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Racial disparities in the treatment of black women with breast cancer in the United States

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BOSTON UNIVERSITY
SCHOOL OF MEDICINE

Thesis

**RACIAL DISPARITIES IN THE TREATMENT OF BLACK WOMEN WITH
BREAST CANCER IN THE UNITED STATES**

by

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B.A., University of California Berkeley, 2016

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requirements for the degree of
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ABSTRACT

Breast cancer affects over three million women in the United States, but this disease burden is not shared equally across all races. Black women, in particular, are diagnosed with more advanced cancer at a younger age and experience a disproportionately high mortality rate compared to white women. Factors that contribute to such disparity include socioeconomic status, tumor biology, age, insurance status, comorbidities, obesity, patients' reproductive history and barriers to quality care. These factors alone, however, do not account for all the racial differences in mortality and outcomes experienced by black women. There is a growing body of literature that indicates black women are not receiving the same treatment and care as white women. Black women are less likely to receive surgery, radiation therapy, hormone therapy and targeted therapy than white women. Black women are also more likely to experience delays in the initiation of treatment, early discontinuation of treatment and overall guideline non-concordant care. The current literature has presented widespread racial disparities in the treatment of black women with breast cancer. Future research needs to focus on tangible interventions such as physician bias training and patient navigators to mitigate the inequity of care in the treatment of breast cancer.

TABLE OF CONTENTS

TITLE.....	i
COPYRIGHT PAGE.....	ii
READER APPROVAL PAGE.....	iii
ABSTRACT.....	iv
TABLE OF CONTENTS.....	v
LIST OF TABLES.....	vii
LIST OF FIGURES.....	viii
LIST OF ABBREVIATIONS.....	ix
INTRODUCTION.....	1
Breast Cancer Classification and Staging.....	4
Breast Cancer Treatments.....	7
Factors Contributing to Healthcare Disparities.....	11
SPECIFIC AIMS.....	14
PUBLISHED STUDIES.....	15
Screening and Staging Disparities.....	15
Treatment Disparities.....	16
Surgery.....	20
Radiation Therapy.....	21

Chemotherapy	22
Hormone Therapy	24
Targeted Therapy	25
Clinical Disparities.....	26
Individual-Level Barriers in Access to Quality Treatment.....	28
Interventions to Reduce Racial Disparities	32
DISCUSSION	36
CONCLUSION.....	45
REFERENCES	46
CURRICULUM VITAE.....	55

LIST OF TABLES

Table	Title	Page
1	Cancer Staging	5
2	Molecular Subtypes of Cancer	6

LIST OF FIGURES

Figure	Title	Page
1	Trends in Female Breast Cancer Incidence and Mortality by Race/Ethnicity	2
2	Female Breast Cancer Incidence and Mortality by Race	4
3	Timeline of Important Breast Cancer Treatment Developments	8
4	Treatment of Early Stage Breast Cancer	10
5	Treatment of Metastatic Breast Cancer	11
6	Effect of Adding Matched Variables on Breast Cancer Hazard Ratio for Black Women Versus White Women	17
7	Delays in Initiation of Breast Cancer Treatment	19
8	Percent of SEER Patients Receiving Guideline Concordant Treatment	20
9	Frequency of Unique Barriers Among Breast Cancer Patients	29
10	Patient Navigator Actions for Patients with Breast Cancer	32

LIST OF ABBREVIATIONS

ACS.....	American Cancer Society
ACTS	Adherence, Communication, Treatments and Support
AET.....	Adjuvant Endocrine Therapy
BCS.....	Breast Conserving Surgery
ET.....	Endocrine Therapy
HER2.....	Human Epidermal Growth Factor Receptor 2
HR.....	Hormone Receptor
IAT.....	Implicit Association Test
MHS.....	Military Health Systems
NCI.....	National Cancer Institute
OR.....	Odds Ratio
RT	Radiation Therapy
SEER.....	Surveillance, Epidemiology, and End Results
SES.....	Socioeconomic Status
SLNB	Sentinel Lymph Node Biopsy
TNCB.....	Triple Negative Breast Cancer
TNM.....	Tumor, Node, Metastasis

