Elderly Black Non-Hispanic Patients With Head and Neck Squamous Cell Cancer Have the Worst Survival Outcomes

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ABSTRACT

Background: In this population study, we compared head and neck cancer (HNC) prognosis and risk factors in 2 underserved minority groups (Hispanic and Black non-Hispanic patients) with those in other racial/ethnicity groups. **Methods:** In this SEER-Medicare database study in patients with HNC diagnosed in 2006 through 2015, we evaluated cancer-specific survival (CSS) between different racial/ethnic cohorts as the main outcome. Patient demographics, tumor factors, socioeconomic status, and treatments were analyzed in relation to the primary outcomes between racial/ethnic groups. **Results:** Black non-Hispanic patients had significantly worse CSS than all other racial/ethnic groups, including Hispanic patients, in unadjusted univariate analysis (Black non-Hispanic patients: hazard ratio, 1.48; 95% CI, 1.33–1.65; Hispanic patients: hazard ratio, 1.12; 95% CI, 0.99–1.28). To investigate the association of several variables with CSS, data were stratified for multivariate analysis using forward Cox regression. This identified socioeconomic status, cancer stage, and receipt of treatment as predictive factors for the survival differences. Black non-Hispanic patients were most likely to present at a later stage (odds ratio, 1.62; 95% CI, 1.38–1.90) and to receive less treatment (odds ratio, 0.67; 95% CI, 0.55–0.81). Unmarried status, high poverty areas, increased emergency department visits, and receipt of healthcare at non-NCI/nonteaching hospitals also significantly impacted stage and treatment. **Conclusions:** Black non-Hispanic patients have a worse HNC prognosis than patients in all other racial/ethnic groups, including Hispanic patients. Modifiable risk factors include access to nonemergent care and prevention measures, such as tobacco cessation; presence of social support; communication barriers; and access to tertiary centers for appropriate treatment of their cancers.

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Background

Approximately 65,000 new cases of head and neck cancer (HNC) are diagnosed in the United States annually, with 13,500 cancer-related deaths.¹ HNC has discrepancies in presentations and outcomes across different racial and ethnic cohorts. Laryngeal cancer has a 50% higher incidence in Black non-Hispanic (NH) men, and nasopharyngeal carcinoma has a higher incidence in Asian NH individuals.^{2–4} Oropharyngeal and oral cavity cancers have similar incidence rates across cohorts, although the prevalence of HPV, a significant positive prognostic factor, is much lower in Black individuals.^{5,6}

Despite ongoing advancements in surgery, radiation therapy (RT), and chemotherapy, survival in HNC remains poor, particularly among Black patients.⁷ Multiple studies examining racial/ethnic disparities have found worse outcomes in Black NH patients than in White NH patients, although there has not been a comparison with Hispanic patients.^{8–15} These studies have attributed the differences in outcomes to differences in socioeconomic status, cancer stage at presentation, insurance coverage, and treatment patterns.

The present analysis explores differences in racial/ethnic disparities associated with cancer outcomes in patients with HNC during the modern era. We used updated SEER-Medicare population data to derive information on patient and tumor characteristics and treatment, payment, and healthcare use data to control for bias of different healthcare/insurance coverage. We focused our comparisons on 2 historically underserved populations (Hispanic and Black NH patients) and aimed to find modifiable predictors that could result in changes in care patterns to achieve equity between the different racial/ethnic cohorts.

Methods

Data

The SEER-Medicare linked database was used to conduct a retrospective cohort observational study. SEER includes

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person-level information on cancer survival and incidence from 18 population-based tumor registries encompassing approximately 28% of the population¹⁶ and containing demographic data, diagnosis date, cancer site, and cancer stage. The linked Medicare data include claims for beneficiaries with fee-for-service coverage and date of death. Medicare payments, patient deductibles, and copayments are included with each Medicare claim, together with dates of service and codes for diagnoses and procedures. This project was reviewed by the Colorado Multiple Institutional Review Board and was deemed exempt due to the deidentified status of the data.

Cohort Selection

Patients selected had squamous cell HNC (ICD-O-3 site codes C00.X–C14.X, C32.X; morphology codes 8050–8089) as the first and only tumor diagnosed in 2006 through 2015 (Figure 1). To capture patients with at least 1 year of prior Medicare eligibility, we included patients aged ≥ 66 years at diagnosis. We excluded patients with an unknown diagnosis date, diagnosed at death, and with unknown stage, race/ethnicity, and poverty or rural-urban commuting area (RUCA) measure. Patients were continuously enrolled in Medicare fee-for-service Parts A and B for 12 months before and after diagnosis with at least 1 paid medical claim in the 12 months after diagnosis. A total of 13,117 patients met the inclusion criteria.

