



## Dissemination trial for Health for Hearts United: Model development, preliminary outcomes and lessons learned

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### ABSTRACT

**Background:** Cardiovascular disease (CVD), the leading cause of death in the U.S., is a particular problem for African Americans (AAs). Church-based health interventions are effective in reducing CVD risk, yet few have been successfully disseminated. This paper describes the model development, preliminary health outcomes, and lessons learned from the Health for Hearts United (HHU) dissemination trial which evolved from the longitudinal Reducing CVD Risk Study in a two-county area in North Florida. Community-based participatory research approaches and the socio-ecological model guided the study.

**Methods:** Data for this paper were from health leaders ( $n = 25$ ) in the first six churches investigated, and the outreach participants ( $n = 86$ ) they engaged. Health leaders completed survey items (daily servings of fruits/vegetables [F/V], fat consumption [FAT], and daily minutes of physical activity [PA]) and clinical measures (body mass index [BMI]; waist, hip and abdomen circumferences; and systolic and diastolic blood pressure [BP]). For outreach participants, a brief CVD Awareness Quiz was administered. Data were analyzed using description statistics, Pearson correlations, and repeated measures analysis of variance.

**Results:** Findings showed that the dissemination model was implemented by 100% of the churches, and resulted in health outcomes changes for health leaders (significant increases between pre- and post-test in F/V; significant decreases in FAT, BMI, abdomen circumference, with educational level and marital status as selected significant covariates) and in a significant increase in CVD awareness for outreach participants. Lessons learned are discussed. Although preliminary, the results suggest that the HHU dissemination model has promise for reducing CVD risk in AA's.

### 1. Introduction

Cardiovascular disease (CVD) is a leading cause of death in the U.S. and a particular concern for African Americans who experience higher age-adjusted morbidity and mortality rates than Caucasians for both heart disease and stroke [1]. Deaths associated with CVD in African Americans arise from several risk factors, including, among others, diet, sedentary lifestyle, excess body weight, elevated blood pressure, and high cholesterol [1]. Clearly, reducing CVD risk is a top priority to

improve the health of this population. Using community-based approaches, including churches, to address chronic disease risk is a key recommendation of Healthy People 2030 [2].

There is considerable evidence that church-based health programs are effective in improving both CVD-related health behaviors and health status of African Americans [3–6]. For example, several studies show health behavior change, such as increased fruit and vegetable consumption, increased physical activity, and improved health status, including lower body mass index (BMI), waist circumference, and lower

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blood pressure, can occur as a result of church-based health programming, using a variety of intervention models [4–9]. Yet few church-based studies have moved in the translation process from intervention effectiveness to dissemination [8–12].

According to Zellner et al. [13], in their comprehensive paper on translational research, “dissemination is defined as an active research approach of spreading evidence-based interventions to a targeted audience via determined channels using planned strategies and examining the success of this dissemination” (p.1060). Early work centered on the National Cancer Institute (NCI) funded Body & Soul intervention which evolved out of two major studies in the early 1990’s: Black Churches United [14] and Eat for Life [15]. The Body & Soul intervention, which focused on improving fruit and vegetable consumption, and included pastoral involvement, educational activities, church environmental changes, and peer counseling, was implemented by lay church coordinators in partnership with planning teams in each church. Efficacy trials, and effectiveness and dissemination evaluation were conducted between 1993 and 2007. Since that time, several states and regions have disseminated Body & Soul. Yet the current evidence is mixed regarding successful outcomes [8,9,16]. For example, Allicock et al. [8] disseminated Body & Soul without researcher or agency involvement to 15 churches in major metropolitan areas in 10 states. They found at post-test that there was no statistically significant difference in daily servings of fruit and vegetables between the early intervention group participants compared to control group participants. Further, the process evaluation findings in the study suggested that added resources such as technical assistance and more involvement from the pastors could improve program implementation.

More recently, Wilcox et al. [see for example 12, 17, 18] have conducted studies focused on dissemination of the Faith, Activity and Nutrition (FAN) intervention to promote healthy church environments in a local county and statewide in South Carolina, implemented by community health advisors who provided training and technical assistance to church committees. FAN focused on helping churches to increase opportunities for physical activity and healthy eating, set physical activity and healthy eating guidelines, share physical activity and healthy eating messages, and engage pastors in promoting physical activity and healthy eating. Findings from the statewide study show that organizational practices of the church committees increased overtime [12]. Follow-up with selected church leaders (n = 19) highlighted implementation successes (79% developed bulletin boards, 26% implemented physical activity programs) and challenges (pastors seldom attended health programs) [18].

