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# Breast Cancer Prevalence and Management in Hispanic Women: Comparison to Black and White Women at a Regional Medical Center

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## ABSTRACT

**Background:** While stage and grade of breast cancer determines prognosis and outcome, race also impacts survival. While Black and White women have been studied, data for Hispanic women is sparse.

**Methods:** Age-matched Hispanic, Black and White women diagnosed/treated with breast cancer at a single institution were retrospectively evaluated regarding prevalence, treatments and outcomes.

**Results:** Overall, 120 women were included in the study (40 per race). No demographic/histologic variables were significantly different among races. ER+/PR+ tumors were less frequent in Hispanics than Whites, but higher than Blacks. Prevalence of triple negative breast cancers in Hispanic women was between the Black and White cohorts ( $p=0.025$  and  $p=0.011$ , respectively). Stage II and III diagnoses ( $p=0.025$ ) were more frequent in Hispanics and they opted for chemotherapy more often ( $p=0.034$ ); however, there were no significant differences in outcomes and mortality among groups. When compared to the State tumor registry, our population had more LCIS diagnoses ( $p=0.01$ ), earlier stages (I  $p=0.02$ ; II  $p=0.006$ ), received more treatment overall (radiation  $p=0.02$ , chemotherapy  $p=0.0001$ ) and experienced better survival ( $p=0.004$ ). In comparing the study population to the SEER database, higher rates of LCIS and IDC and lower rates of ILC and mixed histology in the study population were noted. LCIS and IDC were more prevalent in our cohort than SEER data ( $p=0.005$ ,  $p=0.05$ , respectively), although we noted less ILC and mixed histology ( $p=0.03$  and  $p=0.04$ ).

**Conclusion:** These data are the first reported for Hispanics in our state and highlight the need for larger studies to better serve this growing demographic.

## Introduction

In the United States, women have a one in eight lifetime risk of developing breast cancer,<sup>1</sup> the second

leading cause of cancer-related mortality in women (21.5 deaths per 100,000 women).<sup>2</sup> While stage at diagnosis and hormone receptor status affect prognosis, factors such as age, race and socioeconomic status also have an impact.<sup>3,4</sup> While the impact of these factors between Black and White women has been extensively studied,<sup>1, 2, 5-14</sup> data concerning Hispanic women is sparse.<sup>15,16</sup>

An evaluation of disparities in stage at diagnosis, prognosis and outcomes among Hispanic, Black and

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White women with breast cancer<sup>5,17</sup> revealed higher stage/grade cancers at diagnosis for Hispanic and Black women (stage III and IV; >50%), portending a poorer prognosis. Other studies noted that Hispanic women, like Black women, were more likely to have ER-, PR-, and aggressive ER-/PR-/HER-2- tumors,<sup>18</sup> also resulting in limited therapy options.<sup>19-21</sup>

While pathologic differences in breast cancer have been noted, the etiology has not been definitively elucidated. Estrogen exposure variation,<sup>22-25</sup> influenced by cultural norms, may play a role. For example, estrogen exposure fluctuates with parity and duration of breastfeeding, impacting the prevalence of more aggressive phenotypes of breast cancers.<sup>22-25</sup> Increased parity is associated with a greater incidence of Her-2 positive breast cancer, for which there is a targeted therapy; breastfeeding for >36 months may be protective from development of ER-/PR-/Her-2 lesions<sup>23,24</sup> while an earlier age at first pregnancy/late menopause is associated with an increased incidence.<sup>22</sup> Interestingly, estrogen activity in Hispanic women was found to increase commensurate to length of US residency, correlating with breast cancer incidence.<sup>25</sup> These data suggest that different environmental/social/cultural factors may impact the underlying pathophysiology of breast cancer development and, thus, treatment options and prognosis.

In the United States, the Hispanic population continues to grow, particularly in the Southeast.<sup>26</sup> The Hispanic population in South Carolina grew 154% during 2000-2011, the second fastest in the US. While recently this rate has slowed, comparatively, this region still has the largest growth in the US (33%; 2008-2018).<sup>27</sup> These data necessitate an assessment of breast cancer management, diagnosis, treatment, and outcomes, for Hispanic women in our area. We performed a retrospective review to compare pathologic factors at diagnosis, treatments and outcomes in an age-matched cohort of Hispanic, Black, and White women at a single regional medical center in order to better elucidate patterns that could directly impact patient care of this demographic.

## Methods

Following IRB approval, all female breast cancers diagnosed and/or treated at a single institution between 1/1/2000 and 12/31/2010 were retrospectively evaluated. Those for whom race information and complete records were unavailable were excluded. Race comparison was made using three categories: Hispanic, Black and White. While Hispanic is an ethnicity, individuals that self-reported as Hispanic or Latino were included in this cohort; sub-classifications of black-Hispanics and white-Hispanics were not considered. Patients that met inclusion criteria were initially age-matched across race classification. Specifically, 40 Hispanic patients

were age-matched with 40 Black and 40 White patients. Demographic and clinicopathologic data were collected for each patient to include age at diagnosis, diagnostic modality, histologic type, stage and grade at diagnosis, hormone receptor status, treatments, and outcomes. Histology included lobular carcinoma in situ (LCIS), ductal carcinoma in situ (DCIS), invasive lobular carcinoma (ILC) and invasive ductal carcinoma (IDC). Histology, stage, grade and receptor status for each patient was verified by a board-certified, fellowship trained breast pathologist. Hormone receptor status was not included for any patients with LCIS, as testing hormone receptors is not protocol for this histological type. Her-2 status was not evaluated for patients with DCIS per College of American Pathology (CAP) protocol.<sup>28</sup> As our institution is the referral center for community, need-based medical providers, referral origin and insurance status were also collected. Insurance status was defined as no insurance, private insurance, public/government insurance, and insurance not otherwise specified. As our institution is a small academic medical center, care is provided to patients regardless of their ability to pay. To further estimate socioeconomic status, zip code was collected; the US Census Bureau's website (factfinder.census.gov)<sup>29</sup> was used to collect median income, educational status, and poverty statistics for each zip code as an estimate of socioeconomic impact. The average of the median income data collected for the entire cohort was calculated and patients were stratified as 'above' or 'below' the average. Follow up/survival was considered from the date of diagnosis. While diagnosis dates varied, all diagnoses took place in 2000-2010, with follow-up until 8/2019. Kaplan Meier survival curves were used to represent these data with varied stratifications.

