

## Current Research

## Nutrient Intakes and Food Patterns of Toddlers' Lunches and Snacks: Influence of Location

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**ABSTRACT**

**Objective** To describe nutrient intake and food patterns of lunches and snacks eaten at various locations by US toddlers.

**Design** A national, cross-sectional telephone survey in which mothers and primary caretakers reported toddlers' food and beverage intake for a 24-hour period.

**Subjects** Toddlers (n=632), aged 15 to 24 months, a subset in the 2002 Feeding Infants and Toddlers Study.

**Analyses** Means±standard errors of the mean, percentages, *t* tests of mean differences, mean energy and nutrient intake, and nutrient density of toddlers' lunches and snacks.

**Results** Overall, on any given day, 42.6% of toddlers consumed all meals and snacks at home, 8.1% consumed any meal or snack at day care (and others at home), and 49.3% consumed any meal or snack away from home (all other locations excluding day care). Mean energy intake at lunch ranged from 281 kcal at home to 308 kcal away from home to 332 kcal at day care. There were no significant differences in mean macronutrient intake or fiber intake across locations, but lunches eaten at day care were significantly higher in calcium, phosphorus, magnesium, vitamin D, potassium, and riboflavin compared with those eaten at home or away ( $P<.05$ ). Mean *trans* fat intake was significantly ( $P<.01$ ) lower for lunches consumed at home compared with away from home. For lunches consumed at away locations, the most frequently consumed item, by 35% of toddlers, was french fries.

Carbonated beverages were consumed at away lunches by 16% of toddlers, compared with 3% at home and none at day care. Morning snacks provided 124 to 156 kcal and afternoon snacks provided from 139 to 170 kcal, depending on the location. Foods typically eaten at morning snacks for all locations were water, cow's milk, crackers, and 100% juice. Beverages frequently consumed at afternoon snacks were water, whole cow's milk, fruit-flavored drinks, and 100% apple juice. The most frequently consumed foods for an afternoon snack at home or day care were crackers or non-baby food cookies.

**Conclusions** Nutritious choices such as milk, fruits, vegetables, and whole grains need to be encouraged in a variety of forms to give toddlers an opportunity to build broader food preferences for life. The consumption of milk at home and other locations, such as restaurants and friends' homes, needs to be encouraged in place of fruit-flavored drinks or other sweetened beverages. For lunches at home, parents may be especially receptive to suggestions about appropriate and easy-to-serve foods, homemade or commercial, for a toddler's lunches and snacks. Day-care providers should be encouraged to use menu planning aids, such as those available from the US Department of Agriculture, even if they are not regulated by a government program.

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Statistics on Americans' eating away from home habits show that in 1970 a quarter of total food spending was away from home, and that had increased to 40% by 1995 (1,2). Furthermore, by 2020 away-from-home food expenditures are projected to increase 27.5% compared with 24.3% for at-home food expenditures (3). Numerous factors have contributed to the increased prevalence of eating away from home, including growing numbers of working women and single parents, more affordable and convenient retail food outlets, and increased advertising and promotion by companies (4).

National nutrition surveys show that between the 1970s and the 1990s, fast-food consumption and consumption of prepared foods from grocery stores increased among all population subgroups; among women and young children, consumption of these foods increased by 50% (5). The increasing trend of restaurant meals and fast foods has been associated with poorer nutrition quality, namely higher intakes of total energy, fat, saturated fat, total carbohydrate, added sugars and sodium, and lower intakes of vitamins A and C (5-8). In the late 1990s, fast foods were consumed on any given day by 42% of children, and were associated with a higher intake of

carbonated sweetened beverages and a lower intake of milk, fruits, and vegetables (6,7).

In addition, US families' demand for child care and preschooling has gained broader public attention in recent years. Between 1950 and 1990, the percentage of mothers with preschool-aged children who were employed outside the home increased from 14% to 58% (9). Children aged 3 to 5 years spend an average of 19 hours per week in the care of a nonparent adult. More than one half of all infants and toddlers spend some time in the care of a nonparent provider before reaching age 12 years (9). In 2001, 63% of married women with infants and preschoolers were employed outside the home, and employment rates were even higher for single women (10). Only a small number of studies have investigated maternal employment and young children's dietary status, outside of breastfeeding initiation and duration. A review of the literature by Crepinsek and Burstein (10) found little evidence that maternal employment and the diets of preschoolers aged 2 to 5 years were correlated. One study found that fast-food consumption was higher among children whose mothers worked, and another found that child overweight was associated with maternal employment; however, study findings have been inconsistent with respect to maternal employment and diet quality (10).

Food assistance programs such as the Child and Adult Care Food Program (CACFP) and the Special Supplemental Nutrition Program for Women, Infants, and Children contribute to the dietary intake and food patterns of working mothers' infants and toddlers. About 2.6 million children receive meals and snacks through the CACFP each day through child-care centers and family or group day-care providers (11,12). The US Department of Agriculture provides guidelines for child-care meal patterns (ie, specific food types and amounts) for CACFP reimbursable meals and snacks (13).

Evidence from longitudinal studies show that younger children's eating patterns, in terms of dietary variety, food preferences, snacking patterns, nutrient intakes, and fruit and vegetable consumption, track over periods of up to 6 years (14-19). The 2002 Feeding Infants and Toddlers Study (FITS) found that meal (breakfast, lunch, and dinner) and snack patterns emerged at age 7 to 8 months and were well established by age 9 to 11 months (20). National nutrition surveys have found that the number of daily snacks eaten by children aged 2 to 5 years increased from 1.7 in 1977 to 2.3 in 1996, and the average daily energy intake from snacks increased by about 100 kcal (21,22). Foods eaten between meals (ie, snacks) by preschool-aged children tend to be lower in nutrient density than foods eaten at meals (22,23).

