

Improving low-income parents' fruit and vegetable intake and their potential to impact children's nutrition.

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Abstract:

Purpose – The purpose of this research is to test a comprehensive nutrition program developed specifically to target low-income parents of young school-aged children and determine whether the programme resulted in changes in parents' knowledge, attitude, self-confidence, and behaviours related to both their and their child's nutrition in relation to fruit and vegetable intake.

Design/methodology/approach – This study used a quasi-experimental pre-test/post-test design in which parent centers were selected to participate as either intervention or control sites. The primary method of data collection was self-administered questionnaires.

Findings – The results show significant positive changes in parent knowledge, food behaviors, and home environment. No changes were observed in parents' attitudes; however, parent attitudes were high at baseline.

Practical implications – This work reinforces the importance of developing well designed interventions that specifically target the intended audience and intended outcomes.

Originality/value – This is one of the few studies that have examined the potential and value of nutrition-focused intervention targeting low-income and predominantly Hispanic populations with the potential goal of impacting children.

Keywords: children | fruits | parents | vegetables | low-income families | nutrition | child nutrition

Article:

Introduction

Fruit and vegetable consumption

Fruits and vegetables are important sources of a broad range of nutrients, and strong evidence suggests that fruit and vegetable (FV) consumption can prevent a number of chronic diseases including cardiovascular disease and some cancers (WHO, 2003). Despite the evidence of the positive effects of eating FV, adults and children in the United States are not consuming the recommended amounts. The 2005 Behavioral Risk Factor Surveillance System (BRFSS) survey reported that only one-third of adults consumed fruit two or more times per day and slightly more than one-fourth ate vegetables three or more times per day (Blank et al., 2007). Similarly, the 2007 Youth Risk Behavior Surveillance System (YRBSS) survey reported that only one in five high school students eats five or more fruits or vegetables each day (Eaton et al., 2008). Among younger children, less than one fourth consumes the recommended daily amounts of fruits and vegetables (Field et al., 2003). Total fruit consumption is lower in low-income families and both vegetable and fruit consumption are lower in food insecure households (Lorson et al., 2009). Consequently, there are compelling reasons to develop and implement effective programs and policies to increase fruit and vegetable consumption among adults and children, and in particular, those who are low-income.

A variety of different interventions have attempted to increase FV consumption among both adults and children, with many focusing on the school as the intervention site when the target population is children (Shaya et al., 2008; Knai et al., 2006). These interventions have varied with regard to intervention type, duration, outcome measures, and significance of results. Some interventions have targeted behavior modification through the use of an educational, classroom-based model (Gortmaker et al., 1999), while others have included changes to school environment as a part of the intervention in addition to nutrition education in the classroom (Perry et al., 1998; Prelip et al., 2010). A third model, those that include activities at the classroom, school, and community levels, has also been seen in school-based interventions (Friel et al., 1999; Foerster et al., 1998). The impact of these interventions on the FV consumption of those students who participated in these school-based interventions has varied, with successful interventions showing differences ranging from +0.3 to +0.99 servings per day (Knai et al., 2006).

As for adults, attempts to increase FV consumption have mostly used personal counseling or education (Pomerleau et al., 2005). A variety of intervention techniques have also been used including face-to-face education or counseling (Takahashi et al., 2003; Haire-Joshu et al., 2003), telephone counseling (Marcus et al., 1998; Marcus et al., 2001), and computer-mediated tailoring of messages (Winkleby et al., 1997). Among adults, the more effective interventions have been those that have targeted smaller, focused communities, mainly African-American churches (Pomerleau et al., 2005). These interventions showed increases in FV consumption ranging from +0.7 to +1.4 servings per day (Del Tredici et al., 1998; Haire-Joshu et al., 2003), compared to increases ranging from +0.2 to +0.6 servings per day in untargeted, general population interventions (Marcus et al., 1998; Marcus et al., 2001). Other healthy eating habits have been improved upon through counseling. An analysis of the 2005-2006 National Health and Nutrition Examination Survey suggests the odds to read food labels if their doctor or other health professional suggested it were 50 percent higher for adults over 20 years old with a chronic disease. Those who did read the food labels had healthier eating habits, suggesting counseling has positive impact on dietary habits among a high risk group of adults (Post et al., 2010).

