

Chapter 3

Nutrition Education for Preschool Children

SCOPE

This chapter includes nutrition education provided directly to children from age 2 through prekindergarten in school, at home, through the mass media, and from other sources. It also includes all nutrition education provided to parents of preschoolers, specifically targeting nutritional messages relevant to preschoolers only. In this case, preschoolers themselves do not need to be provided with direct nutrition education.

GOALS OF NUTRITION EDUCATION

Consumption of a healthy diet by young children is essential to provide for normal growth and development and to prevent a variety of nutrition-related health problems, such as anemia, growth retardation, malnutrition, compromised cognitive achievement, obesity, dental caries, and chronic diseases in later life. Children are the nation's most important resource and thus deserve the best possible education for their present and future health.¹ Research evidence suggests that children are not born with the innate ability to choose a nutritious diet; instead, their food habits are learned through experience and education.

The official nutrition education goals of Head Start and the Nutrition Education Training program, programs to be described later, provide a guide for nutrition education for preschool-aged children.² These goals include:

- Creating a positive attitude toward food;
- Encouraging acceptance of a variety of healthful foods;
- Improving children's values and attitudes related to acceptance of a variety of nutritious foods;
- Fostering the development of healthful food habits in children;
- Promoting an understanding of the relationship between food and health;
- Providing foods that contain adequate, but not excessive, amounts of energy nutrients;
- Improving parents', teachers', administrators', and food-service personnel's knowledge of the principles and practices of nutrition; and
- Developing, promoting, disseminating, and/or evaluating nutrition education curricula and materials.

THEORETICAL FRAMEWORKS

The educational strategies used in most of the studies reviewed here were based on two kinds of approaches.

Interventions traditionally thought of as nutrition education were based largely on the information dissemination model, where knowledge is assumed to lead to a change in attitude, which, in turn, leads to a change in behavior. This is often assumed to represent a knowledge-attitude-behavior (KAB) model. The other approach is behavioral, where various behavioral strategies are used, usually without didactic teaching about nutrition content.

Child development research. This research, particularly Piagetian-based research, provides evidence that, while preschool children are becoming less dependent on their direct sensorimotor actions for direction of behavior, they are not yet very well developed cognitively. They are becoming increasingly able to think, but their reasoning is somewhat unsystematic and does not readily lead to abstract generalizations or formation of logical concepts.^{4,1} Preschool children learn by manipulation of the environment, rather than by passive listening, and by exploring, questioning, comparing, and labeling. In addition, language is developing very quickly. Physical manipulation skills are being developed when children touch, feel, look, mix up, turn over, and throw. Emotionally, exploration and the need to test independence seem to dominate during this time. Children take on more initiative, are more purposeful, and are eager to learn, usually from other people; they observe parents, teachers, and other children, they role play, and they, start to accumulate and process information.⁶

Research on children's thinking about nutrition. What preschool children can understand at different ages about food and nutrition specifically has been the subject of a few studies. Gorelick and Clark⁷ have noted that 3 to 5 year olds can easily identify foods. Contento and Michela⁸ found that 5- to 6-year-old children do not truly understand that food is transformed in the body into nutrients to have an effect and that they classify foods based on observable qualities and functions, rather than by nutritional similarities. Lee et al.,¹⁰ on the other hand, found that children were able, upon instruction using cards that displayed pictures of a food, its name in large type, and color-coded bar graphs for vitamins A and C, iron, and calcium, to develop some understanding of the concepts of nutritive value, nutrient function, and the impact of nutrition on health. Singleton et al.,⁹ in a study with 60 children, found that 4 to 7 year olds can comprehend concepts such as energy, a strong heart, that "good foods keep germs out of the body," and that a low-fat diet keeps the heart healthy. They also found that a nutrition education intervention significantly increased the children's perception that health and nutrition are related concepts. Thus, preschoolers are developing

This chapter is based on the technical report titled "Nutrition Education for Preschool Age Children: A Review of Research" by Susan Sharaga Swadener, Ph.D., R.D.

some emerging understanding of relevant concepts. Hertzler argues that "too often preschoolers are simply entertained because they are assumed to be unable to learn."¹²

Research on food acceptance patterns in young children.

