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Predictors of change in fruit and vegetable consumption in a faith-based intervention with African American adults

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Abstract

A majority of African American adults do not eat the recommended daily amount of fruit and vegetables. This study examined baseline demographic, health-related and psychosocial variables as predictors of change in fruit and vegetable consumption from baseline to post-program in a sample of church members taking part in a 15-month intervention. Participants who had a greater waist circumference, greater baseline fruit and vegetable consumption, greater leisure-time physical activity, higher levels of social support, greater attendance at worship service, were obese, and did not have diabetes at baseline showed higher post-test fruit and vegetable consumption.

Introduction

Higher fruit and vegetable intake has been shown to be associated with a decreased risk of a number of chronic diseases such as cancer, cardiovascular disease, diabetes, and obesity [1–5]. African Americans have a higher prevalence of these conditions than the general population [6–9]. African Americans are less likely to consume the recommended daily 2.5 cup equivalents of fruit and 2.5 equivalents of vegetables [10] compared to whites or the population as a whole [11,12]. These differences may contribute to the health disparities among the African American population. In an effort to improve health and reduce health disparities, there is a need to increase fruit and vegetable consumption among African Americans.

Conflicts of Interest
The authors have no conflicts of interest to report.

Churches provide a unique opportunity for improving the health of their members, as many include health as part of their mission, are willing to partner with secular agencies, and have the ability to recruit underserved populations [13–15]. Furthermore, church attendance has been linked to positive health care practices. Aaron and colleagues [16] found that those who attended church more frequently were more likely to have a regular source of medical care, blood pressure measurements, and dental visits.

Faith-based interventions within African American church communities have been successful in increasing fruit and vegetable intake [17–20]. To date, four large-scale studies have shown significant increases in fruit and vegetable consumption among African American church members. Healthy Body Healthy Spirit resulted in a 1.13 increase in fruit and vegetable consumption at 1 year [19], the Eat for Life trial showed a 1.1 serving increase in fruit and vegetable consumption after 1 year [18], and the Black Churches United for Better Health project showed a 0.85 increase in fruit and vegetable consumption after 2 years [17]. The Body and Soul intervention, which combined aspects the Eat for Life and Black Churches United for Better Health interventions, increased fruit and vegetable intake by 0.7–1.4 servings, depending on the measure used, at 6 months [20].

Although faith-based studies targeting African Americans have shown meaningful increases in fruit and vegetable consumption, no faith-based studies have explored which variables predict changes in consumption. A better understanding of who is more or less likely to increase fruit and vegetable consumption can help inform more targeted interventions. For example, if individuals with higher self efficacy are more likely to increase consumption, interventions can incorporate additional, or more intense, intervention strategies targeting those with low self efficacy upon program entry. Perhaps closest to our targeted population was a study by Langenberg and colleagues [21] targeting a diverse sample of WIC mothers (>50% African American) in Maryland. They found that education and employment (borderline), and baseline attitudes, self efficacy, barriers, knowledge, and responsibility (for food shopping and preparation) were significant predictors of change in fruit and vegetable consumption at the 6-month follow-up.

Most of the literature to date (faith-based and/or targeting African Americans) has been cross-sectional studies examining correlates of fruit and vegetable consumption at one time point (i.e. at baseline)[22–26]. Variables such as gender [23,26], age [24–26], employment status[25], income [25,26], marital status [24], comorbidities [25], education [23,24,26], self-rated health [23,26],weight status [26], cooking practices [25], beliefs,[23] knowledge [23], outcome expectations [25], barriers [22,25], rewards [22], benefits [22] self efficacy [23,25], social support [23,25], social norms [22], church attendance [25], and exercise [25,26], have been associated with fruit and vegetable intake in African Americans. Although cross-sectional studies can be useful, studies examining predictors of change in outcomes (i.e. fruit and vegetable consumption) offer additional insight which may assist in efforts aimed at improving the targeted health behaviors.

The Faith, Activity, and Nutrition (FAN) study was a 15-month, physical activity and dietary intervention targeting African Methodist Episcopal (AME) churches in South Carolina. Results from FAN showed that fruit and vegetable consumption was significantly higher at

the post test follow-up in the intervention group compared to the control group [27]. This study addresses a current gap in the literature by examining baseline predictors of change in fruit and vegetable consumption in a sample of African American church members taking part in FAN. We examined whether demographic, health-related and psychosocial variables at baseline predicted increases in fruit and vegetable consumption from baseline to 15 months (i.e. post- program).

Methods

The methods of the Faith, Activity, and Nutrition (FAN) program have been described in more detail elsewhere [27,28]. In brief, FAN was a physical activity and nutrition intervention implemented in African Methodist Episcopal (AME) churches in South Carolina. FAN used a community-based participatory research approach in which a planning committee consisting of church leaders, lay members of the church, and university staff worked together at all stages of the research project to develop, implement, and evaluate the program. The primary goals of FAN were to increase moderate to vigorous intensity physical activity and fruit and vegetable consumption, and to improve blood pressure [28].

