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Working with Cancer: Health and Employment among Cancer Survivors

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Abstract

Background—Cancer affects a growing proportion of US workers. Factors contributing to whether they continue or return to work after cancer diagnosis include: age, physical and mental health, health insurance, education, and cancer site. The purpose of this study was to assess the complex relationships between health indicators and employment status for adult cancer survivors.

Methods—We analyzed pooled data from the 1997–2012 US National Health Interview Survey (NHIS). Our sample included adults with a self-reported physician diagnosis of cancer (n=24,810) and adults with no cancer history (n=382,837). Using structural equation modeling (SEM), we evaluated the relationship between socio-demographic factors, cancer site, and physical and mental health indicators on the overall health and employment status among adults with a cancer history.

Results—The overall model for cancer survivors fit the data well ($\chi^2(374)=3654.7$, $p<0.001$; CFI = 0.98; RMSEA=0.04). Although black cancer survivors were less likely to report good-to-excellent health, along with Hispanic survivors they were more more likely to continue to work after diagnosis compared with their white counterparts. Health insurance status and educational level were strongly and positively associated with health status and current employment. Age and time since diagnosis were not significantly associated with health status or employment, but there were significant differences by cancer site.

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Conclusion—A proportion of cancer survivors may continue to work because of employment-based health insurance, despite reporting poor health and significant physical and mental health limitations. Acute and long term health and social support are essential for the continued productive employment and quality of life of all cancer survivors.

INTRODUCTION

With major improvements in cancer detection and treatment, increasing numbers of cancer survivors return or continue to work post cancer diagnosis (1,2). Recent literature reflects this trend among survivors, many of whom continue to work even during active cancer treatment (3). However, cancer survivors' ability to work strongly depends on their overall health status which, in turn, is influenced by age, cancer, stage at diagnosis, sequelae, treatment, access to healthcare, and health insurance (4–7).

Previous research has reported that most working cancer survivors in the U.S. are highly educated, middle-aged individuals reporting two or more functional limitations (8). Since a large proportion of cancer survivors are of working age, understanding the impact of the physical and mental health status of this population on their employment is important for employers, healthcare providers, public health planners, and cancer patient advocates, as well as the survivors themselves and their families. Most studies of cancer survivorship lack in-depth examinations of the relationships between employment and reported health status, activities of daily living (ADLs), and physical and psychological limitations. Although these factors have been studied independently (3,9–11), their joint impact on health and employment status, remain unknown. Thus, our main aim was to fill this gap by exploring the relationships between selected health indicators and health and employment status among adult cancer survivors.

METHODS

Participants

We analyzed pooled data from the 1997–2012 U.S. National Health Interview Survey (NHIS), merging data from the sample adult files, person files, and the cancer control modules (12). The NHIS collects demographic and health information from a representative sample of noninstitutionalized U.S. civilian population on an annual basis. Information is collected by household; one adult per family is randomly selected and administered questions related to health, including questions about cancer history. Annual adult response rates to the NHIS data used in this study averaged 71.3% (range: 69%–80%) (13). All data were self-reported and participants with missing information were excluded.

Variables

Participants were categorized as individuals with a cancer history (or cancer survivors) if they responded “yes” to the question: “Have you ever been told by a doctor or other health professional that you had cancer or a malignancy of any kind?” For this subsample, further questions permitted stratification by cancer site. For the purposes of this study, we looked at five of the most frequently diagnosed cancers within the U.S. (breast, prostate, lung, bladder, and colorectal cancers) (14). The rest of reported cancer sites were grouped under

“other” (referent). Persons with non-melanoma skin cancer were not included in the study population.

The outcome variables of interest were employment and health status. Employment was dichotomously coded as currently “employed” or “not employed,” determined by participants’ response as to whether or not they were working (paid and unpaid) during the week prior to their NHIS interview. Health status was defined by self-reported health status measured on a Likert scale. To facilitate comparison with previous research, scale values were combined to create a dichotomous variable where health status was classified as “poor-to-fair” and “good-to-excellent”.

We included health-related predictors referring to both physical and psychosocial health. A functional limitation results from a substantial impairment in an individual's ability to complete a range of tasks or major life activities for daily functioning, whether simple or complex; as such, functional limitations form the link between impairment and disability (15). Respondents were asked about the level of difficulty experienced when performing a named task by themselves without using any special equipment. The response categories (ranging from 1–5) were “not at all difficult,” “only a little difficult,” “somewhat difficult,” “very difficult,” and “can’t do at all.” Responses to these nine self-reported items (i.e. walking, standing, stooping, carrying, grasping, climbing, sitting, pushing and reaching) were combined into a single “latent variable” (described below) measuring functional limitations. Three additional questions with the same response categories were captured by a second latent variable to assess performing instrumental activities of daily living (IADLs); these are complex skills needed for successful independent living, i.e. social functions, relaxing, and shopping (16).

Limitations in performing basic activities and the effects of chronic conditions also encompass psychosocial factors, such as psychological distress, known to afflict cancer survivors. Based on the Kessler 6 (K-6) scale of psychological distress (17), participant responses to six questions “How often did you feel (nervous, sad, restless, hopeless, worthless, or ‘that everything was an effort’)?” were measured by a single latent variable, psychological distress. The response options were: “none of the time,” “a little of the time,” “some of the time,” “most of the time,” and “all of the time being,” yielding a score between 1 and 5.

