



# A Pilot Study of a Culturally Tailored Lifestyle Intervention for Chinese American Cancer Survivors

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## Abstract

Although Asian Americans generally have the lowest cancer incidence rates and mortality rates, cancer is the leading cause of death among Asian Americans. The goal of this pilot study was to engage Chinese American cancer survivors (CACS) in systematic changes toward desired health behaviors through a healthy lifestyle intervention delivered by a community-based organization. The Reach out to ENhanceE Wellness (RENEW) program workbook was translated into Mandarin Chinese with additional physical activity (PA) and dietary information that are culturally appropriate (RENEW-C). Fifty-five Chinese cancer survivors were recruited from the greater Houston area to participate in this 50-week program and 50 of them completed both the baseline and postintervention surveys in 2013 and 2014, respectively. Paired sample *t* tests were used to assess changes in 5 groups of outcomes: (1) patient knowledge (measured by Health Education Impact Questionnaire [heiQ]), (2) dietary intake (Automated Self-Administered 24-Hour [ASA24] Dietary Assessment Tool), (3) PA (Community Healthy Activities Model Program for Seniors [CHAMPS]), (4) body mass index, and (5) quality of life (36-item Short-Form Survey [SF-36]). Compared with the baseline, participants reported significantly higher consumption of vegetables and higher frequency of PAs at the post-intervention survey. They also showed improved mental health and lower limitation in doing their work or other activities due to physical health or emotional problems. Despite the small sample size, this pilot study demonstrated the effectiveness of using a community-based participatory approach in a healthy lifestyle intervention tailored for CACS.

## Keywords

diet and exercise intervention, dietary intake, physical activity; quality of life, Chinese American cancer survivors

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## Introduction

Asians were estimated to account for about 5.8% of the US population (18.9 million out of 325.7 million) in 2017 and is projected to be the fastest growing racial/ethnic group in the United States.<sup>1,2</sup> Asian Americans (AAs) have the lowest cancer incidence and mortality rates among all the racial/ethnic groups in the United States.<sup>3</sup> However, cancer remains a major health threat because it is the leading cause of death among AAs in the United States.<sup>3</sup>

It was estimated that there were 15 million cancer survivors in the United States in 2015 with a 5-year survival rate of approximately 66.9%.<sup>4</sup> After the diagnosis of the disease, cancer survivors are often interested in learning information about dietary choices, physical activities (PAs), supplement use, and

nutritional therapies to enhance their quality of life (QoL).<sup>5</sup> The American Cancer Society published guidelines on nutrition and PA for cancer survivors. The guidelines covered 3 aspects: a

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healthy diet with an emphasis on fruits, vegetables, and whole grains; a physically active lifestyle; and a healthy weight.<sup>5</sup>

A growing number of studies examined whether diet and exercise interventions could be used to improve the QoL for cancer survivors.<sup>6-9</sup> A meta-analysis of 46 clinical trials demonstrated positive effects of exercise intervention on cancer survivors' health-related QoL in several domains such as body image/self-esteem, emotional well-being, sexuality, sleep disturbance, and social functioning (SF).<sup>8</sup> Another review of 21 randomized clinical trials also found that exercise interventions improved cancer survivors' fitness, strength, and physical function, and dietary interventions produced improvements in diet quality (eg, higher consumption of fruits and vegetables), nutrition-related biomarkers, and body weight.<sup>9</sup>

The majority of past interventions adopted either dietary or exercise interventions, with only a few studies employing a combined diet and exercise intervention. Reach out to ENhance Wellness (RENEW) is a home-based diet and exercise intervention that was designed to improve the physical function of cancer survivors.<sup>10</sup> Materials of RENEW were developed based on the social cognitive theory<sup>11</sup> and the trans-theoretical model.<sup>12</sup> The RENEW has been demonstrated to positively impact PA, dietary behaviors, and overall QoL for long-term cancer survivors.<sup>13</sup>