Increases in the consumption of foods eaten away from home, fast foods, and snacks among young preschool-aged children, coupled with the development of eating patterns at an early age, have raised concerns about diets and the risk of overweight among toddlers and young children. No studies comparing the food and nutrient patterns of toddlers' meals and snacks eaten at home to those eaten at other locations were found in the recent literature. The purpose of this study, therefore, was to examine food and nutrient intakes at lunch and morning and afternoon snacks eaten at home, or at other locations, among tod-

dlers aged 15 to 24 months who participated in the 2002 FITS.

## METHODS

This study includes a subset (632 children aged 15 to 24 months) of children in FITS, a cross-sectional national survey of children aged 4 to 24 months. The recruitment of subjects, the sampling frame, the data collection process, and nutrient analyses have been previously described (24,25) and are briefly summarized here. All data collection instruments and procedures were reviewed and approved by the Institutional Review Board compliance officer and quality assurance system at Mathematica Policy Research, Inc (Princeton, NJ).

Mothers (or other primary caregivers) provided a 24-hour dietary recall by telephone. A subsample of the population also received a second 24-hour dietary recall for the assessment of usual nutrient intake, but this analysis is based on the day 1 dietary recall interview available for the full sample. Interviewers asked parents (or the most knowledgeable adult) about all foods and liquids that the child consumed from midnight through midnight on the previous day. The dietary recall recorded the use of vitamin and mineral supplements as well as other dietary supplements; however, this particular analysis excludes supplements from the nutrient estimates because our emphasis is on foods.

Trained interviewers used a special protocol when the parent was unable to provide information about foods their child ate while under the care of someone else (25). At the end of the 24-hour dietary recall interview, interviewers asked the respondent if they could contact the day-care provider to complete the recall, or obtained permission for the interviewer to contact the provider. Respondents were instructed about what information to gather (such as needed food detail and using the portion size visual aid) and a specific time for a call back was established. In the majority of cases, mothers or the caregivers/respondents called the day-care provider to obtain the missing food information. This protocol for day-care providers was pilot tested and proven to be effective in completing the 24-hour dietary recalls.

As part of the 24-hour dietary recall protocol, mothers or other respondents were asked the time and location of each eating occasion and if they considered it a breakfast, lunch, dinner, snack, or other eating occasion. Snacks were then further categorized by researchers as morning snack (waking until noon or lunch), afternoon snack (noon or lunch until 6 PM), and evening snack (from 6 PM or dinner to bedtime). Other eating occasions were those that mothers did not consider either a meal or a snack, such as night feedings and between-meal feedings of breast milk or formula, but occasionally included other foods.

For this analysis, the locations of each eating occasion on the 24-hour recall were categorized into three groups: home, ate all meals and snacks on the day of the recall at home (n=264); day care, ate one or more meal or snack at day care on the day of the recall, and the rest of the meals and snacks at home (n=53); and away, ate any meal or snack on the day of the recall at another location (n=315). Other locations away from home or day care included eat-in or take-out restaurants, fast-food outlets, delis,

cafeterias, a friend's house, store, or in the car. This categorization was first used to look at the overall characteristics of toddlers who consumed all of their meals at home vs at another location, and then used to assess lunch- and snack-specific intake. FITS defines location in terms of where the food was consumed, not necessarily the source of the food or where the food was obtained or purchased. For example, if a parent or caregiver purchased food at a fast-food restaurant and fed it to the child at home, that meal would be categorized as home in this analysis. Similarly, food brought from home and consumed at day care would be categorized as day care. The majority of the group (85%) that consumed at least one meal or snack at an away location consumed their other meals and snacks at home. About 10% of the away group, or 5% of the entire sample, also consumed at least one meal or snack at day care (results not shown).

The three location categories were also used for the meal- and snack-specific analysis. We determined that there were sufficient sample sizes to report intake by location for three eating occasions: the morning snack, lunch, and the afternoon snack. Because toddlers were classified by location for each eating occasion, a toddler may have been included in different location subgroups throughout the day. For example, a toddler may have consumed a morning snack at home, lunch away from home, and an afternoon snack at day care. Among the sample of 15- to 24-month-old children, 50% consumed their morning snack at home ( $n=316$ ), 8% at day care ( $n=48$ ), and 16% away from home or day care ( $n=100$ ). Sixty percent of the sample consumed lunch at home ( $n=381$ ), 11% at day care ( $n=67$ ), and 24% away ( $n=151$ ). Five percent did not consume lunch on the day of the 24-hour recall. Sixty-one percent of toddlers consumed an afternoon snack at home ( $n=383$ ), 9% at day care ( $n=58$ ), and 21% away ( $n=134$ ).

This article focuses on absolute nutrient intakes and nutrient density, excluding dietary supplements, at lunch and morning and afternoon snacks by location. Each child's energy and nutrient intakes, percentages of energy from macronutrients, and nutrient densities at each eating occasion were computed; group means  $\pm$  standard errors were calculated for the three eating occasions by location. Nutrient density (ie, grams, milligrams, or micrograms of intake per 1,000 kcal food energy at the eating occasion level) was calculated to assess diet quality and the relationship of food consumption to dietary intake at the lunch and snack level.

