

Forgoing Medical Care Because of Cost

Assessing Disparities in Healthcare Access Among Cancer Survivors Living in the United States

Kathryn E. Weaver, PhD, MPH^{1,2}; Julia H. Rowland, PhD¹; Keith M. Bellizzi, PhD, MPH³; and Noreen M. Aziz, MD, PhD¹

BACKGROUND: Many US cancer survivors live years after diagnosis, which emphasizes the importance of healthcare access for survivors. It is not known whether having cancer has an impact on disparities in healthcare access that are present in the general population. The objective of this study was to examine the prevalence of forgoing care because of financial concerns in a representative sample of US adults to determine whether cancer history and race/ethnicity are associated with the likelihood of forgoing medical care. **METHODS:** Data from the US National Health Interview Survey (NHIS) from 2003 to 2006 were used to identify 6602 adult cancer survivors and 104,364 individuals who had no history of cancer. Self-reports of forgoing medical care services because of cost were analyzed according to cancer history and race/ethnicity using multivariate logistic regression. **RESULTS:** The prevalence of forgoing care because of cost among cancer survivors was 7.8% for medical care, 9.9% for prescription medications, 11.3% for dental care, and 2.7% for mental healthcare. Cancer survivors aged <65 years were more likely to delay or forgo all types of medical care compared with adults who did not have a history of cancer. Hispanic and black cancer survivors were more likely to forgo prescription medications and dental care than white survivors. Disparities among cancer survivors largely were reflective of those in the general adult population. **CONCLUSIONS:** More than 2 million US cancer survivors did not get 1 or more needed medical services because of financial concerns during the studied period. Future research needs to examine the impact of forgoing care on survivors' quality of life and survival. *Cancer 2010;000:000-000. Published 2010 by the American Cancer Society.**

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In the United States, there are approximately 12 million adults who have a history of cancer, commonly referred to as cancer survivors.¹ Access to timely cancer-related and noncancer-related medical care is an important issue for this growing population. Medical needs of cancer survivors include surveillance for primary recurrence and second malignancies, monitoring for chronic and late effects, treatment for other medical comorbidities, mental health services, and general preventive care.² Hewitt and colleagues³ reported that, relative to adults who had no history of cancer, survivors were more likely to be in fair or poor health and to have functional limitations. Survivors also were more likely to consult physician specialists and to use supportive medical services.

Despite their great need for medical services, cancer survivors may experience barriers to accessing care. Cancer treatment may result in financial hardship^{4,5} and an inability to afford medical copayments, prescription medications, and medical services perceived as nonessential (eg, dental and mental healthcare). In addition, cancer-related employment changes^{3,6} may result in loss of health insurance coverage, and survivors who qualify for government insurance may lose this coverage once their initial treatment is complete. However, 1 investigation of insurance coverage⁷ concluded that cancer survivors aged ≤65 years were no more likely to be uninsured than adults of similar age, sex, and race/ethnicity.

Previous examinations of healthcare use among cancer survivors primarily have used administrative databases like the Surveillance, Epidemiology, and End Results (SEER)-Medicare database.⁸⁻¹⁰ Although they are informative, these

Corresponding author: Kathryn E. Weaver, PhD, MPH, Department of Social Sciences and Health Policy, Division of Public Health Sciences, Wake Forest University School of Medicine, Medical Center Boulevard, Winston-Salem, NC 27157; Fax: (336) 716-7554; keweaver@wfubmc.edu

¹Office of Cancer Survivorship, Division of Cancer Control and Population Sciences, National Cancer Institute, National Institutes of Health, Department of Health and Human Services, Bethesda, Maryland; ²Cancer Prevention Fellowship Program, Office of Preventive Oncology, National Cancer Institute, Bethesda, Maryland; ³Department of Human Development and Family Studies, University of Connecticut, Storrs, Connecticut

Kathryn Weaver's current address: Department of Social Sciences and Health Policy, Division of Public Health Sciences, Wake Forest University School of Medicine, Winston-Salem, North Carolina.

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studies are limited, because they include only older cancer survivors and cannot elucidate reasons for forgoing medical care, such as financial concerns. There are also differences in healthcare access between older and younger survivors, suggesting the need to examine financial barriers to care separately by age group.

The objective of the current study was to examine the prevalence of forgoing healthcare services because of cost among adults with a history of cancer using a nationally representative, population-based sample of US adults. Hispanic and non-Hispanic black survivors were compared with non-Hispanic white survivors to determine whether rates of forgoing care differed among ethnic groups. Finally, disparities in forgoing care were compared between cancer survivors and the general adult population to determine whether the magnitude of disparities differed as a function of cancer history.

MATERIALS AND METHODS

Source of the Data

Analyses used data from the National Health Interview Survey (NHIS),¹¹ an annual, in-person, nationwide survey of approximately 30,000 to 40,000 households in the civilian, noninstitutionalized population that is used to track trends in illness and disability in the United States. We combined data from the surveys from 2003 through 2006 to obtain a sample of cancer survivors with sufficient power for cancer versus noncancer history comparisons. The NHIS uses a complex survey design that involves clustering, stratification, and multistage sampling.¹¹ Each survey year represents a different sample, and blacks and Hispanics are over sampled. The final response rate for the adult sample ranged from 69% to 74.2% in the years studied.¹²

Participants

We defined cancer survivors as those individuals who reported a history of cancer. Of the 117,881 individuals aged ≥ 18 years who were surveyed across the 4 years, cancer history was unknown for 210 individuals, and they were excluded from our analysis. We also excluded participants who reported only nonmelanoma skin cancer ($n = 1147$) or “unknown” skin cancer ($n = 669$) and those survivors ($n = 161$) and adults without a history of cancer ($n = 4728$) who reported non-Hispanic “other” race/ethnicity. This resulted in an analytic sample of 6602 cancer survivors and 104,364 adults without a history of cancer.

