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Impact of Rural Residence on Forgoing Healthcare after Cancer Because of Cost

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Abstract

Background—Routine follow-up care is recommended to promote the well-being of cancer survivors, but financial difficulties may interfere. Rural-urban disparities in forgoing healthcare due to cost have been observed in the general population; however, it is unknown whether this disparity persists among survivors. The purpose of this study was to examine rural-urban disparities in forgoing healthcare after cancer due to cost.

Methods—We analyzed data from 7804 cancer survivors in the 2006–2010 National Health Interview Survey. Logistic regression models, adjusting for sociodemographic and clinical characteristics, were used to assess rural-urban disparities in forgoing medical care, prescription medications, and dental care due to cost, stratified by age (younger: 18–64, older: 65+).

Results—Compared to urban survivors, younger rural survivors were more likely to forgo medical care ($p<0.001$) and prescription medications ($p<0.001$) due to cost; older rural survivors were more likely to forgo medical ($p<0.001$) and dental care ($p=0.05$). Rural-urban disparities did not persist among younger survivors in adjusted analyses; however, older rural survivors remained more likely to forgo medical (OR=1.66, 95%CI=1.11–2.48) and dental care (OR=1.54, 95%CI=1.08–2.20).

Conclusions—Adjustment for health insurance and other sociodemographic characteristics attenuates rural-urban disparities in forgoing healthcare among younger survivors, but not older survivors. Financial factors relating to healthcare utilization among rural survivors should be a topic of continued investigation.

Impact—Addressing out-of-pocket costs may be an important step in reducing rural-urban disparities in healthcare, especially for older survivors. It will be important to monitor how healthcare reform efforts impact disparities observed in this vulnerable population.

Keywords

cancer; long-term survivors; rural population; healthcare disparities; health services accessibility

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Introduction

The number of cancer survivors in the United States (US) continues to grow, with an estimated 13.7 million in 2012, growing to an estimated 18 million by 2022 (1). A majority of cancer survivors are now expected to live more than 5 years after their diagnosis (1). Routine follow-up care, including prevention and surveillance of recurrence, new cancers and late effects of cancer and its treatment, and interventions to address late effects (2), is now recommended by numerous health organizations, including the National Cancer Institute, the American Society of Clinical Oncology, and the American Cancer Society; however, financial difficulties among survivors may be a barrier to accessing these services.

Over the past 10 years, the number of Americans who forgo or delay healthcare has increased steadily, such that 28.9 million Americans delayed medical care and 21 million did not get needed care because of cost in 2010 (3). Cancer survivors are no exception. A recent report from 2003–2006 indicated that over 2 million cancer survivors did not receive one or more needed medical services due to financial concerns (4). Financial barriers to healthcare may be particularly problematic for cancer survivors because of their risk for recurrence, second primary cancers, late effects from treatment, and non-cancer comorbidities. Financial reasons for delaying or forgoing medical care may be due to out-of-pocket direct costs (e.g., copayments and insurance deductibles) (5) and indirect costs (e.g., transportation and lost wages) (6, 7). Furthermore, approximately 26% of Americans report having trouble paying medical bills (8) and 25% of cancer patients said they used up most of their savings to pay for treatment (9). In the general adult population, those more likely to forgo healthcare due to cost tend to be less than 65 years old and uninsured, less educated, low income, and in fair or poor health (3, 10).

Patients in rural areas tend to have poor access to healthcare compared to urban patients (11–15). Population-based surveys have found that people in rural areas are more likely to delay or forgo healthcare due to cost (12, 14) and to report out-of-pocket costs exceeding 5% of their income (12). A study by Lu and colleagues (15) reported rural working-age adults in Kentucky were less likely to have overall health insurance coverage, and those who were insured were more likely to have difficulty paying health insurance premiums compared to those in urban areas. Rural cancer survivors are an especially vulnerable population, with higher risk for poor mental and physical health outcomes after cancer (16). To our knowledge, no prior studies have examined rural-urban differences in financial access to healthcare among cancer survivors. Therefore, the purpose of this study is to 1) examine rural-urban differences in forgoing healthcare due to cost among cancer survivors, and 2) investigate the extent to which rural-urban disparities can be accounted for by sociodemographic (i.e., race/ethnicity and insurance) and clinical characteristics (i.e., comorbidities and time since diagnosis).

