

What children eat during afternoons and evenings: is it important?

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Abstract

Objective: To complete a description of the dietary intakes of New Zealand schoolchildren by describing afternoon and evening foods and nutrients.

Design: Twenty-four hour dietary recall data from the 2002 Children's Nutrition Survey were analysed to describe food and nutrient intakes during the afternoon (14.00 to 16.59 hours) and evening (17.00 to 23.59 hours).

Setting: New Zealand homes and schools.

Subjects: Children (n 2875) aged 5–14 years.

Results: Most children consumed something during the afternoon (79%) and evening (98%). Children were less likely to consume something during non-school day afternoons; if 11–14 years of age; and when of Pacific ethnicity. Afternoon food consumers had higher daily intakes for most nutrients. Afternoon intake accounted for much of this difference. In the afternoon, children consumed fruit (26%) and biscuits/crackers (21%). Evening eating contributed to daily intakes of energy (40%), fat (43%), carbohydrate (35%), sucrose (20%), glucose (24%), vitamin A (47%), Ca (26%) and Fe (40%). Children aged 5–6 years consumed a lower proportion of their daily energy intake during the evening than older children. In the evening, just one-third of children consumed vegetables (45% if including potato/kumara/taro), 19% fruit and 17% ate hot chips. Children were more likely to consume vegetables if they also consumed potato/kumara/taro. Twenty-three per cent of children had powdered drinks/cordials, 21% had soft drinks and 19% had milk.

Conclusions: Consuming foods/drinks in the afternoon positively influenced macronutrient distribution, increasing the carbohydrate proportion. During the evening 40% of energy intake was consumed but less than one-half of children consumed vegetables; thus inclusion of vegetables in the evening is important, particularly in meals without potato/kumara/taro.

Keywords
Adolescents
Children
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Nutrients
Vegetables

The 2002 Children's Nutrition Survey (CNS02) has yielded important data on the nutritional status of New Zealand (NZ) children aged 5–14 years⁽¹⁾ and provides an opportunity to explore food and nutrient intake patterns by time of day. Foods and nutrients consumed by NZ children during breakfast (06.00 to 08.59 hours)⁽²⁾ and school hours (09.00 to 13.59 hours)⁽³⁾ have previously been reported. To summarize, 84% of children consumed some food or beverage at breakfast⁽²⁾, >80% between 09.00 and 11.59 hours and >90% between 12.00 and 13.59 hours⁽³⁾. Eating breakfast was associated with better daily nutrient intakes overall⁽²⁾. Children obtained approximately one-third of their daily nutrient intakes during school hours⁽³⁾. To complete the description of daily intake, the present paper describes the contribution of afternoon and evening eating to NZ children's diets.

The NZ Ministry of Health states that 'children are generally very hungry after school and require a substantial

snack to last them through until the evening meal' and recommends breads and cereals as good snack foods, while keeping 'treat' foods (e.g. snack bars, confectionery, crisps, sweet biscuits and fizzy drinks) for 'special times'⁽⁴⁾. To our knowledge there are no studies of what NZ children actually eat during the afternoon.

An evening meal provides an opportunity to include a greater variety of food groups and particularly to increase vegetable intake. This can contribute significantly to intakes of nutrients that are consumed in smaller amounts at other times of the day. It is also often the only time of the day when children have the opportunity to eat in a family setting.

There is a dearth of comparable data on the food intake of children throughout the day. While literature highlights the role of the family meal in contributing to diet quality^(5,6), descriptive data around the evening food consumption is lacking in New Zealand. Documenting foods and nutrients consumed during the afternoon and evening completes

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a unique picture of children's intakes throughout the day, and provides vital information to inform nutrition policy and identify areas for future targeted interventions.

Methods

The present study is a secondary analysis of the CNS02, a cross-sectional survey of a national sample of NZ children and adolescents aged 5–14 years, carried out during the 2002 school year.

A school-based sampling frame was used with over-sampling of Maori and Pacific children. Of 190 schools sampled from private and state school rolls, 172 (91%) participated. Recruitment from each school was proportionate to the number of students on the school roll. Children from selected schools were assigned to one of three ethnic groups: Maori, Pacific, or New Zealand European and Others (NZEO), with a different probability of selection for each ethnic group based on the ethnic distribution of children from 2001 school rolls. Of the 4728 children invited to participate, 3275 (69%) participated.

