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Effects of a Healthy Eating Intervention on Latina Migrant Farmworker Mothers

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Abstract

This is a report of a 2-group pre-/post-quasi-experimental pilot intervention study, Dietary Intake and Nutrition Education–Phase Three. The purpose of the study was to present self-management health education on healthy eating to Latina migrant farmworker mothers. The intervention had three 1-hour classes. Surveys included household food security, general self-efficacy, acculturation, knowledge, and children's food patterns and anthropometric measurements. Positive results were seen in mothers' nutrition knowledge. Intervention children had decreased body mass index percentiles. Children whose mothers had higher acculturation had greater reduction in body mass index percentiles. Mothers living alone had higher probability to attend intervention classes. Lessons learned will guide future health promotion research.

Keywords

children; education; Latinas; migrants; nutrition

THE LARGEST minority of children in the United States is of Latino ethnicity and comprises 16% of the US population younger than 18 years.¹ Despite this position within a growing census, the Latino Consortium of the American Academy of Pediatrics Center for Child Health Research has identified unanswered priorities that need to be addressed for Latino children.² Key issues that have been summarized are the lack of validated research instruments, exclusion from research studies, and failure to analyze data by pertinent subgroups. There are estimated to be more than 2 million Latino farmworker children who are part of the US Latino population. Past research has shown that migrant farmworker children are overweight and obese, and do not achieve recommended daily food group servings established by the U.S. Department of Agriculture (USDA).³⁻⁵ Their families often live in poverty and have low levels of food security.⁶

This is a report of Phase Three of a 2-group pre-/post-quasi-experimental pilot intervention study titled "Dietary Intake and Nutrition Education (DINE)" that was conducted at agricultural work camps after work hours in 2 Midwest states. Its purpose was to investigate the effectiveness of self-management modules of a health education program on healthy

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eating to migrant farmworker mothers. These classes used a visual and integrated learning approach where learners became active participants in acquiring new knowledge.⁷⁻⁹

BACKGROUND

National health care policies seen in the document Healthy People 2020 have targeted the reduction of health disparities and the improvement of access to preventive health care services to racial and ethnic minorities.^{10,11} Some of the major barriers that Latinos face when accessing preventive health care services include lack of health care coverage, limited English proficiency, low income, and cultural beliefs and values that include focus on the present rather than the future, devaluing preventive measures and the use of traditional folk medicine practitioners.¹⁰ Recommendations to improve health status include establishing community partnerships and mobilizing social networks that may be a positive influence toward healthy change.¹² Other important considerations in the design of a healthy eating intervention for minorities were to gain an enhanced understanding of participants' needs and perceptions, and pilot test the intervention.¹³ Descriptive information including measures of food security, acculturation, and self-efficacy obtained in Phase One of the DINE study contributed to the design and curricula content of the DINE health promotion intervention.⁴

Leininger¹⁴ has shown that when interventions are culturally tailored to the racial and ethnic population better outcomes are achieved. In addition, focus group methodology has shown that reassurance in striving toward healthy behaviors, interactions with peers during health promotion education, and group education (en grupo) were highly desirable when teaching healthy behaviors to Latinas.¹⁵ Latina mothers also discussed in focus groups that healthy eating habits of parents set a good example for their children to see and model.¹⁶ In a systematic review of nutrition education among Latinos, it was shown that peer education had positive influences on self-management outcomes.¹⁷ Furthermore, research has shown that when nutrition education was delivered in a group format not only was it more cost-effective, but there was no difference compared with individual classes with changes in body mass index (BMI) or percentage of weight change.¹⁸ Therefore, interactive learning in a group setting was chosen for delivery of the healthy eating messaging in the DINE study.

