Published in final edited form as:

Psychooncology. 2011 October ; 20(10): 1069–1075. doi:10.1002/pon.1828.

Weight Control Needs and Experiences among Rural Breast Cancer Survivors

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Abstract

Objective—Rural women are understudied in research on weight control among breast cancer survivors despite having higher obesity rates than their urban counterparts placing them at higher risk for recurrence. The purpose of this survey study was to describe weight status and methods used for weight control in rural breast cancer survivors and to examine psychosocial factors in this population associated with weight change since breast cancer diagnosis.

Methods—Women treated for breast cancer within the past six years at one of three rural Cancer Centers were mailed a survey with a cover letter from their oncology provider.

Results—Survey respondents ($n = 918$, 83% response rate) were 96% White non-Hispanic, on average 3.2 years from treatment, and 11% reported metastatic disease. Among respondents without known metastatic disease, 68% were overweight or obese, 37% were obese, and 25% reported a weight gain exceeding 5 kg since diagnosis. Among the overweight/obese women, 61% were currently attempting weight loss, and the most common weight loss method was dieting on one's own without assistance. Psychosocial factors associated with weight gain since diagnosis included depression, fear of cancer recurrence, diminished physical strength, body image concerns, relationship changes, and financial stressors.

Conclusions—The high response rate indicates a general interest in body weight issues among rural BrCa survivors, and the findings highlight the need for weight control programs in this population. Findings also indicate that factors related to poor adjustment to breast cancer is associated with weight gain among rural women.

Obesity is a risk factor for initial breast cancer diagnosis and recurrence. Overweight (body mass index [BMI] ≥ 25 kg/m²) and obese (BMI ≥ 30 kg/m²) postmenopausal women have a 1.3- to 1.5-fold increased risk for development of breast cancer (1, 2). Once breast cancer is diagnosed, body weight has a negative impact on disease outcome for pre- and post-menopausal women, with women who are obese at diagnosis having a 1.5 to 2.5 increased risk of recurrence and death compared to their normal weight counterparts (3–5). Moreover, weight gain is common among BrCa patients after diagnosis (6, 7), particularly in women who receive systemic therapy and become post-menopausal (8–11), and weight gain exceeding 6 to 10 kg has been associated with increased risk of recurrence (10, 12).

Rural women suffer from health disparities related to both breast cancer and obesity. Rural residents comprise 20% of the U.S. population representing one of the largest medically underserved populations in the nation (13) and one of the most understudied groups of breast cancer survivors (14). Compared to their urban counterparts, rural women diagnosed with breast cancer are less likely to have diagnostic biopsies in a timely fashion, to receive

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Conflict of Interest Statement: None of the authors have a conflict of interest to report.

breast-conserving surgery, and to receive state-of-the-art treatment (15–17). Rural women are also diagnosed at more advanced stages (18), and thus may have an increased likelihood of death within five years of diagnosis (19). In addition, rural women are more likely to be obese, exercise less, and have nutritionally inadequate diets (13). Women of the most rural counties have obesity rates 1.6 times higher than women in metropolitan surrounding counties (13). These disparities are related to both the demographic composition of rural areas, including older age and lower socioeconomic status, and to cultural and lifestyle factors which are heavily influenced by population density (20). With some of the highest rates of obesity among rural women, effective long-term weight control is an important target for population-level prevention in this high-risk group of breast cancer survivors.

However, several barriers may limit successful weight control in a rural setting. Rural areas often have limited environmental resources that promote healthy lifestyle behaviors (21, 22). Distance, education, and cost may prevent many rural women from participating in weight control programs. In addition, compared to their non-rural counterparts, rural women suffer from higher rates of stress and depressive symptoms accompanied by poorer access to mental health care resources (23), which are established risk factors for weight gain (24) and may complicate adjustment to breast cancer diagnosis and treatment (25).