Most of the previous US intervention studies focused on the general population, with non-Hispanic whites comprising the majority of the samples.<sup>9</sup> Thus, findings from those studies may not be generalized to minority groups such as the AAs because dietary habits are quite different among AAs and other subgroups in the United States. Among the AA population, Chinese were the largest Asian subgroup, about 63% of them were foreign born, and 41% of them did not speak English proficiently.<sup>14</sup> Studies found that in spite of increasing adoption of the Western diets, Chinese immigrants still maintained many traditional Chinese dietary habits—a diet high in fruits, grains, and vegetables and low in fat.<sup>15</sup>

While few studies focused on psychosocial and physical aspects of QoL among AA cancer survivors,<sup>16-18</sup> we did not find studies that specifically examined the impact of a tailored diet and exercise intervention for AA cancer survivors. We adapted the evidence-based lifestyle intervention (RENEW) to be implemented among Chinese cancer survivors by a Houston-based 501(c) (3) nonprofit organization—Light and Salt Association (LSA). The primary goal of this study was to test the feasibility of a home-based health-promotion intervention in Chinese American cancer survivors (CACS). The secondary goal of this study was to evaluate the effect of a lifestyle intervention on patient knowledge, dietary behaviors, PA, weight status, and health-related QoL among CACS.

## Methods

Using the community-based participatory research framework, we developed a pilot study to promote the adoption of health-promoting behaviors and improve the QoL among CACS. Adapted from the “Reach out to ENhanceE Wellness

(RENEW) program developed by Snyder et al,<sup>10</sup> RENEW-C was a tailored intervention for our study population. The RENEW materials were translated into Mandarin Chinese (RENEW-C) with additional PA and dietary information to ensure that the information is culturally appropriate. A focus group, consisting of 6 CACS and community members, was held to evaluate the appropriateness and acceptability of RENEW-C materials. Similar to the original study, RENEW-C goals for each day are to (1) walk at least 30 minutes, (2) eat at least 3 servings of fruits, (3) eat at least 4 servings of vegetables, (4) eat no more than 20 g of saturated fat, and (5) use the “Proportion Doctor” tool.

Staff in LSA recruited study participants and helped with data collection. Eligible participants included Chinese cancer survivors aged 18 years and above who were either in active treatment or posttreatment and who were able to move and get out of bed without difficulty. Fifty-five CACS were recruited for the RENEW-C program from the greater Houston area through e-mails, press release, local Chinese newspapers, and announcement at local TV programs. Participants engaged in a 50-week program that consisted of (1) personally tailored workbook and series of quarterly newsletters, (2) 4 consultation sessions conducted by registered dietitians who reviewed the dietary lessons and problem-solve with survivors, (3) 13 telephone counseling and 4 prompts conducted by trained LSA staff and volunteers. Phone counseling and prompts were designed to enhance social support and self-efficacy, monitor progress, identify barriers, and explore resources. Three training sessions were held for volunteers who administered the program. Participants were recruited from October 2012 to December 2012. The baseline survey was conducted in January 2013 and the follow-up surveys were completed from December 2013 to January 2014.

With demographic information and medical history reported at baseline, 50 of the 55 participants completed both the baseline and postintervention surveys and 24-hour dietary recalls that covered 5 groups of outcomes: (1) patient knowledge (measured by Health Education Impact Questionnaire [heiQ]), (2) dietary intake (Automated Self-Administered 24-Hour [ASA24] Dietary Assessment Tool), (3) PA (Community Healthy Activities Model Program for Seniors [CHAMPS]), (4) body Mass Index, and (5) QoL (36-item Short-Form Survey [SF-36]). Before beginning data collection, participants reviewed and signed the informed consent agreements. During the project intervention period, 2 participants died and 3 participants decided to withdraw from the program. To express the appreciation, for each participant, a \$35 gift card was given after completing the baseline survey and additional \$35 gift card was paid after completing the follow-up survey. The project was reviewed and approved by the institutional review board of Sam Houston State University (protocol # 2013-03-7122).

