

Pilot Social Network Weight Loss Intervention With Two Immigrant Populations During the COVID-19 Pandemic

American Journal of Health Promotion

2022, Vol. 0(0) 1–14


© The Author(s) 2022

Article reuse guidelines:

sagepub.com/journals-permissions

DOI: 10.1177/08901171211053450

journals.sagepub.com/home/ahp

Mark L. Wieland¹ , Jane W. Njeru¹, Gladys B. Asiedu², Katherine A. Zeratsky³, Matthew M. Clark⁴, Rachel Goetze⁴, Christi A. Patten², Sydney S. Kelpin⁴, Paul Novotny⁵, Kiley Lantz⁶, Yahye Ahmed⁷, Luz Molina⁸, Graciela Porraz Capetillo⁸, Ahmed Osman⁹, Miriam Goodson¹⁰, and Irene Sia⁶

Abstract

Purpose: To examine the feasibility and acceptability of a social network weight loss intervention delivered by lay health promoters (HPs) to immigrant populations.

Design: Single-arm, non-randomized, pilot study of a social network weight loss intervention developed by a community-based participatory research partnership and delivered by HPs.

Setting: Community-based setting in Southeastern Minnesota, United States.

Sample: Somali and Hispanic immigrants to the United States: 4 social networks of adults (2 Hispanic and 2 Somali) with 39 network participants.

Intervention: Twelve-week behavioral weight loss intervention delivered by HPs (4 weeks in-person and then 8 weeks virtual).

Measures: Feasibility was assessed by recruitment and retention rates. Acceptability was assessed by surveys and focus groups with HPs and participants. Behavioral measures included servings of fruits and vegetables, drinking soda, and physical activity. Physiologic measures included weight, blood pressure, glucose, cholesterol, and triglycerides.

Analysis: Paired t-tests of pre- to post-intervention changes at the end of 12 weeks of treatment.

Results: Recruitment was feasible and post-intervention was 100%. Participants highly rated the intervention on satisfaction, motivation, and confidence to eat a healthy diet, be physically active, and lose weight. Participants were motivated by group social support and cohesion of their social networks. On average, participants lost weight (91.6 ± 15.9 to 89.7 ± 16.6 kg, $P < .0001$), lowered their systolic blood pressure (133.9 ± 16.9 to 127.2 ± 15.8 mm Hg; $P < .001$), lowered their diastolic blood pressure (81 ± 9.5 to 75.8 ± 9.6 mm Hg; $P < .0001$), had more servings of vegetables per day (1.9 ± 1.2 to 2.6 ± 1.4 ; $P < .001$), and increased their physical activity (2690 ± 3231 to 6595 ± 7322 MET-minutes per week; $P = .02$).

Conclusion: This pilot study of 2 immigrant communities who participated in a peer-led weight loss social network intervention delivered during the COVID-19 pandemic demonstrated high feasibility and acceptability. Participants lost weight, improved their health status, and improved their health behaviors.

Keywords

social network intervention, immigrant health, community-based participatory research, weight loss

¹Division of Community Internal Medicine, Mayo Clinic, Rochester, MN, USA

²Robert D. and Patricia E. Kern Center for the Science of Health Care Delivery, Mayo Clinic, Rochester, MN, USA

³Division of Endocrinology, Department of Nutrition, Mayo Clinic, Rochester, MN, USA

⁴Department of Psychiatry and Psychology, Mayo Clinic, Rochester, MN, USA

⁵Health Sciences Research, Biomedical Statistics and Informatics, Mayo Clinic, Rochester, MN, USA

⁶Division of Infectious Diseases, Mayo Clinic, Rochester, MN, USA

⁷Somali American Social Services Association, Rochester, MN, USA

⁸Language Services, Mayo Clinic, Rochester, MN, USA

⁹Intercultural Mutual Assistance Association, Rochester, MN, USA

¹⁰Alliance of Chicanos, Hispanics and Latin Americans, Rochester, MN, USA

Rachel Goetze, Mental Health Services, VA Maine Healthcare System, VA Center, Augusta, ME

Corresponding Author:

Mark L. Wieland, Division of Community Internal Medicine, Mayo Clinic, 200 First Street SW, Rochester, MN 55905.

Email: Wieland.mark@mayo.edu

Introduction

Immigrants often arrive to the United States (US) at a healthier weight compared to the general US population, but these healthy weight advantages disappear over time, and rates of obesity, with associated complications, rise.¹⁻⁷ Obesity is precipitated, in part, by systematic factors that promote the adoption of unhealthy behaviors after immigration, namely, a sedentary lifestyle and consumption of calorie dense foods.⁸⁻¹¹

Evidence-based health promotion programs are effective at changing dietary and health behaviors in general populations,¹² but despite calls for interventions to address obesity and obesity-related behaviors among immigrant populations,¹³⁻¹⁵ few treatment studies have been reported. Results of existing studies suggest that interventions culturally tailored to immigrant groups may be more successful than applying standard (not culturally targeted) interventions.^{16,17}

One difficulty in designing interventions to promote weight loss and healthy behaviors is that the reasons for weight gain among immigrant groups are multiple and complex, including individual, interpersonal, social, community, and policy-related factors.^{18,19} Community-based participatory research (CBPR) is a means to collaboratively investigate health topics.²⁰⁻²² Rochester Healthy Community Partnership (RHCP) is a 16-year CBPR partnership in Minnesota that develops evidence-based health promotion interventions with immigrant groups. In the “Healthy Immigrant Families” (HIF) project, RHCP partners co-created an intensive face-to-face family-focused intervention of 12 modules delivered to Somali and Hispanic participants by bilingual interventionists.²³ At 12 months, there were significant improvements in the primary outcome of dietary quality compared with wait list controls,²⁴ suggesting this tailored intervention could meet the unique needs of immigrant communities. However, the intensity of the intervention (home-based with multiple family members and professional HPs) limits its dissemination potential, and the intervention did not explicitly target healthy weight loss nor specifically recruit overweight or obese participants.