Measures

Demographic and health status characteristics

Age, sex, race/ethnicity, cancer site, insurance coverage, and comorbid medical conditions were assessed during the individual and household interviews. Insurance coverage was categorized as public (eg, Medicaid, state health insurance programs, military healthcare, or Medicare without supplemental coverage) or private coverage (eg, health maintenance organization or preferred provider with or without Medicare coverage), based on the National Center for Health Statistics recommended recoding variables,¹² with no insurance coverage added for those aged < 65 years. A very small proportion of individuals (0.9%) aged ≥ 65 years reported having no health insurance coverage. We selected self-reported noncancer comorbidities that likely would require medical attention in the previous 12 months (the time frame for forgoing care) from the comorbidities available on the NHIS. These included hypertension (diagnosed on 2 or more occasions), coronary artery disease (ever), stroke (ever), emphysema (ever), asthma (current), ulcer (during the past 12 months), diabetes (ever, excluding gestational diabetes), “chronic bronchitis” (during the past 12 months), “weak or failing kidneys” (during the past 12 months, not including kidney stones, bladder infections, or incontinence), “liver conditions” (in the previous 12 months), and arthritis/joint pain (ever diagnosed, includes arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia). Individuals who had 1 or more comorbidities were compared with those who had no comorbidities. For the purpose of this report, Hispanic refers to individuals of Hispanic or Latino heritage of any race, white refers to non-Hispanic white individuals, and black refers to non-Hispanic black individuals. Self-reported education (highest level completed) was used as a proxy for socioeconomic status, because approximately 25% of cases were missing household income information. The association between self-reported income and education was very strong (Cochran-Mantel-Hanzel test for trend: $F = 4463$; $P < .0001$).

Healthcare access

Participants were asked, “During the past 12 months, was there any time when you needed medical care but did not get it because you could not afford it?” Delayed medical care was assessed with the question, “During the past 12 months, have you delayed seeking medical care because of worry about the cost?” Finally, to assess nonreceipt of prescription medicines, mental healthcare or counseling, and dental care (including

check-ups), participants were asked, "During the past 12 months, was there any time when you needed any of the following, but didn't get it because you couldn't afford it?" Possible response options for each item included: "yes," "no," "don't know," and "refused." The latter 2 options were considered to be missing data.

Data Analysis

All analyses were conducted using SUDAAN software (Research Triangle Institute, Research Triangle Park, NC) to account for the complex sampling design of the survey. The sampling strategies that were used to create the NHIS sample, such as stratification, clustering, and over sampling of certain ethnic groups, result in individuals having different probabilities of selection. Failure to account for this by incorporating sampling weights (which would be the case with simple linear regression) would result in biased estimates of model parameters and variances. We examined models stratified by age (aged <65 vs ≥65 years). The primary coefficients of interest were race/ethnicity (2 dummy codes that reflected the comparison between Hispanic or black and white groups), cancer history, and the interaction between race/ethnicity and cancer history. A statistically significant interaction would indicate that the effect of race/ethnicity was larger or smaller in cancer survivors compared with the general adult population. To illustrate significant interactions, we calculated the odds ratios (ORs) for Hispanic and black cancer survivors, and white cancer survivors served as the reference group. All tests of statistical significance were 2-sided with the *P* value set at .05. In addition, we calculated national estimates for the number of cancer survivors forgoing or delaying different types of care by multiplying the frequency of each forgoing care outcome by the sum of the weights to obtain population estimates.

RESULTS

Characteristics of the Sample

Self-reported demographic characteristics stratified by age and cancer history are shown in Table 1. Survivors and adults without a cancer history differed on several characteristics because of differences in age and patterns of cancer incidence. Hispanics and blacks were under represented in the cancer survivor samples, probably because of younger age, lower cancer incidence, and lower cancer survival rate. For the cancer survivor sample, the most common cancer sites included breast (18.6%), prostate (12.5%), cervix (9.0%), colon (6.9%), skin (mela-

noma; 7.6%), and uterus (5.4%). Multiple cancers were reported by 11.2% of cancer survivors. These did not mirror patterns of cancer incidence due to differences in survival according to disease site. Most cancer survivors (58.8%) were >5 years out from their cancer diagnosis, 5.2% were at <1 year postdiagnosis, and 36% were at 1 to 5 years postdiagnosis. Survivors who were diagnosed before age 18 years comprised 4.3% of the sample.

Prevalence of Nonreceipt of Medical Services Because of Cost by Cancer Survivors

The prevalence of forgoing or delaying care because of cost by cancer survivors was 7.8% (95% confidence interval [CI], 7.1%-8.6%) for forgoing medical care, 10.7% (95% CI, 9.8%-11.6%) for delaying medical care, 9.9% (95% CI, 9.1%-10.8%) for forgoing prescription medication, 11.3% (95% CI, 10.4%-12.2%) for forgoing dental care, and 2.7% (95% CI, 2.3%-3.2%) for forgoing mental healthcare. The prevalence of forgoing 1 or more medical services was 17.6% (95% CI, 16.6%-18.8%). Prevalence estimates stratified by ethnic group are shown in Figure 1. In the total sample, Hispanic and black cancer survivors were more likely to forgo prescription medications (Hispanics: OR, 2.14; 95% CI, 1.52-3.00; blacks: OR, 1.87; 95% CI, 1.38-2.54) and dental care (Hispanics: OR, 2.31; 95% CI, 1.68-3.17; blacks: OR, 1.57; 95% CI, 1.18-2.10) than white survivors. Hispanic survivors also were more likely to forgo medical care compared with white survivors (OR, 1.55, 95% CI, 1.05-2.29). There were no significant differences by ethnic group for forgoing mental healthcare or delaying medical care.