A review of the determinants of FV consumption among six-12 year old children and effective interventions to increase consumption identified availability and accessibility of FVs and taste preferences as the most consistently and positively related to consumption (Blanchette and Brug, 2005). Availability and accessibility to healthy foods is indeed one strategy to improve children's diets overall (Birch, 1999; Birch and Fisher, 1996) and has been identified by the Institute of Medicine as a goal to assess progress toward reduction of obesity through policy and system changes (Institute of Medicine, 2004). In addition, increasing access and availability of FV will create opportunities for children to have repeated exposures to FV and impact preferences (Bere and Klepp, 2005; Cullen et al., 2003). Food preferences in children can be not only be influenced by repeated exposures but also influenced by nutrition education (Bere and Klepp, 2005; Hendy et al., 2005; Blanchette and Brug, 2005; Perry et al., 2004; Baranowski et al., 2000).

Why interventions need to focus on parents

While most school-based interventions to improve FV consumption have targeted children, the school site also presents an opportunity to target the parents of children who attend these schools. The school-based intervention models described above could be utilized to target parents, who would not only benefit from improved knowledge, attitudes, and behaviors related to their own FV consumption, but could also serve to impact the FV consumption of their children.

Increasing the availability and accessibility of FV in the home and school are two key environmental changes to increase fruit and vegetable consumption among children (Hearn et al., 1998; Cullen et al., 2003). Parents are not only generally the primary food purchasers in the home and therefore mediate the availability and accessibility of the FV but they also influence children's FV intake through role modeling and feeding practices (Gibson et al., 1998; Fisher et al., 2002; McClain et al., 2009). From very early in development, mothers' eating behaviors, attitudes, and child-feeding practices have a major impact on the development of children's eating patterns and willingness to try new foods (Birch, 1999; Birch and Fisher, 1996). Children identify not only parents, but also teachers as playing critical roles in their ability to eat a healthy diet and engage in physical activity (O'Dea, 2003). Although some school-based nutrition education and obesity prevention programs have included a parent program component as part of a larger nutrition education program targeted at children (Knai et al., 2006), there remains a gap in the research as how direct intervention with parents may affect parent FV consumption, the home environment, and consequently, student FV consumption. Furthermore, emerging evidence suggests weight management interventions among elementary school age children may be more effective if the parent is targeted and the child is excluded from the educational component (Golan, 2006; Golan et al., 2006).

Purpose of the current study

In the current study, a comprehensive nutrition program was developed specifically to target parents of schoolchildren attending low-income and designated Title 1 schools, those schools within a local school district that have the highest concentration of free and reduced price lunch students. The nutrition program was developed by a team of school district staff, state health department program and evaluation specialists, and academic researchers as part of an ongoing collaboration that focuses on ecological approaches to increase fruit and vegetable consumption and physical activity among school age children. The goal of the current intervention was to improve parent knowledge, attitudes, and behaviors regarding healthy family nutrition; improve healthy decision making about food purchasing and preparation; and to educate parents to role model healthy food choices for their children. Promoting a healthy home food environment among the parents could then impact the potential of student exposure to nutrition education.

The current study, located in a large, urban, multiethnic school district, focuses on the following research question: What is the impact of a targeted nutrition education program on parent knowledge and attitudes, and behaviors regarding healthy eating and nutrition? Results from the study are presented, as well as the lessons learned in developing, piloting, implementing and

evaluating a nutrition education program for low-income, predominantly Hispanic parents in a large urban school system.

Methods

Study design

This study used a quasi-experimental pre-test/post-test design in which school-based parent centers were selected to participate as either intervention or control sites. Parent centers were selected based on eligibility for and participation in Network-Los Angeles Unified School District (LAUSD) programming (described below). A total of 26 schools participated: 15 as intervention sites and 11 as control sites. Within the intervention sites, parents were selected based on their willingness to attend a five-week nutrition education program. The study was approved by the University of California Los Angeles (UCLA) Institutional Review Board and the LAUSD Research and Planning Division.