Other factors related to psychosocial adjustment to breast cancer (25) may also impede efforts at weight control, such as anxiety and cancer-related fears (26, 27), negative body image (28, 29), depression (30–32), relationship changes (33), or financial stress (29, 34, 35). Although there is limited research on psychosocial adjustment among rural breast cancer survivors in particular, studies suggest that a lack of professional support services in rural areas combined with geographic isolation may negatively impact adjustment to cancer (14). Rural breast cancer survivors report anxiety and worry about cancer recurrence (36), and some studies indicate they report needing more help with their cancer-related fears compared to urban women (37). A recent survey study by Burris et al. found that rural survivors with diagnoses of breast, colorectal, or hematologic cancers had greater symptoms of anxiety, depression, and emotional distress compared to nonrural survivors (38). Rural breast cancer survivors also report body image concerns (14, 36), and negative body image may be exacerbated by higher rates of mastectomy and lower rates of lumpectomy in rural compared to urban areas (39). Rural women also report disruption in their social roles as caregivers, concern about putting a strain on their family, and a need for more family support (14, 40). Psychological distress, negative body image, and stressful life events are known factors that hinder successful weight management among women (24, 41–44).

Currently, little is known about the rates of obesity among rural breast cancer survivors, methods or resources for weight control that are available and used by them, and the impact of psychosocial adjustment to breast cancer on weight control in this population. Thus, the purpose of this survey study was twofold: 1) to describe obesity rates and methods used for weight control in a sample of rural breast cancer survivors, and 2) examine factors related to psychosocial adjustment to breast cancer as predictors of change in weight since breast cancer diagnosis.

METHODS

Participants and procedures

Participants were recruited in collaboration with three Cancer Centers located in rural Kansas (Tammy Walker Cancer Center located at Salina Regional Medical Center; Dreiling/Schmidt Cancer Institute at Hays Medical Center; Mt. Carmel Regional Cancer Center, Pittsburg). Registrars at each Cancer Center created mailing lists of all patients treated for breast cancer within the past six years, excluding those who were known to be deceased.

Rurality was based on the zip code approximation of the Rural Urban Commuting Area codes developed by the U.S. Department of Agriculture, Economic Research Service (45). Patients who resided in rural zip code areas (large rural core to isolated rural) were included in the study. Across the three sites, 98% of treated patients resided in a rural area.

The mailing included a cover letter from the patient's oncology provider, an introduction letter from the research team that addressed voluntary participation and confidentiality, the questionnaire, a prepaid return envelope, and a \$5 incentive. Two weeks after the initial mailing, non-responders were mailed a reminder postcard, and one-month after the postcard mailing, remaining non-responders were sent a replacement survey packet excluding the incentive. The study was approved with a HIPAA waiver and waiver of consent by the institutional review board at the University of Kansas Medical Center and by the institutional review boards at each of the three rural cancer centers.

Measures

The survey assessed demographics, breast cancer diagnosis and treatment history, menopausal status, treatment side effects, self-reported current height and weight, self-reported weight at time of diagnosis, current weight loss attempt (yes/no), number of weight loss attempts since breast cancer diagnosis, and weight loss methods tried (yes/no for a list of 8 methods; see Table 2). The measure of weight loss methods was adapted from the weight history questionnaire used in the National Health and Nutrition Examination Survey NHANES (46). Modifications included combining several questions on self-directed diet changes (e.g., "ate less food" "ate less fat," "switched to foods with lower calories") into a single item ("dieted on your own without joining a program or following a special diet book") and separating commercial programs and self-help programs into two items given the likelihood of greater use of self-help groups in rural areas. Psychosocial factors related to adjustment to breast cancer were assessed (yes/no) by asking "which of the following experiences have impacted you as a survivor?" Items included depression, fear of recurrence, diminished physical strength, change in relationships, change in body image, and financial stress. These items were chosen to assess common domains of breast cancer-specific quality of life, such as emotional, physical, and social well-being (47), while maintaining minimal participant burden. Body image and financial stress were included as important concerns for breast cancer survivors at various points along the disease continuum (48).