Our institutional tumor registry provided breast cancer diagnosis data from the hospital system for comparison to the age-matched cohort; data provided included demographic and clinicopathologic data such as race, age at diagnosis, histologic type, stage and grade at diagnosis, hormone receptor status, and outcomes. In addition, our institutional tumor registry was able to procure data from the state cancer registry<sup>29</sup> (SCCR) for comparison to the age-matched cohort to include race, age, histology and overall outcomes for new breast cancer diagnoses in the state. Per reporting guidelines, state cancer registry data includes data from our institution.

National data was procured from the Surveillance Epidemiology and End Results (SEER) program database (SEER)<sup>30</sup> using SEER 18 as a comparison. Hispanic, Black and White data was extracted excluding other races.

Analysis of variance (ANOVA) was performed if the data was non-binary and Pearson's Chi-square statistical test was performed if the data was binary in order to compare outcomes between the race



cohorts. If the results of the ANOVA showed significance, Levene's test for equal variances was performed to determine if the variances between the groups were equal. If they were equal, then a Fisher's Least Significant Difference test was performed. If the variances were not equal, then Tamhane and Dunnett's post-hoc tests were performed. A multivariate linear regression was used to measure collective influence of variables on mortality. The  $\alpha$  level was set at 0.05. All results were analyzed through the statistical program SPSS (Version 23, Copyright 2015). Data collected was compared to state breast cancer data from 1/1/1997-12/31/2007 stratified by race. The National SEER database (SEER 18) was queried to compare local and state data to national breast cancer trends. All data was normalized for appropriate local, state and national comparison. The size of the cohort was considered for all analyses.

## Results

The average age for the cohort was 55.88 with the average age of Hispanic women 56.13, Black women 55.75 and 55.93 years for White women ( $p=0.947$ ; data not shown); there was no significant difference across the three races for histological type ( $p=0.745$ ; data not shown). While 16.7% of the patients were diagnosed with DCIS, the prevalence was greater in the Black cohort (22.5%) when compared to the White/Hispanic cohorts (15% and 12.5% respectively). LCIS was diagnosed in 5.8% of the patients, with a prevalence of 7.5% in both Black/White cohorts and 5% in the Hispanic group. IDC was the most common histological presentation

of breast cancer in our group (70.8%), affecting 82.5% of Hispanic, 70% of White, and 60% of Black women. ILC was found in 4.2% of patients, most frequently in Black women (7.5%) compared to White (2.5%) and Hispanic (2.5%) groups.

Individual hormone receptor status was evaluated for each cohort. ER status was not significantly different ( $p=0.253$ ; data not shown) nor was Her-2 status ( $p=0.503$ ; data not shown). PR status (PR+ or PR-) was significantly different, with White women having more PR+ lesions ( $p=0.011$ ; data not shown). Combination ER+/PR+ ( $p=0.025$ ) and triple negative cancers ( $p=0.009$ ) were found to be significant across the three races; however, ER+/PR+/Her-2+ status was not significant ( $p=0.780$ ; Table 1).

Stage at diagnosis was also found to be significant between the races ( $p=0.025$ ; Table 1). While insurance status was not significantly different across the three races ( $p=0.2422$ ; Table 1), it was significantly different between Hispanic and White women ( $p=0.005$ ; data not shown). Treatments included surgery, radiation, chemotherapy, hormone therapy, or a combination of multiple therapies (Table 1). The majority of patients opted for surgery (88.33%;  $n=106$ ), while 56 (46.7%) opted for radiation. Hispanic women received chemotherapy significantly more often than Black/White patients (63% versus 43% and 48%, respectively;  $p=0.0304$ ; Table 1). No significant difference was noted between the cohorts for use of hormone therapy ( $p=0.740$ ). As expected, the majority of our patients (95%) had multiple modality treatment.

In addition to stratification by race, the data was stratified by stage at diagnosis. As mentioned

