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Food-related behavior and intake of adult main meal preparers of 9–10 year-old children participating in iCook 4-H: A five-state childhood obesity prevention pilot study

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ABSTRACT

It is important to understand adult outcomes in childhood obesity prevention programs as parents and caregivers have a significant influence on the eating and physical activity habits of youth. Grounded in the social cognitive theory, the iCook 4-H study was centered on a dyad model (9–10 year-olds and their primary meal preparers) to teach healthy cooking skills, shopping and meal habits, and being active as a family. The program took place in five states and dyads ($n = 54$) were recruited through flyers, e-mails, and in-person contact. The focus of this article is to provide findings from adult program participants. Demographics and self-reported food intake, procurement, preparation and safety practices, feeding relationships, mealtime routines, and height and weight were collected through surveys at baseline and program completion, which spanned 3 months. Descriptive statistics including two-related samples tests and paired samples *t* tests were used to assess pre- and post-program survey data responses at $p < 0.05$ significance level. Most had a bachelor's degree (31%) or some college (29%), about half were white, 66% were married, about 30% of households participated in assistance programs, and 82% were female. At program conclusion, participants significantly improved meal planning, prioritizing healthy meal choices, shopping with a grocery list, and reading Nutrition Facts Labels. There were also significant, positive differences noted in cooking skill confidence ($p = 0.015$), desire to cook more meals at home, and fewer fast food meals. Adult-youth feeding interactions also significantly improved. There were also significant increases in fruit juice (100%), vegetable soup, and whole grain consumption. Based on results, adults reported improvements in meal planning, cooking, and purchasing skills that were taught in classes.

1. Introduction

It is important to understand adult outcomes in childhood obesity prevention programs as parents and caregivers have a significant influence on the eating and physical activity habits of youth. Because families are such a prominent part of social environments, they may play an important role in combatting the emerging obesity epidemic as lifestyle habits developed as a young

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child carry over into adulthood (Li & Wang, 2008; President's Council on Sports, Fitness, and Nutrition, 2013; Pahkala et al., 2010). Adults take the health practices learned as children to influence their own children, as well as generations to come. Parents directly and indirectly influence a child's eating habits (Whear & Axford, 2009). An example of a direct influence would include the kinds and amounts of food in the house, as well as how the food is prepared. Indirect influences include the mealtime routines and whether or not food is used as a reward or punishment (Whear & Axford, 2009).

Food preparation skills are an essential component of healthful living because they are needed to produce palatable food that meets dietary recommendations. Many people of all ages are not meeting dietary recommendations because of deficiencies in knowledge and skills related to nutrition and food preparation, with fruits and vegetables especially problematic (Condrasky, Corr, & Cason, 2007). Inadequacy in food preparation skills compounded by busy schedules may hinder dietary quality, because families may be more likely to purchase low nutrient-dense fast food, ready-prepared meals, and processed snack foods (Boutelle, Fulkerson, Neumark-Sztainer, Story, & French, 2007). Hammons and Fiese (2011) found that child and adolescent nutritional health is significantly associated with frequency of shared family meals, with those engaging in family meals three or more times a week more likely to be in a normal weight range and have healthier dietary and eating patterns compared to those with less family meal engagement. Dining together as a family not only can improve nutritional quality of meals, but shows family members that time together is valued and members are able to discover important aspects of each other's lives (Fritz, 2006). Hands-on cooking activities that focus on quick, easy meal preparation for both youth and adults may be more successful in improving eating habits, because this type of learning allows participants to incorporate knowledge and create a tangible accomplishment of the food item prepared.

Parent feeding styles may also be related to child nutrition outcomes and weight status. For example, parents who exhibit a high level of control or restriction in their child feeding practices may contribute to higher child weight by promoting overeating (Birch & Fisher, 1998; Johnson & Birch, 1994; Ventura & Birch, 2008). On the other hand, permissive child feeding practices, where parents show lack of boundaries and regulation in food choices, tend to also raise children with disproportionately higher body mass indexes (BMIs), mostly because of lack of feeding boundaries (Hughes, Power, Fisher, Mueller, & Nicklas, 2005). Authoritative or democratic feeding is the parental feeding style that appears to rear the most nutritionally adjusted children. This feeding style is characterized by parents setting appropriate boundaries, while still including the child in food-related decisions, and being able to effectively manage food-related conflicts (Kitzman-Ulrich et al., 2010; Kremers, Brug, de Vries, & Engles, 2003; Van der Horst et al., 2007). Health behavior change programs that include parents/caregivers should educate them about authoritative feeding practices (Kitzman-Ulrich et al. 2010) since it is the recommended parental feeding style.

