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Keys to healthy family child care homes: results from a cluster randomized trial

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Abstract

Early care and education settings, such as family child care homes (FCCHs), are important venues for children's health promotion. Keys to Healthy Family Child Care Homes evaluated a FCCH-based intervention's impact on children's diet and physical activity. This study enrolled 496 children aged 1.5–4 years and 166 FCCH providers into a cluster-randomized control trial (intervention=242 children/83 FCCHs, control=254 children/83 FCCHs) conducted during 2013–2016. The 9-month intervention addressed provider health, health of the FCCH environment, and business practices, and was delivered through three workshops, three home visits, and nine phone calls. The attention control arm received a business-focused intervention. Primary outcomes were children's diet quality (2 days of observed intakes summarized into Healthy Eating Index scores) and moderate to vigorous physical activity (3 days of accelerometry) at the FCCH. Secondary outcomes were child body mass index (BMI), FCCH provider health behaviors, and FCCH nutrition and physical activity environments and business practices. Repeated measures analysis, using an intent-to-treat approach, accounting for clustering of children within FCCHs and adjusting for child age, sex, and BMI, was used to evaluate change (completed in 2018). Compared to controls, intervention children significantly improved their diet quality (5.39, p=0.0002, CI=2.53, 8.26) but not MVPA (0.31, p = 0.195, CI=−0.16, 0.79). Intervention FCCH

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providers significantly improved their diet quality and several components of their FCCH environment (i.e., time provided for physical activity, use of supportive physical activity practices, and engagement in nutrition and physical activity education/professional development). FCCHs are malleable settings for health promotion, especially diet quality.

INTRODUCTION

A high-quality diet and regular physical activity improves young children's weight, cardiometabolic health, skeletal/bone health, psychosocial health, and cognitive development.[1–4] Unfortunately, young children are not meeting diet and physical activity recommendations.[5] These behaviors are adopted early in life track into adolescence and adulthood, hence it is important to intervene early to shape behaviors.[6]

Early care and education (ECE) offers important opportunities to improve young children's diet and physical activity.[7] In Australia and the United States (US), 60–64% of children aged 3–5 years are enrolled in some type of ECE program.[8,9] Many countries in Europe have enrollment rates above 90%.[10] Most children, at least in the US, are in full-day care.[8] Hence, ECE settings are where they get most of their meals/snacks and opportunities for physical activity.

Family child care homes (FCCHs) are the second largest provider of child care in the US.[11] FCCHs are generally smaller, less formal, ECE programs. FCCHs have fewer regulations compared to center-based programs, including limited nutrition and physical activity requirements.[12,13] FCCHs are an important target for intervention as they have poor nutrition and physical activity practices,[14] and the children enrolled have poor diet quality, low physical activity, and increased risk of obesity.[15–17]

Unfortunately, FCCHs have been largely ignored in intervention research.[14] The few existing FCCH-based intervention studies show promising results but many rely on quasi-experimental designs and focus on environmental outcomes.[18–21]

To address this research gap, we developed Keys to a Healthy Family Child Care Home (Keys), an intervention to improve FCCH environments and positively impact children's diet quality and physical activity. This paper describes primary and secondary outcomes from this intervention.

METHODS

Keys used a cluster-randomized controlled trial to evaluate a 9-month FCCH-based intervention's impact on children's diet quality and physical activity while at child care. Study protocols and intervention development have been published,[22,23] but are described briefly below. Protocols were approved by the Institutional Review Boards at the University of North Carolina at Chapel Hill and the Duke University Medical Center and registered at ClinicalTrials.gov (NCT01814215).

Participants and Recruitment

Participants included a convenience sample of FCCH providers in central North Carolina and children aged 1.5–4 years enrolled in these FCCHs, recruited in five cohorts over 2 years. Community partners shared information about the project with local FCCHs. Then, study staff followed up with FCCH providers via mail, email, and telephone to invite study participation. During telephone follow-ups, FCCHs were screened for eligibility (i.e., enrolling at least two children aged 1.5–4 years, providing at least one meal and snack per day, being open year-round, and having been in business for two years with no plans to close in the coming year). Study staff then visited eligible FCCH providers to explain study details and obtain written informed consent. Study staff worked through the FCCH provider to share study information with parents (including project contact information for questions) and collect informed consent. Parental consent for at least two children was required for the FCCH to participate.

Power

Calculations assumed two-sided tests of significance at α=0.025 (overall Type I error=0.05), clusters of three children per FCCH (on average), ICCs of 0.36 for Healthy Eating Index (HEI) score and 0.12 for moderate to vigorous physical activity (MVPA) (based on previous ECE work), and an effect size of 0.40 (+5 points in HEI score, +1 minute/hour in MVPA). The initial sample size of 150 FCCHs and 450 children [22] was revised following cohort 1 due to high child attrition (20% anticipated vs. 47% actual),[24] due mainly to children no longer being enrolled in the FCCH because of change in parental employment, transition into center-based care, or moving out of the area. The updated sample size was 165 FCCHs and 495 children.

Randomization

Following baseline data collection, children were randomized in clusters, based on their FCCH. FCCHs were stratified based on FCCH provider weight (i.e., normal weight, overweight, obese), given that child care providers' own health impacts their nutrition and physical activity practices and the behaviors of the children in their care.[25,26] The study statistician used computerized block randomization to assign FCCHs into either the intervention or control arm (1:1) (SAS 9.3, Cary, NC). Participants were informed of randomization by the project manager, while investigators remained blinded.