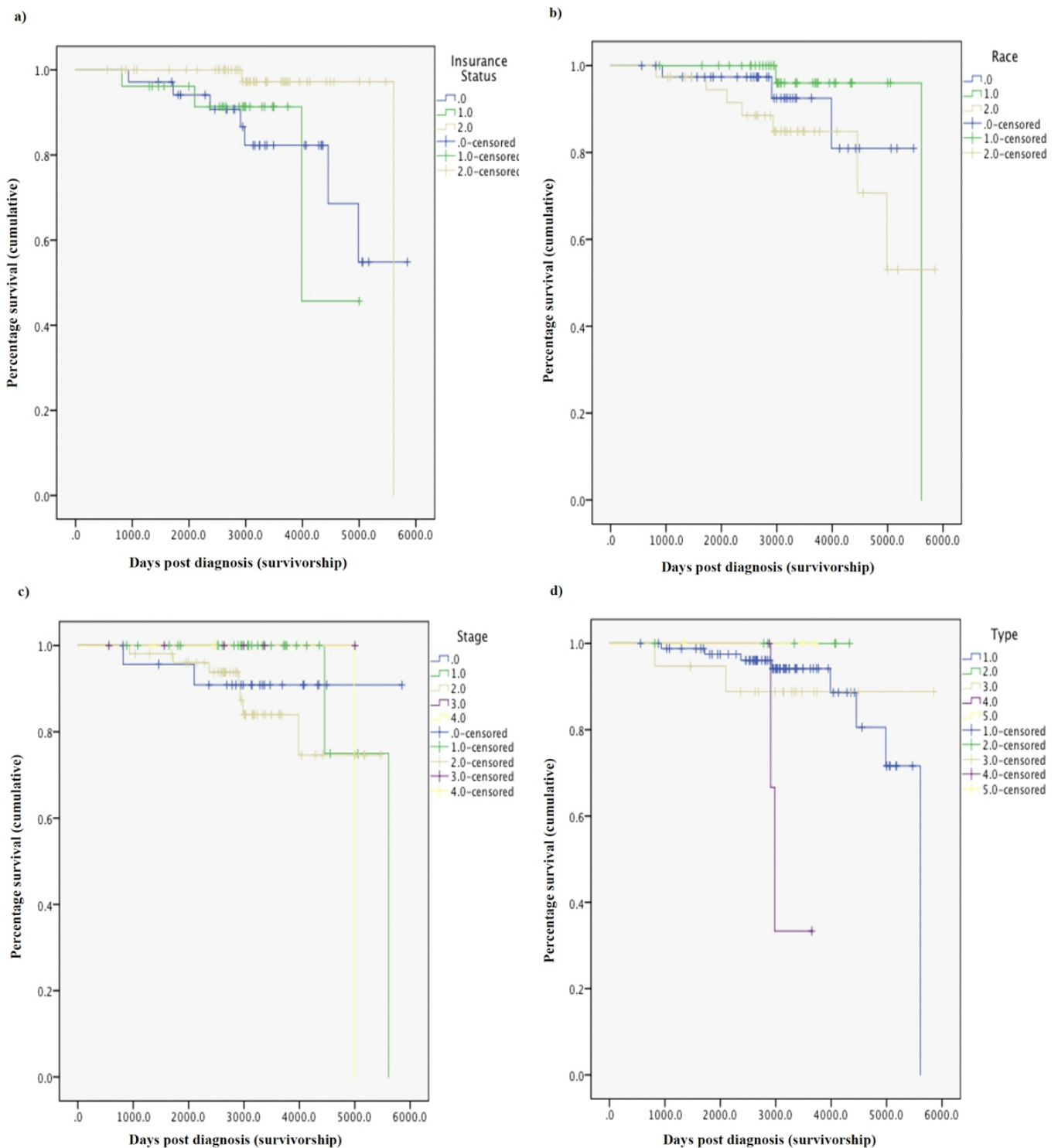
**Table 1.** Demographics of the cohort

	Total	Hispanic	Black	White	P*
Receptor Status†	n=95	n=35	n=29	n=31	
ER+/PR+	63 (82.3%)	22 (57.5%)	14 (32.5%)	27 (72.5%)	0.025
ER+/PR+/Her-2+	13 (11.7%)	6 (15%)	3 (7.5%)	4 (12.5%)	0.780
ER-/PR-/Her-2-	19 (15.8%)	9 (20%)	9 (25%)	1 (2.5%)	0.011
Stage	n=120	n=40	n=40	n=40	0.025
0	25 (20.8%)	5 (12.5%)	11 (27.5%)	9 (22.5%)	
1	33 (27.5%)	9 (22.5%)	9 (22.5%)	15 (37.5%)	
2	51 (42.5%)	21 (52.5%)	15 (37.5%)	15 (37.5%)	
3	6 (5%)	5 (12.5%)	1 (2.5%)	1 (2.5%)	
4	5 (4.2%)	1 (2.5%)	4 (10%)	0 (0%)	
Insurance Status					0
Not insured	19 (16%)	11 (27.5%)	4 (10%)	4 (10%)	
Private	61 (51%)	15 (37.5%)	18 (45%)	28 (70%)	
Public	24 (20%)	7 (17.5%)	13 (32.5%)	4 (10%)	
NOS	16 (13%)	7 (17.5%)	5 (12.5%)	4 (10%)	
Mortality Status‡					
Alive	106 (72.5%)	37 (92.5%)	31 (77.5%)	38 (95%)	
Dead	14 (11.7%)	3 (7.5)	9 (22.5%)	2 (5%)	
Treatment§					
Surgery	107 (88.33%)	35 (90%)	33 (80%)	38 (95%)	0.104
Radiation	56 (46.7%)	18 (45%)	18 (45%)	20 (50%)	0.967
Chemotherapy	59 (48.3%)	25 (62.5%)	15 (35%)	19 (47.5%)	0.034
Hormone Therapy	63 (50.8%)	22 (55%)	19 (42.5%)	22 (55%)	0.740
Combination	114 (80.8%)	39 (92.5%)	38 (95%)	37 (55%)	0.137

\*p-values are based on a comparison of all three race cohorts; †Hormone receptor status completed per AJCC/CAP guidelines;

‡As of 2016 per the study completion date; §Patients may have received multiple treatments.





**Figure 1.** Kaplan Meir curves. All patients represented in the figures have a date of diagnosis 200-2010 with follow-up until 8/1/2019. **a.** survival based on patient insurance. 0 signifies no insurance, 1 government insurance (medicare or medicaid only) and 2 indicates private insurance (includes medicare with supplements). Survival is calculated in days based on a patient's date of last contact. The highest survival probability overall and at all time points where data exists is for private insurance patients. It is interesting to note that the difference between no insurance and government insurance is small at best with some time periods actually slightly favoring no insurance. **b.** survival based on race. 0 signifies Hispanic, 1 signifies Black and 2 signifies White patients. Black patients appear to outlive both Hispanic and White women; although all races have similar survival near the end of the study. This indicated that there may be little difference between the groups. **c.** survival by stage at diagnosis. Stage classification is noted. Patients diagnosed at stage 0 have an immediate worse survival than all other stages but have better survival overall. As expected, stage 1 patients have high survival until approximately 4500 days where survival matches that of stage 2 patients. Though stage 3 and 4 are included on the diagram, the limited number of patients renders that information inconclusive. **d.** survival by histologic type. 1 is IDC, 2 is LCIS, 3 is DCIS, 4 is mixed IDC and ILC, and 5 is ILC. IDC was the most common type in our cohort. IDC's curve is most defined and has the second best survival. DCIS has fewer patients and a less robustly defined curve but the data does show better overall survival at the later point of the time period. Specifically, the patients with DCIS that do make it past a certain threshold tend to do better than all other patients even though they have a steeper decline in survival at the early time points. It is important to note that LCIS, mixed IDC/ILC and ILC all have such small patient cohorts that the survival curve here is not meaningful. As with all graphs, a chi-square statistic from a log-rank test would be needed to compare the curves for statistical significance.



previously, Stage IV disease was found to be significantly less represented compared to Stages 1/2 ( $p < 0.001$ ; data not shown). Surgery and radiation were found to be significant across stages ( $p = 0.001$ ,  $p = 0.028$ , respectively; data not shown), as was chemotherapy ( $p < 0.001$ ); however, hormone therapy was not found to be significant ( $p = 0.612$ ). There was no significant difference between the races at each stage (data not shown).

