

Prevalence of Picky Eaters among Infants and Toddlers and Their Caregivers' Decisions about Offering a New Food

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ABSTRACT

Objectives To determine the prevalence of infants and toddlers who were considered picky eaters, the predictors of picky eater status and its association with energy and nutrient intakes, food group use, and the number of times that caregivers offered a new food before deciding their child disliked it.

Design Cross-sectional survey of households with infants and toddlers (ages four to 24 months) was conducted.

Subjects/Setting National random sample of 3,022 infants and toddlers.

Methods Data included caregiver's socioeconomic and demographic information, infants' and toddlers' food intake (24-hour recall), ethnicity, and caregivers' reports of specified times that new foods were offered before deciding the child disliked it.

Statistical Analyses For picky and nonpicky eaters, *t* tests were used to determine significant mean differences in energy and nutrient intakes. Logistic regression was used to predict picky eater status, and χ^2 tests were used for differences in the specified number of times that new foods were offered.

Results The percentage of children identified as picky eaters by their caregivers increased from 19% to 50% from four to 24 months. Picky eaters were reported at all ages for both sexes, all ethnicities, and all ranges of household incomes. On a day, both picky and nonpicky eaters met or exceeded current age-appropriate energy and dietary recommendations. Older children were more likely to be picky. Those in the higher weight-for-age percentiles were less likely to be picky. The highest number of times that caregivers offered a new food before deciding the child disliked it was three to five.

Applications/Conclusions Dietetics professionals need to be aware that caregivers who perceive their child as a picky eater are evident across gender, ethnicity, and household incomes. When offering a new food, mothers need to provide

many more repeated exposures (eg, eight to 15 times) to enhance acceptance of that food than they currently do. *J Am Diet Assoc.* 2004;104:S57-S64.

Dietary intake by infants begins with a liquid diet, a transition to complementary foods occurs in the latter six months, and, by 24 months, most children are consuming adult foods. Ages at which these progressions occur vary (1-4) and are influenced by maternal characteristics (5-7), ethnicity (8-10), and cultural traditions (11). The transition from primarily a liquid diet to solids and beverages other than breast milk or formula involves new oral sensory experiences (12) and also requires new self-feeding and eating skills.

As the type and amount of foods change and as infants and toddlers develop, the children indicate behaviorally and verbally their likes and dislikes (13,14). Their food dislikes may result in the avoidance of particular foods or groups of foods that are major sources of essential nutrients and contribute to dietary variety (13,15). Children's acceptance of a new food is influenced by examples provided by parents and siblings (16,17), number of exposures to a new food (18,19), perceived opportunities to taste a new food (20), verbal praise given in a social context (21), mother's exposure to and acceptance of a new food (22), family characteristics (23), and long-term effects of early feeding (24).

Children who reject certain types of foods and/or groups of foods that parents think are appropriate may be perceived as picky eaters, problem feeders, or neophobics (25,26). In a study of toddlers who were perceived as picky eaters, mothers reported that the children accepted a limited number of foods, were unwilling to try new foods, limited their intakes of vegetables and some other food groups, and exhibited strong food preferences (13). In studies of older children, multiple repeated exposures (eg, tasting) of a new food were needed to enhance food acceptance (15,18).

Most published studies about children's acceptance or rejection of a new food were conducted with preschoolers and children older than two to 24 months of age (13,15-19,21,22,25-30,33). Only two small studies involved children who were less than two years of age (31,32), restricting their generalization to other groups.

The purposes of this study were to (a) determine in a large cross-sectional survey of infants and toddlers the prevalence of primary caregivers who perceived their children to be picky eaters and the effects of this perception on energy and nutrient intakes based on a one-day food recall, (b) predict picky eater status, (c) compare the percentages of picky and nonpicky eaters who consumed foods from major food categories, and (d) determine the numbers of times that primary caregivers offered a new food before deciding their child disliked it.

