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## Rural-Urban Differences in Health Behaviors and Implications for Health Status among US Cancer Survivors

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### Abstract

**Purpose**—Rural US adults have increased risk of poor outcomes after cancer, including increased cancer mortality. Rural-urban differences in health behaviors have been identified in the general population and may contribute to cancer health disparities, but have not yet been examined among US survivors. We examined rural-urban differences in health behaviors among cancer survivors and associations with self-reported health and health-related unemployment.

**Methods**—We identified rural (n=1,642) and urban (n=6,162) survivors from the cross-sectional National Health Interview Survey (2006–2010) and calculated the prevalence of smoking, physical activity, overweight/obesity, and alcohol consumption. Multivariable models were used to examine the associations of fair/poor health and health-related unemployment with health behaviors and rural-urban residence.

**Results**—The prevalence of fair/poor health (rural 36.7%, urban 26.6%), health-related unemployment (rural 18.5%, urban 10.6%), smoking (rural 25.3%, urban 15.8%), and physical inactivity (rural 50.7%, urban 38.7%) was significantly higher in rural survivors (all  $p < .05$ ); alcohol consumption was lower (rural 46.3%, urban 58.6%), and there were no significant differences in overweight/obesity (rural 65.4%, urban 62.6%). All health behaviors were significantly associated with fair/poor health and health-related unemployment in both univariate and multivariable models. After adjustment for behaviors, rural survivors remained more likely than urban survivors to report fair/poor health (OR= 1.21, 95%CI 1.03–1.43) and health-related unemployment (OR= 1.49, 95%CI 1.18–1.88).

**Conclusions**—Rural survivors may need tailored, accessible health promotion interventions to address health compromising behaviors and improve outcomes after cancer.

### Keywords

cancer survivors; smoking; physical activity; health status; employment

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Addressing health disparities associated with rural residence has been identified as an important public health priority in the United States (US) both generally [1, 2] and for cancer outcomes specifically [3]. Differences in health behaviors may contribute to poorer health among rural residents. Adults living in rural areas are more likely to be overweight or obese and physically inactive or insufficiently active compared to urban residents [4–9]. Rural residence has also been linked with higher smoking prevalence [10–12]. Rural-urban differences in alcohol use are present at both extremes; rural residents are more likely to be current or lifetime abstainers, but rural residents who drink are more likely to have a current alcohol disorder and to exceed recommended daily limits[13].

Numerous studies have documented that many cancer survivors do not meet healthy lifestyle recommendations [14–20]. Maintenance of a healthy weight and physical activity have been linked with better outcomes for cancer survivors, including lower risk of recurrence and improved survival in several studies [for reviews see 21–24]. Continued smoking after cancer diagnosis has been associated with poorer outcomes, particularly for smoking related-cancers [e.g., 25–27]. Although alcohol use is also associated with increased risk of several cancers[28], less is known about the risks and benefits of alcohol consumption after cancer[21, 24]. If survivors choose to consume alcohol, they are generally advised to drink no more than a moderate amount [21, 29]. Meeting health behavior recommendations and exercise are also associated with better health-related quality of life after cancer [14, 30, 31].

It is not known whether differences in health behaviors observed between rural and urban adults without cancer are also present among cancer survivors and if so, whether these differences in modifiable risk factors are related to poorer health outcomes among rural survivors. There are an estimated 2.8 million cancer survivors in the US who reside in rural areas and are at increased risk for poor health and increased psychological distress relative to their urban counterparts [32]. In a study of Canadian rural and small town breast cancer survivors, Vallance and colleagues [33] found that 31% met exercise recommendations, a prevalence very similar to other predominantly urban samples. In contrast, Rogers and colleagues [34] reported that only 19% of their sample of rural US breast cancer survivors met exercise recommendations. One Australian study found that urban colorectal cancer survivors were significantly less likely to maintain or achieve sufficient physical activity post-diagnosis compared to rural survivors [35]. With this exception, very few studies have directly compared health behaviors between rural and urban cancer survivors. Many interventions have been designed to positively influence health behaviors after cancer[19, 23]. If health behaviors contribute significantly to rural-urban survivorship disparities, then delivery of behavioral interventions targeting these modifiable risk factors to rural cancer survivors should be prioritized.

Thus, the purpose of our study was to 1) examine rural-urban differences in health behaviors in a population-based sample of cancer survivors, 2) assess whether health behaviors were associated with fair or poor self-reported health and unemployment due to health, and 3) evaluate whether rural-urban differences in health status persisted after controlling for health behaviors. Relative to urban survivors, we hypothesized that the prevalence of smoking, physical inactivity, and overweight/obesity would be higher among rural cancer survivors, and alcohol use lower. We also hypothesized that these behaviors would be independently associated with self-reported health and unemployment due to health. Finally, we hypothesized that controlling for health behaviors would reduce or eliminate the effect of rural-urban residence on self-reported health and unemployment due to health.

## Methods

### Setting

We conducted a cross-sectional study using data from the 2006–2010 National Health Interview Survey (NHIS), a continuous nationally representative survey of the non-institutionalized, civilian US population [36]. The NHIS is conducted by the National Center for Health Statistics (NCHS), which is part of the Centers for Disease Control and Prevention (CDC). Overrepresentation of African Americans, Asians, and Hispanics is accomplished through the use of a complex sampling design. Both the questions and sampling design were identical from 2006–2010, so we pooled the data across these years to maximize the number of rural cancer survivors. The possibility of duplicate participation across years is extremely unlikely, thus yearly samples are considered to be independent. Trained US Census Bureau interviewers administer the survey in participants' homes. The conditional response rates (number completed divided by the number eligible) for the sample adult survey ranged from 74.2–81.4%, with final response rates ranging from 60.8%–70.8% [36].

### Participants

We included all cancer survivors, defined as adults (18 years or older) who reported ever being told by a doctor or health care professional that they had cancer. Consistent with other NHIS-based studies of cancer survivors[37, 38] and Surveillance Epidemiology and End Results (SEER) practices, we excluded individuals reporting exclusively “unknown” skin or non-melanoma skin cancers.