Data analyses

Descriptive analyses were performed for demographic, cancer history, and weight-related variables. For weight-related variables, analyses excluded women with self-reported metastatic disease. Independent t-tests were used to compare weight gain since diagnosis across groups who were and were not impacted by breast cancer on the six psychosocial factors. Missing data was treated as missing, and no data were imputed.

RESULTS

Of the 1191 surveys that were mailed, 80 were returned due to undeliverable addresses and 11 were returned by family members indicating the patient was recently deceased. Of the remaining 1100 surveys that were delivered, 918 were returned for a response rate of 83% of delivered surveys and 77% including undelivered surveys. Response rates of delivered surveys ranged from 79% to 85% across the three cancer centers. Among the respondents, the frequencies of RUCA rurality categories were as follows: 325 Large Rural Core, 62 Other Large Rural, 262 Small Rural Core, 6 Other Small Rural, and 263 Isolated Rural.

Table 1 shows demographic and cancer-related participant characteristics. The vast majority (96%) were White non-Hispanic, consistent with the respective cancer centers' patient populations. Twenty-four percent of respondents had a college degree, and 33% were working full-time. For cancer stage, 43% reported their cancer was non-metastatic disease (Stage I-III) at the time of diagnosis, whereas 40% reported they did not know whether or not their cancer was metastatic. Respondents were on average 3.2 years from treatment, and 95% were post-menopausal.

Weight-related variables are summarized in Table 2. Excluding women with reported metastatic disease, respondents had a mean body mass index (BMI) of 29.0 kg/m², and 68% were overweight or obese with 37% being obese. Average weight gain since diagnosis was 2.2 kg, however, 25% reported a weight gain exceeding 5 kg. Nearly half (47%) of all respondents and 61% of overweight/obese women were currently attempting weight loss. The most common weight loss method was dieting on one's own without assistance (57%) followed by joining a gym or exercise facility (21%).

We also examined the impact of six negative psychosocial consequences of breast cancer on weight change since diagnosis (Table 3). Weight change was significantly higher for women experiencing each of the six psychosocial factors compared to those not experiencing each factor (p 's = .005 to < .001). Differences in weight change since diagnosis ranged from approximately 4 kg higher for women experiencing fear of recurrence (52% of women) to 9 kg higher among women reporting depression (16% of women) compared to women not experiencing these factors. We also examined weight change between women who reported being impacted by 0 or 1 of these six factors versus those who endorsed 2 or more factors. Weight change was significantly higher among women experiencing 2 or more psychosocial consequences (+6.0 ± 23.2 kg) versus women experiencing 1 or no consequences (-1.1 ± 17.6 kg; p < .001).

DISCUSSION

This study provides new information regarding needs for weight control among rural breast cancer survivors. Over two-thirds of our sample were overweight or obese, exceeding the national rates for women for all racial/ethnic groups (62%) and non-Hispanic White women (58%) (49). Similarly, the 37% obesity rate in our sample exceeds the national obesity rates (33% for all for women and 30% for non-Hispanic White women) (49). Our sample rates are also higher than the last-reported national rates for rural women, however, the national rural data are now more than 10 years old (13) making it difficult to compare the breast cancer survivors in our sample to a general population of rural women. Compared to other breast cancer survivors, a larger percentage of respondents in our study were overweight or obese than in the Life After Cancer Epidemiology (LACE) cohort of predominantly urban dwelling breast cancer survivors, of whom 61% were overweight or obese and 28% were obese (50). However, the average 2.2 kg weight gain reported by our respondents is similar to the 2.4 kg weight gain reported from one-year pre-diagnosis to approximately 2 years post-diagnosis among a sample of 3,214 breast cancer survivors (51). In light of the risk of obesity for breast cancer recurrence, these high rates of obesity among rural survivors highlight a need for weight control interventions in this population.

