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Family home food environment and nutrition-related parent and child personal and behavioral outcomes of the HOME Plus study: A randomized controlled trial

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Abstract

Background—Research has demonstrated a significant positive association between frequent family meals and children's dietary intake; however, the promotion of healthful family meals has not been rigorously tested for key food environment and nutrition-related behavioral outcomes in a randomized trial.

Objective—To describe family home food environment and nutrition-related parent and child personal and behavioral outcomes of HOME Plus, the first rigorously-tested family meals intervention targeting childhood obesity prevention.

Design—Randomized controlled trial. Baseline, post-intervention (12 months, 93% retention) and follow-up (21 months, 89% retention) data (surveys, dietary recalls) were collected.

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Disclosure

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Participants/setting—8–12 year-old children (n=160) and their parents were randomized to intervention (n=81) or control (n=79) groups.

Intervention—The intervention included five parent goal-setting calls and 10 monthly sessions delivered to families in community settings that focused on experiential nutrition activities and education, meal planning, cooking skill development and reducing screen time.

Main outcome measures—Family home food environmental outcomes and nutrition-related child and parent personal and behavioral outcomes.

Statistical analyses performed—Analyses used generalized linear mixed models. Primary comparisons were contrasts between intervention and control groups at post-intervention and follow-up, with adjustments for child age and parent education.

Results—Compared to control parents, intervention parents showed greater improvement over time in scores of self-efficacy for identifying appropriate portion sizes, with significant differences in adjusted means at both post-intervention (p=0.002) and follow-up (p=0.01). Intervention children were less likely to consume at least one sugar-sweetened beverage daily at post-intervention than control children (p=0.04).

Conclusions—The HOME Plus program involved the entire family and targeted personal, behavioral, and environmental factors important for healthful changes in the home food environment and children's dietary intake. The intervention improved two nutrition-related behaviors and this may inform the design of future family meal interventions.

Keywords

pediatric obesity; meals; beverages; clinical trial; parents; child; self efficacy

Introduction/background

Dietary Guidelines for Americans recommends all Americans have a role in creating and supporting healthy eating patterns and consuming varied, well-balanced diets to promote well-being and healthy weight and prevent disease.[1] Portion control and limiting added sugars are particularly important.[1] Yet, only 25% of 6–11 year old children meet daily fruit recommendations and less than 20% meet recommendations for vegetable intake.[2] Consumption of sugar-sweetened beverages (SSBs) and foods prepared away from home, which are often less nutritious, have increasingly contributed to children's total energy intake over the past several decades.[3,4] Thus, efforts to decrease SSB consumption and increase healthful meals prepared at home are needed.

Children's dietary intake is influenced by both the physical and social home environments[5] (e.g., home food environment). Parents and other caregivers contribute to children's eating habits and diet quality through physical environments by making healthful foods available in the home[6–10] and serving them at meals and snacks.[11–14] Almost 70% of calories and 80% of snacks consumed by children are eaten at home.[15] Similarly, the mealtime setting is also important in regard to dietary intake. For example, eating meals while watching television is associated with poorer dietary quality among youth.[16] Moreover, family meals in the home provide an opportunity for parents to support healthful eating through role modeling which

is important for children's development.[7,17] Yet, research has shown parents often report barriers to healthful eating owing to lack of time for meal preparation,[18–21] children's personal characteristics and preferences[8,22–24] and conflicts associated with children's food likes and dislikes.[19,20] Therefore, programs promoting healthful home food environments and social interactions may be useful to support children's dietary quality.[25]

To support parents and caregivers in overcoming barriers to meal preparation and address children's food preferences, engaging families to work together to develop healthful home food environments and prepare healthful meals is critical. In particular, interactive, engaging nutrition education sessions focused on awareness and identification of appropriate portion sizes, meal planning and preparation skills that build self-efficacy may help parents establish and/or maintain healthful home food environments. These experiential activities may also foster healthful food preferences and eating behaviors in their children.[26] Consensus building has been shown to be effective for empowerment and cooperation;[27] thus, involving all children and adults in the household in activities and family goal setting may make behavior change easier and more effective. Furthermore, children may be more likely to accept more healthful foods at meals and snacks if they assist in food preparation.[28–30] Meal preparation training could also provide children with life skills to sustain healthful behaviors.[31] Efforts to reduce eating family dinner while watching TV (i.e., reducing screen time by improving the mealtime setting) may also improve children's dietary quality.