### Variables

**Health behaviors**—Self-reported health behaviors included leisure-time physical activity, alcohol use, smoking status, and maintenance of a healthy body weight, as assessed with NHIS questions. To maintain consistency with the 2008 federal physical activity guidelines [39], respondents were categorized as inactive (no leisure-time aerobic activity that lasted at least 10 minutes), insufficiently active (aerobic activities for at least 10 minutes but less than 150 minutes per week), or sufficiently active (moderate-intensity leisure-time physical activity at least 150 minutes or vigorous-intensity leisure-time physical activity at least 75 minutes per week, or an equivalent combination). Alcohol use categories over the lifetime included: abstainer (less than 12 drinks ever), former (12 or more drinks ever, but none in the past year), and current (at least one drink in the past year). Current alcohol use was sub-categorized as infrequent (1–11 drinks in past year), light (3 drinks per week in past year), moderate (4–14 drinks per week for men and 4–7 drinks per week for women), and heavy (more than 14 drinks per week for men, and more than 7 drinks per week for women). Lifetime smoking status was categorized as never (less than 100 cigarettes total), past smoker (at least 100 cigarettes total, but not currently smoking), and current smoker (smokes some days or every day). Current body mass index was calculated based on self-reported height and weight. Following the definitions used by the CDC[40], respondents were categorized as low or normal weight (BMI < 25.0 kg/m<sup>2</sup>), overweight (BMI 25.0–29.9 kg/m<sup>2</sup>), or obese (BMI 30.0 kg/m<sup>2</sup> or more).

**Health Status**—Respondents rated their current health as excellent, very good, good, fair, or poor, based on a single item derived from the Medical Outcomes Short Form Survey (SF-36)[41]. Respondents who reported being currently unemployed and specified that it was due to health reasons, or those who reported being disabled, were classified as unemployed due to health reasons.

**Rural-urban residence**—We defined rural-urban residence status based on the US Office of Management and Budget's 2003 Rural/Urban Continuum Codes (RUCC) Codes [42]. These codes distinguish metropolitan counties by population size and nonmetropolitan counties by degree of urbanization and adjacency to metropolitan areas. Urban residence was classified as counties encompassing metropolitan statistical areas (RUCC codes 1–3), and rural residence included counties adjacent or not adjacent to metropolitan areas (RUCC codes 4–9).

**Socio-Demographics and Clinical Variables**—Socio-demographic variables included age, gender, geographic region, race/ethnicity, marital status, education, and health insurance coverage. Geographic areas included the four US census regions (Northeast, Midwest, South, and West). We categorized education as less than high school, high school graduate or general equivalency diploma, or some college or more. Health insurance coverage was categorized as public only, private with or without public, or neither. Public only health insurance included Medicare only, Medicaid, military, other government health care coverage, and other state-sponsored health care. Clinical variables included number of cancers (1 or >1) and time since first cancer diagnosis (in years). We recoded cancer type to group esophagus, liver, lung, pancreas, or stomach cancers as “short-survival” cancers (all have a 5-year relative survival of less than 25% [43]) and cervix, uterus, and ovary as gynecologic cancers.

**Missing data**—Data were missing for less than 1% of participants for the demographic characteristics, cancer variables, self-reported health, and employment. Rates of missing data for the health behaviors were 1% (smoking), 3% (alcohol use), 4% (BMI), and 8% (physical activity). Only participants with no missing data were included in the analyses.

## Statistical Analysis

Analyses were conducted using SAS, version 9.2 (SAS Institute, Inc., Cary, NC), and  $p < 0.05$  was considered statistically significant. All analyses took into account the NHIS complex survey design and weighted sampling probabilities [36]. We conducted a series of logistic regression analyses to identify rural-urban differences in health behaviors (BMI, smoking, physical activity, and alcohol use) both unadjusted and adjusted for age, gender, marital status, race/ethnicity, education, geographic region, number of cancers, and time since first cancer diagnosis. We also adjusted for health insurance coverage in models for self-reported health, but not unemployment due to health, given the relationship of employment with health insurance coverage. We used multiple logistic regression models to examine the association between the individual health behaviors and dichotomized health status outcomes: self-reported health (fair or poor vs. good, very good, or excellent health) and unemployed due to health (yes vs. no). Finally, we used multiple logistic regression models to assess the contribution of health behaviors to rural-urban differences in health status. Exploratory analyses, revealed no significant interactions between rural-urban status and any of the health behaviors.

## Results

### Sample Characteristics

The NHIS sample included 1,642 survivors who resided in a rural county and 6,162 survivors who resided in an urban county. Demographic, clinical and health status characteristics are summarized in Table 1 by rural-urban status. Rural survivors were significantly more likely to be Non-Hispanic, white, less educated, and uninsured. There were also differences in geographic region of residence, with rural survivors more likely to live in the Midwest or South. Cancer characteristics were similar between the groups, except

for the higher prevalence of gynecologic cancers among the rural survivors. There were also significant rural-urban differences in self-reported health and unemployment due to health.

### Health Behaviors by Rural-Urban Status

Current smoking was reported by 25.3% of rural cancer survivors, compared to only 15.8% of urban survivors (Table 2). Rural survivors were also more likely to report being physically inactive (50.7% compared to 38.7% of urban cancer survivors). In contrast, rural survivors were more likely to report lifetime abstinence from alcohol and less likely to report moderate or heavy drinking. There were no significant rural-urban differences in body mass index, although rural survivors did have a slightly higher prevalence of obesity.

### Associations between Health Behaviors and Health Status

In separate adjusted models, all four health behaviors were significantly associated with both fair/poor self-reported health and unemployment due to health (Table 3). The odds of being in fair/poor health and unemployed due to health were significantly greater for survivors who currently smoked compared to never smokers (OR= 1.76, 95% CI: 1.46–2.13 and OR= 1.93, 95% CI: 1.50–2.49, respectively). Obese survivors were more likely to have fair/poor health and to be unemployed due to health compared to those in the normal BMI range (OR = 1.50, 95% CI: 1.28–1.75 and OR= 1.68, 95% CI: 1.35–2.09, respectively). Similarly, the odds of having fair/poor health or being unemployed due to health were approximately two and one-half times greater for inactive survivors compared to those who were sufficiently active. Survivors who currently consumed alcohol were less likely to report fair/poor health and to be unemployed due to health, and this relationship did not vary much by the amount of alcohol consumed (ORs from .38–.67).

### Rural-Urban Status, Health Behaviors, and Health Status

In unadjusted models, rural survivors were significantly more likely to be in fair or poor health and to be unemployed due to health (OR= 1.58, 95% CI: 1.35–1.85 and OR=1.90, 95% CI: 1.55–2.33, respectively). We observed reduction in the odds of poor health outcomes associated with rural-urban status after adjustment for the sociodemographic, cancer-related variables, and the four health behavior variables, but the risk associated with rural residence remained significant. The odds of reporting fair/poor health remained 21% greater for rural survivors compared to urban survivors (OR=1.21, 95% CI: 1.03 – 1.43) after adjustment (Table 4). Rural survivors were also more likely to report being unemployed due to health reasons (OR=1.49, 95% CI: 1.18 – 1.88).