Outcomes

Primary outcomes included overall survival (OS) and cancer-specific survival (CSS), stage at diagnosis, and receipt of treatment. OS was measured from diagnosis date to Medicare reported date of death through December 2016. CSS was calculated using SEER-reported survival months through December 2015, accounting for the cause of death. These time periods differ because of respective follow-up times in the linked SEER and Medicare databases. Survival was censored at 36 months. Cancer stage at diagnosis was based on the *AJCC Cancer Staging Manual*, 6th edition and was defined as early (stages I/II) and late (stages III/IV). Treatment was defined as any surgery, RT, and/or chemotherapy initiated within 6 months from diagnosis. These analyses were repeated between the 2 minority groups: Black NH individuals and Hispanic individuals. Time to treatment (treatment delay) was a secondary outcome calculated as days from the earliest diagnostic procedure to treatment start.

Covariates

SEER was used for patient age at diagnosis, race/ethnicity, marital status, geographic region, census tract RUCA code, census tract percentage below the poverty level, Charlson comorbidity score, and tumor characteristics.

Figure 1. Sample derivation.

Abbreviations: FFS, fee-for-service; NH, non-Hispanic; RUCA, rural-urban commuting area.

Medicare claims identified healthcare use in the year before diagnosis.^{17,18} Visits to a primary care provider (PCP) included visits to the specialties of general practice, family practice, internal medicine, and geriatric medicine; a multispecialty clinic; or a group practice. Visits to an otolaryngology (ENT) specialist and the emergency department (ED) were documented.

Medicare claims identified whether a patient had visited an NCI-designated cancer center or teaching

hospital 2 months before diagnosis through 6 months after diagnosis. Receipt of PET imaging after diagnosis was recorded.

Medical Care Spending

We estimated the average spending per patient on treatment using the amount paid by Medicare for cancer- and treatment-related institutional and non-institutional claims.^{19,20} Total spending was estimated by adding patient copayments and deductibles to the Medicare claims.

Statistical Analysis

Chi-square tests assessed univariate associations with binary outcomes, including late versus early cancer stage at diagnosis and receipt versus no receipt of treatment. Multivariate logistic regression examined multivariate associations for these outcomes. Means and standard deviations were calculated for number of healthcare visits, healthcare spending, and time to treatment.

The Kaplan-Meier method and unadjusted Cox proportional hazards were used for univariate survival analyses. Multivariate survival analyses used Cox proportional hazards models, adjusting for covariates. A forward stepwise analysis used 4 different models to examine the effects of controlling for covariates of interest on the hazard ratios (HRs) comparing racial/ethnic groups. The base model controlled for demographic and tumor factors. The second model added socioeconomic status variables (RUCA, poverty, and hospital type). The third model added stage at diagnosis, and the fourth model added treatment.

SAS 9.4 (SAS Institute Inc.) was used for all analyses. Significance was evaluated at $P < .05$.

Results

Descriptive Statistics

Table 1 and supplemental eTable 1 (available with this article at JNCCN.org) list the characteristics of 13,117 patients who met the selection criteria according to race/ethnicity. The sample comprised 10,858 (82.8%) White NH, 994 (7.6%) Black NH, 725 (5.5%) Hispanic, and 540 (4.1%) Asian NH individuals. The Black NH patient group included the highest percentage of patients living in high-poverty areas (58.5%) and with a comorbidity score ≥ 2 (36.9%). Only 39.0% of Hispanic patients lived in high-poverty areas, and 31.3% had a comorbidity score ≥ 2 . Black NH patients were least likely to be married (30.7% vs 49.7% of Hispanic patients), and also had the highest percentage of AJCC stage IV cancers (50.4%). Black NH and Hispanic patients both had the lowest frequency of PCP (76.2%

and 75.6%, respectively) and ENT visits (36.2% and 37.9%, respectively), but Black NH patients had the highest percentage of ED visits in the year before diagnosis (45.0%). Black NH patients were least likely to receive cancer-directed therapy, with only 80.8% receiving such treatment.

Black NH Patients Have Worst Survival Outcomes

Black NH patients had the worst OS (HR of death, 1.47; 95% CI, 1.35–1.60) and CSS (HR, 1.48; 95% CI, 1.33–1.65) (Figure 2). Hispanic patients had survival rates similar to those of White NH and Asian NH patients (OS: HR of death, 1.03; 95% CI, 0.92–1.15; CSS: HR, 1.12; 95% CI, 0.99–1.28). Given that survival outcomes for Hispanic patients, another historically underrepresented group in the United States, did not show a significant difference from those of White NH patients, we performed a forward stepwise Cox regression analysis to explore the effects of several variables on CSS (Table 2). CSS was significantly worse for Black NH patients than for Hispanic patients in the base model adjusting for sex, age, marital status, geographic region, comorbidity score, and primary site of disease (HR, 1.43; 95% CI, 1.16–1.76). Stepwise analysis identified the addition of AJCC stage and receipt of cancer treatment as significant factors to explain the survival differences between these cohorts. Each stage greater than stage I had an increasing risk of death, and each treatment modality had a decreased risk of death compared with no treatment. Accounting for these covariates in the final model resulted in a similar CSS in Black NH patients compared with Hispanic patients (HR, 1.14; 95% CI, 0.92–1.41). OS had a similar trend, with the base model showing a significant difference in OS in Black NH patients compared with Hispanic patients (HR, 1.45; 95% CI, 1.22–1.73), explained by stage and receipt of treatment. These findings were comparable in the CSS (supplemental eTable 2) and OS models including all racial/ethnic cohorts.

