Research Article

Using a Toolbox of Tailored Educational Lessons to Improve Fruit, Vegetable, and Physical Activity Behaviors among African American Women in California

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ABSTRACT

Objective: Evaluate the effectiveness of the *Fruit, Vegetable, and Physical Activity Toolbox for Community Educators (Toolbox)*, an intervention originally designed for Spanish- and English-speaking audiences, in changing knowledge, attitudes, and behavior among low-income African American women.

Design: Quasi-experimental design with treatment and control groups.

Setting: Four community-based organizations and direct health service provider sites.

Participants: African American women ages 18-54 (156 treatment, 171 control), 75% of whom were low income.

Intervention: Six 1-hour *Toolbox* classes.

Main Outcome Measures: Knowledge, attitudes, self-efficacy, empowerment, and behavior change related to fruits and vegetables and physical activity.

Analysis: Dependent *t* tests pre- to posttest and chi-square test between control and treatment groups.

Results: Women in the treatment group reported significant changes in 9 measures of attitude, compared to 1 measure in the control group, as well as 12 measures of confidence and 5 measures of empowerment for which the control group showed no changes. Compared to those in the control group, women in the treatment group were also more likely to make behavioral changes to meet recommendations for fruit and vegetable consumption and physical activity.

Conclusions and Implications: *Toolbox* lessons were effective in increasing participants' knowledge, attitudes, self-efficacy, empowerment, and reported fruit and vegetable- and physical activity-related behaviors.

Key Words: fruit, vegetable, physical activity, empowerment, Supplemental Nutrition Assistance Program, African American women (*J Nutr Educ Behav*. 2011;43:S75-S85.)

INTRODUCTION

Health Disparities among African Americans

Heart disease, cancer, and stroke are the top 3 killers of all Americans, but the risk factors, incidence, morbidity, and mortality rates for these diseases often are greater among blacks than whites.[1] Almost 50% of African American women have been diagnosed with cardiovascular disease.[2] African Americans are 1.8 times more likely to have diabetes than their white counterparts.[3] In California, 43% of African American women have high blood pressure.[4] Furthermore, population health status is growing worse. Obesity among African Americans in California increased from 62.7% to 70.5% between 2000 and 2008.[5,6] These startling statistics call for immediate action in order to preserve and extend the quality of life and longevity of the African American community.

Increasing fruit and vegetable consumption and physical activity have been shown to delay or prevent the onset of type 2 diabetes,[7–9] high blood pressure,[10] and cardiovascular disease.[10,11] Unfortunately, African Americans, on average, do not consume enough fruits and vegetables and engage in adequate physical activity for better health. Between 1997 and 2005, African Americans in California consumed

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doi:10.1016/j.jneb.2011.02.004

on average 3.0-3.6 servings of fruits and vegetables daily.[12] Though this average has increased to 4.3 daily servings as of the most recent estimates, consumption still falls short of the original National Cancer Institute goal of 5 daily servings.[13] In addition, only 42% of African American adults in California met the recommendation for regular physical activity (California Department of Public Health, Public Health Institute, unpublished data, 2005).

Background of the *Network for a Healthy California—African American Campaign*

To lower the risk of preventable, lifestyle-related chronic diseases among low-income African Americans in California and to reduce the resulting health disparities, the California Department of Public Health's *Network for a Healthy California* (*Network*) created the *African American Campaign* (*Campaign*).[14] The purpose of the *Campaign* is to empower African American adults and their families to consume the recommended amounts of fruits and vegetables and engage in the recommended levels of physical activity every day for better health. The *Campaign* originated in November 1998 when an *African American Task Force* was established to address health disparities among African Americans in California. Initially, 5 faith-based projects were funded to establish or expand health ministries within their churches, and each used the National Cancer Institute's *Body & Soul Program*.[15] In 2000, the program expanded into more churches and surrounding neighborhoods, and in 2003, the *Campaign* developed interventions for farmers' markets, grocery stores, community festivals, the media, community-based organizations (CBOs), and direct health service providers (DHSPs) such as health clinics, community health centers, hospitals, and agencies that provide the Special Supplemental Nutrition Program for Women, Infants, and Children.

With the growth of the *Campaign* came the need for additional culturally appropriate nutrition, physical activity, and consumer empowerment lessons that could be used in many community settings to reach African Americans in general and African American women in particular. An emphasis was placed on African American women because they are often the most influential people in the household to shape the lifestyle habits of their families. After reviewing a variety of materials nationally, the *Campaign* selected an existing *Network* resource known as the *Fruit, Vegetable, and Physical Activity Toolbox for Community Educators* (*Toolbox*) to determine how it could be adapted to improve fruit and vegetable consumption and physical activity of low-income African American Californians.

