52.1
	10%ile	10.0	0.0
	25%ile	30.0	15.0
	50%ile	62.5	42.5
	75%ile	108.8	72.5
	90%ile	153.3	107.5
All children	Mean[13]	74.4	58.0
	10%ile	10.0	0.0
	25%ile	32.5	16.3
	50%ile	65.0	46.7
	75%ile	105.0	85.0
	90%ile	145.0	125.0

*refer to appendix 1, Table A1.2 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 3.18 Mean and percentile distribution for MPA: by sex and age group (average of all days)

(average MPA in minutes per day)*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean	86.8	63.9
	10%ile	21.3	5.8
	25%ile	45.0	21.3
	50%ile	77.5	52.5
	75%ile	116.3	92.5
	90%ile	171.7	140.0
Females	Mean	88.3	56.3
	10%ile	20.0	8.8
	25%ile	42.5	22.5
	50%ile	70.0	42.5
	75%ile	120.0	75.0
	90%ile	178.8	117.5
All children	Mean[3]	87.6	60.2
	10%ile	20.0	7.5
	25%ile	43.3	22.5
	50%ile	74.2	48.3
	75%ile	118.3	85.0
	90%ile	172.5	130.0

*refer to appendix 1, Table A1.2 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 3.19 Mean and percentile distribution for VPA: by sex and age group (non-school days)

(average VPA in minutes per day)*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean[2]	59.4	50.2
	10%ile	0.0	0.0
	25%ile	0.0	0.0
	50%ile	45.0	27.5
	75%ile	92.5	75.0
	90%ile	150.0	132.5
Females	Mean[2]	30.8	20.1
	10%ile	0.0	0.0
	25%ile	0.0	0.0
	50%ile	12.5	0.0
	75%ile	45.0	26.3
	90%ile	82.5	61.3
All children	Mean[3]	45.6	35.2
	10%ile	0.0	0.0
	25%ile	0.0	0.0
	50%ile	25.0	10.0
	75%ile	67.5	51.7
	90%ile	126.7	105.0

*refer to appendix 1, Table A1.2 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 3.20 Mean and percentile distribution for VPA: by sex and age group (school days)

(average VPA in minutes per day)*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean[12]	81.5	54.0
	10%ile	5.0	0.0
	25%ile	35.0	5.0
	50%ile	76.3	41.3
	75%ile	120.0	82.5
	90%ile	160.0	125.0
Females	Mean[12]	49.4	34.8
	10%ile	0.0	0.0
	25%ile	15.0	0.0
	50%ile	40.0	18.8
	75%ile	72.5	60.0
	90%ile	102.5	90.0
All children	Mean[3]	66.0	44.8
	10%ile	0.0	0.0
	25%ile	25.0	0.0
	50%ile	58.8	31.7
	75%ile	95.0	71.7
	90%ile	137.5	115.0

*refer to appendix 1, Table A1.2 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 3.21 Mean and percentile distribution for VPA: by sex and age group (average of all days)

(average VPA in minutes per day)*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean[2]	71.6	51.8
	10%ile	11.3	0.0
	25%ile	31.3	13.3
	50%ile	65.0	41.3
	75%ile	101.7	77.5
	90%ile	138.8	115.0
Females	Mean[2]	40.9	26.6
	10%ile	0.0	0.0
	25%ile	13.8	0.0
	50%ile	31.3	15.0
	75%ile	55.8	40.0
	90%ile	88.8	71.3
All children	Mean[3]	56.6	39.5
	10%ile	5.0	0.0
	25%ile	21.3	3.3
	50%ile	45.0	26.3
	75%ile	82.5	61.3
	90%ile	122.5	101.3

*refer to appendix 1, Table A1.2 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 3.22 Mean and percentile distribution for time spent in sedentary activities: by sex and age group (non-school days)

(average minutes per day)*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean[2]	655	704
	10%ile	480	553
	25%ile	580	630
	50%ile	667	713
	75%ile	730	778
	90%ile	800	855
Females	Mean[2]	668	740
	10%ile	515	615
	25%ile	599	685
	50%ile	683	750
	75%ile	745	805
	90%ile	798	860
All children	Mean[3]	661	722
	10%ile	498	580
	25%ile	590	660
	50%ile	675	733
	75%ile	737	794
	90%ile	798	855

