Lifestyle Interventions to Reduce Cancer Risk and Improve Outcomes

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There are more than one half million cancer deaths in the United States each year, and one third of these deaths are attributed to suboptimal diet and physical activity practices. Maintaining a healthy weight, staying physically active throughout life, and consuming a healthy diet can substantially reduce the lifetime risk of developing cancer, as well as influence overall health and survival after a cancer diagnosis. The American Cancer Society's Nutrition and Physical Activity Guidelines serve as a source document for communication, policy, and community strategies to improve dietary and physical activity patterns among Americans. In 2006, they published updated guidelines for the primary prevention of cancer and guidelines for improving outcomes among cancer survivors through tertiary prevention. These two sets of guidelines have similar recommendations, including: achievement and maintenance of a healthy weight; regular physical activity of at least 30 minutes per day and at least five days per week; a plant-based diet high in fruits, vegetables, and whole grains and low in saturated fats and red meats; and moderate alcohol consumption, if at all. Physicians are encouraged to find teachable moments to impart appropriate nutrition, physical activity, and weight management guidance to their patients, and to support policies and programs that can improve these factors in the community to reduce cancer risk and improve outcomes after cancer. *(Am Fam Physician.* **2008;77(11):1573-1578, 1579-1580. Copyright © 2008 American Academy of Family Physicians.)**

▶ **Patient information:** A handout on reducing cancer risk, written by the authors of this article, is provided on page 1579.

▶ **See related editorial on page 1510.**

In the United States, a cancer diagnosis is made every 23 seconds.[1] Currently, the lifetime risk for cancer is roughly one in three among American women and one in two among American men.[1] Following heart disease, cancer is the second most prevalent disease in the United States and is associated with approximately $210 billion in health care costs annually.[2] The most critical modifiable risk factor for cancer is the cessation of tobacco use, followed by weight control, dietary choices, and physical activity.[3-5] Evidence also suggests that these lifestyle factors are not only important in primary cancer risk, but also influence health outcomes after a cancer diagnosis. Cancer survivors currently number more than 10.5 million persons and comprise nearly 4 percent of the U.S. population; therefore, weight control and adherence to regular physical activity and a healthy diet can play an important role in both primary and tertiary prevention.[6]

In 1991, the American Cancer Society (ACS) first published dietary guidelines to advise health care professionals and the general public about lifestyle behaviors to reduce cancer risk.[7] The ACS periodically updates these primary prevention guidelines, most recently in 2006.[8,9] To address the growing needs of cancer survivors, the ACS also issued a guide in 2003[10] for informed choices related to nutrition and physical activity specifically aimed at cancer survivors, which was also updated in 2006.[11] These guidelines provide a concise and understandable summary of the existing scientific information about weight control, physical activity, and nutrition in relation to risk of cancer and disease-free survival after diagnosis. The guidelines also acknowledge areas in which the evidence is not yet definitive, either because the published results are inconsistent or because the methods of studying lifestyle factors in relation to chronic disease in human populations have recognized limitations. The ACS guidelines are consistent with guidelines established for cancer prevention by other countries[4]; those from the American Heart Association and American Diabetes Association for the