These dissemination studies highlight the gaps in the literature on dissemination of church-based interventions. First, only FAN incorporated community-based participatory research approaches (CBPR) in the design of the intervention and how it would be implemented within the churches [17]. The precursors to Body & Soul (Black Churches United and Eat for Life) used focus groups and ongoing input from researchers, practitioners and/or church planning teams for intervention development [14,15]. The Body & Soul dissemination intervention was developed by the two university teams in conjunction with NCI and the American Cancer Society [19]. Further, although Body & Soul and FAN recognized the importance of pastor involvement, in both dissemination models pastor participation was encouraged but not a requirement [18, 24]. Finally neither Body & Soul nor FAN assessed the multiple health behaviors and clinical outcomes of the health leaders themselves which could influence the extent to which health leadership is able to follow intended health practices they are promoting and build their capacity for promoting health [25].

Health for Hearts United (HHU), developed as a part of the Reducing CVD Risk Study conducted between 2008 and 2013, is an 18-month intervention developed using CBPR approaches in a two-county area in North Florida with high prevalence of CVD risk factors and mortality rates [20]. The intervention was framed around three conceptual components: awareness building (individual knowledge development),

clinical learning (individual and small group educational sessions), and efficacy development (recognition and sustainability) [21]. The intervention included three types of programs for the treatment churches: a) church-initiated, b) joint church-staff, and c) staff-directed standard programming. Both treatment and comparison churches received data collection health promotion (display of generic health materials and healthy snacks). In addition, the intervention included four key messages: eat better, move around more, reduce stress, and take charge of your health ([see 20, 21 for an extensive description of the project and intervention]).

With regard to effectiveness, data were collected in four phases (baseline, 6, 18, and 24 mo) from 257 participants ( $\geq 45$  yrs, including n = 104 clinical sub-sample) randomly sampled from six churches in the two counties. Retention rates were 89.5% (overall sample) and 72.9% (clinical sub-sample) [20]. The results of Structural Equation Models showed that there were significant treatment effects for physical activity (PA) (B = 4.50,  $p < 0.05$ ), total cholesterol (TCHOL) (B = -4.29,  $p < 0.001$ ), TCHOL/HDL ratio (B = -0.07,  $p < 0.05$ ), and triglycerides (B = -7.11,  $p < 0.05$ ) [22]. Further, additional analyses showed that the treatment group compared with the comparison group had a decreasing trend in LDL from baseline to 24 months [22]. For the total sample, F/V intake increased and fat consumption decreased across phases, with significant F/V increases for the treatment group between phase 1 and phase 3 [23]. In addition, body mass index (BMI) decreased across the four phases, and systolic BP decreased from phase 1 to phase 3 [22]. These findings show that the HHU intervention was effective in improving selected CVD risk outcomes.

Although evidence of the efficacy of HHU is growing, the dissemination of this intervention to a broader set of churches has not been investigated. Dissemination of HHU would contribute to the literature in that it is CBPR-driven with the design, activities and length determined by the health leaders who participated in the Reducing CVD Risk Study. Further, this study focuses specifically on spreading HHU to churches in a designated geographical area with implications for building the long-term capacity of health leaders for promoting health and maintaining sustainability of health change in the churches themselves, as recommended in the literature [8,25]. Thus, the purposes of this paper are to describe the HHU dissemination model, provide preliminary outcomes for the first six churches investigated, and highlight lessons learned. Examining this initial subset of churches allowed us to investigate in a formative way our processes at the initial stages of the project and in particular to determine the success of these processes thus far in relation to gaps noted in the church-based dissemination literature. Subsequent papers will examine the summative findings for dissemination to the full set of churches in the study.

## 2. The HHU dissemination model

### 2.1. The development process

A planning session was held at the beginning of the project to get input from all of the health leaders from the Reducing CVD Risk Study. Health leaders were church leaders selected by their pastors to serve on steering committees at each church and to work collaboratively with other churches to create the intervention. Staff were members of the project team from the university, including the principal investigator, project coordinator and project assistants. The meeting, held in January 2014, included: a) a project overview and summary of research outcomes, b) a review of successes and challenges in implementing key messages to improve health, and c) breakout planning groups to discuss recommendations for the HHU dissemination model.

The health leaders endorsed the socio-ecological model, with an emphasis on intrapersonal (individual health leaders), interpersonal (within and between health leader groups) and organizational (church) levels [24]. To evaluate the dissemination process, the RE-AIM framework [26,27] was sanctioned.

## 2.2. The HHU dissemination intervention

Based on the feedback from the planning session and ongoing interaction between health leaders and staff, the HHU dissemination model was developed and included three phases: a) Training, b) Coaching & Planning, and c) Delivery & Recognition (see Fig. 1). This model represented the best practices of dosage, duration, and support, identified in the Reducing CVD Risk Study [20]. For example, dosage includes combination in types of programming such as trainings but also church-initiated activities; b) duration (at least nine to 12 months since treatment effects were noted between six months and 18 months and 18 months and 24 months) and no effects were noted between baseline and six months), and c) support (regular contact with staff and health leaders per CBPR.