*refer to appendix 1, Table A1.2 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 3.23 Mean and percentile distribution for time spent in sedentary activities: by sex and age group (school days)

(average minutes per day)*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean[2]	692	791
	10%ile	580	653
	25%ile	635	723
	50%ile	698	795
	75%ile	750	858
	90%ile	808	920
Females	Mean[2]	726	825
	10%ile	608	708
	25%ile	660	768
	50%ile	727	825
	75%ile	790	885
	90%ile	841	936
All children	Mean[3]	708	808
	10%ile	593	683
	25%ile	645	745
	50%ile	710	810
	75%ile	770	874
	90%ile	828	926

*refer to appendix 1, Table A1.2 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 3.24 Mean and percentile distribution for time spent in sedentary activities: by sex and age group (average of all days)

(average minutes per day)*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean[2]	673	747
	10%ile	551	618
	25%ile	619	682
	50%ile	676	751
	75%ile	729	812
	90%ile	781	871
Females	Mean[2]	698	777
	10%ile	584	670
	25%ile	642	727
	50%ile	700	781
	75%ile	758	836
	90%ile	809	877
All children	Mean[3]	685	762
	10%ile	566	641
	25%ile	630	705
	50%ile	691	768
	75%ile	746	826
	90%ile	795	874

*refer to appendix 1, Table A1.2 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 3.25 Mean and percentile distribution for time spent in screen based activities: by sex and age group (non-school days)

(average minutes per day)*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean[12]	294	318
	10%ile	109	115
	25%ile	180	203
	50%ile	288	300
	75%ile	383	429
	90%ile	497	533
Females	Mean[12]	238	234
	10%ile	75	79
	25%ile	140	127
	50%ile	223	220
	75%ile	322	310
	90%ile	409	420
All children	Mean[1]	267	276
	10%ile	93	90
	25%ile	156	160
	50%ile	248	260
	75%ile	357	365
	90%ile	463	483

*refer to appendix 1, Table A1.2 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 3.26 Mean and percentile distribution for time spent in screen based activities: by sex and age group (school days)

(average minutes per day)*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean[2]	174	218
	10%ile	60	83
	25%ile	103	145
	50%ile	165	217
	75%ile	233	277
	90%ile	303	353
Females	Mean[2]	149	174
	10%ile	35	53
	25%ile	83	93
	50%ile	138	161
	75%ile	200	233
	90%ile	273	318
All children	Mean[3]	162	197
	10%ile	53	60
	25%ile	90	113
	50%ile	150	190
	75%ile	215	261
	90%ile	290	342

*refer to appendix 1, Table A1.2 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 3.27 Mean and percentile distribution for time spent in screen based activities: by sex and age group (average of all days)

(average minutes per day)*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean[12]	232	270
	10%ile	98	113
	25%ile	153	180
	50%ile	219	264
	75%ile	301	343
	90%ile	380	445
Females	Mean[12]	193	206
	10%ile	75	88
	25%ile	122	126
	50%ile	181	186
	75%ile	256	264
	90%ile	330	350
All children	Mean[13]	213	239
	10%ile	83	96
	25%ile	134	150
	50%ile	199	223
	75%ile	281	306
	90%ile	360	407

*refer to appendix 1, Table A1.2 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 3.28 Mean and percentile distribution for time spent in sleep: by sex and age group (non-school days)

(average minutes per day)*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean	620	607
	10%ile	533	503
	25%ile	578	551
	50%ile	615	600
	75%ile	661	660
	90%ile	705	720
Females	Mean	636	611
	10%ile	540	510
	25%ile	588	555
	50%ile	630	615
	75%ile	680	661
	90%ile	729	710
All children	Mean	628	609
	10%ile	538	508
	25%ile	585	554
	50%ile	625	605
	75%ile	670	660
	90%ile	720	713

*refer to appendix 1, Table A1.2 for cell counts

Table 3.29 Mean and percentile distribution for time spent in sleep: by sex and age group (school days)