Setting

The Los Angeles Unified School District (LAUSD) is the second largest school district in the United States, serving 688,138 students from a diversity of ethnic backgrounds and employing 36,767 teachers during the 2009-2010 (LAUSD, 2009). The Network for a Healthy California-LAUSD is a collaborative organization of students, teachers, school nurses, administrators, food service professionals, parents, corporate partners and community members who work within the school district to improve nutrition and physical activity among school children. Network-LAUSD activities include small school grants, funding for educational programs, staff development, technical support, and classroom resources to support nutrition education delivered at the classroom level by teachers. A LAUSD school is eligible to participate in Network-LAUSD programming if 50 percent or more of its students are eligible to receive free or reduced lunch (approximately 700 LAUSD schools meet this criteria). Eligible and interested schools apply to the program and must have at least 15 teachers who agree to participate in the program and who agree to commit to providing a minimum of 35 hours of nutrition education during the school year.

We utilized a convenience sample to first recruit the intervention and control schools, followed by recruitment of parents at each of the schools. This technique was consistent with the Network-LAUSD model of program delivery in that participation in all of the Network LAUSD program components is voluntary. A total of 15 Network-participating elementary schools were selected to participate as intervention schools based on an expressed interest in offering the parent nutrition education program at the school site and a commitment to recruit a sufficient number of parent participants. The research team approached potential control schools, also Network-participating elementary schools, and those schools which expressed an interest to participate in the study and indicated availability of parents and space to administer the evaluation instrument were asked to participate.

At each school site, parents were recruited with the assistance of a school site staff member, usually a parent center coordinator. At intervention schools, parents who expressed interest in attending a workshop about nutrition were invited to attend the series of five weekly, 90-minute classes. Each intervention site attempted to recruit 15-20 parents for the classes. At each control school site, school staff assisted with recruitment. Recruitment at each control school site varied in terms of number of parents – all parents who expressed interest in participating in the study were able to do so.

Intervention

The development of the parent nutrition education program was a collaborative process undertaken by Network-LAUSD, the State of California Network for a Healthy California and an academic research and evaluation team from the UCLA School of Public Health. Prior to developing the intervention, a series of nine focus groups were conducted with 64 parents from a number of schools to assess what types of nutrition information parents wanted to learn, how they would like to learn this information, and what type of setting would be best for them to learn about nutrition (Slusser et al., 2011). Given that more than 70 percent of the student population is Hispanic (LAUSD, 2009), it was decided to tailor the program to a Hispanic population. A bilingual moderator (English and Spanish) conducted the focus group interviews with parents of students in elementary schools. Information from the focus groups suggested that parents were concerned about general healthy eating habits in addition to increasing FV consumption. Parents expressed interest in learning about general nutrition information, the importance of eating healthy; portion sizes, and the role of different vitamins and nutrients. Parents were also interested in learning about reading food labels, healthy cooking and healthy food substitutions, exercise and how to get their children to eat a healthy diet.

The information gathered through an extensive review of the literature and existing curricula, coupled with the recommendations from these focus groups provided a basic framework for the content and structure of the workshops. The majority of program materials were adapted from existing nutrition education resources, focusing on literacy, language, and cultural appropriateness for the target audience. The resulting parent nutrition education program consists of five workshops, each lasting approximately 90 minutes. The intervention was guided by social cognitive theory. In particular, components of the parent nutrition education program were designed based upon the concepts of behavioral capability, outcome expectations, self-efficacy, and observational learning (Bandura, 1986). For example, to expect parents to alter their child feeding practices they must have the behavioral capability so that they both know what the desired behavior change is and they must possess the skills to actually make the change. Also, they must have the outcome expectation of making the change will result in a favorable outcome or they will be less likely to actually make a change. Thirdly they must possess self-efficacy or the self-confidence to make the change. Social cognitive theory also guided the intervention through use of observational learning or role modeling as activities were facilitated by a Latina dietitian and involved many group exercise. Curricular components included activities that targeted knowledge and skills with the intent to result in behavior change. For example, label reading was taught with the expectation the participants would be more likely to read food labels while shopping for food for their families and activities were developed giving parents the opportunity to practice skills, such as meal planning resulting in increased self-efficacy for meal planning would.

In early 2008 the program was piloted at five school sites with 174 low-income parents participating. Workshops were offered in both English and Spanish. Parent satisfaction questionnaires, which included both closed- and open-ended questions, were distributed to these participants after each of the five sessions to assess their opinions about the program. The pilot of the program revealed parents were generally happy with the format, content, and delivery of the program; however, they expressed an interest in having more action-oriented sessions, especially to learn how to be more effective at impacting the diets of their families. The curriculum was modified based on these pilot study results. A goal-setting activity was added to the workshops during which participating parents shared with each other their goals for the next week as well as their achievements from the past week. In addition, a label reading activity was added which entailed parents bringing in a food label of a food product they consumed regularly so they could review it during class. Furthermore, where the workshops were previously offered concurrently in English and Spanish, it was decided to separate the English and Spanish workshops into two separate presentations so as to improve the flow and timing of the workshop.

