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Development and Evaluation of the Curriculum for BOLD (Bronx Oncology Living Daily) Healthy Living: A Diabetes Prevention and Control Program for Underserved Cancer Survivors

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Abstract

Underserved minority communities have few resources for addressing comorbidity risk reduction among long-term cancer survivors. To address this community need, we developed and piloted the Bronx Oncology Living Daily (BOLD) Healthy Living program, the first known diabetes prevention and control program to target cancer survivors and co-survivors in Bronx County, New York. The program aimed to facilitate lifestyle change and improve health-related quality of life (HRQoL) through weekly group nutrition education (60–90 minutes) and exercise (60 minutes) classes. We examined baseline characteristics of participants using simple descriptive statistics, and evaluated program implementation and impact using the RE-AIM framework. The curriculum, which drew from the social-ecological framework and motivational and cognitive behavioral strategies, consisted of twelve culturally- and medically-tailored modules with options for implementation as a 12-week or 4-week program. Seven programs (four 12-week and three 4-week in length, respectively) were implemented at 5 community site locations. Sixty-six cancer survivors and 17 cancer co-survivors (mean age 60.5 ± 10.2 years) enrolled in one of the programs. Most participants were female (95.2%) minority (55.4% black, 26.5% Hispanic/Latino) breast cancer survivors (75.7%). Median program attendance was 62.5% and did not significantly differ by program length; however, 67.3% of participants achieved 60% attendance among the 12-week programs, compared to 41.9% among the 4-week programs, and this difference was statistically significant ($p=0.02$). Overall, participants reported significant pre/post improvements in perceived health as good/excellent (66.0% to 75.5%; $p=0.001$), and borderline significant decreases in perceived pain as moderate/severe (45.5% to 38.2%; $p=0.05$). More than 90% of participants reported that the program helped them to achieve their-short term goals, motivated them to engage in healthier behaviors, and felt that the nutrition and exercise classes were relevant

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Conflict of Interest

The authors do not have any potential conflicts of interest to disclose.

to their needs. These results indicate that a short-term lifestyle intervention program for adult cancer survivors was acceptable in our community and motivated cancer survivors to improve their HRQoL. The curriculum can be used as a tool to facilitate development of similar programs in the future.

Introduction

The number of cancer survivors living in the United States has increased more than 4-fold over the past several decades [1], and is expected to increase to 18 million by 2022. There is a growing need to address the unique healthcare needs of the cancer survivor community. Long-term cancer survivors face increased risk of type 2 diabetes, cardiovascular disease, overweight and obesity, chronic pain and fatigue [2, 3], and poorer health-related quality of life (HRQoL) [4]. African-American and Hispanic/Latino cancer survivors are more than twice as likely to suffer from obesity-related comorbidities such as diabetes and cardiovascular disease than whites [5, 6]. These disparities are most pronounced in areas of low-socioeconomic status, where there is typically limited access to treatment, treatment options, and/or information on cancer screening and treatment [7, 8].

The urban community of Bronx County, New York, is one such community. It's population is predominantly ethnic minority (54% Hispanic/Latino and 43% non-Hispanic black) [9] and medically underserved [10], with nearly one-third of residents living below poverty [9] and the highest prevalence of diabetes (15.2%) and overweight and obesity (65.3%) in New York City [11]. There have been important efforts to prevent and control diabetes and obesity among minority communities in the Bronx, including the Bronx Health REACH's Fine, Fit, and Fabulous program, a faith-based diabetes prevention program for black and Latino congregants and churches in low-income NYC neighborhoods [12]. However, there have been no known diabetes prevention and management programs specifically targeted to cancer survivors. A diagnosis of cancer can be a potent motivator to change behavior and improve one's health [13]. To address this community need, we developed and piloted the Bronx Oncology Living Daily (BOLD) Healthy Living (BHL) program, a free, community-based diabetes prevention and control program for cancer survivors in Bronx, NY. The program goals were: (1) to facilitate behavior change among cancer survivors to reduce diabetes risk and improve HRQoL through nutrition education and physical activity, and (2) to increase community capacity for preventing and controlling diabetes and comorbidities among cancer survivors in the Bronx, particularly as they transition from active cancer treatment to chronic care. This article describes the development of the BHL curriculum and its evaluation using the RE-AIM [14, 15] framework.