Statistical Analysis Software (version 8.2, 2001, SAS Institute, Inc, Cary, NC), was used to create the data files and analytic variables; SUDAAN (version 9.0, 2004, Research Triangle Institute, Research Triangle Park, NC), which correctly takes into account the complex design and sampling weights, was used to calculate means and standard errors. Because FITS used a complex survey design, SUDAAN was needed to calculate the correct variance estimates and standard errors. SUDAAN was also used to calculate the  $F$  statistics for the overall location comparisons and the individual  $t$  statistics, which used the Bonferroni adjustment, for the characteristics of toddlers and for the nutrient intake and density (26). We compared mean intakes and reported the significance of the overall location and the two-way location

comparisons at the .05 and the .01 levels of probability. To better understand the observed differences in nutrient patterns by location, we calculated the weighted percentage of toddlers who consumed any amount of specific foods at lunch and at morning and afternoon snacks. All reported foods were first categorized by major food group (meats; fruits; vegetables; grains; mixed dishes; sweets and sweetened beverages; and other, which included foods such as margarine and butter). Next, subcategories were created within each major category (eg, meats were further categorized as beef, chicken, pork, and baby food meat). For some categories, additional specificity was necessary to identify the food items (27). The percentage of toddlers who consumed a particular food at a meal/snack and location were calculated and ranked in descending order of frequency. We report the percentage of toddlers who consumed a particular food item at lunch and morning and afternoon snacks for frequencies of 5% or higher. These percentages are listed in rank order and represent the most frequently consumed foods by toddlers on any given day at a particular lunch or snack location.

## RESULTS

We first classified toddlers by eating location based on the entire day's intake, to compare demographic and socioeconomic characteristics of the subgroups (Table 1). Among toddlers aged 15 to 24 months, 42.6% consumed all of their meals and snacks at home on the day of the recall, 8.1% consumed at least one meal or snack at day care, and the remainder (49.3%) consumed at least one meal or snack away from home and day care.

Characteristics significantly related to meal location patterns included mothers' current work status, annual household income, and the proportion with incomes below 185% of the federal poverty level. Toddlers who consumed at least one meal at a day care had a significantly higher percentage of mothers who worked (87%) compared with toddlers who consumed all of their meals and snacks at home (54%;  $P<.01$ ) and those who consumed at least one meal or snack away from home or day care (59%;  $P<.01$ ). Annual household income was significantly lower among the home consumers (\$50,341) compared with the away consumers (\$57,575;  $P<.05$ ). A significantly higher percentage of home consumers had a low income (defined as at or below 185% of the federal poverty level, or the household income cutoff for the Food Stamp Program) (35%) compared with the day care consumers (15%;  $P<.05$ ) and the away consumers (18%,  $P<.01$ ). There were no significant differences between the three eating location groups regarding the percentage of toddlers who were first born, ever breastfed, or had participated in the Special Supplemental Nutrition Program for Women, Infants, and Children; the toddlers' geographic location or race/ethnicity; or the mothers' mean age, education level, or marital status.

Toddlers' mean energy, macronutrient, and micronutrient intakes at the morning snack, lunch, and the afternoon snack are shown by location in Table 2. Mean intakes and nutrient density of energy, carbohydrate, fiber, iron, and vitamin E did not differ significantly by location. Mean energy intake at lunch ranged from 281 kcal at home to 308 kcal away from home to 332 kcal at day care (not significant). Based on mean intake, lunches

**Table 1.** Child and maternal/household characteristics by meal location of toddlers aged 15 to 24 mo participating in the 2002 Feeding Infants and Toddlers Study<sup>a</sup>

Characteristic	Home (n=264, 42.6%)	Day care (n=53, 8.1%)	Away (n=315, 49.3%)
	←————— percent characteristics ± SEM <sup>b</sup> —————→		
<b>Child characteristics</b>			
Ever breastfed	75.7 ± 2.90	65.5 ± 8.00	74.6 ± 2.90
First born	53.7 ± 3.50	64.3 ± 7.70	61.4 ± 3.10
Hispanic	14.3 ± 2.50	7.5 ± 3.60	13.7 ± 2.50
African American, non-Hispanic	7.0 ± 1.90	12.2 ± 4.70	5.3 ± 1.50
White, non-Hispanic	78.8 ± 3.00	80.3 ± 5.70	81.0 ± 2.70
Child receiving WIC <sup>c</sup>	24.9 ± 3.20	18.5 ± 5.70	16.0 ± 2.50
<b>Maternal/household characteristics</b>			
Mean age of mother (y)	31.0 ± 0.53	29.4 ± 0.83	30.3 ± .40
11th Grade education or less	7.0 ± 1.60	3.6 ± 2.40	6.5 ± 1.90
Completed college	35.3 ± 3.30	33.9 ± 7.00	44.5 ± 3.20
Mean annual income (\$)	50,341 <sup>de*</sup> ± 2,065.5	62,042 ± 5,499.0	57,575 ± 1,773.7
Income is 130% or less than FPL <sup>f</sup>	14.8 ± 3.00	5.7 ± 4.00	7.5 ± 1.90
Income is 185% or less than FPL	35.3 <sup>de**g*</sup> ± 3.90	15.4 ± 5.70	17.5 ± 2.60
Married	80.6 ± 2.80	75.5 ± 7.10	85.3 ± 2.40
Mother currently working	54.3 <sup>dgh**</sup> ± 3.50	87.1 ± 5.00	59.0 ± 3.20
Rural	18.7 ± 2.80	21.4 ± 7.00	17.7 ± 2.40
Urban	47.1 ± 3.50	49.6 ± 7.90	45.7 ± 3.20

<sup>a</sup>Estimates and percentages of the population in the home (ate all meals/snacks at home on the day of the recall), day care (ate any meal/snack at day care and the rest at home on the day of the recall), and away (ate any meal/snack at an eat-in or take-out restaurant, deli, cafeteria, friend's house, or other location on the day of the recall) groups are weighted.

<sup>b</sup>SEM=standard error of the mean.

<sup>c</sup>WIC=Special Supplemental Nutrition Program for Women, Infants, and Children.

