

Resource mobilization combined with motivational interviewing to promote healthy behaviors and healthy weight in low-income families: An intervention feasibility study

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Abstract

Objectives: This non-randomized pilot trial examined the feasibility and acceptability of an intervention for low-income families with one parent with obesity, glucose intolerance and/or diabetes.

Methods: The 12-month intervention combined health coaching using motivational interviewing to promote lifestyle behavior change and community resource mobilization to assist with basic needs plus diet quality and physical activity. Outcome measures included process measures, open-ended questions, and the Family Nutrition and Physical Activity scale.

Results: Forty-five families completed an average of 2.1 health coach in-person visits, including 15 families lost to follow-up. Parents who stayed in the intervention reported the intervention was helpful. Some families and the health coach had difficulties contacting one another, and some of these families reported they would have liked more sessions with the coach. The Family Nutrition and Physical Activity scores improved significantly for all children (6 months: 2.9; $p < .01$; 12 months: 3.2; $p < .05$) and at 6 months for index children (6 months: 3.5; $p < .01$; 12 months: 2.9; $p = .09$). There was variation in the FNPA and other outcome changes between families.

Conclusion: This intervention was feasible in terms of recruitment and delivery of family sessions and community referrals and acceptable to participants, but maintaining contact with participants was difficult. Findings warrant improvements to help retention and logistical aspects of communication between families and coaches and testing in a randomized, controlled trial.

Keywords

Family, obesity prevention, motivational interviewing, intervention, community-based participatory research

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Introduction

In the United States, obesity rates are 42.4% in adults and 18.5% in children.^{1–3} Obesity confers an increased risk for diabetes, cardiovascular disease, and other co-morbidities.⁴ Obesity prevention is challenging due to a lack of effective interventions and complex environmental factors. Children of parents with obesity, glucose intolerance, and/or diabetes are at increased risk for obesity and diabetes.^{5,6} While this risk is in part genetic,⁷ other contributors include parent health behaviors (modeling),^{5,8,9} home environment (access to healthy foods^{10,11} and opportunities for physical activity^{12,13}), and community environment.^{14,15} Risk is higher in low-income^{16,17} and minority populations.^{2,3,16}

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Family-focused programs may prevent unhealthy weight gain among adults and children. Although parents may be encouraged to model healthy behaviors, many adult and child obesity interventions stop short of jointly addressing obesity risk in parents and children.^{18–21} However, child obesity treatment outcomes improve when programs involve parents as both agents for and targets of change,^{22–24} and obesity prevention may be more effective with parental involvement.^{18,25} Adults with obesity also benefit from targeting the whole household.^{26,27} Several interventions targeting children of parents with obesity have had success.^{19,28,29}

Despite family influence on child diet and activity,^{30,31} most child obesity prevention interventions focus on schools.^{25,32} Prevention studies have reported varying success and retention difficulties, especially among low-income populations.^{33–37} Lower-intensity strategies have led to behavior changes,^{36,38–40} but they rarely slow the increase in child body mass index (BMI).^{38,41} Home-based studies²⁵ and those with a community component are limited.⁴⁰

Motivational interviewing (MI) is a communication approach designed to help people identify motivations for change, establish behavioral goals relevant to their values and motivations, and increase self-efficacy for achieving goals.⁴² MI has been successful in promoting adult weight loss, physical activity, and healthy diet^{43–47} and in treating child obesity.⁴⁸ MI has been used with parents,^{48–50} adolescents,⁵¹ and children as young as third grade,⁵² though the use of MI in a family setting (including parent and child) for obesity prevention has received limited study.^{51–54} However, family-focused goal-setting and MI are used to treat child obesity,^{23,55,56} alcohol use, and family functioning.^{53,57} Only five studies have included children in MI sessions resulting in behavior changes,^{58,59} and weight loss.^{22,41,60} Only one²⁸ of these trials focused on primary weight gain prevention, and one targeted parental weight.²²

MI inspires individuals to change behavior, but families must have the necessary resources to achieve their goals.^{51,61,62} Needs may range from a bicycle to housing. In one low-income pediatric practice, 52% of families had one or more unmet basic needs (i.e. employment, education, child care, food, and housing).⁶³ Meeting needs may allow families to focus on healthy behaviors.^{64–69} Interventions to connect individuals to community resources show promise,^{70–73} though more research is needed on how best to connect families with resources and encourage their use.^{74–76} The authors are not aware of any other family obesity-prevention interventions that combine MI with resource assistance.

We anticipated that combining MI with support from community-based organizations would make it easier for low-income families to attain their lifestyle goals. One intervention aim is to motivate families to access resources by aligning family goals and community resources. The primary purpose of this non-randomized pilot study was to explore the feasibility of implementing this intervention and the acceptability to participants. Secondarily, we examined preliminary efficacy of the intervention to change behaviors

related to child obesity. Herein, we illustrate the content, feasibility, acceptability, and descriptive results of our “Living Well Together” (LWT) intervention and lessons learned.

Methods

Study design

This non-randomized pilot study was a 12-month intervention in which all participants received the intervention. Data was collected at baseline, three, six, and 12 months. The intervention had two components: (1) a “health coach” (HC) who used MI with families to help them identify and meet diet and physical activity improvement goals, and (2) connection to resources provided by community agencies. The intervention included (1) two meetings with a community resource screener at baseline; and (2) five in-person meetings in the family’s home or a community site, four scheduled phone calls, and phone calls as needed with the HC. LWT aimed to improve diet and activity behaviors to stabilize weight and promote health. However, the primary focus with families was always on behavior and not weight.

Theoretical framework

This intervention was guided by three complementary conceptual frameworks. First, the family ecological model⁷⁷ explains multi-level influences on parenting behavior related to children’s diet and physical activity. This model guided the inclusion of resource connection with this intervention. Second, social cognitive theory⁷⁸ highlights self-efficacy and the reciprocal interactions between family members and their environments.^{79,80} This model guided the focus on the family and setting attainable stepwise goals for behavior change to promote self-efficacy. Third, the empowerment framework emphasizes a collaborative approach to care and empowers individuals to develop goals and plans for change.⁸¹ This framework guided our use of MI as a patient-focused communication style.^{81–84}

Community-based participatory research

A community partnership was developed in a midwestern city (population ~600,000) with a significant minority population. The partnership included representatives from a university, a community health center (CHC), a religious organization running a food bank, a non-profit focused on financial security for individuals, university extension services, and visiting nurse services. Incorporating information from interviews with families, this partnership worked together to design, obtain funding for, and complete the intervention.

