



Published in final edited form as:

Prev Med. 2019 June ; 123: 152–159. doi:10.1016/j.ypmed.2019.03.024.

Preventive care service use among cancer survivors with serious psychological distress: An analysis of the medical expenditure panel survey data

Sun Hee Rim^{a,*}, K. Robin Yabroff^b, Sabitha Dasari^c, Xuesong Han^b, Kristin Litzelman^d, and Donatus U. Ekwueme^a

^aDivision of Cancer Prevention and Control, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, GA, United States of America

^bSurveillance and Health Services Research Program, American Cancer Society, Atlanta, GA, United States of America

^cCyberdata Technologies, Inc., Atlanta, GA, United States of America

^dUniversity of Wisconsin-Madison, Madison, WI, United States of America

Abstract

Serious psychological distress (SPD) can adversely impact health and quality of life after cancer. The purpose of this study is to examine the association between SPD and the receipt of preventive care services and cancer screening among survivors and adults without a cancer history. A total of 12,564 cancer survivors and 160,023 adults without a cancer history as comparison group were identified from the population-based Medical Expenditure Panel Survey (2008–2015). SPD was assessed using the 6-item Kessler Psychological Distress Scale. We examined use of preventive care and cancer screening services in cancer survivors and comparison adults with/without SPD. Multivariable logistic regression models were conducted for each outcome: preventive service (i.e. blood pressure, cholesterol, influenza vaccination, routine and dental check-up) or cancer screening (i.e. mammography, Papanicolaou test, colorectal cancer screening) adjusting for demographic, comorbidity, usual source of care covariates. Adjusted odds ratios and 95% confidence intervals were calculated. Prevalence of SPD was 9.8% in cancer survivors compared to 4.6% in comparison adults. Survivors with SPD were more frequent utilizers of medical care, reporting 10 or more visits to the doctor's office in the past 12 months (29.3% vs. 14.1% without SPD). Having SPD was associated with lower odds of being up-to-date with preventive service use and cancer screening among age- and gender-eligible individuals. The magnitude of the effect was greater in adults' age ≥ 65 years. Better coordination of care and patient-physician discussions are likely needed to improve delivery of recommended preventive services for persons with SPD.

*Corresponding author at: Division of Cancer Prevention and Control, Centers for Disease Control and Prevention, 4770 Buford Highway, NE, MS F-76, Atlanta, GA 30341, United States of America. srim@cdc.gov (S.H. Rim).

Conflict of interest disclosures

None.

Keywords

Cancer survivor; MEPS; Serious psychological distress; Kessler Psychological Distress Scale

1. Introduction

For the estimated 15.5 million cancer survivors living in the United States today, survivorship can mean facing significant distress both during and long after diagnosis and treatment (Miller et al., 2016). Distress, as defined by the National Comprehensive Cancer Network (NCCN), is “a multifactorial unpleasant experience of a psychological (i.e. cognitive, behavioral, emotional), social, spiritual, and/or physical nature that may interfere with the ability to cope effectively with cancer, its physical symptoms, and its treatment” (NCCN Distress Management Version 2, 2017). Chronic elevated distress can have a disabling and detrimental effect on physical functioning, health (increasing the risk of cardiovascular disease, hypertension, and diabetes (Nyberg et al., 2014; Backe et al., 2012; Blanc-Lapierre et al., 2017)), and quality of life after cancer (NCCN Distress Management Version 2, 2017; Ng et al., 2015; Pinquart and Duberstein, 2010).

Serious psychological distress (SPD)—as a broad construct of depression, anxiety, panic, and existential fears—are common experiences among cancer survivors, who more frequently self-report medication use for anxiety and depression than persons without a history of cancer (Hawkins et al., 2017). A study by Han et al. (2015) estimated the prevalence of SPD in cancer survivors was 8.2% overall but higher in specific demographic subgroups (Han et al., 2015). Maintaining access to a usual source of care and ongoing preventive care after a cancer diagnosis is important to monitor after-effects of diagnosis/treatment as survivors may be at an increased risk for recurrence or developing new cancers and other health conditions. Prior studies have found SPD among cancer survivors to be associated with greater overall health care use and health care costs (Han et al., 2015). Although persons with SPD may be heavier users of the health care system (Han et al., 2015), the extent to which preventive care services are received during these office visits is unclear. Given that use of preventive services are heavily influenced by having health insurance or a usual source of health care and also age (Yabroff et al., 2013), in this report, we build on prior research (Han et al., 2015) to examine the association between SPD and the receipt of preventive care services, including cancer screening, by age and insurance status (Yabroff et al., 2013).

2. Methods

2.1. Data source

Data were obtained from the nationally representative Medical Expenditure Panel Survey (MEPS) Household Component survey (2008–2015) (Medical Expenditure Panel Survey, n.d.), which collects information on demographic characteristics, health status, insurance, and health care use from civilian, noninstitutionalized respondents aged 18 years. Annual response rates were between 47.7% and 59.3% during the analyzed survey years (Medical Expenditure Panel Survey, n.d.).

2.2. Sample selection

Cancer survivors were identified from responses to the question “Has a doctor or health provider ever told you that you have a cancer or malignancy of any kind?” We excluded respondents with non-melanoma skin cancer. Individuals with missing SPD information (~13.4%) were also excluded, yielding a sample of 12,564 cancer survivors and 160,023 without a cancer history. Age at cancer diagnosis was not publicly available in the dataset after 2012. Thus, years since cancer diagnosis, calculated by subtracting the reported age at cancer diagnosis from the age at the time of the survey, could not be measure after 2012.

SPD was determined by the 6-question scale developed by Kessler et al. to measure psychosocial distress (Kessler et al., 2002). Questions included: During the last 30 days, how often did you feel 1) nervous, 2) hopeless, 3) restless or fidgety, 4) so sad that nothing could cheer you up, 5) that everything was an effort, 6) worthless? Response options were: none of the time, a little, some, most, and all of the time, scored on a scale of 0 to 4, respectively. Scores were summed and an average score of 13 was identified as having SPD (Han et al., 2015). This measure has been validated in other populations (Kessler et al., 2010) and had demonstrated good internal consistency and reliability (Han et al., 2015; Kessler et al., 2002, 2003).

Cancer treatment in the past year was defined as having received chemotherapy or radiotherapy or a surgical procedure for a cancer condition in any setting (as available in outpatient visit and office-based medical provider visit files) or having a prescription for an anti-neoplastic medication in the Prescribed Medicines Files.