<sup>d</sup>Mean difference by overall location.

<sup>e</sup>Home vs away.

<sup>f</sup>FPL=federal poverty level.

<sup>g</sup>Home vs day care.

<sup>h</sup>Day care vs away.

\**P*<.05.

\*\**P*<.01.

†Represents a statistic with a coefficient of variation of 30% or higher.

eaten at day care were significantly higher in nutrients for some important nutrients, including calcium, phosphorus, magnesium, vitamin D, potassium, thiamin, riboflavin, pantothenic acid, and folate compared with those eaten at home or away (*P*<.05). Mean *trans* fat intake was significantly (*P*<.01) lower for lunches consumed at home compared with those consumed away. Mean fiber intake at lunch ranged from 2.1 g at home to 2.9 g at day care, and was not statistically different across locations.

Overall, morning snacks provided 124 to 156 kcal and afternoon snacks provided from 139 to 170 kcal, depending on the location (Table 2). Mean intakes of morning snacks consumed at home were significantly higher in protein; saturated fat; cholesterol; potassium; calcium; phosphorus; magnesium; vitamins A, C, and B-12; thiamin; riboflavin; pantothenic acid; folate; and zinc, compared with morning snacks consumed away. Morning snacks consumed at home were significantly lower in *trans* fat compared with morning snacks consumed away from home or at day care. Mean intakes of afternoon snacks consumed at home were significantly higher in zinc, thiamin, pantothenic acid, and vitamins B-6 and

B-12 than those consumed at day care. We also compared nutrient density of morning and afternoon snacks and lunches by location and found no significant differences in the macronutrient densities by location (Table 2). In general, the findings for nutrient densities across locations corresponded to those for mean absolute intakes. *Trans* fat density was lower at morning snacks consumed at home compared with those consumed at day care and away, and higher at lunches consumed away than those consumed at home or at day care. Location was most related to nutrient densities at the morning snack, in which morning snacks consumed at home had a significantly higher nutrient density for potassium; calcium; phosphorus; magnesium; vitamins B-6, B-12, C, D, and K; and riboflavin, compared with morning snacks consumed away or at day care. Nutrient densities at lunch were most different between day care and away locations. Densities for calcium, phosphorus, magnesium, vitamin D, and folate were significantly lower at away locations compared with lunches consumed at day care. There were no significant differences in the nutrient densities of afternoon snacks, with the exception of vitamin B-6, which

**Table 2.** Toddlers aged 15 to 24 months participating in the 2002 Feeding Infants and Toddlers Study (n=632) mean±standard error of the mean (SEM) for intake of energy, macronutrients, fiber, minerals, and vitamins by location<sup>a</sup>

<b>Nutrient</b>	<b>Home Mean±SEM</b>	<b>Day care Mean±SEM</b>	<b>Away Mean±SEM</b>	<b>P value for intake</b>	<b>P value for density</b>
<b>Energy (kcal)</b>					
Morning snack	146±5.8	156±17.7	124±9.4		
Lunch	281±8.8	332±25.4	308±13.9		
Afternoon snack	170±9.2	139±11.0	148±12.0		
<b>Carbohydrate (g)</b>					
Morning snack	23±1.0	26±3.0	20±1.8		
Lunch	35±1.2	40±2.8	39±2.3		
Afternoon snack	27±1.4	24±2.4	24±2.2		
<b>Protein (g)</b>					
Morning snack	4±0.3	4±0.6	3±0.3	bc**	
Lunch	12±0.5	14±1.1	13±0.7		
Afternoon snack	4±0.3	3±0.4	3±0.4	bd*	
<b>Total fat (g)</b>					
Morning snack	4±0.3	5±0.7	4±0.7		
Lunch	11±0.5	13±1.6	12±0.6		
Afternoon snack	6±0.4	4±0.4	4±0.5	bd*	
<b>Saturated fat (g)</b>					
Morning snack	2.1±0.15	1.7±0.27	1.5±0.20	bc*	
Lunch	4.4±0.22	6.0±0.75	4.3±0.24		
Afternoon snack	2.3±0.18	1.5±0.22	1.9±0.22	bd*	
<b>Trans fat (g)</b>					
Morning snack	0.32±0.03	0.58±0.09	0.51±0.07	b**d*c*	bdc**
Lunch	0.65±0.05	0.88±0.14	1.15±0.11	bc**	bce**
Afternoon snack	0.45±0.04	0.42±0.05	0.47±0.05		
<b>Cholesterol (mg)</b>					
Morning snack	12±1.2	10†±3.5	5±1.1	bc**	
Lunch	34±2.3	38±3.9	33±2.5		
Afternoon snack	11±1.0	6±1.2	10±1.5	b*d**	
<b>Fiber (g)</b>					
Morning snack	0.8±0.07	0.9±0.17	0.7±0.08		
Lunch	2.1±0.11	2.9±0.29	2.2±0.18		
Afternoon snack	1.0±0.08	0.8±0.11	0.8±0.11		
<b>Sodium (mg)</b>					
Morning snack	127±9.0	160±34.2	119±14.2		b*
Lunch	512±23.3	599±59.6	530±30.1		
Afternoon snack	174±13.7	137±22.7	129±13.9		
<b>Potassium (mg)</b>					
Morning snack	248±12.8	201±28.1	153±17.1	bc**	bc**d*
Lunch	395±14.3	494±28.3	423±25.4	bd**	
Afternoon snack	241±15.2	195±20.7	214±25.9		
<b>Iron (mg)</b>					
Morning snack	0.8±0.08	1.1±0.21	0.7±0.08		
Lunch	1.7±0.10	2.0±0.15	1.7±0.10		
Afternoon snack	0.8±0.06	0.7±0.08	0.7±0.07		
<b>Zinc (mg)</b>					
Morning snack	0.6±0.04	0.7±0.13	0.4±0.06	bc*	
Lunch	1.4±0.06	1.7±0.15	1.5±0.10		
Afternoon snack	0.6±0.05	0.4±0.05	0.5±0.05	bd*c*	
<b>Calcium (mg)</b>					
Morning snack	115±8.6	80±16.8	66±11.5	bc**	b**d*c*
Lunch	164±8.8	228±21.6	149±12.5	be**d*	be*
Afternoon snack	103±8.9	83±11.9	85±11.2		
<b>Phosphorus (mg)</b>					
Morning snack	103±7.0	83±13.3	64±8.4	bc**	bd*
Lunch	199±8.2	257±19.8	194±11.4	bde*	be**
Afternoon snack	100±7.5	77±10.4	79±9.4		
<b>Magnesium (mg)</b>					
Morning snack	21.4±1.15	18.8±2.49	14.2±1.32	bc**	bd**
Lunch	38.4±1.45	46.8±2.89	37.7±2.02	bde*	be*
Afternoon snack	21.0±1.39	16.8±1.83	17.9±1.88		