The revised program was implemented in 15 LAUSD schools during the 2008/2009 academic year. Parent participants were encouraged to attend all of the five classes as a series. All visuals and handouts were translated from English into Spanish. Program materials were produced in color, printed on high quality paper and incorporated into a sturdy binder for each parent. Two registered dietitians delivered the nutrition education classes and materials in both English and Spanish. Instructors offered mixed-media classes including overhead projection, interactive discussions, question and answer sessions, food preparation, and homework. Refer to Table I for a brief description of each of the five class sessions.

The Network – LAUSD Parent Nutrition Education Program targeted the following specific objectives:

increase parent knowledge, attitudes and behaviors regarding healthy eating and nutrition;

improve parent nutrition knowledge, attitudes and behaviors in making healthy decisions about food purchasing and preparation; and

educate parents to role model healthy nutritional choices for their children.

Data collection

The primary method of data collection was self-administered questionnaires, given to parents prior to the intervention and at the conclusion of the five-week class series. The questionnaires were administered to both the intervention and control groups to assess knowledge, attitudes, eating habits, confidence for making healthier diet changes, diet behaviors, and the home food environment. For the intervention group, the questionnaire was administered at an introductory meeting one week before the first session of the program and then immediately following the last session. For the control group, the two questionnaires were administered approximately six weeks apart as this was the length of time in between the two questionnaires for the intervention group. The post-intervention questionnaire was identical to that used at baseline except that at the intervention schools, questions about workshop attendance and satisfaction were added. Questionnaires were available in English and Spanish to all participants. Grocery store gift cards valued at \$10 were offered as an incentive for participation for parents in the control group. Parents in the intervention group were offered incentives such as recipe books and other educational materials for their participation. Data were collected from 651 volunteers at baseline and from 516 volunteers at post-intervention; 423 respondents were assessed at both time points.

Measures

Diet knowledge was assessed using items specifically created from the intervention curriculum as well as from other sources, including adapted items from Henneman and Benes (2006); Hearts N' Parks: Food, Physical Activity, and Heart Health IQ pre and post questionnaire (National Heart, Lung, and Blood Institute and National Recreation and Park Association, 2001); Cullen et al. (2003); and Baranowski et al. (2000). There were 13 items covering food groups; recommended servings of whole grains, FV, and milk; healthier food choices; fiber; vitamin A; food safety; and physical activity recommendations for children. The measure for diet knowledge was calculated as the percentage of correct answers to these 13 items. As the individual items intentionally covered diverse aspects of food, nutrition, and physical activity, exploratory factor analysis and Cronbach's alpha were not calculated for diet knowledge.

In addition, several previously established multi-item scales were used to measure parent nutrition attitudes and behaviors. We assessed each scale via exploratory factor analysis, examining whether the items loaded on a single factor, and by calculating Cronbach's alpha, which provides a measure of internal consistency reliability (Nunnally, 1978). Each scale loaded on a single factor and Cronbach's alpha (reported below for each scale) generally indicated the scales were reliable in our sample. Food behaviors were assessed using the UCCE Food Behavior Checklist (Sylva et al., 2006), a 16-item "visually enhanced" food behavior checklist that is designed for adults with limited literacy. This food behavior checklist assesses FV consumption, fat and cholesterol, diet quality, food security, and respondents' self-rating of their dietary habits. The instrument was a reliable measure among our respondents ($\alpha=0.77$). Attitudes about the importance of diet were assessed for the respondent and the respondent's child (ren) using items adapted from the USDA's Diet Health and Knowledge Survey (Food Survey Research Group, 1998). This instrument includes five items about the importance of different aspects of dietary behaviors, with response choices of "Not Important", "Neutral", and "Important". Cronbach's alpha for respondent diet importance was 0.60, and 0.61 for child diet importance. Eating habits confidence for making healthier diet changes was assessed using adapted items from the Eating Habits Confidence Survey (Sallis et al., 1988), which includes six items (examples of healthier changes) with response choices of "I cannot", "Maybe I can", and "I know I can". We found this self-confidence measure to be reliable among our respondents ($\alpha=0.88$). We also assessed barriers to healthy eating adapting the Project GRAD Health Assessment Survey (Sallis, 1997) to focus on barriers to healthy dietary behaviors. This instrument includes six items and asks respondents to indicate whether they experience each potential barrier "Never", "Sometimes", or "Often". Among our respondents, the diet barriers scale was highly reliable ($\alpha=0.82$).

