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Breakfast and the diets of Australian children and adolescents: an analysis of data from the 1995 National Nutrition Survey

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Keywords

breakfast, national nutrition survey, cereals, dietary intake, children, adolescents

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Title: **Breakfast and the diets of Australian children and adolescents: an analysis of data from the 1995 National Nutrition Survey**

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Introduction

A number of reviews have emphasised the importance of breakfast for overall good nutrition (Chao & Vanderkooy 1989; Ruxton & Kirk 1997) and consumption of an adequate breakfast may also effect school performance in children (Wyon et al. 1997; Rampersaud et al. 2005). US schoolchildren who skip breakfast have been found to have higher total cholesterol levels (Resnicow 1991). Studies of adolescents in the US and Australia have shown that breakfast consumption is associated with lower BMI (Milligan et al. 1998; Affenito et al. 2005) and in Canada it has been estimated that not eating breakfast every day nearly doubled the odds of being overweight at 4.5 years (Dubois et al. 2006). For these various reasons there has been increasing interest in the use of school breakfast programs to support the health and performance of children and adolescents (Miller et al. 1998; Kleinman et al. 2003). Yet in Australia - aside from some important work on the meal patterns of children (Magarey et al. 1987; Magarey & Boulton 1995) and a report from CSIRO on the nutritional influence of breakfast cereal usage (Syrette et al. 1990) - there have been no studies describing the contribution of breakfast to the dietary intake of children and adolescents.

The National Nutrition Survey (NNS), conducted jointly by the Commonwealth Department of Health and Family Services and the Australian Bureau of Statistics (ABS) during the period February 1995 to March 1996, provided an opportunity to examine this topic with comprehensive national data. Detailed results from the NNS have been published (McLennan & Podger 1997; McLennan & Podger 1998a; McLennan & Podger 1998b; McLennan & Podger 1999), however those reports do not describe the contribution of individual meals to the overall daily intake of nutrients. Kellogg (Aust) commissioned the ABS to analyse the data from the NNS in relation to breakfast food and dietary patterns. Results about the foods consumed at breakfast and the prevalence of breakfast eating or skipping have been published (Williams 2002) and the contribution of the breakfast meal to the diets of adults has also been described (Williams 2005). This paper reports the detailed findings from this analysis of the contribution of the breakfast meal to the nutrition of Australians children and adolescents (aged 2-18 years) as well as some data on the relationship between breakfast consumption and health.

Method

Kellogg (Aust) commissioned the ABS to analyse data collected in the NNS related to breakfast dietary patterns. The NNS covered a nationally representative sub-sample of the National Health Survey and was conducted in the householders' homes by trained nutritionists. The primary method of dietary data collection was a 24-hour recall, hence the data indicate the intake of food items on the day prior to the interview, ie the day of recall. Physical measurements were taken of height, weight, waist and hip circumference and blood pressure. The response rate among those selected from the NHS participants for the NNS sample was 61%. The total sample consisted of 13 858 people aged two years and over from urban and rural areas in all States and Territories, including 3007 subjects aged 2-18 years. Full details of the methodology and the sampling have been published (McLennan & Podger 1998a).

As well as the 24-hour recall, two other approaches were used to collect data on food intake. A food frequency questionnaire was used to assess the intake of selected foods including nutrient supplements over the previous 12 months. In addition, a series of questions was asked, including self-reported health status on a five-point scale and "How many days per week do you usually have something to eat at breakfast?" Throughout this paper, those who indicated they ate breakfast five or more days a week are classified as regular breakfast "eaters"; those who responded "rarely or never" are classified as breakfast "skippers", which is the same definition used in other studies (Williams 2002; Williams 2005). In the 24-hour recalls, participants were asked to nominate the meal at which each food item was consumed, from a list of seven options which included breakfast. Therefore, the breakfast meal was self-defined by the participants, rather than being identified by the time of consumption or the type of food. Adolescents aged 15-18 years were interviewed with their own consent. Children aged 2-14 years were not interviewed; a parent, guardian or close relative was asked to answer on their behalf.