Socio-economic status was assigned using the New Zealand Index of Deprivation (NZDep01), which is derived from the residential address of the child and based on eight dimensions of deprivation, including

income, access to a car and living space⁽⁷⁾. NZDep01 designation could not be assigned for 293 children, and BMI category was not available for 125 children, thus data are reported for 2875 children. Regional health ethics committees gave approval for the survey. Details of the survey methodology are described elsewhere⁽¹⁾.

Dietary intake was collected using a computer-assisted three-pass 24 h recall in children's homes. All children under 10 years of age were interviewed in the presence of a parent/caregiver. At interview, the children were asked to recall foods consumed during the previous 24 h. Thus recorded intakes could span part of two consecutive days. In order to designate a day of intake, the date of intake was defined as the day prior to the interview date, if the interview commenced before 14.00 hours. Energy and nutrient intakes were calculated using the NZ food composition database (2002)⁽⁸⁾. Foods consumed were coded into food groups (Table 1) and by time of consumption before calculating prevalence of consumption.

'Consumers' were defined by whether energy intake was greater than zero between 14.00 and 16.59 hours (afternoon) or between 17.00 and 23.59 hours (evening). As food consumption patterns differ between school days and non-school days (day category)⁽⁹⁾, 24 h diet recalls were coded as to whether consumption fell by day category.

Table 1 Food groups

Food group	Examples*
Bread	All types: rolls, pita, bagels, crumpets, sweet buns
Sandwiches	Also, filled: rolls, pita, croissants
Bread-based dishes	Hot dogs, hamburgers, pizza, nachos, kebabs, wontons
Grains/pasta	Rice, pasta and cereal-based dishes (lasagne)
Biscuits/crackers	Plain, coated, filled
Potato/kumara/taro	Mashed, boiled, baked, scalloped, stuffed potatoes and taro roots and stalks (excludes crisps or fried potato)
Hot chips	Fried potato: chips, wedges, hash browns
Vegetables	All vegetables (except potato/kumara/taro), legumes/pulses and dishes
Fruit	Fresh, cooked, canned, dried
Milks	Cow's, soya, flavoured, shakes, powder
Ice cream	Regular, novelty, reduced-fat
Snack foods	Potato crisps, corn chips, vegetable/grain crisps, popcorn, extruded snacks
Nuts/seeds	Also peanut butter, Nutella™, coconut milk/cream
Beef	} All muscle meats, mixed meat-based dishes
Lamb/mutton	
Pork	
Poultry	All muscle and processed meat, mixed meat-based dishes
Fish/seafood	Canned, battered/fingers, shellfish, fish/seafood dishes and products
Egg dishes	Poached, boiled, scrambled, fried, omelettes, self-crusting quiches
Sausage/processed meats	Luncheon, frankfurters, salami, meat loaf/patties; excludes sausage rolls
Pies/sausage rolls	Pastry-based savoury dishes: meat pies, bacon and egg pie, quiche
Cakes/muffins/desserts	Also slices, scones, pancakes, doughnuts, pastries, milk puddings, cheesecake
Powdered drinks†/cordials	Fruit-flavoured
Soft drinks	Carbonated beverages, sports/energy drinks
Hot drinks	Chocolate, cereal beverages; excludes tea/coffee
Savoury sauces, condiments	Gravy-, tomato- and cream-based, cheese sauces, soya and tomato sauce, dressings, chutney, Marmite™
Sugar/jams/syrups	Sugars, syrups, jam, honey, jelly, sweet toppings
Confectionery	Lollies (candy), gum, chocolate, flavoured ice blocks
Butter/margarine	Includes butter/margarine blends, reduced-fat spreads

*A full list of original food groups and items can be found in Parnell *et al.*⁽¹⁾.

†Flavoured sugar sachets, reconstituted with water.

Height and weight measurements were taken at each child's school using portable standardized equipment. The reference cut-off values of Cole *et al.*⁽¹⁰⁾ were used to categorize children as normal weight, overweight or obese based on BMI.