(continued)

**Table 2.** Toddlers aged 15 to 24 months participating in the 2002 Feeding Infants and Toddlers Study (n=632) mean±standard error of the mean (SEM) for intake of energy, macronutrients, fiber, minerals, and vitamins by location<sup>a</sup> (continued)

Nutrient	Home Mean±SEM	Day care Mean±SEM	Away Mean±SEM	P value for intake	P value for density
<b>Vitamin C (mg)</b>					
Morning snack	15±1.5	13±3.1	8±1.7	bc**	bc**
Lunch	16±1.2	20±3.4	15±1.7		
Afternoon snack	14±1.4	14±2.9	14±2.7		
<b>Vitamin E (mg)</b>					
Morning snack	0.4±0.04	0.4±0.09	0.3±0.04		
Lunch	0.8±0.04	0.8±0.08	1.0±0.07		
Afternoon snack	0.6±0.06	0.4±0.07	0.4±0.05		
<b>Vitamin A (μg RAE<sup>f</sup>)</b>					
Morning snack	61±8.2	50±10.1	32±7.6	bc*	
Lunch	95±6.1	129±14.1	94±14.0		
Afternoon snack	51±5.2	36±7.9	55±8.8		
<b>Vitamin K (μg)</b>					
Morning snack	2.4±0.21	3.9±0.55	3.0±0.34	bd*	bc**d*
Lunch	7.3±0.69	8.9±1.35	17.5†±9.98		
Afternoon snack	3.3±0.22	2.8±0.42	4.0±0.96		
<b>Vitamin D (μg)</b>					
Morning snack	0.8±0.07	0.5±0.13	0.3±0.07	bc**	bc**
Lunch	0.9±0.06	1.4±0.15	0.9±0.11	bde*	be*
Afternoon snack	0.6±0.06	0.4±0.09	0.5±0.08		
<b>Thiamin (mg)</b>					
Morning snack	0.1±0.01	0.1±0.02	0.1±0.01	be**c*	
Lunch	0.2±0.01	0.3±0.02	0.2±0.02	bd*	
Afternoon snack	0.1±0.01	0.1±0.01	0.1±0.01	bd*	
<b>Riboflavin (mg)</b>					
Morning snack	0.2±0.01	0.2±0.03	0.1±0.01	bc**e*	bc**
Lunch	0.3±0.01	0.4±0.03	0.3±0.02	bde**	be**d*
Afternoon snack	0.2±0.01	0.1±0.02	0.1±0.02		
<b>Niacin (mg)</b>					
Morning snack	0.8±0.07	1.3±0.28	0.7±0.06	b*	
Lunch	3.0±0.14	3.2±0.27	3.5±0.26		
Afternoon snack	0.9±0.08	0.7±0.08	0.7±0.08		
<b>Pantothenic acid (mg)</b>					
Morning snack	0.4±0.02	0.3±0.06	0.2±0.03	bc**	bc**
Lunch	0.7±0.03	0.8±0.06	0.7±0.04	bd*	
Afternoon snack	0.3±0.03	0.2±0.03	0.3±0.03	bd*	
<b>Vitamin B-6 (mg)</b>					
Morning snack	0.1±0.01	0.1±0.02	0.1±0.01	bc**	bc**
Lunch	0.2±0.01	0.3±0.02	0.3±0.02		
Afternoon snack	0.1±0.01	0.1±0.01	0.1±0.02	bd*	bd*
<b>Folate (μg)</b>					
Morning snack	21.1±1.71	28.9±5.61	14.6±1.89	b**c**e*	
Lunch	43.3±1.98	58.3±4.98	44.4±3.67	bd*	be*
Afternoon snack	19.6±1.66	15.1±2.01	18.4±2.03		
<b>Vitamin B-12 (μg)</b>					
Morning snack	0.3±0.03	0.3±0.07	0.2±0.03	bc**	bc*
Lunch	0.5±0.03	0.8±0.09	0.6±0.06		
Afternoon snack	0.3±0.03	0.2±0.03	0.2±0.03	bd*	

<sup>a</sup>Mean nutrient intakes are based on foods and beverages consumed by toddlers who had the meal or snack, and exclude nutrients from dietary supplements. Unweighted sample sizes are: morning snack at home (n=316), at day care (n=48), and away (n=100); lunch at home (n=381), at day care (n=67), or away (n=151); afternoon snack at home (n=383), at day care (n=58), or away (n=134). Locations were home: ate lunch or snack at home on the day of the recall; day care: ate lunch or snack at day care on the day of the recall; and away: ate lunch or snack at an eat-in or take-out restaurant, deli, cafeteria, a friend's house, or other location on the day of the recall.