Target population and recruitment

The intervention targeted low-income, English-speaking families with children through recruitment at three CHC sites and 12 food pantries. No income threshold was set. The

index adult was required to have a self-reported BMI ≥ 30 , glucose intolerance, and/or diabetes and be the parent or guardian of at least one child under age 18. The index child was required to live with the parent at least 80% of the time and was the available child closest to age six.

At the CHC, healthcare providers identified eligible patients from the medical record. Initial contact with families was made by providers who told them briefly about the project, gave them recruitment materials, and obtained permission for the research team to contact them with more information. At the food pantries, research team members directly recruited participants at a table in the pantry. Recruitment started with a brief survey of pantry visitors to identify potentially eligible participants, who were then given information about the project. Survey participants received minimal compensation—a water bottle. In addition, some participants contacted the program in response to posters and brochures available at the CHC and all food pantry locations.

Institutional review board approval

The study protocol was approved by the University of Iowa Institutional Review Board. Adult participants signed a written informed consent, and parents and guardians consented for their children. Index children aged eight and older signed an assent document.

Health Coach visits

The Health Coach (HC) met with families in their home or at a community site at baseline, three, six, nine, and 12 months with phone calls as needed, and at six weeks and 4½, 7½, and 10½ months.

Health coach training. Two college-educated HCs were trained by certified trainers from the MI Network of Trainers. One-day training (around 6 h) was followed by individualized training based on audio recordings of practice sessions, the HCs' first three family sessions, and intermittent review of recordings of sessions with families throughout the study by the MI trainers to assess MI fidelity. Training also addressed healthy diet, sleep, and exercise behaviors. The initial coach was a nurse contracted from the visiting nurse service to work hourly, a sustainable arrangement for the CHC. When she was unable to continue, a replacement coach was hired directly by the intervention team and was not a healthcare provider. She received equivalent training to the first HC.

Home visits. Home visits addressed transportation barriers and facilitated the inclusion of the entire family. All family members were invited, but the index adult and the primary food preparer (if different) were required to be present. Children age ≥ 6 years were invited to participate. Adolescents were encouraged to engage in all discussions. Younger

children were not required to participate in the discussions of values and motivation to change but engaged in age-appropriate ways when the family discussed goals (e.g. choosing new foods to try).^{53,56}

Using MI, the coach guided families through a process of choosing realistic, meaningful goals for healthy behavior change. MI techniques include open-ended questions, reflections, affirmations, and summaries.⁴²

First, the HC and family explored current behaviors, values, ambivalence toward change, and perceptions of their ability to change. Then they discussed one or two behaviors and elicited reasons for change, goals, and action steps. Family members were encouraged to choose goals they could work on as a family. Family members were asked to gauge how important the goals were and how achievable the actions seemed. Goals or actions perceived to be unimportant or unachievable were revised. Family members signed an action plan listing the goals and specific steps to achieve them. If families were ready for goals but had difficulty identifying options, the HC assisted families in developing a menu of options to consider. When offering suggestions, the HC focused primarily on the following topics: increasing fruit and vegetable intake,⁸⁵ decreasing screen time,⁸⁶ increasing physical activity, eating meals together, decreasing sugar-sweetened beverages, and getting enough sleep⁸⁷ based on recommendations for children.⁸⁵ The HC and the family discussed resources needed to achieve these goals (e.g. equipment, information), and the HC made appropriate community resource referrals. The HC also provided guidance and materials¹⁹ to help parents discuss diet and physical activity with their children. Families were encouraged to share their goals with health care providers, family, and friends. As the family achieved their initial goals, the HC encouraged them to set additional goals.

Phone calls. The HC followed up by phone using MI to discuss successes or difficulties, problem-solve, help with resource needs, and provide motivational support.

Resource mobilization

A community resource screener assessed needs and linked families to community resources at baseline and one follow-up. Health coaches connect families with resources related to their goals. Resources include education, diet, exercise, and financial and other support.

Education on healthy lifestyles. The University Extension Expanded Food and Nutrition Education Program (EFNEP) teaches nutrition, low-cost recipes, recommended activity levels, and basic exercise techniques. Interested families participated in eight weekly classes at community sites. Partner food pantries provided families with ingredients for EFNEP recipes. Health coaches offered written and online food or exercise resources and information on community programs.

Diet improvement resources. All families were eligible to receive monthly food boxes at a food pantry or the CHC. The intervention helped families access programs such as the Supplemental Nutrition Assistance Program (food stamps), the Special Supplemental Nutrition Program for Women, Infants, and Children, and local food programs. To help families learn to integrate fruits and vegetables into their diets,⁸⁸ the intervention provided fresh and canned fruits and vegetables: 15 servings per person weekly for 2 months and then monthly, which could be obtained at the same time and place as the monthly food box.

Exercise resources. Families were linked with low- or no-cost programs through Parks and Recreation; income-based YMCA memberships with free four-month trial periods; and low-cost or free used exercise equipment, including bikes. Health coaches offered pedometers and information on low-cost physical activity choices.

Financial and other resources. The screener assessed families for eligibility for community and national resources, including temporary assistance for needy families and housing or heating assistance, and provided referrals to vocational/educational programs, charitable organizations, and parenting support programs. Parents were given contact information for a specific person at the organization, and parents made the contact. The screener or HC followed up to determine whether families needed assistance with the referral.

Data collection

Data were collected at baseline, three, six, and 12 months. Data collectors obtained data about the index adult and primary food preparer (if different), and up to two children. Questionnaires were read to adults by phone or in person by a data collector. Data collection visits lasted anywhere from 30 min to an hour. Health coaches measured heights and weights only. Participants received incentives for all data collection except heights and weights, which were done by the HC.

