Seeds of HOPE: Incorporating Community-Based Strategies to Implement a Weight-Loss and Empowerment Intervention in Eastern North Carolina

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ABSTRACT Seeds of HOPE (Health, Opportunities, Partnerships, and Empowerment) was a community-based participatory research project designed to implement an evidence-based weight loss and empowerment intervention aimed at increasing self-efficacy through peer support. HOPE Works, its model, has yielded significant weight loss and increases in participants’ ability to set and achieve goals, including in consumption of fruits and vegetables and in physical activity.

METHODS The Seeds of HOPE project was implemented through 3 peer leader recruitment approaches using Circle Leaders. Study participants met in hope circles to discuss various topics aimed at developing healthier lifestyles. Changes at 6-month intervals were assessed in health behaviors, weight, and hope. One-way ANOVA was used to test differences in mean change in weight and hope across the 3 recruitment approaches.

RESULTS Study participants (N = 146) lost weight (-3.3 pounds, P = 0.003, 95% CI: -5.40 – -1.27). Fruit consumption significantly increased (P = 0.04, 95% CI: 0.01-0.41) while no changes in vegetable consumption or physical activity were observed. No differences based on different leader recruitment approaches were found.

LIMITATIONS There were limitations in the power to fully detect differences across Circle Leader recruitment approaches; loss-to-follow up and representativeness of the sample were present. Further research is needed to determine if these approaches would be successful in other rural counties, with different genders, or with individuals in urban and/or higher socioeconomic populations.

CONCLUSIONS Participants found modest success in weight loss and fruit consumption. Authors find that community engagement strategies are helpful in finding mutually acceptable adaptations to implement interventions such as Seeds of HOPE in diverse communities.

Obesity is a persistent public health problem in the United States, given its contribution to a variety of adverse health outcomes including heart disease, diabetes, and some cancers [1, 2]. Over one-third of US adults (34.9%) are obese, with the highest prevalence among minority women [1]. North Carolina’s adult obesity rate is currently 30.1%, up from 20.9% in the year 2000 and from 12.3% in 1990 [3]. In addition, Eastern North Carolina counties report some of the highest obesity rates and worst performances for both health outcomes and health factors in the state [3, 4]. Among Eastern North Carolina adults aged 18 and older, two-thirds (65.7%) of adults were overweight or obese [3, 4]. While obesity is prevalent among all groups, women, low-income groups, and ethnic and racial minorities are disproportionately affected, with non-Hispanic African Americans self-reporting the highest prevalence of obesity (38.1%) in the period 2013-2015 [1, 5, 6].

Community-based participatory research (CBPR) is an emerging and integral approach to supporting sustainable health interventions [7]. CBPR enhances a community’s ability to address its health needs while increasing the researcher’s awareness and use of socially and culturally acceptable methods [7-9]. Low-income communities in particular experience disparate access to resources, contributing to a greater burden of disease (eg, obesity); CBPR practices work to identify these disparities and their causes [9]. CBPR provides a platform to create culturally appropriate measurement instruments, contributing to more effective interventions for researchers and communities [7, 10, 11].

HOPE (Health, Opportunities, Partnerships, and Empowerment) Works (HW), a weight management program, was a 6-month curriculum-based program that used peer leaders, called Circle Leaders (CLs), to facilitate discussions and activities among small groups of women [12]. Participants completed activities related to diet, exercise, weight control, stress management, goal setting, microenterprise, and other factors. [12]. The project used CBPR principles [13] and utilized community partners through collaborative efforts with community-based staff and a Community Action Council (CAC) [12, 13]. The HW model was evaluated for effectiveness, and results revealed signifi-
cant weight loss (-4.5 pounds), improved diet and physical activity, and increased sense of hope for participants [12].

Full details of the HW intervention and results are published elsewhere [12, 14]. The objective of the present study, Seeds of HOPE (SOH), was to assess the impact of implementing the HW model as a sustainable effort to address social determinants that minority women face in Eastern North Carolina. We hypothesized that community-informed adaptations to implement the evidence-based model would be successful in replicating study outcomes (decreased weight, increased hope) across different CL recruitment dissemination approaches.