Researchers reviewing childhood obesity intervention programs found that when parents were directly engaged in the intervention process, the outcomes were more favorable compared to studies where parents were not directly involved, such as with child-only or parent-only interventions (Hingle, O'Connor, Dave, & Baranowski, 2010; Kelishadi & Azizi-Soleiman, 2014). Parents and caregivers have the responsibility of modeling and reinforcing eating and physical activity behaviors, regulating the amounts and types of food available in the home, and reinforcing behaviors and creating and enforcing rules about how time and resources will be used (Ball, Ambler, Keaschuk, Rosychuk, Holt, Spence, et al. 2012; Hunter, Steele, & Steele, 2008; Lindsay, Sussner, Kim, & Gortmaker, 2006). Understanding the impact on adults participating in childhood obesity interventions is important because children model adult eating and physical activity habits, and adults act as the child's nutritional gatekeepers. With this in mind, adult meal-provider participation and instruction should be a vital component of a childhood obesity intervention (Gerards & Kremers, 2015). Currently, however, there is little research on behavior change interventions involving both parents and children (dyads) attending the sessions together, especially regarding the adult program outcomes.

In the iCook 4-H program, which was grounded in the 4-H experiential learning model (Pfeiffer & Jones, 1983) and social cognitive theory (SCT) (Bandura, 1977), adults and youth from rural, diverse, and/or low-income populations attended educational sessions in a variety of community settings. Each session was designed for family-centered activities around developing basic culinary skills, promoting family mealtime, and tips to stay active as a family. The 4-H experiential learning model hypothesizes that living a healthful lifestyle is best achieved with the help of a support system. In 4-H, adults act as leaders, role models, and participants in community outreach efforts with youth, thereby creating an extensive support system. In turn, through reciprocal role modeling in the family-centered education sessions, adults as well as youth may improve culinary competence, food purchasing and mealtime behaviors, and physical activity levels. Consistent with 4-H programming, iCook's educational method was a “learn by doing” approach, incorporating both observational and hands-on learning and fitting well into the constructs of the SCT. The SCT evolved from Bandura's Social Learning Theory (1977), an educational and psychological theory that emphasizes modeling and reinforcement of desired behaviors from those who have a significant influence, such as family members (Hopper et al., 1996). The constructs of the SCT indicate that environment is a large determinant of behavior, rather than solely personal characteristics. The theory focuses on how both personal characteristics and environmental influences combine to yield behavioral outcomes (DiClemente, Salazar, & Crosby, 2013).

This study was a 3-month pilot test for a childhood obesity prevention intervention study. The goal was to explore changes in adults attending family-centered nutrition education sessions with youth, in self-reported food procurement, preparation, intake and safety practices, feeding relationships, family mealtime routines, exercise practices, and BMI.

2. Methods

The iCook 4-H program was conducted by researchers and Extension partners in Maine, Nebraska, South Dakota, Tennessee, and West Virginia. The curriculum, modified from the Nebraska-based *Fast Foods* and *Youth in Motion* Extension curricula, was created by Extension staff and researchers as part of the iCook 4-H project. Modifications included a focus on MyPlate and increases on food safety and utilizing technology. Each class was designed following an instructional format for consistency. Components included lesson focus, session logistics, long-range goal(s), lesson-specific objectives, introductory activity, instructions/procedures, closure, and materials/handouts. Timing varied slightly depending on the type of recipe being prepared, but on average sessions followed this format: welcome and introduction (10 min); introductory activity (10 min); recipe preparation and culinary skill development (45 min); physical activity break (15 min); family communication (15 min); goal setting (15 min); take-home message and wrap-up (10 min). The following principles were present in all lessons: MyPlate, culinary skill development through recipe

preparation, physical activities, and family communication and goal setting (Table 1).