RHCP then conducted a social network analysis among 1301 adults, both Hispanic ($n = 610$) and Somali ($n = 691$), and found that obesity clustered by social networks.^{25,26} Past research demonstrated that a range of social network characteristics are associated with obesity-related behaviors²⁷ and outcomes.²⁸ Furthermore, Social network interventions, which involve purposeful utilization of existing social networks in the natural environment,²⁹ have been shown to positively affect behavior change in a variety of settings and health outcomes.³⁰ Social network interventions have not been tested in immigrant groups, but they may be especially promising in these populations, where networks are more homogenous (i.e., higher homophily) than non-immigrant networks.^{31,32}

The objective of this study was to pilot test a social network-informed, CBPR-derived, health promotion program for feasibility outcomes in adults with overweight (BMI 25 to <30) or obesity (BMI ≥ 30) from Hispanic and Somali

immigrant communities. To achieve this objective, RHCP used a social ecological theoretical framework to re-design the HIF intervention to account for the dynamic interplay between personal, social, and environmental factors of health behaviors. The materials were tailored for overweight and obese adults from Hispanic and Somali immigrant communities to be delivered by lay HPs within their social networks. We expected that the social network intervention would be a feasible and acceptable approach for health promotion in these immigrant communities. We explored if the intervention was associated with a reduction in body mass index (BMI) and other biomarkers associated with obesity and promoted the adoption of a healthy lifestyle. The adaptation of the intervention occurred during the onset of the coronavirus-2019 (COVID-19) pandemic.

Methods

Using a pre-post study design, four social networks of adults (2 Hispanic and 2 Somali) with 39 network participants were enrolled to receive the in-person intervention (which was modified with the onset of COVID-19). This study was approved by the Mayo Clinic Institutional Review Board (IRB# 19-011574) and participants provided written informed consent.

Lay HPs were selected from network opinion leaders identified in the network analysis or by community partners within the Hispanic and Somali communities. These individuals were approached by RHCP members who explained the study and HP role.

Training of Lay HPs

Our study team recently described the training procedures for interventionists.³³ For this project, the training was streamlined to account for delivery in networks, thereby enhancing intervention scalability. In the HIF intervention, we learned that while startup training is important, ongoing training and supervision is crucial. The HPs and the intervention oversight clinicians met every 2 weeks for 1 hour to review the content for the next 2 sessions and to answer questions related to the ongoing groups (initially in-person, and then by telephone during the COVID-19 pandemic).

Intervention

The intervention consisted of community-based mentoring and education delivered by trained Hispanic and Somali HPs to their social networks over a period of 3 months. HPs provided support and monitored progress on goals toward improved diet, physical activity level, and weight loss via six evidence-based strategies: Tracking, Goal Setting, Mindfulness, Social Support, Problem-Solving Skills, and Motivational Strategies.³⁴ Participants were informed that one of the goals was for a weight loss of 3%. Additional goals included reduction of portion sizes of calorie dense foods, a shift of relative dietary content to increase fruit and vegetable

| Weekly Group Session Outline | Content for Weekly Group Sessions |
|--|---|
| <ul style="list-style-type: none"> • 5 minutes: Welcome • 5 minutes: Review of goals from prior week • 10 minutes: Review of food and/or activity tracking • 15 minutes: New weekly topic • 20 minutes: Set SMART* goals for the following week • 5 minutes: Positive reflections <p>*Specific Measureable Achievable Relevant Timely</p> | <ol style="list-style-type: none"> 1. My Plate; SMART goal setting; Food tracking 2. My Plate: fruits and vegetables; Weigh-ins; Activity tracking 3. Triggers for over-eating; Mindful eating 4. Sugars in food and beverages; How to be physically active 5. Fats; Healthy cooking strategies 6. Importance of physical activity 7. Social support 8. Stress eating; Mindful eating 9. Loss of control; Managing problem foods; Social eating situations 10. Planning healthy meals 11. Self-compassion with eating 12. How to keep going long term |
| Group Session Goals | Group Session Strategies |
| <ul style="list-style-type: none"> • Reduction of portion size (My Plate) • Shift of relative dietary content to My Plate proportions (i.e., 50% fruits and vegetables) • 150 minutes per week of moderate to vigorous physical activity | <ul style="list-style-type: none"> • Food records • Physical activity trackers • Weight monitoring • SMART goal setting • Feedback and re-enforcement • Modeling and social support • Problem solving • Motivational enhancement |
| Intervention Adaption during the COVID-19 Pandemic | |
| <ul style="list-style-type: none"> • Suspended weekly group session content sessions (sessions 1-4 were delivered) • Weekly check-ins by HP with participants in their social networks, supplemented by organic communication via closed social media platforms <ul style="list-style-type: none"> ○ Continued group session strategies (tracking, goal setting, social support, problem solving strategies and motivational strategies) ○ Tracking of food consumption, physical activity, and weight ○ Shared examples of healthful practices during the pandemic (e.g., shared photos of food preparation, home-based exercise routines) • HPs communicated questions or concerns from participants to the health care team. Answers, strategies, and suggestions were provided. | |

Figure 1. Intervention outline and session topics.

consumption, and 150 minutes per week of moderate to vigorous physical activity.

Each of the twelve sessions was to target a particular behavior for weight loss (Figure 1). All sessions included goal setting, review of food and/or activity tracking, and positive reflections. Specific strategies for weight loss, including regular weigh-ins, completion of food and physical activity records, reducing portion sizes, planning meals, use of My-Plate for dietary proportions, removing problem foods from the home, increasing physical activity level, and reducing sedentary behavior were incorporated into the intervention.

Intervention Adaptation During the COVID-19 Pandemic

The intervention began in February 2020, and in mid-March, the weekly face-to-face group visits were canceled in response

to COVID-19 physical distancing guidelines (4 sessions completed). The study team, including HPs and RHCP community and academic partners, met to discuss options for the study. Participants all endorsed enthusiasm for continuing the intervention, but it was felt that participants were not prepared to transition the education sessions to virtual formats (communities had not yet coalesced around shared video communication platforms in the early days of the pandemic). Instead, each social network came together on a closed social media platform to continue at least weekly check-ins and more frequent communication, where HPs and network members promoted tracking, goal setting, social support, problem-solving, and motivational strategies. In this way, the group session strategies (but not content) were sustained (Table 1). All network members participated in these sessions during weeks 4–12, with average attendance of 80%–100% at each meeting. The HPs from each group also met virtually every 2

Table 1. Participant Ratings of the Intervention (N = 38).