SORT: KEY RECOMMENDATIONS FOR PRACTICE

Clinical recommendation	*Primary cancer prevention evidence rating*	*Cancer control evidence rating*
Maintain a healthy weight throughout life		
Balance caloric intake with physical activity. Avoid excessive weight gain throughout the life cycle. Achieve and maintain a healthy weight if currently overweight or obese.	A – Consistent (Level 1) evidence that overweight and obesity are significant risk factors for cancers of the breast (post-menopausal), colon, endometrium, gastric cardia, and kidney.[3-5,9] B – Limited-quality (Level 2) evidence that overweight and obesity are risk factors for multiple myeloma and non-Hodgkin's lymphoma, and cancers of the cervix, gallbladder, liver, ovary, pancreas, and thyroid.[3-5,9,20,21,23]	A/B – Consistent (Level 1) evidence that obesity at diagnosis and limited-quality evidence (Level 2) that obesity at post-diagnosis is a poor prognostic factor for multiple myeloma and non-Hodgkin's lymphoma, and cancers of the breast, cervix, colorectum, esophagus, gallbladder, kidney, ovary, pancreas, prostate, stomach and uterus.[11,20-25] C – Current opinion (Level 3) suggests that achieving a healthy weight may be important for cancer control.[48,49]
Adopt a physically active lifestyle		
Adults: engage in at least 30 minutes of moderate-to-vigorous physical activity (above usual activities) on at least five days of the week (45 to 60 minutes of intentional physical activity are preferable).[9,11,14] Children and adolescents: engage in at least 60 minutes per day of moderate-to-vigorous physical activity at least five days per week.[9,11,14] Limit screen time (television, computer, games) to no more than two hours per day.[50]	A – Consistent (Level 1) evidence indicates that physical activity offers significant protection for cancers of the breast and colon.[4,5,9,28]	B – Limited-quality evidence (Level 2) exists that increased levels of physical activity post-diagnosis offer protection from recurrence and mortality from breast and colorectal cancers.[28-38,49]
Consume a healthy diet, with an emphasis on plant sources		
Choose foods and beverages in amounts that achieve and maintain a healthy weight. Eat five or more servings of a variety of vegetables and fruits each day. Choose whole grains in preference to processed (refined) grains. Limit consumption of processed and red meats.	A – Consistent (Level 1) evidence exists that high intakes of red and processed meats are associated with risk for colorectal cancer.[9,14] B – Limited-quality evidence suggests that plant-based diets that have high amounts of fruits, vegetables and whole grains are protective for some cancers.[9,14]	C – Current opinion (Level 3) endorses plant-based diets with low intakes of saturated fats, although there are currently limited data to support this from the perspective of cancer control.[11,41-43,47,49]
Limit consumption of alcoholic beverages		
Consume no more than one drink per day for women or two drinks per day for men.	A – Consistent (Level 1) evidence exists that high alcohol intake is associated with increased risk for kidney, liver, and head and neck cancers. Alcohol intake also is significantly and linearly associated with risk of breast cancer.[1,9,14,46]	A – Consistent (Level 1) evidence exists that individuals diagnosed with head and neck cancer who continue to consume alcohol have a poorer prognosis. Data for breast cancer are less clear, although of the eight studies conducted to date, none have shown a significant adverse effect of alcohol on cancer control among breast cancer survivors; however, these studies may have inadequately addressed the question.[11,44,45]

**—Protection from prevalent forms of comorbidity (i.e., secondary cancers, cardiovascular disease, diabetes, or osteoporosis).*

A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence; C = concensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, see http://www.aafp.org/afpsort.xml.

*Tertiary prevention evidence rating**
A – Consistent (Level 1) evidence indicates that overweight and obesity are significant risk factors for specific second cancers (see column 2), and comorbidity among cancer survivors (i.e., cardiovascular disease and diabetes).[3-5,9,12-14,22,47,49]
A – Consistent (Level 1) evidence that exercise offers protection from specific second cancers (see column 1), and prevalent forms of comorbidity (i.e., cardiovascular disease, diabetes, and osteoporosis) among cancer survivors.[4,5,9,12-14,28,29,47,49]
A/C – Diets that are plant-based and low in saturated fat and intakes of red and processed meats offer protection from specific second cancers (see column 1) and offer significant protection against cardiovascular disease (a prevalent comorbid condition among cancer survivors).[11,12-14,42,43,47,49]
A – Consistent (Level 1) evidence exists that moderate alcohol intakes are associated with significant cardioprotective effects, which may provide some benefits among survivors (given increased risk of cardiovascular disease), as well as the population at large.[11,12,14,41]

prevention of coronary heart disease and diabetes;[12,13] and for general health promotion, as defined by the 2005 Dietary Guidelines for Americans.[14]