Socioeconomic Factors and Healthcare Use Predict Stage of Diagnosis

Black NH patients were more likely to be diagnosed at AJCC stage III/IV (odds ratio [OR] 1.62; 95% CI, 1.38–1.90). Because stage was a significant contributor to CSS and OS in Black NH patients, we sought to find predictors of late stage at diagnosis (Figure 3). Unmarried/Unpartnered patients were more likely to have a later stage (OR, 1.27; 95% CI, 1.17–1.37) as were those living in areas with $\geq 20\%$ of the population living below the poverty level (OR, 1.12; 95% CI, 1.01–1.23). Visits with a PCP or ENT over the past year decreased the likelihood of presenting with stage III/IV disease (PCP: OR, 0.73; 95% CI, 0.67–0.82; ENT: OR, 0.59; 95% CI,

Table 1. Descriptive Statistics of Black NH Versus Hispanic Patients

Characteristic	Black NH (%)	Hispanic (%)	P Value ^a
Patients, n	994	725	
Sex			.973
Female	27.0	27.0	
Male	73.0	73.0	
Age, y			<.001
66–74	63.9	53.1	
75–84	28.6	34.8	
≥85	7.5	12.1	
Marital status			<.001
Unmarried	69.3	50.3	
Married/Partnered	30.7	49.7	
Registry region			<.001
East	18.0	16.1	
Midwest	15.9	1.8	
South	47.2	4.0	
West	18.9	78.1	
Patient urban/rural recode category			.054
Urban commuting area	93.2	90.6	
Nonurban commuting area	6.8	9.4	
Census tract percentage below poverty level			<.001
<20%	41.4	61.0	
≥20%	58.5	39.0	
Visited NCI-designated CC or teaching hospital			<.001
No or unknown	19.4	26.6	
NCI-designated CC	14.6	24.4	
Teaching hospital	66.0	49.0	
Charlson comorbidity score			<.001
0	37.3	44.4	
1	25.7	24.3	
≥2	36.9	31.3	
Primary site			<.001
Lip and oral cavity	14.1	27.6	
Oropharynx	23.6	19.2	
Nasopharynx	3.1	2.3	
Hypopharynx	7.1	5.7	
Larynx	47.0	35.6	
Salivary glands/overlapping/NOS	5.0	9.7	
AJCC cancer stage			<.001
I	17.4	23.7	
II	13.6	16.0	
III	18.6	19.2	
IVA, IVB, or IV NOS	43.4	35.6	
IVC	7.0	5.5	

(continued)

Table 1. Descriptive Statistics of Black NH Versus Hispanic Patients (cont.)

Characteristic	Black NH (%)	Hispanic (%)	P Value ^a
Receipt of any treatment within 6 mo			.002
No	19.2	13.7	
Yes	80.8	86.3	
Any visits with PCP in prior year			.785
No	23.8	24.4	
Yes	76.2	75.6	
Any visits with otolaryngology in prior year			.467
No	63.8	62.1	
Yes	36.2	37.9	
Any ED visits in prior year			<.001
No	55.0	66.5	
Yes	45.0	33.5	

Statistics are unweighted column percentages.

Abbreviations: CC, cancer center; ED, emergency department;

NH, non-Hispanic; NOS, not otherwise specified; PCP, primary care physician.

^aBold indicates statistically significant P value.

0.54–0.64), whereas ED visits increased the likelihood (OR, 1.21; 95% CI, 1.10–1.32).

The average number of visits to each type of provider (PCP, ENT, or ED) in the year before diagnosis was calculated, because healthcare visits were an important predictor of cancer stage at diagnosis (Figure 4). The mean number of ENT visits (Black NH patients, 0.80 ± 1.58 ; Hispanic patients, 0.85 ± 1.55) and PCP visits (Black NH patients, 4.89 ± 5.72 ; Hispanic patients, 4.86 ± 5.24) were not significantly different. Conversely, ED visits were significantly higher among Black NH patients, with an average of 1.033 ± 1.92 visits in the year before diagnosis compared with 0.76 ± 1.59 visits for Hispanic patients.

