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## Case Study: Behavior changes in the Family-Focused, Obesity-Prevention HOME Plus Program

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### Abstract

**Objective**—The purpose of this case study is to describe two successful HOME Plus participants and highlight how an intervention with individual and group components can help families make lifestyle changes that result in improvements in child weight status.

**Design**—One hundred sixty families participated in the HOME Plus study, and were randomized to either a control or intervention group.

**Sample**—Two successful HOME Plus participants were chosen because of their healthful changes in weight status and behavior and high engagement in the program.

**Measurements**—Data were collected at baseline and post-intervention, one year later. Data included height, weight, home food inventory, dietary recalls, and psychosocial surveys.

**Intervention**—Families in the intervention group participated in cooking and nutrition education sessions, goal-setting activities, and motivational interviewing telephone calls to promote behavioral goals associated with meal planning, family meal frequency and healthfulness of meals and snacks.

**Results**—Analysis of the families' behaviors showed Oliver (fictitious name) experienced changes in nutritional knowledge and cooking skill development while Sophia's (fictitious name) changes were associated with healthful food availability and increased family meal frequency.

**Conclusion**—These cases show that offering a multi-component, family-focused program allows participants to select behavior strategies to fit their unique family needs.

### Keywords

Childhood Obesity; Obesity Prevention; Family Meals; Case Study; Family

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## Background

Childhood obesity is a prevalent public health concern, resulting in negative effects on children's health (Ogden, Carroll, Kit, & Flegal, 2014). Therefore, it is important to develop public health strategies to address and prevent the epidemic of childhood obesity. Both individual and group interventions have been developed to prevent childhood obesity (Sobol-Goldberg, Rabinowitz, & Gross, 2013; Wang et al., 2015). Primary prevention interventions show the most promise in healthful lifestyle change when they incorporate multiple components and levels that influence children's eating and exercise habits in the home, school, community and peer environment (Foltz et al., 2012; Hoelscher, Kirk, Ritchie, & Cunningham-Sabo, 2013). Public health programs incorporating group settings provide a cost-effective way to reach large numbers of people while providing a setting for peer support and reinforcement of learned skills (Goldfield, Epstein, Kilanowski, Paluch, & Kogut-Bossler, 2001). However, group-based interventions often have a blanket approach to obesity prevention, which can allow some participants, especially the most vulnerable (e.g., low income), to "slip through the cracks" (Hoelscher et al., 2013). Group interventions may fall short of offering the appropriate amount of support needed by disadvantaged populations.

Secondary and tertiary approaches to obesity prevention take a more individualized approach, often involving the child's family (Hoelscher et al., 2013). Successful interventions have used motivational interviewing (MI), goal setting, cognitive restructuring, positive reinforcement and parent involvement (Davis et al., 2007). These approaches provide participants the opportunity to self-identify unhealthful behaviors and develop strategies for improvement (Resnicow, Davis, & Rollnick, 2006). In particular, MI promotes self-efficacy and encourages change in participants by exploring ambivalence they may feel towards behavioral changes while providing opportunities to make healthful decisions, goals and lifestyle changes. This active participation is a critical component of adherence; participants are more likely to maintain motivation and exhibit long-term healthful behaviors (Tripp, Perry, Romney, & Blood-Siegfried, 2011).

Various community-based lifestyle intervention programs have shown moderate success in primary outcomes such as decreasing standardized BMI scores (i.e., BMI z-score), waist circumferences and fat mass while increasing cardiovascular health and self-esteem (Ho et al., 2012; Summerbell et al., 2005). However, many of these programs have published solely on the main outcomes of their studies, without examining how participants specifically use the interventions and education offered. Success is greatest when health behaviors are integrated into an everyday routine. Understanding how this dynamic process of behavior change occurs can help guide the development of public health programming to effectively reduce childhood obesity.