Children appear not to be born with the natural ability to choose a nutritious diet; they must learn to do so. Children are born with a preference for the sweet taste. They also show a negative reaction to bitter and sour tastes and a neutral response to the salty taste. Other preferences appear to be learned. It has also been found that preference for a food is a major determinant of food intake in young children." The accumulating evidence from research thus suggests that "early experience with food and eating is crucial in the development of food acceptance patterns, both in terms of the acquisition of food preferences and the regulation of food intake."¹⁴ Everyday experience with food and eating has an impact on food acceptance and intake in several ways:

1. Familiarity with the food. Very young children show a neophobic response or reluctance to taste new or unfamiliar foods. This natural and protective mechanism is one of the most common reasons for food rejection; however, it has been shown that neophobia can be overcome and food acceptance or preference can be increased with exposure.^{11,16} That is, taste is shaped by experience with food, which comes with exposure to it.
2. Association of foods with the postingestive physiologic consequences of eating them. There is evidence that, given repeated experiences with eating foods, young children learn about the nutritional consequences of eating by associating distinctive food cues (e.g., flavors) with the distinctive physiologic consequences of eating those foods (e.g., feeling pleasantly full). Thus, they come to adjust their intakes of these flavors according to anticipated physiologic consequences.¹⁷⁻¹⁹ Children also acquire conditioned preferences for energy-dense versions of foods through such associative conditioning."
3. Association of foods with the emotional tone of the social interactions that surround eating."
4. Learning which of many food cues available (physiologic, environmental, cognitive) are relevant in the initiation, maintenance, and termination of eating."

OVERVIEW OF FEDERAL GOVERNMENT PROGRAMS

Several federal programs are relevant to this age group: Head Start, Nutrition Education and Training (NET) program, and Special Supplemental Food Program for Women, Infants and Children (WIC).

Head Start was established in 1965 to assist preschool-aged children in overcoming the emotional and intellectual disadvantages of poverty.³ Today, the U.S. Department of

Agriculture (USDA) also provides reimbursed meals and supplements for Head Start children and has established that nutritious foods based on the Dietary Guidelines be served. Meal times and food are considered part of the total educational program. The nutrition component, while providing for the nutrient needs of children, also allows for:

- Building children's self-esteem through serving cultural and ethnic foods, allowing choices, encouraging the children to make decisions related to quantities of food taken, and serving their own food; Introducing a variety of unfamiliar nutritious foods and providing the opportunity to build good food habits and attitudes;
- Demonstrating that meal time is a pleasurable experience for socialization as well as eating;
- Providing learning experiences through participation in mealtime activities, such as setting the table, preparing food, serving food, and cleaning up; and
- Developing muscle coordination and decision-making skills by allowing the children to prepare food and serve it family style.^{3,22}

Although nutrition services are mandated, evaluation data indicate that over half of the Head Start grantees have nutrition consultants for fewer than 6 hours per week, so that nutrition services, including nutrition education efforts, are uneven across the country." Teachers are enthusiastic about nutrition education, but feel insufficiently trained and lacking in resources and time. A curriculum was recently developed to meet the needs of Head Start: "Children Get a Head Start on the Road to Good Nutrition." Its evaluation is described below under the appropriate headings, as are other studies examining the impact of the nutrition education component on children and families in Head Start.

The NET program was established by Congress in 1977, with the intent to "teach children, through a positive daily lunchroom experience and appropriate classroom reinforcement, the value of a nutritionally balanced diet and to develop curricula and materials and train teachers and school foodservice personnel to carry out this task."² It is directed at students from prekindergarten through grade 12. Studies involving a few individual preschool programs are described below under the appropriate headings.