(average minutes per day)*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean	593	526
	10%ile	525	450
	25%ile	560	490
	50%ile	600	530
	75%ile	630	566
	90%ile	660	600
Females	Mean	587	524
	10%ile	510	435
	25%ile	551	485
	50%ile	593	528
	75%ile	625	568
	90%ile	658	600
All children	Mean	590	525
	10%ile	517	445
	25%ile	555	490
	50%ile	595	530
	75%ile	630	568
	90%ile	660	600

*refer to appendix 1, Table A1.2 for cell counts

Table 3.30 Mean and percentile distribution for time spent in sleep: by sex and age group (average of all days)

(average minutes per day)*

		The age group of the respondent	
		9–13 years	*14–16 years*
Males	Mean	606	568
	10%ile	543	493
	25%ile	576	528
	50%ile	607	566
	75%ile	638	605
	90%ile	664	649
Females	Mean	610	573
	10%ile	541	488
	25%ile	575	528
	50%ile	611	573
	75%ile	646	615
	90%ile	676	663
All children	Mean	608	570
	10%ile	543	488
	25%ile	575	528
	50%ile	610	570
	75%ile	642	611
	90%ile	670	656

*refer to appendix 1, Table A1.2 for cell counts

EXPLANATORY NOTES

Introduction

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

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 mis-reporting 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 NRVs for a range of macro- and micronutrients, including the estimated average requirement, 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
BMI	Body Mass Index
CAPI	Computer Assisted Personal Interview
CATI	Computer Assisted Telephone Interview
cm	centimetre(s)
CSIRO	Commonwealth Scientific and Industrial Research Organisation
FSANZ	Food Standards Australia New Zealand
g	gram(s)
kg	kilogram(s)
km	kilometre(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)
MPA	Moderate Physical Activity
MVPA	Moderate-to-Vigorous Physical Activity
NNS	National Nutrition Survey
NRVs	Nutrient Reference Values
PA	Physical Activity
PAL	Physical Activity Level
RDD	Random Digit Dialling
RDI	Recommended Dietary Intake

SPSS	Statistical Package for the Social Sciences
VPA	Vigorous Physical Activity

APPENDIX 1: UNWEIGHTED CELL COUNTS

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

			The age group of the respondent			
			5–8 years	*9–13 years*	*14–16 years*	*TOTAL*
Males	Steps taken	weekdays only	369	401	436	1206
		weekend days only	365	398	432	1195
		all day types	365	398	432	1195
	Walking distance	weekdays only	368	400	433	1201
		weekend days only	364	397	429	1190
		all day types	364	397	429	1190
	MVPA	weekdays only	368	400	434	1202
		weekend days only	364	397	430	1191
		all day types	364	397	430	1191
		Total N	369	401	436	1206
Females	Steps taken	weekdays only	370	465	423	1258
		weekend days only	367	464	419	1250
		all day types	367	464	419	1250
	Walking distance	weekdays only	369	465	421	1255
		weekend days only	366	464	417	1247
		all day types	366	464	417	1247
	MVPA	weekdays only	369	465	421	1255
		weekend days only	366	464	417	1247
		all day types	366	464	417	1247
		Total N	370	465	423	1258
Total	Steps taken	weekdays only	739	866	859	2464
		weekend days only	732	862	851	2445
		all day types	732	862	851	2445
	Walking distance	weekdays only	737	865	854	2456
		weekend days only	730	861	846	2437
		all day types	730	861	846	2437
	MVPA	weekdays only	737	865	855	2457
		weekend days only	730	861	847	2438
		all day types	730	861	847	2438
		Total N	739	866	859	2464

Table A1.2 Cell counts for MARCA data by age group and sex

		The age group of the respondent		
		9–13 years	14–16 years	TOTAL
Males	non-school day	461	480	941
	school day	465	465	930
	Total N	525	561	1086
Females	non-school day	498	478	941
	school day	507	416	923
	Total N	585	529	1114
Total	non-school day	959	958	1917
	school day	972	881	1853
	Total N	1110	1090	2200

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 physical activity 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 physical activity 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

	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							Post-hoc comparisons					
FOOD GROUP	p value	L1	L2	L3	L4	p value	Result	p value	L1	L2	L3	L4	L5	L6	Notes
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 activity measures or whether there was a significant interaction between the factors age group and sex on physical activity. Where a significant interaction between factors was evident, main effects were not explored, however a post-hoc comparison of mean difference between males and females 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 for pedometer data, while Table A2.2 gives the key to post-hoc comparisons where a significant main effect of age group was found. Table A2.6 gives the key to the contrasts for post-hoc testing following a finding of interaction for MARCA data.