Further, this project provides four novel approaches that distinguish it from other dissemination studies. First, CBPR approaches were used to determine the dosage and duration of the dissemination model. In the meeting with the health leaders from the Reducing CVD Risk Study, they emphasized that trainings be shorter, that materials presented be simple and brief, and that less face time with staff was needed although ongoing support from staff was encouraged. Second, they stressed that pastors be on the health ministry teams, participating in all phases of the dissemination model. In both the Body & Soul and FAN dissemination models, the pastors were to be engaged but not necessarily on the health ministry teams for implementation. Third, the model focuses on health leader involvement in working on their own health, including health behaviors and health status, which to our knowledge has not been done in previous studies. Fourth, the dissemination model represents multi-level capacity building, with individuals learning about health, health leader groups planning for health, and then health leader groups working at the church level to implement health [28]. Each phase is described below.

### 2.2.1. Training (2–3 Months)

The baseline training was needed to ensure that health leaders had adequate levels of CVD health knowledge. Thus, this phase included three sessions that were 2 h in length and held in a central location for the participating churches. Topics for the trainings centered around the four key messages of the initial intervention developed in the Reducing CVD Risk Study: take charge of your health, eat better, move around more, and reducing stress integrated in the latter two. The trainings also

included brief presentations from health leaders in the Reducing CVD Risk Study who shared best practices on how they had implemented health programming related to the key messages.

Each training included interactive sessions with health professionals serving as speakers (see Fig. 1). In addition, materials from the broader study were disseminated (i.e., notebook, handouts, culturally tailored postcards) along with a self-monitoring tool, the Health Check Report Card (HCRC), to jumpstart health behavior change [21]. All materials were culturally tailored in terms of photos, other images and language to be consistent with African American culture and were reviewed by health leaders from the Reducing CVD Risk Study [21] (see example in Fig. 2).

### 2.2.2. Coaching & Planning (3–4 Months)

This phase included three components: individual health mentoring, health ministry planning, and CVD awareness event planning. This phase was in keeping with African American churches as learning organizations [30], with movement from individual health learning to group planning for learning within the broader organization.

**Individual Health Mentoring.** Individual health mentoring included providing support for the health leaders via telephone calls following the training phase to help them in moving forward in health behavior change. Specifically, the HCRC was used by the health leader teams to achieve progress in eating fruits and vegetables and other foods consistent with CVD health, including items low in sodium, sugar, and fat, and to increase physical activity, with worksheets submitted on their outcomes in comparison to specified goals [29].

**Health Ministry Planning.** To build infrastructure for health within the churches, each team of health leaders worked on strategic plans to develop their health ministries [3,31]. The plans included church purpose and history, and health ministry mission, vision, goals, activities, evaluation, and sustainability. A 1-h in person meeting was used as a way to get updates from the health leader teams about progress in completing the plans and in moving their health ministry forward. Topics varied, depending on the experience of the health leaders, but in general health ministry models, examples of activities implemented in other churches, and strategies for handling challenges were discussed. The strategic plans were shared with staff for feedback, and the final completed plan served as a deliverable for adoption.

**CVD Awareness Event Planning.** The final component of planning

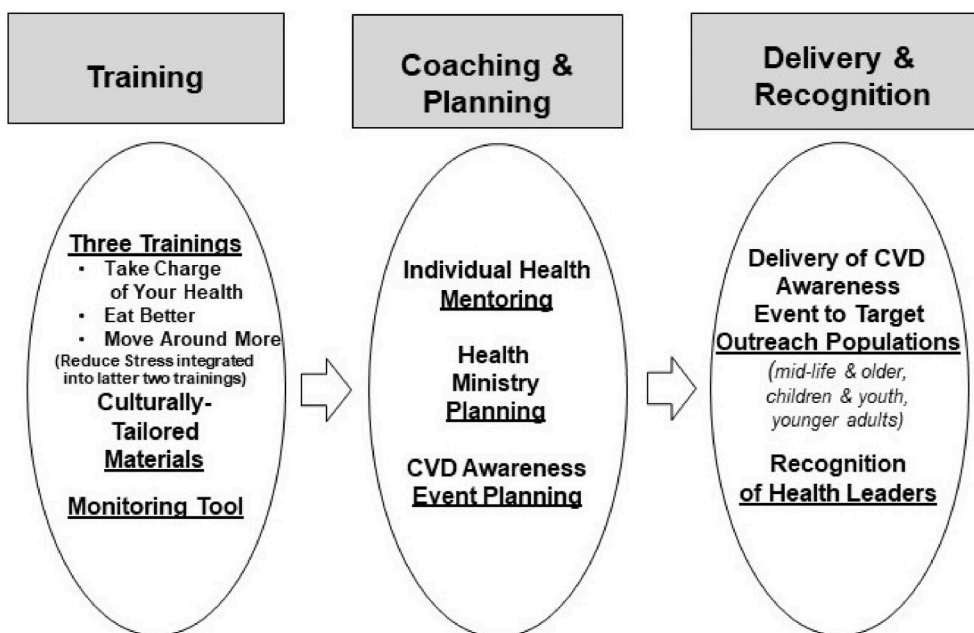


Fig. 1. Health for Hearts United dissemination model.