Participants were family dyads (n = 54), 9–10 year old youth along with their primary adult meal preparer. Adults who were the main food preparers for the youth were the study population for this paper. The primary adult meal preparer had to be ≥ 19 years old, able to participate in a program for a three-month period of time, and be free from life-threatening illness or other conditions and/or activity-related medical restrictions that would prevent participation in a face-to-face nutrition and fitness program. They also had to have regular access to a computer/device with Internet connection. Dyads (with a focus on rural, diverse, and/or low income) were recruited through flyers, e-mails or in-person contact, with the assistance of 4-H program staff and Extension specialists, to participate in a 6-session educational program designed to improve culinary skills, family mealtimes, and physical activity. Sessions were conducted every other week for a total of 12 weeks. A pre-, post-assessment design was used across all five participating states and occurred prior to and immediately following the program.

During baseline and post-assessment the adult completed a 30-min online survey, which was done on-site with laptops or tablets provided by researchers, session leaders, or program site. The incentive was $100 per dyad, distributed as $10 for both adult and child at pre and post assessments ($40), and $60 for the adults, distributed in $10 increments at each of the six educational sessions. To receive monetary compensation, participants were required to attend sessions. All researchers received training in human subjects research and the research procedures were all approved by the Human Subjects Institutional Review Board (IRB) for each participating state.

A 5-state steering committee composed of researchers, Extension partners, consultants and students held conference calls and webinars to guide research decisions. In addition, there were state steering committees composed of academic researchers, Extension specialists, 4-H professionals, and representatives from the priority population and key community stakeholders to provide state-specific input into the research design and curriculum development. Overarching questions and themes were discussed, including a review of data collection instruments for appropriateness for the target population.

2.1. Data collection instruments

Instruments were hosted on a secure server with Qualtrics, online survey software (Qualtrics, Provo, UT, 2012). The surveys were pre-tested prior to administration by the researchers and members of the target population.

2.1.1. Demographic questions

Age, gender, ethnicity, marital status, age(s) of children for whom they prepare meals, and self-reported height and weight information were collected. As a proxy for income status, use of government assistance programs was assessed. Participants were asked to indicate whether they currently used any agencies providing support for low-income (up to 185% of poverty), such as the Women, Infants and Children Program (WIC), Head Start, Temporary Assistance for Needy Families (TANF), or Supplemental Nutrition Assistance Program (SNAP).

2.1.2. Food preparation skills

A 10-item checklist designed for use in the Expanded Food and Nutrition Education Program (EFNEP) was used to assess food handling practices and food preparation skills. It is currently part of the Evaluation/Reporting System software for EFNEP and has been assessed to have a 6th grade reading level.

2.1.3. Family meal routine

Characteristics of family meal times were assessed with 7 items from Project Eat (Neumark-Sztainer, Larson, Fulkerson, Eisenberg, & Story, 2010) and previously conducted with primary meal preparers of 8–10 year olds. There were response groupings for the 7 days of the week (e.g, 1–2 days, 3–4 days) to identify number of days participants had family meals over the week and how dinner meals were procured. Family meals were defined as, “meals when most of the family members ate together.”

2.1.4. Dietary habits

Food intake was assessed using The National Cancer Institute's (NCI) Quick Food Scan for fat intake (2000) and Fruit and

Table 1
iCook 4-H program session focus.