Intervention

The Keys intervention was designed to help FCCH providers create environments that support children's healthy eating and physical activity behaviors. The intervention was developed using Intervention Mapping.[23] Drawing on the Socio-Ecologic Framework,[27] the intervention targeted provider behaviors and practices that would address multiple levels of influence for children – intrapersonal (child), interpersonal (child-provider and child-parent interactions), and organizational (FCCH environment, provisions, and policies). Social Cognitive Theory[28] and Self Determination Theory[29] informed identification of psychological drivers of behavior change: behavioral capacity, self-efficacy, expectations and expectancies (attitudes and beliefs), autonomy, and relatedness (social support).

Behavior change strategies included persuasive communication, guided practice, self-evaluation, autonomy building, physiological and affective change tools, and active learning.

The Keys intervention included three modules addressing FCCH provider health, the FCCH environment, and FCCH business practices. FCCH provider health and business practices were included as they are critical determinants of the FCCH environment. The FCCH environment module encouraged sharing educational materials with families to help parent adopt similar changes at home. Each module lasted three months and was delivered via a workshop, a home visit, and three telephone or email contacts by health coaches trained in adult learning principles[30] and motivational interviewing.[31] The 9-month duration allowed the intervention to run concurrent with a typical school-year.

Attention Control

The control program offered a similar dose of attention (replacing home visits with telephone calls) and focused solely on business practices. Content addressed record keeping, contracts, and marketing.

Measures

Measurement of FCCH providers and children occurred at two time points: baseline and post-intervention, approximately nine months apart. Given the multiple cohorts, data collection spread across 2013–2016. Data collectors, certified on all protocols and blinded to arm assignment, conducted a 2-day measurement visit with each FCCH, arriving before the first meal and staying until children left. Alternate day visits (e.g., Monday and Wednesday, Tuesday and Thursday) spread measurement across three days.

Primary Outcomes: Child Diet Quality and Physical Activity—Children's diet quality at the FCCH was estimated from observed intakes of food and beverages collected via the Diet Observation in Child Care protocol.[32] Data collectors observed all meals/snacks over two days and estimated the amount of food and beverages served and remaining for each child. Data were entered into the Nutrition Data System for Research (NDSR, University of Minnesota, 2016) to estimate intakes of energy, macro- and micronutrients, and food group servings. For each child, data were summed across the two days of intakes, then the HEI-2010 algorithm was applied.[33] HEI scores assess compliance with national dietary guidelines, higher scores reflecting higher compliance. HEI scoring adjusts for total calories consumed, facilitating comparison across children who consumed different numbers of meals/snacks.

Children's physical activity was assessed with ActiGraph GT3X+ accelerometers (ActiGraph, Pensacola, FL). Accelerometers were placed on children at the beginning of the first day and worn over the right hip until being collected at the end of the second day. Alternating day visits allowed accelerometers to be worn for three weekdays. Parents were instructed to remove the monitor at bedtime and replace it in the morning. Data were downloaded and processed (SAS v9.4) to assess wear and physical activity outcomes. FCCH start and end times collected in the FCCH environmental assessment (described below) were used to identify physical activity during the FCCH day. Minimum wear criteria (i.e., ≥1 day

of wear, ≥3 hours of wear during the FCCH day) were established and age-appropriate cut-points applied to calculate minutes of MVPA (≥191counts/5s),[34,35] active play (≥116counts/5s),[34,36] and sedentary time (<8.3counts/5s)[35] per day for each child. Day-level data for each child were averaged then standardized into minutes per hour to account for variation in the length of the FCCH day and children's wear time.

Secondary Outcomes

Child Anthropometrics and Demographics.: Data collectors measured children's height, weight, and waist circumference while children were in light clothing with shoes removed. Height was measured to the nearest 1/8 inch using a Seca stadiometer (Seca Corporation, Columbia, MD; generally as standing height, but six children under 2 years and unable to stand independently were measured lying down[37]); weight was measured to the nearest 0.1 pound using a Tanita 800BWB scale (Tanita Corporation, Tokyo, Japan); and waist circumference was measured to the nearest 0.1 cm using a Guilick II measuring tape. Height and weight were used to calculate BMI. BMI percentile and z-score were calculated using either the Centers for Disease Control and Prevention's sex-specific growth charts[38] for children 2 years or older or the World Health Organization's growth standards[39] for children under 2 years old. Parents completed a brief demographic survey for their child.

FCCH Provider Diet Quality, Physical Activity, Anthropometrics, and Demographics.: FCCH provider diet was assessed using the Block Brief Food Frequency Questionnaire (FFQ).[40] FFQ data were used to calculate a modified HEI-2010 diet quality score.[41] Physical activity was assessed using ActiGraph GT3X+ accelerometers worn for seven days (overlapping with children's physical activity assessment). FCCH provider data were summarized into 60-second epochs. Minimum wear criteria (i.e., ≥3 days and ≥7 hours of wear per day) were established and standard adult cut-points were applied to calculate minutes of MVPA (>2020counts/min),[42] lifestyle activity (>760counts/min),[43] and sedentary time (<100counts/min).[42] Average minutes of activity per day were calculated and standardized to a 14-hour day to account for differences in wear time. FCCH provider height and weight were measured using procedures similar to those used for children, which were then used to calculate BMI and weight status (normal weight, overweight, obese). FCCH providers also completed a demographic survey about themselves and their FCCH.