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METHODS

Sample

Caregivers who had children four to 24 months of age were recruited for the Feeding Infants and Toddler Study (FITS). Methodology for the cross-sectional survey of 3,022 infants and toddlers has been published (34).

Data Collection

Telephone interviews were conducted with the primary caregiver residing in an identified household. For all participants, data included one 24-hour recall (with nutritional supplements) of the child's food intake, ethnicity, weight and height, and the primary caregiver's socioeconomic and demographic characteristics. Caregivers were asked whether they considered their child a very picky eater, somewhat picky eater, or not a picky eater. Coded responses included yes, no, don't know, or refusal. The telephone interviewer did not define the term "picky eater." Rather, it was the caregivers' perceptions that were used as the definition of "picky eater." Response categories for the number of times that mothers offered new foods before deciding that their child disliked a food included "once, twice, three to five times, six to 10 times, and more than 10 times."

Analyses

Data for infants and toddlers considered as "very picky" and "somewhat picky" were combined to form a "picky eater" data set for each of the six age groups (four to six, seven to eight, nine to 11, 12 to 14, 15 to 18, and 19 to 24 months). Those who were not considered picky eaters formed the comparison group. Food (including nutritional supplements) and formula intakes of the infants and toddlers were derived from one 24-hour recall and coded for nutrient analyses using the Nutrition Data System Research Manual (35). Statistical analyses were performed by Mathematica Policy Research, Inc., Princeton, NJ, 2003, using SAS System (SAS system for UNIX, version 8.2; SAS Institute Inc., Cary, NC, 2001). Because another analysis of the data revealed a very low prevalence of nutrient inadequacy (36), it followed that neither picky eaters nor nonpicky eaters were likely to be at risk of nutrient inadequacy. Mean nutrient and energy intakes were calculated by picky eater vs nonpicky eater status, and *t* tests were performed to determine significant group differences ($P \leq .05$).

Because of the difficulty in estimating the quantity of breast milk for those infants four to six months of age who consume breast milk and other nonmilk food and beverages, nutrient intakes for the ages four to six months were not included in these analyses (37). Although this same issue of estimating the quantity of breast milk also applies to older breastfed infants, two factors justify including older breastfed infants in the analysis: (a) the quantity of breast milk consumed for these older infants was assumed to be 600 mL for breastfed infants older than six months to account for replacement of energy from solid foods for the energy from breast milk as solids are introduced, and (b) the proportion of mothers breastfeeding was substantially lower among infants seven to 11 months of age than among younger infants, suggesting that assumptions related to estimating the quantity of breast milk would be less important for older infants. Data were weighted using sampling weights, and statis-

tical tests accounted for the weighting. Results were compared with age-appropriate recommendations for energy and nutrient intakes/day (38,39).

Percentages were calculated by picky vs nonpicky eater status and age groups for the most frequently consumed food groups, based on the one 24-hour recall, and for individual foods within the food groups. Because most dietary transitions occur in the first year, results were merged for ages 15 to 24 months.

To predict picky eater status, logistic regression was used with picky eater status as the dependent variable. The independent variables were the child's sex, age category (four to six, seven to eight, nine to 11, 12 to 14, 15 to 18, and 19 to 24 months), weight-for-age percentile, birth order, and ethnicity and the mother's age, education, working status, marital status, household income, residence (urban, suburban), and ever breastfed status. χ^2 Tests were used to determine whether the number of times that caregivers offered a new food differed significantly ($P \leq .05$) between picky and nonpicky eater groups.

RESULTS

Sample

Of the sample, 51% were males and 49% females. Ethnicity was 77% white, 7% non-Hispanic black, 10% Hispanic, and 6% "other" or multiracial groups. The mothers ranged in age from younger than 15 years to 40 years or older, with a majority of mothers aged 20 to 34 years when their study children were born. Participants represented mostly urban and suburban households, with about two-thirds of the sample reporting household incomes ranging from \$25,000 to \$99,999.