Process measures

At three, six, and 12 months, participants responded to the same open-ended questions in audio-recorded interviews (around 10 min) with the data collector about the program and challenges to making lifestyle changes. Both data collectors were master's level with backgrounds in case management (one had previous qualitative interview experience), and both were trained to ask questions by the principal investigator; they had no prior relationships with participants. These questions were not pilot tested and were asked in a standard way to all participants. Referrals were documented, and the screener and HC asked participants whether contact had been made. Active dropout and loss to follow-up were

documented, and the characteristics of lost and remaining families were compared. Health coach notes and tapes of HC sessions were reviewed to identify goals and time spent with participants. Data were provided by EFNEP on class participation and by the food bank regarding receipt of fruit and vegetable boxes.

Outcome measures

Family nutrition and physical activity (FNPA) tool. The FNPA is a validated 20-item measure used to characterize behaviors related to childhood obesity.^{89,90} The same parent completed the FNPA each time for each child. The FNPA measures changes including decreasing sweetened beverages, sweet snacks, fast food, and TV, and increasing family meals, family physical activity, and fruit and vegetable intake.⁹¹

Body mass index (BMI). Body mass index was calculated for adults, and BMI z-scores for children were calculated using the Centers for Disease Control and Prevention (CDC)⁹² codes. Index children aged less than 2 years (N=2) were not weighed.

Other data

Questionnaires also included demographics and the validated Household Food Security Scale.⁹³

Statistical analysis

We summarized utilization of HC visits and community referrals. The descriptions included all families, regardless of the family's length of participation. For example, a family with one HC visit before dropping out would have a total of one HC visit at each time point. This description accurately reflects the actual use of the intervention by not focusing only on retained families. We also summarized use by families who participated beyond baseline data collection.

Separate analyses were conducted with the index adult, index child, and up to two children per family. When the index adult weight was unavailable (baseline (N=2), 6 months (N=9), and 12 months (N=14)), researchers substituted an available weight from the CHC medical record. A sensitivity analysis with and without this substitution found no significant differences. Changes in outcomes (BMI, BMI z-score, and FNPA) were calculated as the value at six and 12 months minus the value at baseline. The differences were tested via a one-sample T-test or Wilcoxon signed test based on data normality. A complete case analysis did not change the findings.

Qualitative analysis

A qualitative analysis of three-, six-, and 12-month interviews and summaries was performed. Audio tapes were reviewed,

and each response was summarized. Some complex ideas were transcribed word for word. Using editing analysis style⁹⁴ (deductive and inductive themes), two coders (an MD researcher with extensive qualitative experience and a trained graduate student) coded positive and negative comments and suggestions for improvement. Codes were grouped into themes. Tapes were rereviewed as needed. Data were triangulated on number of visits with HCs and screeners and attempts to contact participants. Participants did not have an opportunity to review summaries of their responses to qualitative questions for accuracy of interpretation (member checking).

Results

Participant characteristics and retention

Forty-five families were enrolled at baseline (Tables 1–4). Thirty remained at 6 months, and 20 remained at 12 months (Figure 1). Many retention losses occurred between the baseline interview and the first HC visit (eight families). Most families lost were unable to be contacted; the three active refusals cited the time commitment or were no longer interested. Demographics at 6 months were similar to baseline. Table 5 describes study participation.

Among the 15 participants who withdrew or were lost to follow-up, six did not engage beyond the baseline visits; two met only with the resource screener, two had only one HC visit, two had one HC visit and met with the screener; and three had two HC visits and met with the screener (two of whom returned for 12 month data collection). The characteristics of families who were lost are shown in Table 6. A greater percentage of food insecure and very food insecure individuals (36%) were lost than were food secure individuals (28%). However, food insecure individuals were less likely to have had no HC visits or no referrals for services. Severely food insecure families had a higher number of average visits (3.8 visits) versus food insecure (2.4 visits) and food secure (2.3) families. These data suggest that food insecure families were more likely to try a couple sessions of the program before being lost than were food secure families. Once in the program to stay, severely food insecure participants engaged more. African Americans were more likely to be lost. Participants with less than a high school education were also more likely to be lost and to have no HC visits.

Process data

Thirty-seven families met with an HC at least once. Health coaches spent an average of 18–23 min discussing motivation and goals with the family. Seven families (19%) chose only diet goals, six (16%) chose only physical activity goals, and 24 (65%) chose both types of goals (Table 7).

Thirty-five families met with the screener and received community referrals (Figure 1; Table 8). The HC linked families with diet and physical activity resources. At 6 months,

Table 1. Baseline demographics of 45 families who participated in the intervention at baseline: categorical demographics of index adult/family at baseline.

Race, N (%)	
African American	10 (22.2)
White	21 (46.7)
Other ^a	14 (31.1)
Latino, N (%)	
Yes	13 (28.9)
No	32 (71.1)
Gender, N (%)	
Male	8 (17.8)
Female	37 (82.2)
Recruitment site, N (%)	
Community health center	22 (50.0)
Food bank	22 (50.0)
Food insecure ^b , N (%)	
Yes	26 (57.8)
No	19 (42.2)
More severe food insecurity ^c , N (%)	
Yes	10 (22.2)
No	35 (77.9)
Measured BMI classification, N (%)	
Obese (BMI \geq 30)	32 (71.1)
Overweight (BMI \geq 25)	4 (8.8)
Normal (BMI 18–24)	1 (2.2)
Data not available	8 (17.8)
Recruitment category ^d	
Obese (BMI \geq 30) ^e	36 (80.0)
Glucose intolerant	3 (6.6)
Diabetes	24 (53.3)
Unknown	2 (4.4)

BMI: body mass index.

^aIndividuals assigned to other category when either other or multiple races are selected.

^bTo be classified as food insecure, Household Food Security Scale Short Form score \geq 2; “the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain.”

^cTo be classified as having more severe food insecurity or “food hunger” per the original paper, Household Food Security Scale Short Form score \geq 5 of 6 questions.

^dParticipants could be in more than one category, that is, diabetes and obese or glucose intolerant and obese, and obesity status was based on self-reported height and weight.

^eFour individuals did not have data on weight status at baseline; two were admitted based on diabetes status, and data on which inclusion criteria were met was unavailable for two.

34 families received fruits and vegetables at least twice, and nine families enrolled in the EFNEP class.

Qualitative questions

At 3 months, 24 families answered qualitative questions. A majority commented that they liked the fruit and vegetable boxes, though a few struggled to pick them up during open pantry hours. Families who attended the EFNEP classes

Table 2. Baseline demographics of 45 families who participated in the intervention at baseline: numerical demographics.