| | Percent |
|--|---------|
| General reaction to the whole program | |
| Really like it | 94.7 |
| Think it was just OK | 5.3 |
| Did not like it | 0 |
| Would you recommend the program to family or friends who are overweight? | |
| Yes, definitely | 100 |
| Somewhat | 0 |
| No | 0 |
| Did participating in the program make you want to do anything different to be healthy? | |
| Yes | 94 |
| No | 5.3 |
| Motivated to exercise | |
| Yes | 92.1 |
| No | 7.9 |
| Motivated to eat a healthy diet | |
| Yes | 94.7 |
| No | 5.3 |
| Motivated to lose weight | |
| Yes | 84.2 |
| No | 15.8 |
| After completing the program, do you feel confident about eating a healthy diet? | |
| Yes, much more confident | 91.7 |
| Somewhat more confident | 8.3 |
| No, not at all confident | 0 |
| After completing the program, do you feel confident about being physically active? | |
| Yes, much more confident | 91.9 |
| Somewhat more confident | 5.4 |
| No, not at all confident | 2.7 |
| After completing the program, do you feel confident about losing weight? | |
| Yes, much more confident | 83.3 |
| Somewhat more confident | 16.7 |
| No, not at all confident | 2.7 |

weeks with study staff to provide support and answer questions.

Measures

Baseline and 3-month measures were conducted in-person according to institutional pandemic guidelines for study visits.

Demographic Measures

Study participants reported age, gender, ethnicity, country of birth, language spoken at home, annual household income, and education level.

Feasibility, Acceptability, and Adaptation Measures

Feasibility was assessed via recruitment (goal of 4 social networks; 2 Hispanic and 2 Somali) and retention rates at 3-month follow-up. Acceptability constructs were explored with survey items derived from the health communication assessment tool produced by the National Cancer Institute.³⁵ This survey also included questions about the perceived impact of the intervention on motivation and confidence.

After completing the intervention, focus group were conducted with all HPs and a subset of participants to explore overall experience with the program, facilitators of success during the COVID-19 pandemic, and opportunities for improvement and future expansion of the program. Four focus groups were conducted: HPs (n = 4); Somali women (n = 6); Somali men (n = 6), and Hispanic mixed gender (n = 7). Focus groups with HPs were conducted in English while Somali and Hispanic groups were conducted in Somali and Spanish, respectively, by bilingual RHCP members with qualitative moderation training.³⁶ All interviews were recorded, translated by the moderator (if applicable), and transcribed for analysis.

Biometric Measures and Health Behaviors

Weight was measured to the nearest .1 kg using a portable scale (Seca 880 Digital Floor Scale). Participants were asked to remove shoes prior to measurements. Seated *blood pressure* (systolic and diastolic) measurements were made on the right arm using an automated blood pressure device after sitting quietly for five minutes.³⁷ Blood pressure was measured three times and the average of the second and third readings were used in analyses. *Waist circumference* was measured to the nearest .1 cm at the narrowest part of the torso between the ribs and the iliac crest. *Fasting glucose* and *cholesterol* were collected as whole blood samples by a single finger prick. The portable Whole Blood Lipid Screen Cholestech LDX Analyzer was used to analyze specimens, which combines enzymatic methodology and solid-phase technology measured by reflectance photometry to measure total cholesterol, triglycerides, and glucose in whole blood. A dietary screener of seven items adapted from the Food Behavior Checklist, which has been used successfully among diverse low-income populations,³⁸ was used to assess *servings of fruits and vegetables per day* as well as the extent to which participants consume *fruits/vegetables as snacks and regular soda* (4-point Likert scales). *MET-minutes per week* for energy expended from carrying out physical activity was assessed using the International Physical Activity Questionnaire.³⁹

Data Analysis

Categorical variables were reported with counts and percentages. Means and standard deviations were reported to describe continuous variables. Changes in continuous

endpoints were tested with two-sided, paired t-tests using the difference of the post-measurement minus the pre-measurement values. Because the distributions of the triglyceride and MET-minute values were skewed, they were log transformed for analysis. All tests were done with 5% type I error rates. All analyses were done using SAS version 9.4. (SAS and all other SAS Institute Inc product or service names are registered trademarks or trademarks of SAS Institute Inc, Cary, NC, USA).

Qualitative data from the focus groups were analyzed using template analysis.⁴⁰⁻⁴² Using this approach, a template of themes from a small section of the data and targeted themes were developed and then applied to the larger dataset. Data from HPs were used as a template to inform the rest of the analysis from participant transcripts.

Results

There were 39 study participants: median age was 48 years, 60.5% were female, 93% were born outside the US, 59% self-identified as Hispanic, and 41% self-identified as Somali. Most participants reported annual household income <\$30,000 (51.3%) and education level of high school or lower (60.6%).

Feasibility

Recruitment targets were achieved: 4 social networks (2 Hispanic and 2 Somali; total N = 39). The retention rate in the program at 12 weeks was 100%, with all 39 participants completing 12-week measures (one participant abstained from the post-intervention acceptability survey).

Acceptability

In the post-intervention survey, participants reported very high acceptability and 95% said participating in the program made them want to do new things to be healthy. Participants also reported that the program caused them to feel much more confident about healthy behaviors and weight loss (Table 1).

Results from focus group analysis were clustered into two main categories (Table 2): program successes and facilitators and challenges and opportunities for improvement.

Physiologic and Health Behaviors' Outcomes

Comparing pre- and post-intervention health measures, there were improvements in weight, blood pressure, total cholesterol, triglycerides, servings of fruits and vegetables per day, use of fruits and vegetables as snacks, drinking regular soda, and physical activity. There were no changes in glucose, waist circumference, or drinking other sugar-sweetened beverages (fruit drinks, punch, or sports drinks) (Table 3).

Discussion

In this community-based participatory pilot study among members of two immigrant communities, a social network weight loss intervention delivered by lay HPs was feasible and acceptable. Study participants highly rated the intervention, and all participants completed the program despite the shift from in-person to remote meetings due to the onset of COVID-19, and overall, participants lost weight and made positive diet and physical activity changes. The findings of this pilot project suggest that a weight loss intervention designed by a team of experts partnered with community stakeholders can be successfully delivered by lay community members to members of their social networks.