Methods

Program Development

The BHL program was developed within the Psychosocial Oncology Program (PSOP) of the Albert Einstein College of Medicine, Bronx, NY, and the Montefiore-Einstein Center for Cancer Care (MECCC), the major cancer care center of Bronx, NY, responsible for providing cancer support to the county's approximate 1.4 million residents. Program

development began with formative research that was completed by an expert panel of health care professionals within Einstein (consisting of psychologists, biomedical researchers, registered dietitian-nutritionists [RDNs], exercise physiologists [EP], and certified fitness trainers), and was finalized through planning meetings held with key community stakeholders, including members of the Bronx Health REACH [16] and local cancer survivor community.

Participant Recruitment

Enrollment occurred from January 2011 to March 2012. Participants were recruited from medical referrals within the Montefiore Medical System, the PSOP, and participating community site locations (Supplementary Table 1). Eligibility criteria included being an adult (≥ 18 years of age) cancer survivor or co-survivor (defined as family members, friends, or anyone who acts as support for a person with cancer from diagnosis through treatment and beyond) [17] with one or more risk factors for diabetes, including an elevated body mass index (BMI; [weight(kg)/height(m²)], family history of diabetes, or previous medical diagnosis of diabetes or insulin resistance. Exclusion criteria included physical limitations or illnesses that would deem participation in the program unsafe. Informed consent and medical clearance were obtained from each participant prior to beginning the program. Cancer co-survivors may suffer from sleep disturbances, reduced immunity, weight gain, and cardiometabolic abnormalities.[18]; thus, we decided their participation was appropriate. The BHL program was exempt (deemed a program evaluation) by the Institutional Review Board at the Albert Einstein College of Medicine, Bronx, NY.

Program Delivery

Participants attended one weekly group nutrition education class (60 to 75 minutes) and group exercise class (60 minutes), respectively, for either 12-weeks (full-length program) or 4-weeks (modified-length program). We offered several modified-length programs to accommodate participants with time restraints and/or at the request of site locations (Supplementary Table 1). Participants were invited to join any of our full-length or modified-length programs.

A total of 7 program offerings were conducted from March 2011 to April 2012 (Supplementary Table 1). One RDN and one EP were responsible for managing implementation of all nutrition education and exercise classes. Sessions were taught by the RDN, EP, or trained staff that consisted of 1 certified fitness instructor, 2 dietetic interns, and 1 medical resident. Nutrition instructors were trained by the RDN, and fitness instructors by the EP. In addition, a program coordinator was responsible for managing all staff, implementation of program components, data collection, and data entrance. All classes in a single program session were taught by the same instructor, or pair of co-instructors, and an English/Spanish translator was available at each nutrition and exercise class.

Curriculum Design

The BOLD Healthy Living nutrition education curriculum contained 12 modules (Table 1) to promote nutrition knowledge and facilitate behavioral change among cancer survivors. Modules were sequenced to build upon previous skills learned, in accordance with Bloom's

Taxonomy of cognitive development [19], and topics and objectives were developed using evidenced-based diabetes and cancer prevention and management recommendations from the American Diabetes Association [20, 21], the American Cancer Society [22], and the American Institute for Cancer Research [23]. Lesson plans for each module can be accessed at the BHL program website: (blinded for review).

The curriculum drew from the social-ecological framework [24] and integrated cognitive behavioral and motivational strategies to reduce barriers to change and promote self-efficacy. In addition, we created a participants' toolkit (which can be downloaded from the lesson plans) to promote self-management strategies, which included short-term and long-term goal setting related to diabetes prevention and control strategies, food and activity journaling, daily pedometer use, and a "buddy system" (classmates formed pairs to increase personal accountability and motivation during the week).

Our prior needs assessment [7] indicated psychosocial needs of adult cancer survivors in the Bronx were informational, practical, supportive, and spiritual; and that these needs were greater among African-Americans and Hispanic/Latinos compared to non-Hispanic Whites. Therefore, modules were culturally- and medically- tailored to address these unique psychosocial needs of our population (Table 2).

Educational materials (e.g., handouts, PowerPoint presentations) were largely adapted from free, publicly available resources in order to create a sustainable, cost-effective program that could be easily tailored to other geographical locations. For example, we used materials from the United States Department of Agriculture's MyPlate [25] to facilitate teaching food groups and meal planning, and the New York City Department of Health and Mental Hygiene's Diabetes Action Kit [26] as a locally-tailored source. All educational materials are described and appropriately cited in the lesson plans on our website.

Measures

The primary outcomes for this evaluation were implementation and impact. Implementation measures reflected program sites, enrollment, and attendance. Attendance data were collected by class instructors at each weekly nutrition and fitness class, respectively, by having participants sign their full names and date on an attendance sheet.