All four health behaviors were significantly associated with self-reported health and unemployment due to health in the final multivariable logistic models (see Table 4). Obese, but not overweight survivors were significantly more likely to report fair/poor health and to be unemployed for health reasons, as were current smokers and those survivors who were physically inactive. Former smokers were also significantly more likely to be in fair/poor health. A reduced risk of fair/poor health and unemployment due to health associated with consuming any amount of alcohol remained after adjustment for the other health behaviors and rural-urban status.

## Discussion

Our results mirror those reported in the general rural-urban health behavior literature and extend these findings to the context of cancer survivorship. Specifically, we documented a higher prevalence of current smoking and physical inactivity among rural compared to urban cancer survivors, as well as lower alcohol consumption. Body mass index did not differ. Furthermore, four modifiable risk factors- body mass index, physical activity, smoking, and

alcohol consumption - were all associated with both self-reported health and unemployment due to health among cancer survivors. Rural-urban differences in these outcomes were attenuated as hypothesized, but persisted despite adjustment for the health behaviors. The high rates of smoking and lower participation in leisure-time physical activity we observed among rural survivors are very concerning. The prevalence of smoking among rural survivors (25%) is substantially higher than that in urban survivors in our study (16%) and the general population of US survivors [18, 15]. Similarly, half of our rural cancer survivors reported no physical activity, compared with only 31.5% of all survivors from recent population estimates [18]. The cross-sectional nature of this study precludes us from knowing whether the differences observed among survivors are exclusively due to rural-urban differences prior to cancer or whether differential rates of quitting smoking or resumption of physical activity after cancer are involved. Although several studies have examined health behavior change after a cancer diagnosis [e.g., 44–46], to our knowledge none have specifically examined rural-urban differences in positive or negative health behavior changes after cancer. It will be important for future studies to address this knowledge gap.

However, we found no significant difference between urban and rural survivors for body mass index, unlike previous studies reporting an increased prevalence of obesity among rural adults[4, 47]. The prevalence of obesity in our sample (30.6% rural and 27.9% urban) is slightly higher than in general US population studies (27.4% rural, 23.9% urban)[4], but similar to the overall and regional prevalence ranges reported in a recent study of survivors [18].

Similar to general population health surveys [13], we observed that urban survivors were more likely than rural survivors to consume alcohol (infrequent through heavy use). Although rates of heavy drinking were similar in rural and urban survivors, we did not assess alcohol use disorders, which are more prevalent among rural adults, particularly in the Midwest[13]. Rural-urban differences in this study may be due to cultural/community traditions of alcohol abstinence and religious beliefs/norms, particularly in the rural South [13, 48].

Consistent with other studies among cancer survivors, we observed that health behaviors were significantly associated with patient-reported health outcomes [e.g., 14, 30, 49, 50]. To our knowledge, the association between health behaviors and health-related unemployment has not been previously described in cancer survivors. Other studies have linked both smoking and inadequate physical activity to recurrence, second cancers, and poorer survival [e.g., 23, 51, 52, 21, 26, 53, 54].

Like many other studies of the general adult population [55, 56], we identified a “healthy drinker” effect with survivors reporting any level of alcohol consumption being at lower risk of poor health relative to former drinkers and lifetime abstainers. Importantly for breast cancer survivors, there are mixed data linking alcohol consumption to breast cancer recurrence that should be considered when deciding whether or not to consume alcohol [21]. Nevertheless, smoking, body mass index, physical activity, and alcohol consumption do not appear to fully account for rural-urban differences in self-reported health and health-related unemployment that we observed. This persistence suggests that future research should be attuned to the role of community factors that may influence health after cancer in rural areas. These may include availability of oncology, primary care, and other health services such as rehabilitation and mental health, as well as community socioeconomic and social capital characteristics. It will also be important to examine the availability of cancer support organizations, as well as community norms regarding communication about cancer. Differences in cancer stage at diagnosis and receipt of guideline adherent cancer treatment

are other factors that could account for rural-urban differences in the long-term health status of cancer survivors. Some, but not all, studies have identified rural disparities in these outcomes [57–62]. Longitudinal studies with well characterized stage and treatment data could explore how treatment disparities impact long-term outcomes among survivors.

Our results highlight the need for evidence-based, individual-level interventions to improve health behaviors and outcomes in rural cancer survivors. Survivors in urban areas may face more safety concerns associated with neighborhood crime or traffic, whereas barriers in rural areas may include a lack of places to exercise such as parks and malls [6]. Rural women also more commonly report lack of support from others to exercise, fear of injury, and interference by caregiving duties [5]. Telephone, mail, or internet interventions may be better ways to reach rural survivors who face transportation challenges to attending classes or exercise programs that are typically held in urban centers. Home-based diet and exercise programs can be effective for increasing physical activity and improving quality of life among cancer survivors generally [e.g., 63, 64], and rural women with breast cancer specifically [65]. Telephone-based counseling is also an efficacious smoking cessation treatment both in cancer survivors [66] and the general population [67, 68] and is widely available throughout the US via state tobacco quitlines. E-health or m-health interventions may also have potential in this population because of their convenience, efficacy, and reach [69]. However, when compared to urban/suburban adults, rural adults are less likely to use the internet, have a smart phone, and use their cell phone to look for health or medical information [70, 71], suggesting that they may not be suitable for all rural survivors. Videoconferencing has been used to enhance psychosocial support among rural breast cancer survivors [72], and new home-based point-to-point video conferencing technology may enhance rural survivor's ability to participate in behavioral interventions at home. In addition to approaches targeted at individual survivors, health-systems interventions to promote the identification and treatment of risk factors among cancer survivors are needed, such as survivorship care planning. Community-based ecological approaches are also recommended to target tobacco use and obesity in the general population [73] and may ultimately have a public health impact for survivors as well.

Our study sample included a large nationally representative sample of rural and urban survivors and utilized a robust classification of rural-urban residence. Thus, our results are pertinent to all cancer survivors in the US. However, an important limitation of this study is use of self-reported data to ascertain cancer history, although several studies have confirmed the validity of self-reports of cancer [74, 75]. Under-reporting of smoking and body mass index and over-reporting of physical activity are also a concern [76], but there is no reason to suspect differential reporting by rural-urban status. With this cross-sectional design we cannot assess how health behaviors change after cancer or assess the directionality of observed associations. Finally, we used the dichotomous urban-rural definition based on county-based RUCC codes based on data availability and to be consistent with prior rural disparities research. County-based codes may result in under- or over-bounding of rural areas, and dichotomous groupings may not fully recognize the heterogeneity within rural areas. Yet on balance, these limitations are unlikely to explain our overall findings.