Research Design

This study used a group randomized design and included three waves of implementation. Churches were randomized to receive the intervention immediately following baseline assessments (i.e. intervention group) or at the end of the 15-month intervention period, following post measurements (i.e. control group).

Church Recruitment

As reported in more detail elsewhere [28], 131 pastors from 4 geographically-defined AME districts in South Carolina were sent letters from their presiding elder introducing the FAN program and inviting participation. FAN staff made follow-up telephone calls to the pastors to provide more detail about the FAN program and to answer any questions. Pastors from interested churches typically appointed a liaison to assist in scheduling and coordinating measurement sessions and church intervention trainings.

Procedures

Liaisons from interested churches were asked to recruit members of their congregation to take part in a measurement session at baseline (pre-intervention). Recruitment goals were a function of church size (13 members for small churches, 32 for medium, 63 for large). Study staff provided the churches with flyers and announcements that could be used to recruit participants. At each baseline measurement session, participants completed an informed consent form that was approved by the Institutional Review Board at the University of South Carolina and by the FAN planning committee. To be eligible, participants had to be at least 18 years of age, be free of serious medical conditions or disabilities that would make small changes in physical activity or diet difficult (self-identified), and attend worship services at least once a month (to ensure intervention exposure). Upon providing consent, trained FAN staff took physical assessments and participants completed a comprehensive survey.

The same measures were repeated 15 months later (post-program). Prior to the scheduled post-measurement session, participants were mailed a letter inviting them to take part in a post-test assessments and the survey to complete prior to the session, and churches were asked to make announcements at worship services. Participants also received a phone call from study staff, reminding them to attend the scheduled measurement session. Participants unable to attend their scheduled measurement session were invited to attend a future session at a nearby church. Repeated contacts were made with participants not attending a session, asking them to return their survey in a postage-paid envelope.

Intervention

The intervention targets, guided by the structural ecologic model [29], were developed by the FAN planning committee during the first year using a CBPR approach. Churches were asked to implement intervention activities, focusing on physical activity and healthy eating, which targeted each of the four structural factors within the model. Although churches had a great deal of flexibility in how they addressed each of the factors, they were asked to implement a set of core activities targeting both physical activity and healthy eating: distribute bulletin inserts, share messages from the pulpit, pass out educational materials, create a FAN bulletin board, and suggest guidelines and practices that the pastor can set.

Each church formed a committee and attended a one-day training. Each committee developed a formal intervention plan that followed the structural ecological model [29] and was in line with the overall FAN objectives. Upon submission of their plan and budget, FAN churches received a stipend to assist with FAN-related activities. More details of committee training can be found elsewhere [28].

Each church also sent two individuals to attend a cooks training that focused on the Dietary Approaches to Stop Hypertension (DASH) diet plan. More details of the committee and cooks trainings can be found elsewhere [28,30].

In addition to the trainings, committees (including cooks), and pastors received monthly mailings over the 15 month intervention period. Each mailing focused on either physical activity or healthy eating, and highlighted a health behavior change strategy consistent with the social cognitive theory [31] (e.g. social support, self monitoring, self-efficacy), and a health condition related to poor activity or dietary habits. Finally, study intervention staff made follow-up technical assistance calls to pastors, FAN coordinators, and cooks. The purpose of the calls was to learn what types of activities were being implemented, and to help problem-solve any challenges they were facing.

Measures

Sociodemographic and Health-related Variables.—Participants were asked to self-report their age, gender, race, marital status, total household income, highest grade or years of education completed, and rated their general health status on a scale from 1 (excellent) to 5 (poor). Participants also reported the number of times per month they attended worship services and other church activities or meetings, excluding worship service.

Fruit and Vegetable Intake.—The National Cancer Institute (NCI) fruit and vegetable all-day screener measured fruit and vegetable consumption (cups/day) [32]. Nine of the original ten items were used (French fry consumption was excluded) [33]. Participants were asked about the types and quantity of fruits and vegetables consumed in the past month. This instrument correlates moderately with 24-hour recall measures (Men: r = 0.66; Women: r = 0.51) [34], and is similar to one used in another faith-based intervention with African Americans [17] that also showed a moderate correlation with 3-day food records (r = .51).

Self efficacy for Fruit and Vegetable Consumption.—Self-efficacy for fruit and vegetable consumption was measured with a 10-item scale adopted from the Sallis et al. [35] scale and used in two other faith-based projects [19,20,36]. On a scale of 1 (not at all confident) to 4 (very confident), participants were asked how confident, in the next 6 months, he/she could eat fruits and vegetables when faced with common barriers.