Impact measures reflected anthropometrics, HRQoL, and participants' perceived program satisfaction and effectiveness to achieve their short-term and long-term goals related to diabetes prevention and control. Pre/post program anthropometric measurements of height, weight, and waist circumference were collected by staff (psychology student interns) trained by the program coordinator using standardized procedures [27].

Participants completed pre/post program self-report questionnaires that were administered via standardized telephone interviews [28, 29] by staff trained by the program coordinator prior to the start of the first class (preprogram) that assessed demographics (e.g., age, gender, ethnicity, employment), medical history (e.g. cancer diagnosis yes/no, type of cancer, diabetes diagnosis yes/no) and HRQoL. HRQoL was measured using 2-items from the SF-36 health survey: (1) Perceived health was assessed with the question, "In general,

would you say your health is (please tick one box),” Responses ranged from poor to excellent, and (2) Perceived pain was assessed with the question, “How much physical pain have you had during the past 4 weeks?” Responses ranged from none to very severe. Readiness to change eating habits was assessed using the readiness to change ladder, and responses were categorized into precontemplation/contemplation (low to moderate readiness), action (moderate to high readiness), and maintenance (high readiness).

Participants self-completed pre- and post-evaluation surveys, in which they were asked a combination of Likert-type scale questions, e.g., “How much has the program helped you achieve your goals?” and open-ended questions, e.g., “What were your goals when you started the program?”

Data Analysis

Demographic, anthropometric, medical history, and psychosocial measures were compared among participants enrolled in one of the 4 full-length or 3 modified-length programs, respectively, using independent samples *t*-tests, one-way analysis of variance (ANOVA), or chi-square with Fisher’s exact test reported for expected cell frequencies ≥ 5 . For skewed data, as visually determined by histograms, non-parametric alternatives were used. Descriptive statistics were presented as mean ($\pm$ standard deviation) or median (interquartile range) for continuous variables and n(% column) for categorical variables. Based on significant findings, subsequent analyses were examined for all attendees (overall) and stratified by program length (12-week and 4-week). Percent attendance for each participant was calculated as: $(\text{number of sessions attended} / \text{number of sessions held}) \times 100$. Each nutrition and exercise class counted as a single session, therefore the 12-week programs offered 24 sessions (with the exception of combined programs, see Supplementary Table 1), and the 4-week programs offered 8 sessions. Median percent attendances within and between full-length and modified-length programs were compared using the Kruskal-Wallis test. We examined differences in the proportion and characteristics of attendees who achieved $\geq 60\%$ attendance vs. those who did not using the two-sample test of proportions and descriptive statistics as described above, respectively. This value was chosen because of the distribution of percent attendance in our sample and varying program lengths. Pre/post data were evaluated using the Wilcoxon signed-rank test, chi-square, or Fisher’s exact test. Qualitative data were analyzed by participants’ open-ended responses. Analysis included both cancer survivors and cancer co-survivors. A value of $p < 0.05$ was considered statistically significant. All data were analyzed using Stata (version 13.1, StataCorp, LP, College Station, TX, 2014). The Reach, Efficacy, Adoption, Implementation and Maintenance (RE-AIM) framework was used to evaluate program implementation and impact [15].

Evaluation

Reach

A total of 104 individuals expressed interest in participating upon initial contact (84 cancer survivors and 20 cancer co-survivors). Of this, 83 individuals enrolled in the program at baseline (enrolled at the start of the first class of the program session, and attended at least 1

class within the first two weeks of the 12-week program session, and first week of the 4-week program session, respectively), of which 66 were cancer survivors and 17 were cancer co-survivors. Reasons for not enrolling included competing work schedules or medical appointments, and lost to follow-ups who, after initial contact, were no longer reachable at their provided contact information.

Table 3 summarizes characteristics of participants enrolled at baseline. The majority of participants were female (95.2%) with a mean age of 60.5 ± 10.2 years, non-Hispanic black ethnicity (55.4%), and had cancer of the breast (75.7%). More than one-half of participants were obese or extremely obese, and approximately 30% had existing type 2 diabetes. Compared to participants enrolled in a 4-week program, those enrolled in a 12-week program were significantly older (62.3 ± 10.7 vs. 57.5 ± 8.6 years; $p=0.04$), a greater proportion were retired (58.8% vs. 29.0%), and a smaller proportion had a personal history of cancer (71.2% vs. 93.6%; $p=0.02$). Overall, 64.2% participants perceived their health as good/excellent compared to poor/fair, and 47.0% reported perceived pain as moderate/severe compared to none/mild. Most participants reported moderate to high (46.3%) or high (31.2%) readiness to change.