The purpose of this study is to describe two participants in the Healthy Home Offerings via the Mealtime Environment (HOME) Plus study who were successful in reducing their BMI z-score during the intervention program. The HOME Plus program offered parents and their 8–12 year old child cooking and nutrition education in the form of group cooking and nutrition education sessions, family goal-setting activities, and individualized telephone calls

using an MI approach. Using this multi-component methodology, the HOME Plus program aimed to prevent childhood obesity by increasing healthful meal and snack habits while decreasing sedentary behaviors such as screen time (Flattum et al., 2015; Fulkerson et al., 2014; Fulkerson et al., 2015). Although the main outcomes of the overall HOME Plus program have been evaluated (Fulkerson et al., 2015, Fulkerson et al., 2018), less is known about what approach works best to help families apply the information they learn to achieve the desired behavioral changes and decrease children's weight. The two children and their families described, Oliver Jorgenson and Sophia Lee (whose names have been changed to maintain confidentiality), both experienced a significant enough reduction in BMI to move from either being obese to overweight or overweight to normal weight over the course of the program. Their health behavior changes during the intervention program will be examined and compared to the changes reported for the intervention group as a whole to provide context and a greater understanding of the magnitude of the participants' health related behavior changes.

## Methods

### Design and Sample

The HOME Plus study used a randomized controlled trial design to test the effects of a community-based, family-focused childhood obesity prevention program. A description of the methodology can be found elsewhere (Fulkerson et al., 2014). Primary meal preparing parents (n=160) and one 8–12 year old child (n=160) per family were recruited from the Minneapolis/St. Paul metropolitan area. Families were randomized into the intervention or control group after baseline assessments. Control group families (n=79) received monthly newsletters, while intervention families (n=81) attended monthly family-focused, group-taught sessions and received five individual telephone calls over the 10-month program (Flattum et al., 2015). Parent and child participants provided written consent or assent, respectively. The University of Minnesota's Institutional Review Board approved all study methods and procedures.

Social Cognitive Theory and an ecological framework were used to develop the HOME Plus intervention (Bandura, 1986; Bronfenbrenner, 1994). These theories incorporate the role of families in the initiation, support and reinforcement of behavior change (e.g., healthful dietary intake, reduction of sedentary behaviors). The HOME Plus study's purpose was to reduce childhood obesity by increasing family meal frequency and the availability of healthful food in the home, while improving children's dietary intake and decreasing sedentary behavior (Fulkerson et al., 2014). Three behavioral objectives guided intervention behavioral messages and family goals: 1) *plan healthy meals and snacks with your family more often*, 2) *have meals with your family at home more often*, and 3) *improve the healthfulness of the food available at home* (Draxten, Flattum, & Fulkerson, 2016; Flattum et al., 2015).

Each group session incorporated nutrition education, cooking skills and family meal goal setting (Flattum et al., 2015). In addition to group sessions, the primary meal preparer was contacted five times by a registered dietitian trained in MI. MI phone calls complimented group sessions by providing extra support, motivation and opportunity for families to

explore and individualize goals for their families in relation to the behavioral objectives (Draxten, Flattum, & Fulkerson, 2016).

## Measures

Data were collected at baseline (2011 for Oliver and 2012 for Sophia) and one year later at post-intervention (2012 for Oliver and 2013 for Sophia).

**Motivational Interview Phone Call Data**—Interventionists entered call notes, including goal selection, ongoing progress and goal attainment from each MI call into a secure REDCap database. These notes were reviewed for themes to identify which of the three behavioral objectives each family chose to work on during their calls.

**Child Anthropometry Data**—Trained staff measured child height and weight using standardized protocols (Lohman, Roche, & Martorell, 1988). BMI values and percentiles were calculated and adjusted for age and gender (Centers for Disease Control, 1999). Three weight categories were created: normal weight (i.e., <85<sup>th</sup> percentile), overweight (i.e., 85<sup>th</sup> percentile and <95<sup>th</sup> percentile) and obese (i.e., 95<sup>th</sup> percentile) according to the CDC definitions.

**Home Food Inventory Survey**—Parents completed a Home Food Inventory (HFI) shown to have high construct and criterion validity (kappa range = 0.61 to 0.83; sensitivity range = 0.69–0.89; specificity = 0.86–0.95) (Fulkerson et al., 2008). The HFI obesogenic score was used to measure the availability of high-fat, sugar and/or processed foods in the home. Higher scores (i.e., more obesogenic) indicated a less healthful home food environment.

