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Increased racial differences on breast cancer care and survival in America: historical evidence consistent with a health insurance hypothesis, 1975–2001

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Abstract

Purpose—This study examined whether race/ethnicity had differential effects on breast cancer care and survival across age strata and cohorts within stages of disease.

Methods—The Detroit Cancer Registry provided 25,997 breast cancer cases. African American and non-Hispanic white, older Medicare-eligible and younger non-eligible women were compared. Successive historical cohorts (1975–1980 and 1990–1995) were, respectively, followed until 1986 and 2001.

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Results—African American disadvantages on survival and treatments increased significantly, particularly among younger women who were much more likely to be uninsured. Within node positive disease all treatment disadvantages among younger African American women disappeared with socioeconomic adjustment.

Conclusions—Growth of this racial divide implicates social, rather than biological, forces. Its elimination will require high quality health care for all.

Keywords

Survival; Health insurance; Socioeconomic factors; Race; Ethnicity; Cancer treatment

Introduction

Racial differences on breast cancer care and survival, sentinel indicators of health care performance, have been consistently observed in the United States. African American women have been found to be particularly disadvantaged relative to non-Hispanic white women [1–6]. Contributing the largest African American sample to the nation's cancer Surveillance, Epidemiology and End Results (SEER) program [7], the Detroit metropolitan area remains an example of extreme racial segregation [8, 9]. Consequently, it serves as an important place to accomplish research on race, health and health care.

Biological and sociological theories have been advanced to explain racial group cancer survival differences. Racial differences on such tumor characteristics as hormone receptors have implicated gene-based causal pathways [10, 11], but their ability to account for racial group survival differences has ranged widely [12–16]. As managed care proliferated and the prevalence of uninsured Americans increased over the past 25 years [17–24], a health insurance theory has been advanced to explain social, including racial, cancer survival gradients [25–28]. Various uninsured and underinsured statuses have been found to be strongly associated with later cancer diagnoses, lack of access to treatments, and ultimately, to poorer survival [29–33]. African Americans remain significantly disadvantaged on various indices of socioeconomic status including health insurance coverage [34, 35], yet when they are treated in the same health care systems as their white counterparts, their cancer survival rates are similar [1, 36–41]. These social forces have accounted for much, but not all of such health outcome differences by race/ethnicity.

The relative weight of these theoretical perspectives may be examined with a historical analysis. Breast cancer care advances have been a hallmark of the past generation, but have they been equitably enjoyed by all? It has been suggested that African American women, particularly those not yet Medicare-eligible, have not [42–46]. These studies suggested a 3-way interaction (race/ethnicity effect moderated by Medicare eligibility and cohort) in the prediction of breast cancer survival. This study tested the specific hypothesis that the widened racial divide was most pronounced among younger African American women. Clinical wisdom suggests that because greater clinical and managerial discretion attends lymph node involvement, related treatment inequities were most pronounced for node positive breast cancer. This study explored a series of 3-way interactions in the prediction of breast cancer treatment: surgery, radiation therapy, chemotherapy and hormone therapy.

Methods

Five-year survival was calculated for 4,523 African American and 21,474 non-Hispanic white women with primary invasive breast cancer in the Metropolitan Detroit Cancer Surveillance System [4–6]. Successive 1975–1980 and 1990–1995 cohorts were followed until 1986 and 2001, respectively. Putting the focus on overall population health trends, logistic regression models tested interactions and estimated associations of race/ethnicity with all-cause survival and treatments across age strata (less than 65 vs. 65 years of age and older) and cohorts within stages of disease [47]. The older age categorization is synonymous with Medicare eligibility, nearly all of whom (99%) are covered for medically necessary care. The younger age group is 15–20-times as likely to have no such health insurance coverage [48]. Therefore, younger-older strata are good proxies for being more or less prevalently underinsured.

Results

In the 1990s, non-Hispanic white women with breast cancer were much more likely than African American women to have survived 5 years; odds ratio (OR) = 1.94 (95% confidence interval [CI] 1.79, 2.16). That racial divide had increased significantly since the 1970s (OR = 1.64, 95% CI 1.46, 1.84). The race by age by cohort interaction on 5-year breast cancer survival is also depicted in Table 1. As hypothesized, the increased racial disparity specifically pertained to younger women not yet Medicare-eligible; 1970s OR = 1.60 (1.39, 1.84) vs. 1990s OR = 2.06 (1.85, 2.30). Survival among older, Medicare-eligible, women was by no means equitable, but the racial divide had not increased significantly among them; 1970s OR = 1.74 (1.41, 2.16) vs. 1990s OR = 1.79 (1.58, 2.04). This pattern was apparent for non-metastasized breast cancer with larger disadvantages among younger African American women with node positive disease.