Efficacy

Efficacy was assessed using pre/post quantitative and qualitative measures. Analysis was limited to forty participants with complete pre/post anthropometric measurements, and 55 participants with complete pre/post questionnaire data. There were no statistically significant changes in BMI; however, mean waist circumference significantly improved among participants who completed a 12-week program, decreasing from 41.8 ± 6.4 to 40.8 ± 6.4 inches ($p=0.03$), but not among participants who completed a 4-week program. Participants, irrespective of program length, reported overall significant pre/post improvements in perceived health as good/excellent (66.0% to 75.5%; $p=0.001$) and borderline significant decreases in perceived pain as moderate/severe (45.5% to 38.2%; $p=0.05$).

In response to the Likert-type questions on the post-evaluation surveys ($n=53$ completed), more than 90% of participants reported that the program helped them achieve their short-term goals, motivated them to engage in healthier behavior, and felt the nutrition and fitness sessions were very or extremely relevant to their needs. When asked how well the nutrition instructors met their needs, 64% responded with excellent and 36% with good. Feedback was similar between program lengths. Typical participants' feedback to open-ended questions on the post-evaluations survey included (Supplementary Table 2), "My A1C level went down from 6.4 to 6.1," "The program has helped my rheumatoid arthritis, and now I feel I have a stronger ankle. You made a difference in my life," "Nutrition classes helped me be more aware of food labels and what I am putting in my body;" and "this program has given me motivation and strength."

Adoption

Seven program sessions (three 4-weeks, four 12-weeks) were implemented at 5 community site locations (Supplementary Table 1), including medical centers ($n=3$), a community

church (n=1), and an American Cancer Society Office (n=1) over the course of one year (March 2011–April 2012). Class sizes ranged from 5 to 12 participants.

Overall median program attendance was 62.5% (IQR 40.0% to 80.0%) and we did not detect significant differences in median attendance between program lengths nor by respective sessions within each program length (Supplementary Table 1); however, 67.3% of participants achieved an attendance rate ≥60% among the 12-week programs, compared to 41.9% among the 4-week programs, and this difference was statistically significant ($p=0.02$).

We examined differences between those who achieved ≥60% attendance and those who did not, and found significantly higher mean age (63.6 ± 9.3 vs. 56.2 ± 9.7 years; $p<0.001$) and proportion of retirees (63.8% vs. 25.7%; $p=0.001$) among participants with higher attendance. These observations remained significant when stratified by program length. No differences were observed by gender, cancer diagnosis (yes/no), cancer type, length since cancer diagnosis, or BMI (data not shown).

Implementation

The 12-week program session was designed to have 24 classes: 12 nutrition education classes and 12 exercise classes. However, due to holidays that interfered with holding classes at site locations, 2 of the 4 12-week programs had less than 24 classes (Supplementary Table 1), however, all 12 curriculum modules were delivered by combining modules into an extended class (90–120 minutes). The combined modules did not statistically significantly affect overall median percent attendance (Supplementary Table 1), and the program coordinator and instructors verbally reported that the sessions were well-received. In addition, instructors verbally reported implementation of all curriculum components to the program coordinator. We offered at-home class materials and physical activities to participants who missed sessions for work, medical, or personal reasons.

Maintenance

Data on the maintenance of intervention effects on individuals over time was not collected; however, we provided participants with referrals to free local health programs, including the PSOP program's ongoing BOLD wellness workshops and other community resources (e.g., farmer's markets) in an effort to encourage participant engagement in healthy living initiatives. In addition, to maintain community engagement, we created a coalition of academic and community stakeholders, representing 10 organizations, charged with planning and developing future community outreach events targeting cancer and diabetes throughout the Bronx.

Discussion

Five community sites and over one-hundred individuals expressed interest in our diabetes prevention and control program for cancer survivors. Participants' open-ended responses revealed a need for increased information on diet, cancer prevention, and diabetes risk reduction and/or management, as well as to increase motivation to improve health. This is consistent with prior reports that cancer survivors in the Bronx have a need for more

information related to health management and disease prevention [7, 30]. Nearly all participants reported that the program motivated them to change their lifestyle and engage in healthier behavior related to diabetes prevention and control, and that the curriculum was relevant to their needs.