To our knowledge, this is the first study to describe health behaviors in relation to health status across urban and rural cancer survivors in the US. In conclusion, we present data from a nationally representative sample of US cancer survivors documenting a higher prevalence of smoking and physical inactivity among rural compared to urban survivors. Survivors who live in rural areas are a vulnerable sub-population at increased risk for poor health outcomes after cancer and are more likely to have health-compromising behaviors. Health behaviors may be more easily modified at the individual level compared with other factors associated with rural-urban disparities (e.g., education, income, insurance, travel barriers). Thus they

should be an important focus of efforts to reduce disparities after cancer. Behavior change interventions for cancer survivors may need to be developed or adapted to address unique needs and barriers associated with rural residence. It will be important for future studies to move beyond simple categories to recognize the heterogeneity of rural communities and to better identify the community factors that may influence rural health disparities.

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## References

1. US Department of Health and Human Services. [Accessed 30 Aug 2012] Disparities - Healthy People 2020. 2010. <http://www.healthypeople.gov/2020/about/disparitiesAbout.aspx>.
2. National Institutes of Health, US Department of Health and Human Services. [Accessed 30 Aug 2012] strategic research plan and budget to reduce and ultimately eliminate health disparities Volume I, Fiscal Years 2002–2006. 2002. [http://www.nimhd.nih.gov/our\\_programs/strategic/pubs/VolumeI\\_031003EDrev.pdf](http://www.nimhd.nih.gov/our_programs/strategic/pubs/VolumeI_031003EDrev.pdf).
3. National Cancer Institute. [Accessed 05 Sept 2012] The NCI strategic plan for leading the nation to eliminate the suffering and death due to cancer. US Department of Health and Human Services. 2006. [http://strategicplan.nci.nih.gov/pdf/nci\\_2007\\_strategic\\_plan.pdf](http://strategicplan.nci.nih.gov/pdf/nci_2007_strategic_plan.pdf).
4. Bennett, KJ.; Olatosi, B.; Probst, JC. Health Disparities: A Rural - Urban Chartbook. 2008. <http://rhr.sph.sc.edu>
5. Wilcox S, Castro C, King A, Housemann R, Brownson R. Determinants of leisure time physical activity in rural compared with urban older and ethnically diverse women in the United States. *J Epidemiol Community Health*. 2000; 54:667–672. [PubMed: 10942445]
6. Parks SE, Housemann RA, Brownson RC. Differential correlates of physical activity in urban and rural adults of various socioeconomic backgrounds in the United States. *J Epidemiol Community Health*. 2003; 57:29–35. [PubMed: 12490645]
7. Sharkey JR, Johnson CM, Dean WR. Less-healthy eating behaviors have a greater association with a high level of sugar-sweetened beverage consumption among rural adults than among urban adults. *Food Nutr. Res*. 2011 doi: 10.3402/fnr.v55i0.5819.
8. Reis JP, Bowles HR, Ainsworth BE, Dubose KD, Smith S, Laditka JN. Nonoccupational physical activity by degree of urbanization and U.S. geographic region. *Med. Sci. Sports Exercise*. 2004; 36:2093–2098.
9. Martin SL, Kirkner GJ, Mayo K, Matthews CE, Larry J, Hebert JR, et al. Urban, rural, and regional variations in physical activity. *JRural Health*. 2005; 21:239–244. [PubMed: 16092298]
10. Doescher MP, Jackson JE, Jerant A, Hart LG. Prevalence and trends in smoking: A national rural study. *JRural Health*. 2006; 22:112–118. [PubMed: 16606421]
11. Zahnd WE, Goldfarb J, Scaife SL, Francis ML. Rural-urban differences in behaviors to prevent skin cancer: an analysis of the health information national trends survey. *J. Am. Acad. Dermatol*. 2010; 62:950–956. [PubMed: 20236728]
12. Eberhardt, MS.; Ingram, D.; Makuc, D. Health, United States, 2001. National Center for Health Statistics; Hyattsville, MD: 2001. Urban and Rural Health Chartbook.
13. Borders TF, Booth BM. Rural, suburban, and urban variations in alcohol consumption in the United States: findings from the national epidemiologic survey on alcohol and related conditions. *JRural Health*. 2007; 23:314–321. [PubMed: 17868238]
14. Blanchard CM, Courneya KS, Stein K. Cancer Survivors' adherence to lifestyle behavior recommendations and associations with health-related quality of life: results from the American Cancer Society's SCS-II. *J Clin Oncol*. 2008; 26:2198–2204. [PubMed: 18445845]