All statistical analyses were carried out using the STATA statistical software package version 10.01 SE (Stata Corp., College Station, TX, USA). Survey commands used sampling weights and primary sampling units (schools) to ensure results are representative of the NZ population, by distribution of age, sex and ethnicity. Multiple linear regression was used to examine the relationships between afternoon or evening consumption and nutrient intakes. Because age, sex, ethnicity, NZDep01, day category and body weight status have been associated with food choices and/or nutrient intakes, these variables were included in the model. Age was treated as a categorical variable (5–6, 7–10 and 11–14 years) and NZDep01 status as quintiles. Adjusted mean nutrient intakes for consumers and non-consumers were estimated based on these models. Similarly, logistic regression was used for estimating the prevalence (95% CI) of consumers of specific food groups during the afternoon and evening, and the likelihood of consuming one food group when consuming another.

Interactions between the demographic variables sex, age, ethnicity and BMI category were also tested in the models. A *P* value <0.05 was considered statistically significant.

Results

Afternoon

During the afternoon 79% of NZ children ate or drank a food or beverage (except water; Table 2). Older children (11–14 years) were less likely to eat/drink in the afternoon than children aged 5–6 years (75% *v.* 81%, OR = 0.68, *P* = 0.038). Pacific children were less like to consume food/drink during the afternoon than NZEO (76% *v.* 83%, OR = 0.68, *P* = 0.016). Children were more likely to eat/drink during the afternoon on a school day than a non-school day (81% *v.* 71%, OR = 1.68, *P* < 0.001). There was no effect of sex, BMI category or NZDep01 category on the likelihood of consuming food/drink during the afternoon.

The mean energy intake during the afternoon was 1298 (95% CI 1243, 1356) kJ (15% of daily energy intake). Afternoon intakes contributed proportionately more carbohydrate (16% of daily carbohydrate intake) than fat (9%) or protein (8%; Table 3).

Table 2 Proportion consuming foods/beverages during the afternoon*: children aged 5–14 years (*n* 2875), 2002 Children's Nutrition Survey, New Zealand

Characteristic	Proportion†	95% CI	OR for afternoon consumption†	<i>P</i> value
All participants, <i>n</i> 2875	0.79	0.77, 0.81		
Age group (years)	5–6, <i>n</i> 601	0.81	0.74, 0.86	
	7–10, <i>n</i> 1264	0.81	0.76, 0.85	0.99
	11–14, <i>n</i> 1010	0.75	0.70, 0.79	0.68
Sex	Male, <i>n</i> 1483	0.79	0.75, 0.82	
	Female, <i>n</i> 1392	0.79	0.75, 0.83	1.00
Ethnicity	NZEO, <i>n</i> 830	0.83	0.77, 0.87	
	Maori, <i>n</i> 1038	0.78	0.74, 0.82	0.75
	Pacific, <i>n</i> 1007	0.76	0.72, 0.80	0.68
Day category	Non-school day, <i>n</i> 614	0.71	0.64, 0.77	
	School day, <i>n</i> 2261	0.81	0.77, 0.84	1.68

NZEO, New Zealand European and Others.

All data adjusted for survey weightings.

*14.00 to 16.59 hours; consumers of water only defined as non-consumers.

†Logistic regression controlled for day category, ethnicity, age, sex, New Zealand Index of Deprivation and BMI classification⁽¹⁰⁾, relative to the first category.

Table 3 Mean intake of selected nutrients during the afternoon*: children aged 5–14 years (*n* 2875), 2002 Children's Nutrition Survey, New Zealand

Nutrient	Mean intake during afternoon†	95% CI	% of daily intake†	95% CI
Energy (kJ)	1298	1243, 1356	15	15, 16
Protein (g)	5.4	5.4, 5.0	8	8, 9
Fat (g)	6.7	6.7, 6.2	9	9, 10
Carbohydrate (g)	43	41, 46	16	16, 17
Sucrose (g)	8.6	8.0, 9.2	15	14, 16
Ca (mg)	60	56, 65	10	9, 11
Fe (mg)	0.8	0.8, 0.8	8	8, 9
Zn (mg)	0.8	0.8, 0.7	9	8, 9

*14.00 to 16.59 hours; consumers of water only are defined as non-consumers.

†Linear regression controlled for ethnicity, age, sex, New Zealand Index of Deprivation, day category and BMI classification⁽¹⁰⁾ and adjusted for survey weightings. Data were log-transformed for skewness, and are presented as geometric means.