The majority of overweight and obese survey respondents reported they were currently trying to lose weight, and their most common strategy was to attempt weight loss without any formal assistance. Few women had tried a commercial program or self-help materials, and only 2% had used an internet-based program. These findings indicate a need for greater resources in rural areas supporting evidence-based programs for weight control, without reliance on computer-based technologies. The findings are also consistent with previous

qualitative research with obese rural women indicating a need for more intensive weight control programs in rural areas, particularly greater resources for weight loss dietary counseling (52). Nearly one-fifth of our sample reported they had joined a local gym or exercise facility, indicating a potential resource that may be tapped into to enhance weight control intervention at the rural level. On the other hand, a recent survey on exercise preferences among rural breast cancer survivors indicated the majority preferred home-based exercise, predominantly walking (53).

Our findings also indicate that poor adjustment to breast cancer may exacerbate weight gain after breast cancer diagnosis among rural women. Women who reported being impacted as a survivor by depression, cancer-related fears, diminished physical strength, poor body image, and relationship and financial stress had substantial weight gain, on average, since diagnosis. This is in comparison to women not experiencing these factors who maintained a stable weight on average. Lack of resources and/or low uptake of existing resources for weight control may mirror a similar resource gap to address adjustment to breast cancer for rural women. Previous studies have indicated that professional support services are lacking for many rural survivors who report wanting greater opportunity to interact with other survivors to help minimize their fears and normalize their experiences (14). The absence of programs addressing survivorship concerns and mental health as well as limited opportunities to talk with other survivors may contribute to poor adjustment and emotional distress (38) that further increases rural-urban disparities in diet and exercise behaviors and obesity.

A large percentage of women (40%) were unaware of their cancer stage, i.e., whether or not their cancer was metastatic. This finding is consistent with prior research showing that rural women often lack important knowledge about their cancer (54) and are unaware of their cancer stage (15). While not an objective of this survey study, cancer-related education appears to be another important target of intervention for rural survivors and may help with their psychosocial adjustment and coping (14).

Our high survey response rate speaks to an interest in survivorship programs among rural women. The cover letter from their medical provider highlighted the personal relevance of the survey and likely enhanced the response rate. The cash incentive was also intended to enhance the response rate, however, the number of women who responded exceeded expectations and was 23 to 40% higher than other survey studies using similar cash incentives (55–57). In addition, many women returned the incentive with their survey and expressed their appreciation for addressing survivorship and weight concerns in rural women. The salience of survivorship may have been particularly high for this sample of women who were all within 6 years of diagnosis.

This study is limited in several ways. First, the sample was predominantly White and does not represent the weight control needs of racial/ethnic minority groups, which may be even higher for certain sub-groups of rural survivors such as African Americans and Latinos. Second, to keep the survey length to a few pages, we elected not to use multi-item standardized measures assessing psychological adjustment and quality of life for breast cancer survivors. However, our short checklists were adequate for detecting psychosocial factors associated with weight change in this sample. Third, current weight and weight at diagnosis were based on self-report. Although studies have found adequate validity for self-reported weight, with 70% reporting within 2 kg (58), it is unknown the extent to which recall bias impacted self-reported weights at diagnosis. The LACE study found a correlation of .94 between self-report of pre-diagnosis weight and measured weight abstracted from medical records among breast cancer survivors, supporting the validity of recalled weight in this population (50). Finally, weight change variables had large standard deviations; thus, averages may not adequately reflect the range of experiences among this sample of women.

The current study adds to a limited literature on rural breast cancer survivors and provides unique information regarding the weight control needs in this population. Our collaboration with rural Cancer Centers likely enhanced the salience of the survey and resulted in a high response rate thereby reducing potential selection biases. This survey provides a more thorough characterization of needs, approaches, and issues related to body weight suggesting a need for multicomponent interventions targeting an increasing population of breast cancer survivors who continue to experience negative effects from their diagnosis and treatment, while simultaneously are overweight/obese and are interested in weight control. Patient access and delivery of such combined interventions for rural breast cancer survivors is a priority for breast cancer survivorship research.