A 40-item heiQ was used to assess participants' health knowledge before and after the intervention. Respondents were asked to judge a statement on a Likert scale of 1 (strongly disagree) to 4 (strongly agree). Based on the 40 questions, we derived 8 composite scores including (1) positive and active engagement in life, (2) health-directed behavior, (3) skill and

technique acquisition, (4) constructive attitudes and approaches, (5) self-monitoring and insight, (6) health service navigation, (7) social integration and support, and (8) emotional distress. Cronbach  $\alpha$  and confirmatory factor analysis were used to confirm the validity and reliability of the 8 constructs in a previous study.<sup>19</sup>

Twenty-four-hour dietary recalls were administered at the baseline and follow-up. All information collected from 24-hour dietary recalls was entered to the ASA24 Dietary Assessment Tool, developed by the National Cancer Institute. Automated Self-Administered 24-hour dietary recall is based on the United States Department of Agriculture Automated Multiple-Pass Method.<sup>20</sup>

Specifically designed for the old population, CHAMPS questionnaire was used to assess the frequency and duration of PAs undertaken by the study participants on a weekly basis.<sup>21</sup> Caloric expenditures were calculated based on the frequency, length of minutes, and intensity of PAs each week.

The SF-36 is a self-report instrument widely used to measure an individual's health profile. Details about the SF-36 questionnaire have been published elsewhere.<sup>22</sup> Briefly, it consists of 36 questions measuring the degree to which an individual is limited or impaired on the following 8 domains: (1) physical functioning (10 items); (2) activities due to physical problems—role-physical (4 items); (3) bodily pain (2 items); (4) general health perceptions (5 items); (5) vitality (VT; 4 items); (6) SF (2 items); (7) activities due to emotional problems—role-emotional (RE; 3 items); and (8) emotional well-being—mental health (MH; 5 items). The first and last 4 domains can be further combined to generate 2 composite scores for physical health and MH, respectively. Domain scores were generated by Quality-Metric Health Outcomes Scoring Software 4.0. Each domain score ranges from 0 to 100, with higher scores indicating better functioning, well-being, and state of health. For the comparison purpose, norm-based score for each domain was generated with a mean of 50 and a standard deviation (SD) of 10. These norm-based scores allow comparison of results from this study with the general average of the US population. Differences in scale scores to the norm-based scores reflect the impact of the disease.<sup>22</sup> Specifically, participants' health status is below national average if their scores are below 50 and each point represents one-tenth of a SD.

Paired sample *t* tests were used to assess changes in 5 groups of outcomes. McNemar test was done for 2 of the measures including "eat no more than 10% total calories from saturated fat" and "walk at least 30 minutes". A *P* value that is less than .05 is considered statistically significant. Data were analyzed using SPSS Version 22.

## Results

Table 1 summarizes the demographic characteristics and medical and treatment history of 50 participants. Overall, the majority of participants were female (78%), 50 years old and above (mean = 61.7), self-identified as Christian (58%), and

**Table 1.** Demographic Characteristics and Medical History of 50 Chinese American Cancer Survivors Recruited From the Greater Houston Area in 2013.

Characteristics	Number of Participants (Standard Deviation or Percent)
Gender	Female = 39 (78%) Male = 11 (22%)
Age (in years, 19-91)	Mean = 61.7 (SD = 11.8)
Religion	
Buddhist	12 (24%)
Protestant	28 (56%)
Catholic	1 (2%)
No religion	9 (18%)
Marital status	
Married	42 (84%)
Single/never married	4 (8%)
Separated/divorce	2 (4%)
Others (widow)	2 (4%)
Education	
Less than high school	6 (12%)
High school degree	15 (30%)
College degree	21 (42%)
Graduate degree and higher	8 (16%)
Years living in the United States	Mean = 22.2 (SD = 11.6)
Cancer site	
Breast	33 (66%)
Colon	5 (10%)
Lymphoma/leukemia	3 (6%)
Lung	1 (2%)
Prostate	1 (2%)
Kidney and bladder	2 (4%)
Others (liver, stomach, pancreatic, nasopharyngeal, skin, thyroid)	5 (10%)
Stage at first diagnosis	
Stage 0	10 (20%)
Stage I	7 (14%)
Stage II	16 (32%)
Stage III	11 (22%)
Stage IV	3 (6%)
Do not know	3 (6%)
Length of months since first diagnosis	Mean = 84.7 (SD = 66.3)
13-24 months	8 (16%)
25-36 months	8 (16%)
37-60 months	8 (16%)
61-120 months	13 (26%)
≥121 months	13 (26%)