Kaplan-Meier curves were performed to demonstrate survivorship outcomes based on patient insurance, race, stage at diagnosis, and histologic type (Figure 1). Survivorship based on race (Figure 1b) revealed all races have similar survival near the end of the study. Survivorship by stage at diagnosis (Figure 1c) and by histology (Figure 1d) are also represented.

In addition to our single institution's data, we compared data on staging between races from the state tumor registry. There were no significant differences between our institution and state data in terms of age, ER or PR status (data not shown). Interestingly, while Her-2 status was similar for institution and state Hispanic and White women, Black women at our institution had a significantly higher prevalence of Her-2 negative lesions than reported by the state ( $p = 0.05$ ; data not shown). Receptor combinations were not determined by the state eliminating comparison. No significant differences were noted for DCIS, IDC, ILC and mixed histology tumors between our institution and the state registry (Table 2); however, the prevalence of total LCIS and LCIS for Black and White women was significantly higher at our institution (total  $p = 0.01$ ; Black  $p = 0.003$ ; White  $p = 0.04$ ; Table 2). While the prevalence of LCIS for Hispanic women at our institution was also higher than in the state (5% versus 3.9%, respectively), this was not significantly different ( $p = 0.74$ ). Stage at diagnosis was also compared. There were no significant differences in Stage 0 (total and across all races; Table 2); however, our institution had significantly less total Stage 1 diagnoses than the state (27.5% and 37.7%, respectively;  $p = 0.02$ ). Interestingly, the difference for each race cohort for Stage 1 at diagnosis was not significantly different (Table 2). Total Stage 2 diagnoses were significantly higher at our institution (42.5% versus 28.4%;  $p = 0.006$ ) manifesting across all race cohorts; only the prevalence in Hispanic women was significantly different ( $p = 0.02$ ; Table 2). Stage 3 diagnoses were lower at our institution across every group (total, Hispanic, Black and White) with only the Black prevalence significantly different (2.5% and 12.9%, respectively;  $p = 0.05$ ). Stage 4 diagnoses were not significantly different for any comparison (Table 2).

While surgical interventions were lower overall at our institution compared to the state (88.3% versus 91.1%;  $p = 0.3$ ), the incidence for each race cohort was not significantly different (Table 2).

Total radiation and chemotherapy treatments were significantly higher at our institution ( $p = 0.02$ ,  $p = 0.001$ , respectively) than the state registry records. While hormonal therapy was given more often at our institution when compared to the state, this was not significant (50.8% and 44.7;  $p = 0.18$ ). The incidence of these treatment modalities was also significantly greater in Hispanic and White cohorts; however, while radiation in the Black cohort was greater than the state registry, chemotherapy and hormone therapy was less frequently used in this cohort at our institution. These differences were not significantly different (Table 2).

Outcomes were determined by mortality at the conclusion of the study period. Survival at our institution was higher than reported in the state registry across all comparisons. Total survival was 88% for our institution compared to the state registry at 77% ( $p = 0.004$ ; Table 2). Hispanic women had a significantly better survival at our institution (92.5% versus 71.4%;  $p = 0.004$ ; Table 2) as did White women (95% versus 79.3%;  $p = 0.0001$ ; Table 2). Black women also had a better survival when compared to the state registry (77.5% versus 72.7%); however, this was not significantly different ( $p = 0.5$ ).

When comparing state and SEER data, DCIS, LCIS, IDC and mixed (IDC/ILC) histologies were significantly different ( $p = 0.0001$ ,  $p = 0.0013$ ,  $p = 0.0001$ ,  $p = 0.0001$ , respectively; Tables 2 and 3); ILC prevalence was not significantly different ( $p = 0.056$ ; data not shown). Only IDC was greater in the state data compared to SEER (69.4% and 63.1%, respectively). When comparing the data across individual races, LCIS was less for South Carolina Hispanic women (3.9% versus 10.8%;  $p = 0.0001$ ) as was mixed histology (4.2% versus 7.1%, respectively;  $p = 0.05$ ). DCIS was also less within the Hispanic cohort (12% state versus 15.1% SEER;  $p = 0.14$ ; Table 2 and 3), but IDC was more prevalent (74.9% state versus 73% SEER;  $p = 0.46$ ). Black and White women were significantly different across all histologic classifications with DCIS, LCIS, ILC and mixed histology less represented in the state registry. For both races, DCIS was significantly less frequent (Black 17% state versus 19.2% SEER; White 15.8% state and 18.1% SEER;  $p < 0.001$ ), with LCIS also being less frequent in the state data compared to SEER (1.6% Black and 2.9% White, respectively). IDC was also less frequent in the state registry for both races (73% and 68.3%) compared to SEER (75.1% and 71.5%, respectively; Tables 2 and 3). Likewise, ILC was identified in 5.6% of Black and 8% of White women while mixed histology was noted in 2.8% of Black and 5.5% of the White cohort; both were significantly less than SEER reports ( $p = 0.0001$ ).