The questionnaire also included a number of single items addressing nutrition and dietary behaviors, such as consumption of desserts, fast food, 100 percent juice, regular soda, milk, whole grains, and the presence of four key low nutrient density foods in the home (tortilla chips, soda, candy, and sports drinks). In addition to these items on diet, the questionnaire assessed sociodemographic characteristics, including date of birth, gender, education, race/ethnicity, and the number of children living in the home. For race/ethnicity, respondents were asked to select the racial/ethnic group or groups with which they identify. All respondents who reported being Hispanic or Latino were coded as Hispanic/Latino, regardless of other reported race/ethnicity. The remaining respondents were categorized into the following categories: non-Hispanic White, non-Hispanic African American, non-Hispanic Asian or Pacific Islander, other race/ethnicity, mixed race/ethnicity.

Analytic procedures

All analyses were conducted using Stata 10.1/IC (StataCorp, 2009). The hypotheses – that parents who participated in the comprehensive nutrition workshop intervention would be significantly more likely to improve knowledge, nutrition-supportive attitudes, dietary behaviors, and the home food environment – were tested using analytic techniques that account for the clustering of individuals within schools. Using data from baseline and post-intervention, linear and logistic mixed models were built, with a separate model for each outcome. The mixed modeling technique (also known as random-effects repeated measures modeling) allows for unequal numbers of participants at baseline and post-intervention (Murray, 1998; Snijders and Bosker, 1999). Our mixed regression models included an interaction term for treatment condition (intervention or control) by time (baseline and post-intervention) to determine whether the change in the intervention group from pretest to posttest was significantly different from the change in the control group over the same period. Treatment condition and time were included as fixed effects, and school site was included as a random effect. Individuals with both baseline and post-intervention data (n=423) were incorporated into the analysis by adding an additional random effect for individuals. Adjusted means and proportions were calculated using the coefficients from the linear and logistic mixed regression models.

Covariates were examined to control for characteristics that may have been unbalanced between the intervention and control groups, particularly potential confounders of intervention effects. However, random-effects repeated-measures logistic regression models with moderate-sized samples frequently lack the statistical power to support many covariates and interaction terms

(Liu and Wu, 2008). We were primarily interested in examining which covariates were intervention effect modifiers (i.e. by testing covariate by intervention by time interactions). We therefore examined each hypothesized confounder (i.e. age, gender, race/ethnicity, and education) in a separate mixed regression model. There was no consistent pattern of intervention effect modification across outcomes, and the effect modification observed was minimal. Results presented below thus do not control for age, gender, race/ethnicity, or education.

Results

Descriptive results

Table II shows the demographic characteristics of participants in the intervention and control groups at baseline. Overall, study participants were young and middle-aged adults (average age about 37 years), and mostly parents with between one and four children living in their household. Participants tended to have low education, with 67 percent of parents in control schools and 75 percent of parents in intervention schools having less than a high school diploma. About one-fifth of participants reported receiving food stamps, and about two-fifths reported having access to the internet. In addition, most parents in the study were overweight or obese, with about 70 percent of parents in both intervention and control sites either overweight or obese according to BMI (Body Mass Index above 25) determined by self-reported height and weight.

The intervention group differed significantly from the control group at baseline for proportion completing the questionnaire in Spanish (79.6 percent in control group, compared with 91.8 percent in intervention group); race/ethnicity (higher proportion Hispanic/Latino in the intervention group); proportion female (87.3 percent in control group, compared with 95.4 percent in intervention group); and relation to child in the school (higher proportion of parents in the intervention group). Multivariate analyses (results described below) were repeated on the subsample of participants identified as parents, and overall results and significance were comparable. However, because the questionnaire item on relation to child in the school was not asked in all rounds of the intervention, analyses reported here include both parents and non-parents.