Methods

Seeds of HOPE Study Design

SOH was developed through an iterative process of collaboration with the CAC and community coordinators over 2 and a half years. CBPR processes (ie, regular meetings to discuss ideas challenges, and to solicit feedback) were used to finalize the quasi-experimental design and methods of the study. Extended time for development was needed to address challenges in executing the project, including the illness and subsequent death of the original principal investigator, annual cuts to the budget, and staff turnover. The resulting dissemination design included modification of the original CL recruitment approaches, CL training time, and Circle meeting delivery schedules.

Circle Leader Recruitment

CLs were recruited through community organizations (eg, churches, community development corporations, health facilities) to deliver the intervention. Two additional CL recruitment approaches, former Circle members and general community members, were added based on community feedback. Former Circle members had participated in previous HOPE projects including HW, but had not previously held leadership positions as CLs. General community members were female volunteers who had no previous involvement with any of the HOPE projects.

Manual and Training

The core topics of the 12-session HW manual were augmented for SOH to include more detail on financial literacy, based on feedback from Community Coordinators (through weekly meetings) as well as community members and prior project Circle members (at one community event). CL training was also reduced from classroom style to 3 hours of individualized instruction prior to the start of the Circle. CLs had monthly conference calls led by community and academic staff to provide ongoing technical assistance, as opposed to the monthly 2-hour in person meetings in HW.

Circle Meeting Delivery Schedules

CLs chose the meeting schedule that best met the needs of their Circles. These options included weekly (1 hour/4 sessions per month), monthly (4 hours/1 session per month), and bimonthly (2 hours/2 sessions per month). All meeting schedules resulted in 4 hours of Circle contact per month (for a total of 6 months) and retained the HW meeting structure, including following the curriculum, providing a healthy snack, and dedicating time for group physical activity.

Study Sample

The study sample was comprised of women from 4 North Carolina counties—Duplin, Lenoir, Robeson, and Sampson. These counties were selected based on their high proportion of minorities and their rankings as counties with some of the worst health indicators and outcomes in the state. Robeson County, for example, ranks 100 out of 100 North Carolina counties for both health outcomes and health factors, based on data from the county health rankings [4]. CLs were recruited through various mechanisms such as newspaper advertisements, flyers, church bulletins, and word-of-mouth. CLs used their social networks to recruit women to join their Circles. Women were eligible to participate if they were 18 years or older, were not pregnant or planning to become pregnant in the next 6 months, and resided in 1 of the 4 counties. Women were not enrolled or excluded based on their current weight or BMI.

Measures

Surveys and Data Collection

Community administered surveys captured primary and secondary outcomes at both baseline and follow-up including weight, hope, and other demographics and information. Baseline surveys were completed at the first Circle meeting. Follow-up surveys were completed at the participant’s final Circle meeting. All surveys were confidential and only identifiable via code. Surveys were checked in the field, scanned, electronically entered into a database, and spot-checked for accuracy. Individual outliers were reviewed and corrected when identified.

Primary and Secondary Outcomes

Weight (lbs) was measured using standardized scales. Height (inches) was measured at baseline using only a standardized height chart. BMI (kg/m²) was calculated and categorized as normal (<25), overweight (25-29.9), and obese (30+).

Hope was measured using a 6-item self-report State Hope Scale (1 = definitely false to 8 = definitely true) to provide a total hope score ranging from 0-48 [15]. The State Hope Scale, commonly known as the Hope Snyder Scale, reveals higher scores as higher levels of hope, which is comprised of agency (belief in one’s capacity to initiate action) and pathways (belief in one’s ability to generate routes) to reach desired goals [15, 16].