Recommendations

An integrated set of common guidelines for primary cancer prevention, cancer control, and tertiary prevention is presented in the Strength of Recommendation Taxonomy (SORT) table.[15] These recommendations for practice are briefly addressed below, followed by recommendations specific to primary cancer prevention and those aimed at improving outcomes among cancer survivors. These do not include recommendations for specific supplements (e.g., the use of selenium or vitamin E for prostate cancer), functional foods (e.g., the use or non-use of soy foods for breast cancer), or specific dietary regimens. Although many of these factors were addressed in each of the ACS reports,[9,11] they are not reflected in the recommendations because evidence from carefully controlled trials is currently insufficient. For more comprehensive reviews in this arena, the reader is directed to two recent meta-analyses[16,17] and two systematic reviews.[18,19]

MAINTAIN A HEALTHY WEIGHT THROUGHOUT LIFE

The strongest current evidence for primary prevention and for improving outcomes after a diagnosis of cancer relates to the achievement of a healthy weight. Overweight and obesity are known risk factors for several types of cancers, and evidence is increasing for other types.[3-5,20,21] Furthermore, overweight or obesity at the time of diagnosis is linked with a poorer prognosis for several types of cancer, as is subsequent weight gain (both with regard to cancer control and common comorbid conditions).[22-25] Thus, cancer survivors and persons hoping to reduce their primary risk of cancer should be encouraged to achieve and maintain a healthy bodyweight (body mass index [BMI] = 18.5 to 24.9 kg per m^2).[9,11,26,27]

ADOPT A PHYSICALLY ACTIVE LIFESTYLE

Strong evidence suggests that increased levels of physical activity reduce the risk for colorectal and breast cancers.[5,7-9,28] In addition, evidence of benefit from regular physical activity is accumulating for cancer survivors.[28-32] Moderate-to-vigorous levels of physical activity of at least 30 minutes per day on at least five days per week are recommended, although benefits related to colorectal cancer may require higher levels (i.e., at least 60 minutes per day).[30-32] Examples of moderate-intensity activities include: walking; dancing; horseback riding; yoga; golfing; mowing the lawn; and job-related walking and lifting (e.g., custodial work).[9] Examples of vigorous-intensity activities

include: jogging or running; fast bicycling; circuit weight training; aerobic dance; soccer; cross-country skiing; and heavy manual labor (e.g., forestry, construction).[9] Regular structured exercise is associated with improved physical function, vigor, mood, quality of life, body composition, and cardiorespiratory fitness, and, therefore, may be of particular benefit among survivors.[28-38] Because of the immediate and late-occurring effects of cancer treatment (e.g., neurologic deficits, compromised immune function, cardiac toxicity), cancer survivors should be screened before beginning a program of physical activity.[11]

CONSUME A HEALTHY DIET WITH AN EMPHASIS ON PLANT SOURCES

A diet that provides optimal nutrient composition while maintaining energy balance is best achieved through portion control[39] *(Table 1[14])* and a heavy reliance on plant foods that deliver ample nutrients and proportionally fewer calories.[40] Processed and red meats should be limited because of strong associations with colorectal cancer.[7-9] For cancer survivors, plant-based diets have also been significantly associated with an increased overall survival through the reduction of risk for various comorbid conditions,[41-43] such as cardiovascular disease, for which cancer survivors are especially prone.[6] Fruits, vegetables, and whole grains are fiber-rich foods that contain a number of nutrients and phytochemicals (e.g., polyphenols, terpenes, lignans) that have demonstrated anticarcinogenic activity in laboratory settings and may be helpful in hindering neoplasia individually or, more likely, in concert with one another.[8,10] Specific foods, such as cruciferous vegetables, tumeric, green tea, and berries are currently under study, given their promising biochemical properties. However, the current evidence does not yet support the purposeful inclusion of any particular food or nutrient.[9,11]