Abbreviations: SD, standard deviation,

are married (84%). Fifty-eight percent of them had at least a college degree (58%) and all of them were immigrants with a mean of 22 years of residence in the United States. As for participants' medical and treatment history, 66% of participants were breast cancer survivors and most were diagnosed at stages 0 (20%), II (32%), and III (22%). This is expected because breast cancer is the most common type of cancer among all cancer diagnoses in AA women. The length of survival since the first diagnosis is evenly distributed from 13 to 24 months to more than 10 years with a mean of 84.7 months and a SD of 66.3 months. Results of 5 groups of

**Table 2.** Results of 5 Groups of Outcomes Surveyed at the Baseline (2013) and Postintervention (2014) for the 50 Chinese American Cancer Survivors From the Greater Houston Area.

Measure/Definition	Baseline, Mean (SD or Percent)	Postintervention, Mean (SD or Percent)	Mean Difference	Paired t Test Statistic (P Value)
Patient knowledge measured by heiQ domains				
(1) Positive and active engagement in life	3.19 (0.41)	3.25 (0.40)	0.06	0.83 (.411)
(2) Health-directed behavior	3.31 (0.48)	3.35 (0.44)	0.04	0.41 (.684)
(3) Skill and technique acquisition	2.97 (0.44)	2.94 (0.39)	-0.03	-0.49 (.626)
(4) Constructive attitudes and approaches	3.27 (0.44)	3.21 (0.37)	-0.06	-0.64 (.525)
(5) Self-monitoring and insight	3.10 (0.42)	3.21 (0.36)	0.11	1.62 (.112)
(6) Health service navigation	3.09 (0.37)	3.07 (0.37)	-0.02	-0.30 (.765)
(7) Social integration and support	3.03 (0.45)	3.01 (0.36)	-0.02	-0.34 (.735)
(8) Emotional distress	2.27 (0.54)	2.29 (0.58)	0.02	0.16 (.874)
Dietary intakes				
Average number of vegetables serving per day	Mean = 2.64 (SD = 1.35)	Mean = 3.69 (SD = 1.51)	1.05	4.61 (P < .001)
<1 serving	1 (2%)	0 (0%)		
1.0-1.9 servings	18 (36%)	7 (14%)		
2.0-2.9 servings	14 (28%)	11 (22%)		
3.0-3.9 servings	11 (22%)	15 (30%)		
≥4 servings	6 (12%)	17 (34%)		
Average number of fruit serving per day	Mean = 2.09 (SD = 1.20)	Mean = 2.07 (SD = 1.37)	-0.02	-0.09 (.928)
<1 serving	9 (18%)	12 (24%)		
1.0-1.9 servings	18 (36%)	13 (26%)		
2.0-2.9 servings	12 (24%)	13 (26%)		
3.0-3.9 servings	7 (14%)	9 (18%)		
>4 servings	4 (8%)	3 (6%)		
Average saturated fat intake in gram	Mean = 14.71 (SD = 7.05)	Mean = 16.09 (SD = 7.14)		1.35 (.184)
Eat no more than 10% total calories from saturated fat				
Yes	39 (78%)	41 (82%)		0.25 <sup>a</sup> (.617)
No	11 (22%)	9 (18%)		
PA measures by CHAMPS questionnaire				
Moderate and greater intensity measures				
(1) Caloric expenditure per week in at least moderate intensity physical activities (MET ≥3.0)	1364.36 (1734.97)	1427.93 (1765.1)	63.57	0.23 (.818)
(2) Frequency per week in at least moderate intensity PAs (MET ≥3.0)	6.62 (6.78)	8.01 (7.02)	1.39	1.11 (.270)
All activities measures				
(1) Caloric expenditure per week in all listed PAs	2739.61 (2370.88)	2989.63 (2525.54)	250.02	0.67 (.504)
(2) Frequency per week in all listed PAs	19.06 (10.39)	22.45 (10.47)	3.39	1.96 (.056)
Walk at least 30 minutes				
Yes	43 (86%)	48 (96%)		2.78 <sup>a</sup> (.096)
No	7 (14%)	2 (4%)		
BMI distributions				
BMI	Mean = 23.15 (SD = 3.62)	Mean = 23.86 (SD = 4.53)	0.71	1.88 (.066)
<18.4 (underweight)	4 (8%)	3 (6%)		
18.5-24.9 (healthy weight range)	29 (58%)	33 (66%)		
25-29.9 (overweight)	14 (28%)	9 (18%)		
>30 (obesity)	3 (6%)	5 (10%)		
SF-36 scale				
(1) Physical function (PF)	47.35 (8.18)	48.47 (7.87)	1.12	0.97 (.336)
(2) Role-physical (RP)	43.86 (10.15)	46.69 (7.67)	2.83	2.22 (.031)
(3) Bodily pains (BP)	48.99 (9.10)	49.50 (9.24)	0.51	0.42 (.674)
(4) General health (GH)	45.03 (9.82)	46.78 (10.15)	1.75	1.43 (.160)
(5) Vitality (VT)	51.65 (9.19)	53.67 (8.55)	2.02	1.54 (.129)
(6) Social function (SF)	46.41 (8.64)	48.72 (8.66)	2.31	1.43 (.158)
(7) Role-emotional (RE)	41.75 (11.30)	46.91 (8.07)	5.16	3.31 (.002)
(8) Mental health (MH)	48.10 (7.54)	51.29 (7.85)	3.19	2.61 (.012)
Physical health—PCS (Component summary)	47.24 (8.26)	47.65 (7.89)	0.41	0.52 (.609)
Mental health—MCS (Component summary)	46.46 (7.02)	50.66 (8.10)	4.20	3.29 (.002)

