

Snacking Among US Children: Patterns Differ by Time of Day

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ABSTRACT

Objective: Evaluate foods and beverages consumed, and energy and nutrient densities that constitute morning, afternoon, and evening snacking periods among children in the US.

Design: Evaluate snacking behavior using the National Health and Nutrition Examination Survey, 2009–2012.

Participants: Children aged 4–8 and 9–13 years ($n = 3,647$).

Variables Measured: Self-reported foods and beverages reported as snacks were aggregated into morning (0:00–12:00 hours), afternoon (12:00–18:00 hours), and evening (18:00–24:00 hour) snacking periods.

Analysis: Intakes and amounts consumed during different snacking periods were analyzed from per capita weighted averages using SAS 9.2 and SUDAAN software. Statistical differences were detected using Student *t* test for means and chi-square test for prevalence data.

Results: Snacking contributed 25% of daily energy in both age groups, with the morning snacking period contributing the least energy. The most frequently consumed food groups across all snacking periods were water, snacks and sweets, nonalcoholic beverages, milk and dairy, and fruit. Nutrient densities varied among different snacking periods; the morning snack period for 4- to 8-year-olds was the most nutrient dense.

Conclusions and Implications: Snacking is an important contributor to energy and nutrients in children's diets, but foods and beverages selected vary by time of day and age. Modifying snacking choices, especially in the afternoon, could improve the nutritional quality of children's diets.

Key Words: child, snacks, time of day, nutrients, National Health and Nutrition Examination Survey (*J Nutr Educ Behav.* 2016;48:369–375.)

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INTRODUCTION

Snacking between meals is growing in importance as an eating occasion for children across the world.¹ In the US, the percentage of children snacking on any given day has increased from 74% in 1977–1978 to 98% in 2003–2006.² Children ate or drank between meals 2–3 times/d on average, which accounted for 27% of their daily total energy intake in 2003–2006.² Data from the most recent National Health

and Nutrition Examination Survey (NHANES), 2011–2012, showed that approximately 25% of children and adolescents consumed some food or beverage (including water) between meals ≥ 4 times/d.³

There are increasing concerns about the types of foods and beverages, their nutritional quality, and the amount of energy snacking provides, particularly in the US, where childhood obesity is a public health issue. Snacking frequency was positively associated with

energy intake in 9- to 15-year-olds from the greater Boston area, with each snacking occasion contributing an average increase of 9.4% to total energy for the day.⁴ Dessert items (cookies, cakes, pies, bars, ice cream, and gelatin desserts) and sweetened beverages (soft drinks, fruit drinks, and sports drinks) provided the most energy from snacks among 2- to 18-year-olds from 1989–1991 to 2003–2006, with the largest increases over time from salty snack and candy consumption.² The nutritional quality of foods and beverages consumed as snacks is mixed. Relative to their energy contribution, snacks contributed a disproportionately lower proportion of some micronutrients in the diet of children, such as iron, selenium, zinc, and B vitamins, but their contribution to vitamin C was higher.⁵

There is emerging evidence that the consumption of snacks may make different nutrient contributions to the diets of younger children compared

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with the diets of older ones. Snacks were positively associated with increased Healthy Eating Index scores among Boston-area elementary school-age children but not in adolescents, which could be due to decreased consumption of fruit, 100% fruit juice, milk, and milk products as snacks among 12- to 15-year-olds.⁴ A national survey in Mexico found that among young children (aged 2–5 years), fruit was the food most frequently consumed during snacking, whereas for older children (aged 6–11 years), salty snacks were most frequently consumed.⁶ This raises the question of how much snacking behaviors, eg, the foods consumed and nutrients provided by snacks, might differ between younger and older children in a nationally representative sample of the US population.