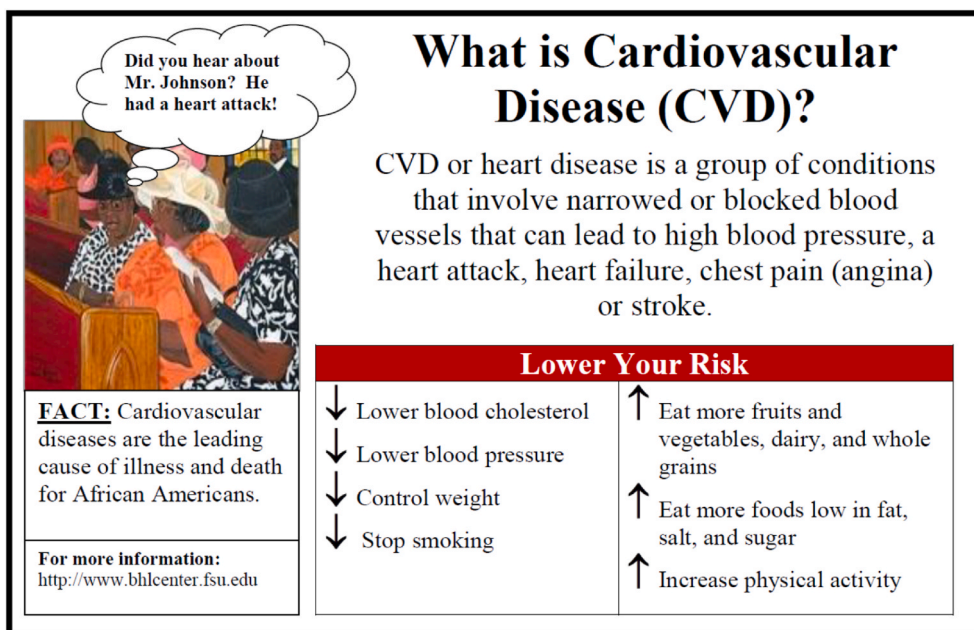


Fig. 2. Example of culturally tailored post card.

was a discussion with health leaders about their ideas for the CVD awareness event. The intent of planning and implementing this event was to build organizational capacity for health programming [31–33]. The 1-h in person meeting with health leaders, described above, was used to get input on their planning for the CVD awareness event and to provide guidance. A planning template, which was distributed during the meeting along with an order form for materials (culturally tailored post cards) that health leaders could use in their events, were completed by health leaders and reviewed by staff in relation to four fidelity criteria: a) a description of CVD, including risk factors; b) how to lower CVD risk focusing on one of the key health messages; c) use of speakers recommended by or agreed to by staff; and d) an event design and length agreed to by staff and health leaders. The final planning sheet that met fidelity criteria served as a deliverable for adoption.

2.2.3. Delivery & Recognition (2–3 Months)

For the final phase of the dissemination model, health leaders created an event that would fit the church organization and the fidelity criteria, and then use their influence to get support for implementation of the event at the church level. This phase also included recognition of the health leaders to build sustainability in health programming [3,4,6].

**Delivery of CVD Awareness Event.** As a culminating activity, the CVD awareness event focused on delivering a program designed by the health leaders themselves to reach a desired outreach population of at least 25 people who could be youth (at least 12 years) or adults and to adhere to fidelity protocol. Outreach participants could include any group within the church (e.g., Sunday School, Bible Study, entire congregation) or an external group (another invited church, neighborhood group, among others). The goal of reaching 25 people was to ensure health leaders used creative ideas for their respective churches to attract an audience for the event. Adhering to fidelity protocol referred to the extent to which the CVD awareness event was consistent with the agreed upon plans that reflected the four fidelity criteria. This assured equivalent dosage and consistency across programs. The desired outcome was to increase CVD awareness of the outreach population, a need identified in the literature [34,35].

**Recognition.** Recognition activities at the end of this phase were planned by staff in conjunction with health leaders to promote efficacy in both health behavior change and in health ministry development [2,4,6]. Recognition activities included a dinner or breakfast event for health

leaders where each was recognized with a certificate, with a follow-on presentation of a plaque presented at a church service at each respective church where the health leaders were again recognized. Each church completing the project also received a check for \$500.