INTRODUCTION

Breast cancer is the most common form of cancer to affect women in the United States. It is estimated that 266,120 new cases of breast cancer will be diagnosed and 40,900 women will die of their disease in 2018 (“Female Breast Cancer - Cancer Stat Facts” 2018). Women living in the US have a 12.5% chance of developing breast cancer in their lifetime. This risk has steadily increased over the decades from 1 in 11 women diagnosed with breast cancer in the 1970’s to 1 in 8 women today (American Cancer Society 2017). Breast cancer, however, does not affect all populations equally. Minority women are diagnosed with more advanced breast cancer and have higher rates of mortality (Ooi, Martinez, and Li 2011) (Figure 1). The data indicates that black women are more likely to die from breast cancer at all ages than any other race/ethnicity (American Cancer Society 2017). The remainder of this paper will focus specifically on racial differences in the treatment of breast cancer between black and white women.

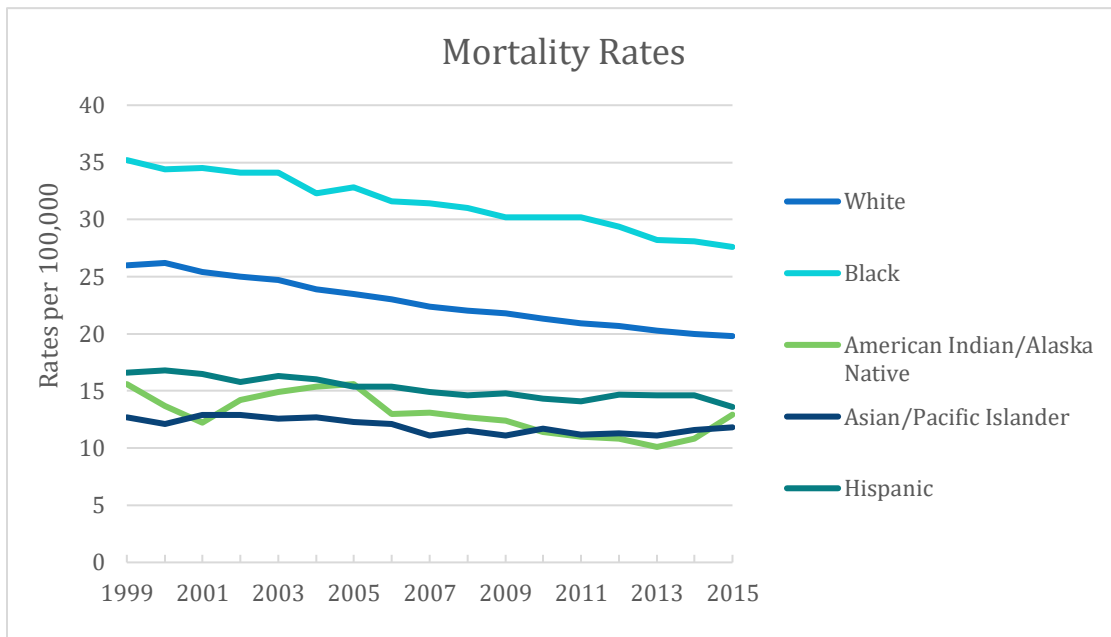
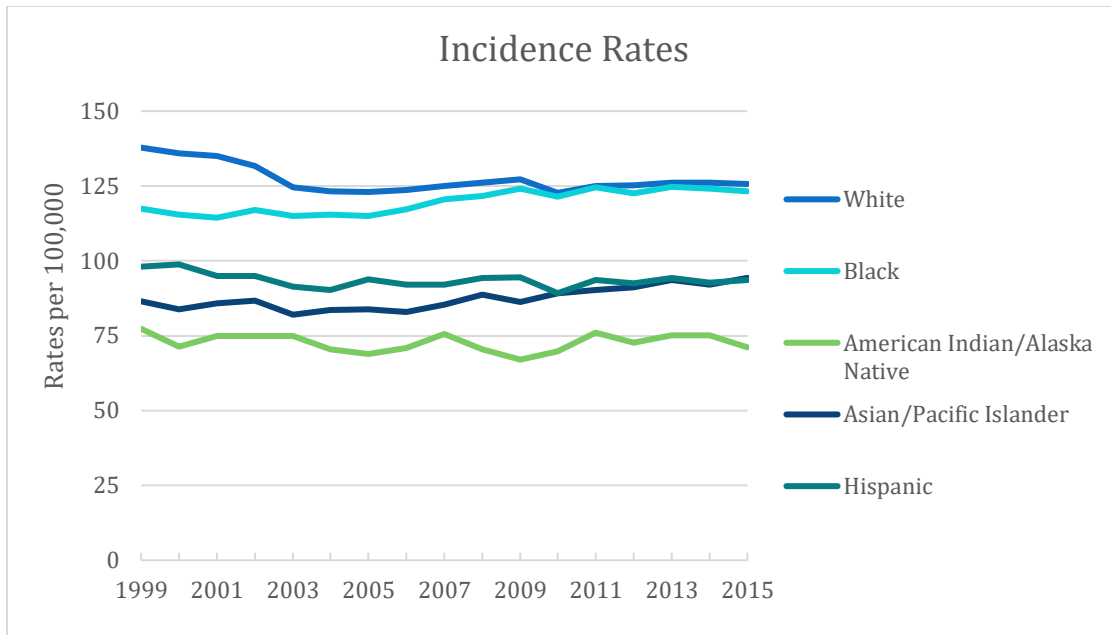