Health insurance is an important factor to consider when assessing financial barriers to healthcare. Patients under the age of 65 primarily receive health insurance via employee benefits (61%), 19% having no health insurance, and another 17% are covered through public insurance (i.e., Medicaid or Medicare) depending on their income, health condition (i.e., cancer), or disability (3). In contrast, most persons aged 65 years and older are eligible for Medicare, with the majority being covered through Medicare and supplemental Medicaid or private insurance. Due to these differences in access to health insurance coverage by age, this study will examine cancer survivors forgoing healthcare because of cost stratified by age (18–64 years old and 65 years and older).

Methods

Data Source and Study Sample

A cross-sectional analysis of population-based data combined from the 2006–2010 National Health Interview Surveys (NHIS) was used to explore rural-urban subgroup differences in rates of forgoing care due to cost after a cancer diagnosis. The NHIS is a continuous survey conducted by the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention (CDC) with data released annually. The survey is administered in-person by trained US Census Bureau interviewers and is designed to produce a nationally representative sample of the US civilian, non-institutionalized population. In 2006–2010, conditional response rates for the sample adult components ranged from 74.2% to 81.4%. Only adult respondents who reported having a history of cancer were included in the present analysis. We excluded individuals who reported “unknown”, squamous, or non-melanoma skins cancers due to differences in treatment and prognosis, consistent with the Surveillance Epidemiology and End Results (SEER) estimates and previous studies (4, 17). Analyses that use public-use data do not require CDC Institutional Review Board approval, and study procedures were exempt from Wake Forest School of Medicine Institutional Review Board.

Outcome Variables

We examined three indicators of financial access to healthcare: delayed or did not get medical care because of cost, could not afford prescription medicine, and could not afford dental care. Delaying or forgoing care due to cost was assessed using two questions, 1) “During the past 12 months, have you delayed seeking medical care because of worry about the cost?” and 2) “During the past 12 months, was there any time when you needed medical care, but did not get it because you couldn’t afford it?” We combined these two variables to compare results to national data reports (18, 19). Respondents who answered “yes” to either question were coded as “yes” for delayed or did not get medical care because of cost. Similar questions were asked regarding prescription medicine and dental care: “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?” Response options for all items included “yes,” “no,” “don’t know,” and “refused.” “Don’t know” and “refused” were considered missing.

Independent Variables

Our primary independent variable was rural-urban residence. Rural-urban residence was accessed through the NCHS Research Data Center and classified according to the US Department of Agriculture (USDA), Office of Management and Budget’s Rural-Urban Continuum (RUC) Codes (20). These codes describe 3141 counties in the United States by degree of urbanization and proximity to metropolitan areas. Urban residence was represented by codes 1–3 that included metropolitan areas with a population of fewer than 250,000 people. Rural residence was represented by codes 4–9 that included counties adjacent or not adjacent to metropolitan areas.

Demographic characteristics included age, race/ethnicity, sex, marital status, education, and insurance status, and geographic region. Age was categorized (<50, 50–64, 65–79, and 80+) for descriptive purposes, but was used continuously in the analyses to adjust for differences across age within the two age strata (18–64 and 65+). Race/ethnicity was categorized as African American (non-Hispanic), Hispanic, Asian (non-Hispanic), White (non-Hispanic), and other (non-Hispanic). Marital status was dichotomized into married or living together and not married (included never married, divorced, separated, and widowed). Education was categorized as less than high school, high school graduate or general equivalency diploma, some college, and college graduate or higher. Health insurance status included three categories: private insurance (health maintenance organization or preferred provider

organization with or without Medicare coverage), public insurance only (Medicare, Medicaid, military, other government healthcare coverage, and other state sponsored healthcare), and none. No insurance only applied to ages 18–64 since less than 1% of respondents 65 and older reported having no insurance, and were excluded from analyses. Geographic region of residence was categorized into Northeast, Midwest, South, and West according to US census regions (21).

Clinical characteristics included number of comorbidities, cancer site, number of cancer diagnoses, time since cancer diagnosis, and self-reported health status. Non-cancer comorbidities were assessed as a count of five conditions, including hypertension, diabetes, heart disease (coronary heart disease, angina pectoris, myocardial infarction, or any other heart condition), lung disease (emphysema, asthma, or chronic bronchitis), and stroke (22). Cancer site was categorized as breast, prostate, gynecologic, melanoma, hematologic, colorectal, testicular, lung, and other. Number of cancer diagnoses was dichotomized into one or more than one. Time since diagnosis was categorized into less than 2 years, 2–5 years, 6–9 years, and more than 10 years. Health status was assessed with one question asking respondents to rate their overall health, with options of excellent, very good, good, fair, and poor.