Frequency and Prediction of Picky Eater Status

The primary caregivers who verified their responsibility for the foods chosen and offered to their infants and toddlers were mostly mothers (91%). Figure 1 describes the percentage of caregivers from the total sample ($n=3,022$) who considered their child to be a picky eater at ages four to 24 months. The percentage of caregivers at four to six months was 19% and increased to 50% at 19 to 24 months. Similar results were reported for the non-Hispanic white children. The highest percentages among non-Hispanic blacks were for ages 9 to 11 months (44%), 12 to 14 months (41%), and 15 to 18 months (61%). Findings for the Hispanics were similar to those for non-Hispanic whites and "other" multiracial groups.

The reported prevalence of picky eaters consistently increased for both sexes, ranging from 17% to 47% for males and 23% to 54% for females (four to 24 months). Household income by picky eater status mirrors the findings for gender and ethnicity. The prevalence of picky eaters doubled from younger to older children among those living in households with incomes of \$25,000 to \$49,999 (about 23% at seven to eight months to 48% at nine to 11 months) and were similar for household incomes of \$50,000 to \$74,999 (23% at seven to eight months and 52% at 19 to 24 months).

Only two variables were predictive of picky eater status. As shown in Table 1, older children were more likely to be considered picky eaters, and children who fell within the higher weight-for-age percentiles were less likely to be picky. The odds ratio of 1.00 is used for the

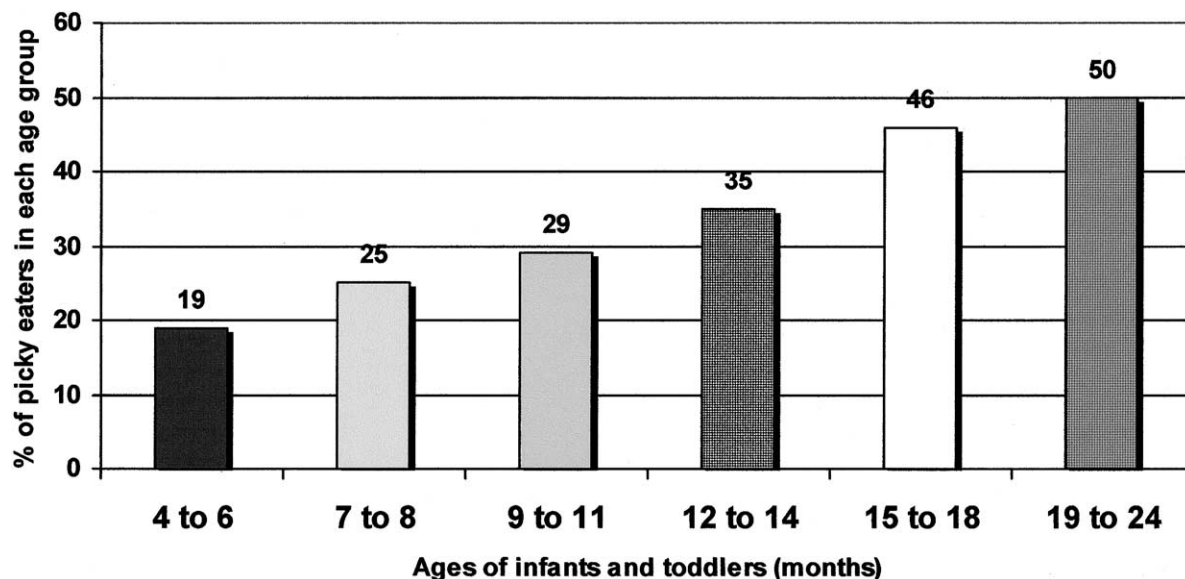


Figure 1. Percentage of caregivers who perceived their infant or toddler as a picky eater.