The current study examines the family home food environment and nutrition-related parent and child personal and behavioral outcomes of the Healthy Home Offerings via the Mealtime Environment (HOME) Plus program, a childhood obesity prevention randomized controlled trial (RCT) that promoted healthful home food environments, parent and child behaviors and self-efficacy for healthy eating through family meals.[32] Social Cognitive Theory (SCT)[33] informed the HOME Plus program goals which assessed changes at the following levels: 1) *household environmental factors*: fruit and vegetable (FV) home availability and offerings at meals, 2) *parent personal and behavioral factors*: meal planning and cooking skills and self-efficacy for identifying appropriate portion sizes, and 3) *child personal and behavioral factors*: cooking skills, FV preferences, neophobia, dietary intake of fruits, vegetables and SSBs, dietary quality and screen time. Based on SCT, it was hypothesized that participation in the HOME Plus intervention would result in more healthful home food environments; higher likelihood of offering fruit and salad at family dinner; greater parental self-efficacy for identifying portion sizes and meal planning and cooking skills; and a greater willingness to consume FV, improved cooking skills and dietary intake and reduced screen time among children. These family home food environment and nutrition-related parent and child personal and behavioral secondary outcomes supplement the previously reported primary weight-related outcomes.[34]

Materials and methods

Study Design

The HOME Plus study was the first RCT designed to examine family meals as an avenue for preventing excess weight gain among children[32,34] and was informed by previous non-interventional studies[13,19,20,35–38] and pilot testing.[29] The primary weight-related and family

meal frequency outcomes of the study and description of the intervention have been reported elsewhere.[34,39] Two cohorts of families (2011, 2012) were recruited, and after baseline data collection, families were randomized to an intervention (n=81) or control (n=79) group within each community site by the study statistician using a computer-generated randomization schedule (nQuery Advisor version 6.01, Statistical Solutions, Ltd). Assignment was not blinded. This study is registered at www.clinicaltrials.gov NCT01538615 (registered 01/17/2012). Figure 1 shows accrual and retention for recruitment, randomization, data collection and analysis.

Participant Recruitment

Flyers, targeted email lists, and in-person presentations/discussions were used to recruit 160 children and their primary meal-preparing parents/guardians from community centers in the Minneapolis/St. Paul metropolitan area. Children were required to be 8–12 years old with body mass index (BMI)-for-age percentiles above the 50th percentile and live with the participating parent/guardian most of the time. Exclusion criteria were: 1) plans to move from the area within 6 months, 2) severe food allergies, limitations, or medical conditions prohibiting study participation and 3) inability to speak/write in English. There was no racial or sex bias in the selection of participants, with the exception of an expectation of more female parents as they are more likely to be primary meal preparers.[40]

Procedure

Parents and children provided written consent and assent, respectively. Trained data collection staff collected parent and child data in participants' homes or community centers at baseline (2011, 2012), post-intervention (12 months post-baseline; 2012, 2013) and follow-up (21 months post-baseline; 2013, 2014). Parents completed surveys related to the home food environment, children completed dietary recall interviews, and parents and children completed psychosocial surveys. Families received a retail gift card at each data collection visit. All study procedures and materials were approved by the University of Minnesota's Institutional Review Board.

Intervention and Control Group Description

The HOME Plus intervention was developed using SCT[33] and a socio-ecological framework[41] to address personal, behavioral and environmental factors associated with the initiation, support, and reinforcement of healthful home food environments, parent and child shopping, eating and screen time-related behaviors and self-efficacy in creating healthy family meals (Table 1).[32,34,39] The intervention program was delivered at six Minneapolis Park and Recreation community centers to maximize diversity and convenience for participants. All intervention group family members were invited to participate in 10 monthly, in-person group-sessions with activities for children and parents separately as well as together. Transportation and childcare were provided, if needed. Intervention parents also participated in five bimonthly goal-setting calls with trained staff.[39] Intervention staff conducted the 10–20 minute goal-setting phone calls using motivational interviewing techniques,[42] tailoring each call by allowing parents to select goals that were reasonable and specific to their family.[43] Families randomized to the control group received 10 monthly,

family-focused newsletters (i.e., resources for family physical activity offered in the area, healthful recipes) but did not receive the HOME Plus intervention program.[32,34,39]

Measures

Family Home Food Environmental Factors—Parents completed the validated, reliable Home Food Inventory[44,45] to assess home food availability of 26 different fruits and 21 different vegetables using a yes/no format *(FV home availability;* range=0–46). To assess whether any family dinners eaten at home included fruit and green salad (*fruit served at family dinner and green salad served at family dinner)*, parents completed the validated Evening Meal Screener for seven days following each data collection visit.[46] Responses were summarized over seven days to create two dichotomous variables for each data collection period: any family dinner with fruit served (yes/no) and any family dinner with green salad served (yes/no). Most families reported offering vegetables at family dinner, precluding us from assessing group differences in servings of vegetables.