The WIC program includes a nutrition education component directed at parents and other caretakers of infants and young children, as well as preschoolers directly. These studies will be described later in this monograph under the heading "Pregnant Women and Caregivers of Young Children."

REVIEW OF NUTRITION EDUCATION STUDIES

While nutrition education for preschool-aged children takes place formally or informally in a variety of settings, such as homes, preschool or daycare centers, grocery stores, and fast-food restaurants, and via TV advertising of foods,

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studies have mostly concentrated on such education in the home and in daycare settings. Twenty-three studies were identified as meeting the selection criteria for inclusion in this monograph. The studies are summarized in Table 1 in the Appendix. Most of the studies that are thought of as "nutrition education" are described in the first few sections below and are based on an information dissemination or KAB model modified to be appropriate in terms of child development. Individual studies will be described and categorized as to whether they showed an effect on knowledge, attitudes, or behavior. Behaviorally based interventions are then described.

Impact of parental involvement on children's nutrition knowledge and behavior. In a study of parents' influence at home on 104 children, Anliker and colleagues found that the more information that was communicated by parents, the more specific it was, and the more positive the messages, the higher the children scored on a knowledge test." Positive nutrition messages (why the food is important) had a greater impact than negative messages (why one should not have certain foods) on children's nutrition knowledge scores. Three studies examined the impact of parent involvement with the nutrition education curriculum. One study with 60 children examined the effect of a 4-week home-based nutrition education program using eight audio cassettes and picture books. Using a pre-test/post-test design, with a home and control condition, the study found a significant increase in knowledge in the home group, as compared to controls, but only when the evaluation method involved open-ended questions converted into quantitatively scored "concept maps."¹⁹ An 8-week nutrition instruction program using a pretest/post-test and control group design compared the knowledge gains of 20 children taught in a child development laboratory and 20 taught at home with 20 controls.²⁰ Children taught in the classroom scored significantly better than those taught at home. A third study found that 22 children who were taught at daycare and had parent augmentation of the curriculum content at home scored higher than 23 children who were taught the curriculum at school only and 15 controls who did not receive any instruction.²¹ These studies suggest that a home-only education requires intensive activities (audio cassettes and picture books) or more training of parents, and that parents and teachers working together can make learning more meaningful through mutual reinforcement.

In a study of parental influence on food selection²² 53 children in a cafeteria setting were asked to select any items that they wished from a large array of options for lunch and to put these on their tray. Given such free choice, the children chose items where 25% of their calories came from foods high in added sugar. When they were then told that their mothers would inspect their trays, they modified their choices to foods lower in added sugar. When mothers were

actually given the trays to modify, they removed items to make the meal lower in calories, saturated fat, and sodium, but they did not add any nutritious foods. The results indicate that mothers have a marked effect on food selection of their children; both the threat of parental monitoring and actual parental monitoring lowered calories and the number of less nutritious foods in the meal. The obesity status of the mothers and the children had no impact on these results.

Effect of nutrition education on families of children in Head Start.

Three separate studies examined the effects of interventions on Head Start parents. In one study, an introductory lecture, four training workshops, 12 newsletters, cassette players plus tapes of exercise/fitness activities, and a food and fitness fair were provided over the course of a 9-month school year to 95 parents.²⁷ These activities resulted in a significant increase in parents reporting exercising with their preschool children at home, an increase in the variety of foods reported to be consumed, and a decrease in the consumption of fat. In a second study, when trained nutrition volunteers (e.g., home economists and dietitians) worked with families, improvements were reported in meal planning, food preparation, and eating habits.²⁸ There were no control groups in these studies. A third study involving 171 mothers found that Head Start women participating in a program of four nutrition workshops and 13 newsletters gave their children a more diverse and higher quality diet, as well as more servings of nutritious foods, than did parents of the children in the control group."