Acknowledgments

SUPPORT: NIH K12 HD052027

REFERENCES

1. Morimoto LM, White E, Chen Z, et al. Obesity, body size, and risk of postmenopausal breast cancer: The Women's Health Initiative (United States). *Cancer Causes Control*. 2002; 13:741–751. [PubMed: 12420953]
2. Huang Z, Hankinson SE, Colditz GA, et al. Dual effects of weight and weight gain on breast cancer risk. *JAMA*. 1997; 278:1407–1411. [PubMed: 9355998]
3. Chlebowski RT, Aiello E, McTiernan A. Weight loss in breast cancer patient management. *J Clin Oncol*. 2002; 20:1128–1143. [PubMed: 11844838]
4. Kroenke CH, Chen WY, Rosner B, Holmes MD. Weight, weight gain, and survival after breast cancer diagnosis. *J Clin Oncol*. 2005; 23:1370–1378. [PubMed: 15684320]
5. Cleveland RJ, Eng SM, Abrahamson PE, et al. Weight gain prior to diagnosis and survival from breast cancer. *Cancer Epidemiol Biomarkers Prev*. 2007; 16:1803–1811. [PubMed: 17855698]
6. Caan B, Sternfeld B, Gunderson E, et al. Life After Cancer Epidemiology (LACE) Study: A cohort of early stage breast cancer survivors (United States). *Cancer Causes Control*. 2005; 16:545–556. [PubMed: 15986109]
7. Saquib N, Flatt SW, Natarajan L, et al. Weight gain and recovery of pre-cancer weight after breast cancer treatments: Evidence from the women's healthy eating and living (WHEL) study. *Breast Cancer Res Treat*. 2007; 105:177–186. [PubMed: 17123151]
8. Demark-Wahnefried W, Peterson BL, Winer EP, et al. Changes in weight, body composition, and factors influencing energy balance among premenopausal breast cancer patients receiving adjuvant chemotherapy. *J Clin Oncol*. 2001; 19:2381–2389. [PubMed: 11331316]
9. Goodwin PJ, Panzarella T, Boyd NF. Weight gain in women with localized breast cancer: A descriptive study. *Breast Cancer Res Treat*. 1988; 11:59–66. [PubMed: 3382763]
10. Camoriano JK, Loprinzi CL, Ingle JN, et al. Weight change in women treated with adjuvant therapy or observed following mastectomy for node-positive breast cancer. *J Clin Oncol*. 1990; 8:1327–1334. [PubMed: 2199619]
11. Holmes MD, Chen WY, Feskanich D, Kroenke CH, Colditz GA. Physical activity and survival after breast cancer diagnosis. *JAMA*. 2005; 293:2479–2486. [PubMed: 15914748]
12. Chlebowski RT, Weiner JM, Reynolds R, et al. Long-term survival following relapse after 5-FU but not CMF adjuvant breast cancer therapy. *Breast Cancer Res Treat*. 1986; 7:23–30. [PubMed: 3516262]
13. Eberhardt, MS.; Ingram, DD.; Makuc, DM. *Urban and Rural Health Chartbook*. Health, United States, 2001. Hyattsville, Maryland: National Center for Health Statistics; 2001.
14. Bettencourt BA, Schlegel RJ, Talley AE, Molix LA. The breast cancer experience of rural women: A literature review. *Psychooncology*. 2007; 16:875–887. [PubMed: 17611958]
15. Howe HL, Katterhagen JG, Yates J, Lehnerr M. Urban-rural differences in the management of breast cancer. *Cancer Causes Control*. 1992; 3:533–539. [PubMed: 1420856]

