

Use of 2001-2002 Behavioral Risk Factor Surveillance System Data to Characterize Cancer Survivors in North Carolina

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OBJECTIVE We used Behavioral Risk Factor Surveillance System (BRFSS) data to examine demographic characteristics, health status, quality of life, and preventive health behaviors among adult cancer survivors in North Carolina.

METHODS We analyzed responses to state-added questions on cancer survivorship and to standard BRFSS questions concerning health status, quality of life, and health behaviors, including access of preventive services associated with cancer prevention and early detection, from the 2001 and 2002 North Carolina BRFSS.

RESULTS Cancer survivors were more likely than individuals with no self-reported history of cancer to be women (62.7% vs 51.3%), white (80.8% vs 70.3%), aged 65 years or older (48.7% vs 13.8%), and up to date with colorectal cancer screening (66.4% vs 52.4%); as likely to be current smokers (28.0% vs 26.2%); and more likely to report poor or fair health status (28.2% vs 17.2%). Cancer survivors reported lower quality of life, measured as the number of physically and mentally unhealthy days in the previous 30 days.

LIMITATIONS This was a cross-sectional survey that relied on self-reported history of cancer, healthy behaviors, and use of preventive services.

CONCLUSIONS Data from a statewide, population-based survey can be used to assess unmet needs of cancer survivors. Comprehensive cancer-control programs should be able to design interventions and monitor progress of state cancer-survivorship goals.

There were an estimated 11 million cancer survivors in the United States in 2006 [1]. The number of US cancer survivors has increased, in part, because of earlier detection and better treatments. As cancer patients live longer, their well-being has become an increasingly important public health issue, which a number of agencies and organizations have begun to address. For example, in 2004, the Centers for Disease Control and Prevention (CDC), in conjunction with the Lance Armstrong Foundation, the American Cancer Society, and other partners, published an action plan that identifies and prioritizes the needs of cancer survivors and proposes strategies for addressing them [2]. The Institute of Medicine of the National Academies published a report in 2005 that recommends that each cancer survivor receives a survivorship plan that summarizes information about long-term care and maintenance of a healthy lifestyle [3].

It is important to understand the behaviors and characteristics of cancer survivors, including their lifestyle, health status, health-related quality of life, use of preventive health services (eg, cancer screening and immunizations), and access to health care (eg, whether they have health insurance and a usual health care professional). However, there are few data sources available at the local and state level to monitor these behaviors and characteristics. Most reports provide information at the national level [4, 5].

The CDC's National Comprehensive Cancer Control Program (NCCCP) funds efforts by all 50 states, the District of Columbia, 7 tribes/tribal organizations, and 7 territories

and US Pacific Island jurisdictions, to develop and implement comprehensive cancer-control programs [6]. Since most of the programs address issues associated with cancer survivorship [7, 8], they need local, population-based data sources to plan and evaluate the impact of survivorship-related activities.

The CDC's Division of Cancer Prevention and Control seeks to enhance state-level data for NCCCP-funded program planning. We used 2001 and 2002 Behavioral Risk Factor Surveillance System (BRFSS) data from North Carolina to describe the demographic and health characteristics of cancer survivors and the association of certain health behaviors, quality of life, use of preventive services, and access to health care with cancer survivorship. The results of this analysis will enhance the CDC's ability to help fund programs identify survivorship-related needs.

Methods

The BRFSS collects data annually, using telephone-based interviews of noninstitutionalized adults (defined as people aged ≥ 18 years) who are selected for participation by means