Socio-demographic variables included gender, age, Hispanic origin and race, education, and health insurance status. Age was measured as a continuous variable in years. Education was treated as 3-level categorical variable: less than high school (referent), high school diploma or equivalent, and some college or higher education. Hispanic origin and race were divided into four mutually exclusive categories: non-Hispanic white (white) (referent), non-Hispanic black (black), Hispanic, and non-Hispanic other/ multi-race (other race). Based on their health insurance, participants were classified as privately insured (referent), publicly insured, and uninsured, using the definitions and classification commonly used by the National Center for Health Statistics (NCHS) (18).

Data Analytic Plan

For the analyses, we used structural equation modeling (SEM) because of the complexity of the pathways and variables (including latent variables) that were being examined. The use of SEM allowed the simultaneous evaluation of all the relationships of the variables, as opposed to the individual effects of each predictor in separate multivariable logistic regression models. Also in SEM, latent variables may be used to measure multiple item scales independent of random measurement error, resulting in improved measurement reliability. Data management and descriptive analyses were conducted using SAS statistical software package version 9.2(19), we used Mplus version 5.2 (20) to test study hypotheses within a SEM framework. Due to the complex sample survey design, we performed all analyses adjusting for sample weights and design effects (12, 21). Records from each survey year were weighted according to person-level weights provided in annual NHIS data files. Weights were adjusted according to the number of representative years used in the analyses (12). The distribution of the variables was examined through frequency tabulations to look for outliers and examine the data errors and variables were tested for collinearity.

Since the focus of this study was on cancer survivors, the SEM analysis included only those individuals, 18 years and older, who both participated in the 1997–2012 NHIS surveys and had been diagnosed with cancer (except non-melanoma skin cancer) (n=24,810). Figure 1 displays the measurement model examined in this study. First, using confirmatory factor analyses (CFA) we estimated individual latent variable models. Second, we measured the fit of all three latent variables in a three-factor model to validate the latent variable measures using model fit indices. Third, we estimated the hypothesized structural equation model.

Preliminary analyses were conducted to determine whether there were sufficient associations (i.e. covariation) among the variables to permit model estimation, or if the correlations of these variables were high. Next, the distribution of antecedent variables (i.e., demographic and cancer-related characteristics), functional limitations, IADLs, and psychological distress was provided for participants with and without a cancer history by employment status was examined (Table 1). CFA were then fitted for each latent variable separately and together in a three-factor model. Finally, we estimated the hypothesized structural equation model (Figure 1).

Model fit for latent variables and the full SEM was evaluated in terms of: a) the comparative fit index (CFI), which compares the hypothesized model to a null model with no paths or latent variables; and b) the root mean square error of approximation (RMSEA), which estimates the extent to which the covariance matrix specified in the model deviates from the covariance matrix observed in the data. CFI values of 0.95 or greater and RMSEA values of 0.05 or less were used as indicators of good model fit (22, 23). The chi-square statistic, while reported, was not used in model fit interpretation due to its sensitivity to testing the null hypothesis of perfect fit when the sample size is large (24, 25). Modification indices (which guide minor modifications to model specifications) were used to improve model fit in the measurement model by correlating error variances where appropriate. Unless otherwise stated, estimates were compared using two-sided t-tests at the 0.05 level, assuming independence.

Confirmatory Factor Analysis (CFA)—Instrumental activities of daily living: CFA identified three indicators that loaded significantly onto a single latent construct. The loadings (regression weights) were 0.80 for relaxing, 0.94 for shopping, and 0.98 for socializing. This model was saturated (i.e., the number of observed variables were equal to the number of parameters being estimated), therefore model fit statistics are not available.

Both the functional limitations and psychological distress latent variables had good model fit. Functional limitations: $\chi^2(22) = 1116.56, p < 0.0001$; CFI = 0.99; RMSEA 0.05. All nine indicators had statistically significant factor loadings with the latent construct; the loadings ranged from 0.76 (grasp) to 1.01 (stand). Psychological distress: $\chi^2(9) = 2304.05, p < 0.0001$; CFI = 0.98; RMSEA < 0.0001

All six indicators had statistically significant factor loadings with the latent construct; the loadings ranged from 0.96 (restless) to 1.11 (hopeless).

The three latent variables (functional limitations, IADLs, and psychological distress) were combined into one model and evaluated. The model provided a good fit to the data: $\chi^2(125) = 3670.46, p < 0.0001$; CFI = 0.99; RMSEA = 0.03, indicating that all three factors (including ADL) were good representations of the data.

Measurement model—Overall, the measurement model depicted in Figure 1 provided an adequate fit to the data: $\chi^2(374) = 3654.73, p < 0.0001$; CFI = 0.98; RMSEA = 0.04. We tested our full model among all cancer survivors only, with reported health status and employment status as the outcomes (Table 2). These analyses of anonymized data were approved by the University of Miami School of Medicine Human Subjects Committee.

RESULTS

Cancer survivors versus individuals without a cancer history

The overall study sample included all persons 18 years and older who participated in the 1997–2012 NHIS surveys and had been diagnosed with cancer (n=24,810) as well as those without a previous cancer diagnosis (n=382,837). Among those currently working, 13,773 were cancer survivors and 283,767 were adults without a cancer history (Table 1).

The largest group of working cancer survivors (45.7%) was between 40–64 years of age versus 39.7% of working individuals with no cancer diagnosis in the same age range. White survivors (80.1%) were more likely to work than those without cancer (62.7%); Hispanic (8.3%) and black (9.4%) cancer survivors were less likely to work than those without a cancer history (18.4% and 14.5%, respectively). There was a comparatively higher percentage of survivors with some college or higher education among working cancer survivors compared to the not employed survivors (43.5% vs. 38.7%); this pattern, was similar among individuals without a cancer history. Cancer survivors, both employed (11.2%) and not employed (5.4%) were less likely to be uninsured compared to those without cancer whether employed (15.3%) or not employed (14.8%).