The most commonly consumed food groups during the afternoon were: fruit (26%), biscuits/crackers (21%), confectionery (17%), bread (15%), powdered drinks/cordials (15%), snack foods (13%), sugar/jams/syrups (13%), and sandwiches, milk and soft drinks (each 12%; Table 4). In the afternoon, children were less likely to

have fruit if they consumed grains/pasta (OR = 0.54, $P = 0.016$), confectionery (OR = 0.58, $P = 0.013$) or soft drinks (OR = 0.43, $P < 0.001$).

Children who consumed some food/drink during the afternoon had 16% (1152 kJ) higher daily energy intake and 19% higher daily Ca intake (93 mg); total fat intake did not differ between consumers and non-consumers.

Table 4 Proportion of children consuming food groups during the afternoon*: children aged 5–14 years ($n = 2875$), 2002 Children's Nutrition Survey, New Zealand

Food group	Proportion‡	95% CI
Fruit	0.26	0.24, 0.28
Biscuits/crackers	0.21	0.19, 0.24
Confectionery	0.17	0.15, 0.18
Bread	0.15	0.13, 0.16
Powdered drinks/cordials	0.15	0.13, 0.17
Snack foods	0.13	0.11, 0.14
Sugar/jams/syrups	0.13	0.11, 0.14
Sandwiches	0.12	0.11, 0.14
Milk	0.12	0.11, 0.14
Soft drinks	0.12	0.11, 0.14
Butter/margarine	0.11	0.09, 0.12
Cakes/muffins/desserts	0.09	0.08, 0.11
Grains/pasta	0.08	0.07, 0.10

*14.00 to 16.59 hours.

†Food groups that at least 8% of children consumed during the afternoon.

‡Logistic regression controlled for ethnicity, age, sex, New Zealand Index of Deprivation, BMI classification⁽¹⁰⁾ and day category, and adjusted for survey weightings.

Evening

Ninety-eight per cent of children reported they consumed some food or beverage (excluding water) during the evening. Foods and drinks consumed during the evening contributed 40% (2882 (95% CI 2806, 2960) kJ) of children's daily energy intake (adjusted for all covariates; Table 5). Older children consumed a greater proportion of their daily energy intake during the evening than younger children (5–6 years, 36 (95% CI 34, 37)%; 7–10 years, 40 (95% CI 38, 41)%; 11–15 years, 42 (95% CI 41, 43)%; Wald test $F = 18.04$, $P < 0.001$). Relative to this 40% evening energy intake, nutrients consumed during the evening in amounts which exceeded this proportion were: cholesterol, Se, vitamin B₁₂, vitamin A, Zn, protein, niacin, fat, vitamin B₆, vitamin C, vitamin E and Fe. Nutrients for which there was less than 40% of daily intake consumed during the evening were: fibre, riboflavin, folate, carbohydrate, thiamin and Ca.

Table 5 Mean nutrient intake during the evening*: children aged 5–14 years ($n = 2875$), 2002 Children's Nutrition Survey, New Zealand

Nutrient	Mean intake†,‡	95% CI	% of daily intake†,§	95% CI
Energy (kJ)	2882	2806, 2960	40	39, 40
Protein (g)	26	25, 27	47	46, 48
Total fat (g)	25	24, 26	43	42, 44
Total SFA (g)	10	10, 11	43	42, 43
Total PUFA (g)	3	2.5, 2.6	40	39, 41
Total MUFA (g)	8	8.2, 8.8	44	43, 45
Cholesterol (mg)	63	59, 68	54	53, 55
Available carbohydrate (g)	76	73, 78	35	34, 35
Starch (g)	40	38, 42	36	35, 36
Sucrose (g)	8.1	7.3, 9.1	20	19, 21
Glucose (g)	2.4	2.1, 2.6	24	22, 25
Dietary fibre (g)	5.2	5.0, 5.4	38	37, 39
Insoluble NSP (g)	2.6	2.5, 2.8	39	38, 39
Soluble NSP (g)	2.5	2.4, 2.6	37	36, 38
Ca (mg)	150	143, 157	26	27, 29
Fe (mg)	3.3	3.2, 3.5	40	39, 41
Zn (mg)	3.5	3.4, 3.6	47	46, 48
Vitamin C (mg)	14	13, 15	42	40, 43
Vitamin A (µg)	141	131, 152	47	46, 48
Retinol (µg)	49	45, 53	28	37, 40
β-Carotene equivalents (µg)	196	176, 219	52	51, 54
Se (µg)	12	11, 13	49	48, 50
Folate (µg)	55	53, 57	36	35, 37
Total niacin equivalents (mg)	11	10, 11	46	45, 47
Riboflavin (mg)	0.4	0.4, 0.4	37	36, 38
Thiamin (mg)	0.3	0.3, 0.3	33	31, 34
Vitamin B ₁₂ (µg)	0.7	0.6, 0.8	48	46, 49
Vitamin B ₆ (mg)	0.4	0.4, 0.4	43	43, 44
Vitamin E (mg)	2.3	2.2, 2.4	41	40, 42

