Impact of Race and Ethnicity on Outcomes for Estrogen Receptor-Negative Breast Cancers: Experience of an Academic Center with a Charity Hospital

Quyen D Chu, MD, FACS, Gary Burton, MD, FACP, Jonathan Glass, MD, FACP, Mark H Smith, MD, Benjamin DL Li, MD, FACS

BACKGROUND: African American women have a higher breast cancer mortality rate than Caucasian women. Estrogen receptor (ER)-negative tumors, which are more aggressive than ER-positive tumors, occur more frequently in African American women than in Caucasian women and may contribute to apparent disparities in outcomes. However, outcome results need to be controlled for socioeconomic status (SES). We evaluated the effect of race and ethnicity on outcomes of patients with ER-negative tumors by determining outcomes in African American and Caucasian women with low SES but similar access to care.

STUDY DESIGN: From a prospective database of 786 patients with stage 0 to III breast cancer, all 375 patients with ER-negative tumors were evaluated. Patients received standard definitive operations and adjuvant treatment. Compliance with treatment was more than 90%. Primary endpoints were cancer recurrence and overall survival (OS). Statistical analysis performed included Kaplan-Meier survival analysis, log-rank test, Cox proportional hazard model, Student's *t*-test, and chi-squared test. A p value ≤ 0.05 was considered statistically significant.

RESULTS: Fifty-four percent of African American patients had ER-negative tumors versus 39% in Caucasian patients. In both groups, 69% of patients received free care or Medicaid, with a median income of $16,577 (range $15,367 to $36,788). Comparing the 2 racial and ethnic groups, mean tumor size ($p = 0.19$), tumor grade distribution ($p = 0.32$), nodal distribution ($p = 0.50$), stage distribution ($p = 0.30$), rate of mastectomy ($p = 0.47$), receipt of adjuvant chemotherapy ($p = 0.07$), and financial class distribution ($p = 0.67$) were not significantly different. The 5-year OS was 77% for both groups ($p = 0.59$). On multivariate analysis, race and ethnicity were not independent predictors of OS ($p = 0.73$).

CONCLUSIONS: In a predominantly indigent population, race and ethnicity had no impact on outcomes for ER-negative breast cancer. (J Am Coll Surg 2010;210:585–594. © 2010 by the American College of Surgeons)

African American women have a lower incidence of breast cancer compared with Caucasian women, yet the mortality rate in African American women is said to be higher.[1-4] The causes of this disparity, and indeed whether this disparity actually exists, have been in the forefront of public discussion. Like so many other societal challenges, these debates can be simplified as being "nature versus nurture." In other words, is the biology of breast cancer in African American women different from that in Caucasian women or do socioeconomic constructs of our society result in disparate breast cancer outcomes?

Proponents for the "biology camp" and "socioeconomic camp" have both provided convincing evidence to support their positions. Unfortunately, many of the studies were based on large administrative databases, which are known to have inherent limitations.[5] To understand the role of biology and socioeconomic status (SES) on breast cancer outcomes, our group reported our experience with 786 patients with operable breast cancer.[6] In this study, we were

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From the Departments of Surgery (Chu, Smith, Li) and Medicine (Burton, Glass), and the Feist-Weiller Cancer Center (Chu, Burton, Glass, Li), Louisiana State University Health Sciences Center in Shreveport, Shreveport, LA. Correspondence address: Quyen D Chu, MD, FACS, Louisiana State University Health Sciences Center and the Feist-Weiller Cancer Center, 1501 Kings Highway, Shreveport, LA 71130.

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Abbreviations and Acronyms

DFS = disease-free survival
EBCTCG = Early Breast Cancer Trialists' Collaborative Group
ER = estrogen receptor
FWCC = Feist-Weiller Cancer Center
LSUHSC-S = Louisiana State University Health Sciences Center in Shreveport
OS = overall survival
SES = socioeconomic status

able to control for SES because the majority of our patients were considered "indigent" (ie, classified as either receiving free care or Medicaid). We report that, despite the low SES of many of these patients, we were able to achieve outcomes comparable to those reported in the literature. Furthermore, we found that whatever biologic differences that might have existed between African American and Caucasian women were mitigated by providing equal access and having strong infrastructures that facilitate patient care, providing parity in breast cancer outcomes between the 2 racial/ethnic groups.[6]