By using weights calculated to reflect sampling design and poststratification adjustment for sex, age, and race/ethnicity, it is possible to obtain national estimates for the outcomes. The frequency count for each outcome was multiplied by the sum of the weights to approximate the total population. Weighted numbers suggest that approximately 893,000 cancer survivors did not get medical care, 1.22 million delayed medical care, 1.12 million did not get prescription medications, 1.28 million did not get dental care, and 310,000 did not get mental healthcare because of cost. The weighted population estimate is that 2,002,000 cancer survivors did not get 1 or more medical service because of financial concerns.

Forgoing Care by Cancer Survivors Compared With the General Population

Cancer survivors aged <65 years were 1.49 to 1.95 times more likely (all *P* < .05) to forgo or delay medical services

Table 1. Demographic Characteristics of Adults With and Without a History of Cancer by Age^a

Characteristic	Ages 18 to 64 Years				Aged ≥65 Years			
	Cancer Survivors, n=3141		Adults Without Cancer, n=86,961		Cancer Survivors, n=3461		Adults Without Cancer, n=16,403	
	No.	WT% (95% CI)	No.	WT% (95% CI)	No.	WT% (95% CI)	No.	WT% (95% CI)
Sex								
Men	878	31.6 (29.6-33.5)	39,760	49.8 (49.4-50.2)	1479	47.7 (45.7-49.6)	6397	40.8 (39.9-41.7)
Women	2263	68.4 (66.5-70.4)	47,201	50.2 (49.8-50.6)	1982	52.3 (50.4-54.3)	11,006	59.2 (58.3-60.1)
Age, y								
<40	650	20.8 (19.3-22.5)	42,388	49.5 (49.0-50.0)	—	—	—	—
40 to <50 y	697	23.3 (21.5-25.1)	21,192	24.6 (24.3-25.0)	—	—	—	—
50 to <65	1794	55.9 (53.9-57.9)	23,381	25.9 (25.5-26.3)	—	—	—	—
65 to <80	—	—	—	—	2302	68.0 (66.1-69.8)	12,639	74.7 (73.9-75.5)
Age ≥80	—	—	—	—	1159	32.0 (30.2-33.9)	4764	25.3 (24.5-26.1)
Ethnicity								
Non-Hispanic, white	2487	85.8 (84.6-87.0)	54,752	72.1 (71.4-72.7)	2958	90.0 (88.8-91.1)	13,209	83.1 (82.2-83.9)
Hispanic	306	6.1 (5.4-7.0)	18,308	15.0 (14.6-15.6)	197	3.9 (3.3-4.7)	1857	7.2 (6.7-7.8)
Non-Hispanic, black	348	8.0 (7.1-9.1)	13,901	12.9 (12.4-13.4)	306	6.1 (5.2-7.0)	2337	9.7 (9.0-10.4)
Education								
<High school	458	13.5 (12.0-15.1)	14,802	15.0 (14.6-15.5)	922	24.1 (22.5-25.8)	5378	28.3 (27.5-29.2)
High school/GED	899	29.4 (27.6-31.4)	24,123	29.0 (28.5-29.5)	1074	32.2 (30.2-34.3)	5692	34.4 (33.4-35.4)
>High school, <Bachelors degree	970	30.6 (28.7-32.6)	26,174	30.7 (30.2-31.1)	782	23.5 (21.8-25.3)	3342	20.2 (19.4-21.0)
>Bachelors degree	794	26.4 (24.6-28.3)	20,876	25.3 (24.8-25.8)	646	20.1 (18.5-21.9)	2689	17.1 (16.4-17.9)
Insurance status								
Private health insurance	2032	69.8 (67.8-71.7)	56,503	69.7 (69.2-70.2)	2133	64.1 (62.1-66.1)	9743	59.7 (58.7-60.7)
Public health insurance	680	17.7 (16.2-19.4)	10,970	10.3 (10.0-10.6)	1315	35.7 (33.7-37.7)	7456	39.4 (38.3-40.4)
No health insurance	422	12.5 (11.2-14.0)	19,084	20.0 (19.6-20.5)	11	0.2 (0.1-0.5)	165	0.9 (0.8-1.1)
No. of comorbidities								
None	1103	36.4 (34.5-38.3)	56,335	65.5 (65.0-65.9)	499	14.7 (13.4-16.1)	3635	21.2 (20.5-21.9)
1	938	29.6 (27.9-31.4)	18,623	21.5 (21.1-21.8)	946	27.2 (25.5-28.9)	5192	30.1 (29.3-30.9)
2	561	17.8 (16.3-19.4)	7391	8.2 (8.0-8.5)	1005	29.3 (27.5-31.1)	4626	26.5 (25.7-27.3)
≥3	539	16.2 (14.8-17.7)	4612	4.8 (4.6-5.0)	1011	28.8 (27.1-30.6)	3950	22.2 (21.5-23.0)

WT% indicates weighted percentage; 95% CI, 95% confidence interval; GED, General Equivalency Diploma.