	N	Mean (SD)	Range
Index adult BMI, kg/m ²	37	39.2 (9.5)	(20, 60)
Index adult baseline age, year	44	39.0 (9.5)	(19, 58)
Number of children of index adult	45	2.2 (1.5)	(1, 9)

SD: standard deviation; BMI: body mass index.

Table 3. Baseline demographics of 45 families who participated in the intervention at baseline: index child.

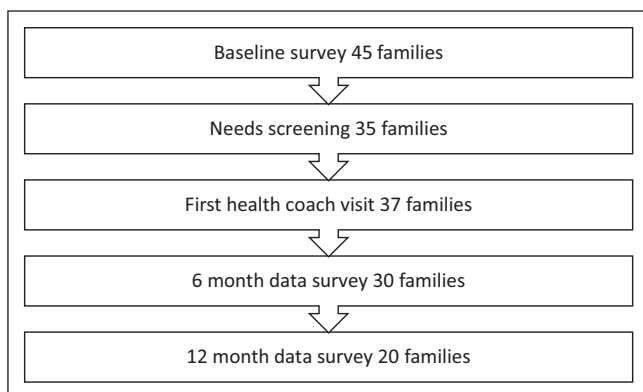
Demographics	N (%)	Mean (SD)	Range
Gender			
Male	19 (45.2)		
Female	23 (54.8)		
Demographics	N	Mean (SD)	Range
BMI Z-score	33	1.4 (1.3)	(-3.2, 3.2)
BMI percentile	33	83.6 (24.7)	(0.1, 99.9)
Age	42	8.5 (4.2)	(1, 17)
FNPA	41	50.3 (6.9)	(34, 62)

SD: standard deviation; BMI: body mass index; FNPA: family nutrition and physical activity.

Table 4. Baseline demographics of 45 families who participated in the intervention at baseline: all children.

Demographics	N (%)	Mean (SD)	Range
Gender			
Male	32 (50.8)		
Female	31 (49.2)		
Demographics	N	Mean (SD)	Range
BMI Z-score	49	1.3 (1.2)	(-3.2, 3.2)
BMI percentile	49	80.1 (25.2)	(0.1, 99.9)
Age	62	9.8 (4.4)	(1, 18)
FNPA	61	49.8 (7.1)	(34, 62)

SD: standard deviation; BMI: body mass index; FNPA: family nutrition and physical activity.

**Figure 1.** Chart showing number of families at each step of the intervention.

were satisfied with the classes. Some found the HC helpful and liked setting goals. Many would have liked more frequent visits and contact from the HC by this point. Three people, including one husband-wife pair, reported significant weight loss. Three families reported that the original HC did not connect well with them during the first visit. These families, and three others, reported difficulty keeping in contact with her. One participant reported that his phone was on vibrate at work, and another participant had changed her number. Barriers to change and participation included time, money, family scheduling conflicts, heavy work schedules, health problems, and other issues.

At 6 months, 27 families answered qualitative questions. Responses were similar to those at 3 months. Though some families had a better relationship with the HC than

Table 5. Intervention participation by the specified time point for all families involved in the study (N=45).

Intervention participation at time point	By family	Range
Prior to 6 months		
≥ 1 health coach visit ^a , N (%)	37 (82.2)	
Health coach visits, all families, mean (SD)	1.4 (0.8)	[0, 3]
Health coach visits, sub-sample those who participated ^b , mean (SD)	1.7 (0.5)	[1, 3]
At 6 months		
Community partner referrals, Mean (SD) ^c	2.2 (0.7)	[1, 3]
Number of referrals, mean (SD) ^c	2.7 (2.2)	[0, 8]
Reported referrals used, mean (SD) ^c	2.4 (1.3)	[0, 5]
At 9 months		
Number of referrals, mean (SD)	4.0 (2.9)	[0, 10]
Before 12 months (not including 12 month end of study visit)		
Health coach visits, all families, mean (SD)	2.1 (1.1)	[0, 4]
Health coach visits, sub-sample those who participated ^b , mean (SD)	2.5 (0.8)	[1, 4]
After 12 months (includes final visit at 2 months)		
Health coach visits, all families, mean (SD)	2.4 (1.4)	[0, 5]
Health coach visits, sub-sample those who participated ^b , mean (SD)	2.8 (1.1)	[1, 5]

SD: standard deviation.

^aIn person visits; does not include phone contacts. The majority of these families (n=35) also met at least once with the community resource screener.

^bThe sub-sample includes only those families with at least one health coach visit during the study (n=37), for example, those who utilized the resources provided.

^cDoes not include the provision of fruits and vegetables through the food bank as part of the program.

Table 6. Characteristics of those with withdrew or were lost to follow-up at 6 months.

	N of group	# lost families	% of all lost families	% of this group that was lost
Food secure	14	4	27	29
Food insecure	19	7	47	37
Severely food insecure	11	4	27	36
African American	13	6	40	46
Latino	13	4	27	31
Caucasian or other	19	5	33	26
Less than HS or vocational degree	13	7	47	54
HS degree or more	32	8	53	25

earlier in the intervention and were more satisfied, they still wanted more visits. One family reacted much better to the second HC. Communication difficulties between participants and staff continued. Resources remained popular among participants, including one participant who started her General Equivalency Diploma (GED) with a referral from LWT.

At 12 months, 18 of 19 families reported that the program was helpful, particularly in terms of education, goal setting, free fruits and vegetables, connections to community resources, and EFNEP classes. Four adults desired more contact with the coaches (one felt the number of visits wasn't enough to be useful), and one wasn't sure the HC portion was useful (HC had difficulty contacting these five families). Two voiced concerns about what would happen when the program ended and the resources stopped. Reported challenges were lack of time, inclement weather, transportation issues, health problems, and time constraints due to caring

for children. Two of these families had been lost after two HC visits (one actively and one passively); one mentioned time commitment issues but wanted more follow-up, and the other found the resources helpful.

All families who were available and interested answered the qualitative questions, so saturation was not used as a stopping criterion. However, within the data gathered, saturation was reached in that we heard the same themes repeating between multiple families. Some overall themes were. (Also see Supplemental Table with more quote examples).