2.3. Outcome measures

Outcome measures included several variables indicative of receipt of preventive care services or as recommended by the U.S. Preventive Services Task Force (USPSTF) or Advisory Committee on Immunization Practices. We examined self-reported responses to having had the following services: blood pressure check within past 2 years; cholesterol check within past 2 years; influenza vaccination in the last year; routine check-up in the last year; and dental check-up at least once a year. Receipt of cancer screening was also examined among age- and gender-eligible individuals: mammogram within 2 years among women aged 40 years; Papanicolau (Pap) test within 3 years among women aged 21–65 years; and colorectal cancer (CRC) screening (fecal occult blood test [FOBT] within 1 year, sigmoidoscopy within 5 years, or colonoscopy within 10 years) among adults aged 50–75 years.

2.4. Statistical analysis

Descriptive statistics were calculated for sociodemographic characteristics (age, sex, race/ethnicity, educational attainment, marital status) and health status. Data were stratified by SPD status among cancer survivors and adults without a cancer history.

According to the Andersen and Aday’s Behavioral Model of Health Service Use (Andersen, 1995), there are factors that *predispose* individuals to access or seek care (i.e. age, sex, race/ethnicity); *enabling* factors such as marital status, educational attainment, health insurance,

and having a usual source of care; and lastly, *need* factors based on cancer status, recency of cancer treatment, and presence of comorbidities. We used this model to guide selection of covariates.

Multivariable logistic regression models were conducted for each outcome, adjusting for age, sex, race/ethnicity, marital status, educational attainment, health insurance, treatment in the past year, having a usual source of care, and number of comorbidities. For specific preventive services (blood pressure, cholesterol check, and influenza vaccination), models additionally adjusted for number of doctor's visits within the past year (0, 1, 2+). Given the age-related differences in insurance coverage, comorbidity, and use of the health care system (Yabroff et al., 2013), data further stratified by age and insurance were examined in detail (Appendix).

Proportions were age-adjusted to the 2000 U.S. census population using the direct method for age groups 18–34, 35–44, 45–54, 55–64, and 65 (Klein and Schoenborn, 2001). Adjusted odds ratios and 95% confidence intervals are reported in the tables. All analyses were conducted using SAS v 9.3 (Cary, NC) and SUDAAN v.11 to account for the MEPS complex survey design.

3. Results

3.1. Sample characteristics

Cancer survivors were older, more frequently insured, non-Hispanic White, and likely to have greater number of comorbidities than adults without a cancer history. Cancer survivors with SPD, in contrast, were generally younger and more commonly reported having only public insurance (49.6% vs 29.0%) or no insurance (9.1% vs 4.2%) compared to non-SPD survivors. SPD – regardless of cancer history – was more prevalent among women, those who were unmarried (never married/ widowed/divorced/separated), heavier weight (greater BMI), and physically inactive. Adults with SPD more often had lower educational attainment, lower income (100–200% of the federal poverty level or below), and were unemployed. Adults with SPD more often had 3 comorbidities and more often were smokers (Table 1). Most survivors were long-term survivors; about 1 in 8 cancer survivors with SPD (~13.9%) had treatment for cancer in the past year.

3.2. Cancer survivors with SPD and access to care and use of preventive care services

Cancer survivors were more likely to have SPD than adults without a cancer history (9.8% vs 4.6%), after adjusting for age differences (Table 2). Access to a usual source of care was highest among survivors without SPD (82.3%), followed by survivors with SPD (81.0%) and adults without a cancer history (73.9% no SPD; 76.4% with SPD). Survivors with SPD, compared to their counterparts without SPD, were more frequent utilizers of medical care, reporting 10 or more visits to the doctor's office in the past 12 months (29.3% vs 14.1%). Adults without a cancer history with SPD similarly were more likely to frequent the doctor's office in the past 12 months than those without a cancer history or SPD. Adults with and without a cancer history with SPD were generally less up-to-date with preventive care services compared to non-SPD counterparts.

Similarly, in analyses adjusting for covariates, having SPD – regardless of cancer history – was associated with lower odds of being up-to-date with preventive service use, including cancer screening (Table 3). The magnitude of the effect was greater in adults age ≥ 65 years, among whom persons with SPD were much less likely than those without SPD to get screened for blood pressure and cholesterol in the last 2 years; influenza vaccination in the last year; have a routine exam in the past year; and appropriate breast and CRC screening (Table 3).

3.3. Cancer survivors with and without SPD by age and health insurance

Cancer survivors aged 18–64 years with SPD, compared to their counterparts without SPD, were more often uninsured (19.4% vs 11.8%) or had only public insurance (45.2% vs. 16.2%) (Fig. 1). Access to care and preventive service varied by health insurance type for survivors with and without SPD in this younger age group. For example, survivors with SPD and private insurance more frequently reported being up-to-date with preventive services such as blood pressure and cholesterol check and a routine check-up in the last year compared to survivors without SPD, while less frequently reported being up-to-date with flu vaccination, dental check-up, and cancer screening services, though most of these differences were not statistically significant. Those with public insurance also followed a similar pattern (Appendix).

Among survivors aged ≥ 65 years, persons with SPD more frequently had Medicare only or Medicare and public insurance compared to those without SPD (39.7% vs 34.8% and 23.8% vs 7.6%, respectively; Fig. 1). Preventive service use was greatest for those with Medicare and supplemental private insurance, regardless of SPD status, compared to those with Medicare only or Medicare and public insurance. However, older survivors with SPD were less often up-to-date with preventive services and cancer screening than their non-SPD counterparts, regardless of insurance type (Appendix).

4. Discussion

Consistent with prior studies (Han et al., 2015), our analysis showed that the prevalence of SPD was greater among cancer survivors than the general population. Although persons with SPD (particularly those with a cancer history) mostly reported having access to a usual source of care and were more likely to be heavy users of health care per prior studies (Han et al., 2015; Pratt et al., 2007), our findings suggest there may be gaps in the type of services rendered during the encounters with the health care system. Persons with SPD, irrespective of a personal cancer history, were less likely to be up-to-date with preventive care and cancer screenings. Although this effect was more prominently noted in persons' ≥ 65 years, a nontrivial proportion of cancer survivors with SPD aged 18–64 with private or public insurance were also not up-to-date on cancer screenings. Our findings highlight opportunities in cancer patient care to identify the need for and offer preventive services to cancer survivors and specifically individuals who might be experiencing SPD. Further efforts to understand the effects of implementing effective systems-based and patient-centered interventions (such as electronic patient reminder systems and patient-oriented individual discussions, as clinically appropriate) to improve receipt of recommended

preventive services, will be important for improving outcomes for all adults and those with SPD.