Statistical Analysis

All statistical analyses were conducted using the Survey procedures in SAS which included strata, cluster, and sampling weights to account for the complex design of the NHIS survey. Cancer history was included as a domain to ensure appropriate estimates were obtained for the cancer survivors. Analyses were stratified, using the domain feature of the Survey procedures, for those cancer survivors who were less than 65 years of age and those 65 years and older due to the differences in health insurance access. Chi-square tests were used to assess rural-urban differences in participant and clinical characteristics and to assess the unadjusted rural-urban differences in forgoing healthcare, medications, and dental care due to cost. Logistic regression was used to assess rural-urban differences after adjustment for covariates described above. These logistic models initially included an interaction between rural-urban status and continuous age, which was removed as none were statistically significant. Results are presented as odds ratios (OR) along with 95% confidence intervals (CI). Asian and other race were dropped from regression models due to extremely small numbers. We also excluded income as a covariate because of 30% missing data; however, we used education as a proxy as it is highly correlated to income. We did conduct a sensitivity analysis to assess the impact of income in the models, but only reported models without income because results did not change significantly.

Results

Between 2006 and 2010, 7804 adults with a history of cancer were included in the NHIS survey, 3799 of whom were younger than 65 years old and 4005 of whom were 65 years or older. Characteristics of the cancer survivors, stratified by age and rural-urban status, are summarized in Table 1. In both younger (<65 years old) and older cancer survivors samples a greater proportions of those residing in rural areas compared to urban survivors were non-Hispanic white ($p<0.001$), less educated ($p<0.001$), had one or more non-cancer comorbidities ($p<0.01$), and rated their health as poorer ($p<0.01$). A greater proportion of the younger ($p=0.037$) and older ($p<0.001$) rural survivors were from the South and the Midwest compared to the urban survivors. Younger rural survivors were also more likely to be publically insured or uninsured ($p<0.001$). The distribution of cancer sites in younger survivors was similar in rural and urban areas, although there were slightly more gynecologic cancers ($p<0.001$) and slightly fewer breast cancers ($p=0.034$) in the rural survivors, and more rural survivors had multiple cancers ($p=0.033$). Additionally, more of

the rural survivors were 10 or more years beyond their initial diagnosis (p=0.043). Older rural and urban survivors were similar with respect to cancer prevalence, numbers of cancer, and time since diagnosis.

Table 2 shows the unadjusted proportion of rural and urban survivors who delayed or did not get medical care, prescription medicine, or dental care due to cost, stratified by age group. In general, younger cancer survivors are much more likely to forgo care than older cancer survivors, and rural cancer survivors are somewhat more likely to forgo care than urban cancer survivors. Significant rural-urban differences were observed for delaying or not getting medical care in both younger and older survivors and for prescription medications in the younger group only.

Logistic regression models were used to assess the rural-urban differences in forgoing medical care, medications, and dental care after adjusting for sociodemographic and disease characteristics. These models were stratified by younger and older cancer survivors, and the results are summarized in Tables 3 and 4.

Among younger survivors, there was no difference between rural and urban cancer survivors in forgoing medical care (Odds Ratio [OR] = 1.04, 95% Confidence Interval [CI] = 0.81–1.34), medications (OR = 1.05, 95% CI = 0.80–1.38), or dental care (OR = 0.84, 95% CI = 0.63–1.10) due to cost. Younger survivors who were female, not married, publically insured or uninsured, had more comorbidities, and had poorer health status were more likely to forgo all types of care. Age was also a predictor of forgoing medications and dental care, and Hispanic ethnicity was a predictor of forgoing prescription medications. Time since diagnosis was a predictor of forgoing dental care only; younger survivors less than 5 years from diagnosis were less likely to forgo dental care. Survivors in the South were more likely to forgo medical care and survivors in the West were more likely to forgo medical and dental care.