Eighty-three percent of working survivors reported good-to-excellent health; this was approximately 15% higher than the not employed survivors, but 10% lower than working

persons with no previous cancer diagnosis. A significantly larger proportion of cancer survivors reported having two or more functional limitations compared to those without cancer; the percentage of functional limitations reported among not employed survivors (61.6%) was almost twice that of employed survivors (36.0%), and more than twice that of not employed persons without a cancer history (26.3%). The level of reported psychological distress (14%) was similar among employed cancer survivors and not employed persons without cancer, although less than that of not employed cancer survivors (17%).

Cancer survivors only

Among employed cancer survivors, 42% were diagnosed 5 years or less prior to the NHIS interview, 21.2% were diagnosed 6–10 years prior to their interview, and 36.4% had a cancer diagnosis over 10 years before the interview. The distribution of time since diagnosis was similar among not employed cancer survivors. However, whereas less than 40% of employed cancer survivors had one of the five most frequently diagnosed cancers, 60% of their not employed peers had been diagnosed with one of these cancers.

Health status—As Table 2 shows, female cancer survivors were significantly more likely to report good-to-excellent health status compared with male survivors (Odds Ratio (OR)=1.3; 95% confidence interval 1.22–1.28). There were notable differences between Hispanic origin and race groups with regards to good-to-excellent health status among cancer survivors: compared with whites, blacks (OR=0.6; 95% C.I. 0.62–0.66) and persons of other races (OR=0.8; 95% C.I. 0.71–0.80) were significantly less likely to report good-to-excellent health. Education was positively associated with health status: survivors with a high school diploma or General Education Development certificate (GED) (OR=1.6; 95% C.I. 1.49–1.75) and those with at least some college education (OR=2.2; 95% C.I. 2.07–2.35) were significantly more likely to report good-to-excellent health compared to survivors with less than a 12th grade level education. Survivors with public insurance (OR=0.5; 95% C.I. 0.49–0.57) and those who were uninsured (OR=0.9; 95% C.I. 0.81–0.91) were significantly less likely to report good-to-excellent health compared to those with private insurance. Having a functional limitation (OR=0.6; 95% C.I. 0.55–0.61), trouble performing IADLs (OR=0.9; 95% C.I. 0.79–0.91), and psychological distress (OR=0.5; 95% C.I. 0.50–0.58) were all significantly inversely related to health status.

Employment Status—Black (OR=1.1; 95% C.I. 1.01–1.11) and Hispanic cancer survivors (OR=1.2; 95% C.I. 1.11–1.25) were somewhat more likely to be employed compared with white cancer survivors. Education was positively associated with current employment: survivors with a high school diploma or GED (OR=2.0; 95% C.I. 1.88–2.04) and those with at least some college education (OR=2.63; $p<0.001$) were more likely to be employed compared to survivors with less than a 12th grade level education. Survivors with public health insurance were less likely to be employed compared to those with private health insurance (OR=0.3; 95% C.I. 0.28–0.32). Persons with functional limitations (OR=0.8; 95% C.I. 0.74–0.82), IADLs (OR=0.8; 95% C.I. 0.75–0.83), and psychological distress (OR=0.9; 95% C.I. 0.93–0.99) were significantly less likely to be employed. Adults who reported good-to-excellent health had an increased likelihood of current employment (OR=2.2; 95% C.I. 2.21–2.25) compared with those who reported poor to fair health.

Cancer History—For every increase in year since diagnosis, the reported impacts on a cancer survivors' IADLs, functional limitations, psychological distress worsened significantly in terms of statistical significance, but the changes in these health indicators were not substantial ($\beta = 0.001$, $p < 0.001$; $\beta = -0.01$, $p < 0.001$; and $\beta = -0.002$, $p < 0.01$ respectively). There was no observable difference in time since diagnosis and a survivors' reported health status (OR=1.0; 95% C.I. 0.91–1.09) or employment status (OR=1.0; 95% C.I. 0.98–1.02) (Table 2).

Compared to survivors of “other” cancers, colorectal and lung cancer survivors were significantly more likely to have difficulty performing IADLs ($\beta=0.05$, $p<0.001$; and $\beta=0.17$, $p<0.001$; respectively) and to have functional limitations ($\beta=0.21$, $p<0.001$; and $\beta=0.08$, $p<0.001$; respectively), but lung cancer survivors did report more psychological distress ($\beta=0.16$, $p<0.001$). Prostate cancer survivors were significantly less likely to have difficulty performing IADLs, functional limitations, and psychological distress ($\beta = -0.02$, $p<0.01$; $\beta = -0.12$, $p<0.001$; and $\beta = -0.08$, $p<0.01$; respectively). Bladder cancer survivors were more likely to have functional limitations ($\beta=0.16$, $p < 0.05$) and breast cancer survivors were significantly less likely to report psychological distress ($\beta = -0.07$, $p < 0.001$).

Compared with survivors of other cancers, survivors with a history of lung cancer were significantly less likely to have good-to-excellent health (OR=0.8; 95% C.I. 0.72–0.84), while prostate cancer survivors were more likely to report good-to-excellent health (OR=1.1; 95% C.I. 1.06–1.18). Survivors of lung (OR=0.7; 95% C.I. 0.69–0.79), colorectal (OR=0.8; 95% C.I. 0.70–0.82) and prostate cancer (OR=0.8; 95% C.I. 0.69–0.81) were significantly less likely to be employed compared with survivors of other cancers (Table 2).