FCCH Nutrition and Physical Activity Environments.: FCCH nutrition and physical activity environments were assessed using the Environment and Policy Assessment and Observation modified for FCCHs (EPAO-FCCH).[44] Data collectors conducted two non-consecutive days of observation and a document review. The EPAO-FCCH assesses compliance with 38 nutrition and 27 physical activity best practices, which are then used to calculate seven nutrition and 10 physical activity environmental sub-scores (range 0–3) as well as overall nutrition (range 0–21) and physical activity scores (range 0–30). Higher scores indicate better compliance with best practices.

FCCH Business Practices.: A modified version of the Business Administration Scale (BAS)[45] was used to capture FCCH business practices. Modifications removed non-relevant sections (e.g., risk management) and items overlapping with demographic surveys and

expanded items related to promoting children's healthy eating and physical activity (e.g., communication with parents). Data were summarized into five sub-scores (i.e., income and benefits, work environment, record keeping, provider-parent communication, and marketing and public relations, each ranging from 1–7) and an overall score (range 5–35).

Process Evaluation

Intervention participation data were tracked by the health coaches using an Access database. Participation data included workshop completion (either in group as prescribed, or individually), number of coaching contacts (range 0–12) and length (in minutes), and number of completed self-monitoring logs (range 0–36). Knowledge of recommended behaviors and practices was evaluated following workshops with a brief quiz and summarized as passed (score of 55% or higher) or not passed. Satisfaction was evaluated with brief surveys rating various aspects of quality of the workshops and coaching contacts (1=poor to 5=excellent).

Statistical Analysis

Analyses were conducted under an intent-to-treat model using the Proc Mixed procedure (SAS v9.4) to perform the repeated measures analysis comparing intervention and control groups.[46] Models specified an unstructured covariance matrix (comparisons based on change in the Akaike information criterion). Maximum likelihood estimation was applied, helping to account for missing data.[47] Models of child-level outcomes accounted for clustering; included child age, sex, and BMI as covariates; and for primary outcomes (HEI score, MVPA/hr) used p values <0.025. Similar methods were used to evaluate secondary outcomes, but models with FCCH provider and environment outcomes did not account for clustering. Specific covariates were selected for FCCH provider outcomes (i.e., age, race, income, and BMI, as known determinants of adults diet and physical activity behaviors), FCCH environment outcomes (i.e., quality rating), and FCCH business outcomes (i.e., provider education, Child And Adult Care Food Program, CACFP). Since secondary outcomes were exploratory, a p-value of <0.05 was used.

To address missing child-level data, multiple imputation was used, models were re-run, and results were compared against the original. One hundred samples were imputed and analyzed in SAS (Proc MI) using available physical activity, HEI, and covariate data. Comparison of baseline data from completers and non-completers suggests that data are missing at random.

RESULTS

Participants

Participants included 496 children and 166 FCCH providers, of which 242 children from 83 FCCHs were assigned to the intervention arm and 254 children from 83 FCCHs were assigned to the control arm. See Figure 1 for the study's CONSORT diagram. Demographics of children, FCCH providers, and FCCHs are presented in Table 1.

At post-intervention, there was a 38% loss-to-follow-up. The main reason was children no longer being enrolled in the FCCH (n=172 children) or FCCH providers refusing to participate in measures (n=19 children).

Primary Outcomes

Child Diet Quality and Physical Activity—Intervention children significantly improved their total HEI scores relative to control children (+5.39 points, $p<0.001$). Improvements were seen in whole grains, seafood/plant protein, refined grains, and sodium (for all $p\leq0.031$), with small to medium effect sizes.[48] Unexpectedly, a significant decrease was noted in total vegetables (−0.49 points, $p=0.003$). Children wore the accelerometers on average 2.7 days for 6.6 hours per FCCH day (no significant differences by time or arm). No significant differences were noted between arms for changes in children's MVPA, active play minutes, or sedentary time. Also, no significant differences were noted between arms for change in children's BMI or BMI percentile. Results with imputed data were similar (Supplemental Table 1). Child outcomes are presented in Table 2.

Secondary Outcomes

FCCH Provider Diet Quality, Physical Activity, and Anthropometrics—FCCH providers in the intervention arm significantly improved their total HEI scores compared to those in the control arm (+3.44 points, $p=0.023$). Improvements were seen in total fruit, total vegetables, whole grains, fatty acids, and sodium (for all $p\leq0.028$), with medium effect sizes.[48] No significant differences were noted for changes in FCCH providers' MVPA or BMI. FCCH provider outcomes are presented in Table 3.

FCCH Nutrition and Physical Activity Environments and Business Practices—FCCHs in the intervention arm significantly increased their nutrition environment scores relative to controls (+0.24, $p=0.040$). A similar increase was noted in the overall physical activity score, but this difference was not significant (+0.54, $p=0.15$). Environmental sub-scores showed significant improvement in time provided for physical activity, daily physical activity practices, and nutrition and physical activity education/professional development (for all $p<0.028$), with small to medium effect sizes.[48] FCCHs in the intervention arm also had significant improvements in record keeping relative to those in the control arm (+0.68, $p=0.022$). FCCH outcomes are presented in Table 3.