Survey results from this study indicated that motivation and confidence to eat a healthier diet and be physically active were positively impacted by the intervention. Qualitative results suggested that this motivation and confidence were facilitated by social network effects and peer mentorship. Participants felt supported by their HP and peers in culturally concordant groups to achieve their health goals. This trust and support also facilitated group accountability, which in turn facilitated individual motivation. Peer mentoring has been shown in past research to be effective in promotion of healthy eating and physical activity among groups with low socioeconomic position.^{43,44}

It is striking that all participants completed the program despite the shift in format from in-person to virtual due to the COVID-19 pandemic. Importantly, new educational content was not delivered after week 4, further supporting the importance of social network factors as a primary mechanism for behavior change in this intervention. Therefore, the ways of reaching and supporting participants may be more important than how much health information is provided. Simulation models from a previous study suggested that traditional weight loss interventions frequently fail because they lack consideration of the participant's social networks, and that network-driven interventions may be highly effective.⁴⁵ Therefore, interventions using social networks in immigrant communities to interface with evidence-based programs for positive behavior change represent a promising public health approach. The 100% end of study retention also speaks to a strength of CBPR for health promotion among immigrant groups.

Study participants lost 2% of their body weight on average. The goal of this intervention was to guide and support participants to achieving a 3% weight loss. Initially, this project was designed to be an in-person intervention and it may be that the shift to a remote intervention and cessation of delivery of new content past week 4 due to COVID-19 precautions had a negative impact on weight loss outcomes. However, it is notable that despite this unexpected shift in treatment delivery method, 36% of participants lost at least 3% of their body weight. Additionally, COVID-19 has been associated with weight gain in the United States.^{46,47} This partnered with observed significant reductions in blood pressure, cholesterol,

Table 2. Evaluation of the Social Network Intervention: Themes and Quotations.

| Themes | Description | Exemplar quotes |
|---|--|---|
| Successes and facilitators Cultural concordance and familiarity with participants' social network. | Participants and HPs noted that shared identity and cultural beliefs facilitated their enrollment and retention in the intervention. Cultural and linguistic group concordance as well as intervention resources in their language enhanced participation. In the Somali groups, gender concordance was also a facilitator. | <p>Speaking the same language and being able to understand us. You see that is the biggest thing, when someone knows your lifestyle, your community, your language then they understand your culture... [Somali women].</p> <p>From what I know as a group the first thing we did to help each other was getting to know everyone in the group. So, knowing that and so and so and so are in my group gives me motivation. I feel that I am at a place where I can start something and have a goal [Somali women].</p> <p>I would not expect that it will be as successful if the people you brought together were not close, or if they were not part of the same social network. So, I think that is what made a difference in the program, that is what we learned. [Somali men]</p> <p>For me, yes, because the people who were doing the weight loss speak the same language, live the same culture, so it was easy...you're communicating with people, you communicate – let's say we have a meeting, you don't have to speak English. I communicate with them with the native language so they can understand me better [HPs]</p> <p>So sometimes, we have to make pressure, "Could you please, please, please tell us what was the weight," and I understand that they were – that's very sensitive. [HP group]</p> <p>[HPs] were excellent because they were always willing to help us... always asking for information and she [HP] was there to provide me with the things that I needed. They always facilitated everything we needed in terms of information, in terms of "lets go to the gym" "lets go to walk". They were always there to motivate us and help us. We even exchanged recipes. But yes, I think they were an important component to all. [Hispanic group]</p> <p>[HP] changed their lifestyle. [HP] knew the program and loved this kind of stuff, so taking her as a role model and leading the program helped us change very much. HP herself changed her meals, everything. She had lost weight, improved her body by becoming fit... and that helped us a lot. [Somali women]</p> <p>They provided us with reminders, like a calendar they remind us. They will call us; they will say plan a time, we will make for Sunday, if Sunday does not work, we can change to Monday, we can change to Saturday, so they helped us hugely. [Somali women]</p> |
| Health promoters as learners and supporters | HPs saw themselves as learners on the job, trying to simultaneously understand the content of the intervention and implementing it: navigating the group dynamics and how to approach participants to follow through especially in sharing sensitive information such as their weight were described as difficult. As learners they were engaged with participants in all program activities and saw this as reinforcement for participation. Intervention participants however perceived HPs engagement as very supportive, emotionally and physically. | |

(continued)

Table 2. (continued)

| Themes | Description | Exemplar quotes |
|--|---|---|
| Personal Motivations | Few participants described their participation as having health problems that would benefit from lifestyle intervention. Others were motivated to be role models for their community. | <p>The motivation was me always thinking to become right healthy weight. To lose the right amount of weight and also to become a role model for my community. When I reach my goal today, then tomorrow inform my community what I benefited from. A lot of people are not even aware of the oils we use to cook with our food, they are not aware. A lot of people are not aware that walking is healthy, they are not aware. Some many people in the community, my community. Our Somalian do not see exercise as part of life, we do not think that. [Somali women]</p> <p>Yes, what interested me was that I was overweight. I felt that I was too heavy and very fat and then when they talked to me about the project it interested me. I was doing several weight loss projects [programs] to lose weight but I wasn't reaching the goal. [Hispanic group]</p> <p>They always have—what works for the other person, they always go like, “I tried this and then we always share a weight before and then I started this.” And then I said, “This is what works for me. This is what I’ve been eating.” And then the people were also saying the same thing. So it was like inclusion. We would share things—teamwork. [HP group]</p> <p>That was the reason that kept us together. Like in the morning we receive a “good morning” “look what I am having for breakfast. Look what I am having for dinner. Look at my snack.” That was motivating. I said, “she ate that I am... going to buy that snack because she is eating it, or that food.” Like that. That is how it worked in these groups. [Hispanic group]</p> <p>You feel you know it’s boring and sometimes you [do not want to do it yourself] but if you have commitment or you have promised with other people [in the group] and they come to you... whenever one of my friends comes to me, and tells me ‘hey lets go [exercise],’ that helps. You sometimes lose your vision, and the group gives you motivation. [Somali men]</p> <p>What I think benefited this program in truth is not just the want or the desire to lose weight or reduce your portions, those were not the only intent. One major influence was that social connection that was between us and our desire as a group to accomplish something and do something... when probably I am down not willing to move forward and then one of the guys cheers me up I see that as a boost and so I think the social network really made a difference because these are people you trust, these are people you feel really comfortable with in doing exercises... “how could you share your weight with someone else or someone you don’t know”... That closeness, that trust that being comfortable among the group ... all that played a role... A place we could all talk about politics, catch up, how COVID is affecting all of us, and the challenges... it became a place of social gathering. [Somali men].</p> |
| Group support and motivation from others | Social support provided motivation for physical activity and healthy living and the motivation for participants to maintain participation. | <p>Motivations from other people within the group were expressed in forms of sharing ideas on healthy foods and exercise and encouraging each other to be active, checking on each other via social platforms etc.</p> <p>The groups built on an already existing social network that facilitated trust, social connection and comfort among participants</p> |