Table 1. Independent variables that were significant predictors of picky eater status of infants and toddlers^{a,b}

Independent variables	Odds ratios	95% Confidence interval
Age categories (mo)		
4-6	1.00	...
7-8	1.38	0.99-1.92
9-11	1.75	1.30-2.35*
12-14	2.20	1.56-3.10*
15-18	3.76	2.69-5.25*
19-24	4.45	3.15-6.28*
Weight-for-age-percentiles		
0-25	1.00	...
25-50	0.62	0.45-0.86*
50-75	0.61	0.45-0.84*
75-100	0.66	0.49-0.88*

^aPrimary caregivers were asked whether they considered their children to be a very picky eater, somewhat picky, or not a picky eater. Very picky and somewhat picky eaters were compared with nonpicky eaters.

^bIndependent variables considered were gender, age, weight-for-age percentile, birth order, and ethnicity and the mother's education, working status, marital status, household income, residence, and ever breast-fed status.

* $P \leq .05$

reference category for the independent variable. If the 95% confidence interval for another category excludes 1.00, then the difference in the odds ratio between that category and the reference category is statistically significant.

Energy and Nutrient Intake of Picky Eaters and Nonpicky Eaters

Energy and nutrient intakes of picky and nonpicky eaters are shown in Table 2. The age groups of seven to eight and nine to 11 months had 17 statistically significant differences in energy and nutrient intake associated with picky eater status, whereas intakes for all the other age groupings had only six statistically significant differences. Carbohydrate, vitamin C, thiamin, riboflavin, niacin, vitamin E, and iron were significantly lower for the picky eater group, ages seven to eight months, and energy, total fat, folate, vitamin B-12, thiamin, riboflavin, vitamin B-6, calcium, magnesium, and zinc were lower for the picky eater group at nine to 11 months. For all nutrients, mean intakes were well above the Recommended Dietary Allowances (RDA) or Adequate Intakes (AI) for picky and nonpicky eater groups.

Consumption of Major Food Groups

Table 3 shows the proportions of picky and nonpicky eaters who consumed foods from major food group categories as reported on the 24-hour recall. Although the data were not analyzed statistically, no major differences were evident between the picky and nonpicky eater groups. The following general observations can be made about the food categories and foods within that category. As shown in Table 3, grain and grain products were consumed by 90% or more of the FITS participants over six months of age. Within the grain group for ages seven to eight and 15 to 24 months, fewer picky eaters consumed unsweetened ready-to-eat cereals, whereas, at ages 15 to 24 months, ready-to-eat sweetened cereal was consumed by a higher proportion of picky compared with nonpicky eaters (24% vs 18%) (data not shown). For all

Table 2. Nutrient intakes of children by picky eater status^a

Energy/Nutrients	Age (mo)		RDA/AI ^b 7-12
	7-8 (n=475) ^c	9-11 (n=677)	
Energy (kcal/d)	←————— <i>means ± SD</i> —————→		739
Picky	785 ± 233 ^d	911 ± 263^e	
Nonpicky	838 ± 221	989 ± 338	
Carbohydrate (g/d)			95*
Picky	108 ± 35 (55%)^{ef}	130 ± 42 (57%)	
Nonpicky	119 ± 36 (56%)	138 ± 51 (56%)	
Total fat (g/d)			30*
Picky	32 ± 9 (37%) ^f	35 ± 12 (34%)^e	
Nonpicky	33 ± 9 (36%)	38 ± 14 (35%)	
Vitamin C (mg/d)			50*
Picky	96 ± 43^e	103 ± 52	
Nonpicky	107 ± 48	105 ± 56	
Folate (μg/d)			80*
Picky	156 ± 88	199 ± 103^c	
Nonpicky	190 ± 335	228 ± 141	
Vitamin B-12 (μg)			0.5*
Picky	1.6 ± 1.1	1.9 ± 1.1^e	
Nonpicky	1.7 ± 1.4	2.2 ± 1.0 ^c	
Thiamin (mg/d)			0.3*
Picky	0.73 ± 0.3^e	0.88 ± 0.4^e	
Nonpicky	0.84 ± 0.4	0.94 ± 0.4	
Riboflavin (mg/d)			0.4*
Picky	1.1 ± 0.5^e	1.3 ± 0.5^e	
Nonpicky	1.2 ± 0.6	1.4 ± 0.6	
Niacin (mg/d)			4*
Picky	9 ± 4^e	11 ± 5	
Nonpicky	10 ± 5	11 ± 5	
Vitamin E (mg/d)			6*
Picky	9.3 ± 3.0^e	9.4 ± 4.0	
Nonpicky	11.2 ± 8.7	9.6 ± 4.2	
Vitamin B-6 (mg/d)			0.3*
Picky	0.7 ± 0.4	0.8 ± 0.4^e	
Nonpicky	0.7 ± 0.4	0.9 ± 0.5	
Calcium (mg/d)			270*
Picky	542 ± 241	608 ± 252^e	
Nonpicky	597 ± 235	693 ± 338	
Magnesium (mg/d)			75*
Picky	98 ± 43	115 ± 44^e	
Nonpicky	105 ± 40	131 ± 60	
Iron (mg/d)			11
Picky	14 ± 9^e	15 ± 10	
Nonpicky	17 ± 8	16 ± 9	
Zinc (mg/d)			3
Picky	5 ± 2	5 ± 2^e	
Nonpicky	5 ± 2	6 ± 3	