Abbreviations: BMI, body mass index; CHAMPS, Community Healthy Activities Model Program for Seniors; heiQ, Health Education Impact Questionnaire; MET, metabolic equivalent of task; PA, physical activity; SD, standard deviation; SF-36, 36-item Short-Form Survey.

<sup>a</sup>They are the  $\chi^2$  statistics from McNemar test performed on 2 of the measures including "eat no more than 10% total calories from saturated fat" and "walk at least 30 minutes."

outcomes at the baseline and postintervention are presented in Table 2.

### **Patient Knowledge**

None of the 8 domains of *heiQ* was statistically significant.

### **Dietary Intakes**

Overall, the vast majority of participants did not meet the recommended daily servings for vegetables (4 servings) and fruits (3 servings) set by RENEW-C goals. At the baseline, participants had a daily average of 2.64 servings of vegetables (SD = 1.35) and a daily average of 2.09 servings of fruits (SD = 1.20); only 12% of participants reported a daily average of 4 or more servings of vegetables and 22% of participants met the guideline of 3 servings of fruits per day. While daily consumption of vegetables increased significantly after intervention, average daily fruit intake did not change significantly.

### **Physical Activity**

Participants, on average, engaged in all listed PA more frequently after intervention. At postintervention, 96% of all participants walked at least 30 minutes every day, compared with 86% at baseline. Although the frequency of participating in moderate or higher intensity PA increased from baseline to postintervention, the improvement was not statistically significant. The resulting caloric expenditures of both moderate and higher intensity PA and all listed PA improved, but the changes were not statistically significant either.

### **Weight Status**

At the baseline, more than half of them were within a healthy weight range (58%), 28% were classified as overweight, 6% were obese, and 8% were underweight. More participants fell within the healthy weight range at postintervention.

### **Quality of Life**

At baseline, the norm-based scores for each scale of SF-36 and scores for the overall physical component summary and mental component summary were below the average-50 except the VT scale. The scores of RP, RE, and MH improved significantly from baseline to postintervention. The MCS also increased significantly to a level that was slightly above national average at postintervention.

## **Discussion**

To our knowledge, this is the first application of a combined diet and exercise intervention targeting CACS specifically. Compared with the baseline, participants reported significantly higher consumption of vegetables and higher frequency of PAs at the postintervention survey. They also showed improved MH

and lower limitation in doing their work or other activities due to physical health or emotional problems.