Gained nutritional information. Some participants reported that they gained nutritional information. One parent said,

“It helped us know how to eat better, how to eat healthier. I think it has just made me more aware of. . . “oh I just bought fruit twice this month.” I guess before I never thought about things like that. So, I've kind of made a more conscientious effort.”

Table 7. Examples of specific goals/action plans set by families in the lifestyle intervention—some details have been trimmed for space.

Physical activity
Walking
<ul style="list-style-type: none"> • Walk in the hallway and stairs of the apartment complex for 30 min twice per week • Walk as a family on Sunday
Biking
<ul style="list-style-type: none"> • Bike ride once per week • Bike every day
Gym
<ul style="list-style-type: none"> • Get a YMCA membership • Go to gym three times per week • Go to YMCA for 1 h 5 days per week
Other
<ul style="list-style-type: none"> • Exercise three times per week • Use exercise DVD, dumbbells, exercise band/ball when kids nap • Go out more and watch less TV • Swim once per week • Dance game on video game console for 20 min one night per week • Sign up for exercise classes and sports for family members • Family exercise 12 times per month
Food/diet
Drinks
<ul style="list-style-type: none"> • Less soda, more water or tea • Soda only on weekends • Coffee instead of regular Mountain Dew
Fruits, vegetables
<ul style="list-style-type: none"> • One fruit per day • Vegetables three times per week, lunch or dinner • Add a vegetable to dinner every day
Fast food, eating out, meals at home
<ul style="list-style-type: none"> • Fast food only on weekends • More food preparation at home • Prepare meals ahead: two meals with leftovers on Sunday and Tuesday to be heated up • Portion control • Eat breakfast five times per week • Two meals from diabetic cookbook per week • Take cooking classes
Processed carbohydrates
<ul style="list-style-type: none"> • Eat pasta three times per week instead of five to seven • Cut out some white bread and tortillas • Whole wheat tortillas two to three times per week
Less fat
<ul style="list-style-type: none"> • Bake food instead of fry three times per week
Meats
<ul style="list-style-type: none"> • More fish, less red meat • No pork; substitute chicken for pork • Substitute turkey meat for others
Snacks
<ul style="list-style-type: none"> • Decrease junk food to twice per week • No candy or donuts • Healthy snack two to three times per week • Healthy snack so not only eating once per day
Other
<ul style="list-style-type: none"> • Grow a garden • Add dairy two to three times per week • Once per week, don't eat after 9 pm • Use less salt

Helped motivate physical activity. Some families described how it motivated them to do more physical activity. For example, one parent said,

when me and my daughter set the goals, it was written down on a piece of paper and we put it on the refrigerator and that was a good reminder to both of us. We got pedometers not too long ago and we put them on first thing in the morning and we challenge each other to beat their steps. And that really got my daughter going. They have a track outside at her school and now she can run around the whole thing, and she used to dread walking half of it in PE.

Resources. Families liked the resources provided. For example, one parent said, “I had a lot of resources at my fingertips with the program.” and another said they “provided the fresh fruits and vegetables, which has been very helpful.”

Goals/motivation. Families talked about effects on goals and motivation. One parent said,

Just to know that someone is interested in my goal of losing weight and eating better, for not only for myself but my kids. So, it helps. That's why I try not to miss my appointments with. . . It's a good program.

Concerns about what happens when program is over. Two parents voiced concerns about what would happen when the program was over. One parent said, “It's been very helpful because when I go get my vegetables, I cook them, and I eat them. I mean, but how long do you think that's going to last?”

Not enough contact with the health coach. Some families reported they wanted more communication with the health coach. For examples one parent said one thing she didn't like about the program was “not having as much communication with the health coach as I would like.”

Trouble getting the food boxes. Some families had trouble getting their food box from the food pantry. One parent said,

They tried to help me with the food pantry box. It's just I work so much, and I couldn't ever get to anywhere in my neighborhood. Like the one day they were available I wasn't able to get there. But that's not the program's fault, I'm just busy.

Outcomes data

Outcomes were reported using all available data at six and 12 months. The sample sizes at these time-points were not the same; however, all differences were calculated compared to the baseline.

Family nutrition and physical activity (FNPA) tool. Family Nutrition and Physical Activity scores improved from baseline on average by 3.5 points ($p=.006$) at 6 months and 2.9 at

Table 8. Types of referrals to community organizations made for family during the lifestyle intervention.

Education	Nutrition and physical activity classes (EFNEP), diabetes education class, GED programs, Iowa Digital Literacy, free school supplies
Physical activity	YMCA memberships, Parks and Recreation discount cards (for activities, classes etc.), free bike helmets
Housing and economic assistance	Anawim (low rent) housing, section 8 housing, free cell phone program, heating/energy assistance, Social Security disability
Health	Medicaid, emergency food pantry, WIC, free glass vouchers, IowaCare (for low income not covered by Medicaid), community health center (PHC, Inc.)
Job placement	Job placement, employment and financial services (Evelyn K. Davis Center), free business clothes

EFNEP: University Extension Expanded Food and Nutrition Education Program.

Table 9. Primary outcome changes from baseline for all groups.

	Mean (SD)	
	Difference ^a at 6 months	Difference ^b at 12 months
Change in adult BMI	-0.5 (2.0) n=36	-0.6 (2.5) n=20
Change in child BMI Z-score, (index children only)	0.10 (0.53) n=27	0.17 (0.95) n=14
Change in child BMI Z-score corrected, ^c (index children only)	0.08 (0.53) n=26	-0.03 (0.60) n=13
Change in child BMI Z-score (all children)	0.08 (0.50) n=38	0.20 (0.77) n=22
Change in FNPA ^{d,e} (index children only)	3.5 (5.9)* n=27	2.9 (5.9) n=14
Change in FNPA (all children)	2.9 (5.6)* n=39	3.2 (5.9)** n=18

SD: standard deviation; BMI: body mass index; FNPA: Family Nutrition and Physical Activity Scale.

*p < 0.01.

**p < 0.05.

^aDifference calculated as 6 month value minus value at baseline; based on repeated measurement over time.

^bDifference calculated as 12 month value minus value at baseline; based on repeated measurement over time.

^cOne underweight child who appropriately was encouraged to gain weight was removed for this calculation. That child remains in all other calculations.