We were able to assemble a cohort of patients with breast cancer that had a homogenous SES because of the uniqueness of our health care system. The Louisiana State University Health Sciences Center in Shreveport (LSUHSC-S) is 1 of 2 tertiary care hospitals in a 10-hospital, state-wide public hospital system with a primary mission of serving as the health care safety net for the approximately 715,000 uninsured citizens of Louisiana. In recent years, in part as a result of the ravages of the 2005 hurricanes, LSUHSC-S has become the major facility for cancer care of the indigent, with cancer patients coming from 59 of Louisiana's 64 parishes (counties)[7] and with more than one-third of patients with breast cancer residing more than 100 miles from LSUHSC-S. The Feist-Weiller Cancer Center (FWCC), which is an integral part of LSUHSC-S, was created to provide high-level cancer care to all residents of Louisiana, regardless of financial circumstances.

In our initial analysis of outcomes in breast cancer patients cared for from 1998 to the present, we did note that a significant proportion of African American women had ER-negative tumors. These tumors are believed to behave more aggressively than ER-positive tumors and consequently, are thought to contribute to the poorer outcomes in African American women.[4,8,9] Because of the significant number of patients with ER-negative tumors in our database, and because we were able to control for SES, we evaluated this cohort separately to determine whether breast cancer outcomes differed between the 2 racial/ethnic groups and found that within the cohort of patients of similarly low SES and with ER-negative tumors, parity in breast cancer outcomes between African American women and Caucasian women can still be achieved.

METHODS

A prospectively maintained breast cancer database was created in 1998 as a method to closely follow patients with breast cancer and as a research tool. From this prospectively maintained breast cancer database, data on patients with stage 0 to III breast cancer who were treated up to September 2008 were analyzed. Approval to analyze our database was obtained from our Institutional Review Board. Of the 803 patients with breast cancer in the database, 17 patients were excluded because they were other ethnicities (Hispanics or Asians) or because of incomplete data. From the remaining 786 patients in the database, 468 patients were African Americans and 318 patients were Caucasian. We identified 375 patients (48%) with ER-negative breast cancers. Almost 90% of patients were treated at FWCC/LSUHSC-S; the remaining patients were treated at EA Conway Hospital, a sister safety-net hospital. Patients were staged according to the American Joint Committee on Cancer Staging Manual, 6th Edition.[10]

All breast operations at FWCC/LSUHSC-S were performed by 2 Society of Surgical Oncology (SSO) fellowship-trained surgical oncologists. Patients at EA Conway Hospital were operated on by 3 general surgeons, each of whom had more than 10 years of surgical experience.

A weekly multidisciplinary tumor board conference was held, and all breast cancer cases were presented and discussed. Conference attendees included surgical oncologists, medical oncologists, radiation oncologists, radiologists, geneticists, residents, fellows, nurses, researchers, coordinators, and educators. Telemedicine conferencing with EA Conway Hospital was used to discuss care of patients treated at that hospital.

To ensure study homogeneity, all treatment and surveillance protocols were standardized. Standard treatment protocols for adjuvant and neoadjuvant chemotherapy, hormonal therapy, radiation therapy, and biologic therapy were offered to all patients. Definitive operations included either breast conservation therapy (lumpectomy with tumor-free margin, sentinel lymph node dissection and/or axillary lymph node dissection, and breast irradiation) or a mastectomy (with or without axillary lymph node dissection in select patients). Adjuvant systemic therapy included chemotherapy, antiestrogen therapy, and/or herceptin as indicated per current standard of care and active adjuvant therapy research protocols.

Patient follow-up consisted of a history and physical examination every 3 months for 3 years, every 6 months in years 4 and 5, and annually thereafter. Chest x-ray, mammogram, complete blood count, and liver function tests were obtained annually. Additional radiologic and/or histologic evaluations were performed based on clinical indications. Clinical data were accrued and recorded prospectively and included age at diagnosis, comorbid conditions, stage of disease, treatment protocol, surveillance protocol compliance, cancer recurrence, and death. Compliance with treatment and surveillance protocols was more than 90%.

Two sources were used to stratify patients according to their socioeconomic status: Internal Revenue Service 2001 ZIP code-based income tract and Louisiana State University Hospital Computer Service database. These sources did not differ between African American women versus Caucasian women and data were not combined across methods. The Internal Revenue Service 2001 ZIP code-based income tract reports income as median annual income per ZIP code stratified into quintiles based on $10,000 increments. If the percentage of patients falls within 1% of either stratification group, the average of both groups is used to estimate the median annual income. Because the 2001 tax year approximated the middle of dates of operations for our patient population, this was chosen. All patients were assigned a median annual income and stratified accordingly.