Social support for Fruit and Vegetable Consumption.—Social support for fruit and vegetable consumption over the past 12 months from family, friends or work colleagues, and people at church were each measured with a 3-item scale. On a scale from 1 (none) to 4 (a lot), participants were asked how much encouragement they got from family/friends or work colleagues/members of church to eat more fruits and vegetables. The items used to assess family and friend/colleague support were derived from a study by Eyler et al. [37] involving minority women, which were adapted from the Sallis et al. [38] scale. The items assessing support from church members were similar to those used in another faith-based project [19].

Church Support for Healthy Eating.—Because an existing church support scale was not available in the literature, we developed six items that assessed church support for healthy eating [39] over the past 12 months. Items that had face validity were developed to capture important types and sources of support in church settings based on experiences from a previous faith-based project [40,41], input from church leaders and lay members, and the guiding theory for our intervention [29]. All items used a four point response scale ranging from 1 (rarely or never) to 4 (most or all of the time).

Physical Activity.—The Community Health Activities Model Program for Seniors (CHAMPS) questionnaire [42] assessed leisure-time moderate to vigorous physical activity. It assesses the frequency and duration of various physical activities completed “in a typical week during the past 4 weeks.” This measure has been shown to be valid [43], have acceptable test-retest reliability [43], and be sensitive to change [42,44–47]. A 36-item modified version, similar to the one described by Resnicow et al. [48], was used in this study. Hours per week of leisure-time moderate to vigorous physical activity (≥ 3.0 METs, with the removal of household and related activities) was calculated.

Perceived Stress.—A 4-item version of the Perceived Stress Scale [49,50] measured the degree to which situations in one’s life are appraised as stressful. On a scale from 1 (never) to 5 (very often), participants were asked how often, in the last month, he/she felt or thought a certain way.

Body Mass Index (BMI).—Height to the nearest quarter inch and weight to the nearest 1/10 kilogram were obtained by trained staff. Body mass index (BMI) was calculated as kg/m2 using standard procedures.

Diabetes.—Self-reported presence of diabetes was assessed by asking participants, "Have you ever been told by a doctor, nurse, or other health professional that you had diabetes [51]?" Participants answering "yes" or "yes, but only during pregnancy" were considered to have diabetes.

Hypertension.—Resting blood pressure was taken three times on the right arm, after participants sat quietly for five minutes,[52] with the automated DinaMap ProCare Monitor (DPC-100X-EN).[53] The average of the second and third measures was used. Because participants may have controlled hypertension, self-reported presence or absence of hypertension was also assessed by asking participants, "Have you ever been told by a doctor, nurse, or other health professional that you had high blood pressure [51] ?" Participants with a systolic blood pressure >140 mmHg, a diastolic blood pressure >90 mmHg, or answering "yes" to the self-report question were classified as hypertensive.

Statistical Analyses

A square root transformation corrected skewness in both baseline and post-program fruit and vegetable consumption scores. Differences in baseline demographic and health-related variables among those completing and not completing both pre and post-program fruit and vegetable consumption measures were assessed with chi-squares and t-tests.

Analysis of covariance (ANCOVA) examined baseline predictors of post-test fruit and vegetable consumption. SAS PROC MIXED was used to control for church clustering. Post-program fruit and vegetable consumption was the dependent variable in all analyses, and the baseline predictor variable of interest was the independent variable. A separate model was conducted for each baseline predictor examined. Baseline fruit and vegetable consumption, age, gender, education, church wave, church size, and intervention group were added as covariates to analyses that did not include these variables.

Results

Of the 1257 participants from 74 churches enrolled in FAN and included in the primary outcomes paper [27], 1186 participants from 74 churches completed the fruit and vegetable consumption measure at baseline. Of these 1186 participants, 627 participants from 68 churches had complete post-program fruit and vegetable consumption data. Those with complete pre and post-program fruit and vegetable consumption data were older ($p<0.0001$), reported attending more church activities/meetings ($p=0.01$), participated in less leisure time physical activity ($p=0.01$), reported great self efficacy ($p=0.003$), were more likely to be married ($p=0.04$) and have hypertension ($p=0.004$) at baseline than those without complete data.

As shown in Table 1, the mean age of participants in this study was 57.4±12.3 years and the mean BMI was 32.6±7.3 kg/m^2. A majority of participants were female (76.2%), married

(56.6%), had total household incomes less than $40,000 (57.7%), had at least some college education (57.1%), and were overweight or obese according to their BMI (88.1%). At baseline, participants consumed 3.9±3.7 cups of fruits and vegetables per day and engaged in 3.6±5.0 hours of leisure-time physical activity a week.