Figure 1: Trends in Female Breast Cancer Incidence and Mortality by Race/Ethnicity (Adapted from “USCS Data Visualizations” 2017). Rates are per 100,000 persons and are age-adjusted to the 2000 US standard population. Breast cancer incidence rates are increasing for black women and other minorities but rates are decreasing for white women. The mortality rate was 42% higher in black women than white women for the 2011 - 2015 time period (DeSantis et al. 2017).

The study of breast cancer racial disparities in the US has been ongoing for many decades now. Despite years of research, the fact remains that black women are not receiving the same treatment and outcomes as their white counterparts. Breast cancer incidence rates continue to rise in black women 0.4% each year, but rates have stabilized in white women since 2005 (DeSantis et al. 2017). Relative 5-year survival rates for women with breast cancer are improving, but there is still a marked difference between black women and white women with 83% and 92% respective 5-year survival rates (DeSantis et al. 2017). Furthermore, as of 2015, breast cancer incidence rates continue to be higher for white women overall, yet mortality rates are higher for black women (Figure 2). Specifically, mortality rates were 39% higher for black women compared to white women in 2015 (DeSantis et al. 2017). As long as these trends in incidence, mortality and survival remain in place, further research on the causes of these black-white health disparities is warranted. The remainder of this section will summarize the staging and classification systems for breast cancer, current treatments for breast cancer and factors contributing to racial disparities in breast cancer treatment and outcomes.

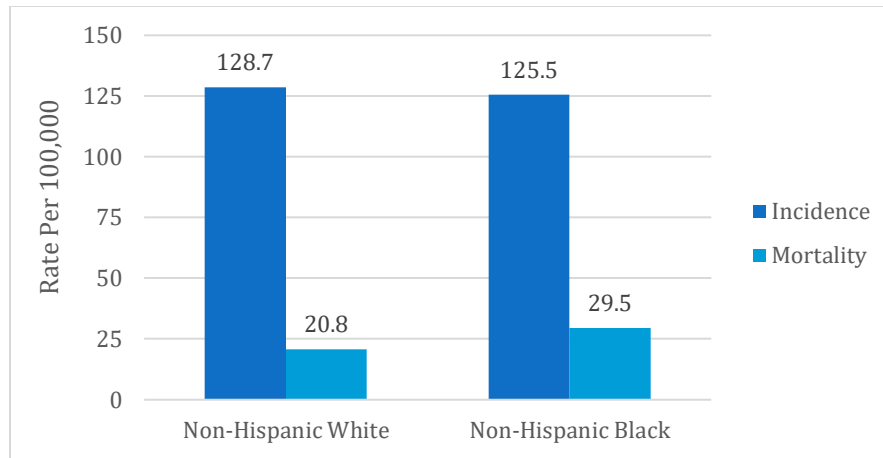


Figure 2: Female Breast Cancer Incidence and Mortality by Race (Adapted from Street 2017). Incidence rates are higher for white women than black women, yet black women have a higher mortality rate.