**Child 24-Hour Dietary Recall**—Trained staff conducted three (two weekdays and one weekend day) 24-hour dietary recall interviews. Dietary intake data were collected using Nutrition Data System for Research software versions 2011 and 2012. Final calculations were completed using version 2012 (Nutrition Coordinating Center, University of Minnesota, Minneapolis, MN). Results were averaged across the three days to obtain the child's average daily servings of fruit and vegetables.

**Psychosocial Surveys**—Parents and children each independently completed psychosocial surveys to assess personal and behavioral variables targeted in the intervention. Parents reported on their own *self-efficacy to cook healthy meals* and *food restriction practices*. Parents also reported on their *perception of the frequency that their child helps choose and prepare meals and snacks*, their *perception of their child's cooking skills*, their *perception of the frequency of family meals*, and their *perception of family meal expectations and discussions*. Children reported on their own *perceptions of family connectedness and dinner enjoyment* and their food *neophobia* (fear of trying new foods). See Table 1 for a description of these personal and behavioral measures.

## Analytic Strategies

Two child participants and their family's primary meal preparer were chosen from the intervention group: Oliver Jorgenson, a ten-year-old male, and Sophia Lee, a nine-year-old female. Both identified from underrepresented minority populations. Selection criteria included high program participation (70% attendance) and a reduction in BMI z-scores over the course of the program. These two cases were chosen subjectively, but represent a wide range of health challenges encountered by many families in the study. MI phone call notes were reviewed to evaluate participant's ongoing progress and goal attainment. To provide context for the magnitude of the cases' data, behavioral changes were compared to average changes in the entire HOME Plus intervention group.

## Results

### Oliver Jorgenson

Oliver Jorgenson's anthropometric data placed him in the "obese" weight category at baseline (BMI percentile = 97.3%). After the intervention, his BMI decreased and he was considered "overweight" (Table 2). Oliver and his primary meal-preparing parent attended 90% of the HOME Plus group sessions and participated in all of the MI phone calls.

Many of the topics brought up by Oliver's parent during the phone calls aligned with behavioral objectives one (*plan healthful meals with family*) and three (*improve healthfulness of foods available at home*). During the first few calls, Oliver's parent expressed surprise upon learning many of the foods the family was eating were considered unhealthy. Throughout the calls, Oliver's parent showed progressive learning in regards to nutrition and healthy meal planning. The family incorporated several changes in their meal routine including decreased portion sizes, having fruit for snacks, adding vegetables to pizza, and exchanging some white rice for brown rice at meals. During the last call, Oliver's parent conveyed more confidence in using strategies learned through the HOME Plus program.

Aligned with their focus on behavioral objectives one (*plan healthful meals with family*) and three (*improve healthfulness of foods available at home*), during MI phone calls, Oliver and his family also showed improvement in these behavioral objectives as measured by their psychosocial survey scale scores (Table 3). Compared to the average scores of the HOME Plus intervention group, Oliver experienced greater improvement in all aspects under behavioral objective one (*plan healthful meals with family*), including parent's self-efficacy to cook healthful meals, parent's perception of the frequency child helps choose and prepare meals and snacks, and parent's perception of child cooking skills. Oliver and his family also showed development under behavioral objective three (*improve the healthfulness of foods available at home*). Although the family's obesogenic home food availability (HFI) score increased, Oliver's food neophobia score improved when compared to the intervention group's average change (Table 3). In addition, compared to his baseline intake, Oliver reported eating more servings of fruit and vegetables after the intervention (Table 3).

In comparison to behavioral objectives one and three, survey responses from Oliver and his parent showed less change in behavioral objective two (*have meals with your family at home more often*). Parental perception of frequency of family meals increased while child's

perception of family connectedness and dinner enjoyment decreased, no data were available on parental perceptions of family meal expectations and discussions.

### Sophia Lee

Baseline anthropometric data indicated Sophia Lee was “overweight” (BMI percentile = 86.3%). At post intervention, Sophia’s BMI decreased and was categorized as “normal” weight (Table 2). Sophia and her primary meal-preparing parent attended 70% of the HOME Plus intervention sessions and participated in all of the MI calls.