^a Counts and WT% values reflect missing data and may not sum to the total number.

than adults without a history of cancer (Table 2, unadjusted model). Adjustment for sex, education, health insurance coverage, and comorbid medical conditions reduced but did not eliminate the effect of cancer history (Table 2, adjusted model). In contrast, for the group aged ≥65 years, there were no significant differences between survivors and those without a history of cancer in either the unadjusted or adjusted model (Table 3).

Ethnic Disparities in Cancer Survivors and the General Population

We examined the interaction between cancer history and race/ethnicity to determine whether the effect of race/ethnicity differed between survivors and the general adult population. The comparisons between ethnic minority

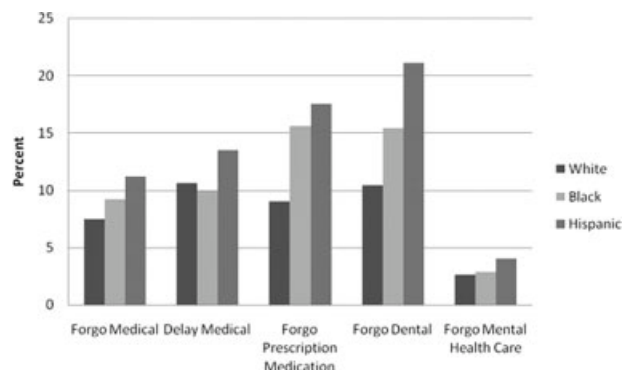


Figure 1. The prevalence of forgoing or delaying medical care because of cost for cancer survivors is shown by race/ethnicity.

Table 2. Forgoing/Delaying Medical Services Because of Cost by Race/Ethnicity and Cancer History for Adults Aged Under 65 Years

Variable	Unadjusted Model		Adjusted Model ^a	
	OR (95% CI)	P	OR (95% CI)	P
Forgo medical care				
Race/ethnicity				
White	Ref	—	Ref	—
Hispanic	1.18 (1.10-1.27)	<.0001	0.62 (0.56-0.68)	<.0001
Black	1.32 (1.23-1.43)	<.0001	0.90 (0.84-0.98)	.01
Cancer history				
Yes	1.84 (1.61-2.10)	<.001	1.55 (1.35-1.79)	<.0001
No	Ref	—	Ref	—
Interaction ^b				
Cancer survivors				
White	Ref	—	Ref	—
Hispanic	1.37 (0.90-29.0)	.49 ^c	0.85 (0.57-1.28)	.13 ^c
Black	0.93 (0.66-1.32)	.06 ^c	0.76 (0.53-1.10)	.38 ^c
Delay medical care				
Race/ethnicity				
White	Ref	—	Ref	—
Hispanic	0.94 (0.88-1.01)	.10	0.55 (0.51-0.60)	<.0001
Black	10.0 (0.93-1.07)	.99	0.73 (0.67-0.78)	<.0001
Cancer history				
Yes	1.74 (1.55-1.96)	<.0001	1.50 (1.32-1.70)	<.0001
No	Ref	—	Ref	—
Interaction ^b				
Cancer survivors				
White	Ref	—	Ref	—
Hispanic	1.22 (0.83-1.79)	.20 ^c	0.84 (0.58-1.23)	.03 ^c
Black	0.75 (0.51-1.10)	.17 ^c	0.65 (0.43-0.96)	.59 ^c
Forgo prescription medications				
Race/ethnicity				
White	Ref	—	Ref	—
Hispanic	1.32 (1.22-1.43)	<.0001	0.75 (0.68-0.82)	<.0001
Black	1.52 (1.41-1.63)	<.0001	1.05 (0.97-1.14)	.19
Cancer history				
Yes	1.89 (1.65-2.15)	<.0001	1.40 (1.21-1.76)	<.0001
No	Ref	—	Ref	—
Interaction ^b				
Cancer survivors				
White	Ref	—	Ref	—
Hispanic	1.78 (1.23-2.57)	.12 ^c	1.18 (0.81-1.72)	.02 ^c
Black	1.45 (0.98-2.15)	.83 ^c	1.17 (0.74-1.83)	.66 ^c
Forgo dental care				
Race/ethnicity				
White	Ref	—	Ref	—
Hispanic	1.29 (1.20-1.38)	<.0001	0.74 (0.68-0.80)	<.0001
Black	1.23 (1.15-1.33)	<.0001	0.87 (0.80-0.94)	.0005
Cancer history				
Yes	1.49 (1.32-1.68)	<.001	1.23 (1.08-1.39)	.001
No	Ref	—	Ref	—
Interaction ^b				
Cancer survivors				
White	Ref	—	Ref	—
Hispanic	1.92 (1.36-2.71)	.03 ^c	1.33 (0.94-1.87)	.001 ^c
Black	1.32 (0.93-1.88)	.72 ^c	1.09 (0.74-1.59)	.26 ^c

(Continued)

Table 2. (Continued)

Variable	Unadjusted Model		Adjusted Model ^a	
	OR (95% CI)	P	OR (95% CI)	P
Forgo mental health care				
Race/ethnicity				
White	Ref	—	Ref	—
Hispanic	1.09 (0.95-1.26)	.21	0.67 (0.57-0.79)	<.0001
Black	1.00 (0.85-1.17)	.96	0.68 (0.58-0.80)	<.0001
Cancer history				
Yes	1.95 (1.59-2.41)	<.0001	1.40 (1.12-1.75)	.003
No	Ref	—	Ref	—
Interaction^b				
Cancer survivors				
White	Ref	—	Ref	—
Hispanic	1.05 (0.58-1.88)	.89 ^c	0.70 (0.38-1.32)	.89 ^c
Black	0.81 (0.41-1.59)	.56 ^c	0.66 (0.33-1.31)	.92 ^c

OR indicates odds ratio; CI, confidence interval; Ref, referent group.