Toolbox Development and Preparation for Testing

The *Toolbox* was originally conceived as a kit for community educators with educational lessons and supporting materials, which were developed for a wide audience, that could then be tailored for use in *Network* adult-oriented campaigns, all of which were intended for adults currently or potentially eligible for the Supplemental Nutrition Assistance Program (SNAP), formerly known as the Food Stamp Program. The *Toolbox* lessons were constructed based on research, which has shown that addressing predictors of behavior change facilitates actual behavior change for nutrition and physical activity.[16,17] The lessons were specifically designed to address knowledge, attitudes, benefits and barriers, self-efficacy, empowerment and advocacy, and goal setting. The lessons were inspired by the concepts of reciprocal determininism, behavioral capability, expectations, self-efficacy, and observational learning from the Social Cognitive Theory and the community-organizing principle of empowerment.[18] Content of the *Toolbox* lessons was also driven by research from surveillance surveys and formative research from which common barriers to eating fruits and vegetables and being physically active consistently emerge (California Department of Public Health, Public Health Institute, unpublished data, 2005). Barriers include that fruits and vegetables were hard to get at work, hard to get at restaurants, that people were unsure of how to prepare them, and that people were too busy to exercise.

The original suite of 14 lessons—1 consumer empowerment, 7 fruit and vegetable, and 6 physical activity—provided instructors with a complete set of tools, including instructions, preparation steps, materials needed, expansion ideas, and handouts.[19] This set of tools did not rely on nutrition education professionals for delivery, but instead it was designed to be administered by multiple users such as health educators, lay health workers, or other qualified staff at community organizations. The text, which was presented in both English and Spanish, was written in layman's terms for clear understanding and ease in delivery.

Preliminary qualitative pilot testing of the *Toolbox* lessons was conducted with Latino adults in 2003 and had very positive results (D. R. Backman, oral communication, 2009). The *Toolbox* was then revised for the *Campaign* through input provided by campaign coordinators and advisory council members (formerly the *African American Task Force*). Based on their input, the *Toolbox* was modified by including photographs of people, fruit, vegetables, and physical activities that were relevant to African American audiences. For example, traditional African American recipes such as sweet potato hash, savory greens, and dirty rice and black-eyed peas were included in a cookbook to coincide with fruit and vegetable-related lessons. Gospel and African dance music was added to bring relevance to the physical activity lessons. Materials that were previously designed and tested by the *Campaign,* including artwork and a DVD that depicts an African American family's success in improving their diet and physical activity habits, were also incorporated to enhance the lessons.

Although these modifications were made, the general learning objectives of each lesson were not changed from the original *Toolbox*. In addition, implementation recommendations from campaign coordinators and advisory council members were factored into the process, resulting in strategic selection of sites such as churches and clinics that serve African American audiences and instructors from the

community who could deliver the *Toolbox* lessons to achieve the desired outcomes.

After the *Toolbox* was modified, it was ready for testing. The purpose of the evaluation was to determine whether exposure to the *Toolbox* lessons would significantly increase fruit and vegetable consumption, physical activity, and the psychosocial determinants of these behaviors among low-income African American women in California. The researchers hypothesized that these factors would significantly improve as a result of being exposed to and participating in the *Toolbox* lessons.

METHODS

Evaluation Design

A prospective, quasi-experimental design was used to examine the effects of the *Toolbox* among the study participants. Pre- and posttest surveys were completed by a sample of mostly low-income African American women who attended the *Toolbox* classes (treatment group) and a sample of mostly low-income African American women who did not receive the intervention (control group).

The study methods were approved by the Institutional Review Board for Protection of Human Subjects at the Public Health Institute prior to the commencement of the study. Written consent was obtained from all participants. A research and evaluation subcontractor was retained by the *Network* to provide feedback on the survey, as well as to assist with participant recruitment, data collection, data analysis, and interpretation of the findings.

The sample was selected from 4 California urban and suburban sites. Each site had 2 treatment groups and 2 control groups. The 4 cities were selected because they had an active African American community with an existing partnership infrastructure, and they were a good geographic cross-section of California (northern, central, and southern).

Estimation of Statistical Power

A standard power calculation of change from pre- to posttest was conducted to estimate the necessary sample size. The power calculation was estimated for the constructs of self-efficacy and perceived barriers using data from the California Dietary Practices Survey.[20] These constructs were chosen because they are empirically strong predictors of change.[21] The power calculation for self-efficacy used a mean of 0.82, a standard deviation of 0.31, and a sample size of 100; this calculation yielded a 0.05 probability of a Type 1 error with 80% power to detect a 0.11 difference in the changed scores. The same calculation for perceived barriers used a mean of 0.49 and a standard deviation of 0.43, and it yielded a 0.05 probability of a Type 1 error with 80% power to detect a 0.15 difference in the changed scores. Thus, to have adequate statistical power, the study design required recruiting a total of 200 women to participate (100 each for the treatment and control groups).