Among older cancer survivors, rural cancer survivors were more likely to forgo medical (OR = 1.66, 95% CI = 1.11–2.48) and dental care (OR = 1.54, 95% CI = 1.08–2.20) due to cost. Younger age survivors and those with public insurance were more likely to forgo all types of care. Those who were not married, had more comorbidities, and poorer health status were more likely to delay or forgo medical care. Those who were Hispanic, not married, had poorer health status, and were from the West were more likely to forgo dental care. After adjustment, there was still no difference between rural and urban cancer survivors in forgoing medications (OR = 1.14, 95% CI = 0.71–1.84). However, those who were more likely to forgo prescription medications were ethnic minorities, less educated, had more comorbidities, and were from the West.

Discussion

Access to healthcare is essential for cancer survivors who require regular follow-up care, especially rural cancer survivors, who are at increased risk for poorer health and higher mortality rates. The aim of this study was to examine rural-urban differences in adult cancer survivors forgoing healthcare due to cost. Overall, we found that rural cancer survivors were more likely than urban cancer survivors to forgo or delay medical care because of cost, particularly older survivors. Our results were similar to previous reports of rural residents delaying or forgoing medical care because of cost (10, 12, 14, 23). However, there are some studies that did not find any rural-urban differences (12, 24) or found the opposite pattern (25). The variability in results may be due to differences in study population and measurement of rural-urban residence (26, 27).

For younger survivors, controlling for sociodemographic and clinical characteristics resulted in the attenuation of the rural-urban effect of forgoing care due to cost. Survivors with public or no insurance, and those with more comorbidities and in poorer health were more likely to forgo care. As insurance coverage was a robust predictor of forgoing care, it is possible that some disparities seen in younger cancer survivors may be addressed through insurance coverage reform efforts. The Patient Protection and Affordable Care Act (PPACA) signed in 2010 may expand access to healthcare, especially for cancer survivors (28). The PPACA will expand Medicaid eligibility, provide health insurance exchanges (i.e., insurance subsidies for uninsured), and eliminate coverage barriers, including pre-existing conditions, such as cancer. However, out-of-pocket medical expenses – such as health insurance premiums, insurance deductibles, copayments, and medical costs not covered by insurance – may be contributing to financial hardships that lead survivors to forgo medical care. In previous studies, working-age (18–64) rural residents reported having difficulty paying for insurance deductibles and copayments (15, 23). A population-based study of people younger than 65 years old also reported out-of-pocket expenses being more burdensome among people with serious illnesses, and specifically cancer survivors reported out-of-pocket expenses exceeding up to 20% of their total family income (29).

In contrast to younger cancer survivors, rural-urban disparities persisted for older survivors, specifically for medical and dental care. No disparity was noted for forgoing prescription medications. This is likely due to enhanced prescription drug coverage through Medicare Advantage and Prescription Drug Plans (specifically Medicare Part D), which was initiated in 2006. Despite Medicare coverage, older rural survivors are still forgoing care because of cost at higher rates than urban survivors. Similar to younger survivors, out-of-pocket costs may be a significant contributing factor for this population. A population-based Medicare beneficiary survey from 1997 through 2007 found that cancer survivors have a higher burden of out-of-pocket medical costs compared to people without a history of cancer (30). Medicare beneficiaries must still pay 20% of the Medicare allowable costs for services, which may be considerable for people with chronic illnesses, such as cancer. Additionally, cancer survivors more often lack supplemental medical coverage compared to those without cancer, leaving survivors responsible for some medical costs, such as mammography (31) or seeing a specialist (32). Furthermore, financial hardship may extend beyond health insurance coverage, such that patients must choose between healthcare needs or life necessities. Previous studies have reported that rural residents choose living expenses (i.e., rent and groceries) over medical care (15, 23).

Despite Medicare coverage, it was surprising that rural disparities persisted for older survivors, but not younger survivors. Older rural survivors may have less social support compared to their urban counterparts, which may contribute to the rural-urban disparity seen. Many rural areas are experiencing population loss, particularly among adults under the age of 30 (33). This may result in a loss of family emotional and tangible support among older survivors. Indeed, a systematic review of the needs of rural cancer survivors found limited physical, informational, and emotional support among rural survivors, which could indicate limited access to supportive care services (34). Additionally, Baernholdt and colleagues (2012) found that older rural adults report lower social functioning which may be related to urban migration patterns and travel difficulties (35). Lack of nearby family likely also exacerbates transportation difficulties among older rural survivors. Overall, the lack of social support in this population may be a factor contributing to the rural-urban disparities seen in forgoing healthcare due to cost after cancer.