Mean adjusted post-test fruit and vegetable consumption (for categorical variables), estimates, standard errors, and p-values for each baseline predictor variable examined are shown in Table 2. Higher post-test fruit and vegetable consumption was significantly higher in obese participants compared to both overweight (p=0.04) and normal weight (p=0.03) participants, and in those without diabetes (p=0.04) at baseline. Participants with a greater waist circumference (p=0.04), higher fruit and vegetable consumption (p<0.0001), higher levels of leisure time physical activity (p=0.01), greater social support (p=0.01) and higher worship service attendance (p=0.04) at baseline also had greater fruit and vegetable consumption at post-test. There was a borderline significant relationship between post-test fruit and vegetable consumption and greater church support (p=0.06) and higher attendance at church activities/meetings (p=0.06). Gender, education, income, marital status, health status, hypertension, age, BMI, stress, and self-efficacy at baseline were not associated with post-test fruit and vegetable consumption (all p-values >0.05).

Discussion

A majority of African American adults do not eat the recommended daily amount of fruit and vegetables, perhaps contributing to the disparities in chronic disease the United States faces. Four major trials to date have focused on increasing fruit and vegetable consumption in African Americans through faith-based behavioral interventions: Eat for Life Trial[18], Black Churches United for Better Health[17], Healthy Body Healthy Spirit[19], and Body and Soul[20]. Although each intervention has successfully increased fruit and vegetable consumption, none of these studies have examined which (baseline) variables predict changes in intervention outcomes. The current study addresses a major gap in the current literature by examining which baseline variables predict change in fruit and vegetable consumption in a successful faith-based physical activity and dietary intervention targeting African Americans (FAN) [54]. The knowledge gained from this study should be considered when developing subsequent faith-based dietary interventions.

Predictor studies are valuable for helping to understand who is most and least likely to make targeted behavioral changes. Individuals lacking the characteristics associated with increased fruit and vegetable consumption can be identified from the outset, and steps to change the modifiable variables can be undertaken. Although non-modifiable predictors cannot be changed, different intervention approaches and/or more intense approaches can be used to counterbalance the unfavorable characteristics of the participant.

This study found that church members who had a greater waist circumference, greater baseline fruit and vegetable consumption, greater leisure-time physical activity, higher levels of social support, greater attendance at worship service, were obese, and did not have diabetes at baseline showed higher post-test fruit and vegetable consumption, after controlling for pre-test values. There were also borderline significant relationships between

post-test fruit and vegetable consumption and higher baseline church support and attendance at church activities. These findings provide insight into who may benefit most from a faith-based intervention such as FAN, and has implications for future faith-based interventions targeting African American. Additional resources, activities, or materials may be necessary for individuals lacking suboptimal levels of the aforementioned indicators upon program entry. For example, individuals with suboptimal levels of social support or with low church attendance upon program entry can be identified early and intervened upon with additional, perhaps more intense, strategies. We were surprised to find the positive associations for waist circumference and obesity; it is possible that the total volume of food consumed by these individuals was higher, and therefore they inherently consumed greater amounts of fruits and vegetables.

No other faith-based studies have examined predictors of change in fruit and vegetable consumption; therefore caution should be taken when comparing our findings to other studies (i.e. different designs). Similar to our predictor findings, cross-sectional studies have found a positive association between fruit and vegetable consumption, social support [23,25], and exercise [25,26] in African Americans. There is cross-sectional evidence that risk behaviors, namely physical activity and fruit and vegetable consumption, may cluster in such a way that individuals with low physical activity also have low fruit and vegetable intake [55]. Perhaps engaging in one healthy behavior (i.e. physical activity) motivated improvements in another healthy behavior (i.e. fruit and vegetable consumption).

Participants with higher attendance at worship service and church activities (borderline) at baseline had greater increases in fruit and vegetable consumption. Worship attendance has been shown to be associated with healthy behaviors [56]. It is also likely that participants, at least in the intervention group, had greater exposure to FAN, which may have resulted in greater increases in fruit and vegetable consumption. This is in line with the findings of Resnicow and colleagues [25] who found a positive association between church attendance and fruit and vegetable consumption and the findings of Campbell and colleagues [17] who found that church attendance over the study period was a strong predictor of increased fruit and vegetable consumption among individuals in the intervention group.

There was a borderline significant relationship between church support at baseline and fruit and vegetable consumption such that church members reporting higher support from his/her church for healthy eating had greater increases in consumption. Cross-sectional data from FAN also showed a positive relationship between church support and fruit and vegetable consumption [39]. Creating social and physical environments that promote good health for all is one goal of Healthy People 2020 [57]. A unique aspect of FAN was its focus on creating a church environment that supported healthy eating practices through getting the word out, providing opportunities, and developing policies and guidelines. Future faith-based studies may want to consider church support and its potential influence on changes in health behaviors such as fruit and vegetable consumption.