Impact of nutrition education on children where knowledge was measured.

Three studies^{7,30,31} conducted in daycare settings examined the impact of nutrition education on children's knowledge. These curricula were developmentally appropriate and activity based, and included group time action stories, songs, and self-selected activities involving food. One such study involved 187 children ranging in age from 3 to 5 years old from 20 classrooms in 14 schools randomly assigned into intervention and control conditions.⁷ The intervention consisted of 12 nutrition education activities, including tasting foods, conducted twice a week for 6 weeks. Those in the intervention group had higher post-test nutrition knowledge scores, particularly in food identification, and, among the older children, increased knowledge of tooth brushing and food choices as well. One study comparing a microcomputer lesson to a traditional one using a puppet and picture cards found both methods were equally effective in increasing knowledge." A third study involving nine preschool programs with 194 children in the treatment group and three preschool programs with 73 children in the comparison group noted increases in knowledge of nutrition, but no changes in knowledge of feelings and emotions." Overall, all of the educational programs resulted in at least moderate increases in knowledge.

Effect of nutrition education on children where knowledge, attitudes, and behavior were measured.

Six studies specifically examined the effect of nutrition education on behavior, as well as knowledge. In one study, where 16 centers used eight activities per week for 6 weeks, such as songs, stories, and activities involving food,³² there was an increase in knowledge, but no change in behavior (tasting foods). The Student Parent Educator Administrator Children (SPEAC) Preschool Nutrition Education Project, developed to integrate the USDA Child Care Food Program with the educational curricula and activities of selected child care programs in Minneapolis during 1979-80, was studied in 139 children in the intervention group and 29 in the comparison group.³³ Results revealed an increased preference for fruits, vegetables, and dairy products by the children in the intervention group. The effect of the NET preschool program in Iowa, "Nutriphonics," was studied in 850 preschoolers and their parents, as well as in 80 teachers in 17 nursery schools and child care centers.³⁴ The program involved a 14-unit learning package (30 minutes, three times per week) that emphasized choosing nutritious foods, rather than nutrition knowledge. The intervention resulted in only one small behavioral change: the increased choice of an infrequent fruit snack (dried apple slices). There was no difference between intervention and control groups in assembling a potluck meal and choosing an empty-calorie versus a nutritious snack. Another intervention, a 10-week program of nutrition activities called "Good Beginnings," resulted in increased knowledge, but no change in attitude or behavior.³⁵

A self-contained nutrition education curriculum for children aged 2 to 5 was designed to meet Head Start nutrition education objectives (Children Get a Head Start on the Road to Good Nutrition). The effect of 6 weeks of instruction using a sampling of the lessons in the curriculum was investigated using a classical experimental design with 1000 Head Start children from 65 classrooms across the country.²³ Teachers were trained in the use of the curriculum. There was no significant difference in nutrition knowledge between the experimental and control groups, but there was a change on two of three attitude scales, and a change in two of the six behaviors measured: decreased refusal of foods served and increased requests for low sugar snacks. Improvements in "requests for more nutritious snacks" and the other behaviors that were measured were similar in the intervention and control groups. In another study, Lawatsch³⁶ modified popular fairy tales to teach about vegetables, comparing the effect of a "benefit appeal" (favorable effects of eating vegetables) and a "threat appeal" (nutritional risks of not eating vegetables). She found both appeals were effective, but the "benefit" group had higher scores for knowledge and for vegetable snacks.

In summary, the three studies that examined the effect of nutrition education on knowledge all found positive results. Of the six studies that reported on the effects of nutrition

education interventions on behavior, as well as on knowledge, three resulted in changes in some behaviors and three resulted in no change. Attitudes were measured in two studies: there were improvements on two of three attitude scales in one study and no changes in the other study. Several researchers speculated that lack of sufficient time in the intervention may have been an obstacle to finding desired effects.

Behavioral interventions affecting food and nutrition behavior.