Recent studies have also shown that the percentages of snack consumers differed between younger and older children at different snacking occasions in a day.^{6,7} Timing of meals has been found to be important in influencing overall energy intake, in which intakes in the morning were associated with a reduction and intakes at night were associated with an increase of total daily energy intake in adults.^{8–10} Late energy intake and evening snacking have also been associated with certain health risks in children, such as obesity and risk for developing metabolic syndrome.^{11,12} The review of Kinsey and Ormsbee¹³ highlighted the importance of meal timing in nutrient intake and metabolism. However, little is known about the characteristics of snacks at different times across a day, which could affect total energy and nutrient intakes. Therefore, a better understanding of types of foods eaten as snacks at different times across the day and their contribution to energy and nutrient intakes among younger and older children is needed. Such data may lead to opportunities of better educating caregivers and children about when they eat each day and what they are consuming as snack foods.

The objective of this analysis was to evaluate the timing of snack consumption (called the snacking period in this study) and the types of foods and beverages that are consumed during morning, afternoon, and evening snacking periods among US children. To get a more complete picture of snacking events, this study also exam-

ined the contribution of snacks to total energy intakes and to nutrient densities for key nutrients during these snacking periods.

METHODS

Data from NHANES 2009–2012 were used for this study. The National Center for Health Statistics Research Ethics Review Board approved all NHANES protocols and each participant provided informed consent before completing any questionnaires or measurements. The secondary data analysis conducted for this study used publicly available NHANES de-identified data and was exempt from further approval from the National Center for Health Statistics Research Ethics Review Board. The NHANES uses a complex, multistage probability sample design that includes a nationally representative sample of the US civilian, all non-institutionalized people living in households.¹⁴ Dietary intake data from 2 nonconsecutive days of 24-hour recalls covering both weekdays and weekends were collected by trained interviewers using the automated multiple-pass method developed by the US Department of Agriculture (USDA).¹⁵ Proxy respondents were used to collect dietary data for children aged ≤ 5 years. Interviews for 6- to 11-year-olds were assisted by proxy. From the age of 12 years, participants reported their own intakes. Data from 3,647 children aged 4–13 years in NHANES 2009–2012 were included in this analysis.

The USDA What We Eat in America food grouping system was applied to classify all foods and beverages consumed into 150 mutually exclusive food categories arranged in 3 hierarchical levels.¹⁶ Day 1 dietary weights were used to calculate the per capita weighted means of foods and beverages consumed as representative of the US population. Snacking was defined by the subject's self-report on meal occasions in the survey questionnaires; time of snack was also recorded. Snacking occasions were categorized into morning, afternoon, and evening snacking periods for snacking events reported between 0:00 and 12:00, 12:00 and 18:00 and 18:00 and 24:00 hours, respectively. All foods and beverages reported as snacks were included in the analysis. For the purposes of food group

analysis and nutrient calculations, multiple eating events were combined by time of day when children reported more than 1 snack within the morning, afternoon, or evening eating periods. For example, if a child reported 2 snacks between 12:00 and 18:00 hours, they would be combined and analyzed as afternoon snacking. Therefore, there were a maximum of 3 possible snacking periods in a day for each subject. To represent meals other than snacks, breakfast, lunch, and dinner were combined and are referred as the meals in this study.

Data were stratified by age into 2 groups (4–8 and 9–13 years) and categorized by snacking periods (morning, afternoon, and evening). Foods and beverages consumed between meals were reported by food categories defined by the USDA. Based on their importance as energy sources and their roles in child health and growth, nutrient densities of selected macro- and micronutrients (ie, protein, fat, sugar, dietary fiber, calcium, sodium, and vitamins C and D) were calculated for each snacking period and expressed as grams, milligrams, or micrograms per 100 kcal. SAS 9.2 (SAS Institute, Inc., Cary, NC, 2008) and SUDAAN 11 (RTI International, RTP, NC, 2012) were used for calculations. Student *t* was used to detect the statistical difference of means (such as mean energy intakes between different snacking periods) and chi-square was used to test prevalence data (such as the percentage of children consuming snacks at different snacking periods) ($P \leq .05$). Bonferroni adjustment was applied to adjust for multiple comparisons.