Consistent with previous population-based studies of patients with chronic diseases (36, 37), rural-urban disparities in forgoing care among cancer survivors were significantly associated with more comorbidities and poorer health status across age groups. The cross-sectional

nature of this study precludes us from determining the direction of association, which may be bi-directional. For example, patients may forgo preventive medical care (i.e., regular medical screenings or follow-up) to avoid medical expenses; however, they may be diagnosed with a disease at a later stage or require more extensive medical care (e.g., hospital admission), which could lead to higher costs and poorer health outcomes. Alternatively, chronic illness and poor health may create financial barriers to care via lost wages and/or lost insurance coverage due to illness (38). Poorer health may also create more opportunities to delay or forgo care via increased demand for medical services.

These findings are subject to several limitations. First, all data on the NHIS, including cancer history, is self-reported. Second, we were limited in our ability to assess the role of current financial hardship on forgoing care due to cost because of 30% missing data on income; however we used education as a proxy. Future studies should consider using census tract variables to further assess the contribution of area-level socioeconomic status on accessing care. Despite these limitations, there are notable strengths. First, we used a large population-based data set that is representative of the US population. Second, this study adds to the body of knowledge by examining rural-urban disparities, an understudied area in cancer survivorship, while expanding on a previous study of cancer survivors forgoing medical care because of cost (4). Furthermore, we were able to access rural-urban residence status based on the USDA RUC codes, which has been used in other studies of rural-urban differences (15, 16, 26, 39, 40), facilitating comparisons.

In conclusion, rural cancer survivors are a vulnerable population with poorer health outcomes (16) and a greater likelihood of forgoing healthcare because of cost compared to their urban counterparts. Future studies should examine factors that may be contributing to the rural-urban disparity among older cancer survivors, such as out-of-pocket expenses (e.g., insurance deductibles and copayments) and distance to care/transportation. Additionally, future studies should also assess the specific healthcare services patients are forgoing due to cost. For example, forgoing cancer-related care (e.g., monitoring for recurrence or second cancers), care for a non-cancer-related condition (e.g., diabetes), or basic annual medical exam may have different health implications and or potential intervention strategies.

Furthermore, while it may be difficult to resolve patients' financial hardships, we can ensure that healthcare providers are aware of rural-urban disparities among cancer survivors. This awareness may facilitate referrals to resources to address rural cancer survivors' financial needs. For example, if a patient cannot afford a prescription medication, healthcare providers may arrange prescription medications through Pharmaceutical Patient Assistance Programs (41).

As the PPACA is fully implemented in 2014, it will be important to examine how disparities in access to care may change for cancer survivors, particularly younger survivors. While expansion of Medicaid eligibility and elimination of healthcare coverage barriers may facilitate health insurance coverage, we should be cautious in anticipating better health outcomes for all cancer survivors, particularly since previous studies report rural-urban disparities among Medicare beneficiaries (13, 42).

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Table 1

Characteristics of Adult Cancer Survivors, Stratified by Age and Rural-urban Status, from the National Health Interview Survey (2006 to 2010)*

Sample Characteristics	Ages 18–64 Years				Ages ≥65 Years			
	Rural n=791		Urban n=3008		Rural n=851		Urban n=3154	
	%	(SE)	%	(SE)	%	(SE)	%	(SE)
Age, years								
<50	39.6	(1.8)	41.1	(1.0)	-	-	-	-
50 to 64	60.4	(1.8)	58.9	(1.0)	-	-	-	-
65 to 79	-	-	-	-	72.1	(1.8)	67.2	(1.0)
≥80	-	-	-	-	27.9	(1.8)	32.8	(1.0)
Race/Ethnicity								
African American	5.0	(1.0)	9.8	(0.7)	4.0	(0.6)	6.8	(0.5)
Hispanic	3.7	(1.0)	8.1	(0.6)	1.5	(0.4)	4.9	(0.4)
Non-Hispanic White	88.1	(1.3)	78.7	(0.9)	93.5	(0.8)	85.3	(0.7)
Asian	N/A	-	2.5	(0.3)	0.6	(0.3)	2.4	(0.3)
Other	3.0	(0.8)	0.9	(0.2)	N/A	-	0.5	(0.2)
Sex								
Male	29.8	(2.0)	32.9	(1.0)	49.0	(1.9)	46.8	(1.1)
Female	70.2	(2.0)	67.1	(1.0)	51.0	(1.9)	53.2	(1.1)
Marital Status								
Married/Living together	65.5	(1.9)	66.6	(1.0)	61.3	(2.1)	58.7	(1.1)
Not Married	34.5	(1.9)	33.4	(1.0)	38.7	(2.1)	41.3	(1.1)
Education								
< High School	18.6	(2.1)	10.2	(0.6)	28.6	(2.0)	19.1	(0.9)
High School/GED	36.0	(2.0)	26.3	(0.9)	32.7	(2.2)	30.9	(1.1)
< Bachelors	28.9	(1.5)	30.8	(1.0)	22.0	(1.6)	24.5	(1.0)
≥ Bachelors	16.6	(1.8)	32.7	(1.2)	16.6	(1.5)	25.6	(1.0)
Insurance Status								
Private with/without Public	52.3	(2.3)	72.2	(1.0)	61.4	(2.2)	61.2	(1.1)
Public Only	28.5	(1.9)	17.0	(0.8)	38.5	(2.2)	38.6	(1.1)
None	19.2	(1.8)	10.8	(0.7)	0.1	(0.1)	0.3	(0.1)