The PRECEDE-PROCEED Model of Health Program Planning and Evaluation concept of self-management provided guidance for selection of variables and predisposing, enabling, and reinforcing factors.^{19,20} Predisposing factors include knowledge, attitudes, values, beliefs and perceived needs, and abilities. Enabling factors include environment and personal contributors such as resources that impact accessibility, availability and affordability, programs and services, skills, money and time, facilities, and laws. Reinforcing factors include positive or negative feedback from peers, family, health care workers, law enforcement, and the media. This model served as a roadmap to guide the intervention. The study aims were as follows: (1) Assess if the migrant farmworker mothers' nutrition knowledge improved after an intervention class. (2) Determine whether there is a difference in (a) child's body mass index percentile (BMI-p) according to age and sex and (b) dietary intake in those children whose mothers participated in the DINE intervention compared with those who did not. (3) Evaluate the feasibility of conducting a multidata collection study that includes ability to recruit participants, clarity of measurement and instruments, safety concerns, fidelity, and identification of barriers in obtaining research data. The hypothesis for Phase Three was that the migrant farmworker mothers who attended an intervention class would achieve improved nutrition knowledge and that children whose families participated in the DINE program would achieve a decreased BMI-p for age and sex, and an increase in the recommended number of servings per week from

each food group (established by the USDA Food Guide Pyramid, later MyPyramid) than those children whose mothers did not participate in the DINE program.

METHODS

Design and sample

This study design was a 2-group pre-/post-quasi-experimental pilot intervention approved by the university's Institutional Review Board by expedited review. In addition, after university protocol with research studies involving non-English-speaking participants, the study underwent a cultural assessment that evaluates the methodology and its congruence with cultural norms. Located by an Internet search, Midwest farms that employed migrant workers were identified and those farm growers were contacted with written recruitment letters that were followed up by telephone contact. Subsequently, farm growers gave letters of access to the research team to enter onto their property, recruit, and enroll a convenience sample of migrant mothers, and conduct the nursing research study. Inclusion criteria included consented migrant mothers and their children 2- to 12-year old who lived on an agricultural work camp. Recruitment flyers and posters were sent to personnel designated by farm owners for announcement of the nursing research project in migrant camp high-traffic areas such as in laundry facilities. Interested participants approached the research team for enrollment and after their questions were answered, they consented into the study in the language of their choice. Assent was obtained from all children who were 8 years and older. All forms were available in English and Spanish. Consent and assent procedures were obtained by bilingual research team members before the first meeting of the intervention and data collection.

Measures

All instruments were sensitive to low literacy levels as measured by the Flesch-Kincaid grade levels. Personal digital assistants (PDAs) were audio-enhanced with wave files so that the study surveys were read to the participant, and these PDAs were successfully pilot tested in Phase One of DINE.²¹ Audio-enhanced PDAs were the mode for administration of the demographic questionnaire and surveys on acculturation, household food security, and general self-efficacy. The mother-reported children's food frequency surveys were administered via audio-enhanced tablet computers or paper format.²² Reports on data quality from the use of audio-enhanced PDAs and from the audio-enhanced tablet computers are reported elsewhere.^{21,22}

Acculturation was measured by the Short Acculturation (12-item) Scale for Hispanics (SASH), a reliable method used in a variety of Hispanic/Latino subgroups, including Mexican Americans.²³ Acculturation was defined in this study as the psychological and social changes that occur when individuals from different cultures come into continuous contact with each other.²⁴ The responses are averaged, and a mean of 2.99 is used to differentiate the less acculturated (1 to 2.99) from the more acculturated (>2.99). This study's SASH Cronbach α was .902 ($n = 53$).

The U.S. Household Food Security Survey Module (HFSSM) measured household food security (the ability of individuals to obtain sufficient food on a day-to-day basis for an active healthy life, in socially acceptable ways).²⁵ The 5-question short form of the Household Food Security Survey Module has been successfully used with demonstrated sensitivity, specificity, and reliability.²⁶⁻²⁹ Positive responses are summed and classified into food security levels: 0 to 1 = food security; 2 = marginal food security; 3 to 4 = low food security; and 5 = very low food security. Cronbach α for the Household Food Security Survey Module was .725 ($n = 53$) in this sample of migrant mothers.

An instrument developed in California with Latina immigrants measured mothers' past food security. The past food security tool included 7 items and had a Cronbach α of .84 with measured convergent ($P < .001$ and $P < .006$) and discriminate ($P < .01$) validity.³⁰ The Cronbach α for past food security survey in this study was .888 ($n = 25$).