Predictors of Receipt of Treatment

Logistic regression revealed that Black NH patients were less likely to receive any treatment for their squamous cell HNC, including chemotherapy, RT, and surgery, compared with Hispanic patients (OR, 0.46; 95% CI, 0.32–0.65) (Table 3). At least one visit to an NCI-designated cancer center (OR, 1.77; 95% CI, 1.17–2.70) or teaching hospital (OR, 2.28; 95% CI, 1.65–3.16) increased receipt of treatment. Patients who underwent a PET scan were also more likely to receive cancer treatment (OR, 2.37; 95% CI, 1.78–3.17). Higher cancer stages predicted lower likelihood of treatment (stage IVA, B, or not otherwise specified: OR, 0.66; 95% CI, 0.44–0.99; stage IVC: OR, 0.33; 95% CI, 0.19–0.58). Mean days from diagnosis until start of treatment were not significantly different between Black

Figure 2. (A) Overall and (B) cancer-specific survival in patients with squamous cell head and neck cancer, by race/ethnicity. Abbreviation: NH, non-Hispanic.

NH (31.7 ± 27.3) and Hispanic patients (31.1 ± 29.0 ; $P=.781$).

Treatment Spending Similar Between Groups

Mean total Medicare payments on treatment claims for Black NH patients who received any treatment were $\$29,765 \pm \$31,084$. This was not significantly different from Hispanic patients, with mean payments of $\$31,050 \pm \$28,989$. Conversely, White NH patients had lower mean payments at $\$25,848 \pm \$26,614$. The distributions of payments remained similar when divided by treatment types.

Discussion

In 1985, the Heckler²¹ report provided the first comprehensive study of healthcare disparities experienced by Black and other minority individuals in the United States, calling it an “affront both to our ideals and to the ongoing genius of American medicine.” More than 30 years later, such disparities persist. In this updated SEER-Medicare analysis, Black NH race continues to function as a critical risk factor for worst CSS outcomes in HNC. We identified late cancer stage at diagnosis and receipt of any treatment as areas of major health gaps accounting for disparities between Black NH individuals and those of other races/ethnicities.

Although other studies have shown that Black NH patients have worse survival outcomes in HNC,^{8–15} our data underscore that this holds true compared with Hispanic patients, a similarly underserved population. Hispanic patients were more likely to present with an earlier cancer stage and to receive treatment. Black NH patients continued to have a higher risk of overall and cancer-specific mortality, even after adjustment for

patient characteristics. Despite a higher percentage of Black NH individuals living in higher-poverty and urban areas, adjusting for these socioeconomic factors did not change their higher risk of mortality. It was not until we adjusted for stage and receipt of treatment that the mortality differences became comparable. Although others have found that, after adjusting for other variables, insurance coverage had the most significant effect on survival in Black patients,^{10,13,22,23} we included only Medicare recipients. This suggests that there are factors in addition to insurance that constitute barriers to access to care and receipt of treatment in Black NH patients with HNC.

Black NH and Hispanic individuals typically have similarities in lower socioeconomic status and high comorbid illnesses^{24,25}; however, Black NH patients had worse CSS outcomes. Therefore, we sought to establish modifiable potential predictors of stage presentation. Black NH individuals were more likely to live in areas of high poverty and to be unmarried. They also had more ED visits before diagnosis. These data indicate 2 major correlates driving poor cancer-specific outcomes in Black NH patients: poverty and lack of social support, and decreased receipt of ideal medical care.

Poverty is a prime predictor of greater cancer burden and is highly correlated with poor health outcomes.²⁶ Black NH individuals are the poorest ethnic group in the United States, with the lowest median household income for the past 50 years.²⁷ Lower social support, including marriage, is another hallmark of poverty and is a significant predictor of poor outcomes in HNC.^{28–30} Poverty is associated with cancer risk factors such as tobacco use, obesity, and lack of access to cancer screening and treatment. Although not recorded in the SEER-Medicare database, tobacco use is associated with laryngeal, oral

Table 2. Effects of Individual Covariates on Cancer-Specific Survival Differences in Black Non-Hispanic Versus Hispanic Patients