Throughout MI phone calls, Sophia’s parent focused on topics related to behavioral objectives two (*have meals with your family at home more often*) and three (*improve healthfulness of foods available at home*). During the initial MI call, Sophia’s parent expressed feeling “busy and overwhelmed,” and stated healthful eating “was not a priority.” During the last two calls, Sophia’s parent reported the family was eating together more often, trying new foods, and having a greater variety of food choices in their home.

Aligned with the focus on behavioral objectives two (*have meals with your family at home more often*) and three (*improve healthfulness of foods available at home*) in the MI phone calls, analysis of psychosocial survey data showed Sophia and her family improved in these areas (Table 3). Specifically, Sophia showed consistent improvement in measures under behavioral objective number two (*have meals with your family at home more often*), showing increases in parent’s perception of frequency of family meals, parent’s perception of family meal expectations and discussions, and child’s perception of family connectedness and dinner enjoyment (Table 3). The family also showed changes under behavioral objective three (*improves the healthfulness of foods available at home*). Sophia’s family showed a decrease in their HFI obesogenic score while their parental food restriction practices increased, especially when compared with the intervention group’s average change (Table 3). In addition, compared to baseline, Sophia reported eating more servings of vegetables at post-intervention. Sophia’s family showed less improvement in behavioral objective one (*plan healthful meals and snack with family more often*). Data showed decreases in parental perception of both frequency in which child helps choose and prepare meals and snacks and in child’s cooking skills.

## Discussion

The HOME Plus program is a family-focused, multi-component, childhood obesity prevention program incorporating group and individualized approaches to healthful lifestyle modifications, particularly related to frequent and healthful family meals. The program offered participants the opportunity to learn about and employ nutritional knowledge, hands-on cooking skills and meal planning strategies. This multi-component approach provided participants with consistent healthful lifestyle messages and tools and strategies to promote and attain better health while allowing for individualization. Currently, most of the research published on similar programs only analyzes and reports on program effectiveness as a whole without consideration of individual participant differences. Therefore, these two case studies are unique, illustrating how families choose to adopt/incorporate lifestyle changes into their daily routines.

MI phone calls with Oliver's family revealed the benefit of nutrition education obtained from the group sessions, which provided the initial building blocks needed to make healthful lifestyle changes. This finding is consistent with studies that have shown the positive effects of nutritional education on children's dietary intake (Evans, Christian, Cleghorn, Greenwood, & Cade, 2012; Howerton et al., 2007). Oliver's family was also able to increase cooking self-efficacy, child cooking skills and child frequency of helping with meal preparation. Cooking instruction emphasizing healthier ways to prepare meals to have a positive impact on dietary intake and behaviors and nutrition education incorporating hands-on cooking skills increases participants' confidence, knowledge and attitudes towards cooking, while improving overall healthy eating behaviors such as vegetable and fruit intake (Fulkerson et al., 2015; Hersch, Perdue, Ambroz, & Boucher, 2014; Reicks, Trofholz, Stang, & Laska, 2014). In addition, children who develop cooking skills are also more likely to try new foods and less likely to depict food neophobic traits, a change seen in Oliver's case. Oliver and his family are an example of how developing practical cooking skills can empower families. Families gain more control over what and how their food is prepared by participating in hands-on programming that includes cooking skills.

Sophia and her family showed substantive changes in behavioral outcome two (*having meals at home with family more often*). Despite their busy schedule, Sophia's family increased their family meal frequency and improved the quality of their family mealtime dynamics. Numerous studies have shown significant associations between family meal frequency and physical and psychological benefits for children and adolescents (Fulkerson, Larson, Horning, & Neumark-Sztainer, 2014; Hammons & Fiese, 2011). Family meals provide an informal "check-in" time for children and parents to connect; children are able to express emotions or concerns, while parents can validate their child's feelings and provide support. By creating a consistent, supportive mealtime environment, Sophia's family may be providing her with the foundation needed to make healthful lifestyle changes.

Sophia's parent reported lower scores at post-intervention measurements compared to baseline measurement for parent's perception of the frequency their child helps choose and prepare meals and snacks and also parent's perception of their child's cooking skills. This decrease was inconsistent with the rest of the intervention families. It could be that Sophia was helping with cooking and meal preparation less at the time of the post-intervention measurement. However, the decrease may have occurred as Sophia's parent gained a more realistic perception of Sophia's cooking skills and abilities after participating in the HOME Plus program. Sophia's family did not focus on behavioral outcome one (*plan healthful meals and snack with family more often*) during their MI calls, suggesting this was not a focus for their family.