^aModels were adjusted for sex, education, insurance coverage (public, private, or no coverage), and noncancer medical comorbidities (0 vs 1 or more).

^bORs for the general adult population are the main effect estimates for race/ethnicity.

^cP values represent the significance of the interaction term for race/ethnicity by cancer history.

and white adults without cancer are represented by race/ethnicity main effects, and the comparisons between ethnic minority and white cancer survivors are represented by interaction effects.

Unadjusted model

Among adults aged <65 years without a history of cancer, Hispanics and blacks were significantly more likely to forgo medical care, prescription medications, and dental care, but not mental healthcare (Table 2, unadjusted model). Only 1 of the interactions was statistically significant, suggesting a similar pattern of results among cancer survivors compared with the general population. In general, the ORs comparing Hispanics and blacks to whites were greater in the group aged ≥65 years for all healthcare outcomes (Table 3, unadjusted model), suggesting that older ethnic minorities were more likely to forgo all types of care. Again, most of the interaction terms were nonsignificant, suggesting that ethnic disparities among survivors largely are reflective of disparities in the general adult population.

Adjusted model for those aged 65 years

In general, adjustment for sex, education, insurance coverage, and comorbidities reversed or eliminated ethnic disparities in outcomes that were observed in unadjusted models (Table 2, adjusted model). After adjustment,

black and Hispanic individuals without a cancer diagnosis were less likely to forgo medical and mental healthcare and to delay medical care. This trend was not statistically significant for cancer survivors, except for the comparison between black and white survivors for delaying medical care. There were significant interactions between race/ethnicity and cancer history for forgoing prescription medication, delaying medical care because of cost, and forgoing dental care (Table 2, adjusted model). Adjusted results for adults aged <65 years suggest that, although, in the general population, Hispanics are less likely than whites (OR, 0.75; 95% CI, 0.68-0.82) to report forgoing prescription medication because of cost, Hispanic cancer survivors are as likely as white survivors (OR, 1.18; 95% CI, 0.81-1.72) to forgo medication. Similarly, Hispanic adults without cancer are less likely, albeit not significantly so, to report forgoing dental care (OR, 0.74; 95% CI, 0.68-0.80), but Hispanic survivors are more likely to forgo dental care compared with white survivors (OR, 1.33; 95% CI, 0.94-1.87). Finally, for delaying care because of cost, Hispanic adults without cancer were less likely than white adults to delay medical care because of cost (OR, 0.55; 95% CI, 0.51-0.60), but there was no significant difference between Hispanic and white survivors (OR, 0.84; 95% CI, 0.58-1.23). The interaction between cancer history and race/ethnicity was not statistically significant for the comparisons between blacks and whites, suggesting

Table 3. Forgoing/Delaying Medical Services Because of Cost by Race/Ethnicity and Cancer History for Adults Aged 65 Years and Older

Variable	Unadjusted Model		Adjusted Model ^a	
	OR (95% CI)	P	OR (95% CI)	P
Forgo medical care				
Race/ethnicity				.42
White	Ref	—	Ref	—
Hispanic	2.55 (1.91-3.41)	<.0001	1.15 (0.82-1.63)	
Black	2.66 (2.06-3.43)	<.0001	1.61 (1.22-2.12)	.0008
Cancer history				
Yes	0.99 (0.74-1.31)	.92	1.01 (0.76-1.35)	.95
No	Ref	—	Ref	—
Interaction ^b				
Cancer survivors				
White	Ref	—	Ref	—
Hispanic	0.85 (0.35-2.03)	.02 ^c	0.55 (0.23-1.36)	.12 ^c
Black	2.49 (1.43-4.32)	.82 ^c	1.56 (0.88-2.79)	.93 ^c
Delay medical care				
Race/ethnicity				
White	Ref	—	Ref	—
Hispanic	1.72 (1.32-2.24)	.0001	0.93 (0.68-1.27)	.65
Black	1.68 (1.34-2.12)	<.0001	1.06 (0.82-1.37)	.64
Cancer history				
Yes	1.14 (0.91-1.43)	.24	1.17 (0.93-1.47)	.19
No	Ref	—	Ref	—
Interaction ^b				
Cancer survivors				
White	Ref	—	Ref	—
Hispanic	0.62 (0.30-1.28)	.009 ^c	0.45 (0.22-0.94)	.07 ^c
Black	1.25 (0.75-2.08)	.27 ^c	0.91 (0.55-1.51)	.56 ^c
Forgo prescription medications				
Race/ethnicity				
White	Ref	—	Ref	—
Hispanic	2.53 (1.95-3.27)	<.0001	1.36 (1.03-1.80)	.03
Black	2.53 (2.03-3.17)	<.0001	1.65 (1.32-2.06)	<.0001
Cancer history				
Yes	0.98 (0.77-1.24)	.86	0.96 (0.76-1.23)	.78
No	Ref	—	Ref	—
Interaction ^b				
Cancer survivors				
White	Ref	—	Ref	—
Hispanic	2.41 (0.99-5.94)	.93 ^c	1.79 (0.74-4.37)	.56 ^c
Black	2.97 (1.85-4.77)	.55 ^c	2.00 (1.20-3.33)	.48 ^c
Forgo dental care				
Race/ethnicity				
White	Ref	—	Ref	—
Hispanic	2.45 (1.92-3.13)	<.0001	1.43 (1.11-1.87)	.007
Black	2.23 (1.84-2.71)	<.0001	1.60 (0.96-2.65)	<.0001
Cancer history				
Yes	0.92 (0.73-1.24)	.45	0.90 (0.72-1.13)	.36
No	Ref	—	Ref	—
Interaction ^b				
Cancer survivors				
White	Ref	—	Ref	—
Hispanic	2.67 (1.16-6.15)	.85 ^c	2.15 (0.94-4.91)	.38 ^c
Black	2.03 (1.23-3.35)	.72 ^c	1.60 (0.96-2.65)	.98 ^c