The comparison of our histology data to SEER 18 histology is outlined in Table 3. While overall DCIS was more frequently diagnosed nationally then at



our institution, this was not significantly different ( $p=0.5$ ). Likewise, our Hispanic and White cohorts had a lower prevalence of DCIS compared to national trends, but this was not significantly different (Table 3). Black women were more likely to be diagnosed with DCIS at our institution, but this was not significant ( $p=0.59$ ). LCIS, IDC, ILC, and mixed histology were all significantly different at our institution when compared to SEER 18 ( $p=0.005$ ,  $p=0.05$ ,  $p=0.03$ ,  $p=0.04$ , respectively; Table 3), with LCIS diagnosed significantly more often than SEER 18 (6.7% versus 2.6%,  $p=0.005$ ). When comparing the prevalence of IDC between our institution and the SEER 18 data overall, our institution had a significantly higher prevalence (71.8% versus 63.1%,  $p=0.05$ ) but we had significantly less ILC compared to the SEER 18 data (2.5% versus 7.7%,  $p=0.03$ ). Our institution also had significantly less mixed histology when compared to the SEER 18 data (3.3% versus 8.4%,  $p=0.04$ ).

## Discussion

The Hispanic population comprises 9.3% of the population of which our healthcare system serves, and this percentage is predicted to continue to grow.<sup>26, 27, 31</sup>

In terms of women's health in our state, race differences in breast cancer prevalence, treatments and outcomes have been evaluated for black and white cohorts; however, to date, no evaluation for Hispanic women has been completed. Our study addresses this deficiency.

Nationally, the average age of breast cancer patients at diagnosis is 62 years; (cancer.gov)<sup>32</sup> however, the average of our cohort was younger, 55.8 years. In particular, the Hispanic population we serve is primarily under 50 years (suburbanstats.org).<sup>33</sup> While histology and receptor status portend prognosis and outcome<sup>30</sup>, our data did not demonstrate any significance in histological subtypes between races, suggesting that differences in treatments and outcomes were not due to variables in biology. When evaluating histology between our institution and the state data, our population had

**Table 2.** Comparison of institutional data to state data.

	Total			Hispanic			Black			White		
	Our Study n=120	SC n=35646	p-value	Our Study n=40	SC n=297	p-value	Our Study n=40	SC n=8688	p-value	Our Study n=40	SC n=26661	p-value
Histology	n=120	n=30411		n=40	n=259		n=40	n=7192		n=40	n=22960	
DCIS	19(15.8%)	4873(16%)	0.86	4(10%)	31(12.0%)	0.71	9(22.5%)	1221(17.0%)	0.36	6(15%)	3621(15.8%)	0.88
LCIS	8(6.7%)	695(2.3%)	0.01	2(5%)	10*(3.9%)	0.74	3(7.5%)	116(1.6%)	0.003	3(7.5%)	569(2.5%)	0.04
IDC	86(70.8%)	21116(69.4%)	0.74	33(82.5%)	194(74.9%)	0.29	25(62.5%)	5251(73.0%)	0.06	28(70%)	15671(68.3%)	0.82
ILC	3(4.2%)	2256(7.4%)	0.18	0(0%)	13(5.0%)	0.15	2(5%)	402(5.6%)	0.6	1(2.5%)	1841(8.0%)	0.19
Mixed†	4(2.5%)	1471(4.8%)	0.23	1(2.5%)	11(4.2%)	0.19	1(2.5%)	202(2.8%)	0.91	2(5%)	1258(5.5%)	0.89
Stage	n=120	n=21437		n=40	n=198		n=40	n=5098		n=40	n=15615	
0	25(21.7%)	4154(19.3%)	0.64	6(15%)	33(16.7%)	0.79	11(27.5%)	1026(20.1%)	0.25	9(22.5%)	3095(19.8%)	0.67
1	33(27.5%)	7875(36.7%)	0.02	9(22.5%)	63(31.8%)	0.24	9(22.5%)	1472(28.9%)	0.37	15(37.5%)	6340(40.6%)	0.69
2	51(42.5%)	5936(27.6%)	0.006	19(47.5%)	56(28.3%)	0.02	15(37.5%)	1626(31.9%)	0.45	15(37.6%)	4254(27.2%)	0.14
3	6(5%)	2018(9.4%)	0.07	4(10%)	31(15.7%)	0.35	1(2.5%)	653(12.9%)	0.05	1(2.5%)	1334(8.5%)	0.17
4	5(4.2%)	928(4.3%)	0.92	1(2.5%)	15(7.6%)	0.24	4(10%)	321(6.3%)	0.34	0(0%)	592(3.8%)	0.21
Treatment§	n=120	n=35646		n=40	n=297		n=40	n=8688		n=40	n=26661	
Surgery	107(88.3%)	32570(91.4%)	0.3	35(90%)	265(89.2%)	0.88	33(80%)	7676(88.4%)	0.09	38(95%)	24629(92.4%)	0.54
Radiation	56(46.7%)	13203(37%)	0.02	18(45%)	103(34.7%)	0.2	18(45%)	3210(36.9%)	0.29	20(50%)	9890(37.1%)	0.09
Chemo	59(48.3%)	11072(31.1%)	<0.0001	25(62.5%)	119(40.1%)	<0.007	15(35%)	3310(38.1%)	0.69	19(47.5%)	7643(28.7%)	0.008
Hormone	63(50.8%)	15936(44.7%)	0.18	22(55%)	75(25.3%)	0.0001	19(42.5%)	7814(89.9%)	<0.0001	22(55%)	8047(30.2%)	0.0006
Mortality‡												
Alive	106(88.3%)	28717(77.5%)	0.004	37(92.5%)	212(71.4%)	0.004	31(77.5%)	6313(72.7%)	0.5	38(95%)	21145(79.3%)	<0.0001

\*state data for South Carolina (SC) retrieved from state tumor registry; †mixed histology indicates IDC and ILC;

‡status noted at the end of the study period; §patients may have had more than one treatment.

