THE ''ROLLING STORE:'' AN ECONOMICAL AND ENVIRONMENTAL APPROACH TO THE PREVENTION OF WEIGHT GAIN IN AFRICAN AMERICAN WOMEN

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Objective: To test the feasibility of the ''Rolling Store,'' an innovative food-delivery intervention, along with a nutrition education program to increase the consumption of healthy foods (fruits and vegetables) to prevent weight gain in African American women.

Methods: Forty eligible African American women were enrolled in the study and randomized to intervention or control groups. A trained peer educator and a Rolling Store operator implemented the study protocol at a local community center.

Results: The program retention rate was 93%. Participants in the intervention group lost a mean weight of 2.0 kg, while participants in the control group gained a mean weight of 1.1 kg at six months. Overall participants showed a mean decrease in weight of −.4 kg (standard deviation 3.0 kg), but the intervention group lost significantly more weight and had a decreased body mass index at six months. In the intervention group, the average number of servings consumed per day of fruits/fruit juice and vegetables significantly increased at six months.

Conclusions: The Rolling Store, at least on the small scale on which it was implemented, is a feasible approach to producing weight loss and improvements in healthy eating when combined with an educational program in a small community center. (*Ethn Dis*. 2009;19:7–12)

Key Words: Community-based, fruits and vegetables, African American women

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INTRODUCTION

More than 10% of African American women aged 40 to 59 years old have class III obesity (body mass index [BMI] >40 kg/m^2).[1–2] The disparity in obesity rates is primarily limited to women; significantly higher rates of obesity exist among African American and Hispanic women than among women of other ethnic groups and men of any ethnic group.[3] A common treatment option for obesity is nutrition education, the aim of which is to restrict total energy intake by eating healthy foods.[4]

Obesity is second only to tobacco use as a preventable cause of death, but the food industry is poorly regulated in terms of advertising and is not held liable for the health consequences of its products.[5] The American Dietetic Association has taken the position that successful weight management requires a lifelong commitment to healthy lifestyle behaviors that emphasize eating habits and physical activity that are sustainable and enjoyable.[6] Subsidies and/or provisions for healthy, traditional foods, plus exercise, may prove beneficial in the prevention of weight gain.[7]

The purpose of this 6-month pilot study was to test the feasibility of the ''Rolling Store,'' an innovative food-delivery medium, along with a nutrition education program to increase consumption of healthy foods (fruits and vegetables) to prevent weight gain in African American women. The hypothesis tested in the study was that access to healthy foods, along with the education of how to prepare these foods, may improve diet quality and promote healthy eating habits.

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METHODS

Participants

The study was conducted at a community center in East Baton Rouge Parish in Louisiana. The mayor-president's office of East Baton Rouge Parish approved the study site. In addition, in-kind service (classroom space and storage for study equipment) was provided to conduct the study at the community center. Forty eligible African American women aged ≥18 years were recruited and randomly assigned: 20 to the treatment group and 20 to the control group. Thereafter, all study participants were assigned to the control group. The study required at least one monthly contact with participants in the control group and at least 24 contacts with those in the treatment group. All participants received calculators, water bottles, and duffle bags as incentives for participating in the study. At the end of 6 months in the study, all participants received a cash stipend of $75.

Study participants were recruited according to detailed inclusion and exclusion criteria and were supervised by

the principal investigator of the study. Personal communication, posters, and fliers were used to recruit participants. The inclusion criteria were African American women, aged ≥18 years, BMI 25–40 kg/m^2, willingness to participate and able to give informed consent, and willingness to make weekly or monthly visits to the study site for six months.

Women with a BMI >40 kg/m^2 were excluded because of the significant morbidity associated with that degree of obesity. Participants were also excluded based on recent and significant underlying diseases such as heart disease, stroke, and cancer (other than nonmelanoma skin cancer), medication that could interfere with the study outcomes (eg, beta blockers for hypertension, all diabetes medications, all lipid-lowering agents), or conditions in which dietary modification was contraindicated (eg, patients on medically supervised diets). In addition, women unable or unwilling to give informed consent, unable or unwilling to regularly participate for the entire study period, unable to communicate with the study staff, currently participating in a dietary or lifestyle modification program, likely to move away from the study area during the study, or planning to become pregnant during the study were excluded.