16. Haggstrom DA, Quale C, Smith-Bindman R. Differences in the quality of breast cancer care among vulnerable populations. *Cancer*. 2005; 104:2347–2358. [PubMed: 16211547]
17. Hershman DL, Wang X, McBride R, et al. Delay of adjuvant chemotherapy initiation following breast cancer surgery among elderly women. *Breast Cancer Res Treat*. 2006; 99:313–321. [PubMed: 16583264]
18. Monroe AC, Ricketts TC, Savitz LA. Cancer in rural versus urban populations: A review. *J Rural Health*. 1992; 8:212–220. [PubMed: 10121550]
19. Mitchell KJ, Fritschi L, Reid A, et al. Rural-urban differences in the presentation, management and survival of breast cancer in Western Australia. *Breast*. 2006; 15:769–776. [PubMed: 16765049]
20. Sobal J, Troiano RP, Frongillo EA. Rural-urban differences in obesity. *Rural Sociology*. 1996; 61:289–305.
21. Slama K. Rural culture is a diversity issue. *Minnesota Psychologist*. 2004;9–11.
22. Hartley D. Rural health disparities, population health, and rural culture. *Am J Public Health*. 2004; 94:1675–1678. [PubMed: 15451729]
23. Hauenstein EJ, Petterson S, Merwin E, et al. Rurality, gender, and mental health treatment. *Fam Community Health*. 2006; 29:169–185. [PubMed: 16775467]
24. Elfhag K, Rossner S. Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain. *Obes Rev*. 2005; 6:67–85. [PubMed: 15655039]
25. Ganz PA. Psychological and social aspects of breast cancer. *Oncology (Williston Park)*. 2008; 22:642–646. 650. [PubMed: 18561553]
26. Clough-Gorr KM, Ganz PA, Silliman RA. Older breast cancer survivors: factors associated with change in emotional well-being. *J Clin Oncol*. 2007; 25:1334–1340. [PubMed: 17312327]
27. Mehnert A, Berg P, Henrich G, Herschbach P. Fear of cancer progression and cancer-related intrusive cognitions in breast cancer survivors. *Psychooncology*. 2009; 18:1273–1280. [PubMed: 19267364]
28. Fobair P, Stewart SL, Chang S, et al. Body image and sexual problems in young women with breast cancer. *Psychooncology*. 2006; 15:579–594. [PubMed: 16287197]
29. Ahn SH, Park BW, Noh DY, et al. Health-related quality of life in disease-free survivors of breast cancer with the general population. *Ann Oncol*. 2007; 18:173–182. [PubMed: 17030550]
30. Burgess C, Cornelius V, Love S, et al. Depression and anxiety in women with early breast cancer: Five year observational cohort study. *Bmj*. 2005; 330:702. [PubMed: 15695497]
31. Golden-Kreutz DM, Andersen BL. Depressive symptoms after breast cancer surgery: relationships with global, cancer-related, and life event stress. *Psychooncology*. 2004; 13:211–220. [PubMed: 15022156]
32. Yeter K, Rock CL, Pakiz B, et al. Depressive symptoms, eating psychopathology, and physical activity in obese breast cancer survivors. *Psychooncology*. 2006; 15:453–462. [PubMed: 16173111]
33. Arndt V, Merx H, Stegmaier C, Ziegler H, Brenner H. Persistence of restrictions in quality of life from the first to the third year after diagnosis in women with breast cancer. *J Clin Oncol*. 2005; 23:4945–4953. [PubMed: 16051947]
34. Carver CS, Smith RG, Petronis VM, Antoni MH. Quality of life among long-term survivors of breast cancer: Different types of antecedents predict different classes of outcomes. *Psychooncology*. 2006; 15:749–758. [PubMed: 16304622]
35. de Boer AG, Taskila T, Ojajarvi A, van Dijk FJ, Verbeek JH. Cancer survivors and unemployment: a meta-analysis and meta-regression. *JAMA*. 2009; 301:753–762. [PubMed: 19224752]
36. McGrath P, Patterson C, Yates P, et al. A study of postdiagnosis breast cancer concerns for women living in rural and remote Queensland. Part I: Personal concerns. *Aust J Rural Health*. 1999; 7:34–42. [PubMed: 10373814]
37. Wilson SE, Andersen MR, Meischke H. Meeting the needs of rural breast cancer survivors: what still needs to be done? *J Womens Health Gend Based Med*. 2000; 9:667–677. [PubMed: 10957755]