Process Evaluation

Intervention participation was high; FCCH providers completed, on average, 2.9 workshops (2.2 in the group setting), 11.3 coaching contacts (averaging 423.5 minutes total), and 22.7 self-monitoring logs. FCCH providers passed, on average, 2.8 of the 3 knowledge assessments. Satisfaction with workshops and coaching were also highly rated, with scores ranging between 4.6 and 4.9 (out of 5).

DISCUSSION

Keys is the first randomized controlled trial to evaluate a FCCH-based nutrition and physical activity intervention for children. Results demonstrated significant improvements in

children's diet quality but not physical activity. Results also demonstrated significant improvements in FCCH providers' diet quality and several aspects of their FCCH environments. Four previous quasi-experimental intervention studies with FCCHs demonstrate similar improvements in nutrition and physical activity practices;[18–20,49] hence, FCCHs appear to be a malleable setting that can be improved to benefit children's health. More intervention studies are needed to confirm essential content and strategies necessary to overcome critical barriers. Even with Keys' comprehensive program (addressing FCCH providers' health, FCCH environments, and FCCH business practices) and intensive delivery model (in-person workshops, home visits, and coaching contacts), effects were small to moderate and sometimes mixed.

Keys' positive dietary findings suggest that FCCH-based nutrition interventions can produce similar improvements in children's diets as center-based interventions.[50] Intervention children had a 9% increase in HEI score overall. HEI component scores generally changed in the right direction, but like other intervention studies, not all changes were significant.[51] The decrease in the vegetable component score warrants attention as it suggests an unintended negative impact on vegetable consumption, possibly from failing to redirect FCCH providers to healthier vegetables when discouraging fried and pre-fried potatoes. Additionally, some food groups may be easier to change (e.g., whole grains) while others (e.g., vegetables) may require more focused or intense intervention.[52] Further analyses are needed to explore mediational pathways driving these changes. Improvements in FCCH providers' diet quality may help explain improvements in children's diet quality despite limited changes in the FCCH nutrition environment.

The non-significant physical activity findings suggest that FCCH providers encounter additional challenges that limit intervention impact. These results contrast several reviews of ECE center-based interventions which generally demonstrate physical activity improvements.[51,53] Significant improvements were observed in several aspects of the FCCH environment, including time provided, daily practices, and education/professional development. While these environmental aspects are associated with children's physical activity,[54–56] improvements appeared insufficient to impact children's behaviors. Additional analyses may aid our understanding of these mixed findings and whether the low physical activity of FCCH providers, and lack of change, moderated the impact of environmental improvements.

A key lesson from this study is the need to refine content for future FCCH interventions. A 2018 systematic review identified 17 studies describing FCCH environments as they relate to child diet, physical activity, and weight.[14] It noted several problematic areas, including frequent use of coercive feeding practices, suboptimal space for active play, reliance on television, inadequate training, and lack of written policies. It should not be assumed, however, that recommendations based largely on center-based studies apply directly to FCCHs. Uniqueness of FCCHs may impact how these practices work to influence children's behaviors. For example, data from FCCH-based studies have demonstrated that adequate indoor space is significantly associated with children's physical activity, even more so than outdoor play space.[57,58] Interventions may need to prioritize reorganizing FCCHs' indoor environments to allow for more gross motor activities.[57] Also, data from this study suggest

that screen use is positively associated with children's MVPA,[59] which contradicts center-based research showing screens to be associated with sedentary time.[60] Intervention messages about screens may need to offer active screen time resources that help engage children of different ages in gross motor activities.[59] The Keys intervention did not significantly impact either of these aspects of the FCCH environment; hence, the lack of change in children's physical activity may be explained by a failure to address critical environmental elements.

Another lesson from the Keys study is the importance of FCCH provider health. Baseline data demonstrated that most FCCH providers had at least four of six key health risk behaviors (e.g., excess weight, insufficient activity, inadequate fruit/vegetable intake, inadequate sleep, high stress, no health insurance).[61] Most alarming was that close to 90% were FCCH providers with overweight or obesity. Poor health behaviors and attitudes, including uncertainty in their physical abilities, dislike of healthy foods, and lack of nutrition and physical activity knowledge, impair FCCH providers' ability to be healthy role models and to adopt recommended practices.[25,26,62] The contrast between diet and physical activity outcomes suggest that changing FCCH providers' behaviors will support children's behavior change.

Future FCCH intervention research would benefit from strategies that address economic barriers, which exist at two levels – FCCH providers and the families they serve. FCCHs have low profit margins, and studies have documented that limited time and resources are barriers to their adoption of recommended diet and physical activity practices.[25,26] FCCHs are an appealing form of child care for low-income families given their lower enrollment fees and flexible schedules (e.g., accommodating shift work). The high rates of acceptance of child care subsidies and participation in CACFP is evidence that Keys' FCCHs were serving low-income families. The Healthy Business module represented at least a modest attempt to address a key "root cause" of obesity, namely economic disadvantage common to the FCCH industry [63]). Record keeping may be an easier business practice to adopt while others, such as developing new contracts or marketing, may require more practical examples and tools to support their use.