Characteristic	Base Model ^a		Base Model + SES ^a		Base Model + SES + Stage ^a		Base Model + SES + Stage + Treatment ^a	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
Sex								
Male	Ref		Ref		Ref		Ref	
Female	0.97	0.8–1.2	0.97	0.8–1.2	1.00	0.8–1.2	1.14	0.9–1.4
Age, y								
66–74	Ref		Ref		Ref		Ref	
75–84	1.02	0.9–1.2	1.02	0.8–1.2	1.11	0.9–1.3	1.08	0.9–1.3
≥85	1.54	1.2–2.0	1.51	1.2–2.0	1.55	1.2–2.0	1.33	1.0–1.7
Race/Ethnicity								
Hispanic	Ref		Ref		Ref		Ref	
Black non-Hispanic	1.43	1.2–1.8	1.42	1.2–1.7	1.38	1.1–1.7	1.14	0.9–1.4
Marital status								
Married/Partnered	Ref		Ref		Ref		Ref	
Unmarried	1.38	1.2–1.6	1.36	1.1–1.6	1.33	1.1–1.6	1.18	1.0–1.4
Geographic region								
West	Ref		Ref		Ref		Ref	
East	0.99	0.8–1.2	0.99	0.8–1.3	0.88	0.7–1.1	0.90	0.7–1.1
Midwest	0.97	0.7–1.3	0.97	0.7–1.3	0.93	0.7–1.3	0.95	0.7–1.3
South	0.85	0.7–1.1	0.83	0.7–1.0	0.75	0.6–0.9	0.82	0.6–1.0
Charlson comorbidity score								
0	Ref		Ref		Ref		Ref	
1	0.88	0.7–1.0	0.86	0.7–1.0	0.90	0.7–1.1	0.99	0.8–1.2
≥2	1.09	0.9–1.3	1.09	0.9–1.3	1.18	1.0–1.4	1.22	1.0–1.5
Primary site								
Oropharynx	Ref		Ref		Ref		Ref	
Hypopharynx	1.63	1.2–2.2	1.63	1.2–2.2	1.61	1.2–2.2	1.51	1.1–2.0
Larynx	0.55	0.4–0.7	0.55	0.4–0.7	0.97	0.8–1.2	0.97	0.8–1.2
Lip and oral cavity	0.77	0.6–1.0	0.77	0.6–1.0	1.20	0.9–1.5	1.32	1.0–1.7
Nasopharynx	0.86	0.5–1.4	0.86	0.5–1.4	1.01	0.6–1.7	1.10	0.7–1.8
Salivary gland/overlapping/NOS	0.87	0.6–1.2	0.87	0.6–1.2	1.07	0.8–1.5	1.10	0.8–1.5
Patient location								
Urban commuting	—	—	Ref		Ref		Ref	
Nonurban commuting	—	—	0.98	0.7–1.3	0.95	0.7–1.3	0.97	0.7–1.3
Census tract percentage below poverty level								
<20%	—	—	Ref		Ref		Ref	
≥20%	—	—	1.06	0.9–1.3	0.98	0.8–1.2	0.99	0.8–1.2
Visited NCI-designated CC or teaching hospital								
No or unknown			Ref		Ref		Ref	
NCI-designated CC	—	—	0.88	0.7–1.1	0.73	0.6–0.9	0.94	0.7–1.2
Teaching hospital	—	—	0.98	0.8–1.2	0.89	0.7–1.1	1.13	0.9–1.4

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Table 2. Effects of Individual Covariates on Cancer-Specific Survival Differences in Black Non-Hispanic Versus Hispanic Patients (cont.)

Characteristic	Base Model ^a		Base Model + SES ^a		Base Model + SES + Stage ^a		Base Model + SES + Stage + Treatment ^a	
	HR	95% CI	HR	95% CI	HR	95% CI	HR	95% CI
AJCC cancer stage								
I	—	—	—	—	Ref		Ref	
II	—	—	—	—	1.96	1.3–3.0	1.80	1.2–2.8
III	—	—	—	—	4.40	3.0–6.4	4.77	3.3–7.0
IVA, IVB, or IV NOS	—	—	—	—	7.11	5.0–10.1	7.39	5.1–10.7
IVC	—	—	—	—	15.53	10.3–23.4	13.05	8.4–20.2
Treatment								
None	—	—	—	—	—	—	Ref	
Chemotherapy alone	—	—	—	—	—	—	0.47	0.3–0.8
RT + chemotherapy	—	—	—	—	—	—	0.28	0.2–0.4
RT alone	—	—	—	—	—	—	0.45	0.3–0.6
Surgery + chemotherapy	—	—	—	—	—	—	0.45	0.2–1.1
Surgery + RT	—	—	—	—	—	—	0.22	0.2–0.3
Surgery + RT + chemotherapy	—	—	—	—	—	—	0.21	0.2–0.3
Surgery alone	—	—	—	—	—	—	0.25	0.2–0.4

Year of diagnosis was included in the analysis but excluded from the table.

Abbreviations: CC, cancer center; HR, hazard ratio; NOS, not otherwise specified; RT, radiation therapy; SES, socioeconomic status.

^aBold indicates statistically significant values.

cavity, and pharyngeal cancers,³¹ which were the most common primary sites of disease in Black NH patients in our study.

There is minimal evidence on the role of primary and specialty care use and outcomes in HNC. Black NH

patients had similar numbers of PCP visits as Hispanic patients, although both were lower compared with White NH patients. In the United States, available evidence suggesting that primary and preventive care reduces cancer mortality rates comes from breast and colon

Figure 3. Multivariate regression, controlling for demographic and tumor characteristics, for predicting late stage at diagnosis.

Abbreviations: ED, emergency department; NH, non-Hispanic; PCP, primary care provider.