^dSignificance tests performed using the Wilcoxon Sign Test for one-sample at both 6 and 12 months.

^eFNPA = Family Nutrition and Physical Activity scale, a measure of behavior linked to childhood obesity. Higher number indicates healthier behaviors.

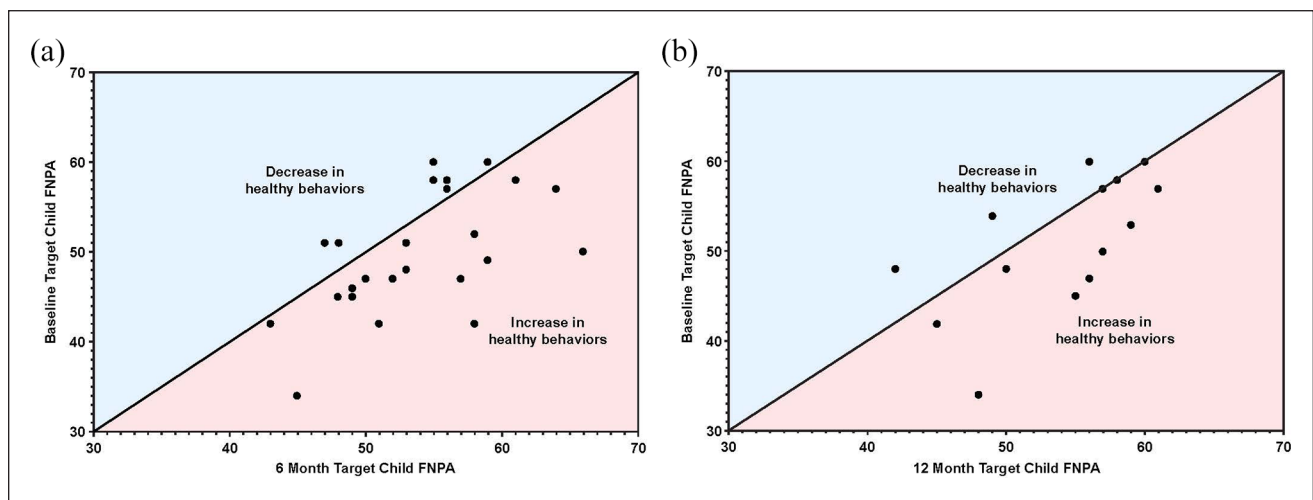


Figure 2. Family Nutrition and Physical Activity score for the index (target) child at 6 and 12 months (x-axis) plotted against baseline (y-axis). A higher score on the FNPA (range 20-80) is better and reflects fewer behaviors that could cause obesity and more behaviors beneficial to obesity prevention. Those above the diagonal line (blue) had a worsening of health behaviors and those below the line (pink) saw an improvement of behaviors.

12 months ($p=.09$) in index children (Table 9; Figure 2) and among all children (up to two per family) at six and 12 months.

Adult BMI. Adults showed no statistically significant change in BMI (-0.5 kg/m^2 at 6 months and -0.6 kg/m^2 at 12 months; Table 9). BMI changes varied (Figure 3).

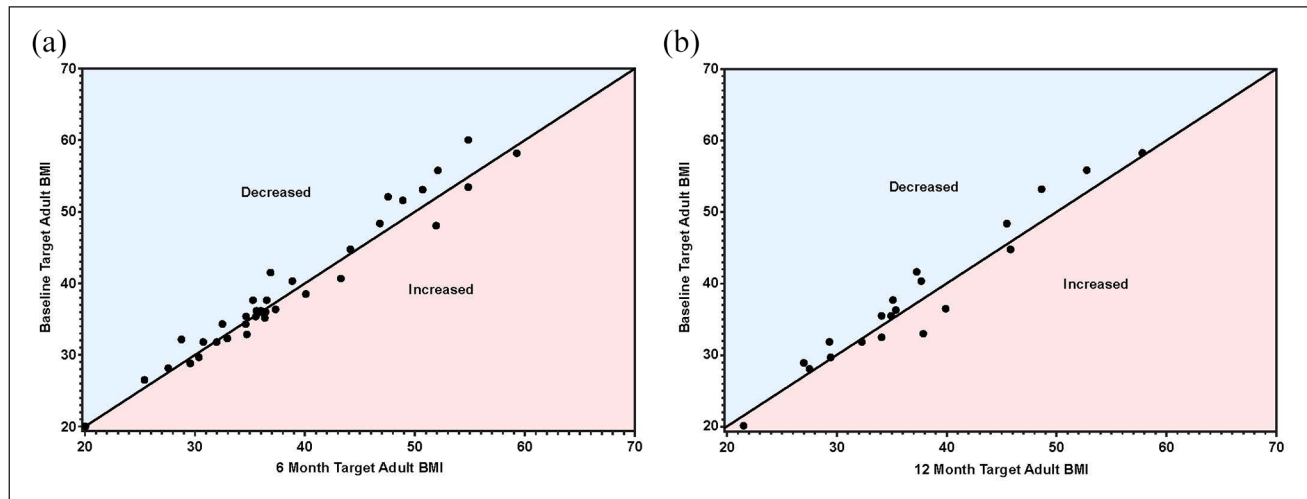


Figure 3. Index (Target) Adult BMI (kg/m^2) at 6 and 12 months (x-axis) plotted against baseline BMI (y-axis). Diagonal line represents no change in BMI; those above the line (in blue) decreased their BMI and those below (pink) increased their BMI.