None of the demographic variables were associated with greater changes in fruit and vegetable consumption, and to our surprise, self efficacy was not associated with increases in fruit and vegetable consumption. Self efficacy has been shown to be one of the strongest

predictors of fruit and vegetable consumption in adults [58]; cross sectional studies with African Americans have also found a positive relationship between self efficacy and fruit and vegetable consumption (cross-sectional) [23,25]. One possible explanation for the lack of relationship in this study was a restricted range, as overall, self-efficacy at baseline was fairly high in our sample.

Limitations, including the use of a self-report measure of fruit and vegetable intake, should be considered when interpreting the findings of this study. Although 24-hour recalls may be considered the gold standard for measuring dietary intake, this approach was not feasible given the size and scope of the study. In addition, the attrition rate in this study was higher than desirable, although in line with what other studies targeting African Americans have reported [59].

This is the first faith-based study to examine baseline predictors of change in fruit and vegetables among African Americans and offer insight into who may be most (or least) likely to make changes. Non-significant predictors in this study should not be discounted, as this type of analysis in faith-based settings is in its infancy. Additional predictor studies will collectively help to identify individuals who may be more “at risk,” and subsequent interventions can incorporate more intense strategies and additional resources c to assist those who are less likely to change, ultimately leading to more effective interventions.

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References

1. Terry P, Terry JB, Wolk A. Fruit and vegetable consumption in the prevention of cancer: an update. J Intern Med. 2001;250(4):280–290. [PubMed: 11576316]
2. Dauchet L, Amouyel P, Hercberg S, Dallongeville J. Fruit and vegetable consumption and risk of coronary heart disease: a meta-analysis of cohort studies. J Nutr. 2006;136(10):2588–2593. [PubMed: 16988131]
3. Lock K, Pomerleau J, Causer L, Altmann DR, McKee M. The global burden of disease attributable to low consumption of fruit and vegetables: implications for the global strategy on diet. Bull World Health Organ. 2005;83(2):100–108. [PubMed: 15744402]
4. Ford ES, Mokdad AH. Fruit and vegetable consumption and diabetes mellitus incidence among U.S. adults. Prev Med. 2001;32(1):33–39. [PubMed: 11162324]
5. Rolls BJ, Ello-Martin JA, Tohill BC. What can intervention studies tell us about the relationship between fruit and vegetable consumption and weight management? Nutr Rev. 2004;62(1):1–17. [PubMed: 14995052]

6. Roger VL, Go AS, Lloyd-Jones DM, et al. Heart disease and stroke statistics−−2012 update: a report from the American Heart Association. Circulation. 2012;125(1):e2–e220. [PubMed: 22179539]
7. Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults, 1999–2008. JAMA. 2010;303(3):235–241. [PubMed: 20071471]
8. Siegel R, Naishadham D, Jemal A. Cancer statistics, 2012. CA Cancer J Clin. 2012;62(1):10–29. [PubMed: 22237781]
9. Centers for Disease Control. National Diabetes Fact Sheet, 2011 Available at http://www.cdc.gov/diabetes/pubs/pdf/ndfs_2011.pdf.
10. U.S. Department of Health and Human Services and U.S. Department of Agriculture. Dietary Guidelines for Americans, 2010 Washington D.C. Available at www.health.gov/dietaryguidelines/dga2010/DietaryGuidelines2010.pdf
11. Blanck HM, Gillespie C, Kimmons JE, Seymour JD, Serdula MK. Trends in fruit and vegetable consumption among U.S. men and women, 1994–2005. Prev Chronic Dis. 2008;5(2):A35. [PubMed: 18341771]
12. Casagrande SS, Wang Y, Anderson C, Gary TL. Have Americans increased their fruit and vegetable intake? The trends between 1988 and 2002. Am J Prev Med. 2007;32(4):257–263. [PubMed: 17383556]
13. Peterson J, Atwood JR, Yates B. Key elements for church-based health promotion programs: outcome-based literature review. Public Health Nurs. 2002;19(6):401–411. [PubMed: 12406175]
14. Thomas SB, Quinn SC, Billingsley A, Caldwell C. The characteristics of northern black churches with community health outreach programs. Am J Public Health. 1994;84(4):575–579. [PubMed: 8154559]
15. Campbell MK, Hudson MA, Resnicow K, Blakeney N, Paxton A, Baskin M. Church-based health promotion interventions: evidence and lessons learned. Annu Rev Public Health. 2007;28:213–234. [PubMed: 17155879]
16. Felix Aaron K, Levine D, Burstin HR. African American church participation and health care practices. J Gen Intern Med. 2003;18(11):908–913. [PubMed: 14687276]
17. Campbell MK, Demark-Wahnefried W, Symons M, et al. Fruit and vegetable consumption and prevention of cancer: the Black Churches United for Better Health project. Am J Public Health. 1999;89(9):1390–1396. [PubMed: 10474558]
18. Resnicow K, Jackson A, Wang T, et al. A motivational interviewing intervention to increase fruit and vegetable intake through Black churches: results of the Eat for Life trial. Am J Public Health. 2001;91(10):1686–1693. [PubMed: 11574336]
19. Resnicow K, Jackson A, Blissett D, et al. Results of the healthy body healthy spirit Trial. Health Psychol. 2005;24(4):339–348. [PubMed: 16045368]
20. Resnicow K, Campbell MK, Carr C, et al. Body and soul. A dietary intervention conducted through African-American churches. Am J Prev Med. 2004;27(2):97–105. [PubMed: 15261895]
21. Langenberg P, Ballesteros M, Feldman R, Damron D, Anliker J, Havas S. Psychosocial factors and intervention-associated changes in those factors as correlates of change in fruit and vegetable consumption in the Maryland WIC 5 a day promotion program. Ann Behav Med. 2000;22(4):307–315. [PubMed: 11253442]
22. Moser RP, Green V, Weber D, Doyle C. Psychosocial correlates of fruit and vegetable consumption among African American men. J Nutr Educ Behav. 2005;37(6):306–314. [PubMed: 16242062]
23. Watters JL, Satia JA, Galanko JA. Associations of psychosocial factors with fruit and vegetable intake among African-Americans. Public Health Nutr. 2007;10(7):701–711. [PubMed: 17381950]
24. McClelland JW, Demark-Wahnefried W, Mustian RD, Cowan AT, Campbell MK. Fruit and vegetable consumption of rural African Americans: baseline survey results of the Black Churches United for Better Health 5 A Day Project. Nutr Cancer. 1998;30(2):148–157. [PubMed: 9589434]
25. Resnicow K, Wallace DC, Jackson A, et al. Dietary change through African American churches: baseline results and program description of the eat for life trial. J Cancer Educ. 2000;15(3):156–163. [PubMed: 11019764]