(continued)

Table 2. (continued)

| Themes | Description | Exemplar quotes |
|---------------------|---|---|
| "Teaching the eyes" | <p>Visual representation was an important factor in participants motivation and ability to follow through the intervention program.</p> <p>The MyPlate concept that was adapted for the intervention was important to assist with portion control.</p> <p>The tracking sheet booklet that was filled out enabled participants to track the progress they were making each week and make adjustments for change.</p> | <p>MyPlate for each of the participants...it's very good and because they—it's a way—a good way to teach the eyes how much you are supposed to eat. [HP group]</p> <p>Yes, something very important that we had was The Plate that we got so we could see the portions that we were eating. Also, very important the booklet that we needed to fill out and noticing the progress of our nutrition, the weight each week and all that. [Hispanic group]</p> <p>But when I started the plan, we discovered the problem that we were eating too many carbohydrates, lots of bread, too many starches and very few vegetables. Then when we started with the plan, and we received the plate marked with the food [hand gestures making a circle] we needed to eat and the portions, that helped me. [Hispanic group]</p> <p>Being provided with the portion size plates to measure our food intake even if you do not use those plates knowing what needs to be visible on my plate today. The protein, the dairy to eat a well-balanced plate with all the calories. Even if you were not able to eat that in the morning to work hard to eat. I healthier more well-balanced plate for lunch or dinner. [Somali Women]</p> <p>HP gave us the booklets...those books, the guides, where we were marking the boxes with the food that we were eating. So, then we realized which things were healthy and which ones were not and we started to do the changes. [Hispanic group]</p> |
| Learning new things | <p>For many of the participants in the program, the knowledge they acquired about nutrition and physical activity was helpful. Many admitted they didn't know much about nutrition before the program. Others expressed that having a plan and a program to follow was new and important.</p> <p>The new knowledge enabled them to change their habits around eating, preparing foods, and being physically active in their daily lives. Participants stated that simple ideas such as rethinking what to eat or what to do if they are unable to go to the gym was important to their success.</p> | <p>I learned the importance of the vegetables, because I didn't have that [knowledge] in my brain, that I needed to eat a lot of vegetables or to add vegetables to everything... But when I started the plan, we discovered the problem that we were eating too many carbohydrates, lots of bread, too many starches and very few vegetables. Then when we started with the plan. [Hispanic group]</p> <p>I was adding to my meals: fruits and vegetables, that never before I gave to my family. I didn't even know that cooking so healthy was so tasty. I stopped eating meat, red meat... Hispanic group</p> <p>Before I did not have any program, but now I have plans, and if I fall out of the program, I get back to my routine. I have changed my eating habit and it has benefited me in many ways toward my life. [Somali women]</p> <p>Also, the other thing is exercise, I am able to exercise at my home, my time is counted. The time I do my house chores, the time I do my exercise, the time I want to walk, I benefited all those. [Somali Women]</p> <p>[The program] taught me to manage my thoughts instead of just eating and going for a run, but to retrace my thoughts: "What did I eat today, did I drink a cup of coffee today? Should I have another cup, should I put sugar or cream only?" learning what food was beneficial, which one was nutritious, what foods we should avoid, the ones we should reduce... Also, activities today we cannot go to the gym so learning ways to get around that. Knowing how to do activities and exercise from the comfort of your home. [Somali women]</p> |

(continued)

Table 2. (continued)

| Themes | Description | Exemplar quotes |
|---|--|---|
| Accountability, team effect and group reinforcement | <p>Within group accountability was reported as reinforcing for individuals to maintain their status in the program. Knowing that they would be held accountable by the group was motivating. Accountability was expressed as direct or sometimes indirect reminders from HPs, within group competitions and friendly challenges.</p> <p>Other group reinforcement included helping each other, maintaining positivity, being together, and sharing ideas of what had worked for individuals.</p> | <p>That was something that you know that I was not expecting, but then it helped me you know, that I am accountable for myself, that knowing that I'm going to be measured. I have a team that's watching me and asking how much you lose, what you do, how's your food? Things like that... So, my expectation was low but then as the program goes it increases. [Somali men]</p> <p>Our group is 2 groups. Those over fifty years old and those under fifty years. So, we have a competition, each group is thinking of ways to defeat the other group, and that was motivational but you have to understand that this challenge was not one of those that says let's get ahead of them. It was more of a group who knew one another truthfully, the motivation stemmed from not falling behind from the group because the group themselves were motivating you. [Somali men]</p> <p>What got us all out of that, what made it easier was the encouragement, the contact our group leaders had with us, and us wanting when you are always reminded what will happen for the next couple of weeks, or being informed of your weight being checked. So, we work hard. [Somali women]</p> <p>One thing that I like from our group was that we wanted to help each other. I was putting an effort because I was not doing it for me, and I didn't want to lag behind. "I want to reach my goal"...because I do not want to disappoint my team... and it was giving me the opportunity to help my team. [Hispanic group]</p> |
| CHALLENGES AND OPPORTUNITIES FOR IMPROVEMENT | | |
| Challenges for health promoters | <p>Many of the challenges reported included, for HPs, training was condensed, and time was short; having to learn new information and relay to the intervention participants. Actual intervention time was short as HPs had to address the many questions that participants had. There were varying group and individual dynamics and having to learn and navigate those dynamics posed a challenge for HPs. These included varying work schedules for participants.</p> | <p>Having 2 sessions in 1 hour, I mean that was hard... yeah, it's too hard for 1 hour... and they [participants] having too much questions. [HP]</p> <p>That's kind of a little bit time-consuming because they were not on time, but they were kind of motivated. They want to do the program, but they kind of sometimes not on time and then not... time's a factor when you've got a group, because some people can at 1 time, and other people can't, and it's just a struggle. Some people can make it a certain day and other people can't. [HP]</p> |
| Challenges for participants | <p>Many of the challenges reported included letting go of habits, meeting cultural expectations, competing priorities, etc.</p> | <p>So we get invited to events like weddings, and we cannot refuse it... I mean in our culture itself, is that when someone puts a plate in front of you and you do not eat, but just touch a little bit... And another thing is when someone puts a plate in front of you most of the time, they take it as disrespect if you don't eat it. [Somali men]</p> |