Parent Personal and Behavioral Factors—Parents reported on their own meal planning abilities, cooking skills and self-efficacy for identifying appropriate portion sizes. Because of the importance of *meal planning and cooking skills* in the HOME Plus study and lack of existing instruments, the research team adapted existing items[19,47–49] and developed a new 12-item scale for assessment (current sample Cronbach's α=.71 as a measure of internal consistency reliability). Higher scores indicate higher meal planning and cooking skills (possible range=12–48). Similarly, a four-item scale (current sample α=.84; possible range=4–16) was created to assess *parental self-efficacy for identifying appropriate portion sizes* (e.g., I feel confident that I know appropriate portion sizes for my child's meal, I feel confident that I can estimate recommended serving sizes for many foods).

Child Personal and Behavioral Factors—Children reported on their own cooking skills, food neophobia (picky eating), FV preferences, dietary intake, and screen time. *Children's cooking skills* were measured with an eight-item scale (e.g., following a recipe to prepare a healthy meal or snack)[29] (current sample Cronbach's α=.78; possible range=8–32). *Food neophobia* was assessed using an adapted, child-report version of the validated 10-item Neophobia Scale[50] (possible range=10–30). Children used a card sort method with pictures of different fruits and vegetables to indicate their preference for 21 fruits and 24 vegetables;[51] their *liking fruit and vegetable* score (possible range=0–45) was calculated by adding the number of fruits and vegetables they reported with either "I like it a little" or "I like it a lot" responses (i.e., those coded 1). Children's *dietary intake* (FV intake mean daily servings), SSB (mean daily servings) was assessed with 24-hour dietary recall interviews (one in person and 2 by phone) by trained data collection staff. FV intake did not include fried fruits and vegetables. SSB intake did not include 100% juice. Dietary intake data were collected using Nutrition Data System for Research software versions 2011 and 2012 (to reflect marketplace throughout the study) and final calculations were completed in June 2016 using version 2012 (Nutrition Coordinating Center (NCC), University of Minnesota, Minneapolis, MN[52]). No modifications or imputations were made to the database. Participants were provided with two-dimensional food models to assist with portion-size estimation and were reminded to reference these during the interview.[53] Parents were

allowed to assist children during recall interviews, if needed. All data were used and averaged across days (no extrapolation) per NCC guidelines. To assess child diet quality, the Healthy Eating Index (HEI) - 2010 was used (possible range=0=100). The Healthy Eating Index (HEI)-2010 total dietary quality score compares diet quality to the 2010 Dietary Guidelines for Americans.[54,55] Children's diet quality scores were calculated by summing 12 dietary component scores from recall data, with higher dietary quality scores indicating more healthful dietary intake. Children reported time spent watching TV, playing video games, computer use, and text messaging, which were summed for total *screen time* hours per week (weekend and weekday; note this includes multitasking across several devices) using validated items.[56]

Demographic Characteristics—Parents reported their child's race/ethnicity and their own as well as their own education level and receipt of household economic assistance (free or reduced priced lunches at school or household receipt of public assistance). Parents and children reported their own sex. Parents' reported their and their child's date of birth and age was calculated based on reported date of birth and date of survey completion.

Statistical Analysis

The study sample size estimation was based on the primary study outcome (child BMI z-score).[32,34] Baseline sample characteristics were summarized overall and by treatment group[57] (see Table 2). Family home food environmental outcomes and nutrition-related parent and child personal and behavioral outcomes were analyzed using generalized linear mixed models with participant-specific random intercept and unstructured covariance matrix. This approach accounts for the correlation between the repeated measures taken on the same participant and accommodates missing data providing estimates and valid inferences from all available data.[58,59] Treatment group (intervention, control), time (baseline, post-intervention [12 months], follow-up [21 months]) and treatment group-by-time interaction were included as fixed effects. All models controlled for child age and parent's education at baseline as they have been known to be associated with the outcomes of interest. Multicollinearity diagnostics based on collinearity indices were performed. Models were fit using likelihood-based estimation method: Restricted Maximum Likelihood for continuous outcomes,[58,60] and Gauss-Hermite quadrature Maximum Likelihood for binary outcomes.[61] Models' diagnostics included residual diagnostics with the Normal Probability Plot and Quantile-Quantile plots, iterative influence analysis using graphical procedures and influence statistics as well as random effect diagnostics. The primary comparisons were contrasts (differences in least-squares means for continuous outcomes or in log-odds for binary outcomes) between the intervention and control groups at post-intervention and at follow-up time points. Confidence limits and p-values were adjusted for multiplicity via simulation approach.[62–64] All data management and analyses were conducted with SAS software.[65] Analyses were performed in 2015 and 2016. A two-sided type I error rate of 5% was used to assess statistical significance. No adjustment for multiple outcomes was performed.