Our intervention materials (RENEW-C) were adapted from the RENEW program developed by Snyder et al,<sup>10</sup> with Chinese translations. The major difference between RENEW-C and RENEW is the dietary guide. We changed the suggested foods and corresponding caloric and fat contents in the workbook to accommodate the dietary habits of Chinese Americans. The original RENEW program was implemented in a randomized controlled trial of more than 600 overweight, old, long-term cancer survivors from Canada, United Kingdom, and United States.<sup>13</sup> Compared with the control group, participants in the treatment group had less rapid decline in physical function; significant improvement in PA, diet, overall QoL; and more weight loss.<sup>13</sup> Similar to the original RENEW program, our study also found improvement in diet, PA, and QoL among CACS, after implementation of RENEW-C.

Previous meta-analyses have consistently found that a diet plus exercise intervention is more effective than a single component intervention (ie, diet only or exercise only) in weight management.<sup>23,24</sup> In this study, frequency of participating in all listed PA increased significantly from baseline to postintervention, whereas the improvement of moderate or higher intensity PA was not statistically significant. This indicated that participants chose to engage in lower intensity PA more frequently, which did not contribute much to energy expenditure. Consequently, the overall caloric expenditures increased after intervention, though it was not statistically significant. Overall, participants had higher consumption of vegetables, engaged in PA more frequently, and more people fell within the healthy weight range, compared with the baseline.

A number of studies have documented the positive impact of adopting a healthy diet and engaging in PA on cancer survival. There was preliminary evidence from clinical trials that diet and exercise were linked to beneficial changes in insulin levels, inflammation, tumor proliferation rates, and perhaps immunity.<sup>9,25</sup> It was consistently found from observational studies that PA was associated with reduced all-cause mortality rates and death rates in breast and colon cancers.<sup>25</sup>

As the survival rates for common cancers have improved since the mid-1970s,<sup>3</sup> QoL of cancers survivors is one of our major concerns. At baseline, SF-36 scores among CACS were lower than the national average, indicating lower QoL among CACS compared with the general US population. As presented by Yi et al,<sup>26</sup> CACS were partially impaired by cancer symptoms or treatment-related side effects in performing daily physical and social activities. Their mental well-being was negatively impacted as well.

Our diet and exercise intervention was associated with improved scores for RP, RE, and MH, with the latter 2 contributing to higher scores for the MCS. Higher RP and RE scores indicated that participants were less likely to encounter problems in work or other daily activities due to physical health and emotional problems, respectively. Particularly, MH scores and MCS scores rose to levels above the average of the general population. This suggested that the participants felt less

nervous and depressive, but more peaceful and calm after the intervention, with less experience of psychological distress and fewer limitations in social/role activities as a result of emotional problems. Previous studies have consistently found that diet and exercise interventions contributed to improvement in QoL among cancer survivors, but positive effects were found in various domains of SF-36 largely dependent on the specific samples.<sup>13,27-30</sup>

Patient empowerment is often defined as the feeling of being able to manage cancer-related limitations and control over one's life.<sup>31,32</sup> Among various measures for patient empowerment, heiQ performs the best in terms of internal consistency and content and construct validity.<sup>31</sup> Higher scores in self-monitoring and insight of the heiQ demonstrated that patients in our study were better able to monitor and manage cancer-related conditions and had better insight into and knowledge of coping with the limitations brought by cancer.<sup>19</sup>

Our pilot study included many strengths. It was the first study that disseminated a healthy lifestyle intervention that has shown effectiveness in the AA community setting. Using the community-based participatory approach, we also used and leveraged community resources to implement the intervention, unlike the randomized controlled trial where designated staff were hired to implement the study. We demonstrated that a study such as ours that attempted to adapt to the cultural needs of the Chinese community was accepted by our participants.

One limitation of our study is that the results cannot be generalized because of small sample size. However, this was a pilot project to see whether we could implement this study within the Chinese American community by using a community-based organization. Due to funding constraints, there were no one-on-one consultations provided by a physical instructor in this project. All the outcome measures were self-reported, so recall bias is another limitation of this study. In addition, our results cannot be generalized beyond the Chinese American community because the project was tested and adapted specifically for Chinese American community. Different counseling techniques or intensities need to be tested further to see if that would make a difference in behavior change.