Our hospital's Computer Services database was used to link patients' financial codes with their names, medical record numbers, initial dates of diagnosis, and ICD-9 diagnosis code 174.0 to 174.9. These financial codes were then used to stratify patients into the following subsets: commercial insurance, Medicare, Medicaid, or indigent or free care. Because this database tracks patients only for the past 7 years, only 49% of patients (n = 184) were identified from this database.

The impact of race and ethnicity on outcomes of patients with ER-negative breast cancers was assessed by comparing outcomes between Caucasian and African American women. Asian and Hispanic women were excluded from analysis because they comprised less than 5 patients in our large database. Study endpoints were compared with those from the recent report by the Early Breast Cancer Trialists' Collaborative Group (EBCTCG) on outcomes for ER-poor breast cancer.[11]

MedCalc software (Microsoft, Inc) was used to perform all statistical analyses. Categorical data were analyzed using the chi-squared test, and the median age and mean tumor size were analyzed by the independent samples *t*-test. Disease-free survival (DFS) was calculated from the date of operation to the date of first recurrence (local or distant) or date of last follow-up. Overall survival (OS) was calculated from the date of operation to the date of death from any cause or date of last follow-up.

The Kaplan-Meier survival method and the log-rank test were used to generate and compare survival curves. Multivariate analyses were performed using Cox proportional hazard regression models. Risk ratios and 95% confidence intervals were calculated from the model. A p value ≤ 0.05 was considered statistically significant.

RESULTS

Three hundred seventy-five patients with ER-negative breast tumors were identified. Table 1 shows patient, clinicopathologic, and socioeconomic characteristics of our cohort. There were 252 African American women (67%) and 123 Caucasian women (33%). This represented 53.8% (252 of 468) of the total number of African American women and 38.7% (123 of 318) of the total number of Caucasian women in our database. The mean age at diagnosis was 55 years for African American women and 59 years for Caucasian women ($p = 0.25$), and the mean follow-up time was 57 months.

The median annual income by ZIP code for the entire group was $16,577 (range $15,367 to $36,788). The median annual income was $16,451 (range $15,367 to $36,773) for African American women and $16,737 (range $15,795 to $36,788) for Caucasian women. The differences between the median incomes were statistically significant ($p < 0.001$) although the magnitude of such differences does not appear to be clinically relevant. All patients resided within geographic areas with reported median annual incomes of $40,000 or less, and approximately 88% (330 of 375) were in areas with a reported median annual income of less than or equal to $30,000. The financial data from our institution's computer services were: 13% commercial insurance, 9% Medicare, 7% Medicaid, and 71% free care ($p = 0.67$) (Table 1).

Of all the clinicopathologic parameters examined, only tumor size distribution ($p = 0.05$) and median annual income ($p < 0.001$) were significantly different between the 2 racial and ethnic groups. Mean tumor grade ($p = 0.83$), tumor grade distribution ($p = 0.32$), tumor size ($p = 0.19$), nodal distribution ($p = 0.49$), stage distribution ($p = 0.29$), ER/progesterone receptor distribution ($p = 0.28$), rate of mastectomy ($p = 0.47$), receipt of adjuvant therapy ($p = 0.07$), and financial class distribution ($p = 0.67$) were not significantly different between the 2 racial and ethnic groups (Table 1).

Overall, 139 of the 375 patients (37%) experienced recurrences, with rates of 36% (90 of 252) in African Amer-

Table 1. Distribution of Patient, Clinicopathologic, and Socioeconomic Characteristics of 375 Patients with Estrogen Receptor-Negative Tumors