(Continued)

Table 3. (Continued)

Variable	Unadjusted Model		Adjusted Model ^a	
	OR (95% CI)	P	OR (95% CI)	P
Forgo mental health care				
Race/ethnicity				
White	Ref	—	Ref	—
Hispanic	4.53 (2.53-8.10)	<.0001	1.84 (0.86-3.93)	.11
Black	1.61 (0.75-3.45)	.23	0.90 (0.38-2.11)	.780
Cancer history				
Yes	0.90 (0.44-1.84)	.78	0.86 (0.40-1.85)	.71
No	Ref	—	Ref	—
Interaction^b				
Cancer survivors				
White	Ref	—	—	—
Hispanic	6.72 (1.54-29.31)	.63 ^c	5.07 (1.15-22.34)	.23 ^c
Black	4.14 (1.26-13.61)	.20 ^c	3.28 (0.94-11.51)	.09 ^c

OR indicates odds ratio; CI, confidence interval; Ref, referent group.

^a Models were adjusted for sex, education, insurance coverage (public, private, or no coverage), and noncancer medical comorbidities (0 vs 1 or more). None of the interaction terms were statistically significant in the adjusted model; thus, only main effects are shown.

^b ORs for the general adult population are the main effect estimates for race/ethnicity.

^c P values represent the significance of the interaction term for race/ethnicity by cancer history.

similar patterns between adults with and without a history of cancer.

Adjusted models for those aged ≥ 65 years

Compared with unadjusted models, the effect of race/ethnicity on forgoing care was diminished in the adjusted model (see Table 3). Significant ethnic disparities remained for prescription medications and dental care in the general population, with Hispanic and black seniors more likely to forgo care because of cost. None of the interaction effects were statistically significant in those aged ≥ 65 years, suggesting that the magnitude of the observed racial/ethnic disparities in forgoing or delaying healthcare did not differ between cancer survivors and the general adult population. It is noteworthy that, in adjusted models, Hispanic cancer survivors appeared to be less likely to forgo or delay medical care and more likely to forgo mental health services, but the interaction terms did not reach statistical significance. There was also a trend for black survivors to be more likely to forgo mental healthcare services; however, again, this interaction did not reach statistical significance.

Exploratory analyses by cancer site and time since cancer diagnosis

We were not able to include cancer-specific variables in our comprehensive model, because there was no equivalent for those individuals without a history of cancer.

However, in an exploratory analysis, we examined the prevalence of forgoing care separately for cancer survivors to describe differences among the 5 most common cancer sites (breast, cervix, prostate, melanoma, and multiple cancers) and by time since cancer diagnosis. There were significant differences in forgoing or delaying all medical services by cancer site (Table 4). In all cases, breast and prostate cancer survivors were least likely to forgo services, and cervical cancer survivors were most likely to forgo services. The survivors with melanoma or multiple cancers reported intermediate levels of forgoing services. After adjusting for age (aged < 65 vs ≥ 65 years), education, insurance coverage, and medical comorbidities (0 or 1 vs ≥ 2 comorbidities), cervical cancer survivors were significantly more likely than breast cancer survivors to forgo all health services (OR range, 1.54-3.08; all $P < .05$). Melanoma survivors also were significantly more likely than breast cancer survivors to forgo medications (OR, 1.68; 95% CI, 1.04-2.72). There were no other significant differences by site.

There also were significant differences by time since diagnosis for forgoing and delaying medical care (Table 4). With the exception of mental health, survivors at < 1 year postdiagnosis were most likely to forgo or delay medical care, and the next highest levels were reported by very long-term survivors (≥ 10 years). Very long-term survivors also were most likely to forgo mental healthcare services. There were no differences by time since diagnosis for

Table 4. Forgoing or Delaying Medical Care Services Among Cancer Survivors by Cancer Site and Times Since Cancer Diagnosis