3. Methods

This section highlights the methods used for the preliminary analyses reported in this paper. The methods are focused on the health leader and outreach participants for the first six churches participating in the study. Dissemination outcomes will be reported in subsequent papers.

3.1. Study site and participants

The site for the HHU dissemination study is the two-county area in North Florida that served as the geographical base for the CVD Study [20]. Each church participating in the study identified a team that included a pastor and at least four adult health leaders, with preferred inclusion of two mid-life or younger adults and two older adults. The pastor was responsible for identifying the health leaders. To achieve the Delivery phase of the intervention, outreach participants could include youth at least ≥12 years of age and adults ≥18 years of age and older. Recruitment strategies were handled by the health leaders and included announcements during services and in church bulletins and personal phone calls and texts. For the first cohort, the sample included a total of 25 health leaders (five pastors, 20 health leaders) and 86 outreach participants.

3.2. Measures

3.2.1. Measures for health leaders

Health leader data included selected self-reported health behavior items and clinical measures to determine health status. Psychometric properties for the self-reported items are reported for each item and also provided in more detail in our earlier published articles [20,23].

- Daily fruit and vegetable intake was measured by the item: “On average, what is the number of fruit/vegetable servings that you eat daily?” Possible responses ranged from zero to six or more (coded 0 to 6, respectively). This single item measure (F/V intake), used

extensively in previous dietary studies, is positively correlated overtime with the 24-h dietary recall ( $r = 0.45$  baseline,  $p < 0.01$ ;  $0.50$  follow-up,  $p < 0.01$ ) [37], and has an inter-measure reliability of  $r = 0.56$ ,  $p < 0.01$  when correlated with mean servings based on a 61-item food frequency questionnaire [38].

- Fat consumption was measured by using the single item of the NCI Fat Screener: “Overall, when you think about the foods you ate over the past 12 months, would you say your diet was high, medium, or low in fat?” (coded 3 to 1, respectively). Thompson and others [39] validated the broader NCI Fat Screener and reported estimated correlations of 0.64 and 0.58 between true intake and this instrument.
- Daily physical activity was measured by the item: “How much physical activity (running, walking, gardening, household chores) do you usually get each day? 0, 15, 30, 45 or 60 or more minutes,” coded 0 to 4, respectively. Milton et al. [40], who determined reliability and validity of the one item physical activity measure using “past week” and “past month” as a timeframe, found that the past week measure showed strong reproducibility ( $r = 0.72$ – $0.82$ ,  $p < 0.01$ ), modest concurrent validity ( $r = 0.53$ ,  $p < 0.01$ ) with the validated Global Physical Activity Questionnaire, and strong agreement with current physical activity recommendations ( $\kappa = 0.63$ , 95% CI 0.54 to 0.72). In the Reducing CVD Risk Study, we selected “daily” as the timeframe for measuring physical activity because of our experience with underserved African American populations where there was difficulty in using longer time estimates [20].
- For background characteristics, age was determined using categories, ranging from “18–21” to “85 and older” coded as 1–11 respectively. Sex was coded as 1 = female and 0 = male. Education level included five categories ranging from “some high school” to “master’s degree or above” (coded 1–5 respectively). Marital status was determined by the item “What is your marital status?” with responses of single (including separated, widowed, divorced, other) (coded as 0) and married (coded as 1). Blood pressure medication was determined by the item, “Are you on blood pressure medication?” (coded 1 = yes, 0 = no).

With regard to clinical data, measurements collected from the health leaders included anthropometric measurements of weight, height, and girth circumferences (waist, abdomen, hip), and systolic and diastolic blood pressure. Body mass index (BMI,  $\text{kg}/\text{m}^2$ ) was calculated.

### 3.2.2. Measures for outreach participants

To determine CVD awareness for the outreach participants, an eight item CVD Awareness Quiz, a modified version of the Heart Disease Knowledge Test (HDKT) [36], was developed to be used as a pre-/post measure. The CVD Awareness Quiz had a Kuder Richardson-20 reliability of 0.607.

### 3.3. Data collection

The study was approved by the Florida State University Institutional Review Board. Procedures for administering the study questionnaire and collecting clinical data (at baseline before the intervention and at post-test nine to 12 months later following the Delivery & Recognition phase) were similar to those used in the Reducing CVD Risk Study [20]. Health leaders received a \$50 discount store gift card with successful completion of all study requirements. For outreach participants, data were collected via self-administration of the CVD Awareness Quiz as participants registered for the CVD awareness events in the Delivery phase and at follow-up immediately following the event. Packets with both pre- and post-tests were distributed in separate confidential envelopes at registration and staff collected the surveys once completed.

