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Physical activity, psychological distress, and receiving mental healthcare services among cancer survivors

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Abstract

Purpose—Physical activity confers multiple health benefits in the general population. This study examined the associations of physical activity with serious psychological distress (SPD) and receiving mental healthcare services among U.S. adult cancer survivors.

Methods—We analyzed data from 4,797 cancer survivors (aged ≥18 years) and 38,571 adults without cancer who participated in the 2009 Behavioral Risk Factor Surveillance System. SPD was assessed using the Kessler-6 questionnaire. Adjusted prevalence and prevalence ratios were estimated by conducting log-linear regression analysis while controlling for potential confounders.

Results—Overall, 6.6 % of cancer survivors (vs. 3.7 % of adults without cancer, $P<0.001$) reported having SPD, and 14.0 % of cancer survivors (vs. 10.0 % of adults without cancer, $P<0.001$) reported receiving mental healthcare services; the percentages decreased with increasing physical activity levels. After multivariate adjustment, compared to cancer survivors who were physically inactive, cancer survivors who engaged in physical activity >0 to <150 min/week and ≥150 min/week were 62 % and 61 % ($P<0.001$ for both) less likely to report SPD, respectively;

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cancer survivors who engaged in physical activity ≥150 min/week were 33 % (P<0.05) less likely to report receiving mental healthcare services. Additionally, the inverse association between physical activity and receiving mental healthcare services persisted among women with breast or reproductive cancers and among men and women with gastrointestinal cancers.

Conclusion—The inverse associations between physical activity and SPD or receiving mental healthcare services suggest that physical activity may play a role in improving mental health among cancer survivors.

Implications for cancer survivors—Healthcare clinicians may consider routinely monitoring and assessing the psychological well-being of cancer survivors and educate them about the potential benefits of physical activity in improving their mental health.

Keywords

Cancer survivor; Physical activity; Serious psychological distress; Mental healthcare services; BRFSS

Introduction

Cancer is the second leading cause of death in the USA [1], resulting in a total of 565,460 deaths (295,253 men and 270,207 women) in 2008 [2]. It has been reported that in the US between 1999 and 2009, the cancer mortality rate declined from 200.7 per 100,000 to 173.1 per 100,000 [2, 3], a drop that may be attributable in part to the advances in cancer screening, improved diagnostic methods, effective treatment, and improved clinical follow-up care after treatment [2, 4]. In fact, the number of cancer survivors rose from 3.0 million in 1971 to 12.6 million in 2008 in the USA [4].

For people with cancer, receiving a cancer diagnosis, experiencing uncertainty related to disease severity and subsequent treatment, experiencing side effects, and fearing cancer recurrence can lead to a significant physical and psychosocial distress [5]. These patients often face a variety of challenges including pain, fatigue, decreased physical functioning, increased risks for recurrent cancer, second malignant neoplasms, and chronic comorbidities, impaired social adaptation, impaired quality of life, and financial hardship associated with use of health care services [6-9]. To date, accumulating evidence has shown that cancer survivors are at increased risks for anxiety, depression, post-traumatic stress disorder, psychological distress, and other psychological comorbidities [10-17]. The psychological sequelae of cancer survivors may further exacerbate their disease severity, decrease their quality of life [15], and increase cancer mortality [18]. Thus, early evaluation of the mental well-being of cancer patients and identification of factors associated with psychological distress are important for improving the health of cancer survivors. Previous studies have shown that engaging in physical activity is associated with lower risks for depressive symptoms [19-22], anxiety [21, 23], and psychological distress [24], and associated with improved physical functioning and quality of life [22, 25-28] in the general population, especially in older adults. However, the association between physical activity participation and the mental health status of cancer survivors is largely unknown. By using a large, population-based sample, we sought to (1) determine the percentages of cancer survivors

who experienced serious psychological distress (SPD) and received mental healthcare services, (2) assess the associations of physical activity patterns with SPD and receiving mental healthcare services among cancer survivors, and (3) compare these findings to those occurring among adults with no cancer history in the USA.

Methods

We analyzed data from the 2009 Behavioral Risk Factor Surveillance System (BRFSS), a population-based telephone survey conducted annually since 1984 to collect health information including health-related behavioral risk factors, preventive health practices, health care access, and related chronic conditions among civilian noninstitutionalized US adults aged 18 years and older. The BRFSS survey design, sampling methods, and weights have been described elsewhere [29-31]; detailed information on BRFSS is available at http://www.cdc.gov/brfss/. The median cooperation rate (the percentage of eligible persons contacted who completed the interview) was 75.0 % for the 2009 BRFSS.

We limited our analyses to data collected from eight states (Georgia, Hawaii, Mississippi, Missouri, Nevada, South Carolina, Vermont, and Wyoming) in which a Mental Illness and Stigma Module was implemented in the 2009 BRFSS. Participants' mental health status was evaluated using the Kessler-6 (K-6) questionnaire, which was developed to monitor the prevalence rates and secular trends for nonspecific psychological distress in the general population [32]. Participants were asked how often in the past 30 days they felt (1) nervous, (2) hopeless, (3) restless or fidgety, (4) so depressed that nothing could cheer them up, (5) that everything was an effort, and (6) worthless. Their responses to each of the questions were coded as "none of the time"=0, "a little of the time"=1, "some of the time"=2, "most of the time"=3, and "all of the time"=4, with a total score ranged from 0 to 24. Based on the K-6 scoring guideline, participants with a total score of ≥13 were defined as having SPD. Receiving mental healthcare services was assessed by asking participants the following question: "Are you now taking medicine or receiving treatment from a doctor or other health professional for any type of mental health condition or emotional problem?" and their responses to the question were dichotomized as yes=1 and no=0.

A cancer diagnosis was assessed by asking participants whether they had ever been told by a doctor, nurse, or other health professional that they had cancer. Participants indicating cancer survivorship were then asked about how many different types of cancer diagnoses they had received, at what age they were diagnosed with the first cancer, and what type of cancer they were most recently diagnosed with. For the number of cancers, participants were dichotomized as having one or two or more types of cancer. For the type of cancers, they were categorized as having (1) female breast cancer, (2) female reproductive cancer (i.e., cervical, endometrial, and ovarian cancer), (3) male reproductive cancer (i.e., prostate and testicular cancer), (4) gastrointestinal cancer (i.e., colon, esophageal, liver, pancreatic, rectal, and stomach cancer), (5) melanoma skin cancer (nonmelanoma skin cancer was excluded because it is considered a relatively benign condition), and (6) other cancer (including leukemia/lymphoma, neuroblastoma, and cancers of the brain, neck, oral cavity, pharynx, thyroid, heart, lung, kidney, bladder, bone, or any other body regions). The survival years after cancer diagnosis was calculated as participants' age subtracted by the age of first

diagnosis, and was categorized as <5, 5 to <10, and ≥10 years. For comparison purpose, we also included data from adults with no cancer history.

Physical activity was assessed by asking participants whether in a usual week they engaged in activities of moderate intensity (i.e., brisk walking, bicycling, gardening, or anything else that causes small increases in breathing or heart rate) or activities of vigorous intensity (i.e., running, aerobics, heavy yard work, or anything else that causes large increases in breathing or heart rate) for at least 10 min at a time. Participants answering "yes" to the question were then asked about how many days per week and how much total time per day they engaged in the activities. We then calculated the average minutes per week (min/week) that participants reported participating in the activities with a conversion of 1 min of vigorous-intensity activities equivalent to 2 min of moderate-intensity activities. Following the 2008 Physical Activity Guidelines [33], participants were categorized as physically inactive (0 min/week), insufficiently active (>0 to <150 min/week), and physically active (≥150 min/week).

Potential confounding variables included age, sex, race/ethnicity (non-Hispanic white, non-Hispanic black, and other), education (less than high school diploma, high school graduate, and greater than a high school diploma), marital status (currently married/living with a partner and other—i.e., divorced, widowed, separated, and never married), body mass index (<25.0, 25.0 to <30.0, and ≥30.0 kg/m^2, calculated from self-reported weight and height), current smoking (yes/no), excessive alcohol drinking (yes/no), existence of comorbid conditions (yes/no), and insurance coverage (yes/no). Current smokers were participants who had smoked ≥100 cigarettes during their lifetime and still reported smoking at the survey time, and current non-smokers were those who either had smoked <100 cigarettes during their lifetime or had smoked ≥100 cigarettes in their entire life but stopped smoking. Excessive alcohol drinking was defined as participants who consumed a daily average of any alcoholic beverages of >2 drinks for men or >1 drink for women, or who had an episode of consuming at least five (for men) or four (for women) drinks on one occasion during the previous 30 days. The comorbid conditions included physician-diagnosed diabetes and coronary heart disease including myocardial infarction and angina pectoris, which were assessed by asking participants whether they had ever been told by a doctor or other health professional that they had had these conditions. Insurance coverage was assessed by asking participants whether they had any kind of health care coverage including health insurance, prepaid plans such as HMOs, or government plans such as Medicare.

Statistical analyses

We estimated the weighted prevalence of SPD and receiving mental healthcare services by cancer diagnosis, by type and the number of cancers, and by years since diagnosis. A multivariate-adjusted log-linear regression analysis was conducted to estimate adjusted prevalence, adjusted prevalence ratio, and 95% confidence interval (CI) for SPD and receiving mental healthcare services. For this analysis, we created a six-level variable by combining cancer status (yes/no) with three levels of physical activity (0, >0 to <150, and ≥150 min/week) and used the cancer survivors who were physically inactive as the referent in our multivariate-adjusted models. For stratified analyses by type of cancers, we reported the estimates of prevalence and prevalence ratios for receiving mental healthcare

services, but not for SPD due to unstable estimates resulting from relatively small subgroups of cancer survivors and a low prevalence of SPD. We used SUDAAN software (release 9.0; Research Triangle Institute, Research Triangle Park, NC, USA) to account for the multi-stage, disproportionate stratified sampling design.

Results

Characteristics of cancer survivors and adults with no history of cancer

Of 55,252 participants who completed the Mental Illness and Stigma Module in eight states, we excluded 1,938 participants with nonmelanoma skin cancer, and further excluded those who responded “don’t know/not sure”, refused to answer, or had missing responses for any of the study variables, leaving a total of 4,797 cancer survivors (1,701 men and 3,096 women) and 38,571 adults with no cancer history (15,025 men and 23,546 women) in our analyses. Compared with adults with no cancer history, cancer survivors were more likely to be older (mean age 59.8 years vs. 44.5 years, $P<0.001$), female (58.3 % vs. 50.5 %, $P<0.001$), and non-Hispanic white (78.3 % vs. 67.2 %, $P<0.001$), or report having insurance coverage (91.2 % vs. 83.5 %, $P<0.001$), diabetes (16.5 % vs. 8.1 %, $P<0.001$), or coronary heart disease (14.7 % vs. 5.2 %, $P<0.001$) (Table 1). In contrast, cancer survivors were less likely to be non-Hispanic black (11.5 % vs. 19.5 %, $P<0.001$), other races/ethnicities (10.2 % vs. 13.2 %, $P<0.05$), or excessive drinkers (8.2 % vs. 16.0 %, $P<0.001$) (Table 1). The distribution by education, marital status, current smoking, and body weight did not differ significantly between the two groups.

Of all cancer survivors, female breast (18.5 %) and reproductive cancers (16.4 %) were the most prevalent. About 46.0 % of cancer survivors had lived at least 10 years since cancer diagnosis, and 87.0 % reported having only one type of cancer (Fig. 1).

For physical activity, approximately 56.1 % of cancer survivors (vs. 65.7 % of adults with no cancer history, $P<0.001$) reported engaging in physical activity ≥150 min/week, 26.7 % of cancer survivors (vs. 23.0 % of adults with no cancer history, $P<0.05$) reported being insufficiently active, and 17.2 % of cancer survivors (vs. 11.3 % of adults with no cancer history, $P<0.001$) reported being physically inactive (Table 1).

SPD and its association with physical activity among cancer survivors versus among adults with no cancer history

Overall, about 6.6 % (95 % CI 5.2–8.3 %) of cancer survivors [versus 3.7 % (95 % CI 3.3–4.1 %) of adults with no cancer history, $P<0.001$] reported having SPD (Fig. 2). The highest prevalence of SPD was observed in women with reproductive cancer and the lowest observed in men with reproductive cancer (Fig. 2); the prevalence was lower among cancer survivors who had lived for 5 to <10 years after cancer diagnosis than among those who had lived ≥10 years ($P<0.05$) and was significantly higher among adults with two or more types of cancer than among adults with only one type of cancer ($P<0.05$).

Among both cancer survivors and adults with no cancer history, the unadjusted and adjusted prevalence of SPD decreased with increasing levels of physical activity (Table 2). Compared to cancer survivors who were physically inactive, the adjusted prevalence ratios for SPD

were 62 % (P<0.001) and 61 % (P<0.001) lower among cancer survivors who engaged in physical activity >0 to <150 min/week and ≥150 min/week, respectively, whereas the adjusted prevalence ratios for SPD were 53 % to 78 % (P<0.001 for all) lower among adults with no cancer history across three levels of physical activity (Table 2).

Receiving mental healthcare services and its association with physical activity among cancer survivors versus among adults with no cancer history

Overall, 14.0 % (95 % CI 12.3–16.0 %) of cancer survivors [vs. 10.0 % (95 % CI 9.5–10.6 %) of adults with no cancer history, P<0.001] reported receiving mental healthcare services (Fig. 3). The highest prevalence of receiving mental healthcare services was also observed in women with reproductive cancer and the lowest observed in men with reproductive cancer (Fig. 3); the prevalence did not differ significantly by years since cancer diagnosis and by the number of cancers.

Among both cancer survivors and adults with no cancer history, the prevalence of receiving mental healthcare services decreased linearly with increasing levels of physical activity without and with adjustment for study covariates (P<0.01 for linear trends, Table 2). Compared with cancer survivors who were physically inactive, the adjusted prevalence ratios were 24 % (P=0.112) and 33 % (P=0.021) lower among cancer survivors who engaged in physical activity >0 to <150 min/week and ≥150 min/week, respectively (Table 2); a similar magnitude of the associations were also observed among adults with no cancer history who engaged in physical activity >0 to <150 min/week and ≥150 min/week.

When analysis was stratified by type of cancers, the inverse association of physical activity with receiving mental healthcare services was evident among women with breast or reproductive cancers and among both men and women with gastrointestinal cancer (Table 3); the unreliable estimates for men with reproductive cancers were not reported due to a small sample size.

Discussion

Our results from a large, population-based sample of US adults showed that cancer survivors were more vulnerable to SPD and more likely to report receiving mental healthcare services in comparison with adults with no cancer history. While increasing levels of physical activity were independently associated with decreased prevalence ratios for having SPD and receiving mental healthcare services among both cancer survivors and adults with no cancer history, the magnitude of decline in the adjusted prevalence of SPD was greater among cancer survivors (declined from 12.9 % to 4.9 %) than among adults with no cancer history (declined from 6.0 % to 2.8 %). Given that there are about 13 million cancer survivors in the USA, the findings of the present study call for more research targeting a potential role of physical activity in improving mental well-being of cancer survivors.

The difficulties and challenges that cancer survivors have to deal with—concern about treatment success, coping with side effects, worries about health care accessibility, fear of recurrence, health vulnerability, and alterations in social activities and support—may have imposed heightened stress on their mental health. Thus, it is not surprising that our

study and several other studies have shown that cancer survivors are at increased risks for psychological distress, depression, anxiety, and other mental disorders compared with people without a history of cancer [10-17, 34]. A recent study using data from the National Health Interview Survey also reported that 5.6 % of patients who had cancer for at least 5 years experienced SPD and cancer survivors were 40 % (20–70 %) more likely to experience SPD than adults who had no history of cancer [17]. An advantage of the present study is that our results further revealed a higher percentage (~14 %) of cancer survivors who reported receiving mental healthcare services. Taken together, our results in combination with findings of the previous studies suggest that routine screening and assessment of psychological distress and mental health disorders through the course of cancer therapy and afterward may be of importance for long-term patient care after cancer diagnosis.

Our results showed that physical activity participation, regardless of whether it met the current recommendations [33], was independently associated with a decreased prevalence ratio for SPD among cancer survivors as shown among adults with no cancer history. Our results further demonstrated that cancer patients who engaged in physical activity were less likely to receive mental healthcare services similar to that seen among adults with no cancer history. Currently, the mechanisms underlying the inverse associations between physical activity and SPD or receiving mental healthcare services as observed in the present study are not clear. However, a growing body of evidence has shown that adoption of healthy lifestyles such as being physically active is associated with improved physical functioning [35-37], improved quality of life [38-41], reduced risks for recurrent or new primary cancer [42], and decreased cancer mortality [42, 43] among cancer patients. Results of other studies including a meta-analysis also showed that exercise interventions had favorable effects on fatigue, depressive symptoms, body image, and health-related quality of life, thereby improving overall psychosocial functioning of breast cancer patients [37, 44, 45]. Thus, the improved physical and psychosocial functioning as well as health-related quality of life attained through physical activity in cancer patients may help explain our findings of overall inverse relationships of physical activity with SPD and receiving mental healthcare services.

The American College of Sports Medicine roundtable on exercise guidelines for cancer survivors indicates that exercise is safe during and after cancer treatments and advises cancer patients to avoid inactivity even among those with active cancers or undergoing difficult treatments [46]. Thus, our findings of the inverse relationships between levels of physical activity and SPD or receiving mental healthcare services suggest that physical activity may have a potential role in the prevention and management of mental distress among cancer survivors, particularly across longer intervals of time. Obviously, this needs to be investigated further in future longitudinal studies and/or physical activity intervention trials.

There are several limitations to acknowledge for the present study. First, all information including cancer status and the measure of psychological distress was self-reported and subject to recall bias. Second, the K-6 questionnaire is a screen of non-specific psychological distress; therefore, the specific type of distress an individual was experiencing could not be determined. Third, the information on cancer stages and treatments were not available in the BRFSS. Finally, although we have demonstrated inverse relationships between physical activity and SPD or receiving mental healthcare services, we are unable

to determine causality due to the cross-sectional design of this study. A meta-analysis has shown that physical exercise interventions have significantly positive effects on depression and health-related quality of life among breast cancer patients and survivors [44]. On the other hand, a prospective survey of colorectal cancer survivors showed that those who experienced higher somatization and anxiety (but not depression) were at greater risk for physical inactivity [47]. Therefore, bidirectional associations between physical activity and psychological distress may have existed.

In conclusion, our findings underscore the importance of routine monitoring and assessment of psychological well-being of cancer survivors. The inverse associations between physical activity and SPD or receiving mental healthcare services among cancer survivors suggest that physical activity may play a role in promoting the mental well-being of cancer survivors. Given the growing number of cancer survivors with an increased cost for cancer treatment [48], it is important to develop effective intervention programs to improve both their physical and mental health.

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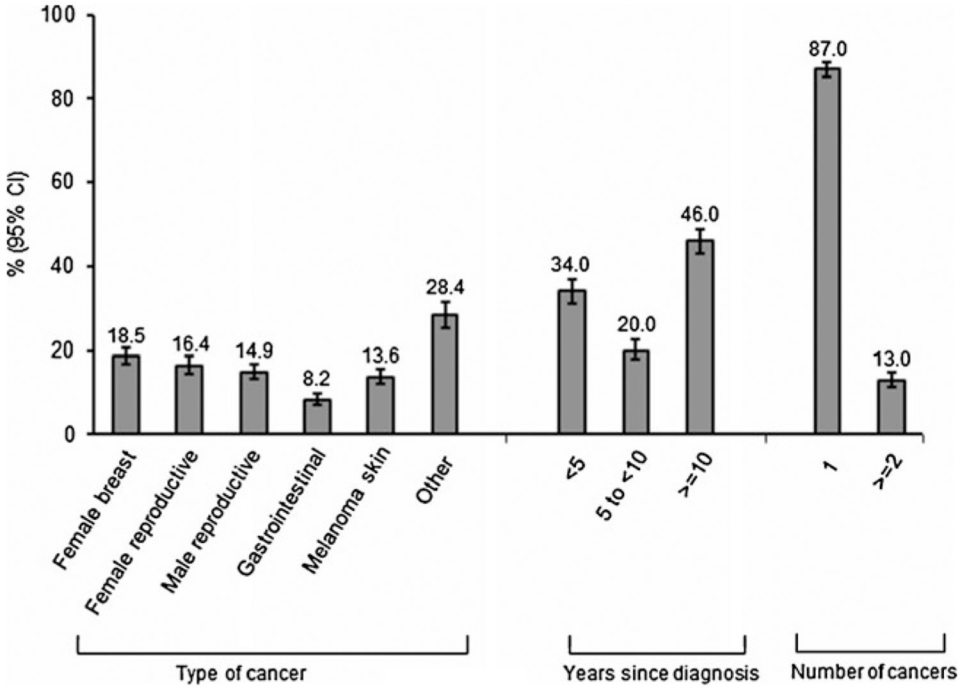

Fig. 1.

Distribution of cancer survivors by type of cancers, years since diagnosis, and the number of cancers, BRFSS 2009

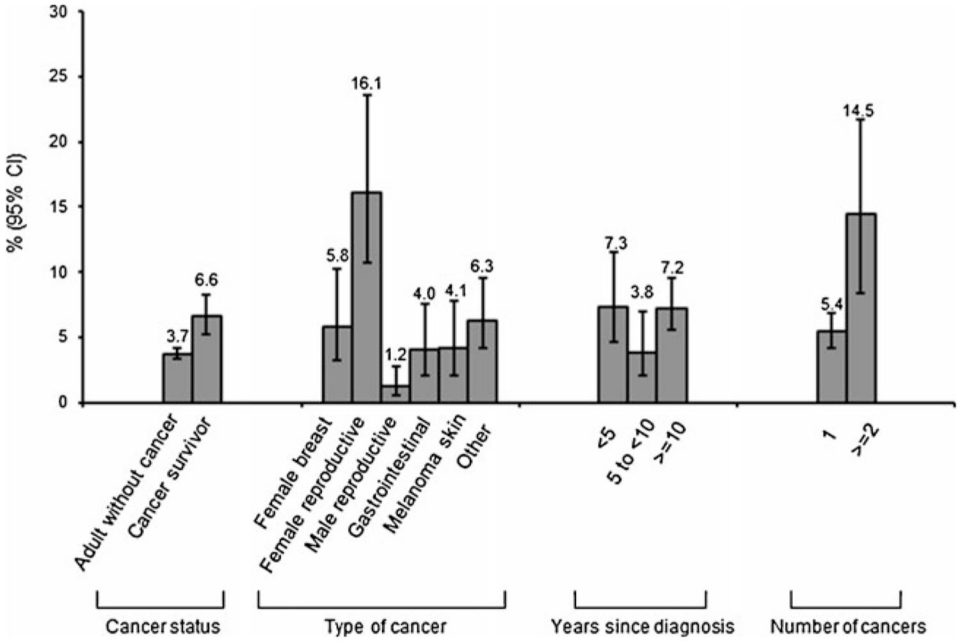

Fig. 2.

Prevalence of serious psychological distress by cancer diagnosis, by type and the number of cancers, and by years since diagnosis, BRFSS 2009

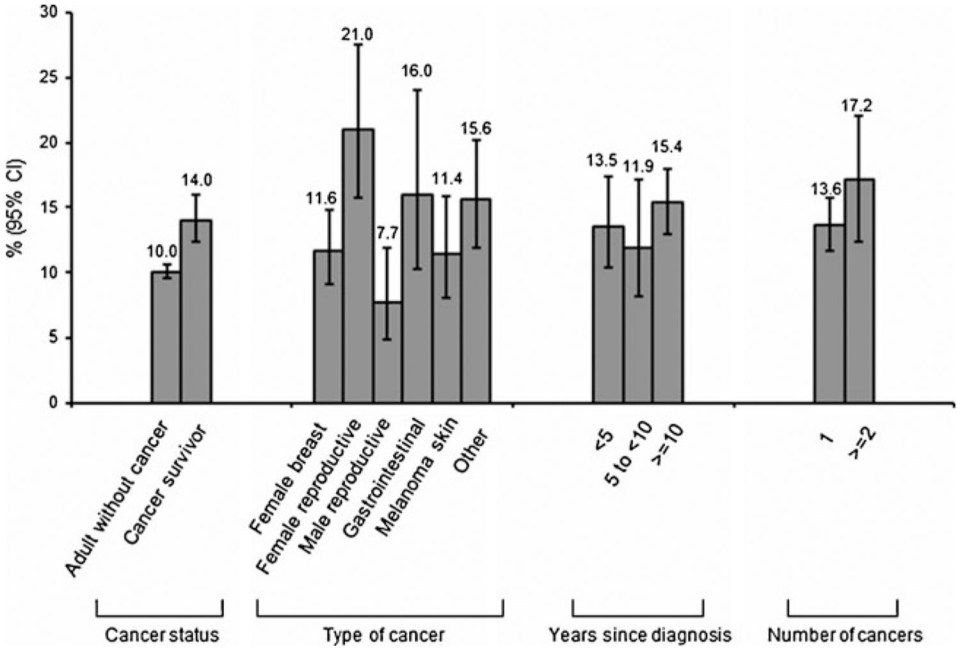

Fig. 3.

Prevalence of receiving mental healthcare services by cancer diagnosis, by type and the number of cancers, and by years since diagnosis, BRFSS 2009

Table 1

Characteristics of cancer survivors (n=4,797) in comparison with adults with no cancer history (n=38,571), BRFSS 2009

	Cancer survivor		Adult with no cancer history		*P* value[a]
	n	**% (95 % CI)**	***n***	**% (95 % CI)**	
Sociodemographic					
Age (years)					<0.001
18–49	627	25.9 (22.7–29.3)	14,703	63.2 (62.3–64.2)	
≥50	4,170	74.1 (70.7–77.3)	23,868	36.8 (35.8–37.7)	
Sex					<0.001
Men	1,701	41.7 (38.7–44.7)	15,025	49.5 (48.4–50.7)	
Women	3,096	58.3 (55.3–61.3)	23,546	50.5 (49.3–51.6)	
Race/ethnicity					<0.001
Non-Hispanic white	3,894	78.3 (75.2–81.1)	27,733	67.2 (66.1–68.3)	
Non-Hispanic black	401	11.5 (9.4–14.0)	5,548	19.5 (18.5–20.6)	
Other	502	10.2 (8.1–12.8)	5,290	13.2 (12.4–14.1)	
Education					0.159
<High school graduate	472	10.6 (9.1–12.3)	3,399	9.0 (8.4–9.7)	
High school graduate	1,440	30.1 (27.5–32.9)	11,590	29.4 (28.4–30.5)	
>High school diploma	2,885	59.3 (56.4–62.1)	23,582	61.5 (60.4–62.6)	
Marital status					0.652
Married	2,675	67.2 (64.5–69.9)	23,084	66.6 (65.5–67.6)	
Not married	2,122	32.8 (30.1–35.5)	15,487	33.4 (32.4–34.5)	
Health behavior and comorbidity					
Physical activity (min/week)					<0.001
0	906	17.2 (15.4–19.3)	5,439	11.3 (10.7–12.0)	
>0 to <150	1,217	26.7 (24.0–29.6)	9,055	23.0 (22.1–23.9)	
≥150	2,674	56.1 (53.1–59.0)	24,077	65.7 (64.6–66.7)	
Current smoking					0.139
Yes	745	17.9 (15.8–20.3)	6,836	19.8 (18.9–20.7)	
No	4,052	82.1 (79.7–84.2)	31,735	80.2 (79.3–81.1)	
Excessive alcohol drinking					<0.001

	Cancer survivor		Adult with no cancer history		*P* value[a]
	n	**% (95 % CI)**	***n***	**% (95 % CI)**	
Yes	381	8.2 (6.8–10.0)	4,971	16.0 (15.1–16.8)	
No	4,416	91.8 (90.0–93.2)	33,600	84.0 (83.2–84.9)	
Body mass index (kg/m^2)					0.761
<25.0	1,754	33.8 (31.2–36.6)	13,467	34.5 (33.4–35.6)	
25.0–29.9	1,776	37.2 (34.3–40.2)	13,953	36.1 (35.0–37.1)	
≥30.0	1,267	28.9 (26.4–31.6)	11,151	29.5 (28.5–30.5)	
Diabetes					<0.001
Yes	807	16.5 (14.7–18.6)	4,384	8.1 (7.6–8.6)	
No	3,990	83.5 (81.4–85.3)	34,187	91.9 (91.4–92.4)	
Coronary heart disease					<0.001
Yes	694	14.7 (12.9–16.7)	3,080	5.2 (4.8–5.6)	
No	4,103	85.3 (83.3–87.1)	35,491	94.8 (94.4–95.2)	
Access to healthcare					
Health insurance					<0.001
Yes	4,536	91.2 (88.7–93.2)	34,151	83.5 (82.5–84.4)	
No	261	8.8 (6.8–11.3)	4,420	16.5 (15.6–17.5)	

[a] Chi-square test

Table 2

Unadjusted prevalence, adjusted prevalence, and adjusted prevalence ratios (with 95 % CIs) for serious psychological distress and receiving mental healthcare services by cancer status and levels of physical activity among adults who resided in eight states of the US, BRFSS 2009

Physical activity (min/week)	*n*	Serious psychological distress			Receiving mental healthcare services		
		Prevalence, % (95 % CI)		APR[a] (95 % CI)	Prevalence, % (95 % CI)		APR[a] (95 % CI)
		Unadjusted	Adjusted[a]		Unadjusted	Adjusted[a]	
Cancer survivor							
0	906	14.9 (10.9–20.0)	12.9 (8.6–17.2)	1.00 (ref)	21.3 (16.2–27.4)	15.6 (11.2–19.9)	1.00 (ref)
>0 to <150	1,217	5.4 (3.5–8.1)	4.9 (2.9–7.0)	0.38 (0.23–0.62)	15.0 (12.0–18.7)	11.8 (9.3–14.4)	0.76 (0.54–1.07)
≥150	2,674	4.6 (2.9–7.3)	5.1 (3.0–7.1)	0.39 (0.24–0.64)	11.3 (9.2–13.9)	10.5 (8.3–12.6)	0.67 (0.48–0.94)
Adult with no cancer history							
0	5,439	7.8 (6.7–8.9)	6.0 (5.0–7.0)	0.47 (0.33–0.66)	16.8 (15.0–18.7)	15.4 (13.6–17.1)	0.99 (0.74–1.32)
>0 to <150	9,055	4.6 (3.7–5.8)	4.5 (3.5–5.4)	0.35 (0.24–0.50)	12.7 (11.4–14.1)	11.5 (10.4–12.7)	0.74 (0.55–0.99)
≥150	24,077	2.6 (2.2–3.1)	2.8 (2.3–3.3)	0.22 (0.15–0.31)	7.9 (7.3–8.6)	8.5 (7.8–9.2)	0.55 (0.41–0.73)

APR adjusted prevalence ratio

[a]Adjusted for age, sex, race/ethnicity, education, marital status, body mass index, current smoking, excessive alcohol drinking, insurance coverage, and having histories of diabetes and coronary heart disease

Table 3

Unadjusted prevalence, adjusted prevalence, and adjusted prevalence ratios (with 95 % CIs) for receiving mental healthcare services by levels of physical activity among different types of cancer survivors, BRFSS 2009

Physical activity (min/week)	*n*	Prevalence, % (95 % CI)		APR[a] (95 % CI)
		Unadjusted	Adjusted[a]	
Among women with breast cancer (*n*=1,102)				
0	202	19.4 (11.8–30.3)	21.9 (10.5–33.3)	1.00 (ref)
>0 to <150	319	10.2 (6.5–15.6)	10.6 (6.4–14.9)	0.49 (0.26–0.91)
≥150	581	9.7 (6.8–13.7)	9.1 (5.9–12.2)	0.42 (0.22–0.78)
Among women with reproductive cancer (*n*=765)				
0	136	40.6 (22.1–62.1)	37.6 (23.4–51.8)	1.00 (ref)
>0 to <150	219	16.6 (11.1–24.2)	17.6 (10.5–24.8)	0.47 (0.28–0.77)
≥150	410	17.8 (12.1–25.4)	17.7 (11.6–23.9)	0.47 (0.29–0.77)
Among men with reproductive cancer (*n*=706)				
0	115	8.4 (3.9–17.0)[b]	–[c]	–
>0 to <150	141	10.0 (4.6–20.2)[b]	–	–
≥150	450	6.8 (3.4–13.1)[b]	–	–
Among adults with gastrointestinal cancer (*n*=448)				
0	104	22.7 (12.1–38.4)	33.8 (14.8–52.9)	1.00 (ref)
>0 to <150	108	15.5 (5.8–35.2)[b]	12.4 (3.2–21.7)[b]	0.37 (0.15–0.88)
≥150	236	13.4 (6.3–21.1)	12.9 (6.9–18.9)	0.38 (0.21–0.70)
Among adults with melanoma skin cancer (*n*=690)				
0	116	10.5 (5.2–19.9)[b]	11.2 (2.2–20.1)[b]	1.00 (ref)
>0 to <150	147	15.6 (7.9–28.4)	15.6 (6.5–24.7)	1.40 (0.52–3.73)
≥150	427	10.2 (6.3–16.2)	10.1 (5.5–14.6)	0.90 (0.36–2.29)
Among adults with any other cancer (*n*=1,086)				
0	233	22.2 (13.8–33.8)	18.7 (8.6–28.8)	1.00 (ref)
>0 to <150	283	19.3 (12.3–29.0)	19.0 (11.0–27.0)	1.02 (0.51–2.03)
≥150	570	11.2 (6.8–17.8)	12.1 (7.1–17.1)	0.65 (0.33–1.26)

APR adjusted prevalence ratio

[a] Adjusted for age, sex (except for sex-specific cancers), race/ethnicity, education, marital status, body mass index, current smoking, excessive alcohol drinking, years since cancer diagnosis, insurance coverage, and having histories of diabetes and coronary heart disease

[b] Estimates did not meet the statistical precision (relative standard error ≤30 %)

[c] Data not reported

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