One study limitation was high attrition, caused primarily by enrollment turnover. Close monitoring of attrition allowed for quick adjustment of the sample size. Children lost to follow-up were similar to completers, suggesting that attrition did not unduly bias the sample. Another limitation was the sample's homogeneity – mostly female FCCH providers, with overweight/obesity, and modest incomes. While recruitment efforts effectively targeted a low-income population at increased risk for adverse health outcomes, the sample homogeneity may limit the generalizability of findings.

CONCLUSION

In summary, the Keys intervention improved diets of children and caregivers but not physical activity. Future research should investigate strategies for working within the restrictive environments of FCCHs and improving training opportunities to better support physical activity. Future research should also examine practical strategies for integrating

effective FCCH-based interventions into child care systems (e.g., CACFP, quality rating and improvement systems) that serve predominantly child care centers.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviations:

BMI	body mass index
CACFP	child and adult care food program
ECE	early care and education
EPAO	environment and policy assessment and observation
FCCH	family child care home
FFQ	food frequency questionnaire
HEI	healthy eating index
MVPA	moderate to vigorous physical activity

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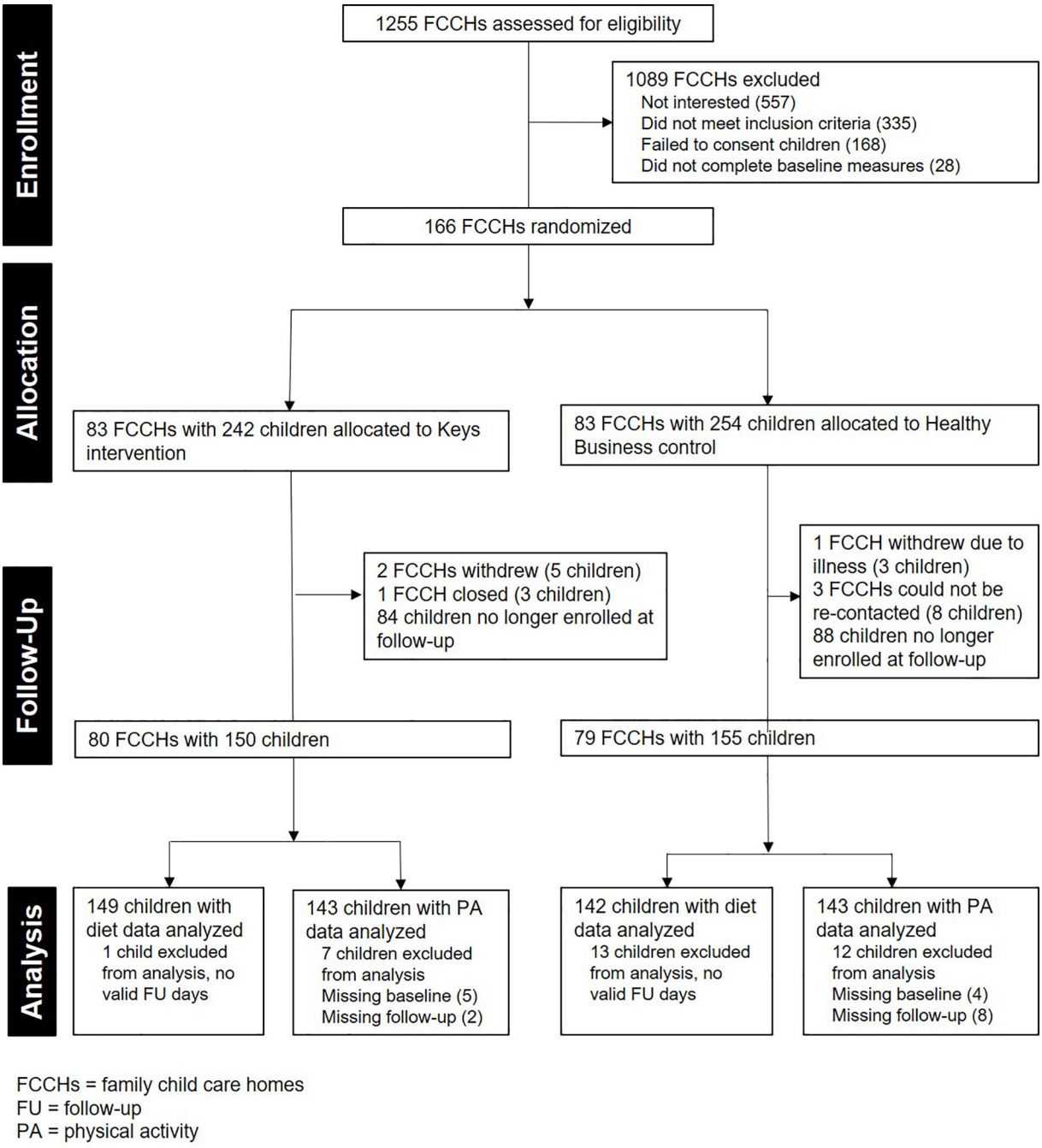

Figure 1:
Keys to Healthy Family Child Care Homes CONSORT diagram

Table 1.