15. Bellizzi KM, Rowland JH, Jeffery DD, McNeel T. Health behaviors of cancer survivors: examining opportunities for cancer control intervention. *J Clin Oncol.* 2005; 23:8884–8893. [PubMed: 16314649]
16. Coups EJ, Ostroff JS. A population-based estimate of the prevalence of behavioral risk factors among adult cancer survivors and noncancer controls. *Preventive Medicine.* 2005; 40:702–711. [PubMed: 15850868]
17. Rausch SM, Millay S, Scott C, Pruthi S, Clark MM, Patten C, Stan D, Sellers T, Vachon C. Health behaviors among cancer survivors receiving screening mammography. *Am. J. Clin. Oncol.* 2012; 35:22–31. [PubMed: 21293247]
18. Underwood JM, Townsend JS, Stewart SL. Surveillance of demographic characteristics and health behaviors among adult cancer survivors — behavioral risk factor surveillance system, United States, 2009. *MMWR Surveill Summ.* 2012; 61:1–23. [PubMed: 22258477]
19. Pinto B, Eakin E, Maruyama N. Health behavior changes after a cancer diagnosis: What do we know and where do we go from here? *Ann Behav Med.* 2000; 22:38–52. [PubMed: 10892527]
20. Eakin E, Youlden D, Baade P, Lawler S, Reeves M, Heyworth J, Fritschi L. Health behaviors of cancer survivors: data from an Australian population-based survey. *Cancer Causes Control.* 2007; 18:881–894. [PubMed: 17638108]
21. Rock CL, Doyle C, Demark-Wahnefried W, et al. Nutrition and physical activity guidelines for cancer survivors. *CA: A Cancer Journal for Clinicians.* 62:242–274. doi: 10.3322/caac.21142.
22. Patterson RE, Cadmus LA, Emond JA, Pierce JP. Physical activity, diet, adiposity and female breast cancer prognosis: a review of the epidemiologic literature. *Maturitas.* 2010; 66:5–15. [PubMed: 20097494]
23. Schmitz KH, Courneya KS, Matthews C, et al. American College of Sports Medicine roundtable on exercise guidelines for cancer survivors. *Med Sci Sports Exerc.* 2010; 42:1409–1426. [PubMed: 20559064]
24. Ligibel J. Lifestyle factors in cancer survivorship. *J Clin Oncol.* 2012; 30:3697–3704. doi: 10.1200/JCO.2012.42.0638. [PubMed: 23008316]
25. Gritz ER, Fingeret MC, Vidrine DJ, Lavez AB, Mehta NV, Reece GP. Successes and failures of the teachable moment: smoking cessation in cancer patients. *Cancer.* 2006; 106:17–27. [PubMed: 16311986]
26. Parsons A, Daley A, Begh R, Aveyard P. Influence of smoking cessation after diagnosis of early stage lung cancer on prognosis: systematic review of observational studies with meta-analysis. *BrMedJ.* 2010; 340:b5569. [PubMed: 20093278]
27. Nagle CM, Bain CJ, Webb PM. Cigarette smoking and survival after ovarian cancer diagnosis. *Cancer Epidemiol Biomarkers Prev.* 2006; 15:2557–2560. [PubMed: 17164386]
28. Bagnardi V, Blangiardo M, La Vecchia C, Corrao G. Alcohol consumption and the risk of cancer: a meta-analysis. *Alcohol Res Health.* 2001; 25:263–270. [PubMed: 11910703]
29. Kushi LH, Byers T, Doyle C, Bandera EV, McCullough M, Gansler T, Andrews KS, Thun MJ. 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: A Cancer Journal for Clinicians.* 2006; 56:254–281. [PubMed: 17005596]
30. Courneya K, Friedenreich C. Physical exercise and quality of life following cancer diagnosis: A literature review. *Ann Behav Med.* 1999; 21:171–179. [PubMed: 10499138]
31. Ferrer RA, Huedo-Medina TB, Johnson BT, Ryan S, Pescatello LS. Exercise interventions for cancer survivors: a meta-analysis of quality of life outcomes. *Ann Behav Med.* 2010; 41:32–47. [PubMed: 20931309]
32. Weaver KE, Geiger AM, Lu L, Case LD. Rural-urban disparities in health status among US cancer survivors. *Cancer.* 2013; 119:1050–1057. [PubMed: 23096263]
33. Vallance JK, Lavalley CM, Culos-Reed NS, Trudeau MG. Physical activity is associated with clinically important differences in health-related quality of life among rural and small-town breast cancer survivors. *Supportive Care in Cancer.* 2011; 20:1079–1087. [PubMed: 21573738]
34. Rogers LQ, Markwell SJ, Verhulst S, McAuley E, Coumeya KS. Rural breast cancer survivors: exercise preferences and their determinants. *Psychooncology.* 2009; 18:412–421. [PubMed: 19241491]

35. Lynch B, Cerin E, Newman B, Owen N. Physical activity, activity change, and their correlates in a population-based sample of colorectal cancer survivors. *Ann Behav Med.* 2007; 34:135–143. [PubMed: 17927552]
36. National Center for Health Statistics, Centers for Disease Control and Prevention NHIS - questionnaires, datasets, and related documentation from 1997 to the present. [http://www.cdc.gov/nchs/nhis/quest\\_data\\_related\\_1997\\_forward.htm](http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm)
37. Weaver KE, Rowland JH, Bellizzi KM, Aziz NM. Forgoing medical care because of cost: assessing disparities in healthcare access among cancer survivors living in the United States. *Cancer.* 2010; 116:3493–3504. [PubMed: 20549763]
38. Yabroff KR, Lawrence WF, Clauser S, Davis WW, Brown ML. Burden of illness in cancer survivors: findings from a population-based national sample. *J Natl Cancer Inst.* 2004; 96:1322–1330. [PubMed: 15339970]
39. US Department of Health and Human Services. 2008 physical activity guidelines for Americans: be active, healthy, and happy!. United States Govt Printing Office; 2008.
40. [Accessed 23 Sep 2012] Centers for Disease Control and Prevention Obesity and Overweight for Professionals: defining overweight and obesity. <http://www.cdc.gov/obesity/adult/defining.html>.
41. Ware JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36): I. conceptual framework and item selection. *Medical Care.* 1992; 30:473–483. [PubMed: 1593914]
42. USDA Economic Research Service. [Accessed 5 Sep 2012] USDA rural-urban continuum codes-documentation. 2012. <http://www.ers.usda.gov/data-products/rural-urban-continuum-codes/documentation.aspx>.
43. Howlader, N.; Noone, A.; Krapcho, M., et al. SEER cancer statistics review, 1975–2009 (Vintage 2009 Populations). National Cancer Institute; Bethesda, MD: 2011.
44. Park ER, Japuntich SJ, Rigotti NA, Traeger L, He Y, Wallace RB, Malin JL, Zallen JP, Keating NL. A snapshot of smokers after lung and colorectal cancer diagnosis. *Cancer.* 2012; 118:3153–3164. doi: 10.1002/cncr.26545. [PubMed: 22271645]
45. Hawkins NA, Smith T, Zhao L, Rodriguez J, Berkowitz Z, Stein KD. Health-related behavior change after cancer: results of the American Cancer Society's studies of cancer survivors (SCS). *J Cancer Surviv.* 2010; 4:20–32. [PubMed: 19902360]
46. Irwin ML, Crumley D, McTiernan A, Bernstein L, Baumgartner R, Gilliland FD, Kriska A, Ballard-Barbash R. Physical activity levels before and after a diagnosis of breast carcinoma. *Cancer.* 2003; 97:1746–1757. [PubMed: 12655532]
47. Patterson PD, Moore CG, Probst JC, Shinogle JA. Obesity and physical inactivity in rural America. *J Rural Health.* 2004; 20:151–159. [PubMed: 15085629]
48. Booth BM, Curran GM. Variations in drinking patterns in the rural south: joint effects of race, gender, and rural residence. *Am J Drug Alcohol Abuse.* 2006; 32:561–568. [PubMed: 17127544]
49. Bellizzi KM, Rowland JH, Arora NK, Hamilton AS, Miller MF, Aziz NM. Physical activity and quality of life in adult survivors of non-Hodgkin's lymphoma. *J Clin Oncol.* 2009; 27:960–966. [PubMed: 19139438]
50. Smith AW, Alfano CM, Reeve BB, Irwin ML, Bernstein L, Baumgartner K, Bowen D, McTiernan A, Ballard-Barbash R. Race/ethnicity, physical activity, and quality of life in breast cancer survivors. *Cancer Epidemiol Biomarkers Prev.* 2009; 18:656–663. [PubMed: 19190157]
51. Rock CL, Demark-Wahnefried W. Nutrition and survival after the diagnosis of breast cancer: a review of the evidence. *J Clin Oncol.* 2002; 20:3302–3316. [PubMed: 12149305]
52. Gritz ER, Demark-Wahnefried W. Health behaviors influence cancer survival. *J Clin Oncol.* 2009; 27:1930–1932. [PubMed: 19289610]
53. Ogunleye A, Holmes M. Physical activity and breast cancer survival. *Breast Cancer Research.* 2009; 11:106. [PubMed: 19735584]
54. 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]
55. O'Keefe JH, Bybee KA, Lavie CJ. Alcohol and cardiovascular health: the razor-sharp double-edged sword. *J Am Coll Cardiol.* 2007; 50:1009–1014. [PubMed: 17825708]
56. Rimm EB, Moats C. Alcohol and coronary heart disease: drinking patterns and mediators of effect. *Ann Epidemiol.* 2007; 17:S3–S7.