Table 1. Standard Dietary Portion Sizes

Category	*Recommended servings per day for adults*	*Serving size*
Fruits	3 to 4	1 medium apple, banana, or orange
		1/2 cup of chopped, cooked, or canned fruit
		1/2 cup of 100 percent fruit juice
Vegetables	4 to 5	1 cup of raw leafy vegetables
		1/2 cup of other cooked or raw vegetables, chopped
		1/2 cup of 100 percent vegetable juice
Grains	6 to 8	1 slice of whole grain bread
		1 ounce of whole grain ready-to-eat cereal
		1/2 cup of whole grain cooked cereal, rice, pasta, etc. (e.g., oatmeal, bulgur, brown rice, buckwheat)
Beans and nuts	4 to 5 servings per week	1/2 cup of cooked dry beans
		2 tablespoons of reduced-fat peanut butter
		1/3 cup of nuts
Dairy foods	2 to 3	1 cup of fat-free or low-fat milk or yogurt
		1 1/2 ounces of reduced-fat natural cheese
		2 ounces of reduced-fat processed cheese
Meats and eggs	6 ounces or less	1 ounce of cooked lean meat, poultry, fish
		1 egg

Information from reference 14.

LIMIT CONSUMPTION OF ALCOHOLIC BEVERAGES

Alcohol is associated with higher risk for a variety of cancers.[5-7,44-46] Risk is largely apparent at levels of more than two drinks per day for men and more than one drink per day for women.[9,11,14] However, moderate alcohol consumption is protective against cardiovascular disease, which is the major cause of death in the United States and a significant comorbid condition among cancer survivors.[14] The consumption of moderate amounts of alcohol should be weighed on an individual basis, taking into account risk of cancer versus heart disease and an ability to control intake.[9,11] Among head and neck cancer survivors, however, complete abstinence from alcohol is recommended because continued alcohol use is associated with higher rates of treatment complications and decreased survival.[44,45]

Additional Recommendations

REDUCING CANCER RISK THROUGH COMMUNITY ACTION

Cancer is the second leading cause of mortality and shares several common risk factors with other prevalent diseases (e.g., cardiovascular disease, diabetes). Therefore, a significant component of the ACS primary prevention guidelines involved a call for public policy and community action.[9] Health care professionals are well-positioned to support and lead community efforts that promote healthy food choices and increased physical activity. The adoption and maintenance of healthy, nutrition-related, and physically active behaviors can be supported by: increasing access to healthy foods (and reducing access to unhealthy foods) in schools, work sites, and communities; providing safe, enjoyable, and accessible environments for physical activity in schools; and providing transportation and recreation in communities.

MAINTAINING FOOD SAFETY

Food safety from microbiologic contamination is a particular concern after the diagnosis of cancer during episodes

Table 2. Tips for Physicians on Advising Patients with Cancer About a Healthy Lifestyle

Take advantage of teachable moments to provide evidence-based guidance to patients regarding cancer prevention and control (e.g., before and after cancer screening; upon the diagnosis of a premalignant lesion; after the diagnosis of cancer in patients or their family members)
Reinforce the importance of weight management, regular exercise, and a plant-based diet as a means to prevent and control cancer
Encourage patients to get nutrients from food sources rather than dietary supplements because there is little data to support the use of dietary supplements for cancer prevention or control
Assist patients in making decisions regarding alcohol use to optimize risk reduction for cancer and cardiovascular disease
Encourage the practice of food safety among cancer patients during treatment
Support community efforts that promote healthy food choices and increased physical activity

of iatrogenic immunosuppression that occur with various forms of cancer treatment.[10,11] Therefore, during chemotherapy and radiation treatments, cancer survivors and their caregivers should follow safe food practices to reduce the risk of food-borne illnesses.[10,11] General guidelines for food safety include: washing hands thoroughly before eating or preparing food; washing produce thoroughly; keeping raw foods separate from ready-to-eat foods and cleaning all utensils and surfaces that have contacted raw meats (including fish and poultry) and eggs; cooking food to proper temperatures; and storing food at low temperatures.[11] Persons eating in restaurants should avoid foods that may potentially have bacterial contamination (e.g., salad bars, sushi, raw or undercooked meats). If the purity of a water source is unknown (e.g., well water), local public health departments can be contacted to check it for bacterial content.[11]