26. Gary TL, Baptiste-Roberts K, Gregg EW, et al. Fruit, vegetable and fat intake in a population-based sample of African Americans. J Natl Med Assoc. 2004;96(12):1599–1605. [PubMed: 15622690]
27. Wilcox S, Parrott A, Baruth M, Laken M, Condrasky M, Saunders R, Dowda M, Evans R, Addy C, Warren T, Kinnard D, Zimmerman L Results of the Faith, Activity, and Nutrition (FAN) Program: A Community-Based Participatory Research Intervention Targeting Physical Activity and Diet in African American Churches. under review.
28. Wilcox S, Laken M, Parrott AW, et al. The faith, activity, and nutrition (FAN) program: design of a participatory research intervention to increase physical activity and improve dietary habits in African American churches. Contemp Clin Trials. 2010;31(4):323–335. [PubMed: 20359549]
29. Cohen DA, Scribner RA, Farley TA. A structural model of health behavior: a pragmatic approach to explain and influence health behaviors at the population level. Prev Med. 2000;30(2):146–154. [PubMed: 10656842]
30. Condrasky M, Baruth M, Wilcox S, Carter C, Jordan J Cooks Training for Faith, Activity, and Nutrition project with AME churches in SC. under review.
31. Bandura A Social foundations of thought and action: a social cognitive theory. Englewood Cliffs, NJ: Prentice Hall; 1986.
32. National Cancer Institute. Fruit & Vegetable Screeners: Validity Results. 2000 Available at http://riskfactor.cancer.gov/diet/screeners/fruitveg/validity.html.
33. Thompson B, Demark-Wahnefried W, Taylor G, et al. Baseline fruit and vegetable intake among adults in seven 5 a day study centers located in diverse geographic areas. J Am Diet Assoc. 1999;99(10):1241–1248. [PubMed: 10524389]
34. Thompson FE, Subar AF, Smith AF, et al. Fruit and vegetable assessment: performance of 2 new short instruments and a food frequency questionnaire. J Am Diet Assoc. 2002;102(12):1764–1772. [PubMed: 12487538]
35. Sallis JF, Pinski RB, Grossman RM, Patterson TL & Nader PR The development of self-efficacy scales for health-related diet and exercise behaviors. Health Educ Res. 1988;3:283–292.
36. Resnicow K, Jackson A, Braithwaite R, et al. Healthy Body/Healthy Spirit: a church-based nutrition and physical activity intervention. Health Educ Res. 2002;17(5):562–573. [PubMed: 12408201]
37. Eyler AA, Brownson RC, Donatelle RJ, King AC, Brown D, Sallis JF. Physical activity social support and middle- and older-aged minority women: results from a US survey. Soc Sci Med. 1999;49(6):781–789. [PubMed: 10459889]
38. Sallis JF, Grossman RM, Pinski RB, Patterson TL, Nader PR. The development of scales to measure social support for diet and exercise behaviors. Prev Med. 1987;16(6):825–836. [PubMed: 3432232]
39. Baruth M, Wilcox S, Condrasky MD. Perceived environmental church support is associated with dietary practices among African-American adults. J Am Diet Assoc. 2011;111(6):889–893. [PubMed: 21616203]
40. Wilcox S, Laken M, Anderson T, et al. The health-e-AME faith-based physical activity initiative: Description and baseline findings. Health Promot Pract. 2007;8(1):69–78. [PubMed: 16885511]
41. Wilcox S, Laken M, Bopp M, et al. Increasing physical activity among church members: community-based participatory research. Am J Prev Med. 2007;32(2):131–138. [PubMed: 17234487]
42. Stewart AL, Mills KM, King AC, Haskell WL, Gillis D, Ritter PL. CHAMPS physical activity questionnaire for older adults: outcomes for interventions. Med Sci Sports Exerc. 2001;33(7):1126–1141. [PubMed: 11445760]
43. Harada ND, Chiu V, King AC, Stewart AL. An evaluation of three self-report physical activity instruments for older adults. Med Sci Sports Exerc. 2001;33(6):962–970. [PubMed: 11404662]
44. King AC, Pruitt LA, Phillips W, Oka R, Rodenburg A, Haskell WL. Comparative effects of two physical activity programs on measured and perceived physical functioning and other health-related quality of life outcomes in older adults. J Gerontol A Biol Sci Med Sci. 2000;55(2):M74–83. [PubMed: 10737689]