The studies described below differ from those described above, which relied on the KAB model of nutrition education, in that behavioral change strategies were specifically investigated. The targets of the interventions were the children's preferences and food acceptance behaviors. Consequently, the outcomes that were measured were also changes in preferences and behaviors. Nutrition knowledge was not measured. The studies were conducted in preschool programs or nursery schools.

One study examined the impact of increasing exposure on children's acceptance of given foods. It was found that, while 2 to 3 year olds demonstrated more neophobia, that is, more reluctance to taste new or unfamiliar foods, than 5 to 6 year olds, preference increased with exposure in all age groups. This increase required a minimum of 8 to 10 exposures and usually was clearly seen only after 12 to 15 exposures.^{1-5,37} When looking and tasting were both studied, the increase in preference was strongest and significant only in the situation in which the children in preschools actually tasted the food and did not just look at it." In short, taste was shaped by exposure to foods.

Modeling by peers and adults has also been examined. In a study in a nursery school, Birch³⁹ examined the effect of peer models' food choices and eating behaviors on the preschoolers' preferences for vegetables. She found that, at lunch, seating a target child with three or four peer models who were selecting and eating a vegetable that was initially not preferred by the target child (e.g., carrots) caused the target child to choose the initially not preferred vegetable, even in the presence of an initially highly preferred food (e.g., peas). The change in preference was still present at 6-week follow-up. In another study, preference for a food was also increased when it was offered by adults who ate it themselves and then offered it to the child." This effect was greater than when the adult did not eat it but offered it only. Food acceptance was also enhanced when the food was offered in a positive social context—for example, with positive attention by preschool teachers.⁴¹ Both the emotional tone of the social interactions between adults and children in the preschool and social modeling by adults and peers were found to impact the development of food acceptance patterns.

Several studies also examined the use of rewards, and the situation was found to be more complex. In one study, when a food was given as a reward in the preschool, there

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was a significant increase in preference: "You did a good job cleaning up the toys. Here, have some peanuts." The opposite was true if the child was asked to eat a food in order to obtain a reward: "If you eat your vegetable, you can go out and play." In particular, making eating a more preferred food contingent on eating a less preferred food ("you can have dessert if you eat your spinach") decreased even further the liking for the initially less preferred food. Another study examined the effect of using reinforcement for trying a new food. Stark et al.⁴² used a behavioral program with 17 children aged 3 to 6 years to modify children's food choices during a snack period in a preschool program. They examined the effect of reinforcement or reward and measured its effect at school and in the home (i.e., outside of the training setting). They found that stickers and praise given for choosing a healthy snack increased healthy snack choices, but only at school, not in the home. In addition, after withdrawal of reinforcements, snack choices returned to baseline levels.

Effect of public service announcements and television ads on preschool children's food choices, with and without adult comment. During a 4-week period, Galst⁴³ divided 65 children, aged 3 to 7 years, into five conditions: TV food ads for high-sugar products with and without an adult present and commenting; TV ads for low-sugar products and public service announcements (PSAs) about fresh fruits and vegetables, dairy products, and other foods from the basic food groups that also discouraged consumption of highly sugared foods, with and without an adult present and commenting; and a control condition. The outcome measure was the weekly proportion of snacks chosen at preschool that contained added sugar. The most effective intervention was ads for low-sugar snacks and pronutritional PSAs that were accompanied by positive evaluative comments by an adult co-observer. Negative comments by the adult co-observer about added sugar snacks did not decrease the intake of these snacks at preschool.

Summary. Of the intervention studies reviewed here that used the KAB theoretical framework, three studies examined the impact of nutrition education on knowledge only, and all found a positive effect. Of the six studies examining the impacts of interventions on knowledge, attitudes, and behavior, all consistently resulted in improved knowledge. The effects on attitudes were measured in only two studies. In one study, there were positive effects on some attitudes, and, in the other, there were none. The effects on behaviors, at least in the short term, were positive to some degree in three of six studies.