(continued)

Table 2. (continued)

| Themes | Description | Exemplar quotes |
|---|--|--|
| COVID-19 pandemic challenges versus opportunities | <p>All participants reported that the pandemic had an impact on the intervention but also created opportunities and avenues for them to stay connected with each other and still participate in the program.</p> <p>Inability of participants to register and exercise in at the gym, follow weekly physical activities in a group setting, take walks with friends, get out for errands were reported as post-COVID challenges.</p> <p>However, they found opportunities and avenues to support each other via technology and social media platforms.</p> | <p><i>I think if my group was like—they were more enjoying when we were in-person. They made some friends that they have time to do things together and then see each other out of the house. They were kind of happier when we were doing it in-person. [HP]</i></p> <p><i>There were a lot of things since we were all getting together. We talked about our families; we were helping each other with many things. That has gone out of the way now since COVID we cannot get together. [Somali women]</i></p> <p><i>The Messenger.... group where we were posting things about our activities, whether we were going for a walk, and we took pictures. We also included what we were eating...everyone liked it, we were all looking after each other. [Hispanic group]</i></p> <p><i>I think if we can meaning you do not have to have diabetes or in the process to acquire it, a prediabetic. You don't have to [be diabetic] ...to change the way you eat, your physical activity. We would like to add that all the families...It can be a family thing, not only mom or dad, meaning to start from the ground up, with our kids and do everything in general. [Hispanic group]</i></p> <p><i>I mean everybody's a candidate because nobody eats healthy I mean sometimes, they're skinny, but I mean they're not healthy but I mean everybody's eligible. [HPS]</i></p> <p><i>I would like for all the people to do it. But I do not want to say "I am on a diet" no, for me is a change in the lifestyle. Something that can stay.... that the lifestyle can stay with us. [Hispanic group]</i></p> <p><i>Once or twice a month as a community to have them in a gathering and to talk about health food for the whole family. Demonstrate food that adults', children, parents, grandparents can eat. Like how some apartment buildings have a community room where they have gathering for the residence once a year or twice a year you know. [Hispanic group]</i></p> |
| Recommendations and suggestions for program improvement | <p>Expand eligibility and inclusion criteria to include families.</p> <p>Reframing intervention to reflect general lifestyle changes and not defined by disease condition or weight status.</p> <p>Provide General Nutrition classes and occasional education presentation</p> | |

Table 3. Biometric and Health Behavior Measures Before and After the Intervention (N = 39).

| | Baseline ^e | Week 12 ^e | P value ^g |
|--|----------------------------|----------------------------|----------------------|
| Weight, kg | 91.6 (15.9) | 89.7 (16.6) | <.0001 |
| Servings of fruit per day | 1.7 (1.0) | 2.9 (2.1) | .013 |
| Servings of vegetables per day | 1.9 (1.2) | 2.6 (1.4) | .009 |
| Fruits and vegetables as snacks ^a | 2.4 (.9) | 3.0 (.8) | .001 |
| Regular soda drinks ^b | 1.6 (.7) | 1.3 (.4) | .003 |
| Fruit drinks, punch, or sports drinks ^c | 1.7 (.8) | 1.5 (.6) | .10 |
| Total MET-minutes per week ^d | 2689.5 (3230.8) | 6595.1 (7371.6) | .02 |
| Log-transformed total METS-minutes per week | 6.5, 7.3, 8.0 ^f | 7.9, 8.2, 9.0 ^f | .0005 |
| Systolic blood pressure, mm Hg | 133.9 (16.9) | 127.2 (15.8) | .001 |
| Diastolic blood pressure, mm Hg | 81.0 (9.5) | 75.8 (9.6) | <.0001 |
| Waist circumference, cm | 102.3 (13.7) | 100.6 (12.3) | .14 |
| Glucose, mg/dL | 90.4 (18.4) | 91.9 (11.1) | .73 |
| Total cholesterol, mg/dL | 205.1 (49.4) | 190.8 (50.1) | .02 |
| Triglycerides, mg/dL | 83, 151, 252 ^f | 69, 93, 196 ^f | .001 |
| Log-transformed triglycerides | 4.4, 5.0, 5.5 ^f | 4.2, 4.5, 5.3 ^f | <.0001 |

^a 4-point Likert scale of frequency in response to, "Do you eat fruits and vegetables as snacks?"

^b 4-point Likert scale of frequency in response to, "Do you drink regular soda?"

^c 4-point Likert scale of frequency in response to, "Do you drink fruit drinks, punch, or sport drinks?"

^d Energy expended from carrying out physical activity as measured by the International Physical Activity Questionnaire.

^e All values are reported as means and standard deviations unless otherwise specified.

^f Reported as 25th percentile, median, and 75th percentile.

^g p-values are based on two-sided, paired t-tests.

and triglycerides suggests that 2% weight loss during this time was clinically meaningful.

Successful weight loss and improvements in other biometric measures were supported by healthy changes to diet and physical activity during this intervention. At baseline, study participants reported consuming an average of 3.6 servings of fruits and vegetables per day. Fruit and vegetable intake increased to 5.5 servings daily, approaching the dietary recommendation of six servings of fruits and vegetables per day. Physical activity also increased more than two-fold on average. Therefore, healthy changes in diet and physical activity during this pilot were both statistically significant and clinically meaningful.

This study had several limitations. The study was not randomized and lacked a control group; therefore, a causative statement cannot be made. Additionally, practice-based conclusions cannot be drawn based on the biometric data presented. Third, health behaviors were based on self-report, which are not as accurate as objective measures. Because individual groups operated both formally through weekly sessions and informally through their social network ties, an accurate assessment of intervention dose could not be assigned to each participant or group. Finally, the intervention switched from face-to-face to virtual and educational modules were truncated after week 4 due to the pandemic, so the intervention was not delivered as intended. Future studies should use randomization and direct measures of health behaviors should be included.