iCook 4-H program	MyPlate focus	Recipe preparation & culinary skills	Physical Activity	Family communication & goal setting
Session 1	Overview of Food groups	Basic knife skills, rinsing fruits, overview of cooking tools Recipe: Fruit Salsa with Cinnamon Chips	Circle Game: Getting to know you activity – emphasis on physical activity and healthful eating	Components of successful family meals Setting SMART-R goals
Session 2	Dairy Group: Choose low-fat or fat-free dairy products	Food Safety Basics: clean, safe cooling, storage, and cross contamination; Working with a blender Recipe: Go Green and Favorite Fruit Smoothie	Know your Heart Rate (Aerobic Activity) Using heart and lungs while being active	Division of responsibilities and the do's and don'ts of taste testing; Setting short and long-term goals
Session 3	Vegetables Group: Vary your Veggies	Knife skills, peeling, oven/stove top, rinsing and seasoning veggies; meal planning Recipe: Oven Roasted Vegetables	Charades: Strength/resistance exercises (anaerobic activity)	Place settings for family meals; SMART-R goals and short- and long-term goals
Session 4	Fruit Group: Focus on Fruits	Grocery Shopping: Stocking the pantry, making lists, comparing food labels; Knife skills, opening cans safely, draining Recipe: Fruit Salad	Stretching Activity: Prevents injury and improves flexibility	Quality communication beyond meal time SMART-R goals and short- and long-term goals
Session 5	Grains Group: Make more of your Grains Whole	Makeover Leftovers: Using leftovers to minimize food waste and save time. Proper reheating temps; Introduce stir fry cooking Recipe: Quick Rice Stir Fry	iCook Shuffle: Healthy downtime and sitting less and moving more	Increasing family meal frequency with planning SMART-R goals and short- and long-term goals
Session 6	Protein Foods Group – Go lean with Protein	Identifying spices and herbs, flipping quesadillas, shredding cheese, combining spices and herbs Recipe: Lentil and Cheese Quesadillas	Cup Stacking Relay: Participate in group active play	How to avoid the power play at dinner; SMART-R goals and short- and long-term goals

Vegetable Screener (2000) by assessing eating habits over the past 12 months.

2.1.5. Child feeding questionnaire

The Birch Child Feeding Questionnaire (Birch et al., 2001), a 28–item instrument, was used to assess adult feeding practices that could contribute to obesity proneness, concern for child weight; restriction and pressure to eat.

2.1.6. Program outcome evaluation

Participants were asked questions specifically related to curriculum material pre and post pilot to assess program outcomes and effectiveness not covered in other instruments. This instrument was not validated at this phase of the project. The pilot served as the field test and laid the groundwork to pursue validating the evaluation as the project progressed.

2.2. Data analyses

Descriptive statistics are presented for each variable for pre and post data. The Shapiro-Wilk test was used to test distribution normality. Data that were not normally distributed were compared using a nonparametric, 2–related samples test with a Wilcoxon signed-rank test with analyses tested at $P < 0.05$. Normally distributed data were compared using a parametric, paired samples *t*-test with a level of significance set at $P < 0.05$.

3. Results

3.1. Demographics

Demographic characteristics are presented in Table 2. Participants were fairly evenly distributed across the 5 states and included more females (n = 44, 82%) than males (n = 10, 18%).

Ages ranged from 27 to 54 years (38.3 ± 5.8 years). The racial breakdown of the sample was White (53.2%), Black (10.6%), Hispanic (17%), Native American (17%), and Other (2.1%). Participants, on average, had 3.04 ± 1.4 children. The majority of participants were married (66%), divorced (13%), or single (13%). Most had completed a bachelor's degree (31%) or some college (29%) and about one-third (30%) used some type of government assistance. Most households contained two adults (71%) and two children (50%). At baseline, mean BMI was 30.1 ± 0.2 (kg/m^2), and there was no difference at post-intervention (not reported in table).

3.2. Food preparation

Post intervention, participants significantly improved meal planning, shopping with a grocery list, making healthier choices for their family when preparing meals, and using the Nutrition Facts Label to make food choices (P < 0.05) (Table 3). Fewer participants reported never running out of food at the end of the month, improving from 18% at baseline to 31% at post-intervention.

3.3. Family meal routine

Adults reported at pre-assessment that over the previous seven days, they ate together as a family almost 3–4 days per week (2.62 ± 1.14; 5.0 = 7 days/week) at breakfast and almost 5–6 days per week in the evening (3.80 ± 0.97; 5.0 = 7 days/week). No differences were reported at post-assessment. Adults reported purchasing significantly fewer meals from fast-food restaurants (p = 0.033) at post-assessment (Table 4). The percent of participants reporting procuring fast food evening meals 1–2 days per week decreased from (76%–54%) and those reporting no fast food evening meals increased from (16%–40%). While there were no other significant pre-post- assessment differences, positive trends were seen for movement away from procuring the evening meal outside the home.