The General Self-Efficacy Scale was used to measure self-efficacy, a possible mechanism to enable self-management.^{9,31} General self-efficacy for this study was defined as the optimistic self-belief that one can perform a novel or difficult task, such as making changes in a mother's cooking patterns and family food selection.³¹ The 10-item survey available in English and Spanish is answered on a 4-point dimension—1 = not at all; 2 = hardly true; 3 = moderately true; and 4 = exactly true—and has established reliability.³² Groups are established on the basis of the empirical distribution of the population, and the studied sample is dichotomized after a median split; there is no cutoff score. Cronbach α was .899 ($n = 54$) in this sample of migrant mothers.

The Food Frequency Questionnaire was used to catalog and characterize food patterns of 1 targeted child per family.³³ This Food Frequency Questionnaire is designed for low-income Latino parents and asks parents how often in the last month each 1 of 66 food items typical to the Latino diet was consumed. It answers the question whether that child's diet met the minimum USDA recommended food group servings for age and sex. Affirmations that the child met recommendations of servings of each of the 5 food groups yield a score. The greater the score, the more minimum requirements suggested by the USDA were met. The Food Frequency Questionnaire has established validity through comparisons of direct observation that yielded similar estimates of food group servings, and is available in Spanish and English.³⁴

Anthropometric measurements were obtained for all children 2 to 12 years old who presented to the study. Behind a privacy screen, children were weighed on a digital scale (Tanita, Arlington Heights, Illinois) and measured in height with a portable stadiometer (Seca, Columbia, Maryland) in indoor clothing with their shoes removed. Body mass index and BMI-p were calculated using the Centers for Disease Control and Prevention's pediatric BMI calculator.³⁵

To measure mothers' pre-/post-intervention gain in knowledge, a Centers for Disease Control and Prevention work sheet (Eat Smart with MyPyramid) from a no longer available workbook, Team Up At Home, was used. The assessment was visual and designed for limited reading ability.

Procedures

Intervention and comparison group sites were predetermined by location and proximity to each other, and ease of traveling for the 2 bilingual research teams that each contained Latina/Latino members. For both the intervention and comparison groups, baseline (T1) data were collected from mothers and children soon after their arrival to the migrant camp at the start of the summer. Anthropometric data were obtained for children 2 to 12 years old, and mothers completed surveys on general self-efficacy, acculturation, and household food security on audio-enhanced PDAs and 1 target child's food frequency on audio-enhanced tablet computers or paper mode. At the close of the summer, about 3 months after T1 data collection, and several weeks after the conclusion of the health promotion intervention (T2), children's anthropometric measurements and the target child's food frequency were repeated.

The intervention group met 5 times, with 3 of the sessions being instructional and 2 data collections. There were three 1-hour classes. The first class focused on nutrition knowledge

and included information on the food pyramid, eating fruits and vegetables, food portions, choosing whole grains, and use of canola or olive oil. The second class focused on activity and included topics on increasing physical activity, decreasing television and video screen time, and suggestions on how a migrant family could achieve these goals within their living environment. The third class focused on the selection of healthy choices and included information on what is a healthy snack, how to read a food label, limiting sweetened beverages, and encouraging more family meals and breakfast every day. Each class started with an icebreaker to welcome the mothers and to highlight what was to be discussed in that class session.³⁶ Class objectives were delivered using visual and hands-on methods incorporating learning tools such as Life form® food replicas (Nasco, Fort Atkinson, Wisconsin) and Food Pyramid Bingo® (Smart Picks, Inc, Lakewood, Ohio) with fresh produce offered as prizes. Some sessions had pre- and post-knowledge tests or descriptive questionnaires about mothers' past food security, fruit and vegetable intake, and activity levels as pilot tests for reliability of those instruments for future studies. All classes were conducted in sheltered areas, water was provided with healthy snacks, and 1 healthy meal was served. Nearby childcare was provided and consisted of book reading, coloring books and crayons, and children's games. Mothers went away with lesson reinforcements such as a jump rope, a bilingual cookbook, an educational comic book designed by the author, Small Changes, Big Results© (Duke, Cleveland, Ohio) that summarized lessons learned, and a healthy eating children's book. The comparison group received 2 visits from the research teams for the purpose of data collection only. Bilingual, low-literacy information on healthy eating provided by the Centers for Disease Control and Prevention was distributed to the comparison group after the first data collection. All intervention and comparison group participants were compensated with a national chain superstore gift card each time they attended a session or data collection. In addition, participants took home the portable headphones used for the audio-enhanced technology in data collection as part of their compensation for participation.