During this time, the peer educator and Rolling Store operator were identified and trained at the Pennington Biomedical Research Center (PBRC). The peer educator received two days of specific and intensive training in study protocol, motivational interviewing technique, behavioral modification technique, and basic dietary assessment. The Rolling Store operator received one day of training in study protocol. The study was approved by the institutional review board of PBRC. Each participant was asked to sign an approved written informed consent form that detailed the purpose, requirements for participation, and the potential benefits and risks of the study. The informed consent also indicated that participation was voluntary and could be terminated by the participant at any time.

Measurements

All measurements were conducted by the peer educator at the community center. At baseline, participants were asked to provide demographic, socioeconomic, and health information such as age, education, and past and present medical history. Dietary assessment was conducted by using the PBRC Food Frequency Questionnaire (FFQ, a modification of the Block questionnaire)[8] at baseline and at six months. The participants were asked to report all foods eaten during the previous 24 hours. Food models and measuring guides were used to facilitate the estimation of portion size, and appropriate probing questions were used. The 24-hour dietary recalls were conducted by the peer educator using face-to-face interviews. The dietary recall data were analyzed at the Delta Nutrition Intervention Research Initiative Dietary Coding Center at PBRC. In addition, the PBRC Food Diary Program, an in-house program based primarily on US Department of Agriculture food composition databases, was used to analyze food intake. Study participants were asked to respond to a physical activity questionnaire[9] for safety reasons before beginning physical activity. The questionnaire contained seven questions, and a response of ''no'' to each question was required. If participants responded ''yes'' to one or more questions, they were deemed ineligible or a physician statement was necessary before participating in physical activity (15–30 minutes of walking every other day).

Anthropometric assessments consisted of measurements of height, weight, and waist circumference. In addition, blood pressure was measured. These were done at the community center at the beginning of the study and monthly for 6 months. Study participants were asked to complete two quality-of-life and health questionnaires, at baseline and at end of study. Quality of life (in the past week) was assessed by using the Impact of Weight on Quality-of-Life instrument.[10] This instrument contains questions about physical function (11 items), self-esteem (7 items), sex life (4 items), public distress (5 items), and work (4 items). An example of these questions is ''because of my weight, I am embarrassed to be seen in public places.'' For each item, the Likert-type responses range from 1 (never true) to 5 (always true). The Short Form Health Survey, a 36-item survey designed to assess general health and emotional well-being was also used in the study.[11] Item content focuses on self-perception of overall health, and physical as well as emotional problems related to health. It also includes a single item that provides an indication of perceived change in health.

Intervention

The control group met with the peer educator each month for 6 months to measure blood pressure and weight. At that time, nutrition and physical activity information was given to each participant in the control group to take home and read.

In a classroom setting, the peer educator taught the same nutrition and physical activity lessons to the intervention group that was given to the control group. The lessons included cooking demonstrations on how to prepare healthier meals. In addition, participants were provided fresh fruits and vegetables each week for 24 weeks from the Rolling Store, and each week participants received recipes for healthy preparation techniques. In the event of an unforeseen circumstance, participants were given at least three opportunities each month for make-up lessons. Nutrition education materials were selected from the PBRC portfolio by the study investigators and were divided into six separate lesson plans. The lesson titles included ''Lifestyle Balance and Record Keeping'' (Food and Exercise),

Table 1. Anthropometric and hemodynamic parameters at baseline and six-month change among 37 African American women in the "Rolling Store" intervention or control group, East Baton Rouge Parish, Louisiana

	All Participants (*N*=37)		Control Group (*n*=19)		Intervention Group (*n*=18)		
Variable	Mean (SD) Value at Baseline	Mean (SD) Change at 6 Months	Mean (SD) Value at Baseline	Mean (SD) Change at 6 Months	Mean (SD) Value at Baseline	Mean (SD) Change at 6 Months	*P* Value*
Age, years	45.9 (9.9)	NA	45.5 (10.6)	NA	46.4 (9.4)	NA	NA
Weight, kg	89.5 (12)	−.4 (3.0)	89.8 (14.3)	1.1 (2.0)	89.1 (9.4)	−2.0 (3.2)	<.001
BMI, kg/m^2	33.7 (3.9)	−.1 (1.2)	34.3 (4.4)	.4 (.8)	33.2 (3.3)	−.7 (1.2)	.001
Waist circumference, cm	96.9 (10.5)	.7 (4.6)	96.8 (10.8)	1.9 (3.7)	97.1 (10.5)	−.5 (5.3)	.12
Systolic blood pressure, mm Hg	128 (13.1)	−1.9 (12.5)	132 (12.3)	−1.4 (12.3)	123 (12.6)	−2.3 (13.0)	.14
Diastolic blood pressure, mm Hg	70.6 (8.5)	.4 (8.6)	71.8 (9.0)	0.1 (9.3)	69.3 (7.9)	.8 (8.1)	.68

* *P* value for the difference in change (from baseline to six months) between the treatment and intervention groups.

