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A Matter Of Race: Early- Versus Late-Stage Cancer Diagnosis:

African Americans receive their cancer diagnoses at more advanced stages of the disease than whites do

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Abstract

We compared the stage at which cancer is diagnosed and survival rates between African Americans and whites, for thirty-four solid tumors, using the population-based Surveillance Epidemiology and End Results (SEER) database. Whites were diagnosed at earlier stages than African Americans for thirty-one of the thirty-four tumor sites. Whites were significantly more likely than blacks to survive five years for twenty-six tumor sites; no cancer site had significantly superior survival among African Americans. These differences cannot be explained by screening behavior or risk factors; they point instead to the need for broad-based strategies to remedy racial inequality in cancer survival.

Racial inequalities in health care and health outcomes between African Americans and white Americans is well documented and is so persistent that the elimination of such disparities is one of two overarching goals of Healthy People 2010.¹ Likewise, the elimination of racial disparities is the subject of numerous Institute of Medicine (IOM) reports.² Inequity in overall cancer survival by race is recognized and attributed to differences in the stage at which cancer is diagnosed, its treatment, and, to a lesser extent, in the aggressiveness of tumors. Given equal treatment, there is considerable evidence that African Americans and whites could experience equal stage-specific survival.³ Addressing treatment disparities will not equalize cancer survival if the stage at which diagnosis occurs differs systematically between African Americans and whites. The prognostic impact of late-stage diagnosis is so strongly related to poorer survival that increasing the percentage of cancers diagnosed at an early stage is a prominent goal of the National Cancer Institute (NCI).⁴

Disparities by race in stage of diagnosis have been reported for a variety of cancers, including female breast, colorectal, and prostate.⁵ For cancers for which there are effective screening tests (female breast, cervix, and colorectal), disparities in stage at diagnosis have been attributed to differences in use of screening technologies.⁶ In these cases, interventions focus on improving access to screening tests. For other cancers, the underlying cause of disparities in stage at diagnosis is unclear. Although differential presence of risk factors (for

example, smoking) might explain higher or lower rates of cancer diagnosis, it does not necessarily follow that these higher rates manifest as more advanced stages at diagnosis. In some cancers, African Americans may develop more aggressive tumors; in these cases, a more advanced stage at diagnosis would reflect differences in biology rather than a failure of medical care. An example of this difference is “less differentiated and more aggressive” prostate tumors in African American men compared with white men or the “triple negative” (estrogen receptor, progesterone receptor, and HER2neu negative) breast cancers that are more common in African American women than in white women.⁷

It is possible that differences in stage at diagnosis are more consistent across a wider range of cancers than would be explained by screening behavior or differences in tumor aggressiveness. If so, a cancer-by-cancer approach to equalizing stage at diagnosis, such as the National Breast and Cervical Cancer Early Detection Program, is unlikely to equalize the overall experiences of African American and white cancer patients.⁸

Here we examine the thirty-four most common solid tumors affecting adults. We compare age-and sex-adjusted stage at diagnosis and survival. To our knowledge, this analysis has not been presented in any published source. Other summaries of stage and survival by race have included fewer tumors and have not been consistently standardized by age and sex.⁹

Study Data And Methods

Data source

We used the NCPs Surveillance, Epidemiology, and End Results (SEER) cancer registry database for the period 1992 through 2003. The SEER registries provide population-based cancer surveillance for sixteen geographic areas that represent approximately 26 percent of the U.S. population. We have data for 1992–2003 from twelve geographic areas; four contain data for 2000–2003 only.

Case selection

We examined patterns of stage at diagnosis for thirty-four different malignancies. We excluded Hispanic whites and races other than white or African American. Hispanic African Americans constitute less than 2 percent of the African American cases overall and for no tumor more than 4 percent of the African American cases. Therefore, we included them in the African American category.