Statistical analysis

Descriptive statistics were used to summarize sample demographics and outcome measurements. The children's baseline information between the intervention and comparison groups was compared using 2-sample t test and χ^2 test. Correlation or t test among the measurements was conducted for preliminary analysis. The intervention effect on improving mothers' nutrition awareness in the treatment group was assessed by the paired t test. Children's BMI-p adjusted by age and sex was compared between the intervention and comparison groups using an analysis of covariance model controlling for covariates. The potential covariates include baseline BMI-p, sex, and acculturation. A Wilcoxon signed-rank test was performed to check children's BMI-p category change in each group. The changes in mother-reported children's nutrition intake were described between the 2 groups. The feasibility analysis of the study was conducted by comparing the demographics of the retained mothers and dropped-out mothers at the baseline. The t test/Wilcoxon rank sum test or χ^2 /Fisher exact tests were used where applicable. Cronbach α was calculated to assess the internal consistency reliability of the instruments. Data were analyzed employing SAS statistical software, version 9.2 (SAS Institute, Cary, North Carolina). A 2-sided significance level was set at .05.

RESULTS

Sample and demographics

Fifty-nine mothers were enrolled into the study (intervention group $n = 34$; comparison group $n = 25$). Responses to questions on demographics showed that the 2 samples of mothers represented a statistically homogeneous group. Most mothers (91%) self-identified

as ethnically Latina, of which 31% racially identified as white, 11% as multigroup, and 55% as others. Only Spanish was spoken at home in 73% of the households. Thirty-six percent were 18 to 27 years old, and 49% were 28 to 37 years old. Education levels were low, with 47% having less than a ninth grade education. In addition, 16% had some high school classes and 24% had a high school diploma. Forty-five percent of mothers were married, with the remainder widowed, single, or cohabitating with a partner. Nineteen percent of women indicated it was their first year as a farmworker, 46% reported to have been a farmworker between 2 and 5 years, and 35% for 5 or more years. Thirty-three percent of mothers reported a monthly family income less than \$500, and 47% reported a monthly income between \$500 and \$1000. Most women (53%) reported that they held permanent residence in Florida, 35% in Texas, 6% in Mexico, and 6% from other US states. Fifty-seven percent of mothers worked full time, and 65% reported they sent money home to the family in Mexico.

The majority of mothers thought that the migrant camp home was a safe place to live (87%). However, 22% thought that child's play area was not very safe. Fifty-four percent received food stamps, and 44% received supplements by Special Supplemental Nutrition Program for Women, Infants, and Children. More than 90% of mothers reported that their child drank milk daily. The same percentage of children drank water on a daily basis, and 21% of children were given soda pop as a beverage. Fifty-two percent of mothers said that their children did not eat a balanced meal. Fifteen percent of mothers had a garden where they grew produce. Most mothers said that their cooking facilities were adequate with working refrigerators and stoves, but 24% said that they did not have an oven that worked. Only 9% of mothers used lard in meal preparation.

Surveys and measurements

Mothers' acculturation—Mothers' acculturation levels in the sample showed that 95% were less acculturated. There were significant differences found in mothers' mean self-efficacy and acculturation levels between the intervention and comparison groups but not in the household food security level, as shown in Table 1. The intervention mothers had higher self-efficacy scores, but the comparison mothers had higher acculturation levels.

Household food security and past food security—Household food security was low-to-very low in 64% of the families, with 29% scoring high food security. Fifty-two percent of mothers experienced low levels of food security in the past as a child (8% marginal, 12% low, and 32% very low), with 48% having no concerns with food security. Low levels of past food security correlated to current low levels of household food security with Pearson's correlations (.622) with a $P = .002$ ($n = 23$).