RESULTS

Distribution of Snacking Periods Among US Children Aged 4–13 Years

Nearly all children (about 96%) reported consuming snacks during at least 1 snacking period on any given day (Table 1). About 45% of children reported snacking during 2 snacking periods a day, whereas only about 25% reported snacks during either 1 or 3 snacking periods per day. No statistically significant differences were found for snacking period frequency between the 2 age groups or between boys and girls. Among

Table 1. Percentage of 4- to 13-Year-Old US Children Consuming Snacks and Distribution of Snacking Periods, From National Health and Nutrition Examination Survey 2009–2012

	Aged 4–8 y			Aged 9–13 y		
	Male n = 1,008	Female n = 909	Total n = 1,917	Male n = 848	Female n = 882	Total n = 1,730
Snacking period count [% (SE)]						
0	4.1 (0.9)	2.6 (0.7)	3.4 (0.7)	5.3 (1.2)	5.2 (1.5)	5.2 (0.9)
1	23.2 (2.1)	25.0 (2.6)	24.0 (1.8)	26.3 (2.0)	25.1 (2.5)	25.7 (1.9)
2	46.4 (2.0)	46.8 (2.5)	46.6 (1.8)	43.5 (2.2)	46.7 (3.0)	45.2 (1.7)
3	26.3 (2.0)	25.6 (2.6)	26.0 (1.7)	25.0 (2.4)	23.0 (3.6)	23.9 (2.2)
Snacking period [% (SE)]						
Morning	48.4 (3.1)	48.1 (3.0)	48.3 (2.2)	44.8 (2.7)	45.9 (3.8)	45.4 (2.4)
Afternoon	78.9 (2.5)	80.7 (1.9)	79.7 (1.5)	75.1 (2.2)	76.3 (2.6)	75.8 (1.8)
Evening	67.6 (3.0)	66.6 (2.0)	67.2 (2.1)	68.1 (2.6)	65.3 (3.2)	66.6 (2.1)
Any period	95.9 (0.9)	97.4 (0.7)	96.6 (0.7)	94.7 (1.2)	94.8 (1.5)	94.8 (0.9)

Table 2. Frequently Reported Foods and Beverages in US Children Aged 4–13 Years: Percent Consumed and Mean Energy Contribution During Each Snacking Period

Snacking Period	Food Group	4–8 y (n = 1,917)		9–13 y (n = 1,730)	
		% Consuming	Per Capita Energy, kcal (SE)	% Consuming	Per Capita Energy, kcal (SE)
Morning	Water ^a	30.4	0 (0.1)	28.4	0 (0.1)
	Snacks and sweets ^b	18.2	28 (2.6)	17.7	32 (3.6)
	Beverages ^c	9.8	12 (2.3)	10.1	16 (3.2)
	Milk and dairy ^d	7.6	11 (1.3)	4.0*	9 (2.2)
	Fruit ^e	5.4	4 (0.7)	4.8	5 (1.1)
Afternoon	Snacks and sweets ^b	56.7	122 (4.7)	48.0*	119 (5.9)
	Beverages ^c	28.1	31 (2.0)	26.4	34 (3.4)
	Water ^a	24.8	0 (0.2)	22.9	0 (0.1)
	Fruit ^e	18.8	16 (1.9)	11.4*	10 (1.1)*
	Milk and dairy ^d	18.6	23 (2.1)	12.7*	18 (2.4)
Evening	Snacks and sweets ^b	38.3	80 (5.2)	41.3	115 (9.2)*
	Water ^a	18.9	0 (0.0)	20.2	0 (0.2)
	Milk and dairy ^d	18.8	27 (4.3)	14.3*	22 (3.5)
	Beverages ^c	17.1	14 (1.1)	20.5*	22 (2.7)*
	Fruit ^e	7.6	6 (0.6)	8.9	7 (1.3)

^aWater includes plain tap and bottled water, carbonated water, and flavored or fortified water; ^bSnacks and sweets include savory snacks (potato chips, tortilla and corn chips, popcorn, and pretzels), crackers, cereal and nutrition bars, sweet bakery products (cakes, pies, cookies, brownies, donuts, sweet rolls, and pastries), candy, and other desserts (ice cream and frozen dairy desserts, pudding, gelatins, ices, and sorbets); ^cNonalcoholic beverages include 100% juice, diet beverages, sweetened beverages (soft drinks, fruit drinks, sports and energy drinks, and nutritional beverages), coffee, and tea; ^dMilk and dairy include milk, flavored milk, dairy drinks, cheese, and yogurt; ^eFruit includes all types of fruits and fruit salads; * $P < .05$ compared with corresponding values in the 4- to 8-year-old group using chi-square test for the percentage and t test for mean comparisons (Bonferroni adjustment was applied).

the 3 snacking periods, the afternoon period was the most popular one reported by 75% to 80% children, followed by the evening period with 65% to 68%. Less than 50% reported having snacks during the morning period.