ROLE OF THE PRIMARY CARE PHYSICIAN

The primary care physician plays a pivotal role in primary and secondary cancer prevention for patients and long-term health care for cancer survivors.[47-49] Although lifestyle risk factors may differ somewhat between cancers (see http://www.cancer.org for detailed guidelines), it is notable that the overall dietary and physical activity recommendations for cancer risk reduction and for improving outcomes after a diagnosis of cancer are remarkably similar.[9,11] Thus, for the most part, a similar message can be delivered to cancer survivors, their family members who may be at an increased risk, and the population at large. This consistency should reduce the uncertainty regarding the delivery of appropriate health behavior messages to various patient populations, which can be one of the largest barriers to providing cancer-related diet and physical activity guidance.[49] Cancer is an area in which a multitude of dietary regimens, isolated nutrients, and alternative and complementary therapies are currently being studied.[47,49] However, there is limited evidence to support the effectiveness and safety of any of these specific regimens.[9,11] Although physicians should maintain an open dialogue with patients about the use of dietary supplements and other complementary or alternative therapies,[16-19,47,49] they should strongly consider delivering messages that can make the most impact on reducing cancer risk and promoting cancer control for their patients *(Table 2)*.

This article is based on guidelines established by the American Cancer Society for the primary prevention of cancer, as well as tertiary prevention among cancer survivors.

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REFERENCES

1. American Cancer Society. Cancer facts & figures 2007. http://www.cancer.org/downloads/stt/caff2007PWSecured.pdf. Accessed May 2, 2008.
2. Anderson RN, Smith BL. Deaths: leading causes for 2002. *Natl Vital Stat Rep.* 2005;53(17):1-89.
3. Bergström A, Pisani P, Tenet V, Wolk A, Adami HO. Overweight as an avoidable cause of cancer in Europe [published correction appears in *Int J Cancer.* 2001;92(6):927]. *Int J Cancer.* 2001;91(3):421-430.
4. Boyle P, Autier P, Bartelink H, et al. European Code Against Cancer and scientific justification: third version (2003). *Ann Oncol.* 2003;14(7):973-1005.
5. Vainio H, Bianchini F. *Weight Control and Physical Activity.* Lyon, France: IARC Press; 2002.
6. Centers for Disease Control and Prevention (CDC). Cancer survivorship—United States, 1971-2001. *MMWR Morb Mortal Wkly Rep.* 2004;53(24):526-529.