All data adjusted for survey weightings.

*17.00 to 23.59 hours.

†Linear regression controlled for ethnicity, age, sex, New Zealand Index of Deprivation, day category and BMI classification⁽¹⁰⁾.

‡Data were log-transformed for skewness, and are presented as geometric means.

§Data for Ca, retinol, glucose and sucrose were log-transformed for skewness, and are presented as geometric means of percentage of daily intake.

Table 6 Proportion of children consuming food groups during the evening*: children aged 5–14 years (*n* 2875), 2002 Children's Nutrition Survey, New Zealand

Food group	Proportion†	95% CI
Poultry	0.24	0.22, 0.25
Beef	0.15	0.14, 0.17
Fish and seafood	0.10	0.09, 0.11
Sausage/processed meats	0.10	0.08, 0.11
Eggs dishes	0.05	0.05, 0.07
Pork	0.05	0.04, 0.06
Lamb/mutton	0.05	0.04, 0.06
Pies/sausage rolls	0.04	0.03, 0.05
Potato/kumara/taro	0.30	0.28, 0.32
Grains/pasta	0.28	0.26, 0.30
Bread	0.23	0.21, 0.25
Hot chips	0.17	0.16, 0.19
Bread-based dishes	0.08	0.07, 0.09
Sandwiches	0.05	0.04, 0.06
Vegetables	0.33	0.31, 0.35
Fruit	0.19	0.17, 0.20
Savoury sauces, condiments	0.25	0.23, 0.27
Powdered drinks/cordials	0.23	0.21, 0.25
Soft drinks	0.21	0.19, 0.23
Milk	0.19	0.18, 0.21
Butter/margarine	0.17	0.15, 0.19
Sugar/jams/syrups	0.16	0.14, 0.18
Ice cream	0.13	0.11, 0.15
Confectionery	0.13	0.12, 0.14
Cakes/muffins/desserts	0.12	0.10, 0.14
Biscuits/crackers	0.10	0.09, 0.11
Hot drinks	0.08	0.07, 0.09
Snack foods	0.08	0.07, 0.09

*17.00 to 23.59 hours.

†Logistic regression controlled for ethnicity, age, sex, New Zealand Index of Deprivation, BMI classification⁽¹⁰⁾ and day category, and adjusted for survey weightings.

The most commonly consumed meat/protein food was poultry (24%) followed by beef (15%), fish/seafood (10%) and sausage/processed meats (10%; Table 6). Sixty-five per cent of children consumed an item from the group: beef, lamb, pork, poultry, other meat, sausage/processed meats and fish/seafood.

Commonly consumed starch staples included potato/kumara/taro (30%), grains/pasta (28%), bread (23%) and hot chips (17%). Nineteen per cent of children consumed fruit. Twenty-three per cent of children drank powdered drinks/cordials during the evening and 21% drank soft drinks (42% drank at least one of these sweetened beverages). Milk was consumed by 19% of children. Of children consuming powdered drinks, soft drinks or milk during the evening, few (<7%) consumed more than one kind. Children were more likely to consume soft drinks if they also consumed hot chips (40% *v.* 17%, $P < 0.001$).