General self-efficacy—Following instrument directions after a median split, mothers' mean general self-efficacy was calculated to be 30.29, and therefore 53% of mothers could be classified as having high self-efficacy.

Children's anthropometric measurements—Eighty-two children were enrolled into the study. Seventy percent of mothers did not have any concerns about their child's weight, but 51% ($n = 42$) of the children were classified as overweight or obese at T1 and 49% ($n = 40$) were classified as overweight or obese at T2. Eighty-nine percent of the families did not have a scale to weigh a child. Thirty-seven children with the mean age of 6.8 years (standard deviation = 3.3; range = 2.0-14.1) had complete BMI information at both T1 and T2. Nineteen (51%) of them were girls. The children in the intervention group had more percentage of girls but lower baseline BMI-p and mothers' acculturation levels (Table 1).

Intervention effect

The effect of the healthy eating intervention program was evaluated by the change in mothers' nutrition knowledge, children's BMI-p, and actual nutrition intake.

Mothers' nutrition knowledge in the treatment group—The mean nutrition knowledge score from the 19 intervention mothers was significantly improved ($t(18) = 2.97$; $P = .0082$; paired t test) from the mean improvement of 3.11 (95% confidence interval = 0.91, 5.3), with a medium to large effect size of Cohen's $d = .68$ (see Table 2).³⁷ The post-knowledge was moderately positively correlated with the baseline knowledge ($r = .48$). The mothers' nutrition knowledge improvement was found significantly negatively associated with acculturation levels ($r = -.53$; $P = .0198$). That is, the mothers with low acculturation levels had greater improvement on nutrition knowledge after intervention.

Children's BMI-p—In terms of BMI-p category change, the children in the intervention group had a significant trend moving from the obese to the normal category ($P = .0156$). Both percentages of children in obese and overweight categories decreased. The BMI-p change for the children in the comparison group was not statistically significant. However, in the comparison group more children moved from the normal BMI-p category into the unhealthy overweight category than the obese category. The insignificant results may be due to the smaller sample size in the comparison group.

The children's post-BMI-p in the treatment group ($M = 65.6$) was significantly lower (1-sided $P = .0472$) than the baseline BMI-p ($M = 70.6$). In contrast, the comparison group's post-BMI-p was higher from baseline, from a mean of 89.5 to 92.2, but not statistically significant. The group difference in children's BMI-p change indicated that the intervention effect was significantly different in both adjusted and unadjusted analyses (1-sided $P = .0419$ and $.0191$, respectively). The unadjusted analysis of covariance controlling for baseline BMI-p was conducted with post-BMI-p as the independent variable. The adjusted analysis was further studied by controlling for the children's sex ($t(35) = 3.65$; $P = .0008$) and mothers' acculturation levels ($r = .65$). These 2 factors were chosen because of the significant contributions to the BMI-p change found by t test and correlation. The preliminary analysis also considered other potential covariates including child's age, mothers' self-efficacy, and household food security levels.

The adjusted analysis of covariance model was significant ($F(5, 27) = 55.42$; $P < .0001$). Ninety-one percent (95% confidence interval of $\eta^2 = .80-.93$) of the total variance in children's post-BMI-p was accounted for. The results are shown in Table 3. The mean of the children's post-BMI-p was significantly lower ($P = .0382$) in the treatment group ($lsmean = 69.0$) than in the comparison group ($LS mean = 78.2$).

The girls ($lsmean = 69.3$) had significantly lower ($P = .0376$) post-BMI-p than the boys ($lsmean = 77.9$). Specifically, the girls in the intervention group had significant lower ($lsmean = 60.6$) post-BMI-p than the boys in the intervention group ($lsmean = 77.4$; $P = .0039$) and all children ($lsmean$ for boys = 78.3, $P = .0422$; $lsmean$ for girls = 78.0, $P = .0024$) in the comparison group controlling other factors in the model. Pilot studies include an evaluation of effect size. For girls, the intervention effect size was large with the partial η^2 of .29, which means that the intervention effect by itself accounted for 29% of the overall (the intervention effect + error) variance in post-BMI-p. For boys, the intervention effect size was medium to large with the partial η^2 of .14. The child was 8.7 lower (standard error = 3.10) in post-BMI-p with 1 level higher in parent's acculturation score. There was no significant difference ($P = .6217$) found between boys and girls in terms of their mothers' acculturation scores.