Characteristics	African American	Caucasian	p Value
n	252	123	
%	67	33	
Mean age, y (range)	55 (54–57)	59 (57–61)	0.25
Mean tumor grade	2.52	2.45	0.83
Tumor grade, n (%)			
1 (2)	5/225 (2)	2/116 (2)	0.32
2 (46)	97/225 (43)	60/116 (52)	
3 (52)	123/225 (55)	54/116 (46)	
Mean tumor size (cm)	3.34	3.02	0.19
Tumor size distribution, n (%)			
T0 (2)	7 (3)	1 (1)	
T1 (30)	67 (27)	47 (38)	0.05
T2 (49)	122 (48)	60 (49)	
T3 (12)	34 (13)	9 (7)	
T4 (7)	22 (9)	6 (5)	
Nodal distribution, n (%)			
N0 (52)	126 (50)	70 (57)	
N1 (26)	66 (26)	30 (25)	0.49
N2 (15)	42 (17)	14 (11)	
N3 (7)	18 (7)	9 (7)	
Stage distribution, n (%)			
Stage 0 (2)	6 (2)	1 (1)	
Stage I (22)	50 (20)	31 (25)	0.29
Stage II (47)	117 (47)	61 (50)	
Stage III (29)	79 (31)	30 (24)	
ER (−)/PR (−) (92)	235 (93)	110 (89)	
ER (−)/PR (+) (8)	17 (7)	13 (11)	0.28
Definitive surgery, n (%)			
Breast-conserving therapy (28)	74 (29)	31 (25)	0.47
Mastectomy (72)	178 (71)	92 (75)	
Systemic treatment, n (%)			
Adriamycin alone (17)	45 (18)	19 (15)	
Adriamycin + taxane (33)	92 (36)	34 (28)	
Taxane alone (3)	5 (2)	6 (5)	0.07
Hormone therapy alone (7)	20 (8)	7 (6)	
Hormone therapy + chemotherapy (22)	45 (18)	36 (29)	
Others (18)	45 (18)	21 (17)	
Median annual income, $	16,451	16,737	
Mean annual income, $ (range)	18,078 (15,367–36,773)	21,721 (15,795–36,788)	<0.001
Financial class, n (%)			
Commercial (13)	14/125 (11)	10/59 (17)	
Medicare (9)	12/125 (10)	5/59 (8)	0.67
Medicaid (7)	10/125 (8)	3/59 (5)	
Free care (71)	89/125 (71)	41/59 (70)	

Numbers in parentheses in the left column indicate percentages.
ER, estrogen receptor; PR, progesterone receptor.

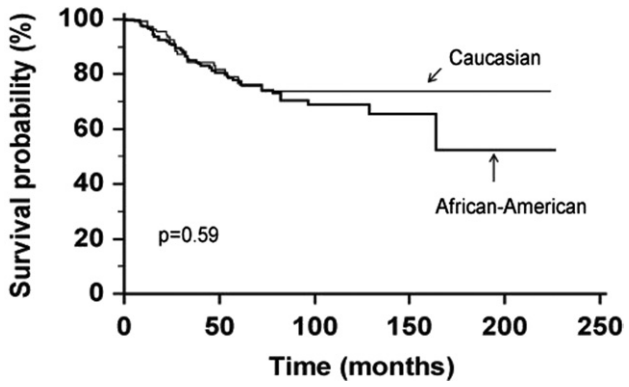

Figure 1. Effect of race and ethnicity on overall survival for 375 patients with estrogen receptor-negative tumors.

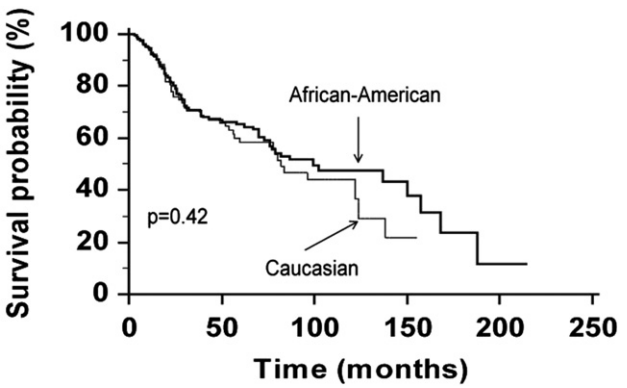

Figure 2. Effect of race and ethnicity on disease-free survival for 375 patients with estrogen receptor-negative tumors.

ican women and 40% (49 of 123) in Caucasian women. Additionally, 77 of 375 (21%) died: 54 of 252 (21%) African American women and 23 of 123 (19%) Caucasian women have died.

To determine whether race and ethnicity had an impact on outcomes for patients with ER-negative tumors, we compared OS and DFS between African American and Caucasian women (Figs. 1 and 2). In our previous study of the entire cohort of 786 patients, neither the OS nor the DFS were significantly different between the 2 racial and ethnic groups. Likewise, in the subgroup of women with ER-negative tumors, no differences were seen, with the median OS survival not reached for either group (Fig. 1) and the 5-year DFS at 65% for African American women and 58% for Caucasian women ($p = 0.42$) (Fig. 2). The median DFS survivals were 99 months for African American women and 82 months for Caucasian women.