Sample Characteristics	Ages 18–64 Years				Ages ≥65 Years			
	Rural n=791		Urban n=3008		Rural n=851		Urban n=3154	
	%	(SE)	%	(SE)	%	(SE)	%	(SE)
Comorbidities, number								
0	36.1	(1.9)	48.1	(1.1)	20.8	(1.6)	22.7	(0.8)
1	34.3	(2.0)	30.3	(0.9)	35.1	(1.7)	35.0	(1.1)
2	18.5	(1.5)	14.1	(0.7)	23.8	(1.4)	26.6	(0.9)
≥ 3	11.1	(1.3)	7.6	(0.6)	20.3	(1.4)	15.6	(0.7)
Cancer Site								
Breast	17.1	(1.3)	20.5	(0.8)	23.9	(1.7)	24.3	(0.9)
Prostate	6.8	(1.2)	8.0	(0.6)	23.7	(1.7)	25.4	(1.0)
Gynecologic	33.1	(1.8)	25.2	(1.0)	9.5	(1.4)	9.4	(0.6)
Melanoma	9.4	(1.2)	11.4	(0.8)	9.2	(1.2)	9.2	(0.7)
Hematologic	6.7	(1.0)	7.2	(0.6)	6.1	(1.1)	5.4	(0.5)
Colorectal	6.3	(0.9)	5.7	(0.5)	11.1	(1.4)	12.5	(0.7)
Testicular	2.6	(0.7)	2.4	(0.4)	0.5	(0.3)	0.1	(0.1)
Lung	2.6	(0.5)	2.7	(0.4)	5.4	(0.9)	5.3	(0.5)
Other	23.7	(1.8)	23.3	(1.0)	20.4	(1.7)	19.5	(0.9)
No. of Cancers								
1	89.5	(1.3)	92.7	(0.6)	90.3	(1.1)	88.5	(0.8)
>1	10.5	(1.3)	7.3	(0.6)	9.7	(1.1)	11.5	(0.8)
Time since diagnosis, year								
<2	14.7	(1.4)	15.8	(0.8)	13.6	(1.5)	13.8	(0.8)
2–≤5	25.1	(1.9)	29.2	(1.0)	25.4	(2.0)	25.7	(1.0)
6–≤9	16.0	(1.7)	17.2	(0.9)	17.0	(1.4)	14.6	(0.8)
≥10	44.2	(2.1)	37.8	(1.1)	44.0	(2.1)	46.0	(1.2)
Health Status								
Excellent	9.6	(1.0)	16.6	(0.9)	9.0	(1.2)	11.1	(0.7)
Very Good	22.8	(1.7)	28.7	(0.9)	20.6	(1.5)	23.2	(0.9)
Good	29.3	(1.9)	30.8	(1.0)	35.6	(2.0)	36.4	(1.0)
Fair	23.0	(1.9)	15.7	(0.8)	23.7	(1.6)	21.5	(0.9)
Poor	15.2	(1.7)	8.3	(0.6)	11.1	(1.2)	7.8	(0.6)