Tables III and IV shows the knowledge, attitudes, and behaviors of participants in the intervention and control groups at baseline. Participants in both intervention and control schools

had low diet knowledge at baseline, as evidenced by low scores on the series of questionnaire items assessing diet knowledge (56 percent correct answers in control group and 53 percent in intervention group). With regard to attitudes, importance of diet for self and for children were high overall, near the maximum value of 3 (“important”), although the means for intervention participants for both diet importance items were slightly higher than control participants. Parents in both groups reported experiencing a moderate level of barriers to making healthy changes for their families. With regard to dietary behavior, control group participants had somewhat healthier diet behaviors, as indicated by higher average scores on the UCCE Food Behavior Checklist (0.56, compared with 0.52 for intervention participants). Low proportions of parents reported adequate vegetable intake (about 11 percent for control group and 5 percent for intervention group), and adequate fruit intake is somewhat higher (about 39 percent for control group and 29 percent for intervention group). However, parent report of frequently eating pastry (e.g., cake and brownies) and frozen desserts was low. About 40 percent of control parents and 31 percent of intervention parents reported frequently drinking 100 percent juice, and nearly half reported frequently eating whole grains (46 percent for control group and 49 percent for intervention). Finally, with regard to the home food environment, about one-third to one-half of participants reported having tortilla chips, soda, candy, and sports drinks in their home. The intervention group differed significantly from the control group at baseline for diet knowledge; diet importance for self; diet importance for children; food behaviors; adequate consumption of vegetables; adequate consumption of fruit; frequency of drinking 100 percent juice; using food labels when shopping; and having candy in the home. With the exception of diet importance attitudes, the intervention group tended to have somewhat lower knowledge and less healthy behaviors than the control group at baseline.

Multivariate results

The adjusted means for the continuous knowledge, attitude, and behavioral outcomes at baseline and post-intervention are shown in Table V. These adjusted means were calculated from the linear mixed model for each outcome, and controlled for the clustering of parents within school sites. The intervention resulted in a significant change in diet knowledge: parents who participated in the parent nutrition education program increased their knowledge scores (percentage correct) from 52.5 percent at baseline to 75.9 percent at posttest, compared with 56.1 percent to 58.0 percent for the control group. With regard to attitudes, no significant intervention effects were observed; there was no difference in the baseline to post-test change between intervention and control groups for diet importance for self, diet importance for children, eating habits confidence for making healthier diet changes, or barriers to healthy eating. With regard to behaviors, Tables III and IV shows that there was a significant improvement in the intervention group as compared with the control group: parents in the intervention group increased their Food

Behavior Checklist score from about 0.52 (range: 0-1) to about 0.63, while parents in the control group increased from 0.56 to 0.58 from baseline to post-intervention.

Table VI shows the adjusted proportions for the dichotomous outcomes, including behaviors and the home food environment. Participation in the intervention was associated with statistically significant improvements in consumption of vegetables and fruit, consumption of whole grains, and using food labels when shopping. Strikingly, the proportion of parents in the intervention group eating the recommended servings of vegetables increased from 2.8 percent to 18.0 percent (compared with 8.1 percent to 10.7 percent for the control group); for eating the recommended servings of fruits, parents in the intervention group increased from 25.5 percent to 61.7 percent (compared with a decrease from 37.7 percent to 35.1 percent for the control group). While consumption of whole grains declined slightly over time for the control group, it increased for intervention group. There was no significant difference between intervention and control groups in the change in consumption of 100 percent juice.

With regard to the home food environment, improvements were observed for the intervention group for three of the four low nutrient density foods assessed. The presence of tortilla chips, soda, and candy in the home in the past week each declined significantly more in the intervention group than in the control group. The presence of tortilla chips dropped from 36.8 percent to 21.2 percent among parents in the intervention group (compared with a slight decline from 37.0 percent to 36.1 percent in the control group). For soda, this drop was from 57.9 percent to 30.8 percent (compared with 52.2 percent to 48.9 percent in the control group). For candy, the decline among the intervention group was from 50.5 percent to 25.6 percent (compared with 30.0 percent to 28.2 percent in the control group). Although the difference between intervention and control groups for change the presence of sports drinks was not statistically significant, the change was in the expected direction: the proportion of intervention parents with sports drinks in the home declined by 10 percentage points from baseline to post-intervention, and declined by one-tenth of one percentage point in the control group.