Secondary outcomes included fruit and vegetable consumption (FVC) and physical activity (PA). FVC was
assessed using 2 questions adapted from the Behavioral Risk Factor Surveillance System (BRFSS) questions about daily servings of fruits, vegetables, and fruit and vegetable juices [17]. PA was assessed using the International Physical Activity Questionnaire short version, in which participants reported walking, moderate activity, and vigorous activity by days per week and minutes per day for the last 7 days [18, 19]. The activity was truncated for outliers (more than 180 minutes per day) and categorized (1 = low, 2 = moderate, 3 = high) based on activity, number of days per week, and minutes per day [18, 20].

**Process Measures**

CLs reported group attendance and program fidelity each month. Attendance was recorded at each session and used to calculate attendance rates. CLs reported the session covered, physical activity completed, and any successes, challenges, or resources needed. This allowed study staff to assess treatment fidelity, or the degree to which the intervention maintained its original form, in terms of following the order of sessions and ensuring a physical activity component at each session [21]. During CLs’ monthly conference calls, community and academic staff discussed successes and challenges in more detail, as well as any concerns or feedback regarding the augmented manual (data not shown). This allowed staff to assess any significant deviations from intervention, and to monitor adaptations while maintaining the core of the original HW intervention [21].

**Data Analysis**

The study sample characteristics were summarized using statistics such as means, proportions, and standard errors for the CLs; the total participant sample; and the 3 CL recruitment approaches. Pre-post changes of primary (weight and hope) and secondary (FVC and PA) outcomes from baseline to 6-month follow-up were conducted using paired t-tests that took into account clustering within Circles. Generalized linear mixed models that included a random intercept for Circles to account for clustering were used to compare changes in primary and secondary outcomes across the 3 CL recruitment groups, and between 2 recruitment methods. Data were analyzed using SAS Version 9.3.

**Results**

Including CLs, 236 women enrolled at baseline. Seventy women (30.4%) were dropped or lost to follow up for the following reasons: Circle dissolved due to CL ending her participation (N = 19); participant relocation (N = 12); conflicts with work or school schedules (N = 11); medical reasons (N = 9); lack of time (N = 2); lack of interest (N = 1); other reasons (N = 3); loss to follow up (N = 3); and reasons unknown (N = 10). Of the remaining 166 participants with follow up data, 20 (6.3%) were CLs and excluded from outcomes analyses, leaving 146 (or 63.5% of those enrolled) comprising the study sample.

Of the 20 Circles that completed the study (see Figure 1), half were led by former Circle members (N = 10). Half of the Circles used the standard (HW) bimonthly meeting schedule (N = 10). In terms of loss to follow up, compared to women who completed the study (data not shown), participants who dropped out were more likely at baseline to be heavier (P = 0.005), have lower hope (P = 0.02), or to be African American or Native American (P = 0.007).

The study sample was 82% African American and American Indian, an average of 54 years of age, and primarily single. Approximately half of the sample had an educational achievement of a high school diploma or less (see Table 1). About one-third reported a household income less than $10,000, and 39% were employed. Demographics were similar across each of the 3 Circle recruitment approaches. Of the 20 CLs, the majority was also African American or American Indian (80%), approximately 49.7 years of age, with 55% single, and the majority either employed or retired. Nearly two-thirds reported having at least a college degree, and 70% reported income between $10,000-35,000 per year.

**Primary and Secondary Outcomes**

On average, women in SOH lost 3.3 pounds (P = 0.003, 95% CI: -5.40 - -1.27) and lost 0.56 in their BMI score (P = 0.005, 95% CI: -0.92 to -0.20) (see Table 2). Of the total sample, 65.5% (N = 93) lost any amount of weight during the course of the intervention and 19.7% (N = 28) lost at least 5% of their baseline weight (data not shown). Average Hope scores were not statistically significant. Fruit consumption significantly increased from baseline, but there was no significant difference in physical activity or vegetable consumption (see Table 2).