45. Stewart AL, Mills KM, Sepsis PG, et al. Evaluation of CHAMPS, a physical activity promotion program for older adults. Ann Behav Med. 1997;19(4):353–361. [PubMed: 9706362]
46. Stewart AL, Verboncoeur CJ, McLellan BY, et al. Physical activity outcomes of CHAMPS II: a physical activity promotion program for older adults. J Gerontol A Biol Sci Med Sci. 2001;56(8):M465–470. [PubMed: 11487597]
47. Stewart AL. Community-based physical activity programs for adults age 50 and older. J Aging Phys Act. 2001;9(Suppl):S71–91.
48. Resnicow K, McCarty F, Blissett D, Wang T, Heitzler C, Lee RE. Validity of a modified CHAMPS physical activity questionnaire among African-Americans. Med Sci Sports Exerc. 2003;35(9): 1537–1545. [PubMed: 12972874]
49. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. J Health Soc Behav. 1983;24(4):385–396. [PubMed: 6668417]
50. Pbert L, Doerfler LA, DeCosimo D An evaluation of the perceived stress scale in two clinical populations. J Psychopathol Behav Assess. 1992;14:363–375.
51. Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Questionnaire. 2009 Atlanta, GA Available at http://www.cdc.gov/brfss/questionnaires/pdf-ques/2009brfss.pdf
52. 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(19):2560–2572. [PubMed: 12748199]
53. de Greeff A, Reggiori F, Shennan AH. Clinical assessment of the DINAMAP ProCare monitor in an adult population according to the British Hypertension Society Protocol. Blood Press Monit. 2007;12(1):51–55. [PubMed: 17303988]
54. Wilcox S P A, Baruth M, Laken M, Condrasky M, Saunders R, Dowda M, Evans R, Addy C, Warren T, Kinnard D, Zimmerman L. Faith, activity, and nutrition program results. A CBPR intervention in African American churches. under review.
55. Baruth M, Addy CL, Wilcox S, Dowda M Clustering of Risk Behaviors among African American Adults. Health Educ J. 2012;71(5):565–575.
56. Reeves RR, Adams CE, Dubbert PM, Hickson DA, Wyatt SB. Are religiosity and spirituality associated with obesity among African Americans in the southeastern United States (the Jackson Heart Study)? J Relig Health. 2012;51(1):32–48. [PubMed: 22065213]
57. US Department of Health and Human Services. Office of Disease Prevention and Health Promotion. Healthy People 2020. Washington, DC Available at http://www.healthypeople.gov/2020/default.aspx. Accessed: September 8, 2012
58. Guillaumie L, Godin G, Vezina-Im LA. Psychosocial determinants of fruit and vegetable intake in adult population: a systematic review. Int J Behav Nutr Phys Act. 2010;7:12. [PubMed: 20181070]
59. Pekmezi D, Jennings E Interventions to promote physical activity among African Americans. Am *J Lifestyle Med*. 2009;3(3):173–184.

Table 1.