3.4. Dietary habits

There were some improvements in self-reported eating habits based on the NCI food screener for high fat foods and fruits and vegetables from pre-to post assessment (data not reported in tabular form). Only consumption of cheese or cheese spread (regular fat) decreased (p = 0.024) with 10% reporting once per day at baseline and only 2% after the intervention. Significant increases in 100% fruit juice (p = 0.012), vegetable-based soups (p < 0.0001), and whole grains (p = 0.009) were reported following the intervention. Although not significantly different, there were trends in increased fruit consumption after the program. Forty percent reported eating fruit 1–4 times per day at baseline, to 60% post-intervention.

3.5. Child feeding questionnaire

Post intervention, adults significantly decreased their control on their child's sweets intake (p = 0.029), offering sweets as a reward for good behavior (p = 0.025) control on the child's fat intake (p = 0.003), and overall offering favorite foods as rewards (p = 0.023) (not reported in tabular form). Parents exhibited less control in regulating their child's junk food intake at program conclusion, with 30% reporting at baseline that they slightly to always disagreed to the statement, “If I did not regulate my child's eating, he/she would eat too many junk foods,” compared to 34% post-intervention (p = 0.033).

3.6. Program outcome evaluation

Program outcome evaluation results are reported in Table 5. Post intervention, adults reported that youth were significantly more likely to help cook family meals, with 96% sometimes to most of the time assisting in meal preparation, compared to 63% at baseline (p < 0.0001). At baseline, 23% mostly to almost always, reported a desire to dine outside of the home rather than cooking at home, compared to only 4% post intervention (p = 0.015). Adults reported more confidence in their cooking skills post-intervention, with 86% mostly to almost always, feeling confident in their cooking skills, compared with 75% at baseline (p = 0.015). Post-intervention, topics of conversation tended to include all family members during meals 49% of the time, a significant improvement from 35% at baseline (p = 0.034). Adults reported that youth were significantly more active post-intervention, with a 16% increase (57%–73%) in mostly to almost always achieving 60 min of physical activity on a daily basis (p = 0.026). Areas that showed little to no change were managing the grocery budget carefully to ensure balanced meals for the family and actively playing together as a family.

4. Discussion and conclusion

At the conclusion of the study, adults reported shopping smarter by using grocery lists and reading the Nutrition Facts Labels on food more often. Label reading is an important skill to teach in nutrition education sessions because the ‘Nutrition Facts’ label is a readily available source of nutrition information for food consumers, and having and being able to interpret this information on food products may impact purchasing decisions, dietary intake, and overall health (Fulkerson, Story, Neumark-Sztainer, & Rydel, 2008). When examining both self-reported and objective measures of food label

Table 2
Demographics of adult participants.

Questions	Responses, n (%)
Gender	
Female	44 (82)
Male	10 (18)
What state do you live in?[!]	
Maine	10 (20.8)
South Dakota	11 (22.9)
Tennessee	8 (16.7)
West Virginia	9 (18.8)
Nebraska	10 (20.8)
What is your age in years? (Mean ± SD)	38.31 ± 5.84[!]
How many children do you have?	
Mean ± SD	3.04 ± 1.54[!]
What is your current marital status? [!]	
Married	31 (66.0)
Divorced	6 (12.8)
Single	6 (12.8)
In a committed relationship	4 (8.4)
What is the highest education level you have completed?	
Elementary School	1 (2.1)
High School	7 (14.6)
Some College	14 (29.2)
Associates Degree	5 (10.4)
Bachelor's Degree	15 (31.3)
Graduate Degree	5 (10.4)
Doctoral Degree	1 (2.1)
What is your primary race? [@]	
White	25 (53.2)
Black	5 (10.6)
Hispanic	8 (17.0)
Native American	8 (17.0)
Other	1 (2.1)
Including yourself, how many adults live in your house? (Mean ± SD)	1.94 ± 0.60[!]
How many children live in your house? (Mean ± SD)	2.69 ± 1.43[!]
Do you or any members of your family participate in the following? (*Aid to dependent children/TANF, EFNEP, Free/Reduced price school meals, Medicaid, welfare-to-work, WIC, SNAP, Supplemental security income?*)	
Yes	14 (30.4)
No	32 (69.6)

[!]Missing n = 6; [@]Missing n = 7; [#]Missing n = 8.