Only one-third of children consumed vegetables (excluding potato/kumara/taro) in the evening. Ethnicity was a strong determinant of vegetable consumption (NZEO 43%, Maori 33%, Pacific 24%, $P < 0.001$). If potato/kumara/taro was included in this category (vegetables/potato) then the prevalence of consumption was 45% and the effect of ethnicity was not significant. There was no

association between vegetable consumption and other covariates. Children were more likely to consume vegetables if they also consumed potato/kumara/taro (71% *v.* 16%, $P < 0.001$) or meat (any of poultry, beef, pork, lamb/mutton, sausage/processed meats; 45% *v.* 17%, $P < 0.001$). Children were less likely to consume vegetables during the evening if they consumed hot chips (21% *v.* 35%, $P < 0.001$) or soft drinks (27% *v.* 34%, $P = 0.005$). There was no effect of grains/pasta consumption on the likelihood of consuming vegetables.

Discussion

Previous papers from the CNS02 have reported the proportion of energy obtained before 09.00 hours (16%)⁽²⁾, between 09.00 and 11.59 hours (11%) and between 12.00 and 13.59 hours (20%)⁽³⁾, demonstrating that intake after 14.00 hours exceeds 50% of daily intake. Therefore documenting what is consumed during the afternoon and evening is essential to a full understanding of the daily patterns of NZ children's food choices and nutrient intakes.

It is encouraging that the most frequently consumed food group during the afternoon is fruit. While foods eaten during the afternoon are indeed carbohydrate-rich (e.g. fruit, biscuits/crackers, bread, sandwiches), they do include some treat foods and provide a mean intake of ~1300 kJ. Afternoon eating does not appear to reduce food/beverage intakes at other times of the day, as children who consumed something during the afternoon had 16% higher daily energy intake than children who did not eat during the afternoon (adjusted for all covariates).

The contribution of evening eating to nutrient intakes reflects the types of foods eaten during that period. Evening eating appears to contain more meat than other time periods, and children appear to consume fewer grain products and carbohydrate-rich foods compared with the rest of the day^(2,3). Thus evening eating provides relatively more protein, fat, cholesterol, Fe and Zn than carbohydrate, folate and thiamin, relative to its contribution to daily energy intake.

The distribution of energy intake during the day changes with age. Not only do older children (11–14 years) have a larger proportion of their daily energy intake during the evening than younger children, they are also less likely to consume something during the afternoon. It has previously been shown that older children are less likely to have breakfast⁽²⁾ or to consume foods/beverages during school hours⁽³⁾. This pattern results in a disproportionate amount of the day's food being consumed during the evening, with the need for food in that time period to be nutritionally sound if daily recommendations are to be met.

To ensure appropriate fat composition of children's diets, it is recommended that children eat fried foods only occasionally^(4,11). Seventeen per cent of children consumed hot chips during the evening and this was

associated with less desirable eating habits: children consuming hot chips were nearly half as likely to consume vegetables and 3.25 times more likely to consume soft drinks.

The NZ Ministry of Health Guidelines recommend that school-aged children have at least three servings of vegetables daily^(4,11), but the Dietary Habits section of the CNS02 Survey Report⁽¹⁾ notes that this was achieved by only 57% of children. The evening meal is the most practical time for eating vegetables and vegetable consumption is low at other times^(2,3). The low proportion of evening vegetable consumers (33%, or 45% for vegetables/potato) is of concern, and contributes to the high prevalence of inadequate vitamin A intakes of Maori/Pacific children⁽¹⁾. Vegetable consumption may be underestimated because some are present in meat or grain/pasta dishes; however, children consuming meat or potato/kumara/taro were more likely to also consume vegetables, but consumption of grains/pasta had no relationship with vegetable consumption.

The survey does not identify the causes of low vegetable consumption. In other studies vegetable consumption has been associated with children's preferences⁽¹²⁾, parental consumption, socio-economic status⁽¹³⁾ and the frequency of eating together as a family^(14,15). The high proportion of hot chips consumption may reflect children's and/or parents' preferences, time constraints of meal preparation and cost.

In conclusion, foods consumed during the afternoon are mostly carbohydrate-rich and contribute significantly to NZ children's daily nutrient intakes; fruit is the most popular choice. However, food choices during the evening and the notably low vegetable consumption indicate that improvement is needed. Since vegetables are consumed more often by those eating meat and potato/kumara/taro rather than by those eating hot chips, it appears that a practical and affordable way to maximize vegetable consumption is to include it in the context of a traditional meat, potato and vegetable combination. There is a need to find practical and affordable ways for families, especially those with older children, to include vegetables in lunches, snacks and particularly evening meals.

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