^aChildren classified as picky eaters were rated by their primary caregiver as a very picky or somewhat picky eater.

^bRecommended Dietary Allowances (RDAs) are in bold type and Adequate Intakes (AIs) in ordinary type followed by an asterisk. Energy value is the Estimated Energy Expenditure (EER).

^cWeighted percentage of children in the total sample considered picky eaters, 25% at seven to eight months, and 29% at nine to 11 months.

^dMean nutrient intake including supplements for one 24-hour recall per child; SD=standard deviation.

^eNutrient intakes significantly different ($P \leq .05$) for picky eater groups vs. nonpicky eater group.

^fWeighted percentage of calories from macronutrients in parenthesis.

Table 3. Percentages of children consuming food categories by picky eater status and age^a

Food Category	Age (mo) ^b									
	4-6		7-8		9-11		12-14		15-24	
	Picky		Picky		Picky		Picky		Picky	
	No n=573	Yes n=138	No n=354	Yes n=121	No n=484	Yes n=193	No n=249	Yes n=121	No n=324	Yes n=297
	← % →									
Grains and grain products	77	79	92	88	96	96	98	98	98	95
Vegetables	47	50	68	67	76	65	79	72	84	77
Fruits	57	64	90	83	89	89	94	84	84	87
Milk and milk products	100	100	100	100	100	100	99	100	97	97
Meat and other protein sources	5	7	13	20	45	33	75	72	89	86
Mixed dishes (eg, casserole, sandwich, pizza)	13	14	46	52	66	58	72	68	71	67
Sweets, sweetened beverages, desserts	12	14	45	48	61	58	76	77	89	86
Other (water, added fats, salty snacks)	41	41	59	64	75	69	87	86	93	93

^aChildren classified as picky eaters were rated by their caregivers as a very or somewhat picky eater on the day of the telephone interview.

^bData represent one 24-hour recall per child in each of the 5 age groups.

age groups, fruits were consumed by a higher proportion of children than were vegetables, and substantial percentages (16% to 32%) of those over six months of age consumed no vegetables on the day of the recall (Table 3). Within the vegetable group, a higher percentage of picky eaters compared with nonpicky eaters were reported to consume french fries (18% vs 11% at 12 to 14 months and 27% vs 19% at 15 to 24 months), and a lower percentage of picky eaters consumed mashed potatoes (about 5% vs 12% at ages nine to 24 months). Bananas, fresh or frozen, were popular with picky eaters, particularly for ages 15 to 24 months. As expected, milk and milk products were consumed by almost 100% of infants and toddlers in both the first and second year.