The Cox proportional hazard model was used to compare race and ethnicity, age at diagnosis, median income, tumor grade, T-stage, and N-stage for risk of cancer recurrence and OS (Tables 2 and 3). Note that race and ethnicity was not an independent predictor of DFS ($p = 0.13$) or OS ($p = 0.73$). Independent predictors for OS were age ($p = 0.03$), tumor grade ($p = 0.026$), T-stage ($p = 0.0005$), and N-stage ($p = 0.008$). Independent predictors for DFS were T-stage ($p = 0.0005$) and N-stage ($p = 0.002$).

Significant differences in outcomes between African American women and Caucasian women may be masked by suboptimal results. Therefore, we compared our outcomes with those recently reported by the EBCTCG.[11] The 10-year mortality rates for African American and Caucasian women were 31% and 26%, respectively ($p = 0.59$). The overall 10-year mortality rate for our entire cohort was 29%, which compares favorably with the 25% to 39% mortality rate for EBCTCG (Table 4).

DISCUSSION

It is an irrefutable fact that disparity in breast cancer mortality exists between African American women and Caucasian women. Relative to Caucasian women, African American women have a higher breast cancer mortality rate despite having an overall lower incidence of disease.[2-4] The disparity gap between the 2 racial and ethnic groups is even wider for women in Louisiana. Besides the District of Columbia, Louisiana ranks first in breast cancer mortality, despite ranking 19th in the incidence of invasive breast cancer.[7,12] Unfortunately, the bulk of Louisiana's breast cancer mortality rate is attributed to the high mortality rate for African American women; among African American women, the mortality rate is 15% above the national mortality rate (the highest in the nation), and among Caucasian

Table 2. Effect of Clinicopathologic Variables on Cancer Recurrence

Variable	Relative risk	95% CI	p Value
Race	1.36	0.91–2.02	0.13
Age	1.01	0.99–1.03	0.19
Median income	1.00	1.0–1.0	0.49
Tumor grade	1.37	0.97–1.95	0.08
T-Stage	1.49	1.19–1.85	0.0005
N-Stage	1.35	1.11–1.63	0.002

Cox Proportional Hazard model.

Table 3. Effect of Clinicopathologic Variables on Overall Survival

Variable	Relative risk	95% CI	p Value
Race	0.91	0.51–1.59	0.73
Age	1.02	1.00–1.05	0.03
Median income	1.00	1.0–1.0	0.93
Tumor grade	1.72	1.07–2.77	0.026
T-Stage	1.63	1.24–2.15	0.0005
N-Stage	1.41	1.09–1.81	0.008

Cox Proportional Hazard model.

Table 4. Comparison of 10-Year Mortality Rate for Patients with Estrogen Receptor-Negative Breast Cancer

Data source	Mortality rate, %
FWCC	29
EBCTCG[11]	25–39

EBCTCG, Early Breast Cancer Trialists' Collaborative Group; FWCC, Feist-Weiller Cancer Center.

women, the mortality rate is comparable to the national average.[12]

Pinpointing the underlying factors leading to disparity in breast cancer has been the focus of many heated debates.[2,3,8,9,12-16] It remains to be determined what the relative influence biology or socioeconomic factor has on such disparity. Proponents favoring biology as the major culprit have argued that the higher mortality rate for African American women was driven largely by African American women having a predominance of ER-negative and/or triple negative tumors (ER-negative/PR-negative/Her-2 negative).[3,8,9,12,15,16] Such disparity in breast cancer mortality persists even after controlling for stage, tumor characteristics, socioeconomic variables, demographics, and treatment factors.[8,13]

Although persuasive, many of these studies have their inherent weaknesses. The majority of studies lack any direct comparison between the 2 racial and ethnic groups within the ER-negative tumor group. Furthermore, most of the reports rely heavily on data analyzed from the Surveillance, Epidemiology and End Results (SEER) database. Although such large administrative datasets are helpful in providing investigators a more global perspective of an issue at hand, these datasets may harbor inaccuracies, which can stem from missing data, selection bias, reporting bias, and other factors.[5] Because Surveillance, Epidemiology and End Results data are collected only from 18 American cancer registries, the data may not be fully representative.