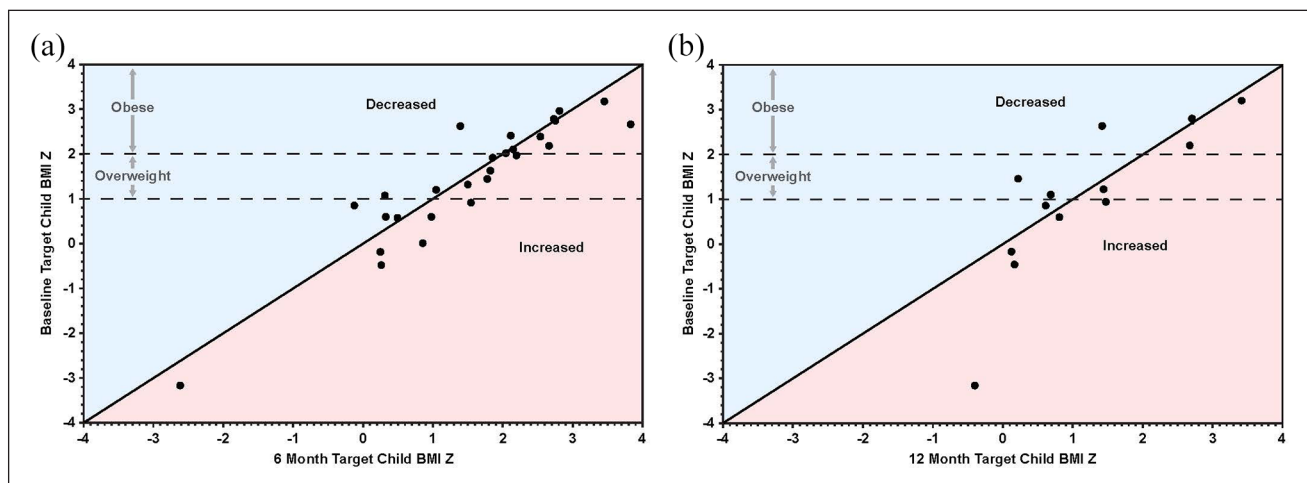


Figure 4. Index (Target) Child BMI z-score at 6 and 12 months (x-axis) plotted against baseline BMI z-score (y-axis). Diagonal line represents no change in BMI z-score; those above the line (blue) decreased their BMI and those below (pink) increased their BMI. Above the horizontal lines designates those who were overweight or obese at baseline versus the rest of the children who were normal weight, except for one underweight child.

Child BMI. There were no statistically significant changes in BMI z-scores among the index or all children (Table 9). BMI z-scores changed (0.08 at 6 months and -0.03 at 12 months) in index children when an underweight child who appropriately gained weight was removed from the analysis. BMI change distribution (Figure 4) is provided.

Discussion

The LWT intervention explored the feasibility, acceptability, and challenges to implementing a healthy behavior intervention for low-income families with an adult with a BMI of ≥ 30 , glucose intolerance, and/or diabetes, and a child under age 18. The intervention proved to be feasible in that we were able to recruit participants and deliver the

intervention components. We were also able to identify challenges and opportunities for improvement. Retention and communication were notable challenges; most families did not actively withdraw, but the research team was unable to contact some families, leading to fewer visits or passive withdrawal. Families found the resources, goal setting, and education helpful. Families found the HC acceptable. Some families and the health coach had difficulties contacting one another, and some of these families reported they would have liked more sessions with the coach. Logistical problems sometimes made communication difficult. Time, money, health problems, motivation, and time constraints related to childcare were barriers to change and participation. As this intervention was small, without a control group, the efficacy of the intervention cannot be determined,

although the descriptive data are promising. Family Nutrition and Physical Activity scores were higher at six and 12 months for all children and for index children at 6 months compared to baseline. These changes (around three points) were clinically meaningful, as studies have shown that a one-point change in FNPA score correlates with a 0.1 change in BMI 50 (child BMI–BMI for 50th percentile/BMI for 50th percentile) \times 100) over 1 year.⁹⁰ Adults with obesity and their children who continued in the study on average maintained a steady BMI or BMI-z score. There was substantial variation in response to the intervention.

LWT was unique in that it combined family-focused health coaching using MI with connection to community resources and focused on change in both adults and children. In addition, LWT included a low-income and ethnically and racially diverse population that still remains underrepresented in MI literature.⁴⁸ Most child obesity prevention trials are school-based.^{18,25} Few obesity prevention studies have systematically included connection to resources, and none combined connection to resources with a MI-based intervention.^{95,96} The closest study design to ours provided predominantly diet and physical activity resources, with more limited resources for other needs.⁷¹

Prevention studies using MI with families are rare.^{97,98} Some studies have used MI or related approaches to treat or prevent childhood obesity.^{53,57,99} The BMI² trial used MI with parents of overweight children.¹⁹ Motivational interviewing sessions with a physician led to a decrease in BMI percentile by 3.8% (average 3.4 contacts over 2 years) and 4.9% with physician plus dietician sessions (average six contacts). Several MI-based studies have included children in MI sessions.^{22,41,58,59} One study found increased fruit and vegetable consumption, increased physical activity, and decreased screen time.⁵⁸ Two showed decreased BMI in children^{22,41} and one in parents.²² In one study, pediatricians used MI in four 45- to 60 min sessions. The children and parents were required to agree on one diet and one physical activity goal. Another met with adolescents and parents to devise a change plan for the adolescent's behaviors, leading to improved eating behaviors and activity motivation (an average of 2.3 sessions).⁵⁹ In a review of MI studies with parents and children, the median session length was 26 min,⁵³ and most included fewer than four sessions.^{53,57}

Similar to MI family studies, the data on child obesity interventions outside of school remains limited, especially those that measure weight/BMI.³² Community-based interventions have shown mixed results for BMI,³² with one standout success story.¹⁰⁰ Others have shown behavior change,¹⁰¹ even if they are not demonstrating BMI change.

The LWT intervention aimed to improve diet and activity behaviors to stabilize weight. Many adults and children maintained a stable BMI. Significant weight loss in adults would require a more intensive approach. A goal of keeping weight stable has been shown to be effective in African American women,¹⁰² and preventing extreme obesity is

important.¹⁰³ Other studies have shown that small lifestyle changes such as in LWT can affect BMI.^{38,104}

This study highlighted lessons for future work. To meet the challenge of working with the whole family together, LWT used MI to motivate the parents alone first and then added the children to meetings for concrete goal setting.¹⁰⁵ Health coaches were trained to deal with resistance, acknowledge ambivalence, and help families focus on points of agreement. When agreement was not reached, parents determined the final goals.

Families in our intervention had many needs that were not directly related to diet and physical activity. Until these needs are addressed, people are unlikely to be able to prioritize healthy lifestyles.^{61,66} Other interventions connecting individuals to community resources show promise, but more needs to be learned.^{70–76} Resources were popular with LWT participants. For some, the provision of fruits and vegetables helped participants make dietary changes, while others did not use this resource consistently. Some YMCA memberships were not used because of safety concerns, transportation difficulties, or lack of time. Despite resource screening, some families struggled to prioritize health behavior changes.