Conclusion

During the COVID-19 pandemic, in this preliminary study, lay health promoters from two immigrant communities were able to shift from an in-person 12-session behavioral social network weight loss intervention to a remote intervention. Participants remained active in the program, they found it highly acceptable and motivating, and they achieved clinically meaningful changes in weight loss, blood pressure, cholesterol, healthy changes in nutrition, and increased weekly physical activity. Future research with larger sample sizes will be integral to better understand and expand these initial findings.

So What? Implications for Health Promotion Practitioners and Researchers

- **What is already known on this topic:** Immigrants to the United States frequently gain weight and can experience the onset of obesity-related health conditions, but utilization of evidence-based health promotion programs is low.
- **What does this article add:** In this pilot project, the training of lay health promoters from immigrant communities in the delivery of a weight loss program to members of their social networks demonstrated strong feasibility and acceptability, and resulted in weight loss, lower blood pressure, lower cholesterol, and improvements in nutrition and physical activity levels.

- **What are the implications for health promotion practice or research:** This study suggests that interventions using social networks in immigrant communities to interface with evidence-based resources for positive behavior change represent a promising public health approach.

Acknowledgments

The authors thank the RHCP partners who contributed to the organization, implementation, and dissemination of this work, and to the health promoters – Rosario Guerrero, Hindi Elmi, Eleazar Flores, and Mohamud Nur.

Authors' Contribution

M. Wieland participated in study design, interpretation of data, drafting of the article and approved the submitted article. J Njeru participated in study design, interpretation of data, drafting of the article and approved the submitted article. G. Asiedu participated in study design, data analysis, interpretation of data, drafting of the article and approved the submitted article. K. Zeratsky participated in interpretation of data, drafting of the article and approved the submitted article. M. Clark participated in study design, interpretation of data, drafting of the article and approved the submitted article. R. Goetze participated in study design, interpretation of data, drafting of the article and approved the submitted article. C. Patten participated in study design, interpretation of data, drafting of the article and approved the submitted article. S. Kelpin participated in study design, interpretation of data, drafting of the article and approved the submitted article. P. Novotny participated in data analysis, interpretation of data, drafting of the article and approved the submitted article. K. Lantz participated in interpretation of data, drafting of the article and approved the submitted article. Y. Ahmed participated in study design, interpretation of data, drafting of the article and approved the submitted article. L. Molina participated in study design, interpretation of data, drafting of the article and approved the submitted article. G. Porraz Capetillo participated in study design, interpretation of data, drafting of the article and approved the submitted article. A. Osman participated in study design, interpretation of data, drafting of the article and approved the submitted article. M. Goodson participated in study design, interpretation of data, drafting of the article and approved the submitted article. I Sia participated in study design, interpretation of data, drafting of the article and approved the submitted article.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This publication was supported by NIH Grant No. R01 HL 111407 from the National Heart, Lung, and Blood Institute and by CTSA Grant

No. UL1 TR000135 from the National Center for Advancing Translational Science (NCATS), and by the Mayo Clinic Office of Health Disparities Research. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the NIH. The funding bodies had no role in study design; in the collection, analysis, and interpretation of data; writing of the manuscript; and in the decision to submit the manuscript for publication.

ORCID iDs

Mark L. Wieland  <https://orcid.org/0000-0001-6166-3949>

Ethical Approval

All study procedures were approved by the Mayo Clinic Institutional Review Board, IRB# 19-011 574

References

1. Goel MS, McCarthy EP, Phillips RS, Wee CC. Obesity among US immigrant subgroups by duration of residence. *J Am Med Assoc.* 2004;292:2860-2867.
2. Kaplan MS, Huguet N, Newsom JT, McFarland BH. The association between length of residence and obesity among Hispanic immigrants. *Am J Prev Med.* 2004;27:323-326.
3. Koya DL, Egede LE. Association between length of residence and cardiovascular disease risk factors among an ethnically diverse group of United States immigrants. *J Gen Intern Med.* 2007;22:841-846.
4. Steffen PR, Smith TB, Larson M, Butler L. Acculturation to Western society as a risk factor for high blood pressure: A meta-analytic review. *Psychosom Med.* 2006;68:386-397.
5. Creatore MI, Moineddin R, Booth G, et al. Age- and sex-related prevalence of diabetes mellitus among immigrants to Ontario, Canada. *CMAJ* 2010;182:781-789.
6. Lear SA, Humphries KH, Hage-Moussa S, Chockalingam A, Mancini GB. Immigration presents a potential increased risk for atherosclerosis. *Atherosclerosis.* 2009;205:584-589.
7. Lutsey PL, Diez Roux AV, Jacobs DR Jr., et al. Associations of acculturation and socioeconomic status with subclinical cardiovascular disease in the multi-ethnic study of atherosclerosis. *Am J Public Health.* 2008;98:1963-1970.
8. Centers for Disease Control and Prevention. Prevalence of fruit and vegetable consumption and physical activity by race/ethnicity-United States. *MMWR (Morb Mortal Wkly Rep).* 2005;56:301-304.
9. Crespo CJ, Smit E, Andersen RE, Carter-Pokras O, Ainsworth BE. Race/ethnicity, social class and their relation to physical inactivity during leisure time: Results from the Third National Health and Nutrition Examination Survey, 1988-1994. *Am J Prev Med.* 2000;18:46-53.
10. Sternfeld B, Ainsworth BE, Quesenberry CP. Physical activity patterns in a diverse population of women. *Prev Med.* 1999;28:313-323.
11. Gadd M, Sundquist J, Johansson S-E, Wändell P. Do immigrants have an increased prevalence of unhealthy behaviours and risk