"Healthy Eating," "Tip the Calorie Balance," "Four Keys to Healthy Eating Out," "You Can Manage Stress," and "Ways to Stay Motivated."

Participants in the intervention group were asked to keep a seven-day food and exercise diary during one week of each month for six months. Each of the assigned seven-day blocks consisted of five weekdays and two weekend days. Food and exercise diaries were used to provide feedback and guidance based on current recommendations to prevent weight gain.

The owner of a truck with a detachable camper shell was employed to operate the Rolling Store. Easily removable magnetic banners labeled "Rolling Store" were displayed on each door, and the slogan "Rolling with Healthy Choices" was placed on the side panels of the truck to promote its appearance. The principal investigator and Rolling Store operator were responsible for stocking the store each week. Citizens from the community were attracted to the Rolling Store and each week inquired as to how to enroll in the program. Because of the enormous interest from people in the community, the Rolling Store operator was allowed to sell fruits and vegetables in addition to those provided at no cost to participants in the intervention group. A budget of $200 per week was allotted for stocking the store. On the same day of each week, the Rolling Store parked in front of the community center from 2:00 PM to 6:00 PM to allow enough time for participants in the treatment group to visit the store to obtain fruits and vegetables.

Participants in the intervention group received 9–14 choices of fruits and vegetables, equivalent to approximately 6–12 servings each week, at a cost charged to the study of $10 per participant. Each week, the 20 participants received an equally distributed amount of assorted fruits and vegetables that were bought in bulk quantities at cost from the local commercial produce market. Fruits and vegetables varied each week, and each week participants received one or more new choices. The fruits offered were apples, bananas, grapefruits, mangos, oranges, pears, plums, tangerines, Asian pears, coconuts, kiwi, limes, nectarines, peaches, strawberries, cantaloupes, and watermelons. Vegetables offered were beets, bell peppers, broccoli, cabbage, carrots, cauliflower, celery, coleslaw, corn, cucumbers, eggplant, green beans, greens (collard, mustard, and turnip), kale, lettuce, mirliton (vegetable pear), okra, jalapeno peppers, radishes, rutabagas, spinach, squash, tomatoes, turnips, onions (yellow, green, red, white), and potatoes (white, red, sweet). The peer educator conducted cooking demonstrations to illustrate how to prepare healthier (low-fat) foods including banana pudding, eggplant casserole, mirliton casserole, stir-fry, and sweet potato casserole. In addition, recipes were provided that described the number of calories and fat grams per serving size.

Statistical Analysis

Anthropometric measurements (height, weight, and waist circumference), quality-of-life and health indices, and dietary intake values for fruit, vegetable, energy (kcal), and total dietary fiber were recorded at baseline and six months for all study participants. To assess the efficacy of the intervention, linear regression analysis and analyses of variance were conducted to test for significant ($P<.05$) differences in mean change from baseline between intervention and control groups. All analyses were carried out by using SAS version 8.1 (SAS Institute, Inc, Cary, North Carolina).

RESULTS

Forty African American women were randomized, and 37 (93%) completed the study. Participants ranged in age from 22 to 66 years. The average BMI (Table 1) fell within the definition of obesity class I. Participants in the intervention group lost significantly more weight after 6 months than did

Table 2. Dietary intake at baseline and six-month change among 37 African American women in the "Rolling Store" intervention or control group, East Baton Rouge Parish, Louisiana

Variable	All Participants (*N*=37)		Control Group (*n*=19)		Intervention Group (*n*=18)		
	Mean (SD) Value at Baseline	Mean (SD) Change at 6 Months	Mean (SD) Value at Baseline	Mean (SD) Change at 6 Months	Mean (SD) Value at Baseline	Mean (SD) Change at 6 Months	*P* Value*
Energy, kcal/day	1700 (1403)	−548 (1179)	1723 (1517)	−636 (1326)	1674 (1307)	−456 (1032)	.48
Total dietary fiber, g/day	11.9 (16.2)	−1.4 (14.8)	13.0 (21.4)	−4.3 (19.7)	10.7 (7.6)	1.7 (5.7)	.03
Fruit/fruit juice servings/day	1.4 (1.3)	0.5 (1.5)	1.3 (1.2)	0 (1.2)	1.5 (1.4)	1.0 (1.7)	.02
Vegetables servings/ day	1.9 (1.5)	0.3 (1.6)	1.8 (1.8)	−0.2 (1.8)	2.0 (1.2)	0.9 (1.2)	.002