Breast Cancer Classification and Staging

Breast cancer is defined as an abnormal growth of malignant cells in the epithelium of the breast that typically originates in the ducts or the lobules. At the time of diagnosis, cancer is either confined to the tissue of origin (In Situ) or has spread to surrounding tissues, becoming invasive. According to the Breast Cancer Facts and Figures 2017-2018 published by the American Cancer Society (ACS), 80% of all breast cancer is invasive. There are currently two major classification systems used for staging cancer, Tumor, Node, Metastasis (TNM) and Surveillance, Epidemiology and End Results (SEER) (Table 1). These staging systems are used to quantify cancer prognosis and aid in determining appropriate treatment. Based on SEER data from 2002 to 2008, 61% of breast cancer in white women was localized and 32% was regional, while for black women, 51% was localized and 38% was regional (Brawley 2013). Analyzing data

from the Concord-2 Study, Miller and colleagues found that survival of distal tumors was 25.7% for white women and 17.1% for black women and survival of regional tumors was 83.5% for white women and 71.8% for black females (Miller et al. 2017). These differences in disease stage and prognosis highlight an important disparity in the field of breast cancer research.

Table 1. Cancer Staging (American Cancer Society 2017)

TNM	SEER	Description
0	In Situ	Abnormal cells remain at the site of origin
I	Local	Abnormal cells have penetrated nearby tissue but remains in the breast
II	Local/Regional	Cancerous cells have moved from the breast to nearby lymph nodes
III	Regional	Cancerous cells have penetrated further lymph nodes and tissue outside of the breast
IV	Distant	Cancerous cells have metastasized to tissue distal from the breast

In addition to staging cancer based on the spread from the site of origin, breast cancer can be classified according to its molecular subtype. Genome profiling and microarray technologies led to the discovery of molecular subtypes (Perou et al. 2000). This newer classification system is used to tailor treatment for breast cancer based on the receptors expressed in the tumor. There are four major subtypes based on two receptors that are frequently tested for, including the Hormone Receptors (HR - estrogen and progesterone) and the Human Epidermal Growth Factor Receptor 2 (HER2) (Table 2).

Luminal A breast cancer is a low-grade cancer with the best prognosis of the four types while Luminal B tends to be high-grade and more aggressive. Triple Negative Breast Cancer (TNBC) is very aggressive and has no identifiable receptor targets making it the subtype with the worst prognosis (Lukong 2017). HER2+ enriched tumors are also aggressive cancers, but they have advanced targeted therapies, giving them better longer-term prognosis (Haque et al. 2012). Luminal A is the most common subtype among all women, but TNBC has a higher prevalence among black women than white women (Perou and Børresen-Dale 2011). As genetic profiling techniques continue to improve, there is hope that additional molecular subtypes will be discovered creating new targets for therapy.

Table 2. Molecular Subtypes of Cancer (Adapted from American Cancer Society 2017).

Major Types	Molecular Profile	Overall Prevalence	Prevalence in White Women	Prevalence in Black Women
Luminal A	HR+/HER2-	71%	72.5%	59.1%
Luminal B	HR+/HER2+	12%	12.4%	12.7%
Triple Negative /Basal Like	HR-/HER2-	12%	10.6%	21.8%
HER2 enriched	HR-/HER2+	5%	4.4%	6.4%

Breast Cancer Treatments

Treatments have dramatically progressed since breast cancer was first identified and continue to improve steadily as technology advances. The progression of chemotherapy agents since the 1970's has enabled more effective treatment of breast cancer. Genome profiling to determine molecular subtype has also revolutionized the treatment of breast cancer allowing for the development of targeted therapies. Figure 3 illustrates important advancements in the history of breast cancer treatment (Figure 3).