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Sample Characteristics	Ages 18–64 Years				Ages ≥65 Years			
	Rural n=791		Urban n=3008		Rural n=851		Urban n=3154	
	%	(SE)	%	(SE)	%	(SE)	%	(SE)
Geographic Region								
Northeast	12.9	(2.6)	20.1	(1.3)	8.7	(1.9)	22.2	(1.2)
Midwest	28.0	(2.7)	23.2	(1.1)	32.8	(3.2)	21.7	(1.3)
South	42.1	(3.2)	35.4	(1.4)	44.1	(3.4)	33.9	(1.5)
West	17.0	(2.3)	21.2	(1.0)	14.5	(2.4)	22.2	(1.1)

*Weighted percentages. SE: Standard Error. Comorbidities are categorized to include hypertension, diabetes, heart disease, lung disease, and stroke.

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Table 2

Rural-urban Differences in Forgoing Care Due to Cost among Cancer Survivors, Stratified by Age and Rural-urban Status

	<65 years old						≥65 years old					
	Rural		Urban		Crude		Rural		Urban		Crude	
	%	(SE)	%	(SE)	OR	(95% CI)	%	(SE)	%	(SE)	OR	(95% CI)
Delayed/didn't get medical care [a]	25.3	(1.7)	18.0	(0.9)	1.54	(1.25–1.97)	7.6	(0.9)	4.4	(0.4)	1.79	(1.30–2.46)
Couldn't afford prescription medicine	22.1	(1.8)	15.5	(0.8)	1.54	(1.23–1.94)	4.4	(0.9)	3.6	(0.4)	1.25	(0.80–1.96)
Couldn't afford dental care [b]	23.3	(1.8)	19.6	(0.9)	1.25	(0.99–1.57)	6.7	(0.9)	4.8	(0.4)	1.41	(1.00–1.98)

SE = standard error, OR = odds ratio

[a] Missing 3

[b] Missing 116

Table 3

Adjusted Odds Ratios for Healthcare Access among Adult Cancer Survivors, Age 18–64 Years, from the National Health Interview Survey (2006 to 2010)

	Delayed/Didn't Get Care Due to Cost		Can't afford Medications		Can't afford Dental Care	
	OR	**(95% CI)**	**OR**	**95% CI**	**OR**	**95% CI**
Rural (ref: Urban)	1.04	(0.81–1.34)	1.05	(0.80–1.38)	0.84	(0.63–1.10)
Sex						
Female	**1.54**	**(1.19–1.98)**	**1.70**	**(1.32–2.20)**	**2.04**	**(1.58–2.63)**
Male (*ref*)						
Race/Ethnicity						
African American	0.87	(0.65–1.15)	1.06	(0.77–1.45)	0.86	(0.62–1.18)
Hispanic	0.93	(0.65–1.32)	**1.51**	**(1.09–2.09)**	1.02	(0.74–1.40)
Non-Hispanic White (*ref*)						
Age, years (*continuous*)	0.99	(0.98–1.00)	**0.97**	**(0.96–0.98)**	**0.97**	**(0.96–0.98)**
Marital Status						
Married/Living together (*ref*)						
Not Married	**1.64**	**(1.32–2.03)**	**1.51**	**(1.21–1.89)**	**1.41**	**(1.14–1.74)**
Education						
≤ High School/GED (*ref*)						
≥ Some College	1.19	(0.96–1.49)	1.08	(0.86–1.37)	1.09	(0.86–1.37)
Insurance Status						
Private (*ref*)						
Public	**1.36**	**(1.03–1.79)**	**1.59**	**(1.19–2.14)**	**2.11**	**(1.61–2.77)**
None	**9.40**	**(7.14–12.39)**	**6.97**	**(5.22–9.31)**	**5.77**	**(4.29–7.77)**
Comorbidities, number	**1.21**	**(1.08–1.35)**	**1.60**	**(1.41–1.82)**	**1.20**	**(1.06–1.36)**
Health Status						
Excellent/Very Good (*ref*)						
Good/Fair/Poor	**2.38**	**(1.86–3.04)**	**2.30**	**(1.73–3.06)**	**2.26**	**(1.75–2.91)**
More than one Cancer	1.04	(0.70–1.57)	1.09	(0.73–1.62)	0.99	(0.69–1.40)
Time since diagnosis, yrs						
<2	0.78	(0.56–1.10)	0.81	(0.59–1.12)	**0.65**	**(0.49–0.85)**
2–5	0.82	(0.61–1.09)	0.90	(0.68–1.19)	**0.65**	**(0.50–0.85)**