All groups by CL recruitment approach lost weight (range: -2.83 lbs to -4.04 lbs across groups) and had reduced BMI, with significant changes in the community CL-led groups (P = 0.03) for both outcomes (see Table 3). Hope remained relatively unchanged for all groups. Similar to weight loss, daily fruit consumption increased for all groups, with statistically significant changes for groups led by organizational CLs (P = 0.01). Analyses of the differences between CL recruitment approaches revealed significant differences between groups for the hope subscale agency (belief in one’s capacity to initiate action) and daily fruit consumption (P = 0.02 and P = 0.05, respectively).

A post hoc analysis comparing the 3 meeting delivery schedule approaches revealed a difference in hope (P = 0.03, data not shown). Within each of the 3 approaches, stratified by meeting schedule, all groups lost weight and had decreased BMIs, with significant differences in Circles meeting monthly (P = 0.01 and P = 0.007, respectively). Participants meeting weekly among Circles led by former Circle members (P = 0.02 and P = 0.05, respectively) exhibited significant increases in fruit consumption (P = 0.05) and PA.
Process Measures

SOH participants attended an average of 63.9% of the sessions—with attendance greater than 50% among all groups—regardless of CL recruitment approach or meeting schedule. Circles led by community members saw the highest attendance rates among all CL recruitment groups, with participants attending an average of 74.6% of sessions. Similarly, Circles meeting on a monthly basis had the highest attendance rates of all meeting schedules with an average 74.4% of sessions attended by participants.

All CLs followed the sessions in the order presented in the manual. Ten Circles missed PA for at least 1 session (range of 1-6 sessions). Eight of the 10 CLs cited time constraints with the baseline or follow-up surveys as the reason for missed PA. Others who missed PA reported low attendance, weather or time issues, and lack of interest by participants.

The majority of CLs followed the meeting schedule they originally chose with their Circle members. Three CLs changed their meeting schedules near or after the mid-point of the intervention; 2 switched from bimonthly to monthly and one from weekly to bimonthly. In addition, 8 CLs made minor adjustments due to minimal scheduling issues. These instances occurred a maximum of twice per Circle and were primarily when CLs missed a session that was rescheduled.

Discussion

Weight loss was modest across all 3 CL recruitment approaches. Furthermore, even with adaptations to the evidence-based HW intervention, all groups in SOH lost weight, roughly similar to the overall weight loss results in HW [12]. A similar percentage of women in HW and SOH lost 5% or more of their body weight (22.5% and 19.7%, respectively) [12]. These findings are consistent with other group-based group weight loss programs [22, 23]. “Healthy Dads, Healthy Kids,” a community randomized controlled trial, highlighted significant community-based healthy lifestyle intervention effects for fathers’ weight loss [22]. Leahey et al. (2014) found that weight loss was enhanced with optional group sessions [24].

While SOH results revealed weight loss across approaches, there were no changes in the Hope Snyder Scale. This may be due to high hope scores at baseline (mean of 38.9 out of 48) and therefore less opportunity for an observed increase of the Hope scale at 6-month follow up. Alternatively, the high hope scores at baseline and 6 months may favorably reflect how the women’s hope scores were supported and maintained. Future studies with larger sample sizes are needed to more thoroughly assess the impact on hope.

The findings revealing weight loss across CL recruitment approaches are promising, as they imply SOH is flexible enough for training peer leaders in a fraction of the time of HW (3 hours versus 21+ hours), and for using minimal resources to promote healthy weight with an augmented version of the HW manual. While the expectation was that the CLs who were prior Circle participants would have had
TABLE 1.
Baseline Demographics of Seeds of HOPE Participants