<sup>b</sup>Mean difference by overall location.

<sup>c</sup>Home vs away.

<sup>d</sup>Home vs day care.

<sup>e</sup>Day care vs away.

<sup>f</sup>RAE=retinol activity equivalent.

\*P<.05.

\*\*P<.01.

†Indicates a statistic that has a coefficient of variation of 30% or higher.

was lower at day care compared with home afternoon snacks.

Table 3 shows the most frequently consumed foods and beverages at morning snacks, lunches, and afternoon snacks by location. Foods typically eaten at morning snacks for all locations were water, cow's milk, crackers, and 100% juice. Non-baby food fruit, not counting 100% fruit juice, was consumed by 17% of toddlers at home, 15% at day care, and 11% at away locations at the morning snack (data not shown). Bananas, 100% apple juice, and 100% grape juice were the only fruits/juices consumed for morning snacks by 5% or more of the subgroup. Sweetened, fruit-flavored drinks were consumed for morning snacks twice as often at day care than at home (18% to 9%, respectively); away consumption of fruit-flavored drinks was 14%. Baby food cookies were consumed about twice as frequently as ready-to-eat cereals at day care and away locations during morning snacks.

Water and cow's milk, whole and low-fat varieties, were frequently consumed beverages during lunch across all three locations. Commonly consumed foods eaten at home for lunch were chicken, cheese, pasta, hot dogs, crackers, macaroni and cheese, and peanut butter. Commonly consumed foods eaten at day care were also chicken, cheese, pasta, and hot dogs, but a higher proportion of toddlers consumed vegetables, such as green beans, mixed vegetables, corn, and peas compared with both home and away locations. Chicken, cheese, pasta, and hot dogs were also commonly consumed for away lunches.

The Figure indicates the percentage of toddlers who consumed non-baby food fruit (of any type), any 100% fruit juice, and any vegetable during lunch. About half of toddlers (48%) ate a fruit at day care compared with about one third at home (31%) and one fourth (23%) at away locations. One-hundred-percent fruit juice was more commonly consumed at lunch at home than at either day care or away locations. Nearly 55% of toddlers consumed any vegetable at away lunches; however, a high proportion was french fries. For lunches consumed away from home and away from day care, the most frequently consumed item, by 35% of toddlers, was french fries (Table 3). Carbonated beverages were consumed at away lunches by 16% of toddlers, compared with 3% at home and none at day care (data for home and day care are not shown in Table 3 because the frequencies were below 5%).

Foods consumed at afternoon snacks were similar across locations. The most frequently consumed beverages were water, whole milk, fruit-flavored drinks, and 100% apple juice. The most frequently consumed foods for an afternoon snack at home or day care were crackers or non-baby food cookies. Other foods consumed by at least 10% of the group include salty snacks and cheese at home, and candy away from home and away from day care. About 5% to 10% of toddlers consumed other foods, ranging from higher-quality foods like bananas, to lower-quality foods like candy across locations. Non-baby food fruit of any type (but not juice) was consumed by about one fourth of toddlers at the afternoon snack at all locations (26% at home, 21% at day care, and 23% away); vegetables of any type were consumed by 5% or fewer toddlers at any location (data not shown).

## DISCUSSION

Overall, about half of toddlers aged 15 to 24 months consumed one or more eating occasions away from home or day care on the day of their 24-hour dietary recall. Because there has been an increase in infants and toddlers spending more than half of their time with nonparent adults, it is not surprising to see a high frequency of meals and snacks consumed outside the home (9). In addition, the number of child-care facilities has jumped from 25,000 in 1977 to 40,000 in 1987 to more than 117,000 in 2004 (9). Household income is another determining factor in the frequency of meals consumed outside the home and the choice of meal location. The FITS finding that those who consumed all of their meals at home on the recall day were more likely to have household incomes at or below 185% of the poverty level may indicate more affordable costs with eating at home than meals out.

The location of an eating occasion was associated with variability in the intake of vitamins and minerals, but not energy or carbohydrate, for lunches and morning and afternoon snacks. Lunches consumed at day care and at home were generally associated with a higher nutrient intake and/or higher nutrient density level for many vitamins and minerals, and a lower frequency of less-healthy foods, such as sweetened, fruit-flavored drinks, compared with lunches consumed away. This was especially true for day care lunches, which were associated with a higher frequency of consumption of milk (65% counting all types) and a lower frequency of fruit-flavored drinks (6%) compared with away lunches. Away lunches were characterized by a 30% frequency of consumption of sweetened beverages (16% carbonated soda plus 14% fruit-flavored drinks) compared with a 28% frequency of consumption of milk.

Although FITS did not collect information on whether the toddlers' day-care providers participated in the CACFP or some other program like Head Start, the findings are of general interest to food assistance and child development programs that provide meal patterns and nutrition education to day-care providers (10-12,28-31). We found no differences in energy or macronutrient intakes at lunch across locations; however, we observed higher intakes of healthful nutrients consumed at day care lunches compared with lunches consumed at home or away. Day care lunches provided higher nutrients and nutrient density of calcium, phosphorus, vitamin D, and magnesium—nutrients associated with milk and other dairy products. The analysis of foods consumed at lunch showed that more than half of day care lunches included milk (whole or low-fat varieties) compared with one third of those at home and one fourth of those away. Other researchers have also reported higher nutrient density for calcium in meals eaten at school or day care compared with home meals (1,10).

