INTRODUCTION

Young children, between birth and 5 years of age, require good nutrition for optimal physical growth and development. Proper nutrition enhances a child's ability to learn and be ready to fully participate in school.1 The importance of consuming more fruits and vegetables continues to be emphasized in the United States Department of Agriculture Dietary Guidelines for Americans 2010.2 Children 2-5 years old need to increase consumption of vegetables (especially dark green and orange), legumes, and whole grains; and decrease consumption of saturated fat, sodium, and extra calories from solid fats and added sugars.3 Studies from child care centers report preschool children are not consuming the recommended amounts of whole grains, vegetables, and fruit.4,5 Children from low-income communities confront many barriers to consuming fruits and vegetables.6 Besides financial constraints, availability of fruits and vegetables in low-income areas seems to account for some of the disparities.7

The prevalence of obesity among low-income, preschool-aged children in the United States increased from 12.4% in 1998 to 14.6% in 2008,8 the combined prevalence rate of obesity/overweight was 31.1%.9 It is more effective to influence children’s eating habits early as a method of changing behavior.10 Promoting healthful eating and active living in school is an effective way to reach children. School-based nutrition education, combined with other school wellness programs, is essential to address childhood health and help advance student academic performance.11

Nutrition Matters! (NM!) was developed after a comprehensive survey of more than 150 early childhood educators.12 Nutrition Matters!, an age-appropriate nutrition education program integrating nutrition, gardening, and physical activity, is aimed at helping young children develop healthful eating and physical activity behaviors. More information about the NM! curriculum can be found online12 and an image of the book’s cover can be found in the Supplementary Materials.

PROGRAM DESCRIPTION AND IMPLEMENTATION

The program’s objectives were to increase intake of fruits and vegetables and increase physical activity in children aged 3 to 5. The NM! curriculum used pedagogical methods that created ways for children to observe and investigate through hands-on activities. It integrated 3 concepts throughout the modules. The content of the modules included: Module I, Nutrition; Module II, From Garden to the Classroom; and Module III, Physical Activity. Each of the modules had a standard educational framework that included: (1) 1-3 activities connected to a specific objective of the lesson and to the Department of Education’s Desired Results;13 (2) a physical activity break; (3) a fruit or vegetable taste-test; (4) a parent letter to reinforce the activity at home, with a recipe featuring the same food that was taste-tested; and (5) a list of age-appropriate story books recommended for each specific lesson. Module II (Gardening) linked gardening and nutrition and helped children build connections about what they grow and eat. It provided in-classroom and outdoor gardening lessons. Module III (Physical Activity) included resources and information about fun, age-appropriate activities to develop gross and fine motor skills. This report evaluated Modules I and II of NM!

Teachers who participated in the series of professional development and specific training were selected to implement the 11-lesson (for the Nutrition and Gardening group), or the 5-lesson (for the Nutrition group) program. Each lesson took approximately 30-45 minutes to complete. Health educators provided technical assistance and support in the implementation of the lessons. They visited the classroom regularly between the months of April-June to ensure implementation and that teachers had all the materials and supplies to appropriately deliver the lessons. Teachers participating in the evaluation received a teaching kit for each module.

Preschool children enrolled in 18 of the 36 early childhood centers at a California unified school district participated in the program in 2007. Children met the low-income criteria for participation in the Food Stamp Nutrition Education Program (now the Supplemental Nutrition Assistance Program).

1University of California Cooperative Extension, Alameda County, Alameda, CA
2Community Health Assessment, Planning and Evaluation Unit, Contra Costa Health Services, Contra Costa County, Martinez, CA
STATEMENT OF POTENTIAL CONFLICT OF INTEREST AND FUNDING/SUPPORT: See page S164.
Address for correspondence: Elizabeth J. Gong, MPH, MS, RD, University of California Cooperative Extension, Alameda County, 1131 Harbor Bay Parkway, Suite 131, Alameda CA 94502; Phone: (510) 639-1252; Fax: (510) 748-9644; E-mail: ejgong@ucdavis.edu
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Program Education, SNAP-Ed). The criteria for site selection were ethnic/racial diversity to reflect the school district’s population, similar number of students in the classroom, no previous nutrition in the classroom intervention, and site with existing garden for garden-based nutrition education.