**Table 3.** Comparison of our data to SEER histology data\*

	Total			Hispanic			Black			White		
	Our Study n=120	SEER n=326,122	p-value	Our Study n=40	SEER n=29,852	p-value	Our Study n=40	SEER n=33,504	p-value	Our Study n=40	SEER n=262,766	p-value
DCIS	19(15.8%)	59,497(18.2%)	0.5	5(12.5%)	5,405 (15.1%)	0.65	9(22.5%)	6,423 (19.2%)	0.59	6(15%)	47,669 (18.1%)	0.61
LCIS	8(6.7%)	8,399(2.6%)	0.005	2(5%)	687 (10.8%)	0.24	3(7.5%)	650 (8.8%)	0.77	3(7.5%)	7,062 (12.3%)	0.36
IDC	86(71.8%)	205,645(63.1%)	0.05	33(82.5%)	19,880 (73.0%)	0.18	25(62.5%)	22,253 (75.1%)	0.07	28(70%)	163,512 (71.5%)	0.83
ILC	3(2.5%)	25,025(7.7%)	0.03	0(0%)	1,940 (7.1%)	0.08	2(5%)	1,967 (6.6%)	0.68	1(2.5%)	21,118 (9.2%)	0.14
Mixed‡	4(3.3%)	27,556(8.4%)	0.04	1(2.5%)	1,940 (7.1%)	0.26	1(2.5%)	2,211 (7.5%)	0.23	2(5%)	23,405 (10.2%)	0.28

\*SEER 18 data used as a comparison; †Totals include only the races compared in this study; ‡mixed histology indicates IDC and ILC.





more LCIS overall, as well as in each race cohort. This suggests that breast cancer at our institution is identified earlier in progression, which may partially explain the better outcomes for all races at our institution compared to the state. This pattern is repeated when comparing our data to the national SEER histology. These data may reflect pathology expertise in identifying early lesions in cooperation with dedication to a multidisciplinary management of breast cancer in conjunction with the state's Best Chance Network ([scdhec.gov](http://scdhec.gov)) referral network.<sup>34</sup>

Hormone receptor status also portends treatment options and outcomes.<sup>31</sup> Incidence of ER+/PR+ lesions for Hispanic women were between Black and White rates, with Black women having the lowest ER+/PR+ incidence.<sup>22, 32</sup> Likewise, the incidence of ER-/PR-/Her-2- (triple negative) breast cancer in Hispanic women was found to be between Black and White women in our study, reflecting the national findings.<sup>22, 33</sup> Overall, this supports the plethora of literature indicating that hormone receptor negative lesions are more frequent in non-white patients<sup>19,20,35</sup>, a phenomenon postulated to be associated with genetic/environmental factors related to estrogens and, even, country of birth.<sup>35</sup> While this may not be true for Black women<sup>34</sup>, this is plausible regarding the lower ER+/PR+ and higher ER-/PR-/Her-2- rates in Hispanic women, given the more recent immigration of this population.<sup>26,27</sup> While these data were unavailable for our cohort, an analysis of these factors would be useful in determining risk and prognosis of Hispanic women longitudinally within the community as other environmental factors begin to potentially influence their breast cancer biology.

Regarding stage of diagnosis between different races, less Hispanics were diagnosed with stage I lesions than white women, supporting prior studies reporting later stages at diagnosis for Hispanic women.<sup>25, 36</sup> This observation has been attributed to lower utilization of mammography and delayed follow-up after an abnormal mammogram<sup>37-39</sup>, suggesting barriers to health care access for this demographic. Conversely, the Best Chance Network, free clinics and low-income clinics which all refer to our institution indicate that the Hispanic population actually over-utilizes mammography services. Thus, in our Hispanic cohort, the later stage at diagnosis may reflect a lack of timely patient follow-up regarding an abnormal mammogram or the increased radiation exposure due to greater than yearly imaging, highlighting the importance of creative and culturally relevant educational relationships within this community to foster awareness and appropriate screening for this population. When comparing stage between our institution and the state registry, we had fewer Stage 0/I patients, but a significantly greater number of Stage II diagnoses; additionally, fewer Stage III/IV diagnoses were noted at our institution. These differences may reflect variation of

demographics between the regions of the state.

Interestingly, all patients diagnosed with Stage 0 had a poorer prognosis initially when compared to later stages, potentially due to patient perception, causing neglect of appropriate follow-up and delay of suggested treatments. Additionally, Stage 0 patients may opt for limited treatment despite NCCN guidelines ([nccn.org](http://nccn.org))<sup>40</sup> of lumpectomy or mastectomy. These perceptions may be overcome by enhanced patient education<sup>25</sup>, particularly for patients with lower levels of education and those with limited health literacy.<sup>25</sup> Additionally, language and cultural barriers may hinder the appropriate transmission of health information<sup>41,42</sup>, including breast health.<sup>34,41</sup>

All patients at our institution were treated with the standard of care as noted in no significant differences among races. This is in contrast to the literature, which reports that Hispanic and Black women are often less likely to receive guideline concordant treatment.<sup>32, 43, 44</sup> When comparing our treatments to the state and SEER data, our institution more significantly utilizes radiation, chemotherapy and hormone therapy than is reported by the state, potentially due to our well-coordinated multidisciplinary approach to breast cancer treatment. Outcome data demonstrates that our approach appears to be effective, given that our mortality rate is significantly lower when compared to the state registry. It is important to note that our institutional data could not be separated from the state registry data, suggesting that there may even be a larger discrepancy than the comparison reflects.

Finally, in concordance with the current literature, the Hispanic group had significantly more uninsured patients than any other race.<sup>36,44</sup> This may be attributed to fear due to residency status, the language barrier, or other general lack of understanding of the process to sign up for government insurance. Our institution has multiple measures to facilitate insurance procurement, assisting with registration for Medicare/Medicaid and robust language services providing translation and interpretation. Additionally, through the Best Chance Network, free screenings are provided to underserved women. Interestingly, while Hispanics had higher rates of being uninsured in our group, there was no statistical difference in outcome, suggesting equality in treatment.