Additional analyses (results not shown) indicate that there was a dose-response in the intervention effect. Parents who attended a greater number of sessions (e.g., attending four or all five of the sessions compared with attending fewer sessions) showed greater improvements in knowledge, behaviors, and the home food environment. However, because this study was designed to evaluate the overall effectiveness of the intervention, we used a more conservative, intention-to-treat approach in our analyses. Based on logs kept at each workshop session, the overall average number of sessions attended was 3.8 out of five, indicating good retention of participants for the duration of the intervention.

Discussion

Overall findings

This evaluation measured the change in knowledge, attitude and behaviors among low-income parents who participated in a five-week parent nutrition education program. These results show significant positive increases in their knowledge, behaviors and home environment related to nutrition and healthy eating. One of the initial concerns during the development of the program was the challenge to both recruit and retain parent participants. The program was successful on both accounts. As mentioned above, parents attended on average 3.8 out of five of the sessions. The majority of parents were very satisfied with the program: on a scale of 1 to 4, the parents rated the workshop an average score of 3.8.

Knowledge

At baseline, parents scored low on most of the knowledge questions, but parents who participated in the intervention showed significant increases in knowledge when compared to the control group parents. The data show parents learned and retained knowledge over time from baseline to posttest as reflected on the program questionnaire. Some of the topic areas in which parent participants showed increased knowledge include daily recommended amounts of fruits and vegetables, label reading, whole grains, use of salt in foods, and amount of physical activity time recommended for children. There were several areas where parents did not show significant increases in knowledge. These included knowledge about food groups, milk, and fiber.

Attitudes and self-confidence

Parents who participated in the Parent Nutrition Education Program did not show significant changes in attitudes towards nutrition and healthy eating when compared to parents who did not participate in the program. Measures of attitude towards nutrition and healthy eating were created from several questionnaire items on the importance of different aspects of diet and nutrition. These questions assessed parent perceptions of the importance of their own diet as well

as the importance they place on the diets of their children. Neither group of parents (intervention or control) showed any changes on these questionnaire items. Similarly, no effects on eating habits confidence were observed in either group of parents. It should be noted that for these factors, baseline data showed high levels of positive attitudes and self-confidence towards healthy eating, indicating a possible ceiling effect in which change due to an intervention could be difficult. Also, knowing that parents possess positive attitudes toward their nutrition and their children's nutrition but do not always exhibit behaviors matching these attitudes could be used as a point of discussion in parent nutrition programs. As attitude change and increased levels of self-confidence are linked to long term behavior change, including program elements to target these factors or other attitudes will be one possible way to strengthen the program.

Behavior

The data indicate numerous significant positive behavior changes among the parents who participated in the intervention in the realms of FV consumption. The percentage of parents who reported eating the daily recommended amount of two cups of fruit and two-and-a-half cups of vegetables a day increased significantly among intervention group parents when compared to control group parents. Elements of the parent nutrition education program targeted at behavior change appear to be effective in encouraging and increasing FV consumption. Furthermore, parents who participated in the program showed significant increases in the variety of fruits and vegetables available in their homes (results not shown; among the intervention group, self-reports of eating more than one kind of fruit each day increased by 63 percent, and self-reports of eating more than one kind of vegetable each day increased by 49 percent). One other behavior in which significant changes were observed was in the use of food labels when purchasing food.

There were several behaviors for which positive changes were not observed in the data. These include the consumption of cake or pie, ice cream or other frozen desserts, and drinking regular soda. Although increases in FV consumption were observed, the consumption of low nutrient, energy dense foods did not change. Program elements directed at decreasing the consumption of such foods may be helpful to improving the health and diet of the participants.

Home food environment

Significant changes were observed among parents who participated in the parent nutrition education program when compared to control group parents with regard to the presence of low nutrient, energy dense foods in the home. For candy, tortilla chips, and soda, parents in the intervention group showed a significant decrease of these items in the home when compared to the control group. For sports drinks, no change was observed. Parents who participated in the intervention also reported having more variety of fruits and vegetables in their home when compared to control group parents.