We aimed to achieve a 75–80% attendance rate; however, slightly less than one-third of participants achieved this, therefore we evaluated attendance using a 60% threshold. As previously reported by Courneya et al. [31], low rates of program adherence are common among cancer survivor populations, with 60–85% adherence rates commonly reported for home-based and supervised exercise programs. The site location with the highest attendance was a faith-based community site. Religion and spirituality appear to play an important role in coping with cancer among residents of the Bronx, as evidenced by our observations and that of the faith-based diabetes prevention program, *Fine, Fit, and Fabulous* [12], which successfully promoted health-related behavior change among overweight adults in our community. Moreover, a greater number of participants achieved an attendance rate of 60% among those who completed a 12-week program compared to a 4-week program. Participants with higher attendance rates were significantly older and of retirement status. This finding mirrors what we found in a 12-week yoga intervention study, also taking place in the Bronx, in which older breast cancer patients were more likely to attend more classes than younger ones [32]. It can be hypothesized that older, retired cancer survivors may have more flexible schedules to allow them to attend classes more frequently, although we did not measure attendance barriers on program evaluations, and therefore cannot confirm this in our sample. However, employment [33] and younger age [32] have been previously reported as barriers to attendance among cancer survivors. To increase accessibility, work-based programs, evening/weekend groups, and DVD/internet-based interventions may be alternative delivery options to engage those still working or with limited free time. Another barrier we found with program implementation was coordinating schedules with site locations around holidays closings. Our 12-week program session was designed to have 24 classes: 12 nutrition education classes and 12 exercise classes. However, due to holidays and corresponding scheduling restrictions at site locations, 2 of the 4 12-week program sessions did not fulfill this criterion. In the case of missing classes, all 12 curriculum modules were still taught by combining sessions (2 at most) into one, longer session (e.g., 90–120 minutes instead of 60–90 minutes); thus, we categorized these programs as full-length. This did not appear to affect participants' acceptance of the program, as attendance figures do not reflect differences in median or mean attendance for the combined programs.

The major strength of our program was culturally- and medically- tailoring the curriculum to meet the unique needs of our participants. Urban areas bear a disproportionate burden for chronic illnesses due to the concentration of income inequalities, unhealthy diets, and patterns of physical inactivity. Researchers have coined the term “food desert” to describe urban, underserved neighborhoods with limited access to healthy and affordable food outlets and an increased number of unhealthy food outlets [34]. These communities also tend to have limited and/or unsafe neighborhood walkability [35]. Unavailability of healthy foods and lack of exercise facilities and safe environments for walking are antecedents that affect the development of unhealthful eating patterns and physical inactivity, and ultimately result

in obesity and other chronic medical illnesses [34]. We implemented numerous measures to help participants overcome these barriers, and included self-management techniques through the use of a toolkit to promote sustainability in these initiatives post-program. The *Cancer Thriving and Surviving* program [36] evidenced that self-management programs can help cancer survivors manage their daily health and life different, thereby reducing emotional and social stresses. Future programs should consider tailoring programs to meet the needs and resources available in the local community, and utilizing self-management strategies to reinforce behavioral change.

Several limitations to this program evaluation should be acknowledged. First, our program is limited to the Bronx, NY, community, and therefore cannot be generalized to external populations. However, we used publicly available class materials to guide our program implementation; therefore, this program should be readily adaptable to other geographical locations. Second, our analysis was based on a small sample size that undermined our statistical power, precluding us from doing further sub-group analysis by both program length and site location. In addition, our evaluation utilized questionnaire data, which is subject to recall bias. Although data is limited, recall bias may be higher when information is obtained after a cancer diagnosis [37, 38]. While we employed standardized interviews designed to minimize recall bias [28, 29] there is limited to no data, to the best of our knowledge, to suggest that this is effective among cancer survivors.