38. Burris JL, Andrykowski M. Disparities in mental health between rural and nonrural cancer survivors: A preliminary study. *Psychooncology*, Online First. 2009
39. Mastaglia B, Kristjanson LJ. Factors influencing women's decisions for choice of surgery for Stage I and Stage II breast cancer in Western Australia. *J Adv Nurs*. 2001; 35:836–847. [PubMed: 11555031]
40. McGrath P, Patterson C, Yates P, et al. A study of postdiagnosis breast cancer concerns for women living in rural and remote Queensland. Part II: Support issues. *Aust J Rural Health*. 1999; 7:43–52. [PubMed: 10373815]
41. Teixeira PJ, Going SB, Houtkooper LB, et al. Weight loss readiness in middle-aged women: Psychosocial predictors of success for behavioral weight reduction. *J Behav Med*. 2002; 25:499–523. [PubMed: 12462956]
42. Teixeira PJ, Going SB, Houtkooper LB, et al. Pretreatment predictors of attrition and successful weight management in women. *Int J Obes Relat Metab Disord*. 2004; 28:1124–1133. [PubMed: 15263921]
43. Womble LG, Williamson DA, Greenway FL, Redmann SM. Psychological and behavioral predictors of weight loss during drug treatment for obesity. *Int J Obes Relat Metab Disord*. 2001; 25:340–345. [PubMed: 11319630]
44. Kiernan M, King AC, Kraemer HC, Stefanick ML, Killen JD. Characteristics of successful and unsuccessful dieters: An application of signal detection methodology. *Ann Behav Med*. 1998; 20:1–6. [PubMed: 9755345]
45. [Retrieved October 21, 2009] 2000 Rural-Urban Commuting Area Codes. U.S. Department of Agriculture, Economic Research Service. from <http://www.ers.usda.gov/Data/RuralUrbanCommutingAreaCodes/2000/>
46. Centers for Disease Control. [Retrieved June 24, 2010] National Health and Nutrition Examination Survey 2007–2008. Weight History Questionnaire. from http://www.cdc.gov/nchs/nhanes/nhanes2007-2008/whq_e.htm
47. Brady MJ, Cella DF, Mo F, et al. Reliability and validity of the Functional Assessment of Cancer Therapy-Breast quality-of-life instrument. *J Clin Oncol*. 1997; 15:974–986. [PubMed: 9060536]
48. Hewitt, M.; Herdman, R.; Holland, J., editors. Institute of Medicine and National Research Council. Meeting Psychosocial Needs of Women with Breast Cancer. Washington, DC: National Academies Press; 2004.
49. Ogden CL, Carroll MD, Curtin LR, et al. Prevalence of overweight and obesity in the United States, 1999–2004. *JAMA*. 2006; 295:1549–1555. [PubMed: 16595758]
50. Caan BJ, Kwan ML, Hartzell G, et al. Pre-diagnosis body mass index, post-diagnosis weight change, and prognosis among women with early stage breast cancer. *Cancer Causes Control*. 2008; 19:1319–1328. [PubMed: 18752034]
51. Caan BJ, Emond JA, Natarajan L, et al. Post-diagnosis weight gain and breast cancer recurrence in women with early stage breast cancer. *Breast Cancer Res Treat*. 2006; 99:47–57. [PubMed: 16541317]
52. Ely AC, Befort C, Banitt A, Gibson C, Sullivan D. A qualitative assessment of weight control among rural Kansas women. *J Nutr Educ Behav*. 2009; 41:207–211. [PubMed: 19411055]
53. Rogers LQ, Markwell SJ, Verhulst S, McAuley E, Courneya KS. Rural breast cancer survivors: exercise preferences and their determinants. *Psychooncology*. 2009; 18:412–421. [PubMed: 19241491]
54. White NJ, Given BA, Devoss DN. The advanced practice nurse: meeting the information needs of the rural cancer patient. *J Cancer Educ*. 1996; 11:203–209. [PubMed: 8989633]
55. VanGeest JB, Wynia MK, Cummins DS, Wilson IB. Effects of different monetary incentives on the return rate of a national mail survey of physicians. *Med Care*. 2001; 39:197–201. [PubMed: 11176557]
56. Beebe TJ, Davern ME, McAlpine DD, Call KT, Rockwood TH. Increasing response rates in a survey of Medicaid enrollees: The effect of a prepaid monetary incentive and mixed modes (mail and telephone). *Med Care*. 2005; 43:411–414. [PubMed: 15778644]
57. Whiteman MK, Staropoli CA, Benedict JC, Borgeest C, Flaws JA. Risk factors for hot flashes in midlife women. *J Womens Health (Larchmt)*. 2003; 12:459–472. [PubMed: 12869293]