Results

Sample characteristics and retention

As shown in Table 2, slightly more than one-third of households received economic assistance. Parents/caregivers were predominantly women (95%), white (77%), with a bachelor's degree or higher (59%); almost two-thirds were overweight/obese. The average child participant age was about 10 years old. About two-thirds (68%) of children were white; almost half (44%) were overweight/obese. Baseline dietary recall completion rates were as follows: three interviews (83%), two interviews (14%) and one interview (3%). Retention at post-intervention and follow-up was high (see Figure 1) as was intervention participation, with 85% of families attending at least half of in-person sessions and at least three of five goal-setting calls.[39]

Family Home Food Environmental Outcomes

There were no statistically significant differences in FV home availability between the groups at any time point (Table 3, family home food environmental outcomes). However, the intervention group reported an average of two more types of FV available at home relative to the control group at post-intervention (adjusted mean difference of 2.09 [95% CI: −0.32, 4.49]). The likelihood of having family dinners with green salad or fruit served did not differ between treatment groups.

Parent Personal/Behavioral Outcomes

Parents in the intervention group showed greater improvement in self-efficacy scores for identifying appropriate portion sizes than parents in the control group over time (treatment group-by-time effect p=0.01) with statistically significant differences in the adjusted means of about a one- point score in favor of the intervention group at both post-intervention (p=0.002) and follow-up (p=0.01). There were no statistically significant differences in parental meal planning and cooking skills scores between the groups at any time point; both groups exhibited slightly increasing trends over time.

Child Personal/Behavioral Outcomes

A statistically significant difference between groups in child SSB intake at post-intervention was observed, indicating that control group participants were more likely to "consume at least one SSB" compared to intervention participants at post-intervention (p=0.04) (but not significant at 21 month follow-up; Table 3, child personal/behavioral outcomes). There was a statistically significant treatment group-by-time effect for neophobia scores (p=0.04). Both groups exhibited improvement over time with the intervention participants having slightly higher scores at baseline, but on average, about one-point lower scores compared to the control participants at post-intervention. However, the adjusted means did not differ significantly by treatment group at any time point. The groups had slightly different patterns of neophobia improvement: the control group exhibited a steady but slow decrease over time while the intervention group showed a slightly steeper decrease from baseline to post-intervention and then stayed stable from post-intervention to follow-up. No statistically significant differences in other child personal or behavioral outcomes were observed

between groups over time; however, group differences were in the hypothesized direction for all outcomes at post-intervention.

Discussion

The present study assessed the effects of a family meals-focused obesity prevention intervention on home food environmental outcomes and nutrition-related parent and child personal and behavioral outcomes. The HOME Plus study was unique in that it expanded family meals research beyond an observational or cross-sectional design into a family-focused RCT with a theoretically-driven intervention program for the whole family[32,34,39] and addressed many of the shortcomings identified in a review of previous interventions.[66] The HOME Plus intervention significantly improved parental self-efficacy for identifying appropriate portion sizes. More importantly, the intervention significantly reduced children's consumption of SSBs post-intervention. Although statistically significant differences between the groups were not seen for FV availability at home, children's cooking skills, children's neophobia scores or children's FV consumption, group differences were in the expected direction, and may be clinically meaningful despite the lack of statistical significance;[67] however, levels that might be clinically meaningful have not been identified for these outcomes. Study findings suggest family-focused, community-based programming can impact the likelihood of SSB consumption and the dynamics of self-efficacy involved in skill building (personal and behavioral factors) that are important for facilitating behavior change.

Parental self-efficacy for identifying appropriate portion sizes was the primary area of improvement that was sustained over the nine-month follow-up period. Thus, compared to parents in the control group, parents in the intervention group reported greater self-efficacy in their ability to identify appropriate portion sizes for themselves and their children, understand serving sizes versus portion sizes, and confidence in estimating recommended serving sizes for various foods. Additionally, intervention session evaluation data indicated most (92%) parents acknowledged they were much more aware of portion sizes because of the HOME Plus program.[39] Together with current research showing increases in portion sizes over time,[68] children's and parents' inability to estimate portion sizes[69] and interest in learning about it,[70] the study findings indicate this is a prime target for family-based health promotion.