| Characteristic                        | Circle Leaders (N = 20) | Total Circle participants (N = 146) | Organization (N = 33) | Former Circle member (N = 69) | Community member (N = 44) |
|--------------------------------------|-------------------------|------------------------------------|-----------------------|-------------------------------|---------------------------|
| N (%)                                | N (%)                   | N (%)                              | N (%)                 | N (%)                         | N (%)                     |
| Race                                 |                         |                                    |                       |                               |                           |
| Black/African American                | 8 (40.0)                | 71 (48.6)                          | 18 (54.5)             | 27 (39.1)                    | 26 (59.1)                 |
| American Indian                      | 8 (40.0)                | 63 (43.2)                          | 11 (33.3)             | 38 (55.1)                    | 14 (31.8)                 |
| White                                | 3 (15.0)                | 7 (4.8)                            | 3 (9.1)               | 2 (2.9)                       | 2 (4.5)                   |
| Other                                | 1 (5.0)                 | 5 (3.4)                            | 1 (3.0)               | 2 (2.9)                       | 2 (4.5)                   |
| Education                            |                         |                                    |                       |                               |                           |
| ≤ High school                        | 1 (5.0)                 | 25 (17.1)                          | 9 (27.3)              | 10 (14.5)                    | 6 (13.6)                  |
| High school graduate                 | 2 (10.0)                | 47 (32.2)                          | 13 (39.4)             | 23 (33.3)                    | 11 (25.0)                 |
| Vocational/trade school or associate's degree | 1 (5.0) | 20 (13.7)                          | 3 (9.1)               | 12 (17.4)                    | 5 (11.4)                  |
| Some college                         | 3 (15.0)                | 22 (15.1)                          | 6 (18.2)              | 10 (14.5)                    | 10 (22.7)                 |
| College graduate or more             | 13 (65.0)               | 28 (19.2)                          | 2 (6.1)               | 14 (20.2)                    | 12 (27.3)                 |
| Income                               |                         |                                    |                       |                               |                           |
| < $10,000                            | 4 (20.0)                | 43 (30.3)                          | 17 (54.8)             | 18 (26.5)                    | 8 (18.6)                  |
| $10,000-$19,999                      | 8 (40.0)                | 28 (19.7)                          | 6 (18.2)              | 17 (25.0)                    | 5 (11.6)                  |
| $20,000-$34,999                      | 6 (30.0)                | 39 (27.5)                          | 4 (12.9)              | 18 (26.5)                    | 17 (39.5)                 |
| $35,000+                             | 2 (10.0)                | 32 (22.6)                          | 4 (12.9)              | 15 (22.1)                    | 13 (29.3)                 |
| Age Mean (SD)                        | 49.4 (3.8)              | 54.7 (1.6)                         | 52.3 (3.9)            | 54.2 (2.2)                   | 57.3 (2.4)                |
| Job status                           |                         |                                    |                       |                               |                           |
| Employed                             | 9 (45.0)                | 57 (39.0)                          | 6 (18.2)              | 30 (43.5)                    | 21 (47.7)                 |
| Unemployed                           | 1 (5.0)                 | 20 (13.7)                          | 9 (27.3)              | 7 (10.1)                      | 4 (9.1)                   |
| Retired                              | 6 (30.0)                | 37 (25.3)                          | 9 (27.3)              | 20 (29.0)                    | 8 (18.2)                  |
| Unable to work                       | 1 (5.0)                 | 15 (10.3)                          | 4 (12.1)              | 7 (10.1)                      | 4 (9.1)                   |
| Other                                | 3 (15.0)                | 17 (11.6)                          | 5 (15.2)              | 5 (7.2)                       | 7 (15.9)                  |
| Marital status                       |                         |                                    |                       |                               |                           |
| Married                              | 9 (45.0)                | 51 (34.9)                          | 6 (18.2)              | 24 (34.8)                    | 21 (47.7)                 |
| Single                               | 11 (55.0)               | 92 (63.0)                          | 27 (81.8)             | 43 (62.3)                    | 22 (50.0)                 |
| Member of unmarried couple            | -                      | 3 (2.1)                            | -                     | 2 (2.9)                       | 1 (2.3)                   |

aBased on women who completed the intervention.
bAccessed by Circle Leader recruitment method (n=146).
cFour women self-reported as Hispanic/Latina.
dOther includes multiracial, Asian, Pacific Islander.
eSingle includes never married, divorced, widowed, separated.