* *P* value for the difference in change (from baseline to six months) between the treatment and intervention groups.

those in the control group. BMI was also significantly reduced in the intervention group compared with the control group. Waist circumference and systolic blood pressure were lowered in the intervention group, although the differences did not reach significance.

Selected dietary intake from the FFQ at baseline and the difference in mean change values between the treatment and control groups at 6 months are shown in Table 2. Although energy intake (kcal) decreased after 6 months in all study participants, the change did not reach significance. A significant mean increase in total dietary fiber was observed in the treatment group at 6 months. The intakes of fruits/fruit juices and vegetables based on the FFQ were analyzed as change from baseline at 6 months with respect to the two treatment groups with baseline as a covariate. In the control group, the mean intake of fruit servings at baseline 1.3 ± 1.2 remained constant, while the mean vegetable servings slightly decreased −0.2 ± 1.8 at 6 months. Participants in the treatment group increased intake of fruit on average from baseline 1.5 ± 1.4 to a mean increase of 1.0 ± 1.7 at 6 months. In the treatment group, mean intake of vegetable servings also increased from baseline 2.0 ± 1.2 to a mean increase of 0.9 ± 1.2 at 6 months. Fruits/fruit juice and vegetable consumption showed a significant mean difference between the control and treatment groups in change at 6 months. In the treatment group, the average number of servings consumed per day of fruits/fruit juice and vegetables significantly increased at 6 months ($P<.016$ and $P<.002$) respectively.

The mean quality-of-life scores among the study groups at baseline were comparable (Table 3). At six months, we observed an overall increase in the quality-of-life scores. A small but nonsignificant decrease was observed overall in general health scores, which indicates that these were not affected by the treatment or control condition. The average self-esteem and emotional well-being scores among participants in the intervention group significantly improved in the intervention group compared with the control group.

DISCUSSION

The purpose of this six-month pilot study was to test the feasibility of the Rolling Store, an innovative food-delivery intervention, along with a nutrition education program to increase consumption of healthy foods (fruits and vegetables) to prevent weight gain in African American women. Participants in the intervention group had a mean weight loss of 2.0 kg; participants in the control group gained weight, but the mean amount was small (1.1 kg). In previous studies conducted in community-based settings, participants in the intervention group lost an average of 3.31 kg and ≈4.5 kg, while the control participants gained an average of ≈.9 kg.[12,13] Results of this study are comparable to those of other low-intensity interventions that usually produce mean weight loss of 1–5 kg at 6 months.[14]

The hypothesis tested in the study was that access to healthy foods, along with education on how to prepare these foods, may improve in diet quality and eating habits, which would result in weight maintenance or loss. The hypothesis was affirmed since participants in the intervention group ate more fruits and vegetables and lost a significant amount of weight. The success of the intervention is evident in that, at the end of the study, the treatment group was consuming the recommended "Five A Day" servings of fruits and vegetables. This increase may be attributed to availability of produce from the Rolling Store and knowledge gained at peer-led lessons on healthy eating and cooking demonstrations. Previous research has shown that a weight-loss program can be conducted by peer educators trained by dietitians, as long as those peers have the requisite interest and knowledge.[12,15] This research affirms the success of a peer in nutrition education and demonstrates that a motivated community member with 16 hours of training can become knowledgeable in leading the lessons. Since, on average, 6–12 servings of fruits and vegetables were taken home each week, other

Table 3. Quality-of-life scores and health measurements at baseline and six-month change among 37 African American women in the "Rolling Store" intervention or control group, East Baton Rouge Parish, Louisiana