4.1. Addressing preventive care and cancer screening

The goal of survivorship care is to enable survivors to live longer and healthier lives, but there are multi-level challenges to achieving this goal (Buchanan et al., 2015a). Cancer survivors have complex health concerns that include monitoring treatment-related side effects, evaluating existing or treatment-induced chronic conditions or neurocognition, surveillance for new primary cancers, and addressing psychosocial/emotional needs and general health/well-being (Hewitt et al., 2006; Buchanan et al., 2015b). In our survey sample, more than two-thirds of survivors had 2 comorbidities and adults with SPD often had 3 comorbidities with different profiles of comorbid conditions. Similar analyses have shown individuals with SPD more likely to have chronic obstructive pulmonary disease, heart disease, and diabetes compared to adults without SPD (Weissman et al., 2015). Although a cancer survivor may continue to see a primary care provider (Pollack et al., 2009) and spend about 25 min on average with an oncologist (Guy and Richardson, 2012) during the clinical encounter, given the greater number of comorbidities (Ekwueme et al., 2014) and battery of concerns that survivors face, preventive care concerns and behavioral health or intensive counseling-type activities may be time-prohibitive or overlooked. Prior research has demonstrated that few cancer survivors have discussions with any care providers about follow-up care, health behaviors (diet, exercise, quitting smoking), and emotional or social needs (Chawla et al., 2016). The complexity of their concerns could interfere with conversations that typically or should happen in follow-up care and wellness visits such as those about cancer screening services, immunizations, tobacco cessation, physical activity and other wellness services.

There is a great deal of heterogeneity in health trajectory (Eckstrom et al., 2013) by age and within age groups (ages 18–64 and 65 years). Given multimorbidities, the priority of preventive care concerns during an office visit may differ for younger vs older adults and those with SPD vs without SPD; and the indication for appropriate care is likely to vary based on the individual's specific condition. For example, while the general assumption is that adults are likely to benefit from prevention and screening, the mortality benefits of screening an older adult may not always outweigh the potential harms of the test itself (Eckstrom et al., 2013). Additionally, younger and older adults may experience SPD differently due to distinctive life circumstances, social relationships, and other influencing factors (Holt-Lunstad et al., 2015). Lastly, differences exist in insurance coverage, access to care, and healthcare utilization between persons aged 18–64 vs. 65 (Yabroff et al., 2013).

It is important to note that while use of clinical preventive services may differ because of age, it should not be offered solely based on age. Not all 65-year-old or 70-year-old adults will deal with the same morbidity burden (Cho et al., 2013), functional status and life expectancy. Earlier analyses of a prospective cohort of healthy men (Yates et al., 2008) showed that healthy, 70-year-old men had a higher probability of living to age 90 (by not smoking, not having obesity, diabetes, and hypertension, and being active) than less healthy 70-year-old men (Yates et al., 2008). A 2017 updated USPSTF review also found that

behavioral counseling is effective at improving adiposity/body mass index, blood pressure, and lipid levels for all ages (Patnode et al., 2017). Opportunity exists for more vigilance in following-up with adults and survivors that go beyond current efforts, distribution of survivorship care plans and/or referrals to appropriate and recommended services (Cancer Program Standards 2012: Ensuring Patient-Centered Care, n.d.). Patient-centered discussion and individualized attention within primary or specialized care settings will likely be beneficial.

For long-term cancer survivors, continued medical surveillance of screenable cancers are important because they are at elevated risk of second cancers (Berkowitz et al., 2011; Murphy et al., 2018). A recent study using cancer registry data found that about 25% of older (≥ 65 years) and 11% of younger cancer survivors had a prior history of cancer (Murphy et al., 2018), with most prior cancers unrelated to the second diagnosis. While the role of access to care and insurance is important to being up-to-date with preventive care and cancer screenings, our adjusted analyses showed that cancer survivors with SPD, regardless of age group, were less likely to be up-to-date on cancer screenings compared to their non-SPD counterparts with the same insurance type. This is notable given that many cancers share etiologic pathways and environmental conditions that can influence the pathobiology of disease; for example, obesity is a risk factor for thirteen different cancers and similarly, human papilloma virus and tobacco are associated with several cancers (Murphy et al., 2018; Steele et al., 2017).

4.2. Addressing SPD

In our analysis, adults with SPD visited doctors more frequently. While our data do not allow us to examine the reasons for the healthcare visits and content of patient-provider discussions, the greater numbers of healthcare visits observed in this subgroup could be a symptom of the SPD. For example, adults may somaticize depressive symptoms and seek clinical care for experiencing non-specific concerns without realizing the possibility of having clinical depression (Bevilacqua et al., 2018). Other studies of adults with SPD have similarly found distress as a motivating factor for seeking healthcare (Weissman et al., 2016).

Our cross-sectional study does not allow for causal inferences. However, SPD, stress, anxiety, and depression are arguably important to monitor given significant associations with inflammation and several metabolic diseases (Cuneo et al., 2017; Davis et al., 2018; Nagaraja et al., 2016). Heart disease and diabetes have been likened to post-traumatic stress disorder in cancer patients (Chan et al., 2018). There is mounting evidence of “social isolation” and depression (potentially characteristic in persons with SPD) as predictors of mortality similar to that of well-documented clinical factors (Pantell et al., 2013). Though the International Agency for Research on Cancer (Straif et al., n.d.) notes that there is still some work to be done specifically on the role of stress in disease onset or progression, the association between psychological status and physical health in cancer patients is a priority issue and one of continued interest for cancer control (Lengacher et al., 2014).

To address these concerns for survivors and adults without a cancer history, the clinical and public health community will need to better distinguish the underlying cause of distress, as

the appropriate intervention to alleviate SPD may differ by cause. For example, factors associated with cost of care may create anxiety and distress (Ell et al., 2008; Shankaran et al., 2018; Yabroff et al., 2016). In such cases, pilot interventions like the Oncology Financial Navigation Program (Shankaran et al., 2018), provides financial counseling at the onset of cancer diagnosis and has shown promise in easing anxiety. For SPD stemming from depression, loneliness or lack of social support, intervention programs such as Befriending (Siette et al., 2017) (which help to develop peer supportive relationships) or LISTEN (Theeke and Mallow, 2015) (focusing on concepts of cognitive behavioral therapy), though still under evaluation, have potential to improve health and minimize negative sequelae of SPD. Additionally, we need to understand reasons patients are not receiving preventive care services. For example, are patients substituting specialty care or condition-centric care for primary preventive care? The patient narrative on these issues is important for closing gaps in the delivery of clinical preventive care.