57. Celaya MO, Rees JR, Gibson JJ, Riddle BL, Greenberg ER. Travel distance and season of diagnosis affect treatment choices for women with early-stage breast cancer in a predominantly rural population (United States). *Cancer Causes Control*. 2006; 17:851–856. [PubMed: 16783613]
58. Elliott TE, Elliott BA, Renier CM, Haller IV. Rural-urban differences in cancer care: results from the Lake Superior Rural Cancer Care Project. *Minn Med*. 2004; 87:44–50. [PubMed: 15495877]
59. Hines RB, Markossian TW. Differences in late-stage diagnosis, treatment, and colorectal cancer-related death between rural and urban african americans and whites in Georgia. *J Rural Health*. 2012; 28:296–305. [PubMed: 22757954]
60. Schootman M, Aft R. Rural-urban differences in radiation therapy for ductal carcinoma in-situ of the breast. *Breast Cancer Res Treat*. 2001; 68:117–125. [PubMed: 11688515]
61. Celaya MO, Berke EM, Onega TL, Gui J, Riddle BL, Cherala SS, Rees JR. Breast cancer stage at diagnosis and geographic access to mammography screening (New Hampshire, 1998–2004). *Rural Remote Health*. 2010; 10:1361. [PubMed: 20438282]
62. Paquette I, Finlayson SRG. Rural versus urban colorectal and lung cancer patients: differences in stage at presentation. *J Am Coll Surg*. 2007; 205:636–641. [PubMed: 17964438]
63. Demark-Wahnefried W, Clipp EC, Lipkus IM, et al. Main Outcomes of the FRESH START Trial: a sequentially tailored, diet and exercise mailed print intervention among breast and prostate cancer survivors. *J Clin Oncol*. 2007; 25:2709–2718. [PubMed: 17602076]
64. Morey MC, Snyder DC, Sloane R, Cohen HJ, Peterson B, Hartman TJ, Miller P, Mitchell DC, Demark-Wahnefried W. Effects of home-based diet and exercise on functional outcomes among older, overweight long-term cancer survivors: RENEW: a randomized controlled trial. *JAMA*. 2009; 301:1883–1891. [PubMed: 19436015]
65. Eakin E, Lawler S, Winkler E, Hayes S. A randomized trial of a telephone-delivered exercise intervention for non-urban dwelling women newly diagnosed with breast cancer: exercise for health. *Ann Behav Med*. 2012; 43:229–238. [PubMed: 22109352]
66. Emmons KM, Puleo E, Park E, Gritz ER, Butterfield RM, Weeks JC, Mertens A, Li FP. Peer-delivered smoking counseling for childhood cancer survivors increases rate of cessation: the partnership for health study. *J Clin Oncol*. 2005; 23:6516–6523. [PubMed: 16116148]
67. Lichtenstein E, Zhu SH, Tedeschi GJ. Smoking cessation quitlines: an underrecognized intervention success story. *Am Psychol*. 2010; 65:252–261. [PubMed: 20455619]
68. Stead LF, Perera R, Lancaster T. Telephone counseling for smoking cessation. *Cochrane Database of Systematic Reviews*. 2006; 3:CD002850. [PubMed: 16855992]
69. Bennett GG, Glasgow RE. The delivery of public health interventions via the internet: actualizing their potential. *Annu Rev Public Health*. 2009; 30:273–292. [PubMed: 19296777]
70. Fox, S. [Accessed 19 Apr 2013] Rural e-patients face access challenges | Pew Research Center's Internet & American Life Project. 2012. <http://pewinternet.org/Commentary/2012/November/Rural-epatients-face-access-challenges.aspx>.
71. Fox, S.; Duggan, M. Mobile Health 2012 | Pew Research Center's Internet & American Life Project. 2012.
72. Collie K, Kreshka MA, Ferrier S, Parsons R, Graddy K, Avram S, Mannell P, Chen X-H, Perkins J, Koopman C. Videoconferencing for delivery of breast cancer support groups to women living in rural communities: a pilot study. *Psycho-Oncology*. 2007; 16:778–782. [PubMed: 17253594]
73. Ockene JK, Edgerton EA, Teutsch SM, Marion LN, Miller T, Genevro JL, Loveland-Cherry CJ, Fielding JE, Briss PA. Integrating evidence-based clinical and community strategies to improve health. *Am J Prev Med*. 2007; 32:244–252. [PubMed: 17296474]
74. Bergmann MM, Calle EE, Mervis CA, Miracle-McMahill HL, Thun MJ, Health CW. Validity of self-reported cancers in a prospective cohort study in comparison with data from state cancer registries. *Am J Epidemiol*. 1998; 147:556–562. [PubMed: 9521182]
75. Parikh-Patel A, Allen M, Wright WE. Validation of self-reported cancers in the California teachers study. *Am J Epidemiol*. 2003; 157:539–545. [PubMed: 12631544]
76. Newell SA, Girgis A, Sanson-Fisher RW, Savolainen NJ. The accuracy of self-reported health behaviors and risk factors relating to cancer and cardiovascular disease in the general population: A critical review. *Am J Prev Med*. 1999; 17:211–229. [PubMed: 10987638]

**Table 1**

Characteristics of Rural and Urban Cancer Survivors from the National Health Interview Survey (2006–2010)