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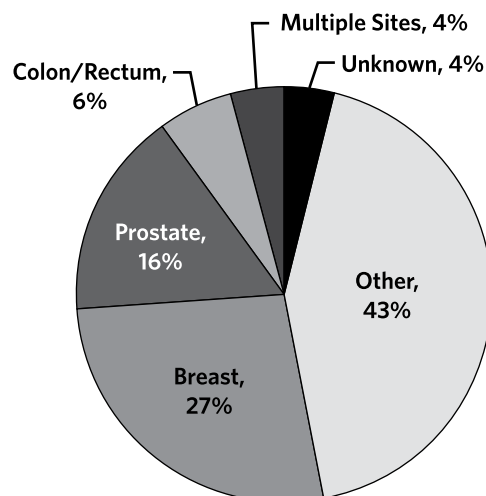
of random digit dialing. Interviews are conducted by health departments in all 50 states, the District of Columbia, and select US territories (ie, Guam, Puerto Rico, and the US Virgin Islands) to monitor the health status of their populations. Overall response rates in North Carolina for 2001 and 2002 BRFSS surveys were 56.2% and 61.6%, respectively.

BRFSS participants in North Carolina were asked state-added questions related to cancer survivorship, beginning with the question, "Have you ever been told by a doctor, nurse, or other health professional that you had cancer?" Response options were "yes," "no," and "don't know/not sure." Respondents who answered "yes" were then asked, "What type of cancer was/is it?" Response options were "breast [cancer]," "colorectal [cancer]," "skin cancer," "other," and "don't know/not sure." Respondents were allowed to choose more than 1 response. Survivors of prostate cancer were identified in the core BRFSS questionnaire in the section on prostate cancer screening; these men were then prompted to answer the state-added questions about any additional cancers. Data from state-added questions were collected only in 2001 and 2002.

We combined North Carolina BRFSS data for 2001 and 2002 and applied final survey weights to produce adjusted estimates for the entire North Carolina population. We also created a variable indicating cancer survivorship that was based on responses to the initial state-added question on cancer history and to the BRFSS core-module question on prostate cancer. Respondents who reported "don't know/not sure" or did not answer these questions were excluded from the analysis. We also excluded cancer survivors who reported a history of skin cancer only, because we could not differentiate between melanoma and nonmelanoma skin cancer. We considered respondents who reported ever having been told they had any form of cancer (other than skin cancer) to be cancer survivors. For all cancer survivors, we calculated the percentage who reported each type of cancer (breast [among women only], colorectal, prostate [among men only], and other), the percentage who reported multiple types of cancer, and the percentage whose cancer type was unknown. We calculated the prevalence of a history of cancer among all adults aged 40 years or older.

We also compared the distribution of the following demographic characteristics among cancer survivors with those among adults who had never had cancer: age (<50 years, 50-64 years, ≥65 years, or unknown), race/ethnicity (non-Hispanic white, non-Hispanic black, or other), sex (male or female), education level (less than high school graduate, high school graduate or more, or unknown), employment status (employed for wages, out of work/unable to work, other, retired, or unknown), marital status (currently married/living together, not currently married, or unknown), and weight status expressed as body mass index (BMI [defined as the weight in kilograms divided by the square of the height in meters]; underweight [BMI, <19.0], normal weight [BMI, 19.0-24.9], overweight [BMI, 25.0-29.9], or obese [BMI, ≥30.0]).

FIGURE 1.
Cancer Sites Reported by 817 Cancer Survivors, North Carolina Behavioral Risk Factor Surveillance System, 2001-2002



Note. Data are for respondents aged 18 years or older (weighted N = 332,239). The "unknown" category includes responses of "don't know/not sure."

In addition, we compared the distribution of the following health indicators among adult cancer survivors with those among adults who had never had cancer: self-reported health status (excellent, very good, good, fair, or poor), disability status (severe, moderate, mild, or none), any leisure-time physical activity in the previous 30 days (yes or no), health-related quality of life (number of physically unhealthy days and number of mentally unhealthy days in the previous 30 days [9]), smoking status (current smoker, former smoker, or never), alcohol consumption in the previous 30 days (yes or no), receipt of influenza vaccine in the previous 12 months (yes or no), and recent cancer screening (yes or no). Breast cancer screening was determined for women 40 years or older and was considered recent if mammography was performed in the previous 2 years. Cervical cancer screening was determined for all women with no hysterectomy and was considered recent if a Papanicolaou (Pap) smear was performed in the previous 3 years. Colorectal cancer screening was determined for participants 50 years or older and was considered recent if an endoscopic examination was performed within the previous 5 years or if a fecal occult blood test was performed within the previous year. A 5-year interval was chosen for endoscopy since we could not determine whether respondents had undergone sigmoidoscopy or colonoscopy. Prostate cancer screening was determined for men 50 years or older and was considered recent if a prostate-specific antigen test was performed within the previous 2 years. Cancer survivors who reported having had breast, prostate, or colorectal cancer were excluded from calculation of recent-screening rates for their type of cancer. However, because the survey did not ask women whether they had ever been told they had cervical cancer, we were