Our study has several limitations. First, our analysis relied on self-reported data and our findings are subject to measurement error (e.g. underreporting) and to recall bias. This bias may be stronger among older adults and could affect variables that determine cancer history, SPD, and preventive care and cancer screening use. Due to inadequate sample sizes and changes in data availability, there were limitations on the extent to which we could examine variation by cancer type, stage of disease, and on the recency of the cancer diagnosis. Lastly, in the absence of a complete view of an individual's medical record including disease stage, we are unable to determine receipt of individual-level, guideline-concordant care, based on personal cancer treatment history and medical condition.

Our study also has many strengths. MEPS allows for nationally representative population-based estimates of health utilization characteristics among cancer survivors and the general public. The MEPS has accompanying medical conditions file that captures verbatim text from respondents on medical conditions that are converted to International Classification of Diseases, Ninth revision, clinical modification (ICD-9-CM) codes. Thus, we verified that most individuals with SPD in our sample also had a corresponding ICD-9-CM code for depression and many had indicated taking antidepressants or psychotherapeutic agents at some point.

In summary, we observed that SPD was associated with lower preventive service use, notably among older adults and cancer survivors. Better coordination of care may be important for these populations. While distress screening and appropriate referrals for SPD may be indicators of quality care, greater attention to treatment of the conditions creating the distress and better patient-physician communication about care are steps to improving delivery of recommended preventive services.

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ypped.2019.03.024>.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Funding

None.

References

- Andersen RM, 1995 Revisiting the behavioral model and access to medical care: does it matter? *J. Health Soc. Behav* 36, 1–10. [PubMed: 7738325]
- Backe EM, Seidler A, Latza U, Rossnagel K, Schumann B, 2012 The role of psychosocial stress at work for the development of cardiovascular diseases: a systematic review. *Int. Arch. Occup. Environ. Health* 85, 67–79. [PubMed: 21584721]
- Berkowitz Z, Rim SH, Peipins LA, 2011 Characteristics and survival associated with ovarian cancer diagnosed as first cancer and ovarian cancer diagnosed subsequent to a previous cancer. *Cancer Epidemiol* 35, 112–119. [PubMed: 20674535]
- Bevilacqua LA, Dulak D, Schofield E, et al., 2018 Prevalence and predictors of depression, pain, and fatigue in older-versus younger-adult cancer survivors. *Psycho-Oncology* 27, 900–907. 10.1002/pon.4605. [PubMed: 29239060]
- Blanc-Lapierre A, Rousseau MC, Parent ME, 2017 Perceived workplace stress is associated with an increased risk of prostate cancer before age 65. *Front. Oncol* 7, 269. [PubMed: 29181335]
- Buchanan ND, Houston KA, Richardson LC, 2015a The essential role of public health in preventing disease, prolonging life, and promoting health of cancer survivors. *Am. J. Prev. Med* 49, S467–S469. [PubMed: 26590640]
- Buchanan ND, Dasari S, Rodriguez JL, et al., 2015b Post-treatment neurocognition and psychosocial care among breast cancer survivors. *Am. J. Prev. Med* 49, S498–S508. [PubMed: 26590645]
- Cancer Program Standards 2012: Ensuring Patient-Centered Care Available from URL. https://www.facs.org/~media/files/quality%20programs/cancer/coc/2016%20coc%20standards%20manual_interactive%20pdf.ashx.
- Chan CMH, Ng CG, Taib NA, Wee LH, Krupat E, Meyer F, 2018 Course and predictors of post-traumatic stress disorder in a cohort of psychologically distressed patients with cancer: a 4-year follow-up study. *Cancer* 124 (2), 406–416. 10.1002/cncr.30980. [PubMed: 29152719]
- Chawla N, Blanch-Hartigan D, Virgo KS, et al., 2016 Quality of patient-provider communication among cancer survivors: findings from a nationally representative sample. *J. Oncol. Pract* 12, e964–e973. [PubMed: 27221992]
- Cho H, Klabunde CN, Yabroff KR, et al., 2013 Comorbidity-adjusted life expectancy: a new tool to inform recommendations for optimal screening strategies. *Ann. Intern. Med* 159, 667–676. [PubMed: 24247672]
- Cuneo MG, Schrepf A, Slavich GM, et al., 2017 Diurnal cortisol rhythms, fatigue and psychosocial factors in five-year survivors of ovarian cancer. *Psychoneuroendocrinology* 84, 139–142. [PubMed: 28711723]
- Davis LZ, Cuneo M, Thaker PH, Goodheart MJ, Bender D, Lutgendorf SK, 2018 Changes in spiritual well-being and psychological outcomes in ovarian cancer survivors. *Psychooncology* 27 (2), 477–483. [PubMed: 28637083]
- Eckstrom E, Feeny DH, Walter LC, Perdue LA, Whitlock EP, 2013 Individualizing cancer screening in older adults: a narrative review and framework for future research. *J. Gen. Intern. Med* 28, 292–298. [PubMed: 23054920]
- Ekwueme DU, Yabroff KR, Guy GP Jr., et al., 2014 Medical costs and productivity losses of cancer survivors—United States, 2008–2011. *MMWR Morb. Mortal. Wkly Rep* 63, 505–510. [PubMed: 24918485]