		<b>Rural n=1642 (Weighted %,SE)</b>		<b>Urban n=6162 (Weighted %, SE)</b>	
Age, years	<50	20.8	1.1	21.2	0.6
	50–64	31.7	1.4	30.4	0.6
	65–79	34.2	1.3	32.4	0.7
	80+	13.2	1.0	15.9	0.6
Sex	Male	38.9	1.4	39.6	0.7
	Female	61.1	1.4	60.4	0.7
Marital Status	Married/Living with Partner	63.5	1.4	62.8	0.8
	Not Married	36.5	1.4	37.2	0.8
Race/Ethnicity	Non-Hispanic, White	90.6	0.9	81.9	0.6
	Hispanic	2.7	0.6	6.5	0.4
	Non-Hispanic, Black	4.5	0.6	8.4	0.5
	Asian Pacific Islander	0.4	0.2	2.4	0.2
	Other	1.8	0.4	0.8	0.1
Education	< High School	23.4	1.3	14.5	0.6
	High School or GED	34.5	1.5	28.5	0.7
	Some College	42.2	1.7	57.0	0.8
Geographic Region	Northeast	10.9	2.1	21.1	1.1
	Midwest	30.3	2.6	22.5	1.0
	South	42.1	2.3	34.7	1.2
	West	15.8	2.1	21.8	0.8
Health Insurance	None	10.1	1.0	5.7	0.4
	Public only	33.3	1.5	27.4	0.7
	Private (with or without public)	56.6	1.8	66.9	0.8
Cancer Type (s) <sup>#</sup>	Breast only	17.1	1.0	19.8	0.6
	Gynecologic only	19.3	1.0	15.4	0.6
	Prostate only	13.0	0.9	14.5	0.5
	Colorectal only	6.9	0.9	6.9	0.4
	Melanoma only	7.4	0.8	8.8	0.5
	Hematologic only	5.4	0.6	5.3	0.4
	Short-survival	6.5	0.7	6.4	0.4
	Other single cancer	16.2	1.3	15.9	0.6
	Multiple cancers	8.2	0.7	7.1	0.4
Number of Cancers	1	89.9	0.9	90.7	0.5
	>1	10.1	0.9	9.3	0.5

		<u>Rural n=1642 (Weighted %,SE)</u>		<u>Urban n=6162 (Weighted %, SE)</u>	
Time since	<2	14.2	1.0	14.8	0.6
First Cancer	2-5	25.3	1.4	27.5	0.7
Diagnosis, years	6-9	16.5	1.1	16.0	0.6
	10+	44.1	1.4	41.7	0.8
Overall Health *	Excellent	9.2	0.7	13.9	0.6
	Very Good	21.8	1.0	26.0	0.6
	Good	32.3	1.3	33.5	0.7
	Fair	23.4	1.2	18.5	0.6
	Poor	13.3	1.0	8.1	0.4
Employment	Retired	38.9	1.8	42.8	0.9
	Employed	31.1	1.7	38.6	0.8
	Unemployed due to health	18.5	1.2	10.6	0.5
	Unemployed for another reason	11.5	1.0	7.9	0.4

# Gynecologic cancers include cervix, uterus, and ovary. Short-survival cancers included esophagus, liver, lung, pancreas, or stomach.

\* Overall health was measured by a single item from the MOS SF-36. SE= standard error

**Table 2**

Health Behaviors of Rural and Urban Cancer Survivors from the National Health Interview Survey (2006–2010)

	Rural N=1642 (n, Weighted %, SE)			Urban N=6162 (n, Weighted %, SE)			p-value*
<u>Body Mass Index</u>							.10 (.23)
<25.0	549	34.5	1.30	2210	37.4	0.75	
25.0–29.9	533	34.8	1.43	2048	34.7	0.74	
30.0+	489	30.6	1.38	1653	27.9	0.69	
<u>Smoking</u>							<.001 (.001)
Never	675	39.9	1.49	2862	46.2	0.80	
Past	555	34.8	1.55	2228	38.0	0.81	
Current	393	25.3	1.22	995	15.8	0.62	
<u>Leisure-time Physical Activity</u> #							<.001 (<.001)
Sufficiently Active	263	18.8	1.45	1220	22.8	0.73	
Insufficiently active	448	30.5	1.41	2140	38.5	0.84	
Inactive	755	50.7	1.91	2349	38.7	0.88	
<u>Alcohol Use</u> ±							<.001 (<.001)
Lifetime abstainer	393	23.1	1.36	1240	18.4	0.59	
Former	497	30.6	1.39	1427	23.0	0.65	
Current Infrequent	210	13.6	1.16	860	14.3	0.56	
Current Light	296	19.8	1.09	1422	24.7	0.75	
Current Moderate	134	8.0	0.83	748	13.8	0.57	
Current Heavy	71	4.9	0.61	308	5.8	0.42	

\* First p-values are unadjusted; second p-values in parentheses are adjusted for age, gender, marital status, race/ethnicity, education, geographic region, health insurance, cancer type, and time since first cancer diagnosis.

# Inactive (no leisure-time aerobic activity that lasted at least 10 minutes), insufficiently active (aerobic activities for at least 10 minutes but less than 150 minutes per week), or sufficiently active (moderate-intensity leisure-time physical activity at least 150 minutes or vigorous-intensity leisure-time physical activity at least 75 minutes per week).

± Lifetime abstainer (less than 12 drinks in lifetime), former (12 or more drinks in lifetime, but none in the past year), current infrequent (1–11 drinks in past year), current light ( 3 drinks per week in past year), current moderate (4–14 drinks per week for men and 4–7 drinks per week for women), and current heavy ( 14 drinks per week for men, and 7 drinks per week for women).