Foods and Beverages Consumed as Snacks Between Meals

Table 2 lists the most frequently reported foods and beverages consumed as snacks. The major food categories of water, snacks and sweets, beverages (nonalcoholic), milk and dairy, and fruit were among the top 5 food groups consumed in all snacking periods for both age groups, although the order varied. During the morning snacking period, water was the most reported food group, followed by snacks and sweets. In the afternoon and evening snacking periods, snacks and sweets was the most frequently consumed food group for both age groups. Compared with 4- to 8-year-olds, children aged 9–13 years were less likely to consume foods from the milk and dairy category in all snacking periods ($P < .05$). In the afternoon snacking period, the percentage of children consuming fruit or snack and sweet foods was lower among 9- to 13-year-olds compared with 4- to 8-year-olds ($P < .05$). In the evening snacking period, beverage consumption was higher in older children compared with younger ones ($P < .05$). The snacks and sweets group contributed the most energy in all snacking periods across age groups.

Specific subgroups within each major food group category are shown in Table 3. Compared with 4- to 8-year-olds, 9- to 13-year-old children had lower percentages of milk and dairy product consumption, including milk, flavored milk, cheese, and yogurt. The percentage of 9- to 13-year-old children who consumed crackers, 100% juice, and some fruit was also lower than that of 4- to 8-year-olds. Although the percentage of 9- to 13-year-old children who consumed savory snacks and sweetened beverages was not statistically higher than that of 4- to 8-year-olds, these foods contributed significantly more energy they did in the younger child group, which suggests that the older

Table 3. Percentage of Food and Beverage Consumption and Mean Energy Contribution in 4- to 13-Year-Old US Children: Breakdown of Major Food Groups

Main Food Group	Sub-Food Group	4–8 y (n = 1,917)		9–13 y (n = 1,730)	
		%	kcal (SE)	%	kcal (SE)
Snacks and sweets	Sweet bakery products	33.4	80 (4.3)	30.1	92 (7.6)
	Savory snacks	30.5	47 (2.7)	32.9	65 (5.5)*
	Candy	30.0	39 (4.0)	30.2	46 (5.7)
	Other desserts	20.0	32 (3.4)	18.0	42 (5.2)
	Crackers	15.7	25 (3.1)	10.7*	16 (2.4)
Beverages ^a	Sweetened beverages	30.4	38 (2.1)	32.1	52 (4.5)*
	100% juice	13.8	16 (2.4)	6.3*	9 (1.8)
	Coffee and tea	4.0	4 (1.9)	8.2*	10 (2.4)
	Diet beverages	3.0	0 (0.0)	6.5*	0 (0.1)
Milk and dairy	Milk	20.3	25 (1.9)	16.1*	25 (3.6)
	Cheese	11.3	14 (2.4)	7.8*	8 (1.1)
	Flavored milk	6.4	14 (2.7)	2.9*	6 (1.5)
	Yogurt	5.4	6 (1.2)	2.6*	4 (1.0)
	Dairy drinks ^b	1.8	6 (0.5)	1.7	5 (2.1)
Fruit	Apples	9.0	7 (0.8)	8.7	7 (0.9)
	Bananas	6.1	6 (0.6)	3.9*	4 (0.9)
	Citrus fruit	4.9	3 (0.5)	3.7	3 (0.6)
	Grapes	4.6	3 (0.7)	2.7*	2 (0.4)
	Berries	2.9	1 (0.1)	3.2	1 (0.7)

% indicates the percentage of children who reported having snacks; kcal, energy intake per capita.