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

Contrast number	Comparison	Males			Females		
		5–8 yrs	9–13 yrs	14–16 yrs	5–8 yrs	9–13 yrs	14–16 yrs
L1	5–8yrs M vs F	1	0	0	-1	0	0
L2	9–13yrs M vs F	0	1	0	0	-1	0
L3	14–16yrs M vs F	0	0	1	0	0	-1

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

Contrast number	Comparison	5–8 yrs	9–13 yrs	14–16 yrs
L1	5–8yrs vs 9–13yrs	1	-1	0
L2	5–8yrs vs 14–16yrs	1	0	-1
L3	9–13yrs vs 14–16yrs	0	1	-1

Table A2.3 Results for statistical analysis of differences in the number of pedometer steps taken by children, tests for age group 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	p value	Result[2]	p value	L1	L2	L3
Weekdays only	0.60				<0.01	m > f	<0.01	**	**	**
Weekend day only	0.32				<0.01	m > f	<0.01	**	**	**
All days	0.44				<0.01	m > f	<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

Table A2.4 Results for statistical analysis of differences in the mean distance travelled (km) by children as measured by pedometer, tests for age group 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	p value	Result[2]	p value	L1	L2	L3
Weekdays only	0.21				<0.01	m > f	<0.01	**	**	**
Weekend day only	0.60				<0.01	m > f	0.02			*
All days	0.26				<0.01	m > f	<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

Table A2.5 Results for statistical analysis of differences in MVPA as measured by pedometer, tests for age group 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	p value	Result[2]	p value	L1	L2	L3
Weekdays only	0.15				<0.01	m > f	<0.01	**	**	**
Weekend day only	0.33				<0.01	m > f	<0.01	**	**	**
All days	0.15				<0.01	m > f	<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

Table A2.6 Post-hoc comparisons used for tests of age and sex interaction on physical activity measures via MARCA

Contrast number	Males		Females	
	9–13 yrs	14–16 yrs	9–13 yrs	14–16 yrs
L1	1	0	-1	0
L2	0	1	0	-1

Table A2.7 Results for statistical analysis of differences in physical activity level (PAL) measured by MARCA, tests for age group 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]					
	p value	L1	L2	p value	Result[2]	p value	Result[3]
School days	0.07			<0.01	m > f	<0.01	a > b
Non-school days	0.81			<0.01	m > f	<0.01	a > b
All days	0.31			<0.01	m > f	<0.01	a > b

[1] see Table A2.6 for key to post-hoc comparisons
[2] m=males; f=females
[3] a=9–13 year olds; b=14–16 year olds
* p value =≤0.05
** p value =≤0.01

Table A2.8 Results for statistical analysis of differences in MVPA measured by MARCA, tests for age group 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]					
	p value	L1	L2	p value	Result[2]	p value	Result[3]
School days	0.80			<0.01	m > f	<0.01	a > b
Non-school days	0.54			<0.01	m > f	<0.01	a > b
All days	0.67			<0.01	m > f	<0.01	a > b

[1] see Table A2.6 for key to post-hoc comparisons
[2] m=males; f=females
[3] a=9–13 year olds; b=14–16 year olds
* p value =≤0.05
** p value =≤0.01

Table A2.9 Results for statistical analysis of differences in MPA measured by MARCA, tests for age group 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]					
	p value	L1	L2	p value	Result[2]	p value	Result[3]
School days	<0.01		**	0.21		<0.01	a > b
Non-school days	0.53			0.43		<0.01	a > b
All days	0.16			0.30		<0.01	a > b

[1] see Table A2.6 for key to post-hoc comparisons
[2] m=males; f=females
[3] a=9–13 year olds; b=14–16 year olds
* p value =≤0.05
** p value =≤0.01