Recruitment

The sample consisted mostly of low-income, Supplemental Nutrition Assistance Program Education (SNAP-Ed)-eligible African American women, ages 18-54 years, in Fresno, Los Angeles, Oakland, and Sacramento. Each class was composed of approximately 20 women. Women were recruited using a variety of methods including telephone contacts with potentially eligible participants listed in databases of the study subcontractor and *Network* community collaborators, flyer distribution, announcements in programs expected to have a high concentration of eligible candidates, and highly targeted, in-person intercepts at the sites. Women were randomly assigned to either the control or treatment group.

As part of recruitment, women were informed of the purpose of the study, the requirements for participating, risks of participating, and how their survey responses would be kept confidential. After they were informed of their rights as participants and possible risks, written consent was acquired from the prospective participants and identification numbers to be used for linking pre- and post-survey data were assigned.

Treatment and Control

The *Toolbox* was designed for use by CBOs and DHSPs. Facilities selected for the study were settings in which CBOs and DHSPs would typically offer nutrition education classes. One church, 1 Boys and Girls Club, and 2 clinics agreed to provide their facilities for the study, and each facility served as 2 treatment and 2 control sites. The church and Boys and Girls Club did not provide any other accommodations or resources for the research team or study participants. In contrast, the 2 clinics were associated with 2 health educators who ultimately implemented the intervention and control conditions at these sites.

The treatment group was exposed to the independent variable, which was 6 free, 1-hour nutrition and physical activity education classes that were conducted 1 time per week over a 6-week period. The class lessons were developed in a way to encourage the participants to articulate their concerns in their own words, seek responses from their peers, and problem solve issues for situations and environmental contexts that are familiar and common. For example, women were asked as a group to "identify ways to include fruits and vegetables in your meals when you eat out." The women were then invited to discuss their ideas among themselves.[19] The lessons were supported by culturally appropriate, tailored resource materials and handouts that the participants could take home after each class.

In all, the *Toolbox* included 14 lessons, 20 handouts, and 7 additional resource materials. Six lessons from the *Toolbox*, including 3 nutrition lessons, 2 physical activity lessons, and 1 community empowement lesson, were selected for the study. The lessons were selected because they were representative of the overall *Toolbox* and contained objectives that reinforced the behaviors and determinants of interest to this research (Table 1).

Women in the treament group attended consecutive *Toolbox* classes. Only women who attended at least 5 sessions were included in the analysis because it was unreasonable to expect the hypothesized changes to occur without receiving a sufficient dose of the intervention. The participants

Table 1. Toolbox Lessons, Objectives, and Resources to Improve Fruit, Vegetable, and Physical Activity Behaviors and Related Factors

Behavioral Factors	Lesson and Objectives	Handouts and Resources
Fruits and vegetables		
Lesson: Healthy Recipe Demonstration and Sampling		
KAB, benefits	Describe at least 3 health benefits associated with eating different colored fruits and vegetables.	*Health Benefits of Fruits and Vegetables* handout *What's in a Cup?* handout
KAB	Identify at least 3 ways to incorporate 5-A-Day recipes into daily meal plans.	*A Handy Guide to Fruits and Vegetables* poster *Recommended Cups of Fruits and Vegetables for Adults* handout
Self-efficacy	Prepare a healthful recipe that includes at least 1 serving of fruit or vegetable.	
KAB	List the serving sizes for fresh, frozen, juiced, canned, and dried fruits and vegetables.	
Lesson: How Much Do I Need?		
KAB, benefits	Describe at least 3 health benefits associated with eating different colored fruits and vegetables.	*Health Benefits of Fruits and Vegetables handout* *Health Benefits of Physical Activity handout*
KAB	Recognize physical activity and fruit and vegetable consumption as important elements of a healthful lifestyle.	*Recommended Cups of Fruits and Vegetables poster* *Recommended Minutes of Physical Activity for Adults handout*
KAB	Recall the 5-A-Day and physical activity messages.	*What's in a Cup? handout*
KAB	Understand the role of a healthful, active lifestyle in reducing the risk of certain chronic diseases.	*A Handy Guide to Fruits and Vegetables poster* *Fruit and Vegetable Scoreboard* *Physical Activity Scoreboard*
Lesson: Healthy Options Away from Home		
KAB, barriers	Identify at least 3 barriers to fruit and vegetable consumption while dining out.	*Smart Choices on the Go* handout *Power Up at Work* handout
KAB	Describe at least 3 strategies for including fruits and vegetables in meals while dining out.	
KAB, barriers	Identify at least 3 barriers to fruit and vegetable consumption in the workplace.	
KAB	Name 3 easy steps to add fruits and vegetables to lunches and snacks at work.	
KAB	Remember the importance of the 5-A-Day recommendation when eating meals away from home.	
Lesson: Advocate for 5-A-Day and Physical Activity in Your Community		
KAB, barriers	Identify and discuss at least 4 barriers to fruit and vegetable consumption.	*Easy Steps to Advocate for Fruits, Vegetables, and Physical Activity in Your Community* handout
KAB, barriers	Identify and discuss at least 4 ways to overcome barriers to fruit and vegetable consumption.	
KAB, barriers	Identify and discuss at least 4 barriers to physical activity.	