## Conclusion

Encouraging results were achieved from this community-based lifestyle intervention administered to 55 CACS from the greater Houston area. After the intervention, participants consumed higher number of servings of vegetables and engaged in PA more frequently; more participants fell within the healthy weight range. These positive changes were closely aligned with the American Cancer Society's guidelines on nutrition and PA for cancer survivors. Consistent with previous findings, participants showed lower limitation in doing their work or other activities due to physical health or emotional problems. Overall, they encountered less experience of psychological distress and social/role incapacity. Given the small sample size in this

pilot study, more studies are needed to investigate the impact of implementing this combined diet and exercise intervention in a larger sample.

## Authors' Note

This project was reviewed and approved by the institutional review board of Sam Houston State University (Protocol # 2013-03-7122).

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## Declaration of Conflicting Interests

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## References

1. Colby SL, Ortman JM. *Projections of the Size and Composition of the US Population: 2014 to 2060: Population Estimates and Projections*. Suitland, MD: United States Census Bureau; 2017.
2. United States Census Bureau. QuickFacts United States. 2017. <https://www.census.gov/quickfacts/fact/table/US/PST045217>. Accessed September 1, 2018.
3. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2018. *CA Cancer J Clin*. 2018;68(1):7-30.
4. Noone AM, Howlader N, Krapcho M, et al. SEER Cancer Statistics Review, 1975-2015, based on November 2017 SEER data submission. 2018. [https://seer.cancer.gov/csr/1975\\_2015/](https://seer.cancer.gov/csr/1975_2015/). Accessed September 1, 2018.
5. Rock CL, Doyle C, Demark-Wahnefried W, et al. Nutrition and physical activity guidelines for cancer survivors. *CA Cancer J Clin*. 2012;62(4):242-274.
6. Baguley BJ, Skinner TL, Wright ORL. Nutrition therapy for the management of cancer-related fatigue and quality of life: a systematic review and meta-analysis. *Br J Nutr*. 2019;122(5):527-541.
7. Lis CG, Gupta D, Lammersfeld CA, Markman M, Vashi PG. Role of nutritional status in predicting quality of life outcomes in cancer—a systematic review of the epidemiological literature. *NutrJ*. 2012;11(1):27.
8. Mishra SI, Scherer RW, Geigle PM, et al. Exercise interventions on health-related quality of life for cancer survivors. *Cochrane Database Syst Rev*. 2012;(8):CD007566.