- Ell K, Xie B, Wells A, Nedjat-Haiem F, Lee PJ, Vourlekis B, 2008 Economic stress among low-income women with cancer: effects on quality of life. *Cancer* 112, 616–625. [PubMed: 18085642]
- Guy GP Jr., Richardson LC, 2012 Visit duration for outpatient physician office visits among patients with cancer. *J. Oncol. Pract* 8, 2s–8s. [PubMed: 22942822]
- Han X, Lin CC, Li C, et al., 2015 Association between serious psychological distress and health care use and expenditures by cancer history. *Cancer* 121, 614–622. [PubMed: 25345778]
- Hawkins NA, Soman A, Buchanan Lunsford N, Leadbetter S, Rodriguez JL, 2017 Use of medications for treating anxiety and depression in cancer survivors in the United States. *J. Clin. Oncol* 35, 78–85. [PubMed: 28034075]
- Hewitt M, Greenfield S, Stovall E, 2006 *From Cancer Patient to Cancer Survivor: Lost in Transition* That National Academies Press, Washington, D.C.
- Holt-Lunstad J, Smith TB, Baker M, Harris T, Stephenson D, 2015 Loneliness and social isolation as risk factors for mortality: a meta-analytic review. *Perspect. Psychol. Sci* 10, 227–237. [PubMed: 25910392]
- Kessler RC, Andrews G, Colpe LJ, et al., 2002 Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychol. Med* 32, 959–976. [PubMed: 12214795]
- Kessler RC, Barker PR, Colpe LJ, Epstein JF, Gfroerer JC, Hiripi E, Howes MJ, Normand SL, Manderscheid RW, Walters EE, Zaslavsky AM, 2003 Screening for serious mental illness in the general population. *Arch. Gen. Psychiatry* 60, 184–189. [PubMed: 12578436]
- Kessler RC, Green JG, Gruber MJ, et al., 2010 Screening for serious mental illness in the general population with the K6 screening scale: results from the WHO World Mental Health (WMH) survey initiative. *Int. J. Methods Psychiatr. Res* 19 (Suppl. 1), 4–22. [PubMed: 20527002]
- Klein RJ, Schoenborn CA, 1 2001 Age Adjustment Using the 2000 Projected U.S. Population. *Healthy People Statistical Notes*, No. 20 National Center for Health Statistics, Hyattsville, Maryland.
- Lengacher CA, Reich RR, Kip KE, et al., 2014 Influence of mindfulness-based stress reduction (MBSR) on telomerase activity in women with breast cancer (BC). *Biol. Res. Nurs* 16, 438–447. [PubMed: 24486564]
- Medical Expenditure Panel Survey Available from URL. http://meps.ahrq.gov/mepsweb/about_meps/survey_back.jsp.
- Miller KD, Siegel RL, Lin CC, et al., 2016 Cancer treatment and survivorship statistics, 2016. *CA Cancer J. Clin* 66, 271–289. [PubMed: 27253694]
- Murphy CC, Gerber DE, Pruitt SL, 2018 Prevalence of prior cancer among persons newly diagnosed with cancer: an initial report from the surveillance, epidemiology, and end results program. *JAMA Oncol* 4 (6), 832–836. 10.1001/jamaoncol.2017.3605. [PubMed: 29167866]
- Nagaraja AS, Sadaoui NC, Dorniak PL, Lutgendorf SK, Sood AK, 2016 SnapShot: stress and disease. *Cell Metab* 23 (2), 388–388.e1. 10.1016/j.cmet.2016.01.015. [PubMed: 26863488]
- NCCN Distress Management Version 2 Available from URL. http://www.nccn.org/professionals/physician_gls/f_guidelines.asp#distress.
- Ng CG, Mohamed S, See MH, et al., 2015 Anxiety, depression, perceived social support and quality of life in Malaysian breast cancer patients: a 1-year prospective study. *Health Qual. Life Outcomes* 13, 205. [PubMed: 26715073]
- Nyberg ST, Fransson EI, Heikkila K, et al., 2014 Job strain as a risk factor for type 2 diabetes: a pooled analysis of 124,808 men and women. *Diabetes Care* 37, 2268–2275. [PubMed: 25061139]
- Pantell M, Rehkopf D, Jutte D, Syme SL, Balmes J, Adler N, 2013 Social isolation: a predictor of mortality comparable to traditional clinical risk factors. *Am. J. Public Health* 103, 2056–2062. [PubMed: 24028260]
- Patnode CD, Evans CV, Senger CA, Redmond N, Lin JS, 2017 U.S. Preventive Services Task Force Evidence Syntheses, Formerly Systematic Evidence Reviews
- Behavioral Counseling to Promote a Healthful Diet and Physical Activity for Cardiovascular Disease Prevention in Adults Without Known Cardiovascular Disease Risk Factors: Updated Systematic Review for the U.S Preventive Services Task Force. Agency for Healthcare Research and Quality (US), Rockville (MD).

- Pinquart M, Duberstein PR, 2010 Depression and cancer mortality: a meta-analysis. *Psychol. Med* 40, 1797–1810. [PubMed: 20085667]
- Pollack LA, Adamache W, Ryerson AB, Ehemann CR, Richardson LC, 2009 Care of long-term cancer survivors: physicians seen by Medicare enrollees surviving longer than 5 years. *Cancer* 115, 5284–5295. [PubMed: 19685532]
- Pratt LA, Dey AN, Cohen AJ, 2007 Characteristics of adults with serious psychological distress as measured by the K6 scale: United States, 2001–04. *Adv. Data* 1–18.
- Shankaran V, Leahy T, Steelquist J, et al., 2018 Pilot feasibility study of an oncology financial navigation program. *J. Oncol. Pract* 14 (2), e122–e129. 10.1200/JOP.2017.024927. Epub 2017 Dec 22. [PubMed: 29272200]
- Siette J, Cassidy M, Priebe S, 2017 Effectiveness of befriending interventions: a systematic review and meta-analysis. *BMJ Open* 7, e014304.
- Steele CB, Thomas CC, Henley SJ, et al., 2017 Vital signs: trends in incidence of cancers associated with overweight and obesity - United States, 2005–2014. *MMWR Morb. Mortal. Wkly Rep* 66, 1052–1058. [PubMed: 28981482]
- Straif K, Loomis D, Guyton K, et al. Future priorities for the IARC monographs. *Lancet Oncol* 15: 683–684.
- Theeke LA, Mallow JA, 2015 The development of LISTEN: a novel intervention for loneliness. *Open J. Nurs* 5, 136–143. [PubMed: 26229740]
- Weissman JD, Russell D, Beasley J, Jay M, Malaspina D, 2016 Relationships between adult emotional states and indicators of health care utilization: findings from the National Health Interview Survey 2006–2014. *J. Psychosom. Res* 91, 75–81. [PubMed: 27894466]
- Weissman JF, Pratt LA, Miller EA, Parker JD, 2015 Serious psychological distress among adults: United States, 2009–2013. *NCHS Data Brief* 1–8.
- Yabroff KR, Short PF, Machlin S, et al., 2013 Access to preventive health care for cancer survivors. *Am. J. Prev. Med* 45, 304–312. [PubMed: 23953357]
- Yabroff KR, Dowling EC, Guy GP Jr., et al., 2016 Financial hardship associated with cancer in the United States: findings from a population-based sample of adult cancer survivors. *J. Clin. Oncol* 34, 259–267. [PubMed: 26644532]
- Yates LB, Djousse L, Kurth T, Buring JE, Gaziano JM, 2008 Exceptional longevity in men: modifiable factors associated with survival and function to age 90 years. *Arch. Intern. Med* 168, 284–290. [PubMed: 18268169]