Nutrient intakes were calculated by staff of the ABS using the 24-hour recall data in the Confidential Unit Record File (CURF), which includes food intakes for each individual surveyed and individual respondent estimates of portion sizes. A food composition database developed by the Australia New Zealand Food Authority was used to calculate nutrient intakes (Australia New Zealand Food Authority 1999). Nutrient intakes at breakfast are presented as median rather than mean values because they were not normally distributed (McLennan &

Podger 1998b). Sodium intakes were not estimated in the NNS because of the unreliability of diet records for this purpose. Foods were categorised using the groupings of the NNS (McLennan & Podger 1998a). Throughout this paper the category 'breakfast cereals' includes both cold ready-to-eat breakfast cereals (RTEC) and hot porridge-type cereals. The broad category 'cereal foods' includes breakfast cereals, breads, pastries, cakes and biscuits.

Food and nutrient intakes were compared with recommended dietary intakes (RDI) for use in Australia at the time of the survey (National Health and Medical Research Council 1991) or other dietary target recommendations. The recommended target for dietary fibre per day was based on the "Age + 5" recommendation – eg 15g dietary fibre at age 10y (Williams 1995). Dietary fibre is defined in the Australian Food Standards Code as that fraction of the edible part of plants that are resistant to the digestion and absorption in the small intestine, including polysaccharides, oligosaccharides (degree of polymerisation > 2) and lignins (Food Standards Australia New Zealand 2002). The dietary target of 55% of energy from carbohydrate was taken from the recommendations of the FAO/WHO expert consultation on carbohydrates (World Health Organization 1998). Servings of cereal foods were calculated by dividing the food intake in grams by the standard cereal servings defined by for the Australian Core Food Groups (Cashel & Jeffreson 1995): 30g for bread, 20g for ready-to-eat-cereal, 90g for cooked rice, pasta or porridge.

The statistical significance of differences between breakfast eaters and skippers and between eaters and non-eaters of breakfast cereal were calculated using the Student *t*-test.

Results

Nutrients provided by breakfast

The median nutrient intakes provided by the foods consumed at breakfast and the percentage this contributed to the total daily intakes are shown in Tables I and II for boys and girls respectively. The breakfast meal provided between 12-19% of daily energy intake, similar to the values reported for adolescents in Belgium (Matthys et al. 2003). For most nutrients the proportions were very similar for males and females, but the breakfast meal contributed a higher proportion of the total energy intake in the younger children compared to those aged 16-18 years, especially for girls. Table III shows the proportion of the recommended daily nutrient intakes provided by the foods consumed at the breakfast meal. Breakfast was generally a very nutritious meal. It was low in fat (26-30% energy came from fat), high in carbohydrate (providing 55-58% of energy), a significant source of dietary fibre, and rich in micronutrients.

Breakfast was a particularly good source of thiamin, riboflavin, niacin, vitamin C, calcium and iron, contributing more than 25% of the median daily intake of these nutrients for children and adolescents. More than 12% of the median daily intakes of all the other vitamins and minerals analysed were supplied at breakfast. For most age groups the breakfast meal provided more than 20% of the RDI of all the micronutrients except zinc. Compared to males, the females aged 16-18 years obtained lower proportions of their RDI for folate, retinol, magnesium, and phosphorus at the breakfast meal, which was related to their lower overall energy intake at breakfast (approximately half that of the boys). The notable fall in calcium intake in the older adolescent girls (16-18y) reflects their lower intake of milk (Williams 2002).

Breakfast cereals, as consumed with milk and sugar, contributed significantly to the nutrient density of the breakfast meal. They provided around 9% and 6% of the total daily energy intake of boys and girls respectively, but were a good source (>25% RDI) of thiamin, riboflavin and iron (for boys only) and a source (>10% RDI) of niacin, folate (for boys only), calcium, iron (for girls) and magnesium. Breakfast cereals alone contributed 3-5% of the total daily energy intake, and the same proportion of the daily sugar intake, but only 1% of the total fat consumed and 9-11% of the dietary fibre intake of boys (and 6-10% for girls). These proportions are very similar to those reported in the diets of English adolescents (Hackett et al. 1986).