We excluded cases diagnosed at age nineteen or younger, cases with a prior cancer diagnosis, cases diagnosed by death certificate or autopsy, and cases reported by a nursing home only. We did not include tumors classified as in situ, unstaged, or for which staging information does not easily apply: brain cancer (all cases are unstaged) and hematopoietic cancers (leukemia, lymphoma, and multiple myeloma). Sites were grouped based on SEER’s groupings, which use primary site and the *International Classification of Diseases for Oncology* (ICD-O morphology).

Analysis

We used the SEER summary stage, which assigns all cases to one of three rank-ordered stage groups—local, regional, and distant—with later stages representing tumors that are more widely spread than earlier stages and, thus, having poorer prognoses. For prostate cancer, tumors are grouped as localized/regional and distant per SEER coding protocol. We used ordered logistic regression to estimate the odds that African Americans are diagnosed at a more advanced stage than non-Hispanic whites, while controlling for sex, age at diagnosis, year of diagnosis (1992–1994, 1995–1997, 1998–2000, or 2001–2003), and

geographic location by registry.¹⁰ Five-year cancer survival was estimated using age- and sex-standardized data and Kaplan-Meier techniques. T-tests were used to assess statistical significance of these year five survival estimates. Records for patients dying of reasons other than cancer were censored at the time of death. We did not adjust for stage in this analysis; thus, the impact of unequal stage at diagnosis is reflected in the survival estimates. To facilitate interpretation, cancer sites were grouped into categories based on whether widely used screening tests were available (screening cancers), whether they were relatively common (2002 incidence more than 5.0 per 100,000 overall or for either sex), or whether they were less common than that.¹¹ Within category, sites were ordered by the total number of cases.

Our study was deemed exempt from review by the University of Minnesota Institutional Review Board. All statistical analyses were completed using SAS software, version 9.1. We considered *p* values less than 0.05 to be statistically significant.

Study Results

Over the period 1992–2003, 190,579 African American and 1,517,068 non-Hispanic white adult cancer patients were identified by SEER registries with one of the thirty-four selected cancers. Overall, 14.2 percent were excluded because they were unstaged or diagnosed with in situ disease. African Americans were more likely than whites to be unstaged at diagnosis (7.34 percent versus 5.50 percent; $p < 0.0001$) and less likely to have in situ disease (6.22 percent versus 8.75 percent; $p < 0.0001$). Following the exclusions, 164,726 (11.24 percent) African Americans and 1,300,936 (88.76 percent) non-Hispanic whites remained.

Stages at diagnosis

African Americans were diagnosed at more-advanced stages than whites for all four cancers with widely recommended screening procedures and for prostate cancer, where screening remains controversial (Exhibit 1). African Americans were also diagnosed at more-advanced stages than whites for eleven of thirteen cancers, with an annual incidence of 5.0 per 100,000 or greater (Exhibit 2). Similarly, African Americans were diagnosed at more-advanced stages than whites for fifteen of sixteen tumor types with low annual incidence (Exhibit 3). Overall, African Americans were diagnosed at more advanced stages than whites for thirty-one of thirty-four tumor sites. We found only two exceptions to the pattern: cancer of the kidney/renal pelvis and small intestine. Only for cancer of the small intestine was advanced stage at diagnosis significantly more common for whites than for African Americans.

Survival advantages

Even for the two cancers where African Americans were diagnosed at earlier stages, the earlier stage at diagnosis did not result in a survival advantage. Overall, whites had a five-year cancer survival advantage for thirty-two of the thirty-four tumor sites, and twenty-six of these differences were statistically significant. There were only two sites (stomach and gallbladder) for which African Americans had a survival advantage; in neither case was the difference statistically significant or large (less than 2 percent).

Possible confounding factors

Geography—To assess whether the observed patterns could reflect geographic variability where non-Hispanic whites from predominantly white registries were compared to African Americans from racially more diverse registries, we removed SEER registries with less than 10 percent African Americans (for example, Iowa). The findings were not changed, which suggests that the stage differences do not reflect underlying geographic differences.

Insurance status—Insurance status is also correlated with stage at cancer diagnosis and survival. SEER registries do not contain information about insurance. Therefore, we limited our analysis to people of Medicare age (sixty-five and older) and found that the racial disparity in stage at diagnosis and survival remained.