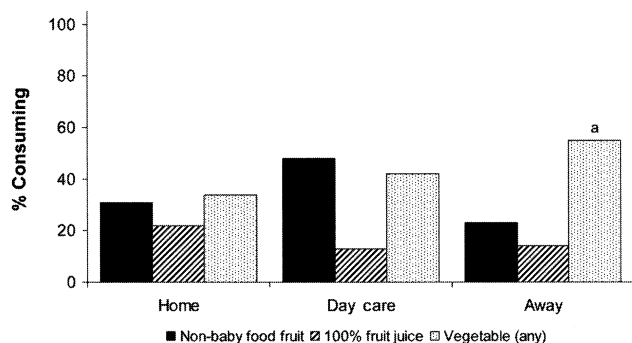
The high frequency of consumption of french fries, carbonated soda, and sweetened fruit-flavored drinks at lunches consumed away from home or day care contribute to several nutrient differences, although energy intake did not differ by location. Our results show that snacks or lunches consumed away, compared with at home, were significantly higher in *trans* fat, and significantly lower in zinc; calcium; phosphorus; magnesium; vitamins A, B-6,

**Table 3.** Most frequently consumed foods and beverages at lunches and snacks by location among toddlers aged 15 to 24 mo participating in the 2002 Feeding Infants and Toddlers Study (n=632)<sup>a</sup>

Eating occasion	Foods and Beverages Consumed					
	Food	%	Food	%	Food	%
<b>Morning snack</b>	<b>Home (n=316)</b>		<b>Day care (n=48)</b>		<b>Away (n=100)</b>	
	Water	30	Water	30	Water	35
	Milk, whole	23	Non-baby food cookie	23	Cracker	26
	Cracker	16	Cracker	20	Non-baby food cookie	21
	Non-baby food cookie	11	Milk, whole	19	Fruit-flavored drink	14
	Fruit-flavored drink	9	Fruit-flavored drink	18	RTE <sup>b</sup> cereal	10
	RTE cereal	8	100% apple juice	12	Candy	10
	100% Apple juice	8	Baby food cookie	11	Cheese	9
	Banana	7	Salty snack	10	Milk, whole	7
	100% grape juice	6	RTE cereal	10	100% apple juice	7
Milk, low-fat	6	Milk, low-fat	6	100% grape juice	6	
Salty snack	5			French fries	6	
<b>Lunch</b>	<b>Home (n=381)</b>		<b>Day care (n=67)</b>		<b>Away (n=151)</b>	
	Water	36	Milk, whole	49	French fries	35
	Milk, whole	25	Chicken	19	Water	34
	Chicken	23	Cheese	18	Chicken	31
	Cheese	18	Pasta	17	Milk, whole	19
	Pasta	13	Green beans	13	Carbonated soda	16
	Hot dog	13	Water	13	Cheese	15
	Fruit-flavored drink	11	Hot dog	12	Fruit-flavored drink	14
	Cracker	9	Lasagna	11	Pasta	10
	Milk, low-fat	9	Cracker	10	Milk, low-fat	9
	100% Apple juice	8	Milk, low-fat	10	Hot dog	8
	Peanut butter	8	Macaroni and cheese	9	Green beans	7
	Macaroni and cheese	8	Soup	8	Butter or oil	7
	Peanut butter sandwich	8	Gravy	7	Beef	6
	Sugar or syrup	8	Mixed vegetables	7	Macaroni and cheese	6
	Soup	7	Corn	7	Raw vegetables	6
	Butter or oil	7	Yogurt	7	Hamburger w/bun	6
	Bread, whole grain	7	Beef	7	Cracker	5
	Pork	6	Soy milk	6	Pizza	5
	Apple, fresh	6	Fruit-flavored drink	6		
Green beans	6	Tomato, cooked	6			
Peas	6	Peas	6			
Lasagna	5	Applesauce	5			
Beef	5	Baby food cookie	5			
100% Grape juice	5	Banana	5			
Raw vegetables	5					
<b>Afternoon snack</b>	<b>Home (n=383)</b>		<b>Day care (n=58)</b>		<b>Away (n=134)</b>	
	Water	33	Water	33	Water	38
	Cracker	22	Cracker	33	Non-baby food cookie	18
	Milk, whole	21	Non-baby food cookie	26	Milk, whole	16
	Non-baby food cookie	20	Milk, whole	19	Candy	16
	Salty snack	14	Fruit-flavored drink	16	Fruit-flavored drink	9
	Fruit-flavored drink	12	100% Apple juice	9	Salty snack	7
	100% Apple juice	10	Cheese	8	Banana	7
	Cheese	10	Ice cream	7	Milk, low-fat	6
	Candy	9	Baby food cookie	7	Ice cream	6
	Banana	6	RTE cereal	6	100% Orange juice	6
	Milk, low-fat	6			Grapes	6
					RTE cereal	5

<sup>a</sup>Locations at the eating occasion were home: ate the lunch or snack at home on the day of the recall; day care: ate the lunch or snack at day care on the day of the recall; and away: ate the lunch or snack at an eat-in or take-out restaurant, deli, cafeteria, friend's house, or other location on the day of the recall. Displayed in descending order; numbers represent weighted percentages of food consumed at the eating occasion and location; numbers are rounded to the nearest whole number.

<sup>b</sup>RTE=ready-to-eat cereals.



**Figure.** Percentage of toddlers aged 15 to 24 months participating in the 2002 Feeding Infants and Toddlers Study who consumed fruits and vegetables at lunch. <sup>a</sup>35% are french fries. Data from the 2002 Feeding Infants and Toddlers Study.

B-12, C, and D; thiamin; riboflavin; pantothenic acid; and folate. Lunch and snacks consumed at home vs day care were significantly higher in protein, total and saturated fat, cholesterol, potassium, zinc, and vitamin B-12, but lower in *trans* fat, calcium, phosphorus, magnesium, vitamins K and D, thiamin, riboflavin, and folate. The analysis of nutrient density further supports the finding that lunches consumed away from home and away from day care are less healthful.