Studies that targeted behavioral change using behavioral strategies in the absence of didactic teaching found that food acceptance was enhanced by repeated exposure to food, peer and adult modeling, positive emotional tone in the

social context when foods are offered, and appropriate use of rewards. These behavioral strategies also resulted in short-term increases in consumption of healthy snacks in one study. Mothers have a substantial impact on children's nutrition knowledge and food selections. Positive adult evaluative comments accompanying low-sugar ads and pronutrition PSAs also influenced food choices positively in one study.

CONCLUSIONS ON ELEMENTS CONTRIBUTING TO EFFECTIVENESS OF NUTRITION EDUCATION

The reviewed studies suggest that, where success was achieved, the following components contributed to the effectiveness of nutrition education for this age group:

- *Involvement of parents/families*, either as major recipients of the program, or in conjunction with the program offered to the preschool child, is extremely important. In studies involving families, it was found that home-only interventions need to be fairly intensive and based on activities that parents and children can do together." Parents and teachers working together can make more of an impact than either alone through mutual reinforcement.²⁵ In studies with Head Start parents,²⁷⁻²⁹ it was found that educating and encouraging parents were effective in increasing children's knowledge and reported consumption of more nutritious foods.
- *A behaviorally focused approach*, which specifically targets preschool children's behaviors, has been shown to increase preference and consumption without didactic teaching.^{1,19,42} It includes social modeling of eating healthful meals and snacks by peers and adult role models, adults offering foods to children in a positive social environment, and appropriate use of rewards. The KAB model, even when modified to take into account the research on cognitive and emotional development in young children, was less effective.
- *The use of developmentally appropriate learning experiences and materials is critical to success.*¹ Child development theory and research suggest that no amount of "teaching" will make children learn concepts that are beyond the capability of their level of cognitive development. Children aged 4 to 7 years can comprehend concepts such as having energy, a strong heart, healthy foods keeping germs out of the body, and low-fat foods keeping the heart healthy." An understanding of nutrients and what happens to food in the body is more rudimentary.⁸⁻¹⁰ Programs need to be tailored to children's level of emotional and motor developmental levels as well.^{6,12}
- *Food-based activities* such as tasting parties, food preparation, vegetable and fruit gardens, engaging the five senses with food, and eating healthy meals and snacks have been successful in increasing children's food preferences.^{5,23,35} Such exposure makes healthful foods familiar and hence

more acceptable to children. Child care nutrition educators note that meals and snacks at child care centers should be the centerpiece of nutrition education in these settings.²²

- *Activity-based teaching strategies* that encourage interaction with real-world objects are essential. The studies reviewed above showed that, where interventions had an impact on knowledge and eating practices, activity-based teaching strategies were involved.^{23,30,33} These findings confirm a review of nutrition education for preschoolers conducted by Olson and Randell in 1981,²⁴ which determined that active participation in a nonthreatening environment was most conducive to success. Activities included art projects, songs, jingles, role playing, stories, puppets, and puzzles.

A program is more likely to be implemented and used if:

- It becomes integrated into the early childhood curriculum.⁴ Nutrition education activities can be integrated into other areas, such as sensory development, language arts, science, dramatic play;
- Staff are adequately trained and are confident in their abilities^{3,4} and
- The program is easy to understand and includes materials that are affordable.

IMPLICATIONS FOR POLICY AND PROGRAM IMPLEMENTATION

The elements contributing to the effectiveness of nutrition education identified above have implications for nutrition education policy and program implementation. These are described below.