As for interaction hypothesis explorations on breast cancer care, access disadvantages increased significantly over time for radiation therapy, chemotherapy and hormone therapy among younger African American women with node positive disease (Table 2, left side); for example, chemotherapy 1970s OR = 1.05 (0.87, 1.27) vs. 1990s OR = 1.19 (1.04, 1.36). However, all three interactions with their attendant African American disadvantages among younger women were no longer significant after socioeconomic adjustment. The racial divide that had existed for surgical treatment of node negative breast cancer appears to have been bridged somewhat among all women with breast cancer, but more so among older women.

Discussion

African American women with breast cancer have not fully benefited from contemporary treatment and survival advances. They appear to be more disadvantaged today than they were a generation ago. Such racial/ethnic disadvantage was particularly pronounced among younger women who were much more likely to be inadequately insured. These findings are consistent with well established socioeconomic-dependent associations of being uninsured with lack of access to best treatments and with consequent poorer survival [29, 53–61]. In

fact, notwithstanding the often great indirect costs of cancer, direct cancer care costs have far outfaced costs of living and of treating most other health conditions [62]. So even many insured cancer patients may, in fact, be inadequately insured.

Study limitations and strengths

This study could conceivably be limited by its focus on all-cause, rather than cancer-specific survival. For the following reasons we think it not. Cancer is the underlying cause of most deaths among younger women with breast cancer [26, 27]. Moreover, the underlying cause of many "non-cancer" deaths can often be directly associated with non-treatment or even with some cancer treatment complications [63]. And this study's hypothesized African American disadvantage among younger women was not only observed for survival, but also for receipt of a number of treatments. This study could also be limited by the known incompletion of its chemo and hormonal therapy data: 8% and 4%, respectively [64]. Again, we think its pattern of findings not to be potently confounded. Between-race differences on such incompletion rates were miniscule (typically less than 1%). Missing data status was not significantly associated with both hypothesized independent (race/ethnicity) and dependent variables (survival) in any of its within-cohort regression models, so it could not have confounded them. And a consistent pattern of findings was observed across, not only chemo and hormonal therapy, but radiation therapy as well.

Conclusions

Race still matters in American health care. The clinical importance of biological differences notwithstanding, they probably cannot explain the observed increased racial disparities in breast cancer treatment and survival. It seems farfetched to think that any between-race oncogenetic differences have systematically changed over this study's mere generational time-frame. Contemporary social policies affecting health care access and management clearly have systematically changed though.

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Table 1

Effects of race moderated by age, stage and cohort[a] on breast cancer 5-year survival: women diagnosed between 1975 and 1980, and 1990 and 1995 were respectively followed until January 1, 1986 and 2001

	1970s 5-year survival cohort			1990s 5-year survival cohort		
Age	***n***	**OR**	**95% CI**	***n***	**OR**	**95% CI**
Race moderated by cohort[b]						
25+	9,967	1.64	1.46, 1.84	16,030	1.94	1.79, 2.16
Race moderated by age and cohort[c]						
<65	6,448	1.60	1.39, 1.84	8,437	2.06	1.85, 2.30
65+	3,519	1.74	1.41, 2.16	7,593	1.79	1.58, 2.04
Race moderated by age, stage and cohort[d]						
Race moderated by age and cohort within node negative disease[c]						
<65	4,534	1.45	1.21, 1.74	5,074	1.86	1.56, 2.22
65+	2,454	1.40	1.05, 1.85	5,263	1.56	1.31, 1.86
Race moderated by age and cohort within node positive disease[c]						
<65	1,211	1.61	1.19, 2.19	2,696	2.02	1.69, 2.42
65+	528	1.89	1.12, 3.19	1,657	1.91	1.47, 2.47
Race moderated by age and cohort within metastasized disease						
<65	478	1.54	0.79, 3.00	467	2.03	1.11, 3.71
65+	359	1.81	0.78, 4.20	429	1.98	0.93, 4.21