Comparison of breakfast eaters and skippers

Nutrient intakes

Tables IV and V compare the mean daily nutrient intakes of male and female Australian breakfast eaters and skippers from ages 8-18 years. Very few Australian children below 8 years miss breakfast regularly (Williams 2002). Those who regularly ate breakfast had better nutrient intakes overall - higher in dietary fibre and richer in almost all vitamins and minerals, especially thiamin, riboflavin, folate, calcium, iron and magnesium, although the differences were not always statistically significant in the older age groups. There were no significant differences in the daily intakes of sugar or fat between breakfast eaters and skippers, except for boys aged 8-11 years (with eaters having higher mean daily intakes).

Dietary goals

For every nutrient, significantly more eaters than skippers met the RDI or dietary target (Figures 1 & 2). These differences were particularly significant for thiamin, riboflavin, folate, calcium, magnesium and iron. These findings are similar to those in the US, where higher percentages of children who did not consume breakfast consume did not meet two thirds of the RDA for vitamins and minerals (Nicklas et al. 2000). Figure 3 compares the proportion of eaters and non-eaters of breakfast cereal specifically who, on the day of the survey, did not achieve a daily intake of 70% of the RDI. For every nutrient (except zinc in boys aged 4-7) a higher proportion of breakfast cereal eaters had daily intakes greater than 70% of the RDI. This finding is consistent with other studies that have reported children who eat RTEC are more likely to have nutritionally adequate diets (Zabik 1987; Nicklas et al. 1995; Ortega et al. 1996).

Children who were breakfast eaters also consumed significantly more servings in the day of core food group cereals than the skippers (3.4 vs 2.0 at ages 4-7, $p<0.001$, and 5.7 vs 4.2 at 16-18, $p<0.05$) and were twice as likely to meet the core food group cereal targets (Cashel & Jeffreson 1995). They were also more likely to meet the target of >55% energy from carbohydrate than skippers (43% vs 33% at ages 4-7, $p < 0.05$; 39% vs 27% at ages 12-15; $p<0.05$). Significantly more breakfast eaters met the dietary targets for fibre than skippers in the oldest, but not other, age group: 32.6% vs 14.6% of 16-18 year olds ($p<0.01$).

Health status

Data on BMI and self reported health (excellent, very good, good, fair or poor) was only available from the 16-18 year olds. Although the mean BMI of 16-18 year old breakfast skippers (24.0) was higher than eaters (22.3), this difference was not statistically significant. Similarly, although slightly more 16-18 year old breakfast eaters rated their health as excellent (25.9% vs 22.4%) or very good (43.9% vs 38.4%) than did skippers, the differences were not significant.

Discussion

The results of this analysis clearly show that breakfast consumption by children and adolescents was associated with a more nutritious diet overall and one that was more likely to meet recommended nutrient intakes, especially of B vitamins, calcium, magnesium and iron. The proportion of the daily intake of nutrients provided by the breakfast meal are similar for many nutrients to those reported in a longitudinal study of 230 South Australian children at ages 11, 13 and 15 (Magarey & Boulton 1995), and an earlier study of 8-year olds (Magarey et al. 1987), although in the 1995 national survey breakfast appeared to provide less of the daily energy, sugar, fibre and folate intake and more of the iron and calcium than reported in those previous studies.

Since this study was undertaken, new nutrient reference values for Australia and New Zealand have been released (National Health and Medical Research Council 2006). For this analysis, comparisons were made to the RDIs from the time of the NNS for two reasons: (1) the new values use different age groupings that do not correspond with those used to report dietary intake results in the NNS, making comparison difficult, and (2) this method allows direct comparison of these results for children and adolescents to the previously published report of the results for adults, which referenced the earlier RDI values (Williams 2005). For most nutrients the new RDI values are not greatly different from before, but those for riboflavin, niacin and zinc are significantly lower (20-40%) than previously, while recommendations for folate are 50 to 100% higher. Using the newer values, breakfast in 1995 provided only 7-19% of the folate RDI for 2-18 year olds.