^aNonalcoholic beverages; ^bDairy drinks and substitutes were included; * $P < .05$ compared with corresponding values in the 4- to 8-year-old group using chi-square test for the percentage and t test for mean comparisons (Bonferroni adjustment was applied).

children increased the amounts consumed of these foods and beverages.

Energy Contribution of Each Snacking Period

On average, snacks contributed 460 and 504 kcal in the 4- to 8-year-old and 9- to 13-year-old groups, respectively, which corresponded to 25% of their daily energy intake in each age group (Table 4). The morning snacking period provided the least energy of the 3 snacking periods (around 3.5% of daily energy intake). In 4- to 8-year-olds, afternoon snacks contributed the most energy ($P < .05$) which was consistent with the high percentage of consumers shown in Table 1. In both age groups, afternoon and evening snacking periods contributed substantially to total energy intake. No statistically significant differences were found between boys and girls.

Nutrient Densities of Snacks Consumed During Different Snacking Periods

The nutrient density of selected nutrients was calculated for each snacking period and for all other meals combined. As shown in Table 5, compared with nutrient densities of other meals, snacks in general were lower in protein, total and saturated fat, vitamin D, and sodium but higher in total and added sugar, and vitamin C ($P < .05$). The densities of calcium and dietary fiber were similar to those of other meals that were at a low level in general compared with dietary intake recommendations. Among the 3 snacking periods, the morning was higher in calcium and vitamin C, and lower in added sugar (for 4- to 8-year-olds) and saturated fat (for 9- to 13-year-olds) ($P < .05$). The afternoon snacking period was lower in calcium and vitamin D, whereas the evening

period was higher in saturated fat ($P < .05$). In the morning, the density of added sugar for 9- to 13-year-old children was higher, and the densities of protein and vitamin D were lower than for 4- to 8-year-old children.

DISCUSSION

Many investigators have evaluated different aspects of child snacking, such as calorie intake from snacks,² snacking location,¹⁷ the influence of the shape of snacks in snacking intake,¹⁸ after-school snack intake,¹⁹ and the quality of snacks in primary and secondary schools.⁴ In this study, snacking behavior during morning, afternoon, and evening snacking periods was examined, with an analysis of the food groups consumed, as well as energy and nutrient intakes provided by snacks during each of these periods. The results from this study provide important insights into snacking which could be used to inform nutrition education programs and promote healthier snacking in children. This study showed that morning, afternoon, and evening snacking periods had distinctive characteristics, with the least energy consumed during the morning. Furthermore, in 4- to 8-year-olds, the morning snacking period provided higher densities of calcium and vitamin C, and a lower density of added sugar, suggesting better nutrient quality.

Data were stratified by age because previous studies^{4,6} suggested that younger and older children have different food patterns. In fact, these results showed that 9- to 13-year-olds consumed more energy from savory snacks and sweetened beverages, whereas more 4- to 8-year-olds reported consuming milk and dairy products and fruit as snacks. There was also a shift from 100% fruit juices to sweetened beverages from younger to older children, similar to findings in Mexico.²⁰ These patterns show that children make less healthy choices about snacking as they approach adolescence. There is no clear explanation for the shift, but it could be influenced by many factors such as influence by parents, peers, media characters, etc.²¹⁻²³ The presence of a parent during proxy-assisted interviews could affect food reporting in both directions, and it is difficult to assess the overall impact.²⁴

Table 4. Energy Contribution From Each Snacking Period Among 4- to 13-Year-Old US Children, From National Health and Nutrition Examination Survey 2009–2012

Snacking Period	Energy Contribution	Aged 4–8 y			Aged 9–13 y		
		All	Male	Female	All	Male	Female
Morning	kcal (SE)	67 (6.0)	69 (9.9)	65 (6.9)	69 (7.4)	76 (8.5)	62 (10.2)
	% EI	3.8	3.8	3.9	3.2	3.3	3.2
Afternoon	kcal (SE)	241 ^{a,c} (7.1)	242 (11.2)	239 (10.0)	234 ^a (9.9)	238 (16.1)	229 (13.2)
	% EI	13.3	12.9	13.8	11.6	11.1	12
Evening	kcal (SE)	152 ^{a,b} (8.4)	162 (12.3)	140 (8.0)	202 ^a (14.3)	229 (24.7)	178 (13.7)
	% EI	8	8.3	7.6	10.2	10.6	9.8
Total	kcal (SE)	460 (9.7)	473 (14.3)	445 (12.3)	504 (17.2)	543 (32.1)	469 (20.2)
	% EI	25.1	25	25.3	25	25.1	25

kcal indicates mean energy intake per capita per day; % EI, percent total energy intake.