- *Preschool programs should clarify their goals* and use available research to design and implement appropriate educational strategies. The fact that half of the preschool classroom studies reported only on impacts on knowledge, while others included behavioral measures, suggests that, despite the stated goals of nutrition education for preschoolers, there is some confusion as to whether nutrition "education" for preschoolers should be mostly directed at increasing information/knowledge or enhancing a more positive attitude to food and healthful behaviors. If the latter was also a goal, many studies did not draw on all available research from the behavioral sciences to bring it about.
- *Preschool and family programs should make greater use of behaviorally focused approaches* that have been shown to be effective in fostering food acceptance patterns. Thus, interventions and family parenting practices should not only emphasize active participation and be developmentally appropriate, they should also provide children with repeated opportunities to taste and enjoy nutritious foods, systematically use adult modeling and peer modeling to encourage healthful eating, encourage adults to

taste and offer foods in a positive, social-affective climate, and ensure that rewards are used appropriately. The use of simple problem-solving activities to enhance self-efficacy should also be more systematically incorporated. *The confidence of teachers to implement nutrition education should be increased.* Surveys show that teachers are enthusiastic about nutrition education but their limited background in nutrition and limited finances for materials are obstacles to nutrition education in preschool centers." More training of teachers in nutrition is needed, as well as an understanding of their role in shaping eating patterns of the children. In one study, the use of dietitians, nutritionists, and home economists as "volunteer nutrition consultants" was successful in assisting families in meal planning, food preparation, and eating habits." This approach could be expanded.

- *New and different approaches should be explored.* Other settings and media should be considered to reach preschool children, not all of whom are in daycare centers. For example, the use of television shows and PSAs could be explored. Nutrition educators should encourage writers and producers at major and cable networks to incorporate appropriate nutrition messages into their programs. Supermarkets could be the site for nutrition displays, colorful educational materials, large models of food, and exhibits emphasizing healthful eating based on the Dietary Guidelines and the Food Guide Pyramid. More nutritionally appropriate toys, games, and puzzles should be developed. Preschool children can also learn food and nutrition skills through interactive computer programs.
- *Full implementation of Head Start goals should be encouraged for all child care centers.* These goals are very much in line with the research findings reported here. They address building self-esteem, demonstrating that meal time is a pleasurable and enjoyable experience, and introducing a variety of unfamiliar foods. In addition, goals about modeling by staff and by the foods served should be added.

IMPLICATIONS FOR NUTRITION EDUCATION RESEARCH

Based on the results from the review of studies, the following recommendations are made for nutrition education research.

- *Curricula and materials for preschool children need to be evaluated.* In the past 15 years, many curricula and materials have been developed and field tested, but they have not been evaluated for effectiveness in increasing knowledge, changing nutrition attitudes, or improving eating habits. Thus, only about a dozen studies were identified that met the criteria for inclusion in this review. More evaluations are necessary to demonstrate more conclusively the effectiveness of nutrition education and

to delineate more comprehensively the specific components that contribute to success. Curricula could have simple evaluation tools built into each lesson to facilitate evaluation.

Longer time frames for the educational programs must be used and longitudinal studies conducted. Interventions must be conducted for a longer time in order for children to acquire preference for healthful foods, to develop food choice skills, and to internalize the nutrition concepts. Longitudinal studies would also permit examination of long-term effects, as well as detection of delayed impact of the educational program. Projects need to be funded so that educational activities can be conducted in the time frame for which they were designed. For example, the curriculum tested by Byrd-Bredbenner et al.²³ was designed for use over a 3-year period, but was only tested for 6 weeks because of funding constraints.

- *Further research on the effects of nutrition knowledge and attitudes/preferences on eating habits must be conducted.* More studies are needed on whether and how young children at different ages can apply their knowledge to everyday nutrition practices.¹ In addition, more research needs to be done on applying in more naturalistic preschool settings those behavioral strategies that have been found to be successful in enhancing food preference and behavioral change in more controlled studies.¹⁴
- *There should be further study of families and children at risk for nutritional problems.* More studies need to be conducted on marginally functional or dysfunctional families or those with lower and unsteady incomes, lower parental education, or poorer housing. Such conditions may result in particular difficulties for children who may feel less secure and less likely to try new foods.