Analytic factors—We conducted a number of additional analyses to confirm that analytic decisions did not change the study results. When we included unstaged tumors in our analysis and considered them to be a category between regional and distant, the patterns remained unchanged.

Discussion

The overwhelming and consistent disparities in stage of cancer diagnosis and survival rates is a wake-up call. African Americans were diagnosed at significantly more-advanced stages than whites were for cancers for which screening is available and noncontroversial (female breast, colorectal, and cervix). African Americans were more likely to be diagnosed at advanced stages for the most common cancers and relatively rare cancers. The pattern was observed for cancers that are associated with tobacco exposure (for example, lung, bladder, and oral) and radiation exposure (for example, thyroid and sarcoma). Given the wide variety of malignancies evaluated, the consistency of the racial disparities does not seem to be explained by differences in risk factors, screening behavior, or tumor biology. Rather, the factors that are most likely responsible for these differences are related to the patients themselves or the institutional racism inherent in the health care system in which they receive care.

Insurance and care-seeking behavior

It is likely that patient factors that are differently found in the white population than in the African American population are responsible for part of the observed disparity. Well-recognized candidates include the availability of health insurance and care-seeking behavior. Although SEER does not include information on insurance status, we found that the observed patterns were unchanged when we limited our analysis to people of Medicare age, which suggests that the effects were not purely due to insurance.

Others have examined the association between insurance coverage and cancer outcomes. [first name?] Halpern used the National Cancer Database to show an association between lack of insurance and higher stage at cancer diagnosis for twelve common cancers.¹² [first name?] Ward and others have shown that uninsured people and those on Medicaid are less likely to be screened for cancer than people with insurance. This finding would be consistent with the stage and survival patterns seen in Exhibit 1. Interestingly, Ward reports a stronger association between stage at breast cancer diagnosis and insurance for white women than for African American women.¹³

Medicaid enrollment

Medicaid enrollment at the time of tumor diagnosis is consistently shown as a risk factor for later stage at diagnosis.¹⁴ [first name?] Perkins examined whether people enrolled in Medicaid in the year prior to cancer diagnosis are diagnosed at later stages and found increased risk of late diagnosis but less than that of people enrolling in Medicaid at diagnosis.¹⁵ Others have found no increased risk of late-stage diagnosis for long-term Medicaid enrollees relative to the insured.¹⁶

Income and education

Income and education are strongly and consistently associated with health care use and outcomes. Both within the United States and in countries with universal health insurance, studies have shown that populations with low income and low education are less likely to be screened for cancer and are more likely to be diagnosed at later stages than other populations.¹⁷

Differences in health care providers

Studies have shown that African Americans are treated by different health care providers than whites are.¹⁸ These providers may be less knowledgeable about cancer signs, symptoms, and diagnosis; have a less-well-established referral network; or have longer wait times for appointments. Provider education would be a strategy for improving the general quality of care. Both Barrel Gaskin and Beth Virnig argue that a race-neutral approach that emphasizes reducing hospital, provider, or regional variability would be more effective than a strategy that focuses solely on race-based approaches.¹⁹

Patients' delay in seeking care

Studies of delay in cancer diagnosis and treatment identify patient and provider components of delay. Patients may delay seeking care after symptom onset because of fear or denial, lack of a primary care provider, or lack of recognition of the importance of a symptom.²⁰ Patients might also experience delays in obtaining an initial appointment, obtaining necessary diagnostic testing, or seeing specialists.²¹ Several studies point to greater delays experienced by African American cancer patients than their white counterparts.²²

Providers' role in delayed diagnoses

[first name?] Gross and colleagues reported that racial disparities in treatment of breast, colorectal, lung, and prostate cancers for elders did not narrow between 1992 and 2002.²³ Their analysis examined process-of-care measures for diagnosed cancer patients covered by Medicare and found poorer quality of care that was consistent over time. Pay-for-performance (P4P) incentives show some promise of improving specific quality-of-care problems. In general, the strategy seems to be most easily implemented for conditions with relatively clear-cut guidelines and established processes of care such as diabetes or nodal retrieval in association with specific cancer-directed surgeries. It is unclear whether P4P could equalize the quality of diagnostic care associated with the broad range of cancers studied here.