It has been reported in other studies that intakes of vitamins and minerals missed when breakfast is skipped are not fully compensated during the rest of the day (Zabik 1987; Nicklas et al. 1993; Preziosi et al. 1999), therefore it is likely that breakfast skippers would have poorer diets over the whole day. One previous survey of Australian 18-year olds found that not eating breakfast was associated with lower intakes of calcium, iron and dietary fibre (Milligan et al. 1998). The results of this study support those findings. The results in Tables IV and V show those children who regularly ate breakfast had significantly better diets overall - higher in fibre and richer in almost all vitamins and minerals, especially thiamin, riboflavin, calcium, iron and magnesium. A longitudinal study of 14,000 children aged 9-14 years in the US found those

who never ate breakfast had lower energy intakes than those who ate breakfast every day (Berkey et al. 2003). In this analysis of the NNS results, skippers aged 8-11 years were also found to have lower daily energy intakes, but this was only statistically significant in the boys (17% less). Overall there was no statistically significant association between regular breakfast consumption and BMI, although there was a trend for the BMI of breakfast skippers to be higher. This finding is different from reports from the US (Affenito et al. 2005), but consistent with a recent study of New Zealand children which also reported no relationship between regular breakfast consumption, weight status or overall energy intake (Wilson et al. 2006).

The analysis presented here compares mean daily nutrient intakes of regular breakfast eaters and skippers – to allow comparison with the same analysis of results from adults (Williams 2005). Although some nutrient intakes were not normally distributed, nonetheless the differences between the median and mean intakes of almost all nutrients were less than 10%, with the exceptions of vitamin A and C (McLennan & Podger 1998b), so the comparison of mean values is still meaningful.

In some other studies it has been reported that breakfast consumption is associated with a lower daily fat intake (Gibson & O'Sullivan 1995; MacDiarmid et al. 1997; Schmidt et al. 1998; Preziosi et al. 1999; Nicklas et al. 2000), although in the Bogalusa Heart Study, the percentage of total energy from fat was lower in children who did not eat breakfast (Nicklas et al. 1993). In this analysis, there was no significant difference in the total daily fat intake or the percentage of energy from fat between regular breakfast eaters or skippers. This may be due to the generally lower percentage of fat in the Australian diet compared to US and UK intakes, and reflects a similar finding in the analysis of Australian adult breakfasts (Williams 2005).

Breakfast cereals

It should be noted that there have been some significant changes to the fortification of breakfast cereals since the NNS was carried out. Since July 1996, folate fortification has been permitted and adopted in many popular ready-to-eat cereals (RTEC), so it is likely that the contribution of folate from breakfast cereals is significantly greater now than it was as the time of the NNS. At the same time, vitamin A is now only permitted to be added in the form of beta-carotene (not retinol) and a number of RTEC products consequently had vitamin A removed as a fortificant in 1996. It is therefore probable that the NNS results overstate the

current total vitamin A intake and understate the total folate intake.

A 24-hour recall may not reflect typical intake patterns, and consuming less than 70% of the RDI for a nutrient does not necessarily indicate an inadequate diet. However, the results in Figure III show consumption of breakfast cereal specifically appeared to be associated with a more nutrient dense diet overall, especially in riboflavin, calcium, iron and magnesium (Figure 3). This is consistent with the findings from two studies of Irish schoolchildren, which reported that those subjects who were breakfast cereal eaters were more likely to have intakes which met British reference nutrient intakes (Sommerville & O'Reagan 1993; McNulty et al. 1996), and also with the findings of a Scottish study of primary school children (Ruxton et al. 1996). Data from a longitudinal study of 9-19 year old girls in the US has shown that eating breakfast cereal was associated with a lower BMI (Barton et al. 2005) as did a survey of American children aged 4-12 years (Albertson et al. 2003), but these Australian results do not support those findings. In analysis of the next National Nutrition Survey of children in Australia (due to commence in 2007) a three-group analysis (RTE cereal breakfast vs other breakfast vs. no breakfast) would be useful in helping to distinguish whether the type of breakfast matters.