### 3.4. Data analysis

For the health leader data, Pearson correlations were computed to determine the bivariate relationship of potential confounders (age, sex, educational level, marital status, and blood pressure medication) and the independent variables in the study. Repeated measures analysis of variance (ANOVA) was used to analyze pre-post differences in the health behaviors and clinical outcomes data. The sample size was considered to be adequate for the repeated measures ANOVA because a) the distributional properties of outcome variables have not shown significant deviations from normality in our previous study [20,23] and b) medium range effect sizes for most of tested effects were expected [41].

For the outreach participant data, the CVD Awareness Quiz was analyzed by adding correct answers (total could be 8), computing percent of correct responses, and performing t-tests of pre-post scores, with the sample size considered adequate [42]. Because of the small sample sizes for both health leaders and outreach participants, the  $p$ -value was set at  $p < 0.10$ .

## 4. Results

The results highlighted in this section are for the health leaders and outreach participants in the first subset of churches in the study.

### 4.1. Health leader outcomes

At baseline, the majority of the health leaders sample ( $n = 25$ ) were 50–63 years of age (60%), female (68%), married (64%) and had some college or a bachelor’s degree (52%) (see Table 1). The results of the correlational analysis showed that fat consumption was negatively associated with educational level ( $r = -0.408$ ,  $p < 0.05$ ), BMI was positively associated with marital status ( $r = 0.401$ ,  $p < 0.05$ ), and daily fruit/vegetable consumption was positively associated with blood pressure medication ( $r = 0.378$ ,  $p < 0.06$ ), consistent with our previous study [20]. Based on these results, educational level, marital status, and blood pressure medication were used as covariates in the next steps of

**Table 1**  
Characteristics of health leaders.

Characteristics	Number <sup>a</sup>	Percent
Age		
45-49	2	8.0
50-56	6	24.0
57-63	9	36.0
64-70	5	20.0
71-77	2	8.0
78-84	1	4.0
Sex		
Female	17	68.0
Male	8	32.0
Marital Status		
Single	2	8.0
Married	16	64.0
Divorced	3	12.0
Widowed	4	16.0
Separated	0	0.0
Other	0	0.0
Education		
Some high school	2	8.0
High school graduate	5	20.0
Some college	6	24.0
Bachelor’s degree	7	28.0
Master’s degree	3	12.0
Ph.D., M.D. or J.D.	0	0.0
Other	2	8.0
Blood Pressure Medication Use		
Yes	9	36.0
No	16	64.0

<sup>a</sup>  $n = 25$ .

the analyses. The results of repeated measures ANOVA to determine initial effectiveness of the HHU dissemination model are presented in Table 2. The independent pair-wise comparison shows that daily consumption of fruit/vegetable servings had a significant increase between pre- and post-intervention measurement ( $p = 0.01$ ). For fat consumption, the results show a significant decrease between pre- and post-intervention measurement ( $p < 0.01$ ), with educational level as a covariate also significant ( $p < 0.01$ ). The BMI results indicate a significant decrease between pre- and post-intervention measurements ( $p < 0.10$ ), with marital status as a covariate also significant ( $p = 0.008$ ). Both waist and hip circumferences showed no overall significant decreases between pre- and post-intervention measurements, yet there were significant covariate associations for marital status for both of these variables ( $p < 0.03$  and  $p < 0.04$ , respectively). Finally, abdominal circumference ( $p < 0.10$ ) significantly decreased between pre- and post-intervention measurements. Of note were increasing trends for pre- and post-intervention in daily physical activity and decreasing trends in systolic and diastolic blood pressure (Table 2).

#### 4.2. Outreach participants outcomes

A total of 86 in outreach participants attended the CVD awareness events for the subset of churches. The outreach populations reached were 100% African American with a majority female (76.6%) but did show a wide range of ages: 18–35 (11.6%), 36–49 (18.6%), 50–63 (38.4%),  $\geq 64$  (31.4%). The outreach participants significantly improved their CVD Awareness Quiz total mean scores between pre-test ( $M = 69.6$ ,  $SD = 18.8$ ) and post-test ( $M = 77.4$ ,  $SD = 19.8$ ) ( $p < 0.001$ ) (Table 3).

### 5. Discussion and lessons learned

This study described the HHU dissemination model and provided preliminary health outcomes and lessons learned for the first six churches in the study. Of the six churches participating, 100% were able to complete all phases of the intervention, including training, planning and delivery. Further, the health leaders were able to recruit and deliver a CVD awareness event to 86 outreach participants. This suggests that, thus far, the dissemination model, developed using CBPR strategies, was effective in training the health leaders and providing sufficient capacity building for them to plan and implement the CVD awareness events.