7. Weinhouse S, Bal DG, Adamson R, et al. American Cancer Society guidelines on diet, nutrition, and cancer. The Work Study Group on Diet, Nutrition, and Cancer. *CA Cancer J Clin*. 1991;41(6):334-338.
8. Byers T, Nestle M, McTiernan A, et al., for the American Cancer Society 2001 Nutrition and Physicial Activity Guidelines Advisory Committee. American Cancer Society guidelines on nutrition and physical activity for cancer prevention: reducing the risk of cancer with healthy food choices and physical activity. *CA Cancer J Clin*. 2002;52(2):92-119.
9. Kushi LH, Byers T, Doyle C, et al., for the American Cancer Society 2006 Nutrition and Physical Activity Guidelines Advisory Committee. American Cancer Society Guidelines on Nutrition and Physical Activity for cancer prevention. Reducing the risk of cancer with healthy food choices and physical activity [published correction appears in *CA Cancer J Clin*. 2007;57(1):66]. *CA Cancer J Clin*. 2006;56(5):254-281.
10. Brown JK, Byers T, Doyle C, et al. Nutrition and physical activity during and after cancer treatment: an American Cancer Society guide for informed choices. *CA Cancer J Clin*. 2003;53(5):268-291.
11. Doyle C, Kushi LH, Byers T, et al., for the 2006 Nutrition, Physical Activity and Cancer Survivorship Advisory Committee. Nutrition and physical activity during and after cancer treatment: an American Cancer Society guide for informed choices. *CA Cancer J Clin*. 2006;56(6):323-353.
12. American Heart Association. Dietary guidelines. http://www.americanheart.org/presenter.jhtml?identifier=1330. Accessed July 27, 2007.
13. American Diabetes Association. Making healthy food choices. http://www.diabetes.org/nutrition-and-recipes/nutrition/healthyfoodchoices.jsp. Accessed July 27, 2007.
14. U.S. Department of Health and Human Services. Dietary guidelines for Americans 2005. http://www.health.gov/dietaryguidelines/dga2005/document/. Accessed January 8, 2008.
15. Strength of recommendation taxonomy (SORT). *Am Fam Physician*. http://www.aafp.org/afpsort.xml. Accessed May 2, 2008.
16. Davies AA, Davey Smith G, Harbord R, et al. Nutritional interventions and outcome in patients with cancer or preinvasive lesions: systematic review. *J Natl Cancer Inst*. 2006;98(14):961-973.
17. Weiger WA, Smith M, Boon H, Richardson MA, Kaptchuk TJ, Eisenberg DM. Advising patients who seek complementary and alternative medical therapies for cancer [published correction appears in *Ann Intern Med*. 2003;139(2):155]. *Ann Intern Med*. 2002;137(11):889-903.
18. Boon H, Wong J. Botanical medicine and cancer: a review of the safety and efficacy. *Expert Opin Pharmacother*. 2004;5(12):2485-2501.
19. Cassileth BR, Deng G. Complementary and alternative therapies for cancer. *Oncologist*. 2004;9(1):80-89.
20. Lindblad M, Rodriguez LA, Lagergren J. Body mass, tobacco and alcohol and risk of esophageal, gastric cardia, and gastric non-cardia adenocarcinoma among men and women in a nested case-control study. *Cancer Causes Control*. 2005;16(3):285-294.
21. Patel AV, Rodriguez C, Bernstein L, Chao A, Thun MJ, Calle EE. Obesity, recreational physical activity, and risk of pancreatic cancer in a large U.S. cohort. *Cancer Epidemiol Biomarkers Prev*. 2005;14(2):459-466.
22. Amling CL. Relationship between obesity and prostate cancer. *Curr Opin Urol*. 2005;15(3):167-171.
23. Calle EE, Rodriguez C, Walker-Thurmond K, Thun MJ. Overweight, obesity, and mortality from cancer in a prospectively studied cohort of U.S. adults. *N Engl J Med*. 2003;348(17):1625-1638.
24. Freedland SJ, Aronson WJ, Kane CJ, et al. Impact of obesity on biochemical control after radical prostatectomy for clinically localized prostate cancer: a report by the Shared Equal Access Regional Cancer Hospital database study group. *J Clin Oncol*. 2004;22(3):446-453.
25. Kroenke CH, Chen WY, Rosner B, Holmes MD. Weight, weight gain, and survival after breast cancer diagnosis. *J Clin Oncol*. 2005;23(7):1370-1378.
26. Chlebowski RT, Aiello E, McTiernan A. Weight loss in breast cancer patient management. *J Clin Oncol*. 2002;20(4):1128-1143.