The biggest concern for this approach is the loss to follow-up/drop-out rate, especially among those with food insecurity, African Americans, and those with very low education. This concern is consistent with other MI studies in children with overweight showing higher attrition among minority participants.⁴⁸ We do not know all the reasons why families were lost, as most of these families did not actively withdraw. Families reported barriers to change related to lack of time, childcare, weather, transportation issues, and health problems, which may have also affected engagement with the program.⁶¹ We eliminated most transportation issues for participating in health coaching sessions by going to participants' homes, but scheduling time for these visits remained a challenge. Participants reported difficulties communicating with staff due to conflicting schedules between staff and participants and participant phone issues. One family lost to follow-up that reengaged for the 12 month data collection wanted more contact, suggesting that, perhaps for some, disconnection with our program may not have been intentional.

Creative methods to maintain contact with families were needed. Texting was useful to let participants know we would be calling and to communicate with participants at work. Asynchronous communication of any type (e.g. texting, Facebook messages) was useful so participants could read and reply at any time. Community partners also helped locate families. Participants should be encouraged to contact the program if they have not heard from us. We recommend rotating times to contact participants (time of day, evenings, and weekends). To accommodate disruption in family life, the intervention must allow for disconnections and reengagement later. Accommodation may require flexibility to adjust the length of participation or to pause a participant's

participation. Overall, creative methods are needed to maintain contact with families.

Even using MI, some families may not have been ready or able to work with an HC. A few families did not feel connected with the HC early on. The HC contact frequency was designed to not overburden the program or participants. However, the data showed that participants wanted more contact early on. Early contact may improve connection with the HC, retention, and satisfaction; thus, we plan to add a two- to four-week visit and emphasize substantive phone check-ins. A 12 month transition visit will be added to the next version of the intervention. During this visit, families will plan for continued behavior change without the program.

This intervention depends on the capabilities of the HC.¹⁰⁶ We recommend choosing HCs with a connection to the community, an affinity for MI, and a history of working with families with low incomes. This HC job must include regular time set aside after school, in the evenings, and weekends to meet with families and phone parents. With these lessons learned, we expect future retention and the number of HC visits to improve.

LWT shows the potential feasibility, challenge, and promise of a more intensive but not overwhelming intervention for families with low incomes. Though families with more resources may benefit from lower-contact approaches, coaching using MI is well suited to helping motivate families to change and to obtain resources. Because the intervention relied on existing resources, the challenges to this approach were gathering information on available resources, training HCs, and maintaining contact with participants. The biggest cost remains the personnel costs for the HC and the resource screener. With the right support, this intervention could be accomplished by a community health worker, decreasing costs and increasing community connection. LWT reflects an approach that may be sustainable but should be targeted to those who need and want a more intensive home-based approach. Using community-based participatory research¹⁰⁷ principles strengthened this approach and led to collaboration outside of this intervention. Resources were shared between partners to make it more feasible; sharing the resource screener worked well.

This pilot can guide future studies. This intervention will need to be tested in a randomized controlled trial. Based on this pilot, we recommend the following changes (described in detail above). To promote retention and in keeping with other recent research,⁴⁸ we recommend engaging families more often early in the intervention, including additional early HC visits, varied methods for contacting participants (e.g. putting notes in their fruit and vegetable boxes or texting) and creative ways to incentivize retention, such as raffles for those who update or confirm their contact information. We need to consider how best to help families navigate obtaining resources, including additional contact with our resource specialist and further training for coaches on community organizations and their processes (paperwork, eligibility criteria,

etc.). There is still room for more research on how best to help families obtain resources. We also need to explore additional ways to incorporate and engage children in the process. A future RCT will need to include more robust formal MI fidelity assessment, collection of income information to better characterize the participants (not as inclusion criteria), and additional methodologies to assess behavior, such as accelerometers. Based on the number of participants who were lost to contact after the baseline interview, we recommend not randomizing participants unless they are able to be contacted again after their baseline interview. Though fathers were encouraged to participate in all intervention activities, further research on how to engage fathers is needed and more data collected on their response to the intervention.⁴⁸ Should the RCT prove successful, implementation research should examine how this approach could be replicated in different settings and adapted to the local resource environment. In addition, research should examine how this model could be incorporated into the patient-centered medical home¹⁰⁸ or integrated with the work of non-profits and the public health system.

Other limitations

Our primary outcome results are based on the six- to nine-month data. Due to missing data, we presented 12 month data supplemented by health center data. We did obtain 12 month data on several families who did not participate or left early. While having the HC gather weight and height data reduced respondent burden (other data collection could be done by phone without children present), families who missed HC visits lacked these data. Therefore, FNPA data are more complete. The HC changed midway through the study. Some families did not receive as many HC visits as desired. We have not provided an accounting of all phone contacts, as we felt the documentation was incomplete. This study included adults with and without diabetes; diabetes can affect efforts to change an individual's BMI. These findings have been shown to be applicable to a low-income multi-racial/ethnic (Caucasian, African American, and Latino predominant), midwestern, medium-sized city population; some findings may not generalize to other populations. Though our recruitment sites drew a low-income population, the intervention did not collect family income data. As the study was a pilot trial, no formal power analysis was performed, and qualitative questions were not validated or pilot tested. In addition, a formal MI fidelity assessment was not done. We did, however, provide details of our training not always provided in intervention reports:⁴⁸ this training did include a review of some taped sessions for MI fidelity to guide training.

Conclusion

An intervention combining family-focused health coaching using MI with community resources shows potential

feasibility and promise for improving diet and exercise and preventing weight gain in children and adults but will require some improvements. Future research needs to explore better ways to (1) enhance retention of this highly mobile population, such as increasing contact early in the intervention, using a variety of ways to contact participants, and providing incentives to update contact information; (2) further improve resource referral; and (3) further enhance engagement of children and fathers. A randomized controlled trial will be needed to prove efficacy, test changes, and generate knowledge as to which resources are most essential.

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Informed consent

Written informed consent was obtained from legally authorized representatives (parents) before the study.

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Supplemental material

Supplemental material for this article is available online.

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