Summary and Future Directions

As the cancer survivor and aging population increases, there is an imperative need to offer programs that target comorbidity risk reduction in cancer survivors, particularly in underserved communities where access to healthcare is limited. Our piloting of the BHL program demonstrates that short-term, culturally-tailored health programs designed for cancer survivors are feasible and can improve HRQoL and motivate participants to improve health behaviors. Engaging multiple community stakeholders may be an effective way to implement sustainable comorbidity risk reduction programs for cancer survivors. Results of this pilot program will be used to implement additional nutrition and wellness programs for members of our cancer community in the Bronx. However, future investigations are needed to explore the long-term effectiveness of such programs. The BHL curriculum can be used as a tool to develop future programs that meet the diverse cultural and medical needs of minority cancer survivor populations at low-costs with relatively few resources.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1**BOLD Healthy Living Nutrition Education Curriculum Topics and Integration of Diabetes and Cancer Prevention Recommendations**

Module	Topics	Diabetes Recommendations^{[1][2]}	Cancer Prevention Recommendations^{[3][4]}
1. Orientation	Introduction to the BOLD Healthy Living Program; diabetes risk test; individual short-term and long-term goal setting.	Nutrition therapy is recommended for all people with type 1 and type 2 diabetes as an effective component of the overall treatment plan.	After treatment, cancer survivors should follow the recommendations for cancer prevention.
2. The Diabetes-Cancer Connection	Overview of the diabetes-cancer connection; how eating right and moving more can prevent and control diabetes; exercise safety tips.	To achieve modest weight loss, intensive lifestyle interventions (counseling about nutrition therapy, physical activity, and behavior change) with ongoing support are recommended.	For those who are overweight or obese, losing even a small amount of weight has health benefits and is a good place to start; Doing some physical activity above usual activities, no matter what one's level of activity, can have many health benefits.
3. Rethink Your Drink	How excess dietary sugar relates to weight gain and diabetes; identifying sugar in beverages using the Nutrition Facts Label; strategies to reduce intake of sugary beverages.	People with diabetes should limit or avoid intake of SSBs (from any caloric sweetener including high fructose corn syrup and sucrose) to reduce risk for weight gain and worsening of cardiometabolic risk profile.	Limit your intake of sugar-sweetened beverages such as soft drinks, sports drinks, and fruit-flavored drinks.
4. Make a Better Plate	Review of the diabetes-cancer connection; identifying food groups; how a healthier plate can prevent and control diabetes.	For good health, carbohydrate intake from vegetables, fruits, whole grains, legumes, and dairy products should be advised over intake from other carbohydrate sources, especially those that contain added fats, sugars, or sodium.	Eat a healthy diet, with an emphasis on plant foods; Eat more of a variety of vegetables, fruits, whole grains and legumes such as beans.
5. Portion Distortion	Portion control; measuring portion; controlling portion sizes for weight management/reduction and blood glucose management.	A simple diabetes meal planning approach such as portion control or healthful food choice may be better suited to individuals with type 2 diabetes identified with health and numeracy literacy concerns. This may also be an effective meal planning strategy for older adults.	Eat smaller portions when eating high-calorie foods.
6. Face the FACTS	Reading and interpreting the Nutrition Facts Label; sodium reduction; fiber intake; using the Nutrition Facts Label to compare food products while shopping.	Substituting low-glycemic foods for higher-glycemic load foods may modestly improve glycemic control; people with diabetes should consume at least the amount of fiber and whole grains recommended for the general public; 2,300 mg/day of sodium is appropriate for people with diabetes.	Read food labels to become more aware of portion sizes and calories. Be aware that "low-fat" or "non-fat" does not necessarily mean "low-calorie;" limit consumption of healthy foods and foods processed with salt.
7. Build a Better Meal	Half-way through review; using MyPlate to	A variety of eating patterns (combinations of different foods or food groups) are acceptable for the	Choose whole-grain breads, pasta, and cereals instead of breads, cereals, and pasta made from refined grains, and brown rice instead of white