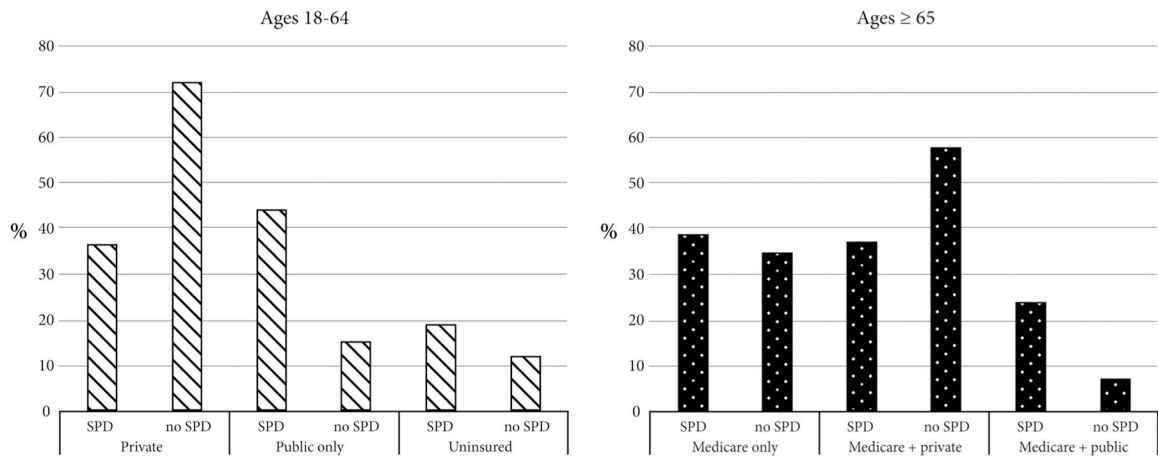


Fig. 1. Age-adjusted percentages[†] of cancer survivors with and without SPD** by age group and insurance type.

[†]Age-adjusted percentages to the 2000 U.S. census population using the direct method for age groups 18–34, 35–44, 45–54, 55–64, and 65.

**SPD: serious psychological distress.

Table 1

Study sample descriptive characteristics by SPD status, MEPS 2008–2015.

Characteristics	Cancer survivors ^a			Adults without a cancer history								
	No SPD (n = 11,497)			SPD ^b (n = 1067)			No SPD (n = 151,739)			SPD ^b (n = 8284)		
	Weighted %	95%CI	SPD ^b Weighted %	95%CI	Weighted %	95%CI	Weighted %	95%CI	Weighted %	95%CI	Weighted %	95%CI
Total	93.0	(92.3, 93.6)	7.0	(6.4, 7.7)	95.4	(95.2, 95.6)	4.6	(4.4, 4.8)				
Age (years)												
18–34	4.7	(4.1, 5.3)	7.7	(5.5, 9.9)	33.8	(33.1, 34.5)	27.3	(25.7, 28.8)				
35–44	6.2	(5.4, 6.9)	11.5	(8.8, 14.2)	18.3	(17.9, 18.8)	18.9	(17.6, 20.2)				
45–54	12.9	(11.8, 14.0)	21.2	(17.3, 25.2)	18.9	(18.5, 19.3)	21.8	(20.4, 23.2)				
55–64	22.6	(21.2, 24.0)	26	(22.7, 29.4)	15.2	(14.7, 15.6)	18.4	(17.0, 19.8)				
65	53.6	(51.7, 55.6)	33.5	(29.0, 38.0)	13.8	(13.3, 14.3)	13.6	(12.6, 14.7)				
Race/ethnicity												
Non-Hispanic White	84.0	(82.7, 85.3)	78.6	(75.4, 81.9)	63.9	(62.0, 65.8)	63.7	(61.3, 66.1)				
Non-Hispanic Black	6.9	(6.2, 7.7)	7.6	(5.9, 9.3)	12.1	(10.9, 13.4)	12.9	(11.4, 14.5)				
Hispanic	5.8	(5.0, 6.6)	9.6	(7.4, 11.8)	15.9	(14.2, 17.6)	16.4	(14.2, 18.5)				
Other	3.3	(2.5, 4.1)	4.2	(2.2, 6.1)	8.1	(7.0, 9.2)	7.0	(6.1, 8.0)				
Sex												
Men	43.0	(41.5, 44.4)	35.5	(31.3, 39.7)	49.1	(48.8, 49.5)	41.9	(40.6, 43.3)				
Women	57.0	(55.6, 58.5)	64.5	(60.3, 68.7)	50.9	(50.5, 51.2)	58.1	(56.7, 59.4)				
Education												
Less than high school graduate	12.4	(11.5, 13.4)	28.1	(24.3, 31.8)	14.7	(14.1, 15.4)	26.5	(25.1, 28.0)				
High school graduate	30.4	(28.9, 31.9)	34.4	(30.3, 38.6)	28.6	(27.9, 29.4)	34.0	(32.1, 35.9)				
Some college	25.4	(24.2, 26.7)	24.9	(20.8, 29.1)	27.0	(26.5, 27.6)	26.3	(24.7, 27.9)				
College graduate	31.7	(29.9, 33.5)	12.6	(9.3, 15.8)	29.6	(28.5, 30.7)	13.2	(11.7, 14.6)				
Marital status												
Never married	8.2	(7.4, 9.1)	13.5	(10.7, 16.3)	29.5	(28.8, 30.1)	29.7	(28.1, 31.4)				
Married	60.0	(57.9, 62.1)	44.7	(39.7, 49.8)	53.2	(52.3, 54.1)	38.7	(36.8, 40.6)				
Widowed/divorced/separated	31.7	(29.9, 33.6)	41.8	(37.2, 46.3)	17.3	(16.8, 17.9)	31.6	(30.0, 33.1)				
Family income												
Poor (< 100% FPL)	9.2	(8.5, 9.9)	25.6	(22.8, 28.5)	11.7	(11.0, 12.3)	30.5	(28.8, 32.2)				