Variable	Weighted Percentage (95% CI)				
	Forgo Medical Care	Delay Medical Care	Forgo Medications	Forgo Dental Care	Forgo Mental Health
Cancer site^a					
Breast, n=1375	5.1 (4.0-6.4)	7.8 (6.3-9.5)	5.8 (3.4-7.5)	7.6 (6.1-9.4)	1.3 (0.8-2.3)
Cervix, n= 593	18.7 (15.3-22.6)	22.6 (18.8-26.8)	24.9 (20.7-29.6)	27.6 (23.5-32.3)	8.8 (6.1-12.5)
Melanoma, n=458	6.0 (4.1-8.7)	9.0 (6.7-12.0)	9.4 (6.7-13.1)	9.5 (7.0-12.9)	3.1 (1.7-5.3)
Prostate, n=805	2.7 (1.5-5.0)	3.9 (2.6-5.8)	4.0 (2.8-5.8)	4.8 (3.3-6.9)	0.5 (0.2-1.4)
Multiple cancers, n=615	7.7 (5.3-11.1)	11.0 (8.3-14.5)	10.8 (8.2-14.2)	11.7 (9.0-15.1)	1.8 (1.1-3.1)
Chi-square test with 4 df	15.41	19.50	21.42	21.76	8.44
P	<.00001	<.00001	<.00001	<.00001	<.00001
Time since diagnosis, y					
<1, n=323	10.3 (7.0-15.0)	15.6 (11.3-21.2)	11.5 (8.0-16.3)	11.4 (8.0-15.9)	1.8 (0.8-3.8)
1-5, n=2246	7.5 (6.3-8.8)	10.1 (8.7-11.6)	10.2 (8.9-11.7)	10.8 (9.4-12.4)	2.6 (1.9-3.4)
6-9, n=967	6.1 (4.6-8.0)	8.0 (6.1-10.4)	8.8 (7.0-11.1)	11.2 (9.1-13.6)	1.6 (1.0-2.6)
≥10, n=2725	9.2 (7.9-10.5)	12.4 (11.0-14.0)	10.4 (9.1-11.9)	12.7 (11.3-14.2)	3.6 (2.8-4.6)
Chi-square test with 3 df	3.22	4.67	0.71	1.18	3.99
P	.02	.003	.54	.32	.008

CI indicates confidence interval; df, degrees of freedom.

^aThe analysis by cancer site was restricted to the 5 most common cancer sites in the National Health Interview Survey sample.

forgoing medications or dental services. After adjusting for age (aged < 65 vs ≥65 years), education, insurance coverage, and medical comorbidities (0 or 1 vs ≥2 comorbidities), significant differences by time since diagnosis remained only for delaying medical care. Compared with survivors at 1 to 5 years postdiagnosis, survivors at <1 year postdiagnosis (OR, 1.59; 95% CI, 1.01-2.50) and at ≥10 years postdiagnosis (OR, 1.31; 95% CI, 1.03-1.66) were more likely to delay medical care because of cost.

DISCUSSION

We estimate that greater than 2 million of the estimated 10 to 12 million cancer survivors who were living in the United States during the period of the survey (2003-2006) did not receive 1 or more needed medical service because of concerns about cost. The prevalence of forgoing care among cancer survivors (7.8% forgo medical care, and 9.9% forgo prescription medications) is greater than that reported for the US population in general (5.2% and 7.2%, respectively, for the year 2005).¹⁴ Lack of access to medical care among cancer survivors is a significant public health concern given the importance of regular medical care for cancer survivors and their growing numbers.

Consistent with earlier research that examined healthcare access in younger survivors using the NHIS,⁷ we observed that cancer survivors aged <65 years were more likely to delay or forgo all types of medical care com-

pared with their same-age peers who did not have a history of cancer. This is concerning, because individuals who are diagnosed and treated as younger adults, especially those with early stage cancers, are expected to live many years after their cancer diagnosis, which makes access to appropriate preventive and health maintenance services crucial for their long-term health and well being.¹³ It is likely that the comparison group of adults without a history of cancer was healthier in the younger age group, increasing the effect of cancer history. In fact, a large percentage of adults aged <65 years without cancer reported no comorbid medical conditions (65.5%) compared with only 36.4% of younger cancer survivors.

In contrast, cancer history was not associated with delaying or forgoing care in individuals aged ≥65 years. The greater incidence of comorbid medical conditions in the older group and the resulting need for more medical services may account for the diminished effect of cancer history in this group. The difference in distribution of comorbidities between survivors and adults without cancer is much less striking in individuals aged ≥65 years compared with the younger age group. Previous research that examined the receipt of healthcare services among cancer survivors aged ≥65 years using the SEER-Medicare database produced mixed results for cancer history. Long-term colorectal cancer survivors were less likely to receive necessary medical care services, such as appropriate follow-up for hospitalizations and chronic medical conditions like heart disease and diabetes.⁸ One longitudinal

study of elderly survivors of nonmetastatic breast cancer indicated that survivors consistently were less likely to receive preventive health services compared with matched controls,¹⁵ but an earlier cross-sectional study indicated that survivors were more likely to receive preventive health services.⁹ It is noteworthy that those studies did not focus specifically on financial barriers to care or ethnic disparities among survivors.

Rates of forgoing care were not consistent across cancer sites. Consistently, women with cervical cancer reported higher rates of forgoing care compared with breast, prostate, melanoma, and multiple cancer survivors. Future research is needed to examine financial barriers to care better in this vulnerable group of cancer survivors. It is noteworthy that few differences were observed by time since diagnosis. Survivors within 1 year of diagnosis were more likely to delay care because of cost, possibly because of high out-of-pocket expenses during their initial cancer treatment.

Similar to previous population-based research that compared cancer survivors and adults without cancer,^{3,16} adults with and without a history of cancer from our sample differed in several ways. Adults who reported a history of cancer were more likely to be older, female, and white. This is consistent with SEER cancer registry estimates, which indicate that cancer prevalence increases with age, women comprise the majority of individuals ever diagnosed with cancer, the proportion of women increases with increasing time since diagnosis, and the vast majority of cancer survivors currently living in the United States are white.¹ It has also been suggested that under reporting of cancer history on self-report surveys may be more likely to occur among men,¹⁷ possibly resulting in a larger proportion of cancer survivors identified as women on the NHIS.