Conclusions

Breakfast skipping is relatively common among adolescents in many Western countries and the practice may be increasing (Siega-Riz et al. 1998). It seems to be associated with a range of health-compromising behaviours, and may not be addressed by simple nutritional interventions that focus solely on increasing the frequency of breakfast (Keski-Rahkonen et al. 2003). Nonetheless the results of this analysis support others' conclusions that regular breakfast eating is important health advice for young people (Dubois et al. 2006).

The average breakfast of Australian children and adolescents in 1995 was a very nutritious meal - high in carbohydrate and dietary fibre, low in fat and rich in vitamins and minerals. Children who didn't eat breakfast regularly were more likely to have diets that were nutritionally inadequate and less likely to meet national dietary targets for cereal and fibre intakes. The high proportion of older children and adolescents who are now skipping breakfast regularly is therefore a cause for concern.

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Table I. Median nutrient intake of Australian boys from breakfast and the percentage contribution to total daily intake

	2-3y			4-7y			8-11y			12-15y			16-18y		
	Median	SE	%	Median	SE	%	Median	SE	%	Median	SE	%	Median	SE	%
Energy (kJ)	1190	40	19	1350	40	19	1550	60	19	1770	80	18	1980	180	17
Protein (g)	9.3	0.9	20	12.0	0.6	20	14.0	0.6	19	15.4	0.8	18	16.4	1.6	16
Fat (g)	9.2	0.8	17	10.0	0.3	16	10.6	0.3	15	11.3	0.9	14	11.1	1.2	13
Carbohydrate (g)	38	2	19	44	2	19	52	3	21	66	2	20	69	6	19
Sugar (g)	19	2	18	21	1	18	24	2	19	26	2	17	31	4	18
Dietary Fibre (g)	1.7	0.2	17	2.1	0.2	17	2.9	0.2	20	2.7	0.3	19	2.8	0.4	17
Thiamin (mg)	0.40	0.04	37	0.46	0.04	37	0.56	0.04	41	0.74	0.03	37	0.64	0.10	38
Riboflavin (mg)	0.66	0.06	37	0.79	0.06	43	0.95	0.07	46	1.21	0.07	43	0.93	0.19	42
Niacin (mg)	5.1	0.4	24	6.4	0.3	24	7.8	0.5	25	9.6	0.4	23	9.4	1.3	21
Folate (µg)	28	2	20	31	1	21	36	2	23	44	3	20	48	5	20
Vitamin A (RE)	113	7	23	125	1	27	125	9	27	165	15	23	135	19	23
Vitamin C (mg)	3.1	0.6	12	3.4	0.4	17	3.2	0.3	22	3.7	0.6	17	5.1	0.8	25
Calcium (mg)	190	27	29	276	19	34	298	13	33	316	15	32	318	30	29
Iron (mg)	1.9	0.2	32	2.6	0.2	34	2.9	0.2	34	4.6	0.3	33	3.4	0.4	30
Magnesium (mg)	39	4	24	51	2	25	59	4	26	67	5	24	70	7	22
Zinc (mg)	1.2	0.1	19	1.4	0.1	19	1.6	0.1	18	1.8	0.1	17	2.1	0.2	15
Phosphorus (mg)	218	25	24	285	14	25	326	15	24	369	22	23	366	34	20
Potassium (mg)	378	34	15	465	15	15	541	22	16	593	40	21	672	59	21

Table II. Median nutrient intakes of Australian girls from breakfast and the percentage contribution to total daily intake