KAB, barriers	Identify and discuss at least 4 ways to overcome barriers to physical activity.	
Advocacy	Summarize 6 steps to advocate for 5-A-Day and physical activity at the community level.	
Physical activity		
Lesson: Be Active Your Way		
KAB, benefits	Name 3 health benefits of physical activity.	*Health Benefits of Physical Activity* handout
KAB	Recall the 5-A-Day and physical activity recommendations.	*Recommended Minutes of Physical Activity for Adults* handout
KAB	Identify 3 ways to be physically active at home and at work.	*Physical Activity Pyramid* handout
Self-efficacy	Use the *Physical Activity Pyramid* and the *5-A-Day and Physical Activity Scoreboard* to help create a weekly physical activity routine.	*Physical Activity Scoreboard* *Keeping FITT* handout
KAB	Understand how the Frequency, Intensity, Time, and Type (FITT) formula can help improve physical activity levels.	
Lesson: Walking on the Path to Better Health		
KAB, benefits	Identify at least 3 benefits of walking as a form of physical activity.	*Let's Get Active* handout
Self-efficacy	Apply the principles of exercise safety to physical activity.	*Physical Activity and Exercise Safety* handout
Behavior	Use walking as a form of physical activity at work and at home.	*Stretching Exercises* handout
KAB	Recognize walking as a way to be physically active with friends and family members.	*Recommended Minutes of Physical Activity for Adults* handout *Physical Activity Pyramid* handout
Behavior	Monitor exertion during physical activity.	*Physical Activity Scoreboard*
KAB	Name 1 new way to get family members to eat more fruits and vegetables.	

KAB indicates Knowledge, Attitudes, Behavior.

received a $50 American Express gift card after the third session and a second $100 grocery gift card after the final class. Participants in the control group completed the pre-survey in week 1 and returned in week 6 to complete the post-survey and receive a $100 grocery gift card. They did not receive the *Toolbox* lessons as part of the study protocol.

The study employed 4 health educators to lead and deliver the *Toolbox* lessons. Each health educator was assigned to 1 of 4 sites, and each delivered all 6 *Toolbox* lessons to their respective treatment groups and collected attendance for their treatment and control groups. Health educators were selected if they had a bachelor's degree in health education or a health-related field and had at least 2 years experience. The health educators also demonstrated a good reputation in the community, were interested and available for the 6-week study, and were recommended by the *Campaign* advisory council members and staff who regularly work with African American audiences. To review the study protocol and perform mock lessons to master the delivery of the *Toolbox*, all health educators completed 2 training sessions that were provided by *Network* staff. At each class during the implementation of the study, a *Network* staff member was present to ensure the health educators were following proper protocol and delivering quality lessons to the participants.

Measures

The *Toolbox* was evaluated for changes in cognitive and behavioral factors that were designed into the lessons. The dependent variables included fruit, vegetable, and physical activity-related knowledge, attitudes and beliefs, self-efficacy and empowerment, and behavior change. The survey did not contain questions about the participants' medical history. The survey included 42 questions, of which 40 had response categories provided and 2 were qualitative. Five additional questions were used to collect demographic data including age, number of people in the household, number of people in the household under 18, use of social services, and annual household income.

Valid and reliable questions to assess fruit and vegetable intake and physical activity behavior were drawn from the California Behavioral Risk Factor Survey.[22] Fruit and vegetable and physical activity attitudes were derived from the *Network's* media tracking survey.[23] Specifically, participants responded to the following statements: "I feel that my family's health will benefit if I serve more fruits and vegetables," "I feel I may develop health problems if I do not eat enough fruits and vegetables," "I feel that my family's health will benefit if we are more physically active," and "I feel I may develop health problems if I am not physically active." A 7-point Likert scale ranging from strongly agree to strongly disagree was used to measure the level of agreement or disagreement with these statements.