9. Pekmezi DW, Demark-Wahnefried W. Updated evidence in support of diet and exercise interventions in cancer survivors. *Acta Oncol.* 2011;50(2):167-178.
10. Snyder DC, Morey MC, Sloane R, et al. Reach out to ENhance Wellness in Older Cancer Survivors (RENEW): design, methods and recruitment challenges of a home-based exercise and diet intervention to improve physical function among long-term survivors of breast, prostate, and colorectal cancer. *Psychooncology.* 2009;18(4):429-439.
11. Bandura A. *Social Foundation of Thought and Action: A Social-Cognitive View.* Englewood Cliffs, NJ: Prentice-Hall; 1986.
12. Prochaska JO, Velicer WF, Rossi JS, et al. Stages of change and decisional balance for 12 problem behaviors. *Health Psychol.* 1994;13(1):39-46.
13. Morey MC, Snyder DC, Sloane R, et al. Effects of home-based diet and exercise on functional outcomes among older, overweight long-term cancer survivors: RENEW: a randomized controlled trial. *JAMA.* 2009;301(18):1883-1891.
14. López G, Ruiz NG, Patten E. Key facts about Asian Americans, a diverse and growing population. 2017. <http://www.pewresearch.org/fact-tank/2017/09/08/key-facts-about-asian-americans/>. Accessed September 1, 2018.
15. Lv N, Cason KL. Dietary pattern change and acculturation of Chinese Americans in Pennsylvania. *J Am Diet Assoc.* 2004;104(5):771-778.
16. Ashing-Giwa KT, Padilla G, Tejero J, et al. Understanding the breast cancer experience of women: a qualitative study of African American, Asian American, Latina and Caucasian cancer survivors. *Psychooncology.* 2004;13(6):408-428.
17. Jenny KY, Swartz MD, Reyes-Gibby CC. English proficiency, symptoms, and quality of life in Vietnamese-and Chinese-American breast cancer survivors. *J Pain Symptom Manage.* 2011;42(1):83-92.
18. Wang JH-Y, Adams I, Huang E, Ashing-Giwa K, Gomez SL, Allen L. Physical distress and cancer care experiences among Chinese-American and non-Hispanic white breast cancer survivors. *Gynecol Oncol.* 2012;124(3):383-388.
19. Osborne RH, Elsworth GR, Whitfield K. The Health Education Impact Questionnaire (heiQ): an outcomes and evaluation measure for patient education and self-management interventions for people with chronic conditions. *Patient Educ Couns.* 2007;66(2):192-201.
20. Subar AF, Kirkpatrick SI, Mittl B, et al. The Automated Self-Administered 24-Hour Dietary Recall (ASA24): a resource for researchers, clinicians, and educators from the national cancer institute. *J Acad Nutr Diet.* 2012;112(8):1134-1137.
21. Stewart AL, Mills KM, King AC, Haskell WL, Gillis D, Ritter PL. CHAMPS physical activity questionnaire for older adults: outcomes for interventions. *Med Sci Sports Exerc.* 2001;33(7):1126-1141.
22. Ware JEJ. SF-36 health survey update. *Spine.* 2000;25(24):3130-3139.
23. Johns DJ, Hartmann-Boyce J, Jebb SA, Aveyard P; Behavioural Weight Management Review Group. Diet or exercise interventions vs combined behavioral weight management programs: a systematic review and meta-analysis of direct comparisons. *J Acad Nutr Diet.* 2014;114(10):1557-1568.
24. Wu T, Gao X, Chen M, Van Dam RM. Long-term effectiveness of diet-plus-exercise interventions vs. diet-only interventions for weight loss: a meta-analysis. *Obes Rev.* 2009;10(3):313-323.
25. Ballard-Barbash R, Friedenreich CM, Courneya KS, Siddiqi SM, McTiernan A, Alfano CM. Physical activity, biomarkers, and disease outcomes in cancer survivors: a systematic review. *J Natl Cancer Inst.* 2012;104(11):815-840.
26. Yi JK, Swartz MD, Reyes-Gibby CC. English proficiency, symptoms, and quality of life in Vietnamese- and Chinese-American breast cancer survivors. *J Pain Symptom Manage.* 2011;42(1):83-92.
27. Basen-Engquist K, Taylor CLC, Rosenblum C, et al. Randomized pilot test of a lifestyle physical activity intervention for breast cancer survivors. *Patient Educ Couns.* 2006;64(1):225-234.
28. Fillion L, Gagnon P, Leblond F, et al. A brief intervention for fatigue management in breast cancer survivors. *Cancer Nurs.* 2008;31(2):145-159.
29. Sandel SL, Judge JO, Landry N, Faria L, Ouellette R, Majczak M. Dance and movement program improves quality-of-life measures in breast cancer survivors. *Cancer Nurs.* 2005;28(4):301-309.
30. Speck RM, Gross CR, Hormes JM, et al. Changes in the body image and relationship scale following a one-year strength training trial for breast cancer survivors with or at risk for lymphedema. *Breast Cancer Res Treat.* 2010;121(2):421-430.
31. Eskildsen NB, Joergensen CR, Thomsen TG, et al. Patient empowerment: a systematic review of questionnaires measuring empowerment in cancer patients. *Acta Oncol.* 2017;56(2):156-165.
32. Maunsell E, Lauzier S, Brunet J, Pelletier S, Osborne RH, Campbell HS. Health-related empowerment in cancer: validity of scales from the Health Education Impact Questionnaire. *Cancer.* 2014;120(20):3228-3236.