Parent-reported children's food patterns—Sixteen children with 8 in each group had complete nutrition consumption reports by their parent at the baseline and the end of the study, as shown in Table 4. After a lapsed time of almost 3 months, there was no improvement in the target child's attainment of the USDA minimum recommendations for food group servings. However, the children in the intervention study had less reduction on grain, vegetables, and fruit intake than those in the comparison group. There was a small meat/protein reduction in the children in the treatment group, not in the comparison group. There was no change in dairy and all food groups for both groups.

Descriptive data instead of formal statistical tests were reported because of the low statistical power of the small sample size.

Feasibility

The average group attendance for the 3 intervention groups, composed of 3 health promotion sessions and 2 data collections, varied. Data on attendance are shown in Table 5. Sixty-two percent of the mothers in the intervention group attended greater than 75% of the study interactions, with 33% attending 100% of the study interactions. Fifty-six percent of mothers in the comparison group came to both data collections. Seven of 34 mothers in the intervention group did not attend any intervention classes. Further analysis was conducted to study the differences in terms of demographics and baseline measures between the retained and dropped-out mothers. There was a statistically significant difference found between the underlying distributions of the marital status between the mothers who attended and those who did not attend intervention class ($P = .0492$, Fisher exact test). The mothers living alone tended to have higher probability to attend intervention class than married mothers.

DISCUSSION

Lessons learned

One of the aims of the pilot study was to evaluate the feasibility of conducting a multisite data collection intervention study with migrant mothers and children. The selection of instruments showed adequate reliability, and the use of audio-enhanced PDAs and tablet computers in data collection was well received and resulted in good data quality.^{21,22} Nursing research conducted in the rural community brings challenges in logistics. To keep travel expenses on budget, reasonably close migrant camps were scheduled on consecutive days and housing accommodations in rural areas needed to be found and paid. Two of the bilingual research team members also held other summer employment, and scheduling of site visits was challenging. While working with a vulnerable population, some spontaneous flexibility was needed in response to unexpected situations. For example, 2 mothers joined the intervention classes after the initial session. They were permitted to join as the opportunity to present health promotion education was important, but their data were missing or incomplete. Two other mothers who had children younger than 2 years (inclusion criteria included mothers with children aged 2 to 12 years) were approached and asked to join the intervention classes. Their data were not included, but they were permitted to attend classes, as they were eager to learn about healthy eating for their infants.

Because of the nature of the migrant farmworker mothers' employment, who are itinerant and whose work hours depend on weather and the ripening of crops, attendance consistency at the health promotion sessions varied. Participant retention rates of other studies have shown to be 85%, with attrition rates of 10% to 15% for Mexican Americans.³⁸⁻⁴⁰ Future interventions with migrant farmworker mothers should include sufficient budgeting for incentives for maintaining participation levels with a bonus amount if all sessions are completed; however, coercion must be avoided. One key mother in each site was asked to

serve as a liaison with the research team to help schedule return data collection trips, but that mother was either difficult to contact, or when she did arrange a mutually convenient time, few participants attended. The site that had the highest retention of participants was led by a public health educator who quickly developed a tender rapport with the mothers. Personalismo is very important in the Mexican American culture where a high value is placed on personal relationships, and this was demonstrated in their high attendance rates. The high retention rates at that site could have also been attributed to the gestalt of the group members, but this was not measured. Although not statistically measured, mothers appeared engaged and interested in the interventions. Migrant mothers came to the healthy eating classes after long days working on harvesting crops or after caring for children all day. In previous encounters with migrant mothers, 1 mother stated, "We want to come, but there is no time here, no time."⁴¹