Circles that exhibited greater weight loss than CLs who were from the general community (given the prior Circle participant CLs’ exposure to the HW intervention), these differences are marginal (-3.11 vs. -4.04 pounds) and not statistically different. The significant increase in PA and fruit consumption for the former Circle member-led groups may imply that familiarity with the intervention may be useful in providing examples based on their own experiences. CLs had higher levels of education compared to circle participants.

Findings indicate that there is potential for SOH meeting schedules to be modified according to community needs. Despite a few instances of missed PA or changes in schedule, Circles overall were able to uphold the core intervention components: having 4 contact hours per month, following the curriculum in order, and incorporating group PA at each meeting. Circles with a month between meetings still lost weight, which could imply that goal setting can be facilitated even with longer increments between meetings. However, Circles on weekly session schedules saw a significant decrease in weight and increase in fruit consumption, suggesting that meeting more frequently may help maintain needed peer support for lifestyle modification.

While the results from this study are suggestive in terms of intervention impact on weight across different CL recruitment approaches, they are not conclusive. Due to a relatively small sample size and modest weight loss, there are limitations in the power to fully detect differences across CL recruitment approaches. There are also limitations in
the representativeness of the sample. As previously mentioned, 30.4% of the study sample dropped out of the project. However, these numbers are not excessive compared to other published group-based weight loss studies with similar study durations [22]. In addition to those lost to follow up, it is not clear whether this model would be successful in other rural counties, with men, or with urban and/or higher socioeconomic populations. CL characteristics may be important in understanding Circle success and should be explored further. The CLs in this sample were slightly younger and had more formal education than the participants. However, results for this sample are informative and provide useful evidence that the intervention can be adapted and delivered to those with an interest and willingness to participate in this peer-led group setting. The findings indicate that with community input, CLs can be identified, trained quickly, and afforded the opportunity to select the delivery schedule that best suits their Circles. As a result of the work of this collaborative project team, SOH is now available as a free web-resource tool through Research4NC (http://research4nc.org/resource?id=1199).

## Conclusion

The SOH model requires minimal resources and can be applied in a multitude of settings with nominal investment. For many practitioners and laypersons, especially in resource-limited communities, this model provides an attainable and affordable opportunity to achieve positive incremental changes in healthy habits.

In addition, the dedication of time and resources to elicit earnest community participation and feedback through CBPR strategies is essential to identify areas of flexibility and adaptability and ensure the SOH model, and other evidence-informed interventions, are accepted and effectively disseminated within marginalized communities. Researchers and social scientists should anticipate and allocate sufficient resources to apply these strategies when developing dissemination models. NCJM

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| Measure                      | Organization (N = 33) | Former Circle member (N = 69) | Community member (N = 44) |
|------------------------------|-----------------------|------------------------------|---------------------------|
| Total T<sub>1</sub>          | T<sub>1</sub>        | T<sub>1</sub>               | T<sub>1</sub>             |
| (N = 146)                    | (SE)                  | (95% CI)                    | (SE)                      |
| Mean weight in pounds        | 180.4 (5.33)          | 185.6 (5.15)                | -3.33 (-5.40 - -1.27)     | 0.003 |
| Body Mass Index              | 32.79 (0.90)          | 32.24 (0.87)                | -0.56 (-0.92 - -0.20)     | 0.005 |
| Hope score                   | 38.90 (0.52)          | 38.63 (0.55)                | -0.28 (-1.53 -0.98)       | 0.65  |
| Fruit consumption            | 2.32 (0.05)           | 2.53 (0.11)                 | 0.21 (0.01-0.41)          | 0.04  |
| Vegetable consumption        | 2.45 (0.08)           | 2.60 (0.10)                 | 0.14 (-0.08-0.37)         | 0.19  |
| Physical activity            | 1.84 (0.05)           | 1.97 (0.06)                 | 0.14 (-0.01-0.28)         | 0.07  |

*P*-values were determined using paired t-tests of mean change from baseline to 6-month follow up.

**Changes in primary and secondary outcomes across Circle Leader recruitment groups were analyzed using generalized linear mixed models.

**P** ≤ 0.05.

**P** ≤ 0.01.
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