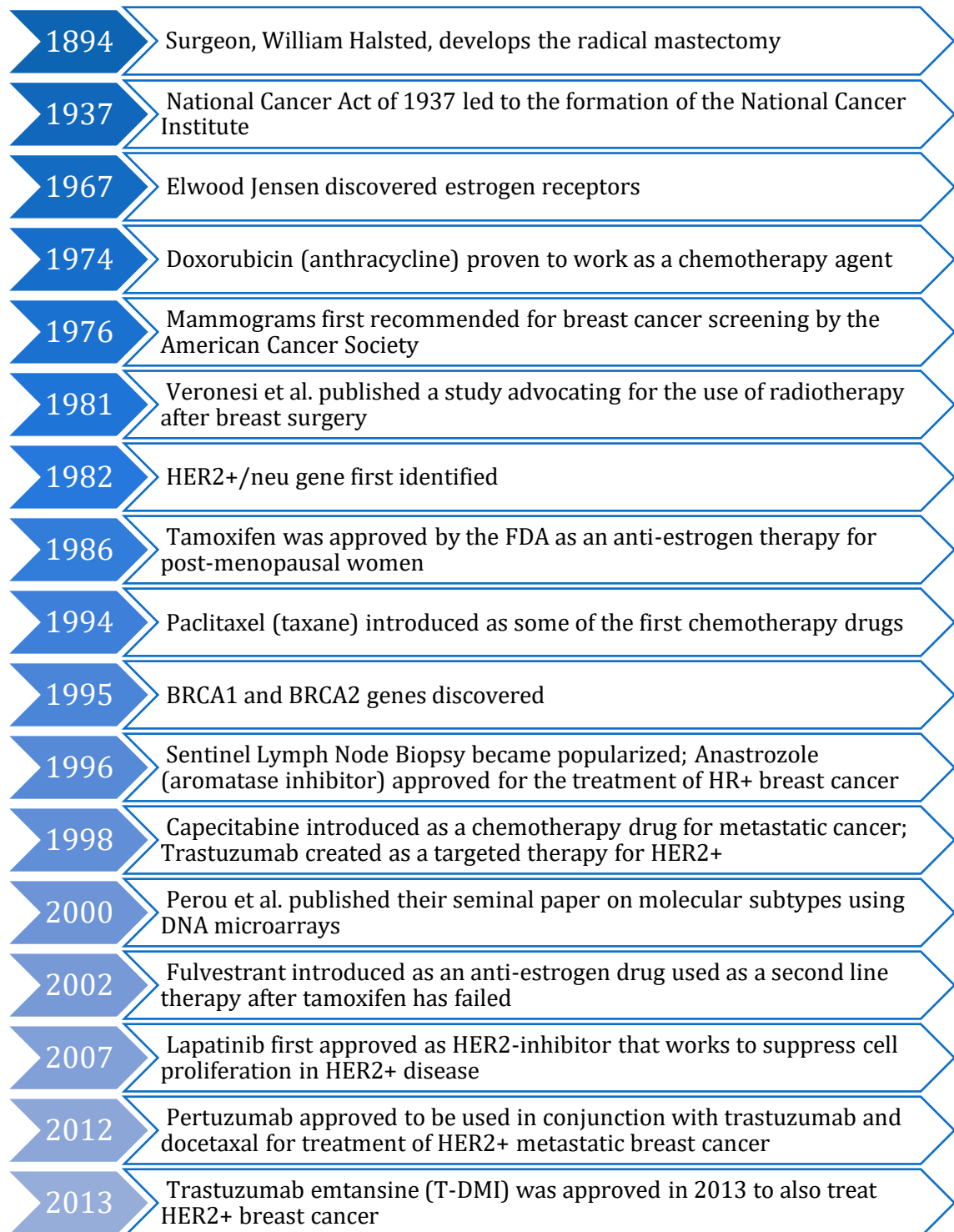


Figure 3: Timeline of Important Breast Cancer Treatment Developments (Lukong 2017; Ades et al. 2017; Lakhtakia and Chinoy 2014; Lakhtakia and Burney 2015; “History of Cancer Screening and Early Detection” 2014).