The superscript indicates significant differences among snacking periods, ie, $P < .05$ when other snacking periods compared to the corresponding values in: ^amorning, ^bafternoon, and ^cevening snacking period, respectively. Student *t* test was used and Bonferroni adjustment was applied.

Water, including tap water, bottled water, flavored water, and fortified waters, was the most frequently reported food category during snacking periods across both age groups. However, a recent study showed that water consumption in 4- to 13-year-old children was below Institute of Medicine recommendations.²⁵ Thus, it is worth exploring how snacking can be used to improve daily fluid intake.

The researchers also evaluated the nutritional quality of snacks consumed during different snacking periods in this study. Sugar density during snacks was much higher than at other meals regardless of the snacking period, owing to the prevalence of sweet bakery products, sweetened beverages, and candy as popular snacking choices. This is a cause for concern. Sugar consumption was associated with hypertension and body weight gain in a recent meta-analysis of randomized controlled trials in adults.²⁶ In children, added sugar had a positive association not only with body weight gain^{27,28} but also with childhood cardiovascular disease risk factors.²⁹ A positive association between sugar intake and the risk of prehypertension and prediabetes was seen in Chinese children.³⁰ The reduction of added sugar is therefore an important public health goal. Although sodium density during snacks was lower than at meals, salt reduction should still be targeted because US children have excessive daily total sodium intake.³¹

The choice of foods and beverages consumed during snacking can influ-

ence both dietary patterns and nutrient intakes. Interventions to improve snacking quality can be effective in the school setting, as shown in a pilot intervention study with Canadian First Nation students to increase calcium and vitamin D intake.³² Children increased their intake of calcium after a week of the intervention but failed to sustain it at 1 year, which suggests the importance of longer-term nutrition education programs as well as the involvement of parents.³³

The NHANES is a cross-sectional survey; as such, it provides a descriptive snapshot of child snacking habits in the US. A major limitation of cross-sectional studies is that they are unable to establish causal relationships between diet and health: for example, the energy consumed or food choices during each snacking period and health outcomes. These surveys rely on self-reported dietary data. Although children at age in this study were assisted by proxies, misreporting still could have occurred, which would have affected the accuracy of intake assessment. Snacking foods and beverages were analyzed at the major and intermediate levels of What We Eat in America food categories in the current study; more information on specific foods and beverages would be useful. In addition, there are no specific dietary guidelines for the number, composition, or timing of snacks. The lack of guidelines or dietary intake recommendations for snacking makes it difficult to assess the nutritional impact of snacks eaten during each snacking period.

IMPLICATIONS FOR RESEARCH AND PRACTICE

This study takes a first step toward considering the quality of snacks and food groups consumed during morning, afternoon, and evening snacking periods in children. Snacking is a major contributor to total energy intake in US children aged 4 to 13 years, with approximately 25% of total calories now coming from snacks. Results from this study show that not all daily snacking periods are the same, and that education about the number of times children eat during the day, along with the nutrient quality of the snacks they select, is warranted.