Variable	All Participants (*N*=37)		Control Group (*n*=19)		Intervention Group (*n*=18)		*P* Value*
	Mean (SD) Value at Baseline	Mean (SD) Change at 6 Months	Mean (SD) Value at Baseline	Mean (SD) Change at 6 Months	Mean (SD) Value at Baseline	Mean (SD) Change at 6 Months	
Quality-of-life score							
Physical function	79.6 (20.6)	9.7 (16.2)	83.0 (19.0)	7.6 (17.7)	75.8 (22.2)	12.0 (14.5)	.84
Self-esteem	74.5 (26.0)	12.3 (16.8)	78.6 (26.6)	6.2 (14.4)	69.9 (25.1)	18.7 (17.2)	.03
Sex life	89.8 (22.4)	3.7 (24.9)	92.0 (23.6)	−1.0 (29.0)	87.5 (21.2)	8.7 (19.2)	.26
Public distress	94.3 (12.1)	4.7 (12.9)	95.2 (11.1)	3.4 (11.8)	93.2 (13.3)	6.1 (14.1)	.48
Work	90.5 (15.4)	7.3 (15.2)	91.4 (13.9)	6.6 (13.7)	89.5 (17.2)	8.0 (17.0)	.95
Total score	83.5 (17.0)	8.4 (13.5)	86.2 (17.3)	5.4 (14.3)	80.6 (16.7)	11.6 (12.2)	.28
Health measurement							
Bodily pain	80.4 (19.1)	5.1 (18.4)	79.7 (18.8)	9.7 (15.6)	81.1 (19.9)	0.2 (20.3)	.13
General health	77.8 (13.0)	−0.6 (14.4)	79.7 (13.1)	−1.1 (14.7)	75.7 (12.8)	−0.1 (14.5)	.79
Mental health	79.9 (14.3)	3.7 (15.0)	85.1 (8.2)	0.9 (14.2)	74.1 (17.4)	6.7 (15.7)	.86
Physical functioning	82.5 (21.8)	11.2 (18.9)	83.8 (23.2)	11.3 (20.9)	81.1 (20.6)	11.0 (17.2)	.68
Role emotional	83.3 (32.9)	13.5 (31.9)	87.3 (26.8)	5.3 (20.1)	78.9 (38.8)	22.2 (39.6)	.04
Role physical	89.4 (25.9)	8.1 (22.9)	91.7 (24.2)	3.9 (19.1)	86.8 (28.1)	12.5 (26.1)	.09
Social functioning	85.3 (19.2)	9.1 (19.0)	89.9 (15.1)	2.6 (13.6)	80.3 (22.2)	16.0 (21.8)	.06
Vitality score	62.5 (15.8)	9.3 (15.4)	64.3 (11.8)	5.3 (12.9)	60.5 (19.4)	13.6 (17.0)	.17

* *P* value for the change from baseline to six months.

household members may have also benefitted.[16] The effect on household members was not measured, nor was sustainability of these changes after the study ended. The convenience of a Rolling Store parked near the community center that dispensed free fresh fruits and vegetables each week was appealing not only to study participants but also to those living near the study site. For example, when nonparticipants were allowed to buy extra fresh fruits and vegetables at cost, people from the community bought everything the Rolling Store operator had for sale.

Study participants reported an improvement in weight-related quality-of-life and health measurements. Self-esteem and emotional well-being of participants in the intervention group were significantly improved at six months, which suggests that, within a short period of time, either a small amount of weight loss or the social support of contact with study personnel may prove beneficial. The quality-of-life measurement scores were similar to those reported in another study of 199 obese participants assessed by the same questionnaire.[17] However, the improvement in quality-of-life score in this study was smaller than in that study, which combined drug therapy and lifestyle modification.

Results from this study suggest that the Rolling Store, along with a nutrition education program conducted in the community, may be an economical and effective approach to prevent weight gain. Since this study was implemented by trained peers from the community, the economics are further enhanced. The small but significant amount of weight loss can be associated with several health benefits.[15] The success of the community setting in which the study was implemented suggests that this might be a model for sustainability. While this small study cannot be interpreted to mean that larger-scale programs would be successful and sustainable, it can inform larger studies to test logistical feasibility and to explore sponsorship of larger interventions. The effect on family members, especially children, must be tested, and the sustainability of health gains must also be evaluated.

The Rolling Store, at least on the small scale in which it was implemented, is a feasible approach to producing weight loss and improvements in healthy eating. In order for communities to undertake such an effort, a motivated community leader or leaders would be needed to organize the cooperative buying at less than retail value, the distribution of fruits and vegetables, and handling of the finances of the enterprise. The peer educator component would also require support. This study lends itself as a model for testing on a larger scale, either funded as part of a larger church's health ministry or funded by a large foundation.

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