**Table 3**

Association between Health Behaviors and Health Status Outcomes (adjusted for selected covariates) for Cancer Survivors from the National Health Interview Survey (2006–2010)

	Fair/Poor Self-Reported Health OR (95% CI)	Unemployed Due to Health OR (95% CI)
<u>Body Mass Index</u>		
<25.0	ref	ref
25.0–29.9	0.93 (0.80–1.08)	1.11 (0.90–1.39)
30.0+	<b>1.50 (1.28–1.75)</b>	<b>1.68 (1.35–2.09)</b>
<u>Smoking</u>		
Never	ref	ref
Past	1.12 (0.97–1.29)	1.05 (0.83–1.32)
Current	<b>1.76 (1.46–2.13)</b>	<b>1.93 (1.50–2.49)</b>
<u>Leisure Physical Activity</u> <sup>#</sup>		
Sufficiently Active	ref	ref
Insufficiently active	1.14 (0.90–1.44)	1.29 (0.94–1.76)
Inactive	<b>2.56 (2.07–3.16)</b>	<b>2.72 (2.02–3.66)</b>
<u>Alcohol Use</u> <sup>±</sup>		
Lifetime abstainer	ref	ref
Former	1.05 (0.88–1.25)	<b>1.25 (1.00–1.57)</b>
Current Infrequent	<b>0.61 (0.50–0.76)</b>	<b>0.67 (0.49–0.91)</b>
Current Light	<b>0.44 (0.36–0.54)</b>	<b>0.45 (0.34–0.61)</b>
Current Moderate	<b>0.44 (0.33–0.57)</b>	<b>0.38 (0.26–0.55)</b>
Current Heavy	<b>0.47 (0.32–0.68)</b>	<b>0.52 (0.33–0.82)</b>

Each model was adjusted for age, gender, marital status, race/ethnicity, education, geographic region, health insurance (self-reported health only), cancer type, and time since first cancer diagnosis. Odds ratios that are statistically significant,  $p < .05$ , are shown in bold.

<sup>#</sup>Inactive (no leisure-time aerobic activity that lasted at least 10 minutes), insufficiently active (aerobic activities for at least 10 minutes but less than 150 minutes per week), or sufficiently active (moderate-intensity leisure-time physical activity at least 150 minutes or vigorous-intensity leisure-time physical activity at least 75 minutes per week).

<sup>±</sup>Lifetime abstainer (less than 12 drinks in lifetime), former (12 or more drinks in lifetime, but none in the past year), current infrequent (1–11 drinks in past year), current light ( 3 drinks per week in past year), current moderate (4–14 drinks per week for men and 4–7 drinks per week for women), and current heavy ( 14 drinks per week for men, and 7 drinks per week for women).

**Table 4**

Correlates of Health Status Outcomes in Cancer Survivors from the National Health Interview Survey (2006–2010)

Variables		Fair or Poor Self-Reported Health n=6,790 OR (95%CI)	Unemployed Due to Health n=6,801 OR (95%CI)
Residence	Rural	<b>1.21 (1.03 – 1.43)</b>	<b>1.49 (1.18 – 1.88)</b>
Age, 10 years		1.01 (0.96 – 1.08)	<b>0.72 (0.68 – 0.78)</b>
Sex	Male	1.17 (0.96 – 1.42)	1.17 (0.90 – 1.53)
Marital Status	Not Married	0.98 (0.85 – 1.13)	<b>1.40 (1.15 – 1.70)</b>
Race/Ethnicity	Minority	<b>1.32 (1.10 – 1.58)</b>	<b>1.39 (1.10 – 1.75)</b>
Education	< High School	<b>2.86 (2.26 – 3.63)</b>	<b>2.85 (2.01 – 4.02)</b>
	High School of GED	<b>1.53 (1.24 – 1.88)</b>	<b>1.77 (1.26 – 2.49)</b>
	Some College	<b>1.45 (1.16 – 1.81)</b>	<b>1.45 (1.02 – 2.06)</b>
	4 year degree+	Ref	Ref
Geographic Region	Northeast	Ref	Ref
	Midwest	<b>0.79 (0.62 – 0.99)</b>	0.80 (0.56 – 1.13)
	South	0.88 (0.72 – 1.09)	1.02 (0.77 – 1.37)
	West	0.82 (0.65 – 1.02)	1.05 (0.75 – 1.46)
Health Insurance	None	<b>1.58 (1.17 – 2.13)</b>	---
	Public Only	<b>1.99 (1.71 – 2.32)</b>	---
	Private	Ref	---
Cancer Type (s)	Breast	<b>0.59 (0.44 – 0.80)</b>	0.68 (0.44 – 1.05)
	Gynecologic	<b>0.57 (0.42 – 0.79)</b>	0.62 (0.39 – 1.00)
	Prostate	<b>0.56 (0.39 – 0.82)</b>	<b>0.39 (0.23 – 0.67)</b>
	Colorectal	0.69 (0.47 – 1.00)	0.81 (0.48 – 1.35)
	Melanoma	<b>0.40 (0.27 – 0.58)</b>	0.60 (0.36 – 1.01)
	Hematologic	1.13 (0.75 – 1.70)	1.05 (0.63 – 1.75)
	Short-survival	<b>1.44 (1.04 – 2.01)</b>	<b>1.81 (1.15 – 2.85)</b>
	Other single	<b>0.64 (0.46 – 0.90)</b>	0.88 (0.56 – 1.38)
	Multiple cancers	Ref	Ref
Time since First Cancer Diagnosis, years	<2	<b>1.43 (1.16 – 1.76)</b>	0.85 (0.64 – 1.15)
	2 – 5	1.07 (0.89 – 1.27)	1.10 (0.85 – 1.42)
	6 – 9	1.00 (0.80 – 1.24)	0.84 (0.62 – 1.13)
	10+	Ref	Ref
BMI	<25.0	Ref	Ref
	25.0 – 29.9	0.98 (0.83 – 1.17)	1.16 (0.93 – 1.46)
	30.0+	<b>1.47 (1.25 – 1.74)</b>	<b>1.63 (1.27 – 2.10)</b>
Smoking	Never	Ref	Ref
	Past	<b>1.28 (1.09 – 1.51)</b>	1.12 (0.86 – 1.46)
	Current	<b>1.90 (1.53 – 2.37)</b>	<b>2.08 (1.58 – 2.73)</b>
Physical Activity	Sufficiently Active	Ref	Ref
	Insufficiently active	1.14 (0.90 – 1.44)	1.21 (0.89 – 1.66)
	Inactive	<b>2.22 (1.78 – 2.76)</b>	<b>2.21 (1.65 – 2.97)</b>



Variables		Fair or Poor Self-Reported Health n=6,790 OR (95%CI)	Unemployed Due to Health n=6,801 OR (95%CI)
Alcohol Consumption	Lifetime abstainer	Ref	Ref
	Former	1.08 (0.89 – 1.31)	1.14 (0.88 – 1.48)
	Current Infrequent	<b>0.64 (0.51 – 0.81)</b>	<b>0.63 (0.44 – 0.90)</b>
	Current Light	<b>0.49 (0.39 – 0.60)</b>	<b>0.47 (0.35 – 0.64)</b>
	Current Moderate	<b>0.49 (0.36 – 0.67)</b>	<b>0.43 (0.29 – 0.63)</b>
	Current Heavy	<b>0.46 (0.31 – 0.69)</b>	<b>0.53 (0.32 – 0.87)</b>