As shown in Table 3, meat and other protein sources were consumed by considerably less than half the infants, ages seven to 11 months, but, by the second year, more than three-quarters of toddlers consumed foods from this group. Within the meat group, chicken was the most commonly reported. A greater proportion of nonpicky eaters consumed mixed dishes than did picky eaters, with spaghetti, ravioli, and lasagna as major items reported within that category. For both picky and nonpicky eaters, few infants four to six months of age received sweets, sweetened beverages, or desserts on the day of the recall, although the percentage consuming foods from this food category increased steadily with increasing age (Table 3). The proportions of picky and nonpicky eaters using other foods and beverages also increased with age.

Number of Times That Caregivers Offered a New Food

Picky and nonpicky eater groups did not differ significantly in the number of times that caregivers offered a new food before deciding the child disliked it; therefore, Figure 2 represents results for total sample (n=3,022). Three to five times was the most frequently reported category for offering a new food. Only 6% to 9% of caregivers offered a new food six to 10 times. For each of the age groups, about 25% of the caregivers offered new foods only one to two times before they decided their child disliked the food.

DISCUSSION

The FITS provides the first national data on the prevalence of caregivers who perceived their infants and toddlers as picky eaters. Unlike the FITS, most studies about food acceptance involve mostly white children who were older than 24 months of age (13,15-19,22,25-33). We found that the prevalence of picky eater groups was reported for both sexes and among children from families with varying household incomes. Furthermore, all ethnic groups in the FITS reported that some children were considered picky eaters. Thus, the prevalence of children perceived as picky eaters was evident in both sexes and all ages, ethnicities, and household incomes.

The FITS differs from other published studies about children's acceptance of a new food, being larger and more representative and using telephone interviews to collect data rather than using interviews conducted in family (5,13,16,27,40) and school settings (21,41-43). Only two other studies have determined the prevalence of picky eater groups, and, unlike the FITS, in those studies mothers described the child's behavior and ranked the child on assessment scales designed to identify neophobic behaviors (13,44). Carruth and colleagues (13) used two in-home interviews and six days of food records and recalls to assess dietary variety and diversity and nutrient intakes of toddlers. Picky eaters had significantly lower dietary variety and diversity scores than nonpicky eaters. Mothers of picky eaters ranked their children's eating behaviors as problematic and used persuasion more frequently than did mothers of nonpicky eaters. No differences in energy and nutrient intake were found by picky eater status (13), whereas, in the FITS, the picky eater group, ages seven to 11 months, had lower nutrient intakes of energy and several nutrients. However, dietary intakes of the FITS participants were nutritionally adequate, regardless of picky eater status (36). Although picky eaters, as a group, met or exceeded recommendations (RDA or AI) on a day, some individuals had marginal intakes of major food groups, such as vegetables and meats and other protein foods, as described by Kay and colleagues in this supplement (45). The question arises of whether those individuals who were perceived as picky