TABLE 1.
Demographic Characteristics of 817 Cancer Survivors and
11,374 Individuals Reporting “No Cancer,” North Carolina
Behavioral Risk Factor Surveillance System, 2001-2002

Characteristic	Cancer, % ± SE	No cancer, % ± SE	P
Age			<.001
<50 y	25.3 ± 2.7	64.7 ± 0.6	
50-64 y	25.5 ± 2.4	20.7 ± 0.5	
≥65 y	48.7 ± 2.9	13.8 ± 0.4	
Sex			<.001
Male	37.3 ± 3.0	48.7 ± 0.7	
Female	62.7 ± 3.0	51.3 ± 0.7	
Race/ethnicity			<.001
Non-Hispanic white	80.8 ± 2.2	70.3 ± 0.7	
Non-Hispanic black	12.8 ± 1.9	18.4 ± 0.6	
Other ^a	6.3 ± 1.4	11.3 ± 0.5	
Marital status			<.001
Currently married/ living together	58.6 ± 2.7	62.1 ± 0.7	
Not currently married	41.4 ± 2.7	37.6 ± 0.7	
Education level			.39
Less than high school graduate	19.5 ± 2.2	16.4 ± 0.6	
High school graduate or more	80.2 ± 2.2	83.4 ± 0.6	
Employment			<.001
Employed for wages	31.8 ± 2.8	65.4 ± 0.7	
Out of work/unable to work	15.7 ± 2.2	9.1 ± 0.4	
Other	6.4 ± 1.2	10.5 ± 0.4	
Retired	46.1 ± 2.8	14.8 ± 0.4	

Note. For most characteristics, the “unknown” category, which includes responses of “don’t know/not sure,” has been suppressed. Therefore, percentages may not total 100%. SE, standard error.

^aIncludes persons who responded “Hispanic,” “Native American/Alaska Native,” “Asian/Pacific Islander,” “Other,” or “Unknown Race.”

unable to identify cervical cancer survivors and thus also unable to exclude these women from calculations for recent Pap testing.

We also compared health care access among cancer survivors with that among individuals with no cancer history, including whether they had current health insurance coverage, whether they had a personal health care professional (defined as 1 professional, >1, or none), and whether they felt that cost restricted their ability to see a physician.

For most analyses, we excluded survey participants who either did not respond or responded “don’t know/not sure” to a particular question. We used SAS with SUDAAN (Cary, NC) to account for the BRFSS’s complex sampling design. χ^2 testing was used in all analyses, to determine whether differences by cancer status were statistically significant (defined as a P value of < .05).

We used logistic regression analysis to produce adjusted percentages (ie, predicted marginals [10]), which is a

method of standardization that produces a weighted average for each level of the health variable of interest. This method allows for comparison between cancer survivors and individuals with no cancer history as if both groups had the same demographic characteristics. Separate models were fit with each health variable as the dependent variable, while controlling for age, race/ethnicity, sex, employment status, and cancer status as independent variables. We used multinomial logistic regression if the categorical dependent variable of interest had more than 2 levels. Multivariate linear regression was used to estimate the mean number of physically and mentally unhealthy days by cancer status, adjusted for age, race/ethnicity, sex, and employment status. P values were calculated by use of the Wald F test.