Oliver and Sophia both experienced an overall improvement in behavioral outcome number three (*improving the healthfulness in food availability at home*). They both decreased their food neophobia scores, indicating more willingness to try new foods. In addition, both reported higher parental food restriction practices. Although severely restrictive parenting styles have been associated with an increase in eating impulsivity and high BMI in children, discrete restriction tactics such as limiting unhealthful home food availability have been shown to be beneficial for controlling adolescent intake (Loth, MacLehose, Larson, Berge,

& Neumark-Sztainer, 2016). By limiting the availability of unhealthful foods in the home, as indicated by the decreased HFI obesogenic score, Sophia's parent may have been exercising the appropriate level of restriction needed to encourage Sophia's healthier dietary intake.

Looking only at anthropometric data, both Oliver and Sophia experienced a decrease in BMI after participating in the HOME Plus program (Table 1). However, a more refined story emerges when looking at the different paths each family took to become healthier. Although both families showed healthier home food availability, Oliver's family (but not Sophia's family) showed clear improvements in planning healthful meals. In contrast, Sophia's family (but not Oliver's family) showed greater improvement in having family meals together. Childhood obesity continues to be a major concern in public health today and finding effective yet efficient interventions for lowering community obesity rates can be challenging. The cases of Oliver and Sophia are examples of how multi-component programing can be used in the public health arena to deliver effective interventions to a large community, while still recognizing and capitalizing on participants' differences, strengths and needs. When working at the community level of practice, using a multi-component approach to prevent childhood obesity may benefit future obesity prevention program effectiveness, as it can allow for some customization for participants.

This case study description has limitations. As a case study, it merely aims to describe changes and not predict nor denote statistical significance between groups. In addition, all survey data were self-reported and may be influenced by social desirability. In-person interviews may have provided this study with a greater, more in-depth understanding of families' perspectives. Nonetheless, this case review used data from a variety of well-validated scales to help paint a multi-dimensional picture of two HOME Plus study participants who managed success in weight change but in different ways. Future direction for multi-component obesity prevention programs should examine the value of providing group and individual support across systems. Intervention programs, such as HOME Plus, should consider collaboration with schools and other community programs, such as park and recreation, in order to reach populations within and across different settings.

## Conclusion

Analysis of the study cases shows how the HOME Plus program meet needs of different families, providing them with choice and support to make healthful behavior change. Traditionally, group-based obesity prevention programs have offered families a broad, blanket approach to encourage behavior change, but families are vastly different, varying in lifestyle habits, cultural preferences, daily routines and values. Ultimately, one lifestyle change may be helpful for one family, but not for another. By taking the time to understand how components are integrated into families' lives by analyzing individual cases, public health nurses may be better able to tailor obesity prevention programs to better meet participants' needs and leverage their strengths. In addition, offering individualized components in a multi-faceted intervention may be important for maximal participant engagement as well as support and follow-up during behavior change. Healthful living is a lifestyle change requiring active participation and dedication from the participants. For this



reason, it is imperative public health nurses help families feel empowered to take charge and play an active role in their health.