An argument against a biologic basis for disparity can be derived by comparing breast cancer mortality rates between the 2 racial and ethnic groups over a 30-year period using breast cancer mortality rates for African American and Caucasian women from 1975 to 2004 in the Surveillance, Epidemiology and End Results database. The mortality rates for both were quite similar up to around the 1980s. However, for the next 20 years, the curves drastically diverge, with the death rate for African American women much higher than that for Caucasian women. Whatever the causes might be for this startling divergence, it is highly implausible that the biology of breast cancer would change so abruptly.[1,14]

Our data support the views of other groups that regardless of differences in tumor biology between African American and Caucasian women, socioeconomics is probably the major driving force behind disparities in breast cancer mortalities.[6,17-23] In our initial analyses of 786 patients with operable breast cancer, we demonstrated that breast cancer outcomes for African American and Caucasian women were comparable. These results were achieved in a population that historically has been linked to poorer outcomes; the median annual income for both groups was less than $17,000, with more than two-thirds of patients classified as either receiving free care or Medicaid. Furthermore, 60% of our patients were African American, making us one of the largest cohorts of African Americans in a comparison study.[6] Although factors that have allowed us to achieve such desirable results have not been formally analyzed, we did note that providing equal access to all patients, regardless of payer statuses, as well as having a strong patient-oriented infrastructure, were pivotal in our ability to achieve parity of outcomes for patients.

We noted in our initial study that African American women did have a statistically significantly higher proportion of ER-negative tumors compared with Caucasian women.[6] Therefore, to delineate the impact of ER-negative tumors on outcomes, we selected a group of patients with ER-negative tumors and analyzed their outcomes. Not only were we able to control for SES, but also for tumor biology.

Similar to the results of our initial study, there were no significant differences in breast cancer mortality rates between African American and Caucasian women with ER-negative tumors. In this relatively homogenous cohort with low SES, only 2 factors were significantly different between the 2 groups: tumor size distribution and median annual income. African American women presented with larger tumors (T3/T4) and a slightly lower median annual income than Caucasian women; however, the latter difference was unlikely to be socioeconomically relevant. Given these differences, one might expect a worse outcome among African Americans, which was not found. These data recognize that biologic differences, in this case a higher proportion of ER-negative tumors, which is a surrogate marker for more aggressive tumor biology, can be mitigated perhaps by the access to care provided by the public hospital system in Louisiana.

As with our analysis of the larger cohort, it is essential that the outcomes in the subgroup of patients with ER-negative breast cancer are at least as good as national norms so as not to mask any potential differences between 2 racial and ethnic groups. Indeed, in the comparison of our data with results from the recent report by the EBCTCG,[11] the overall 10-year mortality rate for our cohort was 29%, which compares favorably with the 25% to 39% mortality rate reported by the EBCTCG (Table 4).

A limitation of our study is the lack of individual socioeconomic data. Similar limitations have been observed in other US public health surveillance systems.[4,24-26] However, area-based socioeconomic metrics such as the census tract, the block group, or the ZIP code-based income have been considered acceptable means to address these shortcomings.[24,27-29]

It has been suggested that poverty may influence breast cancer tumor biology, promoting a more aggressive subtype.[14] Were this the case, one might expect that all impoverished women should have similar tumor biology. Our data do not support this provocative hypothesis. Using ER receptor status as a surrogate marker for tumor biology and analyzing its incidence in a largely impoverished cohort, we found that only 39% of Caucasian women versus 54% of African American women have ER-negative tumors. Therefore, the influence of environment on cancer biology seems unlikely.

The debates surrounding the root causes for disparities in breast cancer mortality do have serious societal implications. These debates potentially influence how scarce resources are being allocated to study the problem. The American Recovery and Reinvestment Act (ARRA) of 2009, through the Challenge Grants, has recently allocated a substantial sum for the study of Basic Cancer Research in Cancer Health Disparities. Furthermore, the National Cancer Institute (NCI) recently released at least 3 requests for applications, devoting at least $10 million to identify differences in biology of ER-negative breast cancers among the different racial and ethnic groups. Such funding mechanisms have already biased the debate toward the biology camp, making it difficult to objectively determine the true impact of biology versus environment on breast cancer outcomes. It is imperative that we understand the important role, if not a dominant role, that socioeconomic constructs have in contributing to the disparate outcomes for patients with breast cancer. We believe that only by accepting this fact can we hope to move the debate forward.