To estimate the percentage of North Carolinians who were up to date with recommended cancer screening and influenza vaccination, we used a logistic regression model in which screening or vaccination status (up to date vs not up to date) was the dichotomous dependent variable and sex (for colorectal cancer screening only), race/ethnicity, employment status, general health status (collapsed into excellent/very good/good health vs fair/poor health), health insurance coverage, history of cancer (no vs yes), and age group were the independent variables. Age group categories were 50-64 years versus 65 years or older, for colorectal and prostate cancer screening; 40-50 years and 50-64 years versus 65 years or older, for breast cancer screening; and less than 50 years and 50-64 years versus 65 years or older, for cervical cancer screening. P values were obtained from general linear contrasts by comparing estimated adjusted proportions of recent-screening status for cancer survivors with those for respondents with no cancer history. We used the same procedure to obtain adjusted estimates, stratified by age group, for the percentage of North Carolina adults who received influenza vaccination in the previous 12 months. In the logistic regression model, the age groups for respondents aged less than 50 years of age were 18-39 years and 40-49 years, and for those aged 50 years or older, the age groups were 50-64 years and 65 years or older.

Results

In 2001 and 2002, 817 respondents reported being cancer survivors. We estimated that, among all adult North Carolina cancer survivors (excluding those with skin cancer), 27% had breast cancer, 16% had prostate cancer, 6% had colorectal cancer, 4% had multiple cancers, and 43% had another type of cancer (reported as “other”) (Figure 1). The prevalence of cancer survivorship among North Carolina residents aged 40 years or older was 8.9% (standard error, ±0.5%) (data not shown). Compared with adults who had never had cancer, cancer survivors were more likely to be 65 years or older (48.7% vs 13.8%), female (62.7% vs 51.3%), and non-Hispanic white (80.8% vs 70.3%) and were less likely to be employed for wages (31.8% vs 65.4%) (Table 1). Individuals with no cancer history were more likely to be currently mar-

ried or living as married than were cancer survivors ($P < .001$). Education level was not associated with cancer history.

Although the unadjusted prevalence of each behavioral risk factor was significantly associated with cancer history, none of these associations remained statistically significant after we adjusted for age group, sex, race/ethnicity, and employment status (Table 2). The prevalence of current smoking among cancer survivors increased from 22.4% to 28.0% after we adjusted for these factors, and it was similar to the prevalence for individuals with no cancer history (26.4% vs 26.2%; $P = .70$). The estimated prevalence of

participation in leisure-time physical activity among cancer survivors increased and was similar to the estimate for individuals with no cancer history (69.7% vs 72.6%; $P = .26$). Cancer survivors drank alcohol at a prevalence similar to that of individuals with no cancer history ($P = .48$).

In the adjusted model, estimated values for health status, health-related quality of life, and disability variables differed significantly by cancer history (Table 2), including the prevalence of fair to poor health (28.2% among cancer survivors vs 17.2% among individuals with no cancer history; $P < .001$), mean number of physically unhealthy days in the previous

TABLE 2.
Behavioral Risk Factors and Health-Status Measures for 817 Cancer Survivors and 11,374 Individuals Reporting "No Cancer," North Carolina Behavioral Risk Factor Surveillance System, 2001-2002