The significant HOME Plus intervention effects on reducing children's SSB consumption indicate family-focused interventions may be helpful in this regard. Working with families to reduce SSB consumption is essential given the ubiquitous availability of these beverages and their link to excess weight and fat gain and obesity trends among youth.[4,71–73] Furthermore, research has shown children and parents working together to reduce SSB consumption would be an acceptable strategy for families.[74] It is worth noting differences were seen in the likelihood of SSB consumption at post-intervention even with the relatively low baseline levels of consumption in the sample. Thus, targeting this type of behavior change within the context of family meals among children and families who are consuming more SSBs may be particularly effective.

Several child outcomes where statistically significant group differences were not observed warrant mention. Food preparation ability among the children was a focus of intervention activities in both active learning nutrition education sessions and meal preparation activities involving the entire family. The present study findings indicate the intervention curriculum made strides in improving cooking skills among the children at post-intervention, but group differences did not reach statistical significance. Although the study team developed a scale to measure children's cooking skills that had good internal consistency reliability, its test-retest reliability and validity were not assessed. Similar to the cooking skills, there were potentially meaningful, although not statistically significant, group differences for neophobia (lower values in the intervention group at post-intervention). Both groups showed decreasing neophobia scores over time which is developmentally appropriate; however, there was a significant treatment group by time effect, with steeper decreases between baseline and post-intervention in the intervention group compared to the control group. The treatment group differences in children's FV consumption over time were not statistically significant but they were intriguing, with a quarter of a serving per day difference between groups at post-intervention, which is similar to the meaningful effects of school-based interventions using meta-analyses.[75] Dietary behavior change is complex and difficult to achieve and sustain.[76] Although more behavioral change owing to the intervention in this trial were expected, improving skills, abilities and food familiarity are just several of many precursors to, and components in, dietary behavior change. Families in the study were at various stages of healthful eating and family meal frequency and perhaps more statistically significant changes would have been more evident in an at-risk, homogenous group.

The HOME Plus program provided nutrition education and facilitated group discussion, idea generation and problem solving for parents in a group setting and one-on-one. Parents participated in meal preparation activities during the intervention alongside their children, but most of the cooking-related skill building was focused on the children as it was expected that there would be more need for children to build skills than their parents. However, cooking skills were highly variable among our adult participants and recruiting parents with self-identified low skills with enhanced curricula in this area may be fruitful in future intervention work.[77] A promising area for future interventions is to continue to identify effective strategies to engage children in taste testing and meal and snack preparation to decrease food neophobia and increase liking and intake of fruits and vegetables and a better quality diet. The HOME Plus program provided taste-testing opportunities at every session with a variety of fruits and vegetables, encouraged increased home consumption and demonstrated movement in important cognitive and behavioral factors, but perhaps more repeated exposures were needed to maximize preference changes.[22]

Strengths and Limitations

Strengths of the present study included the theoretically-driven RCT with strong methodology and measurement and high intervention fidelity (as measured by direct observation),[39] the delivery of the intervention in real-world community settings and the recruitment of a sample representing a wide range of income levels which increases the study's generalizability. The study was also strengthened by the inclusion of a validated

measure of the quality of foods offered at family meals that had only been measured in previous studies with a few survey items.

Generalizability of the study's findings is limited as participants self-selected into the study, had relatively high baseline reports of family dinner frequency (baseline mean=5.0 per week) and were well educated. Importantly, *all* of the families in the intervention identified important behaviors to target for change and indicated they were satisfied with the program.[39,43] Moving forward, it will be important to engage more families with fewer resources, less meal preparation skills and lower family meal frequency. The data collection protocol for assessing the quality of foods served at dinner for seven consecutive evenings resulted in missing data as some parents did not complete measures for a full week. However, most parents completed the survey for at least four nights and the pattern of missing surveys did not differ between treatment groups. Future research is needed to examine the best method and data collection protocol for assessing the quality of foods offered at family meals. Another limitation of the present study is that, although the tools used to measure several of the important targets for intervention (e.g., meal planning, cooking skills) had good internal consistency reliability, valid tools with demonstrated test-retest reliability and psychometric properties were nonexistent at study initiation and that may have affected the findings. Since then, several valid and reliable tools have been developed[78–80] and should be considered in future research. Furthermore, as with all studies that collect data based on self-report, there may be a general reporting or recall bias, particularly among children.

Conclusions

The innovative, engaging HOME Plus intervention program involved the whole family and targeted key personal, behavioral, and environmental factors shown in the literature to be important to the healthfulness of the family home food environment. While behavioral changes were fewer than hypothesized, significantly greater improvement in parental self-efficacy for identifying portion size knowledge and reduced likelihood of children's SSB intake in the intervention group compared to the control group were observed. As awareness and practice of appropriate portion sizes and SSB consumption are important for weight loss/maintenance, these findings inform future obesity prevention efforts with school-age children and their parents.