Study limitations

This study used data from the SEER cancer registries. As such, we could not measure availability of insurance, use of diagnostic technologies, or time from symptom onset to diagnosis. Likewise, for cancers associated with screening tests, we could not determine whether screening was offered or performed. Nor could we measure the presence or absence of specific risk factors such as smoking or diet. Our measurement of demographic factors was limited to age, sex, race, and marital status.

Cancer screening can pose some analytic challenges when researchers are assessing the benefits of early detection. In general, the cancers detected by screening will tend to be smaller and slower growing than those detected when they become clinically apparent. If the stage pattern were only seen in cancers with accepted screens (see Exhibit 1), then bias would be a possible explanation. The consistency across such a large number of tumors with variable clinical courses makes bias an unlikely explanation.

This study did not take into account whether there were differences by race in the underlying rate of cancer incidence. Efforts to prevent cancer through modification of risk factors such as smoking and diet are important. The need for risk-factor reduction, however, does not negate the need to focus on diagnosis at earlier stages as a mechanism to reduce disparities in cancer survival.

In spite of the growing array of treatments available for patients diagnosed with metastatic disease, the most effective way to improve cancer survivorship is through early detection. Although efforts to eliminate disparities in cancer treatment are important and necessary, they are not sufficient to eliminate disparities in overall cancer survival if the disparities in the stage at which diagnoses are made remain.

NOTES

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EXHIBIT 1

Stage At Cancer Diagnosis And Five-Year Cancer Survival, By Race And Cancer Site For Cancers With Available Screening, Year?

	Total number (percent African American)	Percent diagnosed at distant stage	OR for more advanced stage at diagnosis, African American relative to white ^a	95% CI for OR	Five-year cancer survival (%)	
					White ^b	African American ^b
Female breast	273,265 (10.24%)	5.97	1.49 ****	1.46–1.53	81.48 ****	68.87
Colon	150,804 (11.81%)	21.49	1.24 ****	1.21–1.28	65.35 ****	56.47
Rectum	34,197 (9.73%)	15.24	1.06	0.99–1.14	66.51 ****	55.62
Cervix	16,331 (19.24%)	10.01	1.33 ****	1.23–1.45	70.02 ****	60.55
Screening controversial Prostate	295,775 (14.39%)	5.27	2.16	2.07–2.26	81.85 ****	74.19%

SOURCE: Surveillance, Epidemiology, and End Results (SEER) database.

NOTES: OR is odds ratio. CI is confidence interval.

^aOrdered logistic model for probability of earlier stage at diagnosis. Adjusted for age (continuous), sex, year (categorical, 1992–1994, 1995–1997, 1998–2000, 2001–2003), and geographic area.

^bAge- and sex-standardized (age in ten-year categories); *p* values.

p < 0.001

EXHIBIT 2

Stage At Cancer Diagnosis And Five-Year Cancer Survival, By Race And Cancer Site For Relatively Common Cancers Without Available Screening, Year?

	Total number (percent African American)	Percent diagnosed at distant stage	OR for more advanced stage at diagnosis, African American relative to white ^a	95% CI for OR	Five-year cancer survival(%)	
					White ^b	African American ^b
Lung	224,453 (12.20%)	42.22	1.09	1.06–1.11	20.99	16.89%
Bladder	75,231 (5.13%)	3.44	2.09	1.95–2.24	80.56	66.69%
Melanoma	67,768 (0.54%)	3.66	3.48	2.82–4.30	88.85	71.14%
Corpus uteri	49,287 (7.29%)	8.43	2.06	1.92–2.20	78.80	55.34%
Kidney and renal Pelvis	39,104 (11.68%)	21.61	0.96	0.90–1.02	67.45	67.17%
Pancreas	34,568 (13.87%)	61.54	1.10	1.03–1.17	7.37	6.84%
Ovary	30,727 (8.16%)	67.98	1.12	1.02–1.23	49.98	41.28%
Thyroid	27,019 (7.57%)	5.13	1.04	0.94–1.14	95.41	94.15%
Stomach	23,274 (17.97%)	38.28	1.00	0.94–1.07	27.10	27.67%
Larynx	15,252 (16.70%)	3.92	1.63	1.49–1.79	70.37	58.29%
Esophagus	14,249 (15.46%)	34.70	1.05	0.96–1.15	22.36	14.25%
Testis	11,619 (3.34%)	9.62	1.75	1.42–2.16	95.27	88.17%
Liver	10,465 (19.62%)	26.28	1.20	1.09–1.31	20.50	14.03%