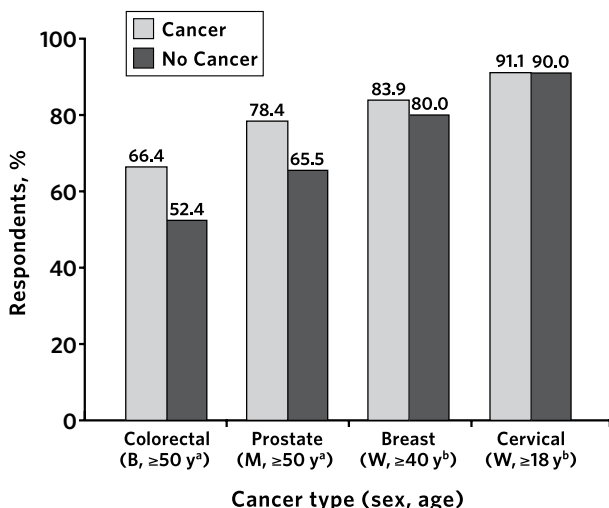
Characteristic	Unadjusted prevalence			Adjusted prevalence ^a		
	Cancer	No cancer	P	Cancer	No cancer	P
Smoking status			.004			.70
Current	22.4 ± 2.6	26.4 ± 0.7		28.0 ± 3.3	26.2 ± 0.7	
Former	32.6 ± 2.7	23.0 ± 0.6		24.3 ± 2.4	23.6 ± 0.6	
Never	44.2 ± 2.8	50.3 ± 0.7		47.6 ± 3.0	50.2 ± 0.7	
Leisure-time physical activity in past 30 d			.008			.26
Yes	64.7 ± 2.8	72.8 ± 0.7		69.7 ± 2.6	72.6 ± 0.6	
No	35.3 ± 2.8	27.1 ± 0.6		30.3 ± 2.6	27.4 ± 0.6	
Consumed alcohol in past 30 d			<.001			.48
Yes	27.5 ± 2.3	41.9 ± 0.7		39.5 ± 3.1	41.7 ± 0.7	
No	71.2 ± 2.4	57.1 ± 0.7		60.5 ± 3.1	58.3 ± 0.7	
Body mass index ^b			.05			.65
<19 (underweight)	3.6 ± 0.9	3.1 ± 0.2		3.3 ± 0.8	3.2 ± 0.2	
19-24.9 (normal weight)	36.4 ± 2.7	35.3 ± 0.7		35.8 ± 2.8	35.5 ± 0.7	
25-29.9 (overweight)	34.1 ± 2.7	33.4 ± 0.7		34.5 ± 2.8	33.4 ± 0.7	
≥30 (obese)	22.5 ± 2.5	21.8 ± 0.6		22.3 ± 2.7	21.9 ± 0.6	
Unknown	3.3 ± 0.9	6.4 ± 0.4		4.0 ± 1.1	6.0 ± 0.4	
Self-reported health status			<.001			<.001
Excellent	8.7 ± 1.4	21.8 ± 0.6		13.8 ± 2.1	21.5 ± 0.6	
Very good	21.1 ± 2.2	33.4 ± 0.7		28.8 ± 2.8	33.1 ± 0.7	
Good	25.4 ± 2.5	28.0 ± 0.7		29.2 ± 2.9	28.1 ± 0.7	
Fair	21.9 ± 2.6	11.3 ± 0.5		16.6 ± 2.2	11.5 ± 0.5	
Poor	22.4 ± 2.4	5.4 ± 0.3		11.6 ± 1.2	5.7 ± 0.3	
Health-related quality of life						
Physically unhealthy days, no.	8.3 ± 0.7	3.3 ± 0.1	<.001	6.4 ± 0.6	3.4 ± 0.1	<.001
Mentally unhealthy days, no.	3.9 ± 0.5	2.6 ± 0.1	.02	3.7 ± 0.5	2.6 ± 0.1	.058
Consider yourself to have a disability			<.001			.003
Yes						
Mild	7.4 ± 1.4	4.4 ± 0.3		5.5 ± 1.1	4.5 ± 0.3	
Moderate	13.4 ± 2.4	4.1 ± 0.2		8.7 ± 1.9	4.3 ± 0.3	
Severe	10.5 ± 1.6	4.7 ± 0.3		6.0 ± 0.9	4.9 ± 0.3	
No	66.6 ± 2.8	86.1 ± 0.5		79.7 ± 2.1	86.3 ± 0.5	

Note. Data are percentages ± standard error, unless otherwise indicated. For most characteristics, the "unknown" category, which includes responses of "don't know/not sure," has been suppressed. Therefore, percentages may not total 100%. SE, standard error.

^aAdjusted for race/ethnicity, sex, age, and employment status.

^bDefined as the weight in kilograms, divided by the square of the height in meters.