### The location of an eating occasion was associated with variability in the intake of vitamins and minerals, but not energy or carbohydrate, for lunches and morning and afternoon snacks.

Fast-food consumption has grown rapidly, and children and adults who report eating fast foods have higher intakes of energy, fat, saturated fat, sodium, carbonated sweetened beverages, and lower intakes of vitamins A and C, milk, fruits, and vegetables than those who did not report eating fast foods (5-8,32). In FITS, away meals are, by definition, associated with fast-food consumption and eating in other locations, including the car. One third of the away lunches included french fries as the vegetable. The low intake of fruits and vegetables by young children has been reported previously (15,19,20,27). The low intake of fruits and vegetables in toddlers' diets is also of concern because overall fiber intake was low in lunches and snacks across all locations and throughout the day (33). Whole-grain breads and rolls were not frequently consumed at lunches or snacks or in any locations. The consistently low intake of fiber at lunches and snacks is an area where fruits, vegetables, and whole grains that deliver fiber and other nutrients should be encouraged.

These are the first reports of *trans* fat intake from lunches and snacks consumed by toddlers, aged 15 to 24 months, by eating location. We found *trans* fatty acid intake to be significantly higher when the eating location

was away, although one limitation is that the food composition databases are not as complete for *trans* fats as they are for other nutrients (34). *Trans* fat is found in margarines, vegetable shortenings, dairy products, meats, human milk, commercial bakery products, and deep-fried foods. Some of the foods containing *trans* fat that were consumed by toddlers include chicken nuggets, french fries, dairy products, and cookies. The frequency of consumption of fried foods, such as chicken nuggets and french fries, was highest at lunches consumed away, contributing to higher intakes of *trans* fat at away lunches.

The typical US consumption of *trans* fat is 5.3 g/day (approximately 2.6% of total energy intake) for people aged 3 years and older (35). There are no available data to indicate a health benefit from consuming *trans* fatty acids. Controlled intervention studies, in different population groups in the United States and other countries, consistently indicate that consumption of diets containing *trans* fatty acids, like diets containing saturated fats, results in increased serum low-density lipoprotein cholesterol levels (a major risk factor for coronary heart disease (35,36)). Growing concern about consumption of *trans* fat has led to requiring new labeling laws enforced by the US Food and Drug Administration (36).

Previous FITS analysis of beverage patterns found that water was consumed on any given day by 74% of toddlers aged 15 to 18 months and 77% of toddlers aged 19 to 24 months (37). In this analysis, water was the most commonly consumed item at morning and afternoon snacks across locations, and the most common beverage consumed at lunches at both home and away locations. However, lunches consumed at locations away from home and away from day care were associated with a higher frequency of consumption of sweetened beverages, such as carbonated soda and fruit-flavored drinks, which tend to displace milk in toddlers' diets (37). In another FITS analysis, Hendricks and colleagues (38) found that mothers who had completed college, children who were ever breastfed, and children who were first born were negatively associated with consuming sweetened beverages. Research has shown parents influence their children's eating habits, and that when they prepare food they can influence their child's dietary habits by discussing the importance of fruits and vegetables over other food choices (31,39,40).

Limitations of this particular FITS analysis include the relatively small sample sizes of lunches and snacks consumed at day care, and the inability to assess diversity in food patterns and nutrient intakes by both meal/snack location and race/ethnicity. Another limitation of this analysis is that it is based on a single day's intake, and does not necessarily reflect the day-to-day variability in most people's food or nutrient intakes. Still, the study provides an opportunity to assess mean differences in groups of toddlers who consumed lunches and snacks at various locations—at home, at day care, or away from home and away from day care. Another limitation is that the location indicator does not always mean that the food source was obtained at the location; some foods could be brought from home and eaten at day care, or purchased away from home and consumed at home.

An area for further methodologic research is the validation of field methods to ascertain complete and accu-

rate dietary intake information of foods consumed at day care and away from home for use in future studies of infants' and toddlers' diets. Additional research needs to be conducted on the contribution of fast food intake to total nutrient intake and nutrient density among toddlers, and longitudinal studies could be conducted to assess the influence of *trans* fat on the diets and health consequences of children later in life.

## CONCLUSIONS

When planning meals for toddlers, a variety of foods should be offered at each meal. The meal should provide protein (in the form of meat, fish, poultry, eggs, or legumes), bread or cereal, fruit or vegetables, and milk (40). Children become hungry between meals, making snacks an important part of their daily intake. Snacks should be planned to ensure the child is hungry at meals, with the interval between meals and snacks tailored to the child's hunger and satiety cues.

Menus planned by child-care providers should be nutritionally adequate because full-day child care programs usually cover the period of time that includes half to two thirds of daily meals and snacks (eg, lunch and an afternoon snack). It is recommended that child-care facility menus provide their proportional share of the child's daily nutrient intakes. A child in a part-time program (eg, 4 to 7 hours per day) should receive food that provides at least one third of daily nutrition needs (29). All day-care providers should be encouraged to follow menu planning aids such as those available from the US Department of Agriculture (13).

Caregivers, restaurants, and government programs should be encouraged to offer developmentally appropriate fruits and vegetables. In addition, the consumption of milk at home and at other locations, such as restaurants and friends' homes, needs to be encouraged in place of fruit-flavored drinks or other sweetened beverages.

During exploration of foods by toddlers, nutritious choices such as milk, fruits, vegetables, and whole grains need to be encouraged in a variety of forms to give toddlers the opportunity to build broader food preferences for life. Further, family mealtime should be encouraged to develop and practice healthful eating occasions.

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