DISCUSSION

Although factors such as age, cancer site, time since diagnosis, and gender may have an independent impact on an individual cancer survivor's potential to continue to work during or post cancer diagnosis and treatment, our research suggests that educational level and private health insurance coverage may have a greater influence on employment decisions. During the study period, the mixed health insurance system in the U.S. was predominantly employment-based. Our model examining the effects of insurance on cancer survivors indicated that publicly insured survivors were significantly less likely to report good-to-excellent health or being employed compared to the privately insured. These findings support previous studies reporting that a majority of survivors elect to return, and/or continue to, work in order to have access to affordable healthcare and thus afford cancer treatment (26, 27). A greater disparity was undoubtedly diluted by access to public insurance, such as Medicaid among the older and qualified disabled cancer survivors (28).

Cancer survivors with at least some college education or a college degree were less likely to report functional limitations, trouble with performing IADLs, and psychological distress compared to those with lower education level. These findings are similar to past research reporting a positive link between higher education and lower levels of psychological distress (29) or functional limitations (30). When considering all other variables in the

model, higher educational level had a significant and positive association with both good-to-excellent health status and with employment among cancer survivors. Education may influence psychosocial and behavioral mechanisms throughout life, including the prevention of physical and mental functional disorders; in fact, higher education has been associated with engaging in preventive health measures and healthy behaviors (31). Although the model did not investigate type of job, it is very likely that higher educated survivors have access to occupations with lower physical demands and greater likelihood of accommodation in the workplace (3, 32,33), thus facilitating a higher rate of return to worker compared with survivors in less accommodating blue collar jobs.

Independently, functional limitations and psychological distress were significant predictors of health status among cancer survivors, and were strong predictors of employment in this and other research (8, 34). While simultaneously considering the other sociodemographic factors examined, time since diagnosis did not have the expected inverse relationship associated with difficulty performing IADLs, having functional limitations, or experiencing psychological distress; this may be due to the fact that there was non participation in the NHIS by those hospitalized, or very sick and who had recently died as a result of the disease.

This suggests that other sociodemographic factors may play a greater role in a survivor's limitations, overall health status, and the ability to continue working after cancer diagnosis. It is possible that many survivors return to work out of necessity, and encounter factors which make their work environment less conducive to work and recovery. Although many survivors who return to work may have a reduced workload, the stress of trying to prove they are able to perform their assigned tasks while recuperating from the disease or even undergoing treatment may be daunting (9, 35). The physical and psychological impacts on health and employment vary by cancer site. Furthermore, a combination of sociodemographic factors (e.g. education) may increase or decrease the negative associations between type of cancer (e.g. lung cancer) and reported health status or current employment for different individuals.

Our results indicate that when all other factors were considered, the associations between education, or race, and health and employment status differed between persons with and without a cancer history. It is possible that the ethnic disparities in reported health status and current employment among survivors may reflect the unequal distribution of employment benefits (such as early retirement packages and disability benefits) usually associated with certain occupations, higher education and better insurance plans. These employment benefits have been shown to be better among whites compared to other race and ethnic groups (36, 37). Despite a greater proportion of diagnoses at a later stage of cancer (38), black and Hispanic cancer survivors are as likely to remain in the workforce as their counterparts with no cancer diagnosis despite their reports of poorer health compared to whites.

Our findings provide an example of the underestimated inequalities present in the U.S. (39, 40), and highlight the need to simultaneously investigate factors that may mediate the relationships between sociodemographic factors, poor health, and employment among cancer survivors. In addition, it will be important to monitor the implementation of the

Affordable Care Act as to whether the ability to retain or gain health coverage despite having cancer as a pre-existing conditions is associated with an increase in the number of lower income Americans who can afford insurance coverage and thus return to work for reasons other than an insurance based access to care.

Additionally, this study illustrates the need for workplace interventions to facilitate cancer survivors staying in or returning to work after a cancer diagnosis and treatment. Effective interventions would reduce work days lost, increase productivity, and reduce psychosocial stresses associated with unemployment and treatment costs among cancer survivors.

Limitations

These findings should be interpreted in the context of the study's limitations. The NHIS data are cross-sectional, which precludes the differentiation between correlative associations and causal relationships when examining persons with a history of cancer. Although the NHIS survey asks persons to report a physician diagnosis of cancer, the data were self-reported and, thus, contingent on participant recall and willingness to report this diagnosis; thus, current employment and cancer diagnosis were not validated. Important clinical variables (such as stage at diagnosis or recurrences of cancer) were also not available; and type of treatment received was made available only in the 2010 NHIS cancer control module.

Nevertheless, the NHIS is representative of the entire U.S. civilian population; as such there are significant strengths to the conclusions derived from these analyses. Our analyses span 14 years of data, thus providing a large sample size and allowing for the estimation of outcomes among a variety of population subgroups. Furthermore, our findings are generalizable to the U.S. population. While we did not model all possible associations between health indicators and employment, the use of SEM allowed the simultaneous evaluation of all the relationships of the variables completely and simultaneously.

CONCLUSIONS

In summary, overall the majority of survivors return to or continue to work post cancer diagnosis. As cancer control and treatment continue to improve and more people work past the traditional retirement age, the number of cancer survivors in our rapidly aging workforce will continue to increase. Health policy analysts, oncologists, epidemiologists, employers, the U.S. Department of Labor, and insurance companies will have to work collectively on various aspects of improving access to and extent of health insurance coverage for persons diagnosed with cancer across all occupational sectors. Our findings clearly point to the need for further research on access to healthcare and disability benefits available to cancer survivors within the workplace. If working cancer survivors experience better health, improved benefits, and worksite-accommodations among those jobs/occupations that do not usually offer these services, the burden on the individual and the healthcare system would be reduced as more survivors would have the ability to return to work or to continue to work throughout their treatment.