Overall, despite noted discrepancies among Hispanic, Black and White women, no deleterious impact on outcomes was observed. While our findings were concordant with both state and national data, we report a better survival. While this is encouraging, cultural norms of Hispanic women need to be further examined to eliminate barriers to access, increase education and optimize breast health in Hispanic women. Additionally, genetic variables should be evaluated to elucidate differences that could portend alternate standards in screening guidelines, lifestyle management and potential



targeted therapies. Ultimately, our hope is to open dialogue which would initiate larger studies regarding these issues to better serve the population of our state and region.

### Conflicts of Interest

None.

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### Ethical disclosure

The authors state that they have obtained appropriate institutional review board approval and have followed the principles outlined in the Declaration of Helsinki for all human or animal experimental investigations. In addition, for investigations involving human subjects, informed consent has been obtained from the participants involved through institutional universal consent (Health Sciences South Carolina Pro00006780).

### References

1. Noone AM HN, Krapcho M, Miller D, Brest A, Yu M et al. SEER Cancer Statistics Review, 1975-2016. Table 4.18. Cancer of the female breast (invasive): Age-adjusted rates and trends by race/ethnicity. National Cancer Institute 2016 [Available from: [https://seer.cancer.gov/archive/csr/1975\\_2016/](https://seer.cancer.gov/archive/csr/1975_2016/)].
2. Cronin KA LA, Scott S, Sherman RL, Noone AM, Howlander N, et al. Annual Report to the Nation on the Status of Cancer, part I: National cancer statistics. *Cancer*. 2018;124:2785-800.
3. Yang XR SM, Rimm DL, Lissowska J, Brinton LA, Peplonska B, et al. Differences in risk factors for breast cancer molecular subtypes in a population-based study. *Cancer Epidemiol Biomarkers Prev*. 2007;16:439-43.
4. Ma H BL, Pike MC, Ursin G. Reproductive factors and breast cancer risk according to joint estrogen and progesterone receptor status: a meta-analysis of epidemiological studies. *Breast Cancer Res*. 2006;8:R43.
5. Shoemaker ML WM, Wu M, Weir HK, Romieu I. Differences in breast cancer incidence among young women aged 20-49 years by stage and tumor characteristics, age, race, and ethnicity, 2004-2013. *Breast Cancer Res Treat*. 2018;169:595-606.
6. Iqbal J GO, Rochon PA, Sun P, Narod SA. Differences in breast cancer stage at diagnosis and cancer-specific survival by race and ethnicity in the United States. *JAMA*. 2015;313:165-73.
7. Power EJ CM, Haq MM. Breast Cancer Incidence and Risk Reduction in the Hispanic Population. *Cureus*. 2018;10:e2235.
8. Rauscher GH CR, Wiley EL, Hoskins K, Stolley MR, Warnecke RB. Mediation of Racial and Ethnic Disparities in Estrogen/Progesterone Receptor-Negative Breast Cancer by Socioeconomic Position and Reproductive Factors. *Am J Epidemiol*. 2016;183:884-93.
9. Chlebowski RT CZ, Anderson GL, Rohan T, Aragaki A, Lane D, et al. Ethnicity and breast cancer: factors influencing differences in incidence and outcome. *J Natl Cancer Inst*. 2005;97:439-48.
10. Krieger N CJ, Waterman PD. Decline in US breast cancer rates after the Women's Health Initiative: socioeconomic and racial/ethnic differentials. *Am J Public Health*. 2010;100:5132-9.
11. Society AC. Cancer Facts & Figures for Hispanics/Latinos: 2018-2020. Atlanta, GA: American Cancer Society, 2018 2018 [Available from: <https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/cancer-facts-and-figures-for-hispanics-and-latinos/cancer-facts-and-figures-for-hispanics-and-latinos-2018-2020.pdf>].
12. Society AC. Cancer Facts & Figures for African Americans: 2016-2018. Atlanta, GA: American Cancer Society, 2016 2016 [Available from: <https://www.cancer.org/research/cancer-facts-statistics/cancer-facts-figures-for-african-americans.html>].
13. Warner ET TR, Boggs DA, Rosner B, Rosenberg L, Colditz GA, Palmer JR. Estrogen receptor positive tumors: do reproductive factors explain differences in incidence between black and white women? *Cancer Causes Control*. 2013;24:731-9.
14. Haiman CA PM, Bernstein L, Jaque SV, Stanczyk FZ, Afghani A, Peters RK, et al. Ethnic differences in ovulatory function in nulliparous women. *Br J Cancer*. 2002;86:367-71.
15. Hoppe EJ HL, Grannan KJ, Dunki-Jacobs EM, Lee DY, Wexelman BA. Racial disparities in breast cancer persist despite early detection: analysis of treatment of stage 1 breast cancer and effect of insurance status on disparities. *Breast Cancer Res*. 2019;173:597-602.
16. Williams DR MS, Shields AE. Understanding and effectively addressing breast cancer in African American women: Unpacking the social context. *Cancer*. 2016;122:2138-49.
17. Yedjou CG SJ, Miele L, Noubissi F, Lowe, Fonseca DD, Alo RA, et al. . Health and Racial Disparity in Breast Cancer. : Springer; 2019.
18. Vona-Davis L RD. The Influence of Socioeconomic Disparities on Breast Cancer Tumor Biology and Prognosis: A Review. *J Women's Health*. 2009;18:883-93.
19. Plasilova ML HB, Killelea BK, Horowitz NR,