- factors for coronary heart disease? *Eur J Cardiovasc Prev Rehabil.* 2005;12:535-541.
12. Lorig K, Ritter PL, Villa FJ, Armas J. Community-based peer-led diabetes self-management: A randomized trial. *Diabetes Educ.* 2009;35:641-651.
 13. Kandula NR, Kersey M, Lurie N. Assuring the health of immigrants: What the leading health indicators tell us. *Annu Rev Publ Health.* 2004;25:357-376.
 14. Singh GK, Kogan MD, Yu SM. Disparities in obesity and overweight prevalence among US immigrant children and adolescents by generational status. *J Community Health* 2009;34:271-281.
 15. Davidson EM, Liu JJ, Bhopal RS, et al. Consideration of ethnicity in guidelines and systematic reviews promoting lifestyle interventions: A thematic analysis. *Eur J Publ Health.* 2014;24:508-513.
 16. Renzaho AM, Mellor D, Boulton K, Swinburn B. Effectiveness of prevention programmes for obesity and chronic diseases among immigrants to developed countries - a systematic review. *Public Health Nutr.* 2010;13:438-450.
 17. Nierkens V, Hartman MA, Nicolaou M, et al. Effectiveness of cultural adaptations of interventions aimed at smoking cessation, diet, and/or physical activity in ethnic minorities. a systematic review. *PLoS One.* 2013;8:e73373.
 18. Dunn JR, Dyck I. Social determinants of health in Canada's immigrant population: Results from the National Population Health Survey. *Soc Sci Med.* 2000;51:1573-1593.
 19. Malmusi D, Borrell C, Benach J. Migration-related health inequalities: Showing the complex interactions between gender, social class and place of origin. *Soc Sci Med.* 2010;71:1610-1619.
 20. Horowitz CR, Robinson M, Seifer S. Community-based participatory research from the margin to the mainstream: Are researchers prepared? *Circulation.* 2009;119:2633-2642.
 21. Shalowitz MU, Isacco A, Barquin N, et al. Community-based participatory research: A review of the literature with strategies for community engagement. *J Dev Behav Pediatr.* 2009;30:350-361.
 22. Israel BA, Schulz AJ, Parker EA, Becker AB. Review of community-based research: Assessing partnership approaches to improve public health. *Annu Rev Publ Health.* 1998;19:173-202.
 23. Wieland ML, Weis JA, Hanza MM, et al. Healthy immigrant families: Participatory development and baseline characteristics of a community-based physical activity and nutrition intervention. *Contemp Clin Trials.* 2016;47:22-31.
 24. Wieland ML, Hanza MMM, Weis JA, et al. Healthy immigrant families: Randomized controlled trial of a family-based nutrition and physical activity intervention. *Am J Health Promot.* 2018;32:473-484.
 25. Wieland ML, Njeru JW, Okamoto JM, et al. Association of social network factors with weight status and weight loss intentions among hispanic adults. *J Behav Med.* 2020;43:155-165.
 26. Njeru JW, Wieland ML, Okamoto JM, et al. Social networks and obesity among Somali immigrants and refugees. *BMC Publ Health.* 2020;20:238.
 27. Fletcher A, Bonell C, Sorhaindo A. You are what your friends eat: systematic review of social network analyses of young people's eating behaviours and bodyweight. *J Epidemiol Commun Health.* 2011;65:548-555.
 28. Christakis NA, Fowler JH. The spread of obesity in a large social network over 32 years. *N Engl J Med.* 2007;357:370-379.
 29. Valente TW. Network interventions. *Science.* 2012;337:49-53.
 30. Latkin CA, Knowlton AR. Social network assessments and interventions for health behavior change: A critical review. *Behav Med.* 2015;41:90-97.
 31. Centola D. An experimental study of homophily in the adoption of health behavior. *Science.* 2011;334:1269-1272.
 32. Rostila M. Birds of a feather flock together—and fall ill? Migrant homophily and health in Sweden. *Social Health Illness.* 2010;32:382-399.
 33. Bronars CA, Hanza MA, Meiers SJ, et al. Treatment fidelity among family health promoters delivering a physical activity and nutrition intervention to immigrant and refugee families. *Health Educ Behav.* 2016;Accepted Manuscript In Press.
 34. Artinian NT, Fletcher GF, Mozaffarian D, et al. Interventions to promote physical activity and dietary lifestyle changes for cardiovascular risk factor reduction in adults: a scientific statement from the American Heart Association. *Circulation.* 2010;122:406-441.
 35. US D of Health and Human Services. *Making Health Communication Programs Work.* Washington DC: National Institutes of Health, National Cancer Institute; 2004.
 36. Amico KL, Wieland ML, Weis JA, Sullivan SM, Nigon JA, Sia IG. Capacity building through focus group training in community-based participatory research. *Educ Health (Abingdon).* 2011;24:638.
 37. Chobanian AV, Bakris GL, Black HR, et al. The seventh report of the Joint National Committee on Prevention, detection, evaluation, and treatment of high blood pressure: the JNC 7 report. *JAMA.* 2003;289:2560-2572.
 38. Townsend MS, Kaiser LL, Allen LH, Joy AB, Murphy SP. Selecting items for a food behavior checklist for a limited-resource audience. *J Nutr Educ Behav.* 2003;35:69-77.
 39. Craig CL, Marshall AL, Sjostrom M, et al. International physical activity questionnaire: 12-country reliability and validity. *Med Sci Sports Exerc.* 2003;35:1381-1395.
 40. Brooks J, McCluskey S, Turley E, King N. The utility of template analysis in qualitative psychology research. *Qual Res Psychol.* 2015;12:202-222.
 41. McCluskey S, Brooks J, King N, Burton K. The influence of 'significant others' on persistent back pain and work participation: a qualitative exploration of illness perceptions. *BMC Musculoskel Disord.* 2011;12:236.
 42. King N. Doing template analysis. In: Symon G, Cassell C, eds. *Qualitative organizational research.* London: Sage; 2012: 426-50.
 43. Perez-Escamilla R, Hromi-Fiedler A, Vega-Lopez S, Bermudez-Millan A, Segura-Perez S. Impact of peer nutrition education on dietary behaviors and health outcomes among Latinos: A systematic literature review. *J Nutr Educ Behav.* 2008;40:208-225.

44. Visram S, Clarke C, White M. Making and maintaining lifestyle changes with the support of a lay health advisor: Longitudinal qualitative study of health trainer services in northern England. *PLoS One* 2014;9:e94749.
45. Bahr DB, Browning RC, Wyatt HR, Hill JO. Exploiting social networks to mitigate the obesity epidemic. *Obesity* 2009;17:723-728.
46. Bhutani S, vanDellen MR, Cooper JA. Longitudinal weight gain and related risk behaviors during the COVID-19 pandemic in adults in the US. *Nutrients*. 2021;13:671.
47. Zachary Z, Brianna F, Brianna L, et al. Self-quarantine and weight gain related risk factors during the COVID-19 pandemic. *Obes Res Clin Pract*. 2020;14:210-216.