In the total sample of cancer survivors, Hispanic and black cancer survivors were more likely to forgo prescription medications and dental care than white survivors, and Hispanic survivors were more likely to forgo medical care. This is consistent with previous survey research, which indicated that black and Hispanic cancer survivors were more likely to report that costs of medication, diagnostic tests, and hospitalization were a barrier to needed cancer treatment.¹⁸ Our study builds on that previous survey by using a national population-based sample of US survivors and including a comparison sample of adults without cancer. Our questions about forgoing medical care were not cancer-specific, which may be more relevant to this population of long-term survivors. Other studies have documented high levels of financial stress and con-

cerns about medical costs among minority cancer survivors,¹⁹ but it is not known whether these concerns resulted in forgone medical care.

Adjusted models suggest that race/ethnicity disparities can largely be attributable to differences in socioeconomic status and medical insurance coverage. The occurrence of medical comorbidities also may contribute to differences in forgoing care. Among survivors and adults without cancer, those adults who reported more comorbidities were more likely to forgo care (data not shown). This is worrisome, because cancer treatment can be associated with late and long-term health effects.¹³ If these same conditions exacerbate financial obstacles to treatment, then health disparities are likely to be exacerbated.

Relatively larger disparities between ethnic minority and white individuals were observed among those aged ≥ 65 years compared with the group aged < 65 years, but these disparities were similar in the survivor and general adult populations. The finding that older black adults (with or without a cancer history) are more likely to forgo medical care is consistent with administrative database research documenting that older African-American women are less likely to receive preventive health services⁹; that black breast cancer survivors are less likely to receive influenza vaccinations, bone densitometry, and mammograms¹⁵; and that nonwhite colorectal cancer survivors are less likely to receive influenza vaccinations²⁰ and other preventive care services.^{20,21} However, examining ethnic disparities was not a focus of those studies, and comparisons in disparities were not made between adults with and without cancer.

The current study adds to the body of knowledge on healthcare access disparities in cancer survivors by examining nonreceipt or delays in care because of financial concerns using a representative sample of the US population. However there are several limitations. First, this study relied on self-report of delaying or forgoing care because of financial concerns. A respondent who answered “no” to the question, “Was there any time when you needed medical care but did not get it because you couldn’t afford it?” could have 2 possibilities in mind: 1) no care was needed and, thus, financial concerns were irrelevant; or 2) care was needed and received. Thus, differences in forgoing care also may reflect differences in health and perception of needing care. Cancer survivors may be sensitized to perceive greater healthcare needs, thereby increasing opportunities to forgo or delay healthcare. Self-reports of forgoing or delaying care also may be subject to

recall bias. Perhaps medical care that is not received is more salient to cancer survivors than to the general population because of vigilance for signs of cancer recurrence. Second, although we stratified our analyses by age, differences in the age distribution between cancer survivors and the general population may have resulted in residual confounding. In addition, our assessment of comorbidities was incomplete. We relied on self-reported comorbidities that were determined for other purposes on the NHIS, and we were not able to assess the currency or severity of every condition. Thus, additional research among survivors is needed to gain a better understanding of the role of comorbidities in forgoing medical care because of financial strain. Finally, although the sample is representative of community dwelling adults, it is not representative of the entire population of cancer survivors, especially those in poorest health who may have resided in hospices, nursing homes, or hospitals or who were too ill to complete the interview.¹⁷ Thus, our results may not generalize to survivors diagnosed with the most advanced disease and with sites associated with relatively short survival. The NHIS also does not collect information about cancer stage at diagnosis, current treatment for cancer, or cancer recurrence, so we cannot characterize those features in our survivor population.

In this study, we identified an important issue in survivorship care, namely, that financial concerns may prevent cancer survivors, and particularly survivors aged <65 years, from accessing needed medical services. However, given the preliminary nature of these data, further research is needed to answer crucial questions in this area. First, future studies should better characterize the types of healthcare services that survivors delay and forgo because of financial concerns. It is important to know whether the services are cancer-related (eg, screening for recurrence or second cancers, assessment or treatment of late effects) or related to other comorbid conditions. Future research also should investigate whether cancer survivors seek a greater number of services overall and/or choose to forgo less crucial or elective services. To our knowledge, information about the type of care that was not received is not available in the NHIS or in any other population-based dataset. Therefore, targeted research is needed to ask survivors about their experiences forgoing care because of medical cost and the implications for their health. It is also important to gain a better understanding of the role of insurance coverage and out-of-pocket expenses when evaluating financial barriers to needed care, particularly in light of changes in the health insurance industry, such as increases

in high deductible plans, increased insurance coverage in certain states, and increased coverage for mental health-care services. Finally, it is crucial to investigate the impact of forgoing care on survivors' physical and mental well being, length of survival, and cost of care.

Although race/ethnicity disparities in forgoing care because of cost among cancer survivors largely reflect those in the general adult population, given their need for monitoring of recurrence and late effects of treatment, increasing access to care for cancer survivors is an important public health goal. To improve the physical and mental well being of cancer survivors, assessment of access to care may need to become a routine part of postcancer treatment follow-up plans, especially for vulnerable groups, such as ethnic minorities, uninsured or underinsured, and younger survivors. Referral for social work services may be helpful in educating survivors about low-cost sources of medical care and financial assistance programs. Ultimately, public policy interventions that improve access to health insurance coverage generally appear to have the greatest potential impact on reducing healthcare access disparities among cancer survivors.

CONFLICT OF INTEREST DISCLOSURES

The authors made no disclosures.

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