FIGURE 2.
Recent Cancer Screening Among Cancer Survivors
and Individuals Reporting "No Cancer," North Carolina
Behavioral Risk Factor Surveillance System, 2001-2002



Note. See Methods for definitions of "recent." All screening rates except those for cervical cancer screening exclude individuals who reported cancer at the specified site. Rates are adjusted for the following demographic characteristics: age, sex (when appropriate), race/ethnicity, employment status, general health status, and insurance status. B, women and men; M, men; W, women.

^aStatistically significantly different ($P < .05$).

^bData are from 2002 only.

30 days (6.4 vs 3.4; $P < .001$), mean number of mentally unhealthy days in the previous 30 days (3.7 vs 2.6; $P = .058$), and self-reported disability of any severity (20.2% vs 13.7%; $P = .003$).

We also found that cancer survivors had a significantly higher prevalence of recent screening for prostate cancer and colorectal cancer than did adults with no cancer history (Figure 2). For example, among respondents aged 50 years or older, the adjusted rate of colorectal cancer screening was 66.4% among cancer survivors and 52.4% among individuals with no cancer history. However, the prevalence of recent screening for breast cancer and cervical cancer did not differ significantly by cancer history. Although a greater proportion of cancer survivors reported receipt of influenza vaccination, the adjusted estimate for cancer survivors aged 50 years or older was only 59.3% (Figure 3).

We found that cancer survivors were as likely as adults with no cancer history to have health insurance (84.9% vs 84.4%; $P = .87$) but were more likely to have seen more than one health care professional (28.3% vs 15.1%; $P < .001$) (Table 3).

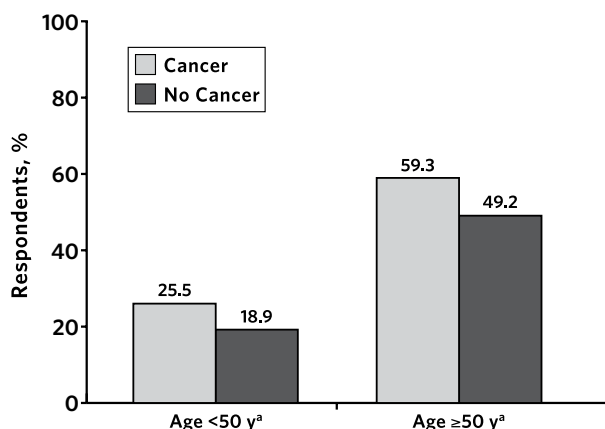
Discussion

We undertook this study to describe the demographic and health characteristics of North Carolina cancer survivors and the association of cancer survivorship with certain health behaviors, quality of life, use of preventive services, and access to health care, using statewide, population-based

data. Although cancer prevalence can be measured by cancer registries [11], measures of cancer survivors' life experiences can be ascertained only by talking to the survivors. Cancer survivorship has emerged as a major public health issue, focusing attention on the needs of this subpopulation [12, 13]. The *North Carolina Comprehensive Cancer Plan* [13], for example, includes complementary goals of increasing the prevalence of healthful behaviors and decreasing the prevalence of risky behaviors in the general population, as well as among cancer survivors.

By use of North Carolina BRFSS data collected in 2001 and 2002, we were able to assess various health measures among cancer survivors, compared with those among individuals with no cancer history, including healthy behaviors, access to care, and use of preventive services associated with cancer prevention and early detection. Similar to others, we found that cancer survivors perceived themselves as having a lower quality of life than did individuals without cancer, including poorer health status and more mentally and physically unhealthy days. Our finding that 28.2% of cancer survivors considered themselves to be in fair or poor health was similar to results from the 2000 National Health Interview Survey (NHIS), in which 26.6% of cancer survivors reported fair or poor health status [14]. A previous study that used CDC's Healthy Days measures for adult cancer survivors showed that survivors who reported activity limitations due to cancer were more likely to report more physically and mentally unhealthy days, compared with survivors who reported no activity limitations [9]. Hudson and colleagues [15] similarly found that survivors of cancer during childhood reported more physically and mentally unhealthy days than did their siblings.