**Table 2**  
Results of repeated measures ANOVA for health leaders.<sup>a</sup>

Variable	Pre-test <sup>b</sup> Mean (SD)	Post-test <sup>c</sup> Mean (SD)	F
<b>Health Behaviors</b>			
Fruit/vegetable (serving/day)	2.29(±1.26)	3.37(±1.49)	9.120***
Fat <sup>d,e</sup>	1.83(±0.70)	1.62 (±0.57)	5.510**
Physical Activity (min/day)	2.66(±1.16)	2.79(±1.14)	0.082
<b>Clinical Outcomes</b>			
BMI <sup>f</sup>	34.16(±6.02)	33.29(±6.28)	3.002*
Waist (cm) <sup>g</sup>	106.45(±12.71)	103.86(±13.40)	0.313
Abdomen (cm)	111.88(±14.49)	106.27(±13.49)	2.945*
Hip (cm) <sup>h</sup>	120.85(±14.21)	117.09(±10.69)	1.352
Systolic BP (mmHg)	130.49(±20.55)	122.73(±12.99)	1.034
Diastolic BP (mmHg)	81.49(±10.23)	80.13(±7.44)	0.152

\* $p < 0.10$  \*\* $p < 0.05$  \*\*\* $p < 0.01$ .

<sup>a</sup>  $n = 25$ .

<sup>b</sup> Pre-test data were collected at baseline before the beginning of the intervention.

<sup>c</sup> Post-test data were collected following the Delivery & Recognition phase of the intervention (9-12 months after baseline).

<sup>d</sup> Perceived fat consumption (1 = low, 2 = medium, 3 = high).

<sup>e</sup> Intervention X educational level,  $F(1, 20) = 8.033, p < 0.01$ .

<sup>f</sup> Intervention X marital status,  $F(1, 21) = 8.520, p < 0.008$ .

<sup>g</sup> Intervention X marital status  $F(1, 21) = 4.986, p < 0.03$ .

<sup>h</sup> Intervention X marital status  $F(1, 21) = 4.521, p < 0.04$ .

**Table 3**  
Results of CVD awareness quiz for outreach participants.<sup>a</sup>

CVD Quiz Items	Pre-test Frequency (%) Correct	Post-test Frequency (%) Correct
1. Cardiovascular disease (or heart disease) is a group of conditions that involves the narrowing of blood vessels. (TRUE)	69 (80.2)	77 (89.5)
2. Heart disease ranks #2 (after diabetes) in death rates in the U.S. (FALSE)	35 (40.7)	51 (59.3)
3. Key ways to decrease the risk of heart disease include lowering blood pressure, controlling weight and increasing LDL (bad) cholesterol. (FALSE)	27 (31.4)	34 (39.5)
4. Daily stress can influence the risk for heart disease. (TRUE)	83 (96.5)	80 (93.0)
5. U.S. Dietary Guidelines recommend eating more fruits/vegetables each day to reduce the risk of heart disease. (TRUE)	79 (91.9)	82 (95.3)
6. Consuming lower levels of sodium (salt), sugar and saturated fats will reduce heart disease. (TRUE)	79 (91.9)	77 (89.5)
7. Saturated fats, trans fats and polyunsaturated fats (nuts, olive oil) all contribute to the risk for heart disease. (FALSE)	41 (47.7)	55 (64.0)
8. Exercise that includes rapid breathing for a sustained period of time is the best type of physical activity for heart health. (TRUE)	66 (76.7)	78 (90.7)
	<i>M (S.D.)</i>	<i>M (S.D.)</i>
Total Average Percent Correct	69.6 (18.8)	77.4 (19.8) *

\* $p < 0.001$ .

<sup>a</sup>  $n = 86$ .

The health leader outcomes, although very preliminary, suggest that the HHU dissemination model may be able to yield positive changes in the health behavior and health status of health leaders. These findings suggest that a relatively short, time efficient intervention may improve physical health which is consistent with our previous longitudinal study and the literature. For example, the results in this study regarding increase in daily servings of fruits/vegetables and decrease in fat consumption are consistent with studies that show that church-based health interventions can improve food choice and dietary quality [3,14,23,43,44]. The improved anthropometric outcomes are consistent with studies that show improved clinical outcomes (BMIs, girth circumferences, blood pressure) as a result of health behavior changes [45–52]. Of further interest was the significant covariates (educational level, marital status) in the study, suggesting the independent association of these factors in fat consumption and in weight-related outcomes (BMI; waist and hip circumferences), respectively. These factors will need to be studied in more depth in future research to determine possible implications for church-based health programming.

The results for the outreach participants showed that outreach participants improved their CVD knowledge between pre-test and post-test following attending the CVD awareness events. This suggests that promoting freedom and creativity on the part of health leaders to design and implement their own CVD awareness events with staff guidance was effective in health leaders reaching diverse age groups and yielding significant improvements in CVD awareness between pre-test and post-test assessments. The inclusion of this capacity building phase of the HHU dissemination model provides a snapshot in time of what churches can do. In future papers, we will examine more specifically dissemination constructs of adoption, implementation and maintenance. Yet, at least at this initial stage, the preliminary outcomes for outreach participants are positive and encouraging.