Characteristics of participating children, FCCH providers, and FCCHs

	Total Sample	
Children	**n=496**	
Age (months, mean (SD))	35.7	(11.4)
Male	246	(49.6%)
Race		
Black or African American	314	(63.3%)
White	135	(27.2%)
Other	47	(9.5%)
Hispanic or Latino	20	(4.1%)
Days per week in child care (mean (SD))	4.9	(0.7)
FCCH Providers	**n=166**	
Age (years, mean (SD))	49.3	(9.1)
Race		
Black or African American	123	(74.1%)
White	30	(18.1%)
Other	13	(7.8%)
Hispanic or Latino	8	(4.8%)
Education		
High school diploma or GED	41	(24.7%)
Associate's degree or 60 hrs college credit	82	(49.4%)
Bachelor's degree or greater	42	(25.3%)
FCCH Programs	**n=166**	
Quality Rating[a]		
1 or 2 stars	13	(7.8%)
3 stars	40	(24.1%)
4 stars	68	(41.0%)
5 stars	45	(27.1%)
Accepts CACFP[b] Subsidy	151	(91.0%)

[a]Quality Rating is a North Carolina program that assesses the quality of the child care program. Ratings can range between 1 and 5 stars, with more stars equating to higher quality care.

[b]CACFP refers to the Child and Adult Care Food Program, a federally funded program that reimburses participating child care programs for providing eligible meals and snacks served to low-income and other children in their care.

FCCH, Family Child Care Home; GED, General Education Development; CACFP, Child and Adult Food Program

Table 2.

Child outcomes: Changes in diet, physical activity, and weight

Outcome	Intervention				Control				Diff in mean change	(95% CI)[a]	p-value[a]	Effect size[b]	ICC[c]
	baseline		post-intervention		baseline		post-intervention						
	mean	(SD)	mean	(SD)	mean	(SD)	mean	(SD)					
	n=242		n=149		n=253		n=142						
Child Diet													
HEI Score	**61.3**	**(16.57)**	**64.35**	**(16.34)**	**61.96**	**(19.22)**	**59.85**	**(17.34)**	**5.39**	**(2.53, 8.26)**	**<0.001**	**0.29**	**0.61**
Adequacy:													
Total fruit	4.46	(1.64)	4.38	(1.4)	4.47	(1.31)	4.30	(1.66)	0.03	(−0.28, 0.33)	0.859	0.06	0.38
Whole fruit	4.59	(1.61)	4.71	(1.06)	4.69	(1.37)	4.60	(1.41)	0.18	(−0.10, 0.47)	0.211	0.14	0.29
Total vegetables	**2.01**	**(2.12)**	**1.84**	**(1.51)**	**1.89**	**(1.88)**	**2.08**	**(1.80)**	**−0.49**	**(−0.82, −0.17)**	**0.003**	**−0.18**	**0.46**
Greens and beans	1.25	(3.18)	1.14	(2.54)	0.98	(2.85)	1.16	(2.62)	−0.21	(−0.71, 0.28)	0.399	−0.10	0.58
Whole grains	**3.65**	**(5.48)**	**4.89**	**(4.92)**	**3.58**	**(5.35)**	**3.57**	**(5.10)**	**1.57**	**(0.59, 2.55)**	**0.002**	**0.23**	**0.66**
Dairy	8.94	(2.47)	9.05	(2.55)	9.34	(2.03)	9.33	(1.87)	0.14	(−0.36, 0.64)	0.587	0.05	0.39
Total protein	3.61	(2.30)	3.41	(2.53)	3.60	(2.25)	3.31	(2.62)	0.01	(−0.41, 0.42)	0.972	0.03	0.47
Seafood/plant protein	**1.57**	**(3.50)**	**1.79**	**(3.10)**	**1.72**	**(3.69)**	**1.57**	**(3.23)**	**0.67**	**(0.06, 1.28)**	**0.031**	**0.10**	**0.65**
Fatty acids	4.7	(5.05)	4.56	(5.00)	4.47	(5.19)	4.30	(5.07)	0.04	(−0.86, 0.93)	0.938	0.01	0.53
Moderation:													
Refined grains	**5.24**	**(5.77)**	**6.20**	**(4.76)**	**5.47**	**(5.09)**	**4.43**	**(4.54)**	**1.96**	**(1.08, 2.84)**	**<0.001**	**0.37**	**0.6**
Sodium	**4.58**	**(5.07)**	**5.05**	**(4.22)**	**5.35**	**(4.10)**	**4.43**	**(4.52)**	**1.41**	**(0.57, 2.25)**	**0.001**	**0.31**	**0.58**
Empty calories	16.70	(6.63)	17.34	(4.80)	16.40	(6.56)	16.78	(6.05)	0.03	(−0.97, 1.03)	0.948	0.04	0.68

Outcome	Intervention				Control				Diff in mean change	(95% CI)[a]	p-value[a]	Effect size[b]	ICC[c]
	baseline		post-intervention		baseline		post-intervention						
	mean	(SD)	mean	(SD)	mean	(SD)	mean	(SD)					
	n=242		n=149		n=253		n=142						
Child Physical Activity													
MVPA min/hr[d]	4.77	(2.63)	5.48	(2.80)	4.72	(3.05)	5.15	(2.60)	0.31	(−0.16, 0.79)	0.195	0.10	0.31
Active play min/hr[d]	8.19	(3.88)	9.17	(3.97)	8.08	(4.61)	8.65	(3.74)	0.45	(−0.25, 1.16)	0.202	0.10	0.32
Sedentary min/hr[d]	38.31	(7.02)	37.37	(6.32)	38.74	(8.06)	38.40	(6.55)	−0.75	(−1.95, 0.45)	0.219	−0.08	0.34
Child Weight													
BMI	16.99	(2.10)	16.96	(2.40)	16.67	(1.82)	16.44	(1.95)	0.21	(−0.02, 0.44)	0.077	0.10	0.24
BMI percentile	65.57	(29.41)	66.10	(30.74)	62.59	(30.76)	62.24	(30.25)	1.42	(−2.61, 5.45)	0.489	0.03	0.03

Note: Boldface indicates statistical significance ($p<0.05$).