FIGURE 3.
Receipt of Influenza Vaccine in the Past 12 Months Among
Cancer Survivors and Individuals Reporting "No Cancer,"
by Age, North Carolina Behavioral Risk Factor Surveillance
System, 2001-2002



Note. Rates are adjusted for the following demographic characteristics: age, race/ethnicity, sex, employment status, general health status, and insurance status.

^aStatistically significantly different ($P < .05$).

TABLE 3.
Access to Health Care for 817 Cancer Survivors and 11,374 Individuals Reporting “No Cancer,” North Carolina Behavioral Risk Factor Surveillance System, 2001-2002

Characteristic	Unadjusted prevalence, % ± SE			Adjusted prevalence, % ± SE		
	Cancer	No cancer	P	Cancer ^a	No cancer ^b	P
Health insurance coverage			.002			.87
Yes	90.2 ± 1.8	83.9 ± 0.6		84.9 ± 2.6	84.4 ± 0.6	
No	9.5 ± 1.7	15.8 ± 0.6		15.1 ± 2.6	15.6 ± 0.6	
Have personal physician or HCP			<.001			<.001
Yes, only 1	62.4 ± 2.6	64.2 ± 0.7		62.1 ± 3.0	64.6 ± 0.7	
Yes, >1	32.0 ± 2.5	14.9 ± 0.5		28.3 ± 2.3	15.1 ± 0.5	
No	5.2 ± 1.3	20.7 ± 0.7		9.6 ± 2.4	20.3 ± 0.6	
Restricted from seeing physician because of cost			.85			.79
Yes	10.1 ± 1.8	9.8 ± 0.4		10.3 ± 1.7	9.8 ± 0.4	
No	89.4 ± 1.8	90.0 ± 0.4		89.7 ± 1.7	90.2 ± 0.4	

Note. For most characteristics, the “unknown” category, which includes responses of “don’t know/not sure,” has been suppressed. Therefore, percentages may not total 100%. HCP, health care professional; SE, standard error.

^aWeighted to the population distribution.

^bAdjusted for race/ethnicity, sex, age, and employment status.

Even though cancer survivors have been shown to be at increased risk of developing second cancers [16], we found that the adjusted prevalence of 3 cancer risk factors (ie, current smoking, physical inactivity, and alcohol use) was similar to that for individuals with no cancer history. In the unadjusted model, cancer survivors were less likely to be current smokers, to engage less frequently in leisure-time activity, and to consume alcohol within the past 30 days than were individuals with no cancer history. However, after we adjusted for age, race/ethnicity, sex, and employment, prevalence estimates for current smoking increased by 5%; for leisure-time activity, by 5%; and for alcohol consumption, by 12%. These results are similar to those from other studies, showing that cancer survivors are just as likely as are individuals with no cancer history to engage in behaviors associated with an increased risk for cancer [5, 17]. Results from previous studies have also shown that smoking cessation and increased exercise are associated with lower rates of cancer recurrence [18-20].

Since cancer survivors are at a higher risk for developing second cancers, screening for cancers that can be detected early is critical. Similar to others, we found that cancer survivors reported higher rates of recent screening for breast, colorectal, and cervical cancer than did adults with no cancer history [17, 21]. However, we were unable to determine whether survivors who should receive screening at earlier ages because of past treatments did so, because the North Carolina BRFSS asked only about a limited set of cancers [22]. Given that many cancer survivors are at risk for developing influenza and pneumonia and associated complications, immunizations are recommended for this group [23-25]. We found that cancer survivors were more likely to report having received an influenza vaccination in the previous 12 months than were individuals with

no cancer history. However, only 59.3% of cancer survivors 50 years or older received influenza vaccination during the past 12 months, even though it is recommended for the general population [23, 26]. Among cancer survivors younger than 50 years old, only 25.5% had been vaccinated in the previous 12 months.