Figure 4. Distribution of (A) ED and (B) PCP visits in different racial/ethnic cohorts. Abbreviations: ED, emergency department; NH, non-Hispanic; PCP, primary care provider.

cancer, for which screening guidelines are available.^{32,33} An important role of primary care when considering smoking-related cancers is smoking cessation, but studies have shown that Black NH individuals are less likely to engage in smoking cessation programs or to quit smoking in these programs.^{34,35} There are no data that we are aware of describing ED use and cancer stage at presentation, but it is well-documented that frequent users of EDs have increased overall mortality rates, more comorbid conditions, and lower health literacy.^{36,37} The Black NH patients in our study were more likely than Hispanic patients to have ED visits. Nationally, Black NH individuals are more likely to use the ED as a usual source of care and are only two-thirds as likely to see a PCP.^{38,39} Although these statistics have improved with the Affordable Care Act,⁴⁰ this highlights the importance of increasing education, trust, and access to care among Black patients in order to increase PCP use.

Payment for cancer treatment-related care was similar between Black NH and Hispanic patients but higher than for White NH patients. This may correspond to the presence of advanced disease on presentation, which is associated with increasing costs.⁴¹ This finding is similar to prior data showing that Black patients accumulated more in costs for HNC than White patients,⁴² and further corroborates that healthcare spending in the preventive and early diagnosis stages will improve outcomes and ultimately decrease overall spending.

Although we found that receiving cancer-directed treatment of any kind improved outcomes, Black NH patients were less likely to receive treatment even when we adjusted for characteristics including age, cancer stage and primary site, socioeconomic status, and comorbid conditions. Although it is impossible to assess what treatment options were offered or declined, it has

previously been described that Black patients are less likely than others to undergo surgery for HNC.^{10,15,43} There are many data showing mistrust of the medical community among Black patients,^{44,45} in addition to the role of implicit bias and structural racism in the community,⁴⁶ all of which can be associated with delayed or forgone medical care or refusal of ideal medical care. It is imperative for healthcare workers to educate themselves on racism and cultural differences and to form trusting relationships with their patients to provide optimal cancer care.

Patients were more likely to undergo treatment if they received services at an NCI-designated cancer center or teaching hospital. Studies have shown that individuals in minority groups are less likely than others to receive treatment at high-volume hospitals and NCI-designated centers^{47,48}; however, these facilities are associated with increased HNC survival outcomes, particularly between different racial/ethnic groups.^{49,50} Due to the complexity of HNC treatment, it is important for patients and physicians to consider referral for treatment at or at least treatment recommendations from a tertiary cancer center.

Although there is much ongoing research addressing health disparities in underserved populations, several solutions could improve outcomes in Black NH patients. Diversifying the healthcare workforce to allow better racial/ethnic and cultural understanding can decrease communication barriers and improve patient retention and compliance with treatments.⁵¹ Increased use of patient navigation programs can help patients maneuver complex issues that prevent ideal care, including financial and social issues, follow-up appointments, and education.⁵² Finally, disparities can be reduced by challenging healthcare systems to focus on racial/ethnic inequalities through initiatives such as implicit bias

Table 3. Covariates Predicting Receipt of Treatment in Black Non-Hispanic and Hispanic Patients

Characteristic	Odds Ratio ^a	95% CI	P Value ^b
Race			<.001
Hispanic	Ref		
Black non-Hispanic	0.46	0.32–0.65	
Sex			.011
Male	Ref		
Female	1.58	1.12–2.25	
Age, y			.086
66–74	Ref		
75–84	0.85	0.63–1.15	
≥85	0.60	0.60–0.38	
Marital status			.435
Married/Partnered	Ref		
Unmarried	0.89	0.66–1.19	
Registry region			.027
West	Ref		
East	1.44	0.93–2.22	
Midwest	1.02	0.60–1.72	
South	1.73	1.15–2.55	
Patient urban/rural recode category			.196
Urban commuting area	Ref		
Nonurban commuting area	1.45	0.82–2.54	
Census tract percentage below poverty level			.549
<20%	Ref		
≥20%	1.09	0.82–1.45	
Visited NCI-designated CC or teaching hospital			<.001
No or unknown	Ref		
NCI-designated CC	1.77	1.17–2.70	
Teaching hospital	2.28	1.65–3.16	
Charlson comorbidity score			.016
0	Ref		
1	1.73	1.19–2.51	
≥2	1.16	0.86–1.58	
Primary site			.006
Oropharynx	Ref		
Hypopharynx	0.47	0.27–0.80	
Larynx	0.75	0.52–1.10	
Lip and oral cavity	1.13	0.70–1.80	
Nasopharynx	0.57	0.26–1.26	
Salivary glands/overlapping/ NOS	1.64	0.80–3.35	

(continued)

Table 3. Covariates Predicting Receipt of Treatment in Black Non-Hispanic and Hispanic Patients (cont.)