Treatment for breast cancer is largely determined by the molecular subtype and stage of the cancer (Figure 4). Early-stage breast cancer is usually targeted locoregionally with breast conserving surgery (BCS) and adjuvant treatment such as radiation therapy (RT) or chemotherapy to reduce the chance of recurrence (Harbeck and Gnant 2017). Standard adjuvant treatment for early stage HR+ breast cancer is endocrine therapy (ET) over the course of 5-10 years. Tamoxifen is usually given to premenopausal patients and tamoxifen/aromatase inhibitors for postmenopausal women (Harbeck and Gnant 2017). Chemotherapy is recommended for patients with TNBC or HER2+ enriched subtypes (Carey et al. 2007). For early breast cancer, anthracyclines and taxanes (paclitaxel and docetaxel) are the recommended chemotherapy agents to be given over the course of 18-24 weeks. Neoadjuvant systemic therapy using chemotherapy, endocrine therapy or targeted therapy is the standard of care for tumors that are too large for breast conserving therapy (Harbeck and Gnant 2017). For TNBC, patients typically receive neoadjuvant anthracycline-taxane chemotherapy with the possible addition of platinum. Patients with HER2+ cancers are given trastuzumab for one year in addition to anthracycline-taxane chemotherapy (Harbeck and Gnant 2017).

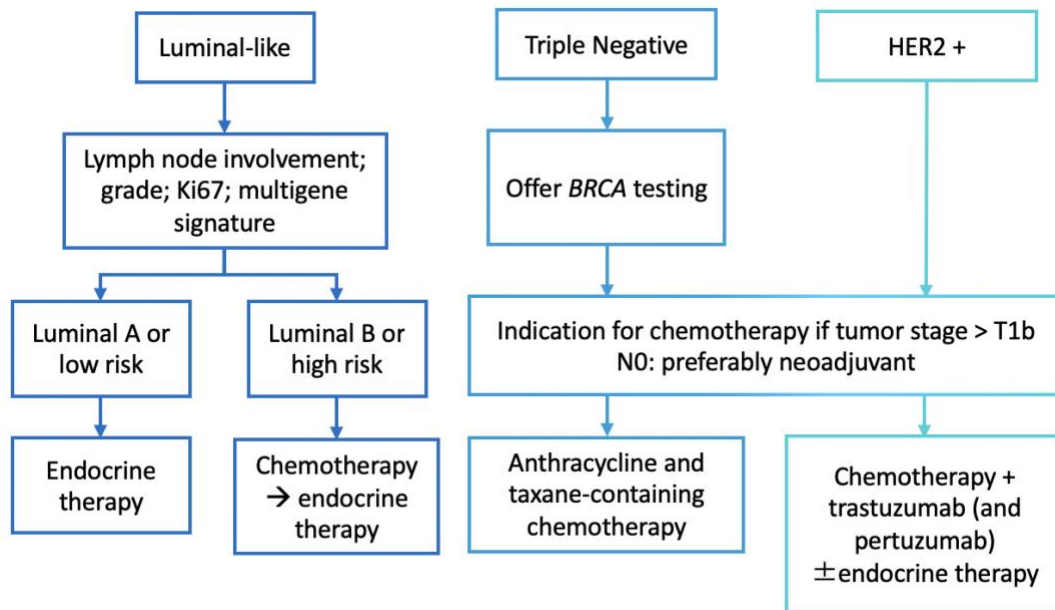


Figure 4: Treatment of Early Stage Breast Cancer (Adapted from Harbeck and Gnant 2017). The indicated treatment courses vary according to the subtype of breast cancer. Mutations in the BRCA1/BRCA2 tumor suppressor genes are rare, but confer an elevated risk of 69-72% of developing breast cancer compared to the average population (Kuchenbaecker et al. 2017). Genetic testing for BRCA1/2 is recommended for patients with a family history suggesting a high risk of BRCA1/2. Patients who test positively for BRCA1/2 may consider a prophylactic mastectomy (Gabai-Kapara et al. 2014).

Late-stage or metastatic breast cancer is also treated with chemotherapy, hormonal therapy and targeted therapy (Figure 5). Patients with metastatic breast cancer typically receive systemic therapy followed by locoregional therapy as appropriate. In metastatic HR+ /HER2- breast cancer, endocrine therapy including tamoxifen, aromatase inhibitors, fulvestrant, and progestins is recommended (Lukong 2017). For premenopausal patients, ovarian suppression is also suggested. For patients with metastatic HR- /HER2+, anti-HER2 therapy, trastuzumab, and taxane chemotherapy is the standard treatment course (Lukong 2017). As additional molecular subtypes are discovered, further targeted therapies will hopefully become available.