PROGRAM EVALUATION

The evaluation measured children’s eating behaviors, using a pretest/posttest design and observations conducted before and after NM! lessons. Teachers who implemented Module II (Gardening) did outdoor gardening activities with children, including planting seasonal vegetables. Trained observers conducted direct observations in the classroom at regular snack time. Children were offered each of 4 fruits and vegetables (figs, raspberries, blanched snap peas, roasted beets—each featured in both Modules I and II), family-style, 1 at a time, and were observed using a checklist. The checklist listed 5 specific behaviors and the checks were later converted to a “preference,” or willingness to try, score from 0-4 for each food item based on these behaviors: 0, the child did not take the food from the serving plate; 1, the child took the food from the serving plate but did not bring it to nose or mouth; 2, the child took the food and brought it to nose or mouth, but did not put it in mouth; 3, the child took the food and put it in mouth but did not swallow (including taking a bite and spitting it out); or 4, the child took the food and ate it (chewed and swallowed). Observations took a total of 20-35 minutes per site, including time for food plating, assigning study identification numbers, and seating the children.

In 2007, 18 early childhood education sites participated. Six sites implemented Modules I and II (nutrition lessons and on-site gardening lessons linked to nutrition), 6 sites implemented only Module I (nutrition lessons), and 6 sites served as a control group (no lessons; no garden on site; Table 1). The 12 teachers implementing NM! completed a survey designed to be filled out after each activity, including whether the teacher completed each component of the activity. The authors secured formal written consent from teachers and parents. Personal information was separated from coded surveys.

The behavior scores were analyzed using Microsoft Excel (version 2003, Microsoft Corporation, Redmond, WA, 2003) data entry template developed by the funder. The template calculated pretest means, posttest means, the difference between means, and P values for paired t test. Statistical significance was set at P < .05.

There were 266 pre-post observations from the 3 groups. Each group had 6 early childhood education sites reporting. Sites reported varying number of children ranging from 3-30 (Table 1). The average number of pre- and post-tests was 15 from the Nutrition and Gardening group, 16 from the Nutrition group, and 14 from the control group. The Nutrition and Gardening group (n = 91) showed a significant increase in preference, or willingness to try, for 3 (figs, raspberries, snap peas) of the 4 food items tested. The Nutrition group (n = 94) also had a significant increase in preference for figs, raspberries, and snap peas. The increase in preference score for beets for both NM! groups was not significant.

The control group (n = 81) showed a significant decrease in preference for beets; preference for the other 3 foods did not change significantly (Table 2).

Twelve teachers (6 from the Nutrition and Gardening group; 6 from the Nutrition group) who implemented NM! completed a retrospective questionnaire to report children’s observed behavior during the activity, teachers’ likes and dislikes, activity preferences, and usefulness of the curriculum, on a 7-point Likert scale for 105 statements (7 for each activity). Teachers were also asked what challenges might have interfered with lesson delivery. Teachers reported average responses from 5.83 to 6.30.

SUMMARY

Garden-based nutrition education programs have the potential to improve willingness to taste fruits and vegetables, encourage fruit and vegetable intake, and increase preferences among youth, whose current preferences for them are low. In the present evaluation, preschool children’s willingness to try 3 of the 4 test fruits and vegetables increased after the nutrition lessons (only) and after the nutrition and gardening lessons of NM! One particular outcome noted in the evaluation is the children’s increased willingness to try vegetables and fruits, such as snap peas, figs, and raspberries, after their involvement with growing plants and preparing snacks with seasonal vegetables and fruits. Further studies are needed to help identify whether the slightly higher increase with the addition of gardening is worth the effort gardens require.

Behavior change is more likely to occur when there are multiple levels of intervention, and nutrition education is 1 of the targets, particularly during the early years. Our experience with NM! showed children are more likely to taste vegetables and fruits when they participated in gardening and nutrition activities that allowed them to be active learners. Efforts to build health and wellness in schools might include creating parent-run produce stands to increase access in neighborhoods with no nearby supermarkets. Maintaining communication and support from the school district, center directors, teachers, and assistants, as well as providing on-going professional development and
technical assistance, was valuable to the evaluation process.

Interventions aimed at single behavioral targets are unlikely to have a substantial impact on children’s eating behaviors. Nutrition knowledge is important and should be integrated into schools, but it is not enough to affect behavior change.15 Using age-appropriate gardening education connected to nutrition can positively influence eating behaviors and has the potential to improve vegetable and fruit intake. However, more research is needed to further study the influence of gardening on the consumption of fruits and vegetables by preschool children.

NOTES

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST

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SUPPLEMENTARY DATA

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.jneb.2011.03.007

REFERENCES