[a] Difference in mean change, 95% CI, and p-value reflect the fully adjusted model, which controls for baseline values as well as child sex, age, and BMI.

[b] Effect sizes calculated using Cohen's d.

[c] ICCs reported are for the difference scores using the entire sample.

[d] Estimates of activity reflect only time spent at the FCCH.

HEI, Healthy Eating Index; MVPA, moderate to vigorous physical activity; BMI, body mass index

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Table 3.

FCCH Provider and FCCH Outcomes

Outcome	Intervention				Control				Diff in mean change	(95% CI)[a]	p-value[a]	Effect size[b]
	baseline		post-intervention		baseline		post-intervention					
	mean	(SD)	mean	(SD)	mean	(SD)	mean	(SD)				
	n=83		n=80		n=83		n=79					
FCCH Provider Diet												
Modified HEI Score	**59.67**	**(9.29)**	**63.50**	**(9.23)**	**59.46**	**(9.57)**	**60.36**	**(9.95)**	**3.44**	**(0.48, 6.39)**	**0.023**	**0.31**
Adequacy:												
Total fruit	**3.97**	**(1.47)**	**4.42**	**(1.09)**	**4.34**	**(1.15)**	**4.32**	**(1.26)**	**0.48**	**(0.05, 0.92)**	**0.028**	**0.37**
Whole fruit	4.3	(1.31)	4.71	(0.74)	4.46	(1.09)	4.52	(1.21)	0.37	(−0.02, 0.76)	0.060	0.29
Total vegetables	**3.43**	**(1.33)**	**3.80**	**(1.29)**	**3.80**	**(1.42)**	**3.67**	**(1.39)**	**0.55**	**(0.07, 1.04)**	**0.026**	**0.36**
Greens and beans	3.25	(1.61)	3.73	(1.63)	3.34	(1.81)	3.47	(1.68)	0.35	(−0.20, 0.90)	0.212	0.2
Whole grains	**7.16**	**(2.06)**	**7.86**	**(1.98)**	**7.39**	**(2.11)**	**7.33**	**(2.22)**	**0.77**	**(0.09, 1.45)**	**0.026**	**0.36**
Dairy	5.03	(3.02)	5.08	(3.18)	4.75	(2.99)	4.93	(2.87)	−0.13	(−1.09, 0.82)	0.783	−0.04
Total protein	2.68	(0.97)	2.78	(1.02)	2.48	(0.84)	2.62	(1.01)	−0.02	(−0.35, 0.32)	0.917	−0.04
Seafood/plant protein	3.84	(1.43)	4.05	(1.34)	3.76	(1.47)	3.72	(1.52)	0.27	(−0.24, 0.79)	0.296	0.17
Fatty acids	**4.96**	**(2.54)**	**5.57**	**(2.86)**	**5.29**	**(2.86)**	**4.93**	**(2.47)**	**1.09**	**(0.20, 1.98)**	**0.017**	**0.36**
Moderation:												
Refined grains	5.21	(2.54)	5.03	(2.58)	4.49	(2.43)	5.06	(2.23)	−0.68	(−1.46, 0.10)	0.089	−0.31
Sodium	**7.81**	**(1.87)**	**8.19**	**(1.59)**	**8.45**	**(1.63)**	**7.94**	**(1.94)**	**0.84**	**(0.14, 1.54)**	**0.019**	**0.51**
Empty calories	8.03	(4.23)	8.26	(4.48)	6.91	(4.27)	7.85	(3.77)	−0.52	(−1.90, 0.86)	0.455	−0.17