Table 3
Food preparation.

Questions	Responses (mean ± SD)	
	Pre	Post
How often do you plan meals ahead of time?	3.48 ± 0.99[†a]	3.80 ± 0.76[‡b]
How often do you run out of food by the end of the month?	2.68 ± 1.25[†a]	2.30 ± 1.44[‡a]
How often do you shop with a grocery list?	3.37 ± 1.09[‡a]	3.78 ± 0.87[‡b]
How often do you compare prices before you buy food?	4.22 ± 0.975[†a]	4.24 ± 0.830[‡a]
This question is about meat and dairy foods. How often do you let these foods sit out for more than two hours?	1.58 ± 0.97[†a]	1.43 ± 0.071[‡a]
How often do you thaw food at room temperature?	2.64 ± 1.34[†a]	2.20 ± 1.01[‡a]
When deciding how much to feed your family, how often do you think of healthy food choices?	3.90 ± 0.81[†a]	4.14 ± 0.71[‡b]
How often have you prepared food without adding salt?	3.30 ± 1.18[†a]	2.27 ± 1.22[‡a]
How often did you use the 'Nutrition Facts' on the food label to make food choices?	3.02 ± 1.19[†a]	3.49 ± 0.94[‡b]
How often do your children eat something in the morning within two hours of waking up?	4.42 ± 0.810[†a]	4.65 ± 0.706[#a]

[a–b] Non-parametric, 2-related samples test, and parametric, paired samples t-test with means significantly different at $p < 0.05$ level.
All question responses on a 5-point Likert Scale from 1 = Do not do to 5 = Almost Always.
[†]Missing n = 4; [‡]Missing n = 5; [#]Missing n = 5.

use in a sample stratified by income, Soederberg-Miller et al. 2015 found positive associations with label use and dietary quality. A study by Fulkerson et al. (2008), which included primarily mothers, found that although most women could read and made purchasing decisions based on the Nutrition Facts Label, there are population subgroups found to be less proficient, such as those with no post-secondary education and perceive their health to be fair or poor. Most participants in our study had either completed a bachelor's degree or had some college, which may partially explain this sample's likelihood of label reading. Although label-reading education should be provided to less proficient subgroups, it is still an important skill to teach for the proficient, because even proficient label readers indicated barriers limiting use of labels (Byrd-Bredbenner, Alfieri, & Kiefer, 2000). In the iCook 4-H program, label reading was specifically stressed in one session, with supplementary reinforcement in others to help participants use either newly developed or more advanced label reading skills when making choices at the point of purchase.

Based on study results, adults reported placing more emphasis on planning healthy meals, obtaining fewer meals from outside the

Table 4
Family meal routine.

Questions	Responses (mean ± SD)	
	Pre	Post
Did all, or most of your family living in your home eat dinner or supper (evening meal) together?	3.80 ± 0.97[†a]	3.82 ± 1.01[‡a]
Did all, or most of your family living in your home eat breakfast together?	2.62 ± 1.14[†a]	2.63 ± 1.15[‡a]
Was at least one parent present when your child ate his/her evening meal?	4.54 ± 0.79[†a]	4.55 ± 0.68[‡a]
Was a family evening meal purchased from a fast-food restaurant, and eaten either at the restaurant or at home?	1.94 ± 0.55[†a]	1.67 ± 0.60[!b]
Was a family meal purchased and eaten in other types of restaurants (full-service, sit-down)?	1.62 ± 0.70[†a]	1.45 ± 0.58[‡a]
Was a family evening meal delivered to your home (pizza, sandwiches)?	1.24 ± 0.555[†a]	1.14 ± 0.354[‡a]
Was a family evening meal picked up as takeout food?	1.54 ± 0.646[†a]	1.41 ± 0.537[‡a]

[a–b] Non-parametric, 2-related samples test, and parametric, paired samples t-test with means significantly different at $p < 0.05$ level.
All question responses on a scale with 1 = Never, 2 = 1–2 days, 3 = 3–4 days, 4 = 5–6 days, 5 = 7 days.
[†]Missing n = 4; [‡]Missing n = 5; [!]Missing n = 6.