27. Parker ED, Folsom AR. Intentional weight loss and incidence of obesity-related cancers: the Iowa Women's Health Study. *Int J Obes Relat Metab Disord*. 2003;27(12):1447-1452.
28. U.S. Agency for Healthcare Research and Quality. Effectiveness of behavioral interventions to modify physical activity behaviors in general populations and cancer patients and survivors. Rockville, Md.: Agency for Healthcare Research and Quality; 2004. AHRQ publication no. 04-E027-1.
29. Holmes MD, Chen WY, Feskanich D, Kroenke CH, Colditz GA. Physical activity and survival after breast cancer diagnosis. *JAMA*. 2005;293(20):2479-2486.
30. Meyerhardt JA, Giovannucci EL, Holmes MD, et al. Physical activity and survival after colorectal cancer diagnosis. *J Clin Oncol*. 2006;24(22):3527-3534.
31. Meyerhardt JA, Heseltine D, Niedzwiecki D, et al. Impact of physical activity on cancer recurrence and survival in patients with stage III colon cancer: findings from CALGB 89803. *J Clin Oncol*. 2006;24(22):3535-3541.
32. Demark-Wahnefried W. Cancer survival: time to get moving? Data accumulate suggesting a link between physical activity and cancer survival. *J Clin Oncol*. 2006;24(22):3517-3518.
33. Courneya KS. Exercise in cancer survivors: an overview of research. *Med Sci Sports Exerc*. 2003;35(11):1846-1852.
34. Galväo DA, Newton RU. Review of exercise intervention studies in cancer patients. *J Clin Oncol*. 2005;23(4):899-909.
35. Knols R, Aaronson NK, Uebelhart D, Fransen J, Aufdemkampe G. Physical exercise in cancer patients during and after medical treatment: a systematic review of randomized and controlled clinical trials. *J Clin Oncol*. 2005;23(16):3830-3842.
36. McTiernan A. Physical activity after cancer: physiologic outcomes. *Cancer Invest*. 2004;22(1):68-81.
37. Schmitz KH, Holtzman J, Courneya KS, Mâsse LC, Duval S, Kane R. Controlled physical activity trials in cancer survivors: a systematic review and meta-analysis. *Cancer Epidemiol Biomarkers Prev*. 2005;14(7):1588-1595.
38. Schwartz AL. Physical activity after a cancer diagnosis: psychosocial outcomes. *Cancer Invest*. 2004;22(1):82-92.
39. Young LR, Nestle M. Expanding portion sizes in the US marketplace: implications for nutrition counseling. *J Am Diet Assoc*. 2003;103(2):231-234.
40. Rolls BJ, Drewnowski A, Ledikwe JH. Changing the energy density of the diet as a strategy for weight management. *J Am Diet Assoc*. 2005;105(5 suppl 1):S98-103.
41. Kroenke CH, Fung TT, Hu FB, Holmes MD. Dietary patterns and survival after breast cancer diagnosis. *J Clin Oncol*. 2005;23(36):9295-9303.
42. Pierce JP, Stefanick ML, Flatt SW, et al. Greater survival after breast cancer in physically active women with high vegetable-fruit intake regardless of obesity. *J Clin Oncol*. 2007;25(17):2345-2351.
43. Rock CL, Demark-Wahnefried W. Nutrition and survival after the diagnosis of breast cancer: a review of the evidence [published correction appears in J Clin Oncol. 2002;20(18):3939]. *J Clin Oncol*. 2002;20(15):3302-3316.
44. Day GL, Blot WJ, Shore RE, et al. Second cancers following oral and pharyngeal cancers: role of tobacco and alcohol. *J Natl Cancer Inst*. 1994;86(2):131-137.
45. Deleyiannis FW, Thomas DB, Vaughan TL, Davis S. Alcoholism: independent predictor of survival in patients with head and neck cancer. *J Natl Cancer Inst*. 1996;88(8):542-549.
46. Smith-Warner SA, Spielgelman D, Yaun SS, et al. Alcohol and breast cancer in women: a pooled analysis of cohort studies. *JAMA*. 1998;279(7):535-540.
47. Hewitt ME, Greenfield S, Stovall E. From *Cancer Patient to Cancer Survivor: Lost in Transition*. Washington, DC: National Academies Press; 2005.
48. Kuhn KG, Boesen E, Ross L, Johansen C. Evaluation and outcome of behavioural changes in the rehabilitation of cancer patients: a review. *Eur J Cancer*. 2005;41(2):216-224.
49. Jones LW, Demark-Wahnefried W. Diet, exercise, and complementary therapies after primary treatment for cancer. *Lancet Oncol*. 2006;7(12):1017-1026.
50. American Academy of Pediatrics; Committee on Public Education. American Academy of Pediatrics: children, adolescents, and television. *Pediatrics*. 2001;107(2):423-426.