Notes: n = number of incident female breast cancer cases, OR = odds ratio, CI = confidence interval. Main and interaction effects (ORs and 95% CIs) of race, age, stage and cohort were estimated from logistic regression models. All effects were age-adjusted in logistic regression models that treated non-linear age (lower survival among the youngest and oldest) as a categorical variable: 25–44 (reference category), 45–54, 55–64, 65–74, 75 years of age and older

[a] Racial groups: African American and non-Hispanic white. Age groups: less than 65 years of age (not yet Medicare eligible) and 65 years of age and older (Medicare eligible). Stage of disease at diagnosis groups: node negative (localized and regional), regional node positive, and distant or metastasized disease. Cohorts: diagnosed in the 1970s and 1990s

[b] Significant 2-way interaction, $P<0.05$

[c] Significant 3-way interaction, $P<0.05$

[d] Significant 4-way interaction, $P<0.05$

Table 2

Effects of race moderated by age and cohort within breast cancer stage of disease at diagnosis[a] on receipt of cancer-directed treatments: incidence cohorts diagnosed between 1975 and 1984, and 1990 and 1999 were followed until January 1, 1986 and 2001

							Adjusted for socioeconomic status[b]					
	1970s and 1980s cohort			1990s cohort			1970s and 1980s cohort			1990s cohort		
Age	***n***	**OR**	**95% CI**	***n***	**OR**	**95% CI**	***n***	**OR**	**95% CI**	***n***	**OR**	**95% CI**
Node negative breast cancer												
	Race moderated by age and cohort on surgery[c]						Race moderated by age and cohort on surgery[c]					
<65	6,991	2.04	1.23, 3.38	8,854	1.65	1.02, 2.68	4,724	1.01	0.49, 2.11	8,803	1.66	0.87, 3.20
65+	4,198	2.74	1.66, 4.51	8,879	1.50	0.89, 2.52	3,074	2.40	1.26, 4.60	8,828	1.22	0.65, 2.29
Node positive breast cancer												
	Race moderated by age and cohort on radiation therapy[c]						Race moderated by age and cohort on radiation therapy					
<65	3,069	0.84	0.68, 1.04	4,642	1.12	0.98, 1.28[d]	2,459	0.87	0.68, 1.11	4,615	0.93	0.79, 1.11
65+	1,461	1.04	0.74, 1.46	2,759	1.08	0.88, 1.33	1,123	1.06	0.71, 1.58	2,743	0.93	0.72, 1.21
	Race moderated by age and cohort on chemotherapy[c]						Race moderated by age and cohort on chemotherapy					
<65	3,082	1.05	0.87, 1.27	4,644	1.19	1.04, 1.36	2,476	0.90	0.72, 1.12	4,617	0.97	0.81, 1.15
65+	1,464	1.53	1.11, 2.11	2,759	0.90	0.73, 1.12	1,124	1.36	0.94, 1.97	2,743	0.94	0.71, 1.23
	Race moderated by age and cohort on hormone therapy[c]						Race moderated by age and cohort on hormone therapy					
<65	3,083	0.90	0.71, 1.14	4,643	1.15	0.97, 1.35[d]	2,476	0.86	0.62, 1.19	4,616	1.01	0.82, 1.25
65+	1,464	0.98	0.68, 1.41	2,757	1.05	0.85, 1.29	1,124	0.91	0.60, 1.38	2,741	0.90	0.69, 1.17

Notes: n = number of incident female breast cancer cases, OR = odds ratio, CI = confidence interval. Main and interaction effects of race, age, stage and cohort were estimated from logistic regression models (ORs and 95% CIs estimated from regression statistics). All effects were age-adjusted in logistic regression models that treated non-linear age (lower survival among the youngest and oldest) as a categorical variable: 25–44 (reference category), 45–54, 55–64, 65–74, 75 years of age and older

[a] Racial groups: African American and non-Hispanic white. Age groups: less than 65 years of age (not yet Medicare eligible) and 65 years of age and older (Medicare eligible). Cohorts: 1970–1980s and 1990s. Stage of disease at diagnosis groups: node negative (localized and regional) and regional node positive. Distant breast cancers that had already metastasized at the time of diagnosis were excluded

[b] Adjusted for poverty: low, middle and high poverty areas based on census tract prevalence below the federal poverty criterion [49–52]

[c] Statistically significant 3-way interaction, $P<0.05$

[d] 90% confidence interval does not include the null ($P<0.10$)