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	Delayed/Didn't Get Care Due to Cost		Can't afford Medications		Can't afford Dental Care	
	OR	**(95% CI)**	**OR**	**95% CI**	**OR**	**95% CI**
6–9	0.93	(0.67–1.31)	0.98	(0.69–1.40)	1.08	(0.81–1.43)
10+ (*ref*)						
Geographic Region						
Northeast (*ref*)						
Midwest	1.32	(0.92–1.91)	0.97	(0.68–1.37)	1.06	(0.76–1.47)
South	**1.43**	**(1.01–2.03)**	1.21	(0.87–1.68)	1.33	(0.98–1.79)
West	**1.65**	**(1.15–2.37)**	1.00	(0.70–1.45)	**1.56**	**(1.11–2.19)**

95% CI: 95% Confidence Intervals; Participants with missing data for covariates are excluded from the analyses. Ref: reference group

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Table 4

Adjusted Odds Ratios for Healthcare Access among Adult Cancer Survivors, Age ≥65 Years, from the National Health Interview Survey (2006 to 2010)

	Delayed/Didn't Get Care Due to Cost		Can't afford Medications		Can't afford Dental Care	
	OR	**(95% CI)**	**OR**	**95% CI**	**OR**	**95% CI**
Rural (ref: Urban)	**1.66**	**(1.11–2.48)**	1.14	(0.71–1.84)	**1.54**	**(1.08–2.20)**
Sex						
Female	1.24	(0.86–1.78)	1.29	(0.87–1.92)	1.27	(0.92–1.74)
Male (*ref*)						
Race/Ethnicity						
African American	0.92	(0.52–1.61)	**2.31**	**(1.33–4.01)**	1.37	(0.87–2.15)
Hispanic	1.34	(0.74–2.42)	**1.92**	**(1.10–3.35)**	**1.81**	**(1.12–2.94)**
Non-Hispanic White (*ref*)						
Age, years (*continuous*)	**0.94**	**(0.91–0.96)**	**0.94**	**(0.91–0.97)**	**0.92**	**(0.90–0.95)**
Marital Status						
Married/Living together (*ref*)						
Not Married	**1.65**	**(1.14–2.40)**	1.40	(0.96–2.03)	**1.62**	**(1.16–2.28)**
Education						
≤ High School/GED (*ref*)						
≥ Some College	1.10	(0.78–1.55)	**0.58**	**(0.38–0.87)**	1.09	(0.75–1.59)
Insurance Status						
Private (*ref*)						
Public	**1.80**	**(1.28–2.55)**	**1.52**	**(1.01–2.29)**	**1.73**	**(1.20–2.48)**
Comorbidities, number	**1.35**	**(1.13–1.61)**	**1.63**	**(1.36–1.97)**	1.11	(0.92–1.34)
Health Status						
Excellent/Very Good (*ref*)						
Good/Fair/Poor	**2.09**	**(1.36–3.23)**	1.65	(0.96–2.83)	**1.94**	**(1.38–2.72)**
More than one Cancer	0.97	(0.54–1.72)	0.86	(0.46–1.64)	0.74	(0.38–1.44)
Time since diagnosis, yrs						
<2	1.04	(0.61–1.75)	1.10	(0.60–2.01)	1.36	(0.85–2.18)
2–5	1.17	(0.77–1.78)	1.21	(0.79–1.86)	0.75	(0.47–1.21)
6–9	1.33	(0.82–2.15)	0.93	(0.52–1.65)	0.74	(0.44–1.24)

	Delayed/Didn't Get Care Due to Cost		Can't afford Medications		Can't afford Dental Care	
	OR	**(95% CI)**	**OR**	**95% CI**	**OR**	**95% CI**
10+ (*ref*)						
Geographic Region						
Northeast (*ref*)						
Midwest	1.04	(0.59–1.83)	1.39	(0.72–2.67)	1.19	(0.65–2.20)
South	1.35	(0.80–2.28)	1.03	(0.56–1.89)	1.45	(0.83–2.55)
West	1.34	(0.76–2.33)	**2.11**	**(1.12–4.00)**	**2.34**	**(1.33–4.14)**

95% CI: 95% Confidence Intervals; Participants with missing data for covariates are excluded from the analyses. Ref: reference group