Given the higher burden of chronic disease and disability among cancer survivors, access to health care is a priority for this population [4]. We estimated that 15.1% of cancer survivors in North Carolina had no health insurance; this finding was similar to the estimate of 15.6% among US cancer survivors that was reported by Sabatino and colleagues [5], using NHIS data. We also found that cancer survivors were more likely to have a personal health care professional and to have more than one health care professional than were adults with no cancer history. This finding was expected, since cancer patients continue to receive multidisciplinary care delivered by multiple health care professionals. In a previous study, cancer survivors continued to see their oncologist after they had completed their cancer treatment [26].

The NCCCP will use these findings to understand the behaviors and characteristics of cancer survivors, as well as to design and deliver interventions to encourage and reinforce healthful behaviors by cancer survivors and to discourage them from engaging in risky behaviors. The immediate postdiagnosis period has been described as the “teachable moment” when cancer patients tend to be most receptive to messages about improving their health behaviors. Health care professionals have a relatively controlled environment in which to deliver these messages, and the logistical barriers to some interventions are low [18, 27]. Study findings can be shared with health care professionals to capitalize on the rare opportunity to coordinate their actions and

take advantage of this teachable moment by providing their patients information, resources, and support to reduce risky behaviors, such as accessing the North Carolina Tobacco Cessation Quitline [28], and by reinforcing healthy behaviors, such as initiating the conversation about appropriate cancer screening and vaccination.

Comprehensive cancer programs can also use the study findings to help coordinate efforts to determine which health care professionals should be aware of cancer survivors' risks and needs, which should deliver messages encouraging survivors to make healthful behavioral changes, and which should provide the patients' follow-up care. The NCCCP and other cancer programs have many opportunities to broadly disseminate the information we presented in this report, including developing and disseminating resources for physicians [29], hosting Web sites (eg, NC Cancer [available at <http://www.nccancer.com>]) that provide cancer information for physicians and cancer survivors [30], and supporting patient-physician-researcher informational exchanges (eg, the Annual North Carolina Survivorship Summit). Until coordinated systems are developed to ensure that cancer survivors have access to high-quality survivorship care, professionals from a broad spectrum of health care areas should be educated about behaviors associated with cancer risk, cancer survivors' risk for secondary cancers, and opportunities these professionals may have to meet cancer survivors' unique needs [3].

Our findings are subject to several limitations. First, because participation in the BRFSS requires a landline telephone, our results may be biased by the exclusion of persons who cannot afford telephones and of individuals who use only cellular telephones [31]. Second, because BRFSS data are based on self-reports by survey participants, results may be subject to recall bias. Studies have shown, however, that BRFSS survey findings are both reliable and valid [32, 33]. Third, our reliance on self-report of cancer history may have led to misclassification of participants' cancer status [2, 34]. Prevalence estimates from North Carolina's cancer registry, for example, have shown that prostate cancer is underreported by BRFSS survey participants [11, 35]. A fourth limitation is that, because BRFSS survey response rates in North Carolina were only 56.2% and 61.6% for the years of the study, our results could have been biased by any substantial differences between people who chose to participate and those who did not. Our results were also limited by a lack of information about the characteristics of the cancers that survey participants reported, including time since diagnosis, stage at diagnosis, and phase of care at the time of the survey, each of which has been shown to affect health-related quality-of-life measures [15]. Since these data are 9-10 years old, current patterns may differ from those during 2001-2002.

Despite these limitations, we have shown that BRFSS data from North Carolina can be used to assess the health behaviors and special needs of cancer survivors and to gen-

erate information useful in designing programs that meet those needs. With the number of cancer survivors increasing nationwide, assessing the needs of these survivors and designing health-promotion programs to meet those needs will be imperative [27]. The BRFSS questions for cancer survivors, which were introduced nationwide in the 2009 BRFSS survey, will complement state-specific survivorship questions and enhance state efforts to generate baseline estimates that can be used for program planning and monitoring of interventions targeting cancer survivors. **NCMJ**

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