Table 5
Program outcome evaluation.

Questions	Responses (mean ± SD)	
	Pre	Post
When you think about each day of the week, how often is your child physically active for at least 60 min each day?	3.61 ± 0.81[‡a]	3.90 ± 0.65[‡b]
How often does your child help cook meals?	2.57 ± 0.74[‡a]	3.08 ± 0.40[‡b]
When you think about each day of the week, how often are you physically active for at least 30 min each day?	3.31 ± 0.85[!a]	3.47 ± 0.87[‡a]
How often do you enjoy making meals with your child?	2.96 ± 0.92[!a]	3.82 ± 0.78[‡b]
How often does your child help in meal planning?	2.47 ± 0.68[‡a]	2.96 ± 0.64[‡b]
How often do you enjoy making meals?	3.51 ± 0.92[‡a]	3.71 ± 0.71[‡a]
How often do you need to manage your grocery budget carefully to ensure balanced meals for your family toward the end of the pay period?	3.58 ± 1.30[!a]	3.48 ± 1.24[!a]
How often do you make eating together as a family a priority?	4.08 ± 0.86[‡a]	4.14 ± 0.87[‡a]
How often do the topics of conversation at mealtimes include all family members?	3.92 ± 1.09[!a]	4.33 ± 0.77[‡b]
How often does your child help shop for groceries?	3.18 ± 0.83[‡a]	3.45 ± 0.79[‡a]
How often would you rather eat out than make the evening meal?	2.85 ± 0.92[!a]	2.47 ± 0.65[‡b]
How often is it stressful to eat together as a family?	2.00 ± 0.87[‡a]	1.92 ± 0.84[‡a]
How often does your family actively play together?	3.21 ± 0.81[@a]	3.28 ± 0.74[@a]
How often do you feel confident with your cooking skills?	3.88 ± 0.90[‡a]	4.24 ± 0.75[‡b]

[a–b] Non-parametric, 2-related samples test, and parametric, paired samples t-test with means significantly different at $p < 0.05$ level.
All question responses on a 5-point Likert Scale from 1 = Never to 5 = Always.
[‡]Missing n = 5; [!]Missing n = 6; [@]Missing n = 7.

home (fast food and sit-down), and having more confidence in their cooking skills. Researchers have found that likelihood of meal planning is related to a parent's belief in the importance of family meals (McIntosh et al., 2010) and that quality may be impacted by desire, ability, and confidence to cook healthy meals (Dave, An, Jeffery, & Ahluwalia, 2009; Van der Horst et al., 2007). The iCook program consistently reinforced family meal importance and also demonstrated and modeled ways to improve mealtime quality through healthy, quick and easy food preparation, eating together, and positive conversation. Throughout sessions, youth and adults participated in culinary skill development as a team effort, which may also have positively impacted the likelihood of adults meeting recommended dietary standards (Larson, Perry, Story, & Neumark-Sztainer, 2006).

With a program emphasis on consuming a variety of healthy foods and beverages, there were some notable dietary improvements in our adult sample. The iCook 4-H sessions taught participants easy ways to incorporate low-fat dairy, fruits, vegetables, lean/alternative protein sources, and whole grains as well as how to choose products with less fat and fewer added sugars. Previous research documents that meal preparers who enjoyed cooking and had the highest cooking skills also reported the highest weekly fruit and vegetable consumption (Hartmann, Dohle, & Siegrist, 2013; Nelson, Corbin, & Nickols-Richardson, 2013). Based on the food screener scales, 100% fruit juice, vegetable soup, and whole grain consumption significantly increased. There was also a significant decrease in regular fat cheese and cheese spread consumption. We speculate that soup consumption may have been higher at post-assessment due to seasonality (late fall/early winter), which may also be a contributing factor to no significant increases in fresh produce consumption.