This study has implications for the socio-ecological model with levels of intrapersonal, interpersonal, and organizational supported. Specifically, almost all health leaders participated in the intervention and showed individual improvements in health behaviors and clinical outcomes. Further, the interpersonal level was supported through the

health leaders planning the health ministries and in implementing the CVD awareness events. Finally, the outcomes of this study have implications for the organizational level through the health leaders working at the church level to deliver the CVD awareness events. In sum, thus far the socio-ecological model is supported through the preliminary findings.

This study has both strengths and limitations. With regard to strengths, the study is one of the few conducted that focuses on the development of a dissemination model using CBPR approaches, which evolved from a longitudinal study to reduce CVD risk in African Americans. Further, this study advances the literature on dissemination models focused on reducing CVD risk. There are, however, several limitations of this study including church recruitment using recommendations from existing churches in HHU which might bias results, limited geographical area, small sample size, and lack of a comparison group.

There are four lessons learned thus far from the HHU dissemination model development and preliminary outcomes of this study. First, the CBPR approaches allowed for recruitment of six churches for the study by health leaders from previous churches in the Reducing CVD Risk Study. Getting churches on board is not an easy process and having the sponsorship of previous churches opened the door and helped in establishing trust. Further, the unvarnished feedback received by these previous health leaders helped to shape a time efficient dissemination intervention model that was low on face-time of staff. This provided the new health leaders the freedom to create programming that would meet the needs of their respective outreach participants. Previous church-based dissemination research shows that only the FAN study used CBPR and it was used in a limited way [17]. The Body & Soul studies incorporated other strategies such as focus groups and university teams to get input for intervention development [14,15,19]. This full use of CPBR approaches contributes to the literature on dissemination studies and we subsequently incorporated the use of this process throughout the HHU dissemination trial.

A second lesson learned was the ability to retain health leaders throughout the dissemination intervention, including pastors. We began the cohort of six churches with 25 health leaders recruited to participate in activities throughout the intervention. This included attending the trainings (or completing make-ups if sessions were missed), attending the planning meeting, and participating in the planning for and delivery of the CVD awareness event. Of the 25 health leaders recruited, 24 completed all activities (96% retention rate). Further, all of the pastors on the health leader teams were able to complete all activities related to the intervention. These results suggest that a less time-intensive intervention with shorter trainings and briefer materials may have played an important role in keeping health leaders involved and not feeling burdened. Further, establishing a co-learning environment reflected our confidence in them to design and create programming that would meet needs in their respective churches. Finally, the fact that all of the pastors completed the intervention is a contribution to the literature in that previous dissemination studies only encouraged involvement and then had difficulty in pastor participation [8,18,24]. The HHU dissemination model shows that requiring participation of pastors is possible and could yield further benefits regarding improvement of pastors' health and maintenance of programming long-term (25).

Our final lesson learned is that inclusion of trainings and other activities around improving health of health leaders can result in both health behavior and health status changes. Although these are only preliminary outcomes, the inclusion of investigating possible multiple health changes in health leaders is an innovation that, to our knowledge, has not been used in church-based dissemination studies. In the dissemination research reviewed for this study, church planning committees or community health workers were used to deliver programming with no inclusion of examining their possible health changes. As Zoellner et al. [13] states, dissemination is "spreading evidence-based interventions to a targeted audience." Yet dissemination depends to a

large extent on those on the ground receiving the intervention and deciding whether to accept it or not. Including the investigation of changes in health behaviors and health status for those involved in dissemination could add the practical benefit of providing role modeling, testimonials and accountability [25,30]. While we will know more about the actual results and possible benefits in subsequent papers, it is clear thus far that the dissemination model yielded positive health behavior and health status changes for the health leaders which by itself is a successful outcome.

## 6. Conclusions

The purpose of this paper was to describe the HHU dissemination model, and to provide preliminary health outcomes and lessons learned for the first six churches investigated in the study. The findings suggest that the HHU dissemination model resulted in selected positive dietary and anthropometric outcomes for the health leaders, and increased CVD awareness for the outreach participants who attended events. Lessons learned included importance of incorporating CBPR approaches, retaining health leaders including pastors, and including measures to determine possible health changes in health leaders. Future research with the full set of churches will provide more comprehensive evaluative evidence regarding the HHU dissemination model, especially in the extent RE-AIM constructs were achieved. Yet, this study demonstrates the potential of this model for reducing CVD risk in African Americans.

## Declaration of competing interest

No conflicts of interest, including financial disclosures, were reported by the authors of this paper.

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