Module	Topics	Diabetes Recommendations ^{[1][2]}	Cancer Prevention Recommendations ^{[3][4]}
	visualize portions sizes as a weight management technique; practicing meal planning and making healthier food choices at each meal.	management of diabetes. Personal preferences (e.g., tradition, culture, religion, health beliefs and goals, economics) and metabolic goals should be considered when recommending one eating pattern over another.	rice. Limit consumption of red meats (such as beef, pork and lamb) and avoid processed meats; Limit consumption of salty foods and foods processed with salt.
8. Heart Healthy Home Cooking	Relationship between obesity, diabetes, and heart disease; overview of healthy vs. unhealthy fats; heart-healthy cooking tips; favorite recipe makeovers.	The amount of dietary saturated fat, cholesterol, and trans fat recommended for people with diabetes is the same as that recommended for the general population; an increase in foods containing long-chain omega-3 fatty acids (EPA and DHA) (from fatty fish) and omega-3 linolenic acid (ALA) is recommended.	Prepare meat, poultry, and fish by baking, broiling, or poaching rather than by frying or charbroiling.
9. Be a Savvy Shopper	Eating healthy on a budget; cost-saving strategies while grocery shopping.	To provide the individual with diabetes practical tools for day-to-day meal planning.	Community efforts are needed to create an environment that makes it easier to make healthy choices.
10. Survival Skills	Ordering healthy meals while eating out; staying healthy on-the-go; healthy eating tips for holidays and parties.	To maintain the pleasure of eating by only limiting food choices when indicated by scientific evidence.	When you eat away from home, be especially mindful to choose food low in calories, fat, and added sugar, and avoid eating large portion sizes.
11. A BOLDer Community	Healthy living in the Bronx community; local resources for healthy living (e.g., farmers' markets, community gardens, walking routes); engaging families and friends in healthy living.	To address individual nutrition needs based on personal and cultural preferences, healthy literacy and numeracy, access to healthful food choices, willingness and ability to make behavioral changes, as well as barriers to change.	Increase access to affordable, healthy foods in communities, places of work, and Schools; Provide safe, enjoyable, and accessible environments for physical activity in schools and workplaces, and for transportation and recreation in communities.
12. Staying Motivated	Reflection of goals, barriers, and successes from the program; strategies for staying motivated; celebration with invited family and guests.	Reinforcement of previous recommendations.	Reinforcement of previous recommendations.

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Table 2

Culturally- and medically- tailoring of the BOLD Healthy Living curriculum to address the psychosocial needs of minority cancer survivors in Bronx, NY

Psychosocial Need ^[1]	Examples of Need	Strategies to Address Need
Informational (Gaining knowledge and help regarding cancer, treatment, symptom management, and lifestyle change).	<ul style="list-style-type: none"> • Non-native English speakers. • Feelings of medical mistrust. • Use of CAM. • Value intuition and experience over empiricism. 	<ul style="list-style-type: none"> • Materials were available in English and Spanish, and a Spanish-speaking translator was provided at each program session (nutrition and exercise). • The RDN provided a Q&A session on CAM. • Educated on disease etiology and pathophysiology to improve knowledge and patient-provider communication.
Supportive (Desire for emotional and coping support, stress management, and connection with others).	<ul style="list-style-type: none"> • Beliefs in collectivism, that the family/group is more important than the individual. • Motivated by positive social interactions. • Coping with the emotional and psychological stresses of cancer diagnosis and treatment. • Improvements in quality of life (e.g., fatigue, pain, depression, physical limitations). 	<ul style="list-style-type: none"> • Invited family members and/or caregivers (cancer co-survivors) to participate in program sessions. • Offered small classes, similar to peer support groups, that fostered a supportive and collaborative environment. • Focused on improving quality of life and promoting healthy living rather than weight loss or cosmetic appearance. • Offered safe exercise environment with modifications available for each exercise. • Created a toolkit with techniques to improve self-management.
Spiritual (Finding meaning, hope, peace, and spiritual resources, as well as discussing death and dying).	<ul style="list-style-type: none"> • Have a stronger sense of religion and spirituality. • May see themselves as more vulnerable. 	<ul style="list-style-type: none"> • Participants' created individual short-term and long-term goals with options to honor their spiritual beliefs. • Encouraged participants to use spirituality and their spiritual community as a coping mechanism. • Allowed participants to share personal coping mechanisms and anecdotes with one another. • Reduced feelings of vulnerability (e.g., "Why me?") through knowledge of the disease process, promotion of self-management strategies to help "control" future risk of disease, and group support (e.g., participants shared personal anecdotes, etc. in the small group setting).
Practical (Finances, transportation, family care, and personal assistance).	<ul style="list-style-type: none"> • Work-related issues may interfere with program adherence. • Urban areas may lack safe areas for outdoor activities. • May rely on caregivers for transportation and cooking. • Healthful foods may appear to be expensive and/or access to healthful foods may be limited in certain neighborhoods. • Cancer treatments may interfere with ability to eat certain foods. 	<ul style="list-style-type: none"> • Provided strategies for healthy living when faced with common barriers, such as work and time constraints. • Offered transportation support (e.g., reimbursement of subway or bus fares) to participants. • Created walking groups among participants and provided safe, accessible community walking routes. • Provided a list of free community exercise classes, Farmers' markets and community gardens. • The RDN individually addressed barriers to healthful eating, and provided medical referrals when appropriate. • Incorporate culturally appropriate foods into lesson plans and interactive workshops, e.g., a cooking class that featured a variety of ethnic foods.