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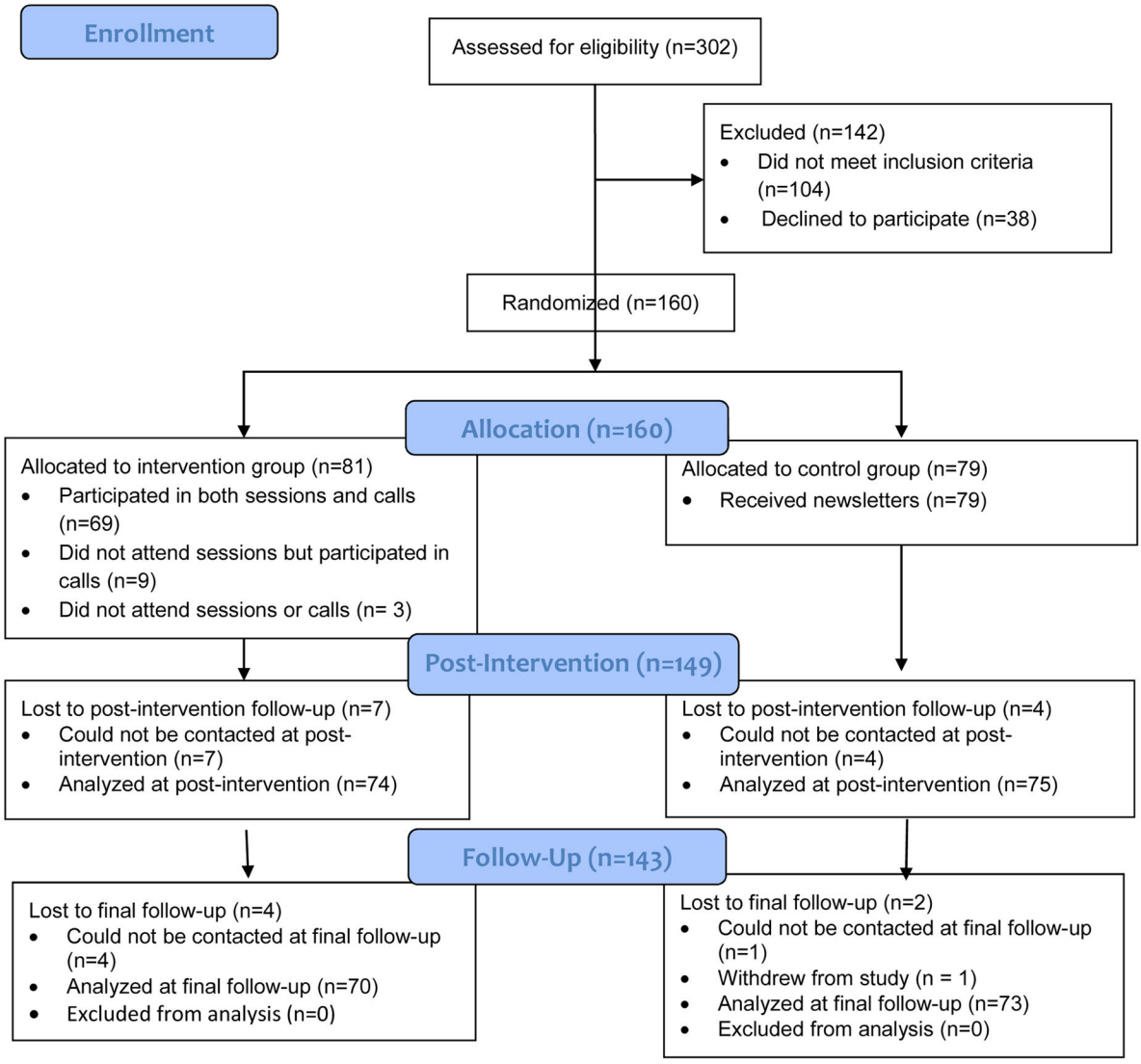

Figure 1.
HOME Plus study participant enrollment, randomization, and analysis

Table 1

Primary home food environment and parent and child personal and behavioral factors addressed in the HOME Plus intervention program and key targets of change