Outcome	Intervention				Control				Diff in mean change	(95% CI)[a]	p-value[a]	Effect size[b]
	baseline		post-intervention		baseline		post-intervention					
	mean	(SD)	mean	(SD)	mean	(SD)	mean	(SD)				
	n=83		n=80		n=83		n=79					
FCCH Provider Physical Activity												
MVPA min/day	15.51	(11.97)	14.94	(12.99)	17.36	(15.89)	15.32	(14.59)	1.16	(−3.89, 6.22)	0.650	0.11
Lifestyle min/day	120.10	(47.33)	113.77	(55.57)	121.80	(55.14)	108.87	(48.74)	3.92	(−9.94, 17.77)	0.577	0.13
Sedentary min/day	396.17	(100.42)	409.57	(136.14)	408.04	(95.10)	401.62	(96.24)	21.28	(13.30, 55.86)	0.226	0.2
FCCH Provider Weight												
BMI	33.57	(7.61)	33.50	(7.66)	33.05	(7.24)	33.18	(7.39)	−0.13	(−0.68, 0.41)	0.631	−0.03
FCCH Environment												
Overall Nutrition Score	**9.30**	**(1.70)**	**9.42**	**(1.77)**	**9.09**	**(1.83)**	**9.06**	**(1.73)**	**0.24**	**(0.01, 0.47)**	**0.040**	**0.09**
Foods provided	2.15	(0.27)	2.13	(0.28)	2.05	(0.25)	2.05	(0.27)	−0.03	(−0.12, 0.06)	0.542	−0.09
Beverages provided	2.01	(0.28)	2.10	(0.26)	1.95	(0.31)	1.95	(0.27)	0.10	(−0.01, 0.20)	0.084	0.31
Feeding environment	1.45	(0.20)	1.49	(0.23)	1.36	(0.22)	1.37	(0.20)	0.04	(−0.04, 0.12)	0.339	0.17
Feeding practices	1.43	(0.26)	1.37	(0.26)	1.43	(0.28)	1.33	(0.27)	0.04	(−0.06, 0.13)	0.466	0.12
Menus	0.64	(1.20)	0.65	(1.21)	0.79	(1.30)	0.82	(1.32)	0.00	------	------	−0.02
Educ/prof development	**0.68**	**(0.35)**	**0.74**	**(0.32)**	**0.68**	**(0.33)**	**0.67**	**(0.32)**	**0.09**	**(0.01, 0.16)**	**0.02**	**0.22**
Nutrition policy	0.94	(0.70)	0.94	(0.72)	**0.86**	**(0.59)**	0.89	(0.58)	0.00	0.00	------	−0.05
Overall Physical Activity Score	13.14	(2.16)	13.19	(2.37)	12.83	(2.08)	12.36	(2.34)	0.54	(−0.21, 1.29)	0.154	0.25
Time provided	**1.37**	**(0.59)**	**1.41**	**(0.60)**	**1.49**	**(0.59**	**1.27**	**(0.51)**	**0.26**	**(0.03, 0.49)**	**0.028**	**0.44**
Indoor play equipment	1.39	(0.45)	1.40	(0.45)	1.39	(0.54)	1.37	(0.53)	0.02	(−0.18, 0.22)	0.818	0.05

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Outcome	Intervention				Control				Diff in mean change	(95% CI)[a]	p-value[a]	Effect size[b]
	baseline		post-intervention		baseline		post-intervention					
	mean	(SD)	mean	(SD)	mean	(SD)	mean	(SD)				
	n=83		n=80		n=83		n=79					
Physical activity practices	**1.65**	**(0.29)**	**1.65**	**(0.27)**	**1.67**	**(0.32)**	**1.51**	**(0.32)**	**0.16**	**(0.04, 0.27)**	**0.009**	**0.52**
Outdoor playtime	1.22	(0.65)	1.20	(0.64)	1.25	(0.77)	1.16	(0.78)	0.08	(−0.15, 0.32)	0.493	0.11
Outdoor play environment	1.30	(0.37)	1.17	(0.34)	1.28	(0.39)	1.19	(0.39)	−0.04	(−0.18, 0.10)	0.572	−0.12
Educ/prof development	**0.37**	**(0.39)**	**0.46**	**(0.39)**	**0.37**	**(0.37)**	**0.32**	**(0.32)**	**0.15**	**(0.04, 0.27)**	**0.011**	**0.38**
Physical activity policy	0.80	(0.75)	0.79	(0.74)	0.76	(0.73)	0.78	(0.73)	0.00	------	------	−0.05
Screen time	2.40	(0.56)	2.47	(0.54)	2.23	(0.54)	2.31	(0.54)	−0.03	(−0.22, 0.16)	0.755	−0.04
Screen time practices	2.65	(0.49)	2.65	(0.53)	2.39	(0.65)	2.43	(0.63)	−0.04	(−0.24, 0.15)	0.649	−0.06
Screen time policy	1.01	(0.37)	1.00	(0.36)	0.98	(0.31)	0.99	(0.30)	0.00	------	------	−0.07
Business Practices												
Overall Score	13.95	(4.91)	14.56	(4.68)	13.96	(4.60)	14.25	(4.14)	0.61	(−0.93, 2.14)	0.437	0.07
Income and benefits	2.16	(2.00)	1.91	(1.88)	2.01	(1.83)	1.61	(1.49)	0.15	(−0.48, 0.77)	0.641	0.08
Recordkeeping	**2.34**	**(1.62)**	**3.00**	**(1.98)**	**2.42**	**(1.73)**	**2.53**	**(1.58)**	**0.67**	**(0.10, 1.25)**	**0.022**	**0.33**
Work environment	5.48	(2.15)	4.89	(2.48)	4.87	(2.40)	5.16	(2.22)	−0.79	(−1.66, 0.07)	0.073	−0.39
Communication	1.78	(1.08)	1.84	(1.06)	1.96	(1.25)	1.99	(1.10)	0.00	(−0.44, 0.44)	0.999	0.03
PR and marketing	2.33	(1.74)	2.93	(1.98)	2.70	(1.94)	2.96	(2.10)	0.42	(−0.21, 1.06)	0.189	0.18

Note: Boldface indicates statistical significance ($p<0.05$).

[a]Difference in mean change, 95% CI, and p-value reflect the fully adjusted model, controlling for baseline values; provider age, race, income, and BMI for provider outcomes; FCCH quality rating for nutrition/physical activity environment scores; and provider education and acceptance of CACFP subsidy for business practices.

[b]Effect sizes calculated using Cohen's *d*.

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HEI, Healthy Eating Index; MVPA, moderate to vigorous physical activity; BMI, body mass index; Educ., education; Prof., professional; PR, public relations