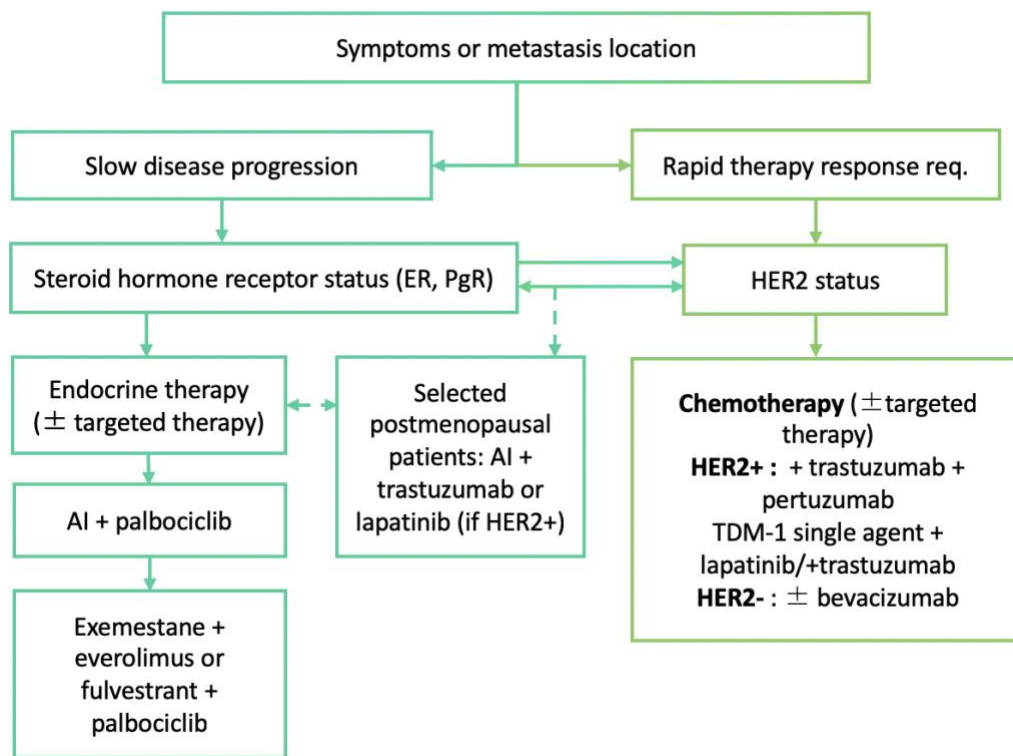


Figure 5: Treatment of Metastatic Breast Cancer (Adapted from Harbeck and Gnant 2017).

Factors Contributing to Healthcare Disparities

In examining risk factors for breast cancer, there is an attempt to determine the causes of unequal distribution of aggressive breast cancer subtypes across races. A review on health disparities and TNBC, published by Newman and colleagues in 2017 identified the following factors as contributing to the racial disparities in breast cancer outcomes: poverty/socioeconomic status (SES), insurance status, lactation and reproductive history, obesity, comorbid conditions such as diabetes, alcohol and tobacco use, and allostatic load (Newman and Kaljee 2017).

A study based on the SEER database found that SES and tumor characteristics (e.g., molecular subtype, tumor size, grade and sentinel lymph node involvement) were two of the major differentiating factors between black and white women (Ren et al. 2018). SES is often tied to a patient's insurance status and patients with no insurance or public insurance such as Medicaid are less likely to receive the same quality of care as commercially insured patients (Wittayanukorn et al. 2015). Notably, research has indicated that after controlling for insurance status, over 70% of the racial differences in outcomes remained (Jemal et al. 2017). Socioeconomic status and insurance status are two of the largest hurdles to overcome on the path to racial equity in breast cancer treatment.