- Chagpar AB, Lannin DR. Features of triple-negative breast cancer: Analysis of 38,813 cases from the national cancer database. *Medicine (Baltimore)*. 2016;95:e4614.
20. Newman LA R-FJ, Morrow M, Carey LA, King TA. The 2014 Society of Surgical Oncology Susan G. Komen for the Cure Symposium: triple-negative breast cancer. *Ann Surg Oncol*. 2015;22:874-82.
  21. Lin NU VA, Hughes ME, Theriault RL, Edge SB, Wong YN, Blayney DW et al. Clinicopathologic features, patterns of recurrence, and survival among women with triple-negative breast cancer in the National Comprehensive Cancer Network. *Cancer*. 2012;118:5463-72.
  22. Chen L LC, Tang MT, Porter P, Hill DA, Wiggins CL, Cook LS. Reproductive Factors and Risk of Luminal, HER2-Overexpressing, and Triple-Negative Breast Cancer Among Multiethnic Women. *Cancer Epidemiol Biomarkers Prev*. 2016;25:1297-304.
  23. Hines LM SR, Byers T, John EM, Fejerman L, Stern MC, Baumgartner KB, et al. The Interaction between Genetic Ancestry and Breast Cancer Risk Factors among Hispanic Women: The Breast Cancer Health Disparities Study. *Cancer Epidemiol Biomarkers Prev*. 2017;26:692-701.
  24. Ambrosone CB ZG, Ruszczyk M, Shankar J, Hong CC, McIlwain D, Roberts M, et al. Parity and breastfeeding among African-American women: differential effects on breast cancer risk by estrogen receptor status in the Women's Circle of Health Study. *Cancer Causes Control*. 2014;25:259-65.
  25. Castaneda CA. CM, Villarreal-Garza C, Rabanal C, Dunstan J, Caleron G, De La Cruz M et al. Genetics, tumor features and treatment response of breast cancer in Latinas. *Breast Cancer Management*. 2018;7:BMT01.
  26. Brown ALM. Mapping the Latino population, by state, county and city Pew Hispanic Center, 20142014 [Available from: <https://www.pewresearch.org/hispanic/states>].
  27. Noe-Bustamante L LM, Krogstad JM. . U.S. Hispanic population reached new high in 2018, but growth has slowed Pew Hispanic Center2018 [Available from: <https://www.pewresearch.org/fact-tank/2019/07/08/u-s-hispanic-population-reached-new-high-in-2018-but-growth-has-slowed>].
  28. Wolff AC HM, Hicks DG, Dowsett M, McShane LM, Allison KH, Allred DC, et al. . American Society of Clinical Oncology; College of American Pathologists. Recommendations for human epidermal growth factor receptor 2 testing in breast cancer: American Society of Clinical Oncology/College of American Pathologists clinical practice guideline update. *J Clin Oncol*. 2013;31:3997-4013.
  29. [Available from: [https://factfinder.census.gov/faces/nav/jsf/pages/community\\_facts.xhtml](https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml)].
  30. J.M. Diversity of Breast Carcinoma: Histological Subtypes and Clinical Relevance *Clin Med Insights Pathol* 2015;8:23-31.
  31. Howell AAA, Clarke RB, Duffy SW, Evans DG, Garcia-Closas M, Gescher AJ, et al. Risk determination and prevention of breast cancer. *Breast Cancer Res*. 2014;16:446.
  32. Chen L LC. Racial disparities in breast cancer diagnosis and treatment by hormone receptor and HER2 status. *Cancer Epidemiol Biomarkers Prev*. 2015;24:1666-72.
  33. Amirikia KC MP, Bush J, Newman LA. Higher population-based incidence rates of triple-negative breast cancer among young African-American women: Implications for breast cancer screening recommendations. *Cancer*. 2011;117:2747-53.
  34. Wheeler SB R-HK, Carey LA. Disparities in breast cancer treatment and outcomes: biological, social, and health system determinants and opportunities for research. *Oncologist*. 2013;18:986-93.
  35. Martínez ME GS, Tao L, Cress R, Rodriguez D, Unkart J, Schwab R, et al. Contribution of clinical and socioeconomic factors to differences in breast cancer subtype and mortality between Hispanic and non-Hispanic white women. *Breast Cancer Res Treat*. 2017;166:185-93.
  36. Francoi MA SG, de Azevedo SJ, Geib G, Zaffaroni F, Liedke PER. Differences in Breast Cancer Stage at Diagnosis by Ethnicity, Insurance Status, and Family Income in Young Women in the USA. *J Racial Ethn Health Disparities*. 2019;6:909-16.
  37. Miller KD GSA, Ortiz AP, Fedewa SA, Pinheiro PS, Tortolero-Luna G, Martinez-Tyson D, et al. Cancer Statistics for Hispanics/Latinos, 2018. *CA Cancer J Clin*. 2018;68:425-45.
  38. Stuver SO ZJ, Simchowitz B, Hassett MJ, Shulman LN, Weingart SN. Identifying women at risk of delayed breast cancer diagnosis. *J Comm J Qual Patient Saf*. 2011;37:568-75.
  39. Miranda PY TW, González P, Johnson-Jennings M, González HM. Breast cancer screening trends in the United States and ethnicity. *Cancer Epidemiol Biomarkers Prev*. 2012;21:351-7.
  40. [Available from: [https://www.nccn.org/patients/guidelines/content/PDF/stage\\_0\\_breast-patient.pdf](https://www.nccn.org/patients/guidelines/content/PDF/stage_0_breast-patient.pdf)].
  41. Tian N GP, Zhan FB, Chow TE, Wilson JG. Identifying risk factors for disparities in breast cancer mortality among African-American and Hispanic women. *Womens Health Issues*. 2012;22:e267-e76.
  42. Vargas Bustamante A FH, Garza J, Carter-Pokras



- O, Wallace SP, Rizzo JA, Ortega AN. Variations in healthcare access and utilization among Mexican immigrants: the role of documentation status. *J Immigr Minor Health*. 2012;14:146-55.
43. Freedman RA VK, He Y, Pavluck AL, Winer EP, Ward EM, Keating NL. The association of race/ethnicity, insurance status, and socioeconomic factors with breast cancer care. *Cancer*. 2011;117:180-9.
44. Walker GV GS, Guadagnolo BA, Hoffman KE, Smith BD, Koshy M, Allen P, et al. Disparities in stage at diagnosis, treatment, and survival in nonelderly adult patients with cancer according to insurance status. *J Clin Oncol*. 2014;32:3118-25.