	2-3y			4-7y			8-11y			12-15y			16-18y		
	Median	SE	%	Median	SE	%	Median	SE	%	Median	SE	%	Median	SE	%
Energy (kJ)	1100	36	19	1214	75	19	1356	38	17	1175	68	15	1037	101	13
Protein (g)	9.1	0.4	20	10.3	0.6	19	10.4	0.8	17	10.1	0.9	15	7.1	1.1	12
Fat (g)	8.1	0.6	17	8.6	0.6	16	9.5	0.4	14	7.7	1.0	12	5.1	0.7	10
Carbohydrate (g)	38	2	21	41	2	19	33	3	19	38	3	17	38	4	15
Sugar (g)	19	1	19	20	1	18	19	2	17	18	1	16	15	2	14
Dietary Fibre (g)	2.1	0.2	20	2.0	0.1	16	1.8	0.1	14	2.1	0.2	16	1.8	0.3	15
Thiamin (mg)	0.42	0.03	23	0.44	0.03	40	0.41	0.04	34	0.41	0.04	34	0.24	0.04	30
Riboflavin (mg)	0.67	0.03	39	0.71	0.03	45	0.68	0.05	40	0.63	0.04	37	0.21	0.11	33
Niacin (mg)	5.3	0.2	25	5.5	0.2	24	5.9	0.3	22	5.6	0.3	19	4.1	0.3	17
Folate (μg)	27	2	23	29	2	21	28	2	19	33	4	20	28	3	17
Vitamin A (RE)	104	8	22	116	7	24	108	8	21	90	7	14	51	12	16
Vitamin C (mg)	2.8	0.3	18	3.2	0.3	17	2.6	0.30	1	2.6	0.2	17	1.4	0.4	18
Calcium (mg)	205	18	29	212	15	34	210	28	30	175	24	31	90	25	21
Iron (mg)	2.1	0.1	33	2.4	0.2	32	2.1	0.2	31	1.7	0.2	27	1.4	0.2	22
Magnesium (mg)	41	2	26	44	3	24	42	3	21	45	5	21	33	5	18
Zinc (mg)	1.1	0.1	19	1.1	0.1	19	1.2	0.1	16	1.2	0.1	14	0.8	0.1	11
Phosphorus (mg)	228	10	24	236	16	25	244	23	21	227	22	20	141	21	16
Potassium (mg)	408	21	16	406	29	16	207	39	17	409	52	20	294	41	20

Table III. Percentage of recommended dietary intake [(a)] or dietary target for fibre [(b)] obtained from breakfast

	2-3y		*4-7y*		*8-11y*		*12-15y*		*16-18y*	
	males	*females*	*males*	*females*	*males*	*females*	*males*	*females*	*males*	*females*
Protein	69	63	62	53	48	36	35	22	28	18
Dietary Fibre	31	35	27	24	28	17	24	16	20	13
Thiamin	93	95	84	66	88	66	73	26	72	49
Riboflavin	91	90	82	70	81	62	71	46	68	42
Niacin equivalents	57	57	60	52	63	45	54	35	53	37
Folate	32	34	39	35	34	24	27	20	31	19
Retinol equivalents	61	51	65	52	55	41	43	23	39	19
Vitamin C	44	55	60	59	87	60	68	72	95	74
Calcium	36	33	36	30	38	29	29	24	37	21
Iron	38	35	50	41	63	45	47	25	46	21
Magnesium	61	60	51	45	40	30	30	22	26	17
Zinc	29	27	26	22	21	15	18	11	19	9
Phosphorus	52	57	43	36	44	32	33	21	38	19

[(a)] National Health and Medical Research Council (1991)
[(b)] Williams (1995)

Table IV. Comparison of the mean daily nutrient intakes of young Australian male breakfast eaters and skippers†