Implications

There were two goals of the intervention. The first was to evaluate whether or not a direct, face-to-face education model would work to improve the knowledge, attitudes, and behaviors related to healthy eating of the low income parents who participated in the program. The results show the intervention was successful in achieving this goal. Through a carefully planned, tailored intervention, we were able to see significant improvements in knowledge and behaviors among the parents who participated in the intervention. The second goal was to impact student knowledge, attitudes, and behaviors related to healthy eating through intervening with their parents. Although evaluating the second goal was beyond the scope of this study, there is evidence in the literature to support the impact of parent education on their children's eating behaviors (Golan, 2006; Golan et al., 2006). This study suggests the school site may provide for an ideal setting to intervene with parents about food and nutrition or other topics for future interventions.

The success of the program was certainly a result of the careful tailoring process. From the initiation of the project, all collaborating partners understood that in order for this project to be successful within the school district, it would have to be tailored towards a Hispanic population. As we began to construct our plan, starting with the focus groups, we had this population in mind. By directly accessing this population for feedback and suggestions about how we could design and create an intervention to serve them, we were able to develop a culturally relevant intervention. Undoubtedly, the success of the intervention rested upon the ability to address the needs and concerns of the target population.

Strengths and limitations

The limitations met in this evaluation are not new. Randomization was not a viable option for this study as the way the intervention was designed and implemented only allowed for self-selection of parents into both the intervention and control groups. Furthermore, the schools that participated in the study were selected by convenience through an expressed interest to participate in the study and therefore, were not randomly selected. The results of the study are based on data that was self-reported. We have no reason to believe that parents reported the data that they did because of study participation. We did not observe parents in their daily activities in order to confirm the data they reported on the questionnaires. Furthermore, the evaluation measures the immediate outcome of the intervention and not whether the changes were lasting. By modifying the curriculum to impact the attitudes and self-efficacy this might help support more lasting changes.

This study stresses the importance of developing well-designed interventions that specifically target the intended audience. We live in a time when practitioners are often required to use pre-existing interventions off the shelf. While this may result in less resource expenditures at the front-end, there is a high risk of not seeing desired outcomes. This project focused on the needs, desires, and experiences of the target population: low-income parents. Furthermore, it utilized a setting, the school, to reach a population that is highly accessible through this setting, but not traditionally targeted. We expended a considerable amount of time and energy learning about our target population within the context of a school setting. Once we understood our target population, we were able to search for pre-existing curricula and materials, which we then adapted to meet the local needs. Although we initially thought that we had designed a strong intervention, piloting demonstrated that we needed to adjust. In essence, our experience demonstrated that when creating an education intervention, if you do it right, it can actually work. This experience adds to the general understanding of how to effectively work with parents to improve knowledge, attitudes, behaviors, and the home environment, with an ultimate goal of improving child FV consumption. This parent piece is critical in the larger scheme to improve child FV consumption.

On a national level, much has been done to impact the school nutrition environment and to change student knowledge, attitude and behaviors related to healthy eating; however, much less has been done to work with parents, who play an integral role in shaping the habits of their children. It may be due to the fact that parents have traditionally been considered hard-to-reach. This project demonstrated that they were not hard to reach and were, in fact, quite willing to volunteer for the project, which they felt addressed their needs and pertained to their concerns. The parents who participated in the intervention thought very highly of it and expressed interest in participating in similar projects in the future.

Opportunities for future research

The parents who participated in the program showed significant improvements in knowledge, behaviors, and home environment related to nutrition and healthy eating. These objectives were achieved with the goal of potentially impacting student exposure to nutrition education. Perhaps the main unanswered question is: what impact does an intervention such as this have on the children of participating parents? More research is needed to examine this relationship. Our collaborative is currently preparing to investigate this issue. One of the great challenges is the limitations of existing resources. In a large urban, low-income district, such as Los Angeles Unified School District, it will probably never be possible to offer a face-to-face program, such as the one presented here, to a large number of parents. Additional work should focus on alternative delivery formats, such as web-based, cable-TV-based, DVDs, or a train-the trainer model.

Conclusion

Parents influence the knowledge, attitudes, and behaviors related to healthy eating among their children. Following this belief, the Network for a Healthy California – LAUSD developed their Parent Nutrition Education Program with the intent to increase the exposure students have to nutrition education at home. Much effort was exerted on the part of Network – LAUSD staff and other collaborators to design and implement this program. The findings from this study have led to positive changes among the participants and refinements of the parent nutrition education program. The success of the program on impacting the knowledge and behaviors of the parent participants reinforces the importance of developing well-designed interventions that specifically target the intended audience and intended outcomes.

Tables 1-6 are omitted from this formatted document.

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