Relevant Intervention Topics Promoted	Target of Change[a]		
	Family Home Food Environmental Factors[b]	Parent Personal & Behavioral Factors[c]	Child Personal & Behavioral Factors[d]
Reduction in unhealthful home food/beverage availability	√		
Healthful home food/beverage availability	√		
Healthful snacking	√	√	√
Frequency and healthfulness of family meals	√	√√	√
Reduction in screen time at meals	√	√√	
Meal planning skills		√√	√
Healthful goal setting		√√	√
Cooking skills (e.g., safety, chopping, cooking)		√	√√
Portion size awareness, knowledge & practice		√	√
Dealing with picky eaters		√	
Taste-testing fruits and vegetables		√	√
Fruit and vegetable consumption		√	√
Sugar-sweetened beverage consumption		√	√

[a] A check mark indicates a topic was delivered to the corresponding target of change (household, parent and/or child). Double check marks indicate the topic was emphasized for recipients even though the intervention addressed the topic across more than one target.

[b] Family Home Food Environmental Factors include those associated with changes at the household level.

[c] Parent Personal and Behavioral Factors include those associated with changes at the parent level.

[d] Child Personal and Behavioral Factors include those associated with changes at the child level.

Table 2

Baseline demographic characteristics of all 160 child and parent participants in the HOME Plus trial and by treatment group (intervention and control)

Characteristics	Total analytic sample n=160 families[a]	Intervention n=81 families[a]	Control n=79 families[a]
Household Demographics			
Economic assistance[b] (n, % yes)	62 (39%)	36 (44%)	26 (33%)
Parent Demographics			
Age (mean, standard deviation)	41.3 (7.7)	41.3 (8.0)	41.3 (7.4)
Sex (n, % female)	152 (95%)	76 (94%)	76 (96%)
Ethnicity (n, %)			
Hispanic	5 (3%)	2 (2%)	3 (4%)
Race (n, %)			
White	123 (77%)	63 (78%)	60 (76%)
Black	24 (15%)	12 (15%)	12 (15%)
American Indian, Asian or Multi-racial	13 (8%)	6 (7%)	7 (9%)
Education (n, %)			
≤ Associates Degree	64 (41%)	30 (38%)	34 (44%)
≥Bachelor's degree	91 (59%)	48 (62%)	43 (56%)
Weight status[c,d] (n, %)			
Normal (BMI<25)	62 (39%)	35 (44%)	27 (35%)
Overweight/Obese (BMI≥25)	95 (61%)	44 (56%)	51 (65%)
Child Demographics			
Age (mean, standard deviation)	10.3 (1.4)	10.5 (1.4)	10.1 (1.4)
Sex (n, % female)	75 (47%)	37 (47%)	38 (47%)
Ethnicity (n, %)			
Hispanic	15 (9%)	7 (9%)	8 (10%)
Race (n, %)			
White	109 (68%)	56 (69%)	53 (67%)
Black	28 (18%)	13 (16%)	15 (19%)
American Indian, Asian, Multi-racial	23 (14%)	12 (15%)	11 (14%)
Weight status[d] (n, %)			
BMI%<85th	90 (56%)	48 (59%)	42 (53%)

Characteristics	Total analytic sample n=160 families[a]	Intervention n=81 families[a]	Control n=79 families[a]
85th%≤BMI% <95th	36 (23%)	16 (20%)	20 (25%)
≥95th	34 (21%)	17 (21%)	17 (22%)

[a]Numbers may be reduced by varying small amounts because of incidental missing data.

[b]Economic assistance was defined by either being eligible for free or reduced priced lunches at school or household receipt of public assistance

[c]Two pregnant women in the intervention condition and one in the control condition were not included in weight status descriptives.

[d]Weight status categories as defined by the Center for Disease Control and Prevention.[81]

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Table 3

Family home food environmental and parent and child personal and behavioral outcome differences[a] of the HOME Plus trial by treatment group (intervention and control) over time (n=160)