Table A2.10 Results for statistical analysis of differences in VPA measured by MARCA, tests for age group 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]					
	p value	L1	L2	p value	Result[2]	p value	Result[3]
School days	0.01	**	**	<0.01	m > f	<0.01	a > b
Non-school days	0.78			<0.01	m > f	<0.01	a > b
All days	0.16			<0.01	m > f	<0.01	a > b

[1] see Table A2.6 for key to post-hoc comparisons
[2] m=males; f=females
[3] a=9–13 year olds; b=14–16 year olds
* p value =≤0.05
** p value =≤0.01

Table A2.11 Results for statistical analysis of differences in sedentary time measured by MARCA, tests for age group 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]					
	p value	L1	L2	p value	Result[2]	p value	Result[3]
School days	0.99			<0.01	f>m	<0.01	b>a
Non-school days	0.09			<0.01	f>m	<0.01	b>a
All days	0.62			<0.01	f>m	<0.01	b>a

[1] see Table A2.6 for key to post-hoc comparisons
[2] m=males; f=females
[3] a=9–13 year olds; b=14–16 year olds
* p value =≤0.05
** p value =≤0.01

Table A2.12 Results for statistical analysis of differences in screen time measured by MARCA, tests for age group 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]					
	p value	L1	L2	p value	Result[2]	p value	Result[3]
School days	0.09			<0.01	m>f	<0.01	b>a
Non-school days	0.03	**	**	<0.01	m>f	0.06	
All days	0.02	**	**	<0.01	m>f	<0.01	b>a

[1] see Table A2.6 for key to post-hoc comparisons
[2] m=males; f=females
[3] a=9–13 year olds; b=14–16 year olds
* 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:

- children aged 2–8 years - waist circumference, height, weight, 2 days diet recall, and demography,
- children aged 9–16 years - 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.

Distance Is an estimated daily walking distance in kilometres generated by the New Lifestyles-1000 pedometer.

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).
Multimedia Activity Recall for Children and Adolescents (MARCA)	A computerised 24-hour recall collecting information on all activities engaged in during the previous day. Time slices can be as fine as five minutes with approximately 250 activities to choose from (free text option available for activities not listed).
Metabolic Equivalents (METs)	A unit used to express the energy cost of physical activity (as a multiple of resting metabolic rate) measured by the amount of oxygen used by the body during physical activity compared to the rested state.
(Moderate Physical Activity) MPA	Moderate physical activities requiring ≥ 3 to < 6 METs as defined by the MARCA software.
Moderate-to-Vigorous Physical Activity (MVPA - MARCA)	Moderate-to-vigorous physical activities requiring ≥ 3 METs as defined by the MARCA software.
Moderate-to-Vigorous Physical Activity (MVPA - Pedometer)	Is an estimated account of the minutes of moderate-to-vigorous physical activities (requiring > 3 METs) per day as recorded by the New Lifestyles-1000 pedometer.
Non-sedentary activities	Activities requiring ≥ 3 METs.

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).

Pedometer A portable medical-grade accelerometer pedometer (New Lifestyles-1000) that can count steps, estimate walking distance, and record moderate-to-vigorous activity in minutes (seven day automatic memory).

Percentile distribution Points that divide a distribution of numeric values. In this report the distribution is divided into the 10^{th}, 25^{th}, 50^{th}, 75^{th} and 90^{th} percentile. So if the 10^{th} percentile of the distribution is '12', 10% of the values in the dataset are less than or equal to 12.

Physical Activity Level (PAL) A measure of energy expenditure expressed as a multiple of resting metabolic rate and based on reported physical activities.

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).

Screen based activities Activities which involve the use of screens or monitors (i.e. television, computers, videogames, texting).

Sedentary activities Activities requiring < 3 METs.

Sleep time Average number of minutes of sleep activity.

State/territory of residence The State or Territory in which the respondent currently lives.

Steps A daily step count calculated by the New Lifestyles-1000 pedometer used in this survey.

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.

VPA Vigorous physical activities requiring ≥6 METs as defined by the MARCA software.

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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