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REFERENCES

1. Hoffman B. Cancer survivors at work: a generation of progress. *CA Cancer J Clin.* 2005; 55: 271–280. [PubMed: 16166073]
2. Horner MJ, Ries LAG, Krapcho M, Neyman N, Aminou R, Howlander N, et al. National Cancer Institute. SEER Cancer Statistics Review, 1975–2006.
3. Amir Z, Brocky J. Cancer survivorship and employment: epidemiology. *Occup Med (Lond).* 2009; 59 (6) 373–377. [PubMed: 19692522]
4. Spelten ER, Sprangers MAG, Verbeek JHAM. Factors reported to influence the return to work of cancer survivors: a literature review. *Psychooncology.* 2002; 11: 124–131. [PubMed: 11921328]
5. Short P, Vasey JJ, Tuncelli K. Employment pathways in a large cohort of adult cancer survivors. *Cancer.* 2005; 103: 1292–1301. [PubMed: 15700265]
6. Hewitt M, Rowland JH, Yancik R. Cancer survivors in the United States: age, health, and disability. *J Gerontol A Biol Sci Med Sci.* 2003; 58: 82–91. [PubMed: 12560417]
7. Bouknight RR, Bradley CJ, Luo Z. Correlates of Return to Work for Breast Cancer Survivors. *Journal of Clinical Oncology.* 2006; 24 (3) 345–353. [PubMed: 16421415]
8. Rowland JH, Yancik R. Cancer survivorship: the interface of aging, comorbidity, and quality care. *J Natl Cancer Inst.* 2006; 98: 504–505. [PubMed: 16622113]
9. Dellapasqua S, Colleoni M, Goldhirsch A. Focusing on physical function limitations in elderly women surviving cancer: any opportunity for improvement? *Nature Clinical Practice Oncology.* 2006; 3: 598–599.
10. Sweeney C, Schmitz KH, Lazovich D, Virnig BA, Wallace RB, Folsom AR. Functional Limitations in Elderly Female Cancer Survivors. *J Natl Cancer Inst.* 2006; 98 (8) 521–529. [PubMed: 16622121]
11. Sehl ME, Satariano WA, Ragland DA, Reuben DB, Naeim A. Attribution of functional limitation to cancer decreases in the year following breast cancer diagnosis in older patients. *Crit Rev Oncol Hematol.* 2009; 71 (1) 62–69. [PubMed: 19081266]
12. Botman SL, Moore TF, Moriarity CL, Parsons VL. Design and estimation for the National Health Interview Survey, 1995–2004. National Center for Health Statistics. *Vital Health Stat.* 2000; 2 (130)
13. National Health Interview Survey (NHIS). Division of Health Interview Statistics, National Center for Health Statistics. Hyattsville, Maryland: Centers for Disease Control and Prevention. U.S. Department of Health and Human Services; Survey Description documents. http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm [Accessed July 19, 2012]
14. American Cancer Society. Atlanta: American Cancer Society; 2012. *Cancer Facts & Figures 2012.*
15. Verbrugge LM, Jette AM. The disablement process. *Social Science and Medicine.* 1994; 38: 16–14.
16. National Cancer Institute. [Accessed June 6, 2011] Dictionary of Cancer terms. <http://www.cancer.gov/dictionary?cdrid=430402>
17. Kessler RC, Andrews G, Mroczek D, Ustun TB, Wittchen HU. The World Health Organization Composite International Diagnostic Interview Short-Form (CIDI-SF). *Int J Methods Psychiatr Res.* 1998; 7: 171–185.
18. Cohen RA. Using the National Health Interview Survey to monitor health insurance and access to care. Proceedings from the Annual meeting of the American Statistical Association: Section on Health Policy statistics. *JSM.* 2009. 108–118.
19. SAS Institute. Survey Data Analysis. Accessed November 10, 2014