Despite program efforts to increase family meal frequency, there were no significant changes in this item. It may have been difficult to produce changes in this area because families in our sample, in particular for the evening meal, were already eating meals together at a high rate. Participants in our study reported having all family members present for the evening meal on average almost 5–6 days per week, and 3–4 days per week for breakfast. These rates are in line, if not slightly higher than, averages based on the Flexible Consumer Behavior Survey (FCBS), which was done from 2007–2010 with a working-age subsample that lives with children under age 17 (Todd, 2014). Perceived maternal time pressures, caused by issues such as an increased prevalence of employed parents, a greater percentage of single parents in the workforce, and longer working hours, and youth being involved in many extracurricular activities, may negatively impact family mealtime attendance (McIntosh et al. 2010; Jabs & Devine, 2006). Family meal togetherness plays and important role in building family bonds and promoting health promotion (Utter et al., 2013), which is why the iCook 4-H curriculum stressed family mealtime importance in every session through discussions and activities. Regardless of family mealtime frequency, the program was effective in improving mealtime quality, such as including all family members in mealtime conversations. Researchers have shown that an area where many parents desire assistance is decreasing conflict at mealtimes (Fulkerson et al. 2008). During every iCook session, while taste

testing food prepared, participants and session leaders would sit together and have “mock” family mealtime and address different ways to improve communication among family members and decrease conflict/negative interactions.

Following the iCook 4-H program, parent-to-child feeding practices were significantly altered, as evidenced by a reported decrease in control of child sweet, junk food, and fat intake, as well as offering food as a reward. Educating adult meal-preparers about the adult-child feeding relationship is an important curriculum component because overly controlling or overly permissive feeding practices may be detrimental to a child's future eating habits (Birch & Fisher, 1998; Johnson & Birch, 1994; Ventura & Birch, 2008). In this program, authoritative feeding practices, characterized by shared parent-child decision-making related to food choice and effective management in food-related conflicts, were taught to the parents, namely through a video and class discussions (Kitzman-Ulrich et al. 2010; Kremers et al.2003; Van der Horst et al. 2007).

Every iCook 4-H session contained a physical activity component, where adults and youth were educated about the benefits of physical activity and were provided with a diverse list of activities that families could complete together (Sorenson, Kattelmann, Meendering, Kabala, Mathews, Olfert, et al., 2015). Educating adults and children together about the benefits of physical activity is important because if adults are inspired to be physically active, their child is more likely to follow this example (Kalakanis, Goldfield, Paluch, & Epstein, 2001; DiLorenzo, Stucky-Ropp, Vander Wal, & Gotham, 1998). Post intervention, adults reported that youth were significantly more likely to achieve 60 min of physical activity a day, but no significant improvements were reported in adult physical activity levels or active play together as a family. Physical activity levels may be positively related to self-efficacy in being physically active for both adults and adolescents (Rutkowski & Connelly, 2012). The iCook program only included short physical activity breaks at every session and may not have provided enough exposure for adults to improve their self-efficacy to be more physically active. This discrepancy in findings between youth being more active and adults not, may have several contributing factors. Other researchers have shown that parent self-efficacy in the ability to perform physical activities did not impact adolescent levels (Rutkowski & Connelly, 2012). Additionally, youth may have other role models other than parents who impact physical activity levels, such as teachers, coaches, or siblings. Youth may have more outlets for being active such as with school sanctioned recess, organized sports, and clubs/groups that promotes activity. Parents and caregivers must continually be reminded of their substantial influence in setting a positive example of being physically active, a topic continually highlighted in the iCook 4-H program. Ideally, youth should be exposed to positive role models at school and at home to help reinforce being physically active.

5. Limitations

Some limitations of this study include using a convenience sample, collecting self-reported data, and not having a control group since it was the pilot phase. Convenience samples can be problematic because they can lead to the under- or over-representation of particular groups within the sample. This limits the ability to make generalizations from our sample to the population of interest. Information gathered was self-reported, where participants could have unintentionally misreported some data. Since this was a pilot study, there was no control group, so researchers were not able to compare program outcomes with a randomized treatment design. Another limitation was the under-representation of some minority groups, such as the Asian population. There may have been an immediacy effect, where results were more pronounced because the post assessments were taken directly after program conclusion when motivation to practice newly learned skills was still high. If assessments were taken at a later date post-intervention, it cannot be assumed that results would be as pronounced. Future research plans include utilizing a randomized control, treatment design with the revised curriculum based on pilot results and feedback.

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