	Baseline				Post-Intervention[b]				Follow-Up[b]			
	Intervention	Control			Intervention	Control			Intervention	Control		
	LSMean(SE)	LSMean(SE)	Difference [95% CI][c]	p	LSMean(SE)	LSMean(SE)	Difference [95% CI][c]	p	LSMean(SE)	LSMean(SE)	Difference [95% CI][c]	p
Family Home Food Environmental Outcomes												
Home Availability Fruit & Vegetable Summary Score[d]	20.3 (0.83)	20.5 (0.82)	−0.16 [−2.45,2.14]	0.89	22.5 (0.88)	20.4 (0.86)	2.09 [−0.32,4.49]	0.09	21.6 (0.89)	21.9 (0.86)	−0.27 [−2.68,2.15]	0.83
Parent Personal/Behavioral Outcomes												
Meal Planning & Cooking Skills Scale Score[e,f]	33.0 (0.58)	32.4 (0.57)	0.58 [−1.02,2.18]	0.48	34.1 (0.59)	32.7 (0.58)	1.40 [−0.23,3.03]	0.09	34.7 (0.60)	34.1 (0.59)	0.54 [−1.11,2.19]	0.52
Self-Efficacy for Identifying Appropriate Portion Sizes Scale Score[e,g]	10.8 (0.26)	10.8 (0.26)	0.04 [−0.70,0.77]	0.92	**12.4 (0.27)**	**11.2 (0.27)**	**1.19 [0.44,1.94]**	**0.002**	**12.5 (0.28)**	**11.5 (0.27)**	**0.99 [0.23,1.75]**	**0.01**
Child Personal/Behavioral Outcomes												
Cooking Skills Scale Score[e,h]	20.7 (0.58)	20.5 (0.57)	0.23 [−1.37,1.83]	0.78	21.5 (0.60)	20.0 (0.58)	1.49 [−0.15,3.13]	0.08	21.0 (0.61)	21.1 (0.59)	−0.07 [−1.73,1.59]	0.93
Neophobia Scale Score[e,i]	17.4 (0.46)	17.0 (0.46)	0.37 [−0.91,1.64]	0.57	15.5 (0.47)	16.5 (0.46)	−0.94 [−2.23,0.35]	0.15	15.8 (0.47)	16.3 (0.46)	−0.51 [−1.81,0.79]	0.44
Liking Fruits & Vegetables Summary Score[ej]	30.9 (0.80)	30.1 (0.79)	0.81[−1.40,3.03]	0.47	32.9 (0.81)	31.4 (0.80)	1.46[−0.78,3.70]	0.20	32.8 (0.82)	31.8 (0.81)	1.04[−1.22,3.29]	0.37
Fruit & Vegetable Servings[e]	2.4 (0.18)	2.1 (0.18)	0.32 [−0.18,0.81]	0.21	2.7 (0.19)	2.5 (0.18)	0.25 [−0.26,0.76]	0.33	2.5 (0.19)	2.6 (0.18)	−0.04 [−0.55,0.48]	0.88
HEI-2010 Score[e,h]	54.7 (1.29)	51.8 (1.28)	2.94[−0.63,6.51]	0.11	55.6 (1.33)	52.8 (1.30)	2.72[−0.95,6.38]	0.15	55.1 (1.36)	56.2 (1.32)	−1.11[−4.81,2.60]	0.56
Screentime (hrs/week)[e]	25.3 (2.97)	33.3 (2.95)	−7.99 [−16.23,0.25]	0.06	33.0 (3.06)	33.0 (3.00)	0.05 [−8.39,8.49]	0.99	34.4 (3.13)	41.7 (3.03)	−7.30 [−15.83,1.23]	0.09
Family Home Food Environmental Outcomes												
Family Dinners with Green Salad Served (yes vs. no)[l]	0.54(0.35)	0.07(0.33)	1.61 [0.63,4.10]	0.32	0.99(0.40)	0.60(0.39)	1.47 [0.50,4.35]	0.48	0.79(0.41)	0.53(0.38)	1.30 [0.44,3.83]	0.64
Family Dinners with Fruit Served (yes vs. no)[l]	0.47(0.36)	0.72(0.35)	0.78 [0.29,2.07]	0.61	1.07(0.42)	0.47(0.39)	1.83 [0.60,5.59]	0.29	−0.01(0.40)	0.36(0.39)	0.69 [0.24,2.03]	0.50
Child Personal/Behavioral Outcomes												
SSB[m] Intake (yes vs. no) [e]	0.85(0.29)	1.14(0.31)	0.75 [0.33,1.68]	0.48	**0.66(0.30)**	**1.59(0.34)**	**0.40 [0.17,0.95]**	**0.04**	0.35(0.30)	0.47(0.29)	0.88 [0.39,1.98]	0.76

[a] All models adjusted for child age and parent's education at baseline.

[b] Post-intervention was 12 months after baseline and follow-up was 21 months after baseline

[c] CIs and p-values adjusted for multiplicity via simulation

[d] Model had 3 missing cases; possible score range=0–46

[e] Model had no missing cases

[f] Possible score range=12–48

[g] Possible score range=4–16

[h] Possible score range=8–32

[i] Possible score range=10–30

[j] Possible score range=0–45

[k] HEI=Healthy Eating Index. Average scores for children aged 2–17 years are 55.07 out of a possible 100.

[l] Model had 26 missing cases

[m] SSB=Sugar-sweetened beverage