Questions specific to the *Toolbox* intervention were also developed for the study. The researchers measured knowledge of the amount of fruits and vegetables and physical activity recommended every day for good health, 3 factors determining the amount of fruits and vegetables recommended for individual daily consumption, the best ways to help reduce the risk of chronic disease, and steps to advocate for more fruit, vegetables, and physical activity in the community. Self-efficacy or confidence in practicing fruit and vegetable-related habits, such as buying more fruits and vegetables on the next shopping trip, planning meals or snacks with more fruits and vegetables, and adding more fruits and vegetables as snacks at work, was measured using a 10-point scale ranging from 1 (not confident) to 10 (very confident). Confidence in physical activity habits, such as creating a physical activity routine, finding out the recommended daily minutes of physical activity needed for good health, and applying the principles of exercise safety, was measured using the same 10-point confidence scale. This scale was also used to measure how confident the participants were to advocate for more fruit, vegetables, and physical activity in their communities. Specifically, the participants were asked:

> *How sure are you that you can: identify things in your neighborhood that make it difficult for you to find and eat fruits and vegetables; identify at least one way to overcome those things in your community that make it difficult for you to find and eat more fruits and vegetables; and talk with people about the things in your community that make it difficlt for you to find and eat more fruits and vegetables.*

A similar set of statements and responses was included for physical activity.

Finally, a series of behavioral questions related to the *Toolbox* objectives was asked. On a 5-point scale ranging from "much less" to "a lot more," participants were asked:

> *Over the past 6 weeks, have you: purchased more or less fruit than the 6 weeks before, purchased more or less vegetables than the 6 weeks before, prepared meals or snacks with more fruit than the 6 weeks before, prepared meals or snacks with more vegetables than the 6 weeks before, had more fruits or vegetables as a meal or snack at work than the 6 weeks before, and ordered more fruits or vegetables as part of a meal or snack while dining out than the 6 weeks before.*

The survey was reviewed by the research subcontractor and 5 evaluation experts at the Califoria Department of Public Health and compared against the objectives and lessons in the *Toolbox* to establish face validity. To assess ease of use, comprehension, and readability, the survey was pilot-tested at the Sacramento Black Expo with approximately 30 African American women prior to the launch of the study. The pilot-test findings resulted in 1 word change and minor format adjustments in the survey.

Data Collection

Data were collected in October and November 2007. Pre-surveys were administered to the control and treatment groups prior to the implementation of the *Toolbox* lessons, and the post-surveys were administered at the end of the intervention. Both surveys were administered by the research subcontractor. Pre- and post-surveys were matched by the identification number that was assigned to participants at the time of recruitment and held by the research subcontractor. Names or other identifiers were not collected as part of the dataset.

Analysis

Survey data sets were built using double key entry, and the analysis was conducted using SAS (version 9.1, SAS Institute, Inc., Cary, NC, 2006). Outcome measures focused on change over time in knowledge, attitudes and beliefs, self-efficacy, empowerment, and reported fruit and vegetable consumption and physical activity. Dependent *t* tests and chi-square tests were used to test for significant differences between the pre- and post-survey results. The study did not warrant control for confounding variables. All significance testing was assessed at the 95% confidence level with $P < .05$.

RESULTS

The treatment group consisted of 186 African American women, and there were 199 African American women in the control group at baseline. The final sample, which included complete pre- and post-survey data, consisted of 156 African American women in the treatment group and 171 African American women in the control group (Table 2). Throughout the course of the study, this represented a 16% dropout rate for the treatment group and a 14% dropout rate for the control group. There were no differences in demographic characteristics of women across the 2 samples at baseline or at the completion of the study.

Knowledge and Attitude Change

One aim of the *Toolbox* lessons was to increase knowledge of fruit and vegetable and physical activity recommendations, as well as to convey the benefits of meeting the recommendations. Women in the treatment group demonstrated statistically significant improvements in 9 measures of fruit and vegetable and physical activity-related knowledge and attitudes (Table 3). Both treatment and control

Table 2. Demographics: Total Sample of African American Women (%)

	Treatment, n = 156	Control, n = 171
Age		
18–28 y	20	20
29–36 y	21	19
37–45 y	28	34
46–64 y	31	27
Annual household income		
< $17,000	37	34
$17,001-29,000	28	32
$29,001-41,000	16	16
≥ $41,000	19	18
No. of people in household		
1–2	39	40
3–4	42	40
≥ 5	19	20
No. of people in household under 18		
0–1	57	56
2–3	31	36
≥ 4	12	8
People receiving food stamps	50	46

Note: Chi-square test, no significant differences found.

groups showed a significant improvement in the knowledge of recommended cups of fruit and vegetables, but all other measures were significant only for the treatment group. Improvements were observed for serving size estimation, knowledge of recommendations for fruit and vegetable consumption and physical activity, and disease prevention and health promotion measures.