20. Muthén, B, Muthén, L. Mplus User's Guide. Sixth Edition. Los Angeles, CA: Muthén & Muthén; 1998–2010.
21. Parsons VL, Moriarity CL, Jonas K, Moore TF, Davids KE, Tompkins L. Design and estimation for the National Health Interview Survey, 2006–2015. National Center for Health Statistics. Vital Health Stat. 2014; 2 (165)
22. Kline, RB. Principles and Practice of Structural Equation Modeling. 3rd ed.. New York: Guilford Press; 2010.
23. Kenny DA. Assessing model fit. Accessed September 23, 2010
24. Bentler PM, Bonnet DC. Significance Tests and Goodness of Fit in the Analysis of Covariance Structures. Psychological Bulletin. 1980; 88 (3) 588–606.
25. Jöreskog, K, Sörbom, D. LISREL 8: Structural Equation Modeling with the SIMPLIS Command Language. Chicago, IL: Scientific Software International Inc.; 1993.
26. Bradley CJ, Neumark D, Luo Z, Bednarek HL. Employment-contingent health insurance, illness, and labor supply of women: evidence from married women with breast cancer. Health Econ. 2007; 16: 19–37. [PubMed: 16960850]
27. Finkelstein EA, Tangka FK, Trogdon JG, Sabatino SA, Richardson LC. The personal financial burden of cancer for the working age population. Am J Manag Care. 2011; 15: 801–806.
28. Nekhlyudov L, Madden J, Johnson Graves A, Zhang F, Soumerai SB, Ross-Degnan D. Cost-related medication nonadherence and cost-saving strategies used by elderly Medicare cancer survivors. J Cancer Surviv. 2011; 5 (4) 395–404. [PubMed: 21800053]
29. Brännlund A, Hammarström A. Higher education and psychological distress: a 27-year prospective cohort study in Sweden. Scand J Public Health. 2014; Mar; 42 (2) 155–162. [PubMed: 24265167]
30. Zimmer Z, House JS. Education, income, and functional limitation transitions among American adults: contrasting onset and progression. Int J Epidemiol. 2003; 32: 1089–1097. [PubMed: 14681281]
31. Fletcher JM, Frisvold DE. Higher Education and Health Investments: Does More Schooling Affect Preventive Health Care Use? J. Hum. Cap. 2009; Summer; 3 (2) 144–176. [PubMed: 22368727]
32. Center for economic and policy research. Hard work? Patterns in Physically demanding labor among older workers. Accessed October 26, 2014
33. Bureau of Labor Statistics. [Accessed October 26, 2014] U.S. Department of Labor, The Economics Daily, White-collar workers more likely to receive disability benefits in small establishments. <http://www.bls.gov/opub/ed/1999/May/wk3/art04.htm>
34. Clarke TC, Soler-Vila H, Lee DJ, Arheart KL, Ocasio MA, LeBlanc WG, Fleming LE. Working with cancer: Health and disability disparities among employed cancer survivors in the U.S. Prev Med. 2011; 53 (4–5) 331–334. [PubMed: 21884724]
35. Pransky G. Work and Cancer Survivors. J Occup Environ Med. 2010; 52 (1) 111.
36. U. S. Bureau of Labor Statistics. Labor force characteristics by race and ethnicity, 2008. Washington, DC: U.S. Department of Labor; 2009. <http://www.bls.gov/cps/cpsrace2009.pdf> [Accessed September 23, 2010]
37. Toldson IA, Snitman A. Education Parity and Economic Disparities: Correcting education attainment discrepancies among Black people in the United States. Journal of Negro Education. 2010. Accessed September 10, 2011
38. Soler-Vila H, Kasl SV, Jones BA. Prognostic significance of psychosocial factors in African-American and white breast cancer patients: a population-based study. Cancer. 2003; 98 (6) 1299–1308. [PubMed: 12973855]
39. Wilson, WJ. The Truly Disadvantaged: The inner city, the underclass, and public policy. Chicago: University of Chicago Press; 1987.
40. Wilson, WJ. Social Theory and the Concept 'Underclass'. In: Grusky, DB, Kanbur, R, editors. Poverty and Inequality. Stanford: Stanford University Press; 2006.

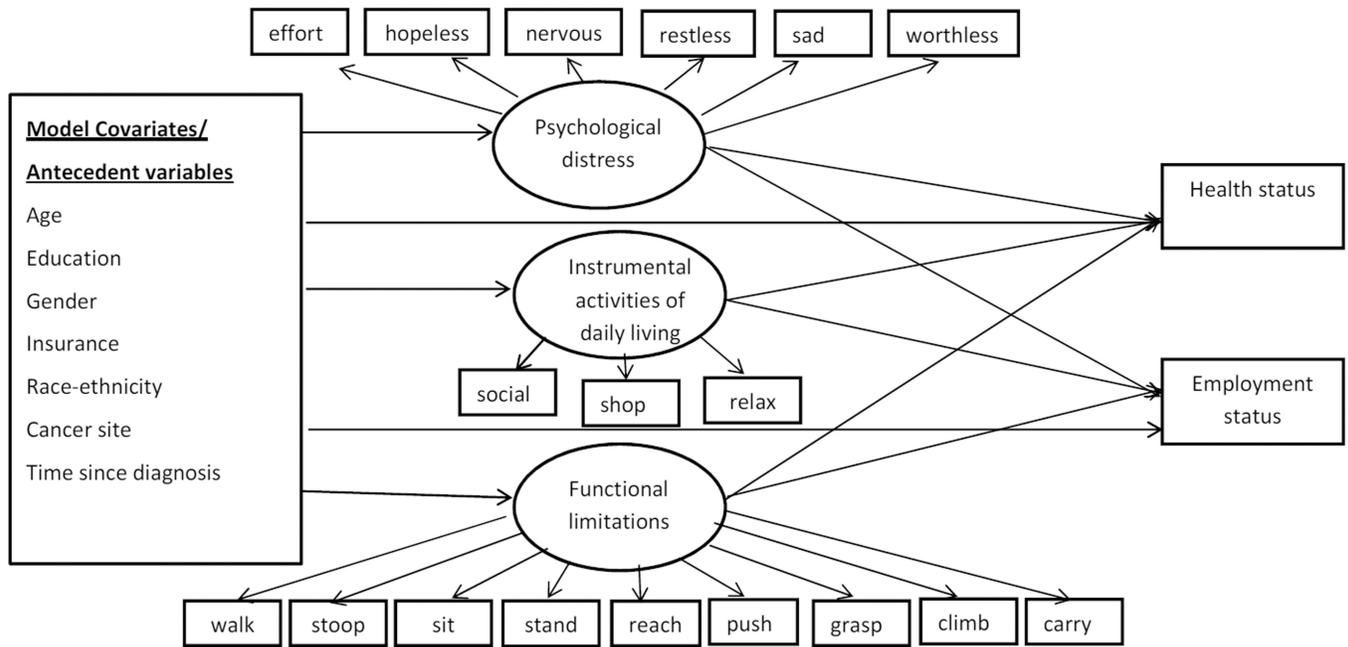


Figure 1. Measurement model for structural equation modeling (SEM) for adult cancer survivors: National Health Interview Survey 1997–2012.