Characteristic	Odds Ratio ^a	95% CI	P Value ^b
AJCC cancer stage			<.001
I	Ref		
II	1.00	0.61–1.62	
III	1.09	0.69–1.74	
IVA, IVB, or IV NOS	0.66	0.44–0.99	
IVC	0.33	0.19–0.58	

Abbreviations: CC, cancer center; NOS, not otherwise specified.

^aOdds ratios are calculated as likelihood to receive treatment.^bBold indicates statistically significant P value.

training, increased disparity research, and allocation of funding for programs that increase access to care for underserved populations.⁵³

This study has limitations inherent in the use of the SEER-Medicare registry. Our population was limited to patients enrolled in Medicare fee-for-service plans, which excludes younger patients and those receiving other insurance/medical coverage. Age has not previously been described to impact racial disparities, but socioeconomic status may, and patients in the SEER-Medicare database have been described to be at an economic disadvantage.⁵⁴ Receipt of treatment is a significant prognostic factor in our findings, but we cannot distinguish reasons why treatment was not offered or accepted, which may introduce bias. Furthermore, SEER-Medicare does not provide HPV data. HPV-related oropharyngeal cancer has a lower incidence in Black Americans and may have a significant impact on the survival differences.^{6,12,55} Finally, the SEER registry does not have accurate tobacco use data, although prior studies that have stratified patients by smoking habits showed no impact on disparities.^{10,11,24}

Conclusions

This analysis provides further evidence of the disparities in survival outcomes in HNC among Black NH patients compared with all other racial/ethnic cohorts, including Hispanic patients, another underserved ethnic minority. Our findings showed that Black NH patients present with later stage at diagnosis and receive less treatment after diagnosis. Efforts should be made to address modifiable factors that lead to these higher cancer stages, including improving access to nonemergent healthcare; enhancing prevention and screening programs, including tobacco cessation; and increasing navigational support. Once patients are diagnosed, efforts to increase trust, decrease

bias and racism, and provide access to multidisciplinary/tertiary cancer care should be prioritized to bridge the treatment gap for Black NH individuals.

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Supplemental online content for:

Elderly Black Non-Hispanic Patients With Head and Neck Squamous Cell Cancer Have the Worst Survival Outcomes

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eTable 1: Descriptive Statistics of Patients by Race/Ethnicity

eTable 2: Effects of Individual Covariates on Cancer-Specific Survival Differences in All Racial/Ethnic Groups

eTable 1. Descriptive Statistics of Patients by Race/Ethnicity

Characteristic	White Non-Hispanic (%)	Black Non-Hispanic (%)	Hispanic (%)	Asian Non-Hispanic (%)	P Value ^a
Patients, n	10,858	994	725	540	
Sex					.029
Female	30.3	27.0	27.0	32.0	
Male	69.7	73.0	73.0	68.0	
Age, y					<.001
66–74	51.0	63.9	53.1	46.8	
75–84	34.8	28.6	34.8	36.5	
≥85	14.2	7.5	12.1	16.7	
Marital status					<.001
Unmarried	47.2	69.3	50.3	35.2	
Married/Partnered	52.8	30.7	49.7	64.8	
Registry region					<.001
East	19.3	18.0	16.1	8.3	
Midwest	12.4	15.9	1.8	2.2	
South	30.2	47.2	4.0	3.7	
West	38.0	18.9	78.1	85.7	
Patient urban/rural recode category					<.001
Urban commuting area	84.5	93.2	90.6	97.2	
Nonurban commuting area	15.5	6.8	9.4	2.8	
Census tract percentage below poverty line					<.001
<20%	80.3	41.4	61.0	80.4	
≥20%	19.7	58.5	39.0	19.6	
Visited NCI-designated CC or teaching hospital					<.001
No or unknown	27.9	19.4	26.6	21.3	
NCI-designated CC	21.6	14.6	24.4	42.8	
Teaching hospital	50.5	66.0	49.0	35.9	
Charlson comorbidity score					<.001
0	45.7	37.3	44.4	50.0	
1	25.2	25.7	24.3	22.8	
≥2	29.1	36.9	31.3	27.2	
Primary site					<.001
Lip and oral cavity	27.7	14.1	27.6	31.3	
Oropharynx	25.5	23.6	19.2	21.7	
Nasopharynx	1.8	3.1	2.3	9.4	
Hypopharynx	4.7	7.1	5.7	5.9	
Larynx	30.5	47.0	35.6	23.3	
Salivary glands/overlapping/NOS	9.7	5.0	9.7	8.3	
AJCC cancer stage					<.001
I	28.1	17.4	23.7	26.3	
II	15.1	13.6	16.0	14.6	
III	16.6	18.6	19.2	16.1	
IVA, IVB, or IV NOS	36.3	43.4	35.6	39.3	
IVC	3.9	7.0	5.5	3.7	

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eTable 1. Descriptive Statistics of Patients by Race/Ethnicity (cont.)