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**Table 1**

Scales from the Parent and Child Psychosocial Survey used in the HOME Plus Study

Scales	Example Items (Response Options)	Number of items psychometrics	Source
<b>Parent survey</b>			
Parent's self-efficacy to cook healthy meals	How likely are you to prepare a healthy meal after a tiring day? (5 choices: Not at all likely - Very likely)	4 items Cronbach alpha = 0.83	(Beshara, Hutchinson, & Wilson, 2010; Nothwehr, 2007)
Parent's perception of frequency child helps choose and prepare meals and snacks	During the past 7 days, how often has your child helped make dinner? (8 choices: 0 days - 7 days)	4 items Cronbach alpha = 0.71	(Boutelle, Lytle, Murray, Birnbaum, & Story, 2001)
Parent's perception of child's cooking skills	In the past month, my child has prepared fruits and vegetables. (Yes - No)	9 items Cronbach alpha = 0.78	(Fulkerson et al., 2010)
Parent's perception of frequency of family meals	In the past 7 days, how many times did all or most of your family living in your home eat dinner together? (8 choices: 0 days - 7 days)	5 items Cronbach alpha = 0.78	(Fulkerson, Neumark-Sztainer, Hannan, & Story, 2008; Fulkerson, Neumark-Sztainer, & Story, 2006)
Parent's perception of family meal expectations and discussions	In my family, eating brings people together in an enjoyable way. (4 choices: Strongly agree - Strongly disagree)	8 items Cronbach alpha = 0.81	(Hogen, 1988; Neumark-Sztainer, Larson, Fulkerson, Eisenberg, & Story, 2010)
Parent's food restriction practices (CFQ)	If I don't guide or regulate my child's eating, he/she would eat to many of his/her favorite foods. (5 choices: Strongly agree - Strongly disagree)	8 items Cronbach alpha = 0.73	(Birch et al., 2001)
<b>Child Survey</b>			
Child's perception of family connectedness and dinner enjoyment	Do you usually like eating dinner with your family? (2 choices: Yes - No)	8 items Cronbach alpha = 0.72	(Hogen, 1988; Neumark-Sztainer et al., 2010)
Child's food neophobia	I am always trying new and different foods (3 choices: Very true for me; Sort of true for me; Not true for me)	10 items Cronbach alpha = 0.76	(Pliner, 1994)

**Table 2**

## Participant Change in BMI and Weight Status Category

Participant	Baseline BMI percentile	Weight status category at baseline	Post-Intervention BMI percentile	Weight status category at post-intervention
Oliver	97.3%	Obese	94.1%	Overweight
Sophia	86.3%	Overweight	75.0%	Normal

Note. Normal weight = child age and gender adjusted BMI < 85%; Overweight = child age and gender adjusted BMI 85% but < 95%; Obese = child age and gender adjusted BMI ≥ 95%

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**Table 3**

Behavioral Objectives and Dietary Outcome

	Oliver		Sophia		Intervention Group				
	BL	P	BL	P	BL	P			
<b>Behavioral Objective #1: Plan healthful meals and snack with family more often</b>									
Parent's self-efficacy to cook healthy meals	6	11	+5	8	10	+2	12.00	12.96	+ <b>.96</b>
Parent's perception of frequency child helps choose and prepare meals and snacks	2	10	+ <b>8</b>	16	6	- <b>10</b>	10.69	11.97	+ <b>1.28</b>
Parent's perception of child's cooking skills	1	9	+ <b>8</b>	6	2	- <b>4</b>	4.01	5.55	+ <b>1.54</b>
<b>Behavioral Objective #2: Have meals with your family at home more often</b>									
Parent's perception of frequency of family meals	15	18	+3	13	18	+5	22.09	22.69	<b>.60</b>
Child's perception of family connectedness and dinner enjoyment	25	24	-1	17	23	+6	19.40	20.00	<b>.60</b>
Parent's perception of family meal expectations and discussions	22	-	-	18	24	+6	27.19	27.54	<b>.35</b>
<b>Behavioral Objective #3: Improve the healthfulness of foods available at home</b>									
Home Food Inventory (HFI) obesogenic score	15	18	+3	38	29	-9	28.78	23.10	- <b>5.68</b>
Parent's food restriction practices (CFQ)	31	33	+2	27	36	+9	27.22	24.86	- <b>2.36</b>
Child's neophobia	18	11	-7	18	15	-3	17.32	15.46	- <b>1.82</b>
<b>Dietary Outcomes</b>									
Child's average daily servings of fruit	0	.92	+ <b>.92</b>	1.08	1.04	- <b>.04</b>	1.07	1.23	+ <b>.16</b>
Child's average daily servings of vegetables	0.94	1.52	+ <b>.58</b>	.0227	.3827	+ <b>.36</b>	1.41	1.61	+ <b>.20</b>

Note. BL= baseline, P=post-intervention, =difference between baseline and post-intervention scores  
<sup>a</sup>Data were missing for Parent's perception of family meal expectations and discussion for Oliver at post-intervention.