Characteristics	Cancer survivors ^a				Adults without a cancer history			
	No SPD (n = 11,497)		SPD ^b (n = 1067)		No SPD (n = 151,739)		SPD ^b (n = 8284)	
	Weighted %	95%CI	Weighted %	95%CI	Weighted %	95%CI	Weighted %	95%CI
Near poor/low income (100–<200% FPL)	18.9	(17.8, 20.1)	31.1	(27.5, 34.6)	17.1	(16.6, 17.6)	27.0	(25.5, 28.5)
Middle income (200–<400% FPL)	27.7	(26.5, 29.0)	25.7	(22.7, 28.7)	30.7	(30.1, 31.3)	25.8	(24.6, 27.1)
High income (<400% FPL)	44.1	(42.1, 46.1)	17.6	(13.6, 21.5)	40.5	(39.3, 41.7)	16.7	(15.2, 18.1)
Region								
Northeast	17.8	(15.9, 19.6)	14.7	(11.0, 18.5)	18.5	(17.4, 19.6)	15.8	(13.9, 17.7)
Midwest	23.1	(21.1, 25.0)	20.5	(16.4, 24.5)	21.4	(20.2, 22.5)	21.4	(19.4, 23.5)
South	37.8	(35.1, 40.4)	42.4	(37.6, 47.2)	36.7	(35.2, 38.2)	39.7	(37.6, 41.9)
West	21.4	(19.4, 23.5)	22.4	(18.4, 26.4)	23.4	(22.2, 24.7)	23.1	(21.0, 25.1)
Health insurance								
Any private	66.8	(65.1, 68.5)	41.2	(36.7, 45.8)	69.1	(68.0, 70.3)	41.9	(40.1, 43.6)
Public only	29.0	(27.3, 30.7)	49.6	(45.0, 54.2)	15.7	(15.0, 16.4)	39.9	(38.1, 41.7)
Uninsured	4.2	(3.6, 4.8)	9.1	(6.7, 11.6)	15.1	(14.3, 16.0)	18.2	(17.1, 19.4)
BMI, kg/m ² ^c								
< 18.5	1.7	(1.3, 2.1)	1.7	(0.9, 2.6)	1.6	(1.5, 1.7)	2.5	(2.0, 3.0)
18.5–24.9	32.1	(30.7, 33.5)	26.9	(23.0, 30.9)	34.3	(33.6, 34.9)	26.8	(25.5, 28.2)
25–29.9	36.2	(34.8, 37.6)	32.7	(28.5, 36.9)	34.4	(33.9, 34.8)	28.6	(27.1, 30.2)
≥ 30	30.0	(28.6, 31.4)	38.7	(34.6, 42.8)	29.7	(29.0, 30.4)	42.1	(40.4, 43.8)
Smoking status ^c								
No	86.5	(85.4, 87.6)	64.2	(59.9, 68.5)	83.2	(82.6, 83.8)	62.4	(60.6, 64.2)
Yes	13.5	(12.4, 14.6)	35.8	(31.5, 40.1)	16.8	(16.2, 17.4)	37.6	(35.8, 39.4)
Physical activity ^c								
Not active	52.5	(50.8, 54.2)	75.1	(71.1, 79.0)	45.0	(44.2, 45.8)	64.6	(63.2, 66.0)
Number of comorbidities								
None	14.5	(13.4, 15.6)	7.4	(5.2, 9.6)	46.1	(45.5, 46.8)	23.8	(22.4, 25.2)
One	18.2	(17.1, 19.4)	11.4	(8.8, 14.0)	22.5	(22.1, 22.9)	19.5	(18.3, 20.7)
Two	20.0	(18.8, 21.2)	15.4	(12.7, 18.2)	13.9	(13.6, 14.2)	17.4	(16.2, 18.6)
Three or more	47.3	(45.7, 48.8)	65.8	(61.8, 69.8)	17.5	(17.0, 17.9)	39.4	(37.8, 40.9)

Characteristics	Cancer survivors ^a				Adults without a cancer history			
	No SPD (n = 11,497)		SPD ^b (n = 1067)		No SPD (n = 151,739)		SPD ^b (n = 8284)	
	Weighted %	95% CI	Weighted %	95% CI	Weighted %	95% CI	Weighted %	95% CI
Cancer type ^d								
Breast	19.1	(17.8, 20.3)	12.6	(10.1, 15.1)				N/A
Prostate	14.4	(13.3, 15.4)	7.6	(5.1, 10.1)				
Colorectal	6.2	(5.5, 6.9)	7.0	(4.8, 9.3)				
Other	60.8	(59.1, 62.4)	73.1	(69.1, 77.1)				
Health status								
Excellent/very good	39.1	(37.6, 40.7)	4.8	(3.3, 6.3)	59.2	(58.4, 59.9)	13.7	(12.5, 14.8)
Good	36.4	(35.0, 37.8)	18.9	(15.6, 22.1)	29.7	(29.2, 30.2)	28.3	(26.9, 29.8)
Fair/poor	23.2	(22.0, 24.3)	74.5	(71.0, 78.0)	10.2	(9.9, 10.5)	56.3	(54.6, 58.0)
Not ascertained/inapplicable	1.3	(1.1, 1.5)	1.9	(0.9, 2.8)	0.9	(0.9, 1.0)	1.7	(1.4, 2.1)
Employment status								
Employed at time of interview	38.1	(36.2, 40.0)	18.1	(15.0, 21.3)	68.0	(67.3, 68.7)	34.7	(33.0, 36.5)
Job to return	0.1	(0.0, 0.1)	0.2	(0.0, 0.6)	0.1	(0.1, 0.1)	0.2	(0.1, 0.3)
Not employed	58.8	(56.8, 60.9)	77.1	(73.6, 80.5)	27.8	(27.1, 28.5)	58.6	(56.9, 60.4)

Abbreviations: FPL = federal poverty level; N/A = not applicable.

^aNon-melanoma skin cancer cases were excluded.

^bSPD: serious psychological distress.

^cTotal number may be less due to missing values.

^dTotal is more due to individuals diagnosed with multiple cancers.

Table 2 Age-adjusted percentage of selected access to care and health/preventive service utilization by cancer and SPD status.