Table 1

A comparison of Employment and Socio-demographic characteristics of persons in the U.S. with and without a previous cancer diagnosis: National Health Interview Survey, 1997–2012

	Persons with cancer diagnosis n=24,810				Persons without cancer n=382,837			
	Not employed ^a (n=11,037)		Employed ^a (n=13,773)		Employed ^a (n=283,7)		Not employed ^a (n=99,070)	
Age								
18–39	3,086	22.4% (20.90–23.90)	947	8.6% (7.11–10.09)	147,984	52.2% (50.18–54.22)	35,499	35.8% (33.79–37.81)
40–64	6,293	45.7% (44.98–46.42)	2,721	24.7% (22.31–27.09)	110,865	39.0% (37.02–40.98)	28,237	28.5% (26.57–30.43)
65	4,394	31.9% (31.27–32.53)	7,369	66.7% (64.15–69.25)	24,918	8.8% (6.93–10.67)	35,334	35.7% (33.48–37.92)
Gender								
Male	5,115	37.2% (34.41–39.99)	3,801	34.4% (32.53–36.27)	136,429	48.1% (45.64–50.56)	40,595	41.0% (38.63–43.37)
Female	8,658	62.8% (60.24–65.36)	7,236	65.6% (63.58–67.62)	147,338	51.9% (48.71–55.09)	58,475	59.0% (56.56–61.44)
Race/ethnicity								
Hispanic	1,139	8.3% (7.36–9.24)	821	7.4% (6.12–8.68)	52,248	18.4% (15.98–20.82)	18,853	19.0% (17.07–20.93)
Non-Hispanic White	11,046	80.1% (76.98–83.22)	8,780	79.6% (74.84–84.36)	177,879	62.7% (59.47–65.93)	57,908	58.5% (56.36–60.64)
Non-Hispanic Black	1,272	9.4 % (9.24–9.56)	1,156	10.5% (9.48–11.52)	41,127	14.5% (11.27–17.73)	17,005	17.1% (15.23–18.97)
Non-Hispanic Other ^b	316	2.2% (2.15–2.25)	280	2.5% (2.37–2.63)	12,513	4.4% (3.41–5.39)	5,304	5.4% (4.69–6.11)
Education								
<High school	3,680	29.2% (24.90–33.50)	3,075	29.4% (26.17–32.63)	77,367	34.0% (32.01–35.99)	30,814	37.4% (35.59–39.21)
High school/GED	3,437	27.3% (24.88–29.72)	3,344	31.9% (29.87–33.93)	51,151	22.5% (20.42–24.58)	23,351	28.4% (26.53–30.27)
Some college/higher	5,476	43.5% (40.26–46.74)	4,056	38.7% (36.67–40.73)	99,024	43.5% (41.08–45.92)	28,109	34.2% (32.24–36.16)
Health insurance status								
Private	9,323	70.0% (65.99–74.01)	1,754	16.2% (14.23–18.17)	208,918	75.9% (72.65–79.15)	32,774	34.0% (32.25–35.75)
Public	2,490	18.7% (18.02–19.38)	8,488	78.4% (74.33–82.47)	23,947	8.7% (6.82–10.58)	49,354	51.2% (49.16–53.24)
Uninsured	1,492	11.2% (8.41–13.99)	584	5.4% (4.08–6.72)	42,114	15.3% (13.24–17.36)	14,266	14.8% (14.32–15.28)

	Persons with cancer diagnosis n=24,810				Persons without cancer n=382,837			
	Not employed ^a (n=11,037)		Employed ^a (n=13,773)		Employed ^a (n=283,7)		Not employed ^a (n=99,070)	
Difficulty with instrumental activities of daily living								
Yes	399	2.9% (2.17–3.63)	671	6.1% (5.20–7.00)	2,783	1.0% (0.96–1.04)	3,599	3.6% (3.58–3.62)
No	13,374	97.1% (93.36–100.84)	10,366	93.9% (90.00–97.80)	280,984	99.0% (95.76–102.2)	95,471	96.4% (93.92–98.88)
2 Functional limitations								
Yes	4,959	36.0% (32.78–39.22)	6,799	61.6% (58.39–64.81)	11,635	4.1% (3.58–4.62)	26,055	26.3% (25.01–27.59)
No	8,815	64.0% (60.63–67.37)	4,238	38.4% (35.90–40.90)	272,132	95.9% (92.06–99.74)	73,015	73.7% (71.16–76.24)
Psychological distress								
Yes	1,939	14.1% (12.30–15.90)	1,931	17.5% (16.23–18.77)	24,809	8.7% (7.75–9.65)	14,207	14.3% (12.44–16.16)
No	11,874	85.9% (82.74–89.06)	9,106	82.5% (78.69–86.31)	258,958	91.3% (87.85–94.75)	84,863	85.7% (83.22–88.18)
Health Status								
Good-excellent	11,362	82.5% (79.62–85.38)	7,285	66.1% (63.59–68.61)	265,173	93.5% (90.20–96.80)	78,635	79.3% (77.28–81.32)
Poor-fair	2,401	17.5% (15.58–19.42)	3,734	33.9% (31.87–35.93)	18,479	6.5% (6.37–6.63)	20,366	20.7% (19.63–21.77)
Time since diagnosis of cancer								
0–5	4,759	42.4% (40.30–44.50)	7,627	39.0% (35.75–42.25)		--		--
6–10	2,362	21.2% (19.10–23.30)	3,803	20.4% (18.00–22.80)		--		--
>10	4,076	36.4% (33.52–39.28)	7,976	40.6% (38.00–43.20)		--		--
Cancer site								
Bladder	227	2.3% (1.74–2.86)	546	2.9% (2.85–2.95)		--		--
Breast	2,189	18.3% (15.31–21.29)	4,386	20.9% (18.42–23.38)		--		--
Colorectal	605	5.4% (3.47–7.33)	1,885	9.4% (8.23–10.57)		--		--
Lung	241	2.1% (0.78–3.42)	881	4.5% (4.04–4.96)		--		--
Prostate	980	9.7% (7.79–11.61)	2,904	16.2% (14.35–18.05)		--		--
Other cancers ^c	6,955	62.2% (57.54–66.86)	8,804	46.1% (43.56–48.64)		--		--