Confidence/Self-Efficacy

The *Toolbox* was designed to improve confidence and empowerment for fruit and vegetable consumption and physical activity habits; this design was in part reinforced by the advocacy and self-efficacy components of the lessons. The treatment group demonstrated significant improvements in the percentage who were "highly confident" in 9 specific techniques and tools that help increase fruit and vegetable consumption, such as using the "scoreboard"[24] (Table 4) and planning in advance for fruit and vegetable consumption at eating occasions. On the post-survey results, over three quarters of the women in the treatment group were highly confident that they could prepare recipes that include at least one-half cup of fruits or vegetables; buy more fruits and vegetables the next time they shop; plan meals or snacks that include more fruits and vegetables; and add more fruits and vegetables as snacks at work. This high rate of confidence was also seen with other fruit and vegetable-related variables, as shown in Table 4. In addition, these women showed significant improvements in their confidence regarding 3 measures related to physical activity, namely, scoreboard use, safe exercise, and finding out the recommended minutes of exercise needed for good health.

Empowerment was measured by women's perceptions that they could identify barriers, solutions, and opportunities regarding physical activity behavior and fruit and vegetable consumption. *Toolbox* lessons had a positive effect on the participants' self-efficacy beliefs related to community advocacy. There were significant improvements in the percentage of respondents who were highly confident for 5 of the 6 measures. Women in the treatment group believed they could identify, in their community, obstacles to fruit and vegetable consumption and at least 1 way to overcome obstacles to fruit and vegetable consumption and physical activity. They were also confident that they could talk to people in their community about the obstacles. No significant improvements were observed in the control group.

Self-Reported Behavior Changes

The efficacy of the *Toolbox* to improve behavior related to fruit and vegetable consumption was assessed by women self-reporting improvements in more fruit and vegetable acquisition. After 6 weeks of classes, a significantly higher proportion of women in the treatment group compared to the control group reported that they purchased and prepared more fruits and vegetables since the intervention had started (Table 5). Women in the treatment group were also significantly more likely to report ordering more fruits and vegetables when eating out and eating them more at work. These measures generally assess changes that make fruits and vegetables more proximate.

Behavior changes to meet recommendations for fruit and vegetable consumption and physical activity were also an important goal of the *Toolbox*,[25] and these variables were assessed through self-report. Although proportions of both treatment and control groups increased from pre- to posttest, only the treatment group had significant changes (Table 6). There was a significant increase in the proportion of women in the treatment group who reported that they ate 3.5 or more cups of fruits and vegetables, had been physically active for 5 or more days in the previous week, and were physically active for 5 or more days in a usual week.

DISCUSSION

It is clear from the effectiveness of this intervention that the *Toolbox* offers a comprehensive approach to overcoming different types of barriers to fruit and vegetable consumption and physical activity, including environmental, individual, and psychosocial, among African American women. Baseline responses from both groups and post-treatment responses from the control group were generally consistent with estimates from statewide surveillance surveys on knowledge, attitudes, perceptions, and behavior (California Department

Table 3. Knowledge and Attitude Change Related to Fruit and Vegetable Consumption and Physical Activity

	Treatment		Control	
	Pre	**Post**	**Pre**	**Post**
Knowledge: Correct Number of Cups				
2.5-5.5 cups	0.4	0.5	0.4	0.4
3.5-6.5 cups (correct answer)	22.4	41.0***	24.6	33.9*
4.5-7.5 cups	13.5	9.6	14.0	14.0
Don't know/no answer	23.1	0.6	19.3	9.9
Knowledge: Fruits, Vegetables, and Physical Activity				
The number of cups equivalent to a handful of fruits and vegetables: one-half cup	35.9%	48.7%*	36.3%	40.4%
Three factors determining the amount of fruit and vegetables recommended for individual daily consumption: Age, gender, physical activity level	23.7%	46.8%***	21.6%	19.3%
Best ways to help reduce risk of chronic disease: Healthful eating and physical activity	78.9%	89.1%**	91.2%	85.4%
Recommended amount of moderate-intensity physical activity adults should get daily: At least 30 minutes	72.4%	84.0%**	72.5%	77.1%
Attitudes				
Percentage strongly agreeing that their family's health will benefit if they serve more fruits and vegetables	76.9%	89.7%**	83.6%	87.1%
Percentage strongly agreeing that they may develop health problems if they do not eat enough fruits and vegetables	48.7%	68.6%***	49.7%	53.8%
Percentage strongly agreeing that their family's health will benefit if they are more physically active	70.5%	84.6%***	77.2%	76.6%
Percentage strongly agreeing that they may develop health problems if they are not physically active	49.4%	67.3%***	57.9%	55.6%

*$P < .05$; **$P < .01$; ***$P < .001$.
Note: Paired *t* tests and a chi-square test were used to test for significance; n = 156 treatment, n = 171 control.

of Public Health, Public Health Institute, unpublished data, 2005). The significant improvements by the treatment group indicate great potential for future dissemination of this intervention in settings that women visit frequently. Overall, the *Toolbox* lessons with the discussion format and tailored materials were a very effective educational design for participants.