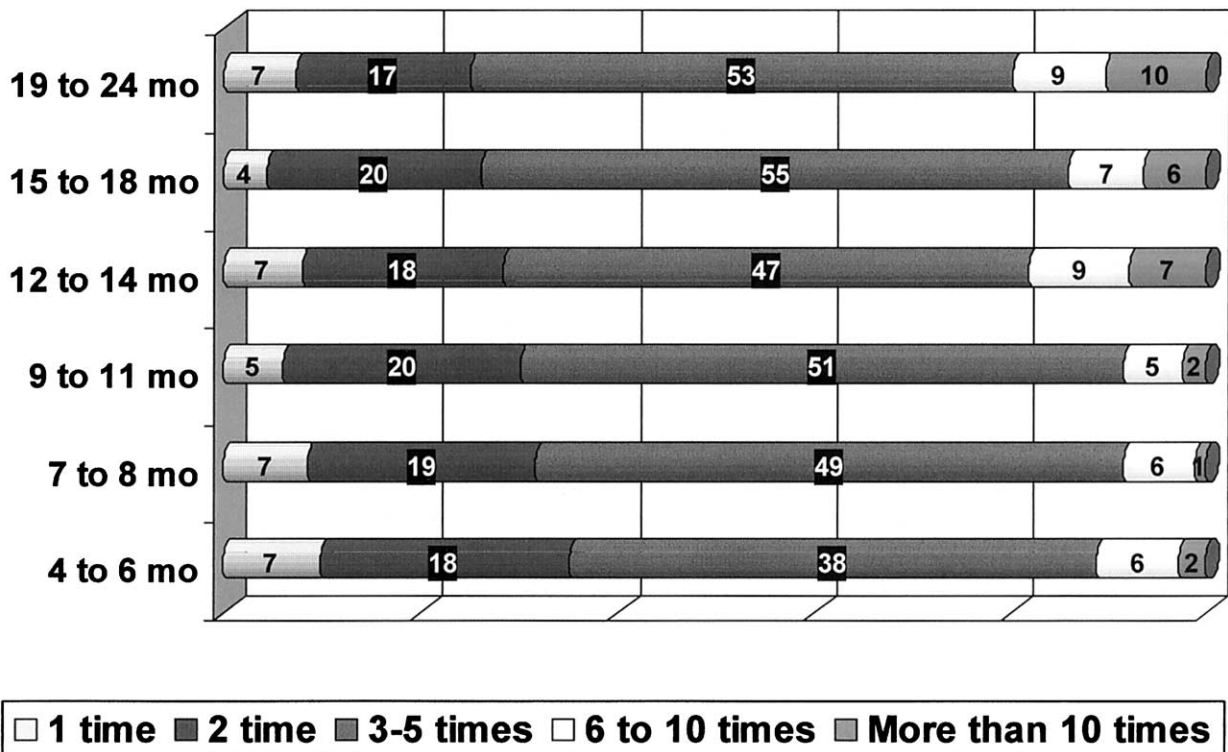


Figure 2. Percentage of mothers offering a new food a specified number of times before deciding their infant or toddler disliked it.

eaters will continue to meet their nutritional needs for essential nutrients, such as folate, calcium, iron, and zinc, if this behavior is long continued.

Studies in older children have shown that eight to 15 repeated exposures to a new food are necessary to enhance acceptance of that food (15,18). The FITS data clearly show that the infants and toddlers were not provided with repeated exposures to a new food, and, in light of these findings, it is particularly disturbing that only a few of the FITS caregivers offered foods six to 10 times in the first year. In addition, data about foods most frequently consumed suggest that some of the FITS children had very limited exposure to a variety of foods, such as vegetables and meats.

The importance of early exposure to later dietary variety was studied in a group of children participating in a longitudinal study (2 to 96 months), and the results suggest that early exposure may affect later food acceptance (46). Skinner and colleagues reported that fruit exposures in the first two years were predictive of fruit variety in the diet when the children were of school age. The number of vegetables liked by the mother predicted the vegetable variety consumed by the children (46). In a group of black children, taste acceptability at two years of age and early exposure to sucrose solutions at six months was significantly correlated (47). The children with early sucrose exposure drank more of a sweetened beverage than those that did not. These studies suggest the importance that early exposure may have on food acceptance at a later age when new variety, flavors, textures, and tastes are introduced to the child.

Limitations of Study

The FITS food intake data represent one 24-hour recall for each child given by caregivers via telephone interviews with multiple interviewers. Food intake patterns among individual children must also be studied longitudinally to confirm our findings. The cross-sectional survey design limits the development of food-related profiles that explain how mothers may make decisions about transition foods and how their infants and toddlers exhibited likes and dislikes. Although the FITS design allows results to be extrapolated to the general population, particularly white caregivers, the small sample sizes for some of the ethnicity groups limit applicability of the weighted findings.

APPLICATIONS

- Dietetics professionals need to be aware that the prevalence of children perceived as picky eaters was evident in both sexes and all ages, ethnicities, and household incomes.
- When new foods are introduced, caregivers should provide tasting opportunities more frequently than they do at the present; between eight to 15 repeated exposures to a new food may be required to enhance the child's acceptance.

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