Some of the good habits of younger children, such as milk, cheese, and fruit consumption during snacks, could be emphasized so that these habits could be continued among older children. By looking at which food groups are consumed at different times, targets for improvement can be tailored to foods children are already eating. For example, snacking could be an opportunity to increase water intake and promote intakes of fruit, milk, whole grains, and fiber-containing foods. Replacement of current snacks with nutrient-dense foods could lower the risks of excessive intakes of sugar and sodium and could increase the consumption of nutrients such as calcium and fiber that are inadequately consumed among children.³¹ Reducing sweetened beverage intake at

Table 5. Nutrient Density at Different Snacking Periods Among 4- to 13-Year-Old US Children, From National Health and Nutrition Examination Survey 2009–2012

	Age	Meals		Morning		Afternoon		Evening	
		n		n		n		n	
	4–8 y	1,916		607		1,439		1,140	
	9–13 y	1,728		442		1,169		1,031	
		Mean	SE	Mean	SE	Mean	SE	Mean	SE
Protein	4–8	4.0	0.0	2.2 ^a	0.1	1.9 ^a	0.1	2.3 ^{a,c}	0.1
	9–13	4.1	0.1	1.6 ^{a,d}	0.1	2.0 ^a	0.1	2.1 ^a	0.1
Fiber	4–8	0.8	0.0	0.9	0.1	0.8	0.0	0.7	0.1
	9–13	0.8	0.0	1.1	0.2	0.8	0.0	0.7	0.0
Total fat	4–8	3.7	0.0	2.7 ^a	0.2	3.0 ^a	0.1	3.0 ^a	0.1
	9–13	3.6	0.0	2.2 ^a	0.2	3.0 ^{a,b}	0.1	3.1 ^{a,b}	0.1
Saturated fat	4–8	1.3	0.0	1.0 ^a	0.1	1.0 ^a	0.0	1.2 ^{b,c}	0.0
	9–13	1.3	0.0	0.7 ^a	0.1	1.0 ^{a,b}	0.0	1.2 ^{b,c}	0.1
Total sugar	4–8	5.9	0.1	10.6 ^a	0.5	10.4 ^a	0.2	10.7 ^a	0.3
	9–13	5.5 ^d	0.1	12.2 ^a	0.5	9.6 ^{a,b}	0.3	10.9 ^{a,b}	0.4
Added sugar	4–8	3.1	0.1	5.1 ^a	0.4	6.5 ^{a,b}	0.3	6.7 ^{a,b}	0.4
	9–13	3.3	0.1	7.8 ^{a,d}	0.4	6.5 ^{a,b}	0.3	7.4	0.3
Calcium	4–8	61.7	1.3	91.7	15.0	42.9 ^{a,b}	1.9	61.3 ^c	4.4
	9–13	56.9 ^d	1.1	62.2	7.5	48.4	5.2	49.9	4.3
Sodium	4–8	172.0	1.9	123.1 ^a	15.9	96.0 ^a	2.6	90.3 ^a	4.1
	9–13	181.6 ^d	2.1	95.0 ^a	9.0	128.9 ^a	16.5	91.3 ^{a,c}	3.6
Vitamin C	4–8	4.3	0.2	14.8 ^a	2.8	7.1 ^{a,b}	0.6	10.1	2.9
	9–13	3.7	0.2	9.4 ^a	1.9	5.6 ^a	0.5	6.8 ^a	0.7
Vitamin D	4–8	0.4	0.0	0.3 ^a	0.0	0.2 ^{a,b}	0.0	0.4 ^c	0.0
	9–13	0.3 ^d	0.0	0.2 ^{a,d}	0.0	0.2 ^a	0.0	0.2 ^a	0.0

Mean indicates the mean nutrient density, expressed as g/100 kcal for protein, fiber, and total and saturated fat, total and added sugar; as mg/100 kcal for calcium and sodium; and as μg /100 kcal for vitamins C and D.

$P < .05$ compared with the corresponding indicators; ^aCompared with meals in the same age group; ^{b,c}Compared with the morning and afternoon snacking periods in the same age group, respectively; ^dCompared with the same snacking period in the 4- to 8-year-old group.

even 1 snacking period during the day could reduce overall calorie and added sugar intake without forbidding consumption all together. Education of children and caregivers should target foods to promote when children express hunger between meals, in addition to foods that should be limited between meals. Longitudinal and intervention studies are needed to address the health impact of snacking; and further investigation into the potential sociodemographic interaction with snacking will also provide insight into how to use this occasion to balance children's diets to meet their nutritional needs and develop healthy dietary habits.

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CONFLICT OF INTEREST

The authors have not stated any conflicts of interest.