In addition to linking knowledge with personal behavior change, the *Toolbox* intervention linked women's behaviors, gains in knowledge, and changes in personal practices to empowerment in their larger social environment. For example, the advocacy lesson encouraged women as a group to talk through the specific steps of advocating for environmental change that were outlined in the handout *Easy Steps to Advocate for Fruits, Vegetables, and Physical Activity in Your Community*.[26] Women in the treatment group not only gained knowledge and changed their practices, but they also gained confidence that they could change their neighborhoods, which is consistent with recommendations in the *Healthy People 2010* goals.[27] The *Healthy People* perspective for achieving equity suggests that the greatest opportunities for reducing health disparities are in empowering individuals to make informed health care decisions and in promoting community-wide safety, education, and access to health care.[27] Making informed decisions about nutrition and physical activity and fostering a community environment that supports those behaviors is a natural extension of this logic. The *Toolbox* provided the women with a sense of empowerment from which they gain influence over their immediate environments, including home, neighborhood, church, and workplace.

Although the *Toolbox* was ultimately designed for use by health educators, lay health workers or other qualified staff at DHSPs and CBOs, the evaluation study used health educators only to deliver the lessons in order to reduce possible variance in delivery between sites. If lay educators taught the lessons, it is possible that the magnitude of the intervention effects may be smaller. This pattern was observed in the *Body & Soul* evaluation, which used professional staff in evaluation pilot studies and lay staff in the actual study; smaller but still significant effects were demonstrated for the lay staff delivery.[15]

Table 4. Confidence in Fruit, Vegetable, and Physical Activity Habits and Empowerment, Expressed as the Percentage Highly Confident That They Can Perform Activity or Change Habit

	Treatment		Control	
	Pre	**Post**	**Pre**	**Post**
Fruits and Vegetables				
Prepare a healthful recipe that includes ≥ one-half cup of fruits and vegetables per serving	60.9	78.2***	66.1	64.9
Remember the importance of eating fruits and vegetables when eating away from home	60.3	75.6**	60.2	59.1
Buy more fruit the next time they shop	68.6	82.1**	70.8	74.9
Buy more vegetables the next time they shop	73.7	84.0*	76.0	80.7
Plan meals or snacks with more fruit	61.5	74.4**	64.3	70.2
Plan meals or snacks with more vegetables	58.3	75.0***	66.7	72.5
Add more fruits and vegetables as snacks at work	55.1	76.3***	62.0	67.3
Find out about how many cups of fruit and vegetables they need every day for good health	66.0	80.1***	66.7	64.3
Use the *Fruit and Vegetable Scoreboard* to help set a goal to meet their recommended amount of fruits and vegetables	56.4	69.9**	55.0	53.2
Physical Activity				
Use the *Physical Activity Scoreboard* to create a weekly physical activity routine	42.3	57.1**	43.9	45.6
Apply the principles of exercise safety to their physical activity routine	51.9	70.5***	54.4	58.5
Find out how many minutes of physical activity they need for good health	68.6	80.8**	70.8	73.1
Empowerment				
Identify things in their neighborhood that make it difficult to find and eat fruits and vegetables	46.2	65.4***	52.1	48.5
Identify at least 1 way to overcome those things that make it difficult to find and eat more fruits and vegetables	51.3	64.7**	51.5	49.1
Talk with people about things in their community that make it difficult to find and eat more fruits and vegetables	41.0	59.0***	46.8	42.1
Identify things in their community that make it difficult for them to be more physically active	52.6	62.2	59.1	60.2
Identify at least 1 way to overcome those things that make it difficult to be more physically active	46.2	66.0***	59.1	50.3
Talk with people about the things in their community that make it difficult to be more physically active	43.6	61.5***	50.3	48.5

*$P < .05$; **$P < .01$; ***$P < .001$.
Note: A chi-square test was used to test for significance; n = 156 treatment, n = 171 control.

Lay administration of the *Toolbox* may also result in fewer differences. Even so, nearly all evaluation measures were significant, and significance levels themselves were very strong, so some mediation of the intervention effect could still produce a positive change. In addition, when the previous Spanish-language version of the *Toolbox* was pilot tested, lay persons implemented the lessons, and they reported that the lessons were clear, easy to understand, and easy to use (D. R. Backman, oral communication, 2009).

Another important component of the *Toolbox* is that it can be effectively delivered in a wide range of settings including CBOs, DHSPs, as well as faith-based organizations. These settings have many advantages in promoting healthful eating and physical activity at the community level. They are ideal places to reach low-income target audiences, are often conveniently located and easy to access, and are places where community members can acquire other health-promoting resources.