Characteristic	White Non-Hispanic (%)	Black Non-Hispanic (%)	Hispanic (%)	Asian Non-Hispanic (%)	P Value ^a
Receipt of treatment within 6 mo					<.001
No	12.9	19.1	13.6	11.5	
Yes	87.1	80.7	86.3	88.5	
Any visits with PCP in prior year					<.001
No	19.1	23.8	24.4	22.6	
Yes	80.9	76.2	75.6	77.4	
Any visits with otolaryngology in prior year					.035
No	59.4	63.8	62.1	60.4	
Yes	40.5	36.2	37.9	39.6	
Any ED visits in prior year					<.001
No	68.7	55.0	66.5	75.4	
Yes	31.3	45.0	33.5	24.6	

Statistics are unweighted column percentages.

Abbreviations: CC, cancer center; ED, emergency department; NOS, not otherwise specified; PCP, primary care physician.

^aBold indicates statistically significant P value.

eTable 2. Effects of Individual Covariates on Cancer-Specific Survival Differences in All Racial/Ethnic Groups

Characteristic	Base Model ^a		Base Model + SES ^a		Base Model + SES + Stage ^a		Base Model + SES + Stage + Treatment ^a	
	HR	P Value	HR	P Value	HR	P Value	HR	P Value
Sex		.004		.002		.001		<.001
Male	Ref		Ref		Ref		Ref	
Female	1.10		1.11		1.15		1.20	
Age, y		<.001		<.001		<.001		<.001
66–74	Ref		Ref		Ref		Ref	
75–84	1.29		1.29		1.38		1.34	
≥85	1.84		1.85		2.03		1.78	
Race/Ethnicity		<.001		<.001		.209		.898
White NH	Ref		Ref		Ref		Ref	
Black NH	1.38		1.29		1.10		1.00	
Hispanic	1.10		1.05		0.95		1.01	
Asian NH	0.94		0.94		0.92		0.94	
Marital status		<.001		<.001		<.001		<.001
Married/Partnered	Ref		Ref		Ref		Ref	
Unmarried	1.52		1.49		1.41		1.30	
Geographic region		.005		.092		.028		.020
West	Ref		Ref		Ref		Ref	
East	0.90		0.91		0.90		0.93	
Midwest	1.03		1.03		1.04		1.02	
South	1.07		1.03		1.03		1.08	
Charlson comorbidity score		<.001		<.001		<.001		<.001
0	Ref		Ref		Ref		Ref	
1	1.07		0.99		1.07		1.14	
≥2	1.46		1.35		1.45		1.50	
Primary site		<.001		<.001		<.001		<.001
Oropharynx	Ref		Ref		Ref		Ref	
Hypopharynx	1.80		1.80		1.93		1.78	
Larynx	0.67		0.67		1.35		1.28	
Lip and oral cavity	0.73		0.73		1.41		1.57	
Nasopharynx	1.22		1.22		1.44		1.34	
Salivary gland/overlapping/NOS	0.93		0.93		1.35		1.60	
Patient location		—		.694		.584		.939
Urban commuting	—		Ref		Ref		Ref	
Nonurban commuting	—		0.98		1.02		1.02	
Census tract percentage below poverty level		—		<.001		.005		.057
<20%	—		Ref		Ref		Ref	
≥20%	—		1.18		1.12		1.08	
Visited NCI-designated CC or teaching hospital		—		.137		<.001		<.001
No or unknown	—		Ref		Ref		Ref	
NCI-designated CC	—		0.97		0.80		0.98	
Teaching hospital	—		1.05		0.97		1.15	

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eTable 2. Effects of Individual Covariates on Cancer-Specific Survival Differences in All Racial/Ethnic Groups (cont.)

Characteristic	Base Model ^a		Base Model + SES ^a		Base Model + SES + Stage ^a		Base Model + SES + Stage + Treatment ^a	
	HR	P Value	HR	P Value	HR	P Value	HR	P Value
AJCC cancer stage		—		—		<.001		<.001
I	—		—		Ref		Ref	
II	—		—		2.83		2.57	
III	—		—		5.26		5.16	
IVA, IVB, or IV NOS	—		—		8.33		7.87	
IVC	—		—		19.47		14.96	
Treatment		—		—		—		<.001
None	—		—		—		Ref	
Chemotherapy alone	—		—		—		0.54	
RT + chemotherapy	—		—		—		0.26	
RT alone	—		—		—		0.38	
Surgery + chemotherapy	—		—		—		0.34	
Surgery + RT	—		—		—		0.19	
Surgery + RT + chemotherapy	—		—		—		0.21	
Surgery alone	—		—		—		0.21	

Year of diagnosis was included in the analysis but excluded from the table.

Abbreviations: CC, cancer center; HR, hazard ratio; NH, non-Hispanic; NOS, not otherwise specified; RT, radiation therapy; SES, socioeconomic status.

^aBold indicates statistically significant values.