	8-11y			12-15y			16-18y		
	Eaters	Skippers	P	Eaters	Skippers	P	Eaters	Skippers	P
Energy (kJ)	9791	8186 **	0.005	11491	12097	0.526	13967	12445	0.092
Protein (g)	82.9	69.5 *	0.011	101	99.6	0.850	124	109	0.114
Fat (g)	88.0	73.1 ***	< 0.001	105	111	0.510	124	108	0.143
Carbohydrate (g)	309	259 ***	< 0.001	354	380	0.439	422	379	0.173
Sugar (g)	155	120 ***	< 0.001	179	200	0.450	217	201	0.493
Dietary Fibre (g)	20.9	17.4 ***	< 0.001	24.2	21.7	0.293	22.1	15.8 ***	< 0.001
Thiamin (mg)	2.0	1.6 *	0.031	2.4	2.0	0.083	2.5	1.8 *	0.011
Riboflavin (mg)	2.5	1.7 **	0.001	3.1	2.5	0.074	3.4	2.2 **	0.001
Niacin (mg)	37.9	30.5 **	0.001	46.3	43.2	0.442	55.2	49.1	0.153
Folate (μg)	228	192	0.104	275	244	0.254	330	268 *	0.013
Vitamin A (RE)	1041	698 **	0.008	1428	1163	0.278	1352	1065	0.250
Vitamin C (mg)	122	102	0.423	124	102	0.279	164	130	0.360
Calcium (mg)	967	630 ***	< 0.001	1104	995	0.292	1367	1055 **	0.009
Iron (mg)	12.0	9.9 ***	< 0.001	16.3	14.4	0.175	18.8	15.1 *	0.025
Magnesium (mg)	282	221 ***	< 0.001	326	289	0.062	403	317 **	0.004
Zinc (mg)	10.4	8.6 **	0.008	12.8	13.1	0.870	15.3	13.4	0.149
Phosphorus (mg)	1477	1167 **	0.001	1747	1671	0.493	2167	1803 *	0.026
Potassium (mg)	2904	2446	0.069	3513	3162	0.273	4300	3428 *	0.023

† Eaters had breakfast five or more days /week; skippers ate breakfast rarely or never * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table V. Comparison of the mean daily nutrient intakes of young Australian female breakfast eaters and skippers[†]

	8-11y			12-15y			16-18y		
	Eaters	Skippers	P	Eaters	Skippers	P	Eaters	Skippers	P
Energy (kJ)	8323	8181	0.731	8767	7921 *	0.046	8538	8984	0.529
Protein (g)	69.7	64.9	0.300	76.1	67.9	0.106	80.0	81.3	0.830
Fat (g)	77.6	76.5	0.815	79.4	73.7	0.280	73.0	82.5	0.260
Carbohydrate (g)	257	256	0.966	273	240	0.011	264	264	0.999
Sugar (g)	132	132	0.959	145	189 **	0.005	132	133	0.960
Dietary Fibre (g)	17.1	15.6	0.229	19.5	16.3 *	0.017	19.7	19.0	0.700
Thiamin (mg)	1.6	1.1 **	0.001	1.7	1.2 ***	< 0.001	1.6	1.3 *	0.048
Riboflavin (mg)	2.1	1.4 ***	< 0.001	2.2	1.4 ***	< 0.001	2.0	1.4 **	0.001
Niacin (mg)	31.6	27.3 *	0.020	34.9	29.5 **	0.005	36.0	34.3	0.562
Folate (μg)	193	157 *	0.016	219	172 ***	< 0.001	224	205	0.439
Vitamin A (RE)	988	744 *	0.017	1400	577 *	0.033	957	846	0.491
Vitamin C (mg)	105	70 *	0.012	134	95 *	0.042	116	144	0.294
Calcium (mg)	828	565 ***	< 0.001	843	623 *	0.010	844	724 *	0.041
Iron (mg)	10.6	8.7 **	0.006	12.0	8.5 ***	< 0.001	11.5	10.4	0.284
Magnesium (mg)	233	200 **	0.007	257	207 ***	< 0.001	262	250	0.587
Zinc (mg)	8.7	8.0	0.287	9.7	8.0 **	0.005	10.0	10.1	0.885
Phosphorus (mg)	1232	1059 **	0.004	1327	1114 *	0.015	1361	1300	0.523
Potassium (mg)	2528	2041 **	0.004	2856	2332 ***	< 0.001	2757	2542	0.435

[†] Eaters had breakfast five or more days /week; skippers ate breakfast rarely or never * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Figure 1. Percentage of females meeting the RDI of selected vitamins and minerals, comparing breakfast eaters (E) and skippers (S)

Figure 2. Percentage of males meeting the RDI of selected vitamins and minerals, comparing breakfast eaters (E) and skippers (S)

Figure 3. Breakfast cereal eating and % children and adolescents not meeting 70% RDI.

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