SOURCE: Surveillance, Epidemiology, and End Results (SEER) database.

NOTES: OR is odds ratio. CI is confidence interval.

^a Ordered logistic model for probability of earlier stage at diagnosis. Adjusted for age (continuous), sex, year (categorical, 1992–1994, 1995–1997, 1998–2000, 2001–2003), and geographic area.

^b Age- and sex-standardized (age in ten-year categories); *p* values.

**
p < 0.05

p < 0.01

p < 0.001

EXHIBIT 3

Stage At Cancer Diagnosis And Five-Year Cancer Survival, By Race And Cancer Site For Uncommon Cancers, Year?

	Total number (percent African American)	Percent diagnosed at distant stage	OR for more advanced stage at diagnosis, African American relative to white ^a	95% CI for OR	Five-year cancer survival (%)	
					White ^b	African American ^b
Tongue	9,639 (10.51%)	11.97	2.07 ***	1.81–2.37	63.17 ****	41.44
Soft tissue incl. heart	8,891 (13.64%)	14.52	1.26 ***	1.11–1.43	69.26 ****	60.76
Gum and mouth	8,569 (13.61%)	5.79	1.79 ***	1.57–2.05	64.25 ****	50.63
Non-epithelial skin	5,574 (8.41%)	3.82	1.30*	1.05–1.60	87.65	87.02
Small intestine	5,431 (16.77%)	31.10	0.83 **	0.72–0.95	61.86	57.86
Tonsils	5,302 (13.81%)	11.28	1.56 ***	1.29–1.89	67.21 ****	43.78
Anus, anocanal, and anorectum	4,691 (11.85%)	10.57	1.47 ****	1.23–1.75	72.20 ****	64.46
Gallbladder	3,623 (12.50%)	36.88	1.19	0.98–1.45	19.83	21.70
Vulva	4,390 (9.20%)	4.28	1.55 ****	1.25–1.93	66.50	61.15
Salivary gland	4,078 (10.15%)	11.23	1.17	0.95–1.44	74.18 **	68.60
Hypopharynx	2,935 (19.52%)	16.97	1.06	0.85–1.32	41.67 ****	26.21
Bones and joints	2,236 (10.60%)	16.01	1.14	0.87–1.49	71.99 **	62.40
Nose, nasal cavity, and middle ear	2,227 (12.66%)	14.68	1.73 ****	1.34–2.23	60.89 ****	48.62
Male breast	1,974 (14.03%)	7.75	1.34 **	1.03–1.73	72.95 ****	60.14
Nasopharynx	1,537 (18.87%)	13.92	1.37 **	1.00–1.87	58.23	54.10
Oropharynx	1,177 (21.92%)	18.18	1.88 ****	1.36–2.59	48.62 ****	33.50

SOURCE: Surveillance, Epidemiology, and End Results (SEER) database.

NOTES: OR is odds ratio. CI is confidence interval.

^a Ordered logistic model for probability of earlier stage at diagnosis. Adjusted for age (continuous), sex, year (categorical, 1992–1994, 1995–1997, 1998–2000, 2001–2003), and geographic area.

^b Age- and sex-standardized (age in ten-year categories); *p* values.

*** *p* < 0.05

1000 > p ****
100 < p ****

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