Demographic and Health-related Characteristics of Participants (n=627)

	N	Mean (SD) or %
Gender		
Male	149	23.8
Female	478	76.2
Education		
Less than high school	63	10.1
High school graduate	206	32.9
Some college	173	27.6
College graduate	185	29.5
Income		
<$20,000	152	28.3
$20,000-$39,999	158	29.4
$40,000-$59,999	115	21.4
≥$60,000	112	20.9
Weight category		
Normal weight (BMI <25)	73	11.9
Overweight (BMI ≥25>30)	175	28.4
Obese (BMI ≥30)	368	59.7
Marital Status		
Married/ Member of unmarried couple	352	56.6
Not Married	270	43.4
Health Status		
Excellent	37	6.0
Very good	142	22.9
Good	327	52.8
Fair	104	16.8
Poor	9	1.5
Hypertension		
Yes	424	68.6
No	194	31.4
Diabetes		
Yes	157	25.6
No	457	74.4
Age, years	627	57.4 (12.3)
Body Mass Index, m/kg^2	616	32.6 (7.3)

	N	Mean (SD) or %
Waist Circumference, cm	619	97.3 (14.8)
Fruit and Vegetable Consumption, cups/day	627	3.9 (3.7)
Leisure time Physical Activity, hours/week	624	3.6 (5.0)
Perceived stress[1]	615	2.3 (0.7)
Church Support for F&V[2]	608	2.2 0.7)
Social Support for F&V[2]	617	2.5 (0.9)
Self efficacy for F&V[2]	616	3.2 (0.7)
Attend worship service (times/month)	622	5.5 (3.8)
Attend church activities or meetings (time/month)	620	4.2 (3.7)

[1] Range 1–5; lower scores indicate less stress

[2] Range 1–5; higher scores indicate more support

Table 2.

Baseline Predictors of Change in Fruit and Vegetable Consumption

	N	Adjusted Post-test Mean (cups/day)	Estimate (SE)	p-value
Gender	627			
Male		1.77 (0.06)	0.03 (0.06)	0.62
Female		1.74 (0.04)	0.0 (Reference)	
Education	627			
Less than high school		1.84 (0.09)	0.0 (Reference)	
High school graduate		1.68 (0.05)	−0.16 (0.10)	0.16
Some college		1.70 (0.06)	−0.14 (0.10)	
College graduate		1.80 (0.06)	−0.04 (0.10)	
Income	537			
<$20,000		1.77 (0.06)	0.0 (Reference)	
$20,000-$39,999		1.76 (0.06)	−0.003 (0.08)	0.82
$40,000-$59,999		1.70 (0.07)	−0.07 (0.09)	
≥$60,000		1.76 (0.07)	−0.01 (0.10)	
Weight category	616			
Normal weight		1.63 (0.08)	−0.19 (0.09)	0.03
Overweight		1.70 (0.06)	−0.13 (0.06)	
Obese		1.83 (0.05)	0 (Reference)	
Marital Status	622			
Married/ Member of unmarried couple		1.72 (0.05)	0.0 (Reference)	0.20
Not Married		1.79 (0.05)	0.07 (0.06)	
Health Status	619			
Excellent		1.77 (0.11)	0.11 (0.25)	
Very good		1.81 (0.07)	0.15 (0.23)	0.79
Good		1.76 (0.05)	0.10 (0.23)	
Fair		1.70 (0.07)	0.04 (0.24)	
Poor		1.66 (0.23)	0.0 (Reference)	
Hypertension	618			
Yes		1.77 (0.05)	0.0 (Reference)	0.35
No		1.71 (0.06)	−0.06 (0.06)	
Diabetes	614			
Yes		1.66 (0.06)	0.0 (Reference)	0.04
No		1.79 (0.04)	0.13 (0.06)	
Age, years	627	N/A	0.004 (0.002)	0.08

	N	Adjusted Post-test Mean (cups/day)	Estimate (SE)	p-value
Body Mass Index. m/kg^2	616	N/A	0.01 (0.004)	0.17
Waist Circumference, cm	619	N/A	0.004 (0.002)	0.04
Fruit and Vegetable Consumption, cups/day	627	N/A	0.41 (0.03)	<0.0001
Leisure time Physical Activity, hours/week	624	N/A	0.01 (0.01)	0.01
Stress	615	N/A	−0.02 (0.04)	0.65
Church Support for F&V	607	N/A	0.08 (0.04)	0.06
Social Support for F&V	617	N/A	0.08 (0.03)	0.01
Self efficacy for F&V	616	N/A	0.04 (0.04)	0.36
Attend worship service (times/month)	622	N/A	0.01 (0.01)	0.04
Attend church activities or meetings (time/month)	620	N/A	0.01 (0.01)	0.06

Note: The sample size is not 627 for all analyses due to missing data; baseline fruit and vegetable consumption, age, gender, education, church wave, church size, and intervention group were added as covariates to analyses that did not include these variables.