Limitations

There were several limitations to the study. First, fruit and vegetable consumption, physical activity, and the psychosocial determinants of these behaviors were measured by self-report; as such, they were subject to possible comprehension, memory, and reporting errors. Second, some sensitization among control group participants may have taken place. It is likely that completing the pre-survey and being enrolled in a nutrition and physical activity study

Table 5. Reported Behavior Change in the Amounts of Fruits and Vegetables Purchased, Prepared, Ordered, and Eaten over the Past 6 Weeks (%)

	Treatment, Post n = 156	Control, Post n = 171
Purchased more (net) fruit	90.4**	68.4
Purchased more (net) vegetables	85.9*	74.9
Prepared more (net) meals/snacks with fruit	83.3**	66.7
Prepared more (net) meals/snacks with vegetables	86.5*	75.4
Ordered more (net) fruits or vegetables as part of a meal when dining out	76.3*	63.7
Ate more (net) fruits and vegetables as a meal/snack at work	85.3**	65.5

*$P < .05$; **$P < .001$.
Note: A chi-square test was used to test for significance.

caused women to think about their diet and physical activity level, which may result in a change in the control group's responses over time, even though they did not receive the targeted intervention. Third, the intervention required women to participate in an hour-long program for 6 consecutive weeks. Therefore it is plausible that, despite efforts to randomize group assignments, women who completed the intervention were more motivated to participate, interested in the study topics, and/or likely to make the targeted behavior changes than women in the control group. Fourth, without long-term follow-up data, it is impossible to know if the gains achieved in this study lasted beyond the end of the intervention. Fifth, trained health educators delivered the lessons to the participants. Although health educators are currently active end-users of the *Toolbox* in practice, other professionals such as lay health workers and other qualified staff at CBOs and DHSPs use the *Toolbox*. Future research should determine whether delivery of the lessons is less or more effective among different levels of professionals. Finally, the treatment group received 1 American Express $50 gift card midway through the study as an incentive for their participation. It is impossible to determine the role of the gift card in influencing the participants to buy produce at a grocery store. It is important to note, however, that the gift card could be used on any merchandise and at any retail outlet. If the *Toolbox* lessons influenced the treatment group to use the gift card at a grocery store to buy produce, this would be yet another measure of success.

Table 6. Self-Reported Behavior Changes to Meet Fruit and Vegetable and Physical Activity Recommendations (%)

	Treatment n = 156		Control n = 171	
	Pre	Post	Pre	Post
Daily fruit and vegetable consumption: ≥ 3.5 cups/d	12.2	31.4*	17.5	21.6
Physically active for ≥ 5 d/wk in the previous wk	34.0	59.0*	36.3	42.1
Physically active for ≥ 5 d/wk in a usual wk	37.2	60.3*	39.2	46.2

*$P < .001$.
Note: A chi-square test was used to test significance.

IMPLICATIONS FOR FUTURE RESEARCH AND PRACTICE

Participation in *Toolbox* lessons was effective in increasing knowledge, changing attitudes, increasing self-efficacy, and changing behavior regarding fruit and vegetable consumption and physical activity. In addition, women gained confidence in their ability to negotiate their environments to make changes to support these behaviors. The objectives of the *Toolbox* were met with this target group. Within the 6-week timeframe, African American women involved in the intervention changed their behavior not only at home, but also at work with regard to eating the recommended number of cups of fruits and vegetables as well as getting the recommended amount of physical activity.

Despite the positive outcomes demonstrated in this study, additional research in this area is warranted. Future studies should mitigate for the limitations reported in this study as much as possible. It would be helpful to study several intervention groups to measure the effect of dose on outcome measures and incorporate a longer-term follow-up period to demonstrate the sustainability of the outcomes. Finally, measures of body composition and other biological markers, especially during a longer study period, would help to understand how behavior change influences these indicators.

STATEMENT OF POTENTIAL CONFLICT OF INTEREST

This research project was funded by the Preventive Health and Health Services Block Grant of the Centers for Disease Control and Prevention and the United States Department of Agriculture SNAP-Ed through a contract with the California Department of Public Health's *Network for a Healthy California* (author SBF) administered by the Public Health Institute (authors DB, VS, AAA, SB, LB, AD, MH, AO, and SW) for the data collection, analysis, interpretation of results, and manuscript preparation. The opinions expressed are those of the authors and

do not necessarily represent the views or recommendations of their respective affiliations.

FUNDING/SUPPORT

This study was funded by the Preventive Health and Health Services Block Grant of the Centers for Disease Control and Prevention and the United States Department of Agriculture SNAP-Ed through a contract with the California Department of Public Health's *Network for a Healthy California*.

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