Limitations

There was a compromise in independence of statistical test assumption when we did not turn away potential sibling children from measuring growth parameters. No questions were asked whether siblings were full or half-related. All the children (with a few siblings) were included in the children's study to improve the power of the study. Although each mother was asked to select 1 target child to follow for dietary assessments at T1 and T2, that child was not always present for measurement of height and weight because of participation in church recreational activities, visiting family at another location, or food shopping with the second parent. The selection of a target child was not a reliable representative of the intervention effects. Power was lost when anthropometric measures were not obtained at the 2 data collections and limited paired t test measurements for children. Although 2 Midwest states were used in data collection with 6 farm sites, the results of this study cannot be generalized to the larger migrant farmworker population. With any parent-reported food survey assessment of children's dietary frequency, mothers may have faulty memory of what their children ate, especially during the busy harvest season when they are away from their children for longer periods picking crops in the fields. Children who attend summer Migrant Education Programs eat 2 meals and a snack at school. Mothers have no observational knowledge of children's dietary intake.

The original research plan was unable to be completed because of the lack of responses from the booster intervention (a healthy eating book) mailed to mothers in January. In the original design, mothers were asked in a letter where they would be working the next summer and a stamped self-addressed envelope was included. This information would have enabled a data collection for children's growth parameters and retesting of mothers' knowledge 1 year after the intervention. This did not come to fruition as no information was returned to the research team. It is unknown whether there was any long-term benefit of the healthy eating intervention.

The principal investigator made fidelity checks to both teams on a regular basis. However, although intervention fidelity was part of the research design and protocol, it is unknown whether the 2 teams delivered the intervention in an identical manner at all points, at all times. The logistics of traveling to distant and rural locations and the budget restraints of the grant made it prohibitive to have 1 research team conduct all the interventions in both states. Two research teams, 1 in each state, made sense to keep travel costs within the limited budget line.

Implications for community health research

Working as a migrant farmworker may represent an intergenerational situation of poverty and may exemplify families who worry about providing adequate food for the children and

adults. In review of the descriptive data collected, the limitation of not having a garden to grow food decreases the migrant families' potential for fresh fruits and vegetables, although increasing food budget costs. Research on community or personal gardens may be indicated to assess whether they make a difference in food security or children's dietary intake. Perhaps the farm growers can allow workers to take home produce they picked; however, some farms only grow limited varieties of fresh produce. Future research is needed to explore this situation. Some families do not have a working oven, and this affect the types of healthy recipes families can prepare as meats are then often prepared by frying methods. Any future healthy diet education must remember the nature of kitchen facilities that are available to the participants. There were non-significant increases in children's achievement in some minimal requirements of food group serving. However, these increases cannot be associated with causation from parental knowledge as it may be attributed to increases in family household income because of the seasonal harvesting employment, decrease in prices of seasonal produce, and increased availability of fresh produce. In addition, it is unknown whether the families' permanent location had any influence on dietary food habits. Future research may include the conduct of focus groups or content within an intervention curriculum that asks mothers what suggestions they have for improving their children's nutrition. In designing the next healthy eating intervention for migrant farmworker families, lessons learned in the conduct of this study and knowledge gained will guide content and objectives.

The Cronbach α of the study instruments was similar to those calculated in past studies and can be used with reliability in this sample of migrant farmworker mothers.^{4,6} The new instrument used to measure past food security correlated with current household food security and may serve as a resource to measure past food security.

Working with migrant farmworker families who represent a vulnerable population that has documented health disparities brings challenges in research study operations and statistical analyses. However, difficulties in the conduct of research with migrant farmworker children and families should not deter researchers from working to resolve these differences, and should not discourage researchers and public health agencies from developing and administering health promotion programs. The families of migrant farmworkers represent a vulnerable population that calls for inclusion in research studies.

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Table 1

Sample Demographic and Baseline Measurements

	Intervention	Comparison	<i>P</i>
Mothers	n ^a = 30	n = 25	
Self-efficacy, M ± SD	33.5 ± 7.0	27.7 ± 7.8	.0284 ^b
Acculturation, M ± SD	1.5 ± 0.5	1.8 ± 0.7	.0055 ^b
Household food security, M ± SD	2.1 ± 2.2	2.7 ± 1.9	.3015 ^b
Children	n = 27	n = 10	.9765 ^c
Age (yr), M ± SD	6.9 ± 3.6	6.8 ± 2.6	<.0001 ^d
Female, n (%)	16 (59.3)	3 (30)	.0162 ^c
Baseline BMI percentile, M ± SD	70.6 ± 31.7	89.5 ± 13.6	.0493 ^b
Parent's acculturation, M ± SD	1.30 ± 0.50	1.73 ± .71	

Abbreviations: BMI, body mass index; SD, standard deviation; M, mean.