CAM, complementary and alternative medicine; Q&A, questions and answers; RDN, registered dietitian-nutritionist

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Table 3

Comparisons of characteristics of cancer survivors and co-survivors at baseline enrolled in a 12-week vs. 4-week BOLD Healthy Living program^a

Characteristic	Total (n=83)	12-Week (n=45)	4-Week (n=38)	p-Value
Age , mean $\pm$ s.d.	60.5 $\pm$ 10.2	62.3 $\pm$ 10.7	57.5 $\pm$ 8.6	0.04
Gender , n(%)				
Female	79 (95.2)	49 (94.2)	30 (96.8)	0.99 ^b
Male	4 (4.8)	3 (5.77)	1 (3.2)	
Ethnicity , n(%)				
Non-Hispanic Black	46 (55.4)	32 (42.2)	14 (45.2)	0.36 ^b
Hispanic/Latino	22 (26.5)	12 (33.3)	10 (32.3)	
Other	15 (18.1)	8 (24.4)	7 (22.6)	
Employment , ^c n(%)				
Employed	20 (24.4)	6 (11.8)	14 (45.2)	0.006^b
Unemployed	9 (11.0)	6 (11.8)	3 (9.7)	
Retired	39 (47.6)	30 (58.8)	9 (29.0)	
Unable to work	14 (17.1)	9 (17.7)	5 (16.1)	
Cancer , n(%)				
No	17 (20.5)	15 (28.8)	2 (6.5)	0.02^b
Yes	66 (79.5)	37 (71.2)	29 (93.6)	
Cancer Type , ^{c,d,e} n(%)				
Breast	50 (75.7)	26 (50.0)	24 (82.8)	0.001^b
Gynecological	4 (6.1)	1 (1.9)	3 (10.3)	
Lung	4 (6.1)	2 (3.9)	2 (6.9)	
Other	8 (30.1)	8 (21.6)	0 (0.0)	
Years Since Cancer Diagnosis , median (IQR) ^e	5.1 (1.5, 9.1)	7.3 (2.4, 11.5)	2.2 (1.3, 6.3)	0.02^g
Diabetes , ^f n(%)				
No	60 (72.3)	35 (67.3)	17 (32.7)	0.19
Yes	23 (27.7)	25 (80.7)	6 (19.3)	
Waist Circumference (inches) , mean $\pm$ s.d.	41.4 $\pm$ 5.5	42.3 $\pm$ 6.2	40.2 $\pm$ 4.3	0.15
BMI (kg/m²) , median (IQR)	31.1 (27.2, 36.6)	31.1 (26.8, 38.4)	31.0 (28.8, 34.4)	0.71
BMI (kg/m²) category , n(%)				
Normal Weight (18.5–24.9)	8 (10.8)	4 (9.3)	4 (12.9)	0.69 ^b
Overweight (25.0–29.9)	23 (31.1)	15 (34.9)	8 (25.8)	
Obese (30.0–39.9)	31 (41.9)	16 (37.2)	15 (48.4)	
Extremely Obese ($\geq$ 40)	12 (16.2)	8 (18.6)	4 (12.9)	
Perceived Health , ^c n(%)				
Good/Excellent	52 (64.2)	31 (60.8)	21 (70.0)	0.41

Characteristic	Total (n=83)	12-Week (n=45)	4-Week (n=38)	<i>p</i> -Value
Poor/Fair	29 (35.8)	20 (39.2)	9 (30.0)	
Perceived Physical Pain, n(%)				
None to Mild	44 (53.0)	26 (50.0)	18 (58.1)	0.48
Moderate to Severe	39 (47.0)	26 (50.0)	13 (41.9)	
Readiness to Change,^c n(%)				
Low to Moderate	18 (22.5)	14 (28.0)	4 (13.3)	0.24 ^b
Moderate to High	37 (46.3)	23 (46.0)	14 (46.7)	
High	25 (31.2)	13 (26.0)	12 (40.0)	

s.d., standard deviation

^aBaseline refers to the start of each respective program session, and includes only participants who attended at least one class.

^bFisher's exact test reported.

^cEmployment: n=82; Perceived health, n=81; Readiness to change, n=80. These variables are missing observations due to non-response.

^dOther includes cancers of the colon and rectum (n=1); gynecological (n=2); prostate (n=1); hematological (n=1); multiple types (n=3).

^eBased on n=66 cancer survivors.

^fOnly Type 2 Diabetes reported.

^gWilcoxon Rank-sum test reported.