^aUnweighted frequencies, column percentage (95% confidence interval)

^bNon-Hispanic other is a very broad and varied category of persons from a variety of races and ethnicities, including persons of multiple races. This group may be more diverse than the other race-ethnicity groups.

^cAll other cancer sites not listed, excluding non-melanoma skin cancer.

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Table 2

Estimates of the effects of demographic factors, and functioning and limitation variables on Health status and Employment among U.S. adult cancer survivors: National Health Interview Survey, 1997–2012 (n=24,810).

	Instrumental activities of daily living		Functional limitation		Psychological distress		Health status		Employed status	
	β (95% C.I.)		β (95% C.I.)		β (95% C.I.)		Odds ratios		Odds ratios	
Demographics										
Age	<0.01 (0.002–0.002)	***	0.02 (0.020–0.020)	***	-0.01 (-0.010–0.010)	***	1.0 (0.91–1.13)	***	<1.0 (0.94–0.96)	***
Male (referent)	1.00		1.00		1.00					
Female	0.03 (0.027–0.029)	***	0.25 (0.240–0.260)	***	0.11 (0.104–0.116)	***	1.3 (1.22–1.28)	***	<1.0 (0.88–1.02)	***
Race-Ethnicity										
Non-Hispanic white (referent)	1.00		1.00		1.00					
Non-Hispanic black	0.08 (0.079–0.081)	***	0.37 (0.360–0.380)	***	0.07 (0.057–0.077)	***	0.6 (0.62–0.66)	***	1.1 (1.01–1.11)	**
Hispanic	0.05 (0.035–0.055)	***	0.18 (0.166–0.194)	***	0.12 (0.112–0.128)	***	0.9 (0.88–1.02)	***	1.2 (1.11–1.25)	*
Non-Hispanic other/multi-race	0.04 (0.032–0.044)	*	0.12 (0.106–0.134)	*	0.09 (0.077–0.097)	*	0.8 (0.71–0.80)	*	0.9 (0.83–0.93)	*
Education										
Less than high school (referent)	1.00		1.00		1.00					
High school/ GED	-0.10 (-0.102–0.102)	***	-0.45 (-0.464–0.436)	***	-0.22 (-0.226–0.214)	***	1.6 (1.49–1.75)	***	2.0 (1.88–2.04)	***
Some college/College degree	-0.16 (-0.157–0.155)	***	0.72 (-0.739–0.701)	***	-0.34 (-0.340–0.340)	***	2.2 (2.07–2.35)	***	2.6 (2.56–2.70)	***
Health Insurance										
Private insurance (referent)	1.00		1.00		1.00					
Public insurance	0.05 (0.042–0.058)	***	0.24 (0.222–0.258)	***	0.19 (0.187–0.191)	***	0.5 (0.49–0.57)	***	0.3 (0.28–0.32)	***
Uninsured	0.003 (0.003–0.003)	***	0.002 0.001–0.003	***	0.002 (0.002–0.002)	***	0.9 (0.81–0.91)	**	1.0 (0.99–1.03)	
Cancer History										
Time since diagnosis	<0.01 (0.000–0.002)	***	0.01 (0.003–0.011)	***	<0.01 (-0.004–0.008)	***	1.0 (0.91–1.09)	***	1.0 (0.98–1.02)	
Other cancers (referent)	1.00		1.00		1.00					
Bladder cancer	0.02 (0.024–0.024)		0.16 (0.143–0.173)	*	<0.01 (0.001–0.008)		1.0 (0.87–1.03)		1.0 (0.85–1.15)	
Breast cancer	-0.01 (-0.009–0.010)		0.02 (0.009–0.037)		-0.07 (-0.082–0.058)	***	1.0 (0.89–1.11)		1.0 (0.82–1.24)	
Colorectal cancer	0.05 (0.042–0.058)	***	0.21 (0.196–0.232)	***	-0.01 (-0.014–0.006)	***	1.0 (0.89–1.09)		0.8 (0.70–0.82)	**
Lung cancer	0.17 (0.154–0.186)	***	0.08 (0.077–0.081)	***	0.16 (0.159–0.161)	***	0.8 (0.72–0.84)	**	0.7 (0.69–0.79)	**
Prostate cancer	-0.02 (-0.042–0.002)	**	-0.12 (-0.128–0.112)	***	-0.08 (-0.122–0.118)	**	1.1 (1.06–1.18)	*	0.8 (0.69–0.81)	***

Difficulty with functioning and limitations

	Instrumental activities of daily living	Functional limitation	Psychological distress	Health status	Employed status
Instrumental activities of daily living				0.9 (0.79–0.91)	0.8 (0.75–0.83) ***
Functional limitation				0.6 (0.55–0.61)	0.8 (0.74–0.82) ***
Psychological distress				0.5 (0.50–0.58)	0.9 (0.93–0.99) ***
Health status					2.2 (2.21–2.25) ***

* p < 0.05;

** p < 0.01,

*** p < 0.001

| 95% confidence intervals presented for beta values and odds ratios.