^a The mothers with available self-efficacy, acculturation, and household food security data

^b *t* test

^c Satterthwaite test

^d χ^2 test.

Table 2

Intervention Effect by Mothers Who Attended Nutrition Knowledge Class and Children Outcome Measures

	Baseline	End of Study	Unadjusted <i>P</i>	Adjusted <i>P</i>
Mothers (n = 19)				
Knowledge, M ± SD	8.1 ± 4.5	11.2 ± 4.4	.0082 ^a	
Children				
BMI percentile category, n (%)				
Intervention (n = 27)	12 (44)	17 (63)	.0156 ^b	
Normal	6 (22)	4 (15)		
Overweight	9 (33)	6 (22)		
Obese				
Comparison (n = 10)	3 (30)	1 (10)	1.0000 ^b	
Normal	0 (0)	3 (30)		
Overweight	7 (70)	6 (60)		
Obese				
BMI percentile, M ± SD	70.6 ± 31.7	65.6 ± 30.5	.0837 ^c	.0382 ^c
Intervention (n = 27)	89.5 ± 13.6	92.2 ± 9.5	.0943 ^a	
Comparison (n = 10)			.3996 ^a	

Abbreviations: ANCOVA; analysis of covariance; BMI, body mass index; SD, standard deviation; M, mean.

^a Paired *t* test^b Wilcoxon signed-rank test^c ANCOVA.

Table 3

ANCOVA for the Children's Post-BMI Percentile

Parameter	Type III SS	F	Partial η^2	P
Baseline BMI percentile	22154.3	238.8	0.90	<.0001
Group	440.6	4.75	0.15	.0382
Acculturation	733.9	7.91	0.23	.0091
Sex	443.7	4.78	0.15	.0376
Sex $\times$ Group	402.7	4.34	0.14	.0468

Abbreviations: ANCOVA; analysis of covariance; BMI, body mass index; type III SS, type III sums of squares.

Table 4

Intervention and Comparison Target Children Meeting Recommendations of USDA's Minimum Recommendations for Dietary Food Group Servings

	<u>Intervention (n = 8)</u>		<u>Comparison (n = 8)</u>	
	T1, n (%)	T2, n (%)	T1, n (%)	T2, n (%)
Grain	3 (38)	3 (38)	5 (63)	2 (25)
Vegetable	2 (25)	1 (13)	1 (13)	0 (0)
Fruit	4 (50)	3 (38)	4 (50)	2 (25)
Dairy	3 (38)	3 (38)	3 (38)	3 (38)
Meat/Protein	6 (75)	4 (50)	6 (75)	6 (75)
All food groups	0 (0)	0 (0)	0 (0)	0 (0)

Table 5

Attendance at Intervention Classes and Data Collections

Farm	Type	n	Retention Percentage (Average of Participants Who Returned Consecutively)			Intervention Class Mean Attendance Percentage (Total Mean of People Enrolled Who Attended Each Class)					Individuals Who Attended Classes and Data Collections			Total Group Attendance Percentages	
			Class 1	Class 2	Class 3	Data 2	Class 1	Class 2	Class 3	Data 2	100%	>75%	Data 1 Only	Mean	Mean
A	I	9	83.33	62.5	60	50	88.9	55.6	44.4	55.6	2	5	2	66.7	66.1
B	I	15	61.5	62.5	80	75	61.5	46.7	26.7	46.7	3	5	4	55.5	45.4
C	C	4				100					4		0		100
D	C	10				30					3		7		30
E	I	10	100	87.5	100	85.7	100	88.9	77.8	88.9	6		1	87.9	93.3
F	C	11				63.6					7		4		63.6

Abbreviations: I, intervention group; C, comparison group.