Author Contributions

Study conception and design: Chu, Glass, Smith, Li
Acquisition of data: Chu, Smith, Li
Analysis and interpretation of data: Chu, Smith
Drafting of manuscript: Chu, Burton, Glass, Smith
Critical revision: Burton, Glass, Li

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Discussion

DR KIRBY BLAND (Birmingham, AL): It is with pleasure that I discuss this excellent paper by Drs Chu and Li and their associates at LSU Shreveport. This paper encompasses enlarging interests for a number of societal and scientific reasons. In addition, this is the most common solid organ tumor in women. To my knowledge, this is the first paper to actually provide in-depth analysis of a disadvantaged socioeconomic group, and it goes head-to-head with a selective database for a single institution with comparisons of biologic and socioeconomic status of African-American and Caucasian women. These comparisons were made, and I congratulate you relative to surgery, systemic therapy, cancer recurrence, and financial class.

The authors have ensured that the analysis has compared standard definitive surgery and adjuvant therapies among the groups, and they, again, are to be congratulated because their compliance rate actually exceeded 90%. The conclusion is that race and ethnicity have no impact on outcomes in these ER-negative patients, as you have heard, but it clearly challenges the majority of the current molecular profiling data that are available in various international studies.

I bring the latter point into my questions in that molecular subtypes of breast cancer are highly important clinically to differentiate subgroups that possess different responses to therapeutic outcomes. These outcomes are demographically linked to ethnic groups, and they are biologically linked to genetic alterations.

Various studies have suggested that the luminal A, the HER2/neu, as well as basal subtypes are consistently the most reproducible and homogeneous of these cancers. And as you know, prognostically, the luminal A cancers have a poorer survival, as do the HER2/neu positive, but triple negative, particularly in the African-American woman, is a very aggressive variant.

As I reviewed your database, more than 90% of the population of African-American women and more than 90% of the Caucasian women were both ER-negative and PR-negative. You don't use HER-2/neu in this group. Ben and Dr Chu, maybe you could, perhaps, tell us about that, and what are your frequencies of triple negatives, which are a very aggressive subtype?

In the population-based studies, premenopausal African-American women have a higher incidence of very aggressive basaloid types, more than 40% of these variants; in postmenopausal groups of all ethnicities, normally this is around 15%.

The median age of the group that you studied was principally postmenopausal in both ethnicities. So could you share with us any molecular data that would separate these categories?

The authors have made a compelling argument against the biologic basis for disparity that could be derived by comparing breast cancer mortality between the 2 racial and ethnic groups that use a 30-year interval for follow-up in the SEER data. This is in their manuscript. Although similar mortalities were evident up until about the 1980s, there has been a shift and there is clearly a higher frequency of death among African-American women. However, it is your premise that regardless of differences in tumor biology between the 2 groups, socioeconomic deprivation is the principal driver between disparities for these breast cancer mortalities. Therefore, what is your hypothesis to differentiate the challenged socioeconomic status of the African-American from her middle and higher socioeconomic cohorts? Is this biology different because of nutritional differences in socioeconomic class?

Finally, if there is not a direct correlation between the influence of poverty, which in my mind is a surrogate for nutritional depletion, and alteration of the immune status and the potential influence of tumor biology, what demographic constructs should we be investigating?

I enjoyed this paper very much for a number of reasons. It's provocative, it's insightful, and hopefully it will move to translational outcomes that will improve the care of a disadvantaged group in our health system.

DR WILLIAM C WOOD (Atlanta, GA): I would add my congratulations to Drs Chu and Li to those of Dr Bland, for the superb clinical results that they have achieved in this population of patients. The genomic revolution in cancer biology allows us to pierce the veil of apparent randomness in response to therapy and increasingly appreciate the categories of very different cancers that are either responsive to or resistant to our various therapies.

These long-standing debates as to what portion of outcomes reflecting racial disparity may be biologic versus sociologic and economic are at least being parsed more carefully with this new biologic information, if not really answered as yet. The authors in this paper, and in others they have written, demonstrate outcomes that are not statistically different between the African-American and Caucasian women when they are grouped by similar socioeconomic circumstances in Louisiana. I have 3 questions.

The first is related to the question with which Dr Bland began. You focus on hormone-negative patients in this report, and you published