58. Stunkard AJ, Albaum JM. The accuracy of self-reported weights. *Am J Clin Nutr.* 1981; 34:1593–1599. [PubMed: 7270483]

Table 1

Demographic and medical characteristics of rural breast cancer survivors (n = 918)

Participant characteristic	Mean $\pm$ SD or n (%) ^a
Age	65.9 $\pm$ 13.1
Race	
White non-Hispanic	885 (96%)
Non-White	32 (4%)
Marital status	
Married	612 (67%)
Divorced/Separated/Single	129 (14%)
Widowed	176 (19%)
Education level	
H.S. degree or less	366 (40%)
Some college	333 (36%)
Bachelor's degree	133 (15%)
Graduate degree	82 (9%)
Employment status	
Full-time	298 (33%)
Part-time	100 (11%)
Retired	435 (48%)
Not employed	77 (8%)
Self-reported cancer stage	
Stage I–III	395 (43%)
Stage IV	105 (11%)
Unknown	364 (40%)
Time since treatment, years	3.2 $\pm$ 2.6
Currently taking anti-hormone treatment	412 (45%)
Menopausal status	
Post-menopausal	865 (95%)
Peri-menopausal	23 (2%)
Pre-menopausal	26 (3%)

^aVariables have missing values as follows: 7% for age, 6% for cancer stage, 6% for anti-hormone treatment, $\leq$ 1% for all others

Table 2Weight status, weight change since diagnosis, and weight loss attempts among rural breast cancer survivors^a

Weight variable	Mean $\pm$ SD or n (%) ^a
BMI	29.0 $\pm$ 6.9
Overweight or obese (BMI $\geq$ 25)	505 (68%)
Obese (BMI $\geq$ 30)	276 (37%)
Self-reported weight change since diagnosis, kg ^b	2.2 $\pm$ 20.7
Gain > 5 kg since diagnosis	173 (25%)
Currently trying to lose weight	362 (47%)
Weight loss methods tried ^c	
Diet on own without assistance	439 (57%)
Commercial program	100 (13%)
Diet book	83 (11%)
Self-help group	32 (4%)
Internet program	17 (2%)
Joined gym or exercise facility	159 (21%)
Medications	32 (4%)
Surgery	1 (5%)

^aIncludes respondents without self-reported metastatic disease and with reported current height and weight (n = 737);^b8% missing data (n = 678);^cRespondents could endorse more than once weight loss method

Table 3Weight change (kg) since diagnosis by psychosocial factors impacting survivorship^a

	N (%) endorsing factor as impacting survivorship	Weight change since diagnosis, Mean $\pm$ SD		p-value
		Impacted survivorship	Did not impact survivorship	
Depression	121 (16%)	9.7 $\pm$ 26.5	0.9 $\pm$ 19.2	< .001
Fear of recurrence	399 (52%)	4.4 $\pm$ 21.9	0.0 $\pm$ 19.2	.005
Diminished physical strength	301 (39%)	5.0 $\pm$ 21.2	0.4 $\pm$ 20.2	.004
Change in body image	239 (31%)	5.9 $\pm$ 25.1	0.6 $\pm$ 18.3	.002
Change in relationships	67 (9%)	11.0 $\pm$ 24.2	1.2 $\pm$ 19.6	< .001
Financial stress	145 (19%)	7.4 $\pm$ 23.8	1.0 $\pm$ 19.8	.001

^aIncludes respondents without self-reported metastatic disease and with reported current weight and weight at diagnosis (n = 678)