	Cancer survivors ^d		Adults without a cancer history	
	No SPD (n = 11,497)	SPD ^b (n = 1067)	No SPD (n = 151,739)	SPD ^b (n = 8284)
	Weighted % ^c (95%CI)	Weighted % ^c (95%CI)	Weighted % ^c (95%CI)	Weighted % ^c (95%CI)
Total ^d	90.1 (88.8, 91.3)	9.8 (8.7, 11.1)	94.4 (95.2, 95.6)	4.6 (4.4, 4.8)
Access to care				
Usual source of care ^e				
Yes	82.3 (80.4, 84.0)	81.0 (75.6, 85.4)	73.9 (73.2, 74.7)	76.4 (75.0, 77.8)
No/missing	17.7 (16.0, 19.6)	19.0 (14.6, 24.4)	26.1 (25.3, 26.8)	23.6 (22.2, 25.0)
Total number of doctor's visit in past 12 months ^f				
None	19.2 (17.5, 21.1)	13.6 (9.9, 18.7)	33.3 (32.7, 34.0)	20.2 (19.0, 21.5)
1–3 visits	38.9 (37.1, 40.7)	24.8 (20.4, 29.9)	41.9 (41.3, 42.4)	34.1 (32.6, 35.6)
4–9 visits	27.8 (26.2, 29.4)	32.2 (27.8, 36.9)	18.7 (18.4, 19.1)	27.8 (26.5, 29.2)
10 visits or more	14.1 (12.7, 15.7)	29.3 (25.1, 34.0)	6.1 (5.9, 6.3)	17.9 (16.8, 19.1)
Treated in the past year				
Yes	18.9 (17.3, 20.6)	13.9 (10.5, 18.4)	N/A	N/A
No/missing	81.1 (79.4, 82.7)	86.1 (81.6, 89.5)	N/A	N/A
Preventive services				
Blood pressure checked in last 2 years	95.8 (95.0, 96.5)	94.6 (92.0, 96.4)	87.7 (87.2, 88.1)	90.0 (89.1, 90.9)
Cholesterol checked in last 2 years	76.2 (74.0, 78.2)	76.0 (70.3, 80.8)	68.1 (67.6, 68.6)	69.6 (68.2, 70.9)
Influenza vaccination in the last year	45.3 (43.3, 47.4)	40.4 (35.8, 45.2)	38.2 (37.4, 38.9)	38.7 (37.1, 40.3)
Routine check-up in the last year	72.8 (70.7, 74.7)	70.6 (65.3, 75.3)	62.1 (61.4, 62.8)	65.2 (63.5, 66.9)
Dental check-up at least once in the last year	63.7 (61.4, 65.9)	37.1 (31.7, 42.8)	61.4 (60.6, 62.2)	40.0 (38.4, 41.5)
Cancer screening (among age- and gender-eligible individuals) ^g				
Breast cancer screening (mammogram within 2 years) among women aged 40 years ^h	67.4 (64.4, 70.3)	51.1 (44.3, 57.9)	68.1 (67.3, 68.9)	55.2 (52.2, 58.3)
Cervical cancer screening (Pap test within 3 years) among women aged 21–65 years ^{h,i}	83.9 (81.2, 86.3)	70.2 (65.2, 76.3)	82.2 (81.7, 82.7)	75.5 (73.4, 77.5)
Colorectal cancer screening (FOBT within 1 year, sigmoidoscopy within 5 years, or colonoscopy within 10 years) among adults aged 50–75 years	68.7 (66.5, 70.8)	61.4 (55.4, 67.2)	57.5 (56.4, 58.5)	53.8 (51.1, 56.6)

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Abbreviations: N/A = not applicable.

^aNon-melanoma skin cancer cases were excluded.

^bSPD: serious psychological distress.

^cAge-adjusted percentages to the 2000 U.S. census population using the direct method for age groups 18–34, 35–44, 45–54, 55–64, and 65.

^dTotal for preventive services and cancer screening rows varies as each row are subpopulation of total based on individual selection criteria.

^eUsual source of care ascertained from question: “Is there a particular doctor’s office, clinic, health center, or other place that you usually go if you are sick or need advice about your health?”.

^fNumber of doctor’s visits was based on the question that asked respondents: “In the last 12 months, not counting the times you went to an emergency room, how many times did you go to a doctor’s office or clinic to get health care for yourself?”.

^gIndividuals with corresponding cancer diagnosis were excluded.

^hSubpopulation were only female.

ⁱNot able to exclude individuals with cervix removed as the information was not available in the data.

Table 3

Odds^c of preventive care and cancer screening service by SPD, cancer status, and age.

	Age 18–64 ^c		Age 65 ^c	
	Cancer survivors ^d with SPD ^b	Adults without a cancer history with SPD ^b	Cancer survivors ^d with SPD ^b	Adults without a cancer history with SPD ^b
	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)
Preventive services ^d				
Blood pressure checked in last 2 years	0.57 (0.33, 0.99)	0.88 (0.79, 0.99)	0.21 (0.12, 0.35)	0.53 (0.32, 0.87)
Cholesterol checked in last 2 years	0.87 (0.60, 1.28)	0.79 (0.73, 0.87)	0.39 (0.24, 0.63)	0.56 (0.40, 0.79)
Influenza vaccination in the last year	0.72 (0.56, 0.93)	0.87 (0.80, 0.95)	0.66 (0.48, 0.91)	0.81 (0.65, 1.01)
Routine check-up in the last year	0.77 (0.59, 1.02)	0.94 (0.87, 1.02)	0.38 (0.26, 0.55)	0.64 (0.49, 0.83)
Dental check-up at least once in the last year	0.48 (0.37, 0.61)	0.57 (0.52, 0.61)	0.46 (0.32, 0.67)	0.50 (0.40, 0.62)
Cancer screening (among age- and gender-eligible individuals) ^{de}				
Breast cancer screening (mammogram within 2 years) among women aged 40 years ^f	0.66 (0.44, 0.99)	0.59 (0.51, 0.68)	0.51 (0.30, 0.87)	0.47 (0.37, 0.60)
Cervical cancer screening (pap test within 3 years) among women aged 21–65 years ^{fg}	0.60 (0.43, 0.84)	0.70 (0.63, 0.79)	N/A	N/A
Colorectal cancer screening (FOBT within 1 year, sigmoidoscopy within 5 years, or colonoscopy within 10 years) among adults aged 50–75 years ^f	0.80 (0.54, 1.18)	0.93 (0.82, 1.06)	0.63 (0.40, 0.98)	0.67 (0.52, 0.87)

Abbreviations: N/A = not applicable.

^aNon-melanoma skin cancer cases were excluded.

^bSPD: serious psychological distress.

^cAdjusted odds ratios from logistic regression model controlling for age, sex, race/ethnicity, marital status, educational attainment, health insurance, treated in past year, access to care and number of comorbidities. Reference groups for control variables were: female, white, married, some college education or higher, private insurance (Medicare and private for persons' age 65), have access to care, no comorbidities. Medicare is included for health insurance among persons age 65years.

^dFor specific preventive services (blood pressure checked, cholesterol checked, and influenza vaccination) and cancer screening variables, models additionally controlled for number of doctor's visits in past 12 months (reference: 0 visits).

^eIndividuals with corresponding cancer diagnosis were excluded.

^fBreast and cervical cancer screening subpopulation is only female.

Not able to exclude individuals with cervix removed as the information was not available in the data.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript