A Comparison of Chronic Conditions & Health Characteristics between Cancer Survivors and non-Cancer Survivors

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Abstract

Objective—Cancer survivors have unique healthcare needs. An important consideration for survivorship is chronic disease and other health risk factors. The purpose of this study is to describe demographics, risk factors, and comorbid health conditions in adult cancer survivors.

Method—We analyzed 2019 Arizona Behavioral Risk Factor Surveillance System (BRFSS) data to compare cancer survivors to non-cancer controls (i.e., non-cancer survivors) to identify assess differences between the two populations. Adjusted and unadjusted population-based estimates and 95% confidence intervals were calculated, and multivariable logistic regression models were calculated, adjusting for sex, race/ethnicity, and age.

Results—8,920 respondents (1,007 survivors; 7,913 non-cancer survivors) were included. Compared to non-cancer survivors, cancer survivors were more likely to be female, 65 years and older, non-Hispanic white, veterans, and less likely to be employed.

Survivors had higher rates of coronary heart disease, stroke, chronic obstructive pulmonary disease, kidney disease, hypertension, arthritis, multiple chronic conditions, being overweight, and being a former smoker.

Survivors were more likely to report fair/poor health than non-cancer survivors.

Discussion—These findings can be used by healthcare and public health practitioners to evaluate the programmatic efforts and resources, implement targeted interventions towards cancer survivors, and ultimately improve health and quality of life.

Keywords

cancer survivor; BRFSS; chronic conditions; comorbidities; risk factors

Introduction

A cancer survivor is someone who has been diagnosed with cancer, starting from the time of diagnosis to the end of life [1]. There were approximately 17 million cancer survivors alive in the United States in 2019, with nearly 400,000 in Arizona, and these populations are expected to increase as treatment improves and survivors live for many years beyond their diagnosis [2]. Approximately half of cancer survivors have lived 10 years beyond diagnosis [3] and more than 60% of cancer survivors are 65 years of age or older [2, 4]. Cancer survivors have complex health needs that should be taken into consideration when thinking about survivorship care, but these are poorly understood due to limited research [5, 6].

An important consideration for survivorship is the presence of chronic disease and other risk factors. A high prevalence of chronic conditions has been reported amongst cancer survivors [7, 8]. The presence and severity of comorbidities is one of the strongest predictors of early mortality and poorer health-related quality of life among cancer survivors [6]. About two-thirds of cancer patients have at least one comorbid condition present [7], and on average, survivors report having five medical conditions [6]. Diabetes and hypertension have been shown to be the most common chronic conditions present among survivors [4, 9]. Other comorbidities commonly associated with cancer survival include cardiovascular/coronary heart disease, chronic obstructive pulmonary disease (COPD), and osteoarthritis [4, 9]. Long-term cancer survivors (greater than 5 years) often die from cardiovascular disease rather than recurrence of cancer [10].

Health risk behaviors among cancer survivors tend to vary based on geography and demographics [11]. There is a relatively high prevalence of physical inactivity across all cancer types [6]. Nearly a third of cancer survivors report no regular physical activity [11, 12]. Female cancer survivors have been found to be about 30% less likely to meet physical activity recommendations than male cancer survivors [13]. Obesity is a known risk factor for some cancers [14] and high rates of obesity and obesity-related health conditions have been observed among cancer survivors [13]. Approximately 40% of all cancer diagnoses were associated with being overweight or obese [14]. Prevalence of current smokers has been found to be lower among cancer survivors than the general population [10, 15], however, approximately 15% of cancer survivors still report being current smokers [11]. Cancer survivors have also been shown to have lower rates of binge drinking than non-cancer survivors[16].

Cancer survivors have higher rates of healthcare coverage than the general population [5, 17], but approximately 4.5% of cancer survivors were still uninsured in 2017 in Medicaid expansion states [18]. Survivors who were uninsured or with public insurance were more likely to have multiple comorbid chronic conditions [19]. Survivors have higher rates of visits to their primary care provider [5] and care managed by a primary care provider [17], however, they often do not receive recommended yearly preventative care such as regular cancer screenings or influenza vaccination [11].

The Centers for Disease Control and Prevention's (CDC) National Comprehensive Cancer Control Program (NCCCP) provides support to states, territories, and tribes, including the

state of Arizona, to not only help understand the burden and impact of cancer, but to improve cancer survivorship through coalition building and strategic planning [20]. With a population of 7.2 million, Arizona has a higher Hispanic (31.7%) and American Indian population percentage (5.3%), and a lower Black/African American population percentage (5.2%) versus the United States nationally [21]. The purpose of this study is to describe how risk factors and comorbid health conditions differ between adult cancer survivors and non-cancer survivors, using Arizona specific data.

Methods

We analyzed data from the 2019 Arizona Behavioral Risk Factor Surveillance System (BRFSS), a representative, state-based telephone survey where residents aged 18 and over are randomly selected and recruited via landline or cellular telephone [22]. The combined response rate for landline and cell phone samples was 54.7% [23]. Respondents were asked whether they had ever been told by health care professional that they had skin cancer or other types of cancer. We classified respondents who answered "yes" to other types of cancer as cancer survivors, and respondents who answered "no" to this question as non-cancer survivors. Respondents who reported only skin cancer, were unsure of their cancer type, or refused to provide a response to these questions were excluded.

2.1 Demographic Characteristics

We compared the following demographic characteristics among cancer survivors and non-cancer survivors: sex (male or female); age (18–24, 25–34,35–44, 45–54, 55–64, 65+ years of age); race/ethnicity (White, non-Hispanic; Hispanic; Black, non-Hispanic; American Indian/Alaska Native, non-Hispanic; Asian/Pacific Islander, non-Hispanic; Other, non-Hispanic); marital status (married/member of an unmarried couple, not married); education level (did not graduate high school, high school graduate, greater than high school); veteran status (yes or no); employment status (employed, out of work/unable to work, other [homemaker, student, retired]), and household income (less than $15,000; $15,000 to less than $25,000; $25,000 to less than $35,000; $35,000 to less than $50,000; greater than $50,000).

2.2 Comorbidities and Health Risk Behaviors Characteristics

We compared the proportion of cancer survivors and non-cancer survivors who reported comorbid conditions, were obese, current cigarette smokers, or binge drinkers. Respondents were asked whether they had ever had any of the following chronic diseases: angina/coronary heart disease; stroke; asthma; chronic obstructive pulmonary disease (COPD)/emphysema/chronic bronchitis; kidney disease; diabetes; hypertension; and arthritis. We created a summary variable for multiple chronic conditions to indicate how many of the previous conditions each respondent had ever been told they had. If a respondent was missing at least one of these responses, they were excluded from this variable.

Body mass index (BMI) categories were calculated based on respondents' reported height and weight: underweight (<18.5 kg/m^2), normal weight (18.5 - < 25.0), overweight (25.0 - < 30.0), and obesity (30.0). Current smokers were adults who smoked 100 cigarettes

in their lifetime and said they currently smoke cigarettes every day or some days. Former smokers were adults who smoked 100 cigarettes in their lifetime but said they currently did not smoke. Never smokers were adults who never smoked a cigarette or who smoked <100 cigarettes in their lifetime. Male respondents were classified as binge drinkers if they reported having 5 drinks on one occasion and female respondents were coded as binge drinkers if they reported having 4 drinks on one occasion in the past 30 days.

2.3 Health Care Characteristics

We compared the proportion of cancer survivors and non-cancer survivors who reported access, utilization, and barriers to seeking healthcare. Respondents were asked to describe their general health and were subsequently grouped into two categories: excellent/very good/good and fair/poor. They were asked whether or not they had health insurance or coverage, a personal doctor or healthcare provider (0, 1, or > 1), and if cost had prohibited them from seeking medical care in the past year. Respondents were asked the length of time since their last medical checkup and answers were categorized as <1 year, 1–2 years, or >2 years.

2.4 Statistical Analysis

We used SAS survey procedures (SAS version 9.4, SAS Institute Inc., Cary, North Carolina, USA) to account for the complex sampling design of BRFSS. Weights and strata were used to provide population-based estimates, while 95% confidence intervals (CIs) and chi-square test statistics were used to allow for informal comparisons between cancer survivors and non-cancer survivors. Multivariable logistic regression models were then run for all chronic conditions, health risk behaviors, and healthcare characteristics, adjusting for sex, race/ethnicity, and age, using the SURVEYLOGISTIC procedure in SAS. Differences were considered statistically significant if the confidence intervals of the estimates did not overlap [24]. Chi-square test statistics and p-values from the logistic regression models were provided for reference. Prevalence estimates were not provided if the sample size was less than 20. Given that deidentified data from public sources were used, this secondary data analysis was considered exempt from institutional review board approval.

3 Results

3.1 Demographic Characteristics

Of the 8,941 respondents who were included in the BRFSS dataset, 8,920 answered whether they had ever been diagnosed with cancer (excluding skin cancer) during the study period. Among Arizona adults, 7.5% reported being cancer survivors (n= 1,007, Table A.1). Cancer survivors were significantly more likely to be female (59.8%) than non-cancer survivors (49.9%) [Figure 1, Table A.1]. Cancer survivors were significantly more likely to be aged 65 and over (60.5%) compared to non-cancer survivors (20.2%), while non-cancer survivors were significantly more likely to be aged 35–44 than cancer survivors (16.9% and 5.8%, respectively). Cancer survivors were significantly more likely to be non-Hispanic White (72.4%) than non-cancer survivors (57.2%), Cancer survivors were significantly more likely to be veterans (19.7%) than non-cancer survivors (10.9%). Cancer survivors were significantly less likely to be currently employed (27.4%) than non-cancer survivors (58.0%).

3.2 Comorbidities and Risk Factor Characteristics

Compared with non-cancer survivors, cancer survivors more often reported angina/coronary heart disease (16.4% vs. 5.6%, respectively), stroke (9.2% vs. 3.0%), COPD (18.8% vs. 5.7%), kidney disease (12.6% vs. 3.5%,), diabetes (20.6% vs. 10.1%,), hypertension (53.6% vs. 30.8%), and arthritis (47.0% vs. 21.7%) [Figure 2, Table A.2]. Cancer survivors were more likely to have three or more chronic conditions (34.0%) than non-cancer survivors (11.4%). After adjusting for race/ethnicity, sex, and age, diabetes was no longer statistically significantly different between cancer survivors and non-cancer survivors.

Cancer survivors reported being overweight (41.6%) significantly more often than non-cancer survivors (33.8%). Cancer survivors were also significantly more likely to be a former smoker (40.6%) than non-cancer survivors were (25.1%). Cancer survivors were less likely to report binge drinking (5.7%) than non-cancer survivors (15.8%). After adjusting for race/ethnicity, sex, and age, BMI and binge drinking were no longer statistically significantly different between cancer survivors and non-cancer survivors.

3.3 Health Care Characteristics

Compared with non-cancer survivors, cancer survivors were significantly less likely to self-report having good or better overall health (65.5% vs. 82.4%, respectively) [Figure 3, Table A.3]. However, compared with non-cancer survivors, cancer survivors were significantly more likely to report having health insurance (94.4% vs. 84.5%, respectively), one personal healthcare provider (79.2% vs. 64.2%, respectively), and a medical checkup within the past year (84.8% vs. 72.6%, respectively). After adjusting for race/ethnicity, sex, and age, having health insurance, having one personal healthcare provider, and having a medical checkup within the past year were no longer statistically significantly different between cancer survivors and non-cancer survivors.

Discussion

More individuals than ever before are living long after a cancer diagnosis, and public health and healthcare professionals need to better understand their specific healthcare needs and risk factors. This study represents the first state-level assessment of risk factors and chronic health conditions of adult cancer survivors in Arizona. This study found several significant differences in demographics, chronic conditions and risk factors, and healthcare characteristics in cancer survivors compared to non-cancer survivors.

Cancer survivors were more often older, female, or White, non-Hispanic compared to non-cancer survivors, similar to other past studies [7, 25, 26]. This study also found more cancer survivors who were veterans, compared to non-cancer survivors. This might be due to the differences in age, and risk factors of US veterans compared to the general population [27]. Cancer survivors less often identified as being currently employed, however, this might be due to the majority older population of cancer survivors [4]. Cancer survivors might also have an overall higher rate of unemployment or early retirement than non-cancer survivors due to physical limitations [26].

Our study found cancer survivors had higher rates of coronary heart disease [28], COPD [8, 25], hypertension [5], and arthritis [8, 28] than non-cancer survivors. A previous study demonstrated cancer survivors commonly report an increased number of chronic conditions both before and after a cancer diagnosis [6]. At least one previous study did not find any significant differences of the same comorbid conditions between survivors and non-survivors, with the exception of osteoarthritis (a subtype of arthritis), which was found to be less frequently associated with survivors than those without cancer [9]. This study found that cancer survivors were more likely to have multiple chronic conditions than non-cancer survivors, as in previous studies [5, 19]. The prevalence of chronic conditions in cancer survivors may also be associated with age, as the majority of cancer survivors are over the age of 65 [4]. Some studies found very few differences in incidence of chronic conditions among cancer and non-cancer patients [25, 29] when adjusting for age. In our study, many differences remained, even after adjustment. Although survivors have been found to have higher rates of certain chronic conditions than non-cancer survivors, these might be overlooked when providing survivorship care.

Engaging in health-related behaviors can prevent chronic disease [30]. Unlike previous studies, our study observed no significant difference in current smoking status between cancer and non-cancer survivors [12]. Tobacco cessation and prevention and regular physical activity have been shown to prevent recurrence of cancer and decrease the risk for comorbid conditions [11, 14]. Cancer survivorship care, in addition to managing existing conditions, should include lifestyle recommendations, such as diet, exercise, and tobacco cessation, to reduce the risk of additional comorbidities and improve survival and quality of life among survivors [11, 14].

Utilization of and access to routine healthcare can reduce the occurrence of lifetime chronic health conditions [14, 31]. Access to care often varies by demographic characteristics (e.g., race, ethnicity, age, sex) [32], and lower socioeconomic classes are disproportionately uninsured [33]. Our findings did not show a significant difference in health insurance rates, medical checkups, or having a personal healthcare provider after adjusting for age, sex, and race/ethnicity. Our findings agree with past literature [13, 17] that survivors are less likely to report having good or better overall health [28]. Nearly two-thirds of cancer survivors report lacking a summary of their cancer treatment, and about a quarter report no clear instructions on follow-up care [11]. A quarter of survivors report no discussion of strategies to improve health, exercise, or diet with their physician [34]. The Institute of Medicine recommends cancer survivors and their primary care providers receive a written survivorship care plan that outlines what occurred during treatment and a comprehensive care summary that outlines a plan for follow-up care [35]. The intent is to assist in bridging the gaps in care during the transition from oncological to primary care [35]. However, there are currently low levels of adoption of survivorship care plans within oncology [36], and primary care providers have reported insufficient knowledge of cancer survivor issues to provide appropriate follow-up care on their own [37].

This study is not without limitations. First, BRFSS data are self-reported and subject to limitations associated with these types of data collection instruments, including recall bias and social desirability bias. However, studies have found BRFSS findings to be reliable and valid [38]. Second, the 2018 BRFSS data for Arizona did not include the specific type of

cancer for cancer survivors [5, 8, 13, 16], and even if this data were available, small sample sizes would have prevented in-depth analyses. Third, this is a cross-sectional study that cannot establish temporality of the relationships between chronic conditions and cancer. Fourth, this study was intentionally limited to Arizona cancer survivors, and might not be generalizable to other states or the United States. Fifth, due to survival bias, respondents might have survived cancer for many reasons, including early cancer detection or being engaged in more positive health behaviors, and may not be representative of overall cancer experience in Arizona or the United States. BRFSS may also underrepresent vulnerable or hard to reach populations, such as residents of institutions and long-term care facilities, leading to potential underestimations in disparities in health outcomes [39]. Studies with a focus on survivorship and populations not captured in BRFSS would be useful in deepening understanding of the issues faced by cancer survivors.

Implications for Practice and/or Policy and Research

The findings of this current study can be used by a variety of healthcare and public health practitioners to evaluate the current state of programmatic efforts and resources, as well as implement targeted interventions towards cancer survivors. The Arizona Cancer Coalition, supported by the NCCCP, could use these findings to help further current goals in the new Arizona 2020–2024 Cancer Control Plan, such as increasing the percentage of patients who receive a treatment summary plan or survivorship care plan. Other states could emulate this study with state-specific data, and findings could help support deepening the collaboration between cancer coalitions, health care systems, providers, tobacco cessation groups, communities, work sites, and nutrition and physical activity groups to promote healthy lifestyle changes for survivors, especially among socioeconomically disadvantaged individuals and communities [14]. With a growing number of cancer survivors with unique health-related needs, it is vital that states address those needs, to ultimately improve survivors' health and quality of life.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Funding:

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 or the Arizona Department of Health Services.

Availability of Data and Material:

The limited dataset for the Arizona BRFSS that was used for this analysis is available through the Arizona Department of Health Services.

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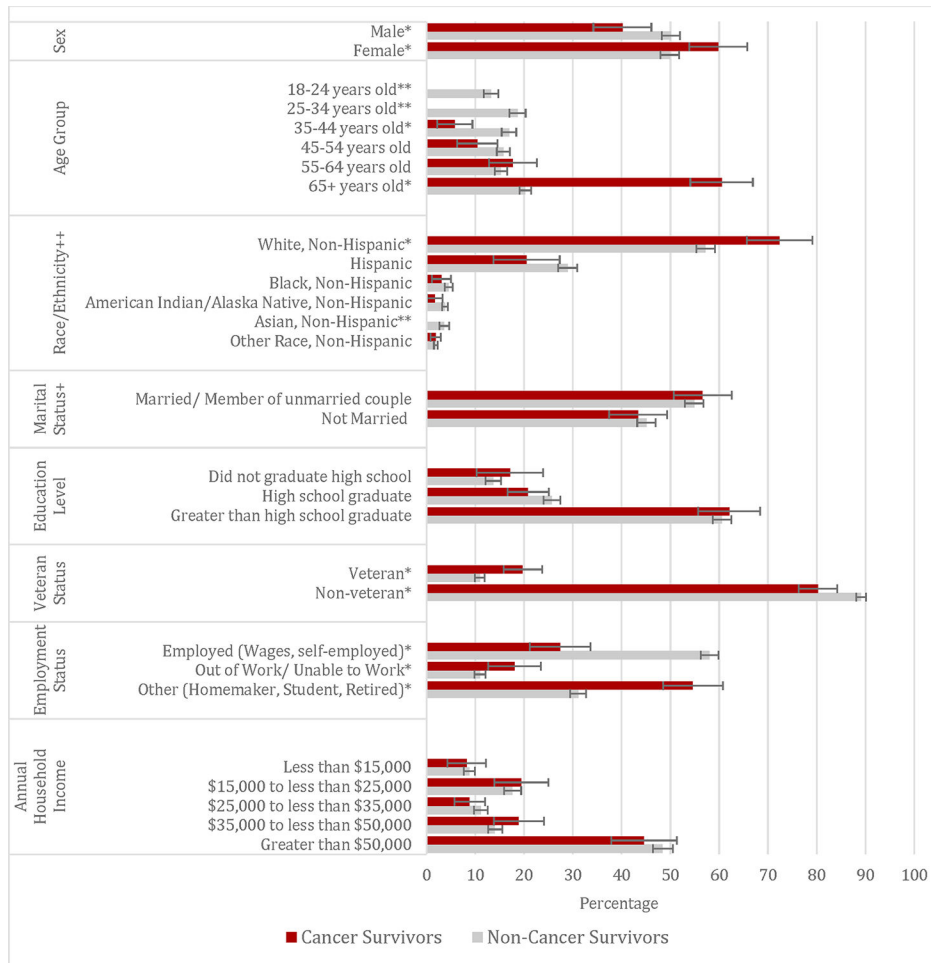
Figure 1.

Comparison of demographic characteristics between non-cancer survivors (n=7,913) and cancer survivors (n= 1,007) with 95% confidence intervals, Behavioral Risk Factor Surveillance System, Arizona, 2019

* statistical significance, based on non-overlapping confidence intervals

** small sample size for one group so data suppressed and no comparison made

+ Not Married variable includes: Divorced, widowed, separated, never married

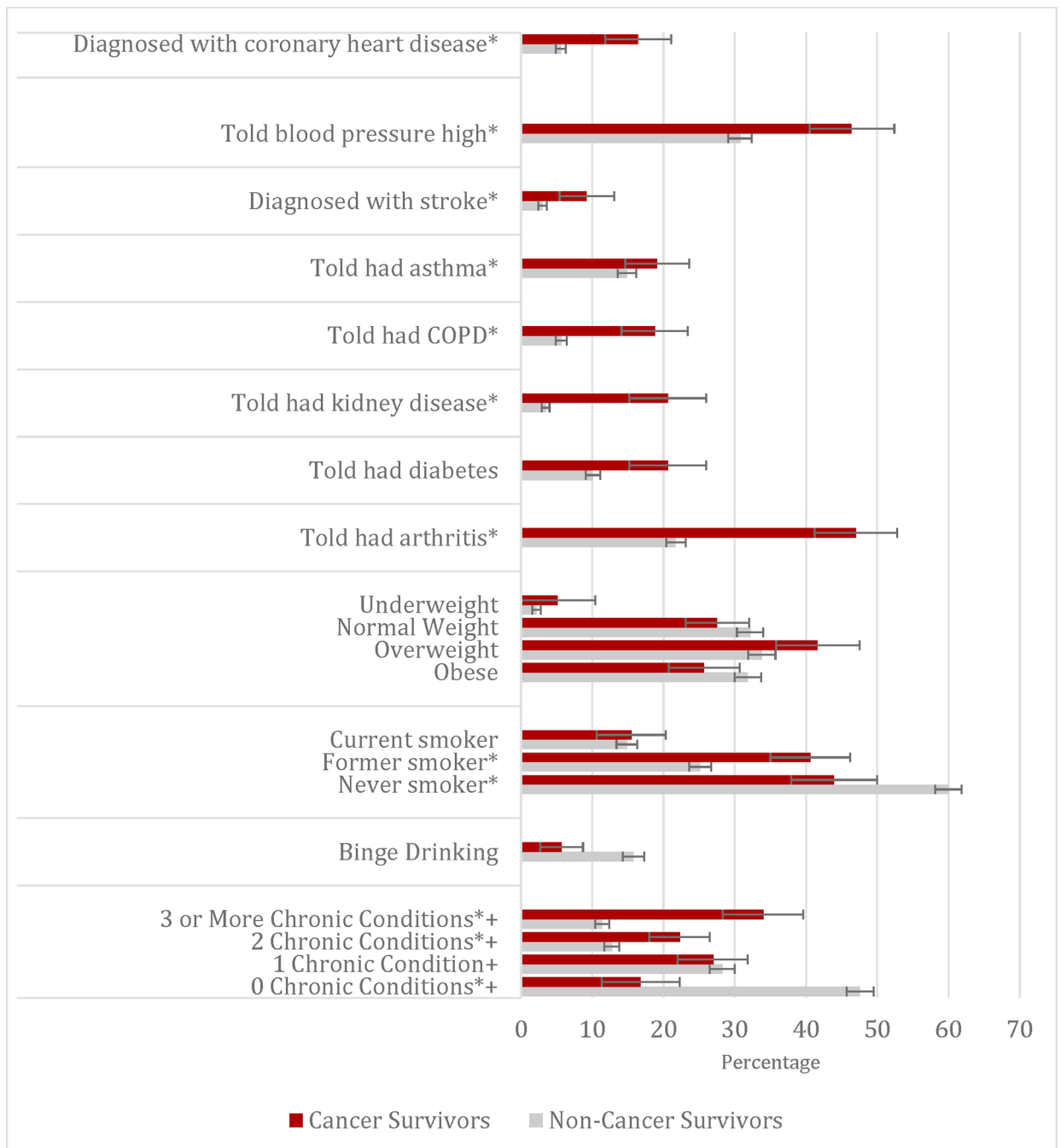++ Other Race, Non-Hispanic includes: NHPI, non-Hispanic; other race, non-Hispanic; multiracial, non-Hispanic

Figure 2.
Comparison of comorbidities and risk factors between non-cancer survivors (n=7,913) and cancer survivors (n= 1,007) with 95% confidence intervals, Behavioral Risk Factor Surveillance System, Arizona, 2019

*= statistical significance, based on multivariable logistic regression models adjusted for sex, age, and race/ethnicity

+= Multiple Chronic Conditions variable includes: Angina/Coronary Heart Disease; Hypertension; Stroke; Asthma; COPD; Kidney Disease; Diabetes; Arthritis
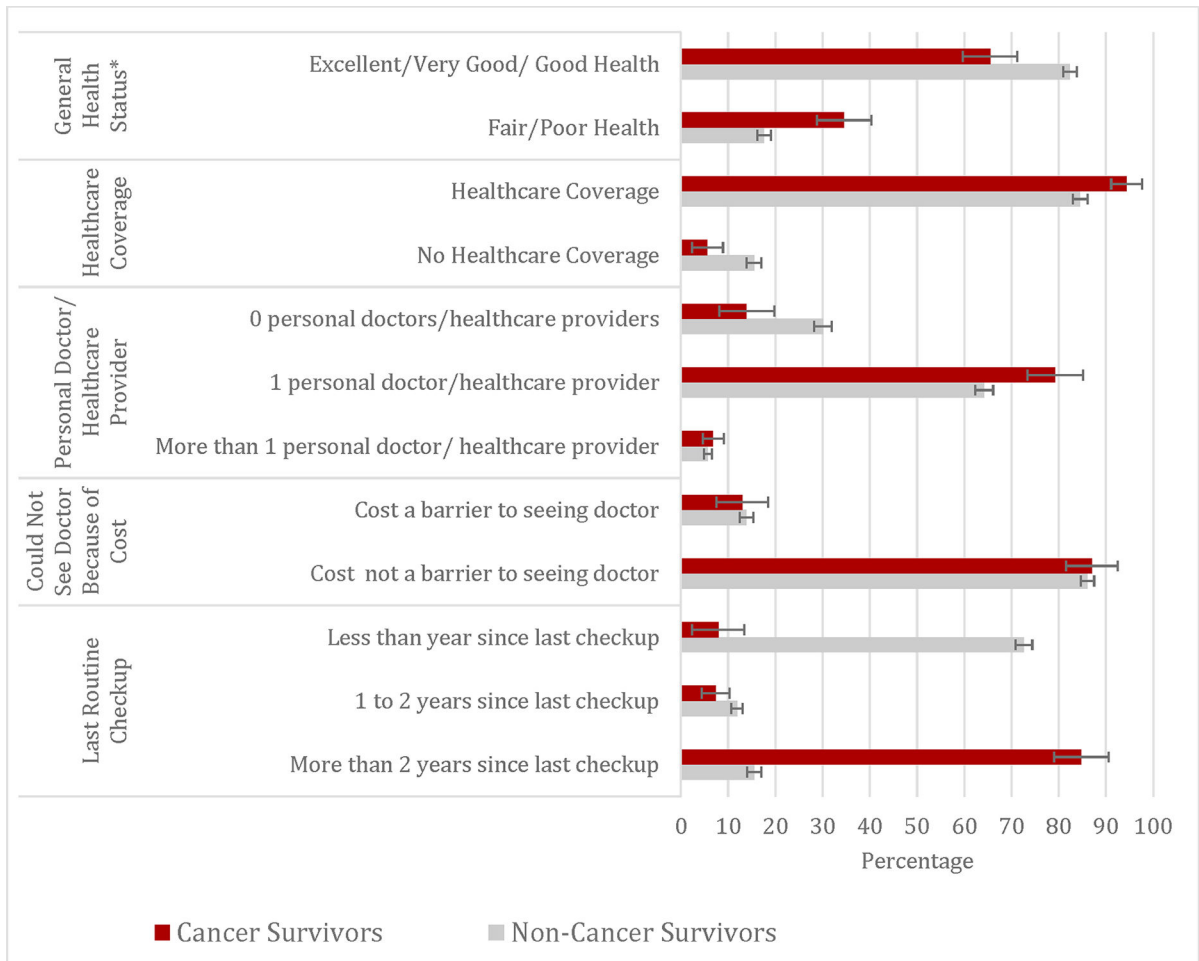
Figure 3.
Comparison of health care characteristics among non-cancer survivors (n=7,913) and cancer survivors (n=1,007), with 95% confidence intervals, Behavioral Risk Factor Surveillance System, Arizona, 2019
*= statistical significance, based on multivariable logistic regression models adjusted for sex, age, and race/ethnicity