Furthermore, lactation and reproductive history have a complicated interplay with breast cancer risk. Breast feeding for longer has been shown to protect against basal-like breast cancer and TNBC (Brawley 2013; Ma et al. 2017). Higher parity without breast feeding has also been linked to an increased risk of TNBC and black women on average have more children than white women (Palmer et al. 2011; Martin et al. 2017). Although breastfeeding rates are increasing for black women, studies have found that white women are more likely to breastfeed their children and for longer than black women in the US. (Williams, Mohammed, and Shields 2016; Anstey et al. 2017). Policies that support breastfeeding may help reduce the unequal rates of TNBC across ethnicities.

Additionally, lifestyle factors such as diet and daily activity levels can have a major impact on breast cancer occurrence. Black women in the US have a higher likelihood of being obese, and obesity is linked to increased rates of postmenopausal

breast cancer (Brawley 2013). Increased alcohol consumption and, to a lesser extent, tobacco use are associated with higher rates of breast cancer, as well (Williams et al. 2016). Fortunately, lifestyle factors are points of targetable intervention for physicians and healthcare providers to reduce rates of breast cancer.

Lastly, allostatic load is the concept that repeated stressors across a person's life can accumulate to present as biological dysregulation (Williams et al. 2016). Data from the Black Women's Health Study indicated that women who experience racial discrimination on the job had a 20% higher chance of developing breast cancer (Taylor et al. 2007). Life stressors, especially those resulting from racial discrimination are experienced unequally across the US population. Mitigating the negative effects of allostatic load may yet prove to be one of the greatest challenges in the work to eliminate racial disparities in healthcare as it will ultimately require a systemic intervention to alleviate.

SPECIFIC AIMS

The aims of this thesis are to:

1. Provide an overview of racial disparities currently published in the breast cancer literature.
2. Examine the racial disparities between black and white women specifically in the treatment of breast cancer and the resulting outcomes.
3. Analyze the published literature for sources of future research and interventions to help mitigate racial disparities in the survival of black women with breast cancer.

PUBLISHED STUDIES

Screening and Staging Disparities

One of the most crucial aspects of breast cancer treatment is early detection. Mammography remains the gold standard for initial screening and detection of breast cancer. According to the American Cancer Society, women ages 45 to 54 should have annual mammograms and women aged 55 and older should have a mammogram every other year. Based on SEER data from 2015, 50% of white women and 55% of black women had a mammogram in the past year (American Cancer Society 2017). A study by Silber et al. published in 2013 using data from the SEER-Medicare database, found that after matching for patient demographics (age, year of diagnosis, and SEER site), white women had a 12.2% higher chance of having been screened for breast cancer in the 6 to 18 months prior to diagnosis compared to black women (Silber et al. 2013). However, many studies have found that screening mammography is statistically equivalent between black and white women (Newman and Kaljee 2017; Miller et al. 2017). In fact, a study focused on women in South Carolina found that black women have higher rates of breast cancer screening but were still more likely to be diagnosed with late stage breast cancer (Samson et al. 2016). Therefore, breast cancer screening rates are generally considered equivalent in black and white women among experts in the field.

After a woman has a positive mammogram, completing a sentinel lymph node biopsy (SLNB) is the standard of care. If patients have a positive lymph node biopsy, they should then receive either an axillary lymph node dissection or axillary radiotherapy

(Harbeck and Gnant 2017). A study published by Reeder-Hayes et. al in 2011, examining SEER-Medicare data from 2000 to 2002, found that when comparing across all ages, black women were about half as likely to receive SLNB as white women. This same study found that Medicare did not protect black women from receiving reduced rates of SLNB, indicating that insurance status is unlikely to be a major determining factor for racial disparity in the receipt of SLNB (Reeder-Hayes et al. 2011). In a study of patients undergoing surgical treatment in New York, white women were statistically more likely to undergo a SLNB than minority patients (Bickell et al. 2006). SLNB is a crucial first step in determining the subtype of breast cancer which informs treatment, but the literature indicates that black women are receiving significantly lower rates of SLNB. Given the fact that black women are more likely to have lymph node involvement, the reduced rates of SLNB have the potential to dramatically impact diagnosis and therefore treatment outcomes in black women (Foy et al. 2018; Ren et al. 2018).

Treatment Disparities

There is a growing body of published literature that points to racial differences in the treatment courses of women with breast cancer. In 2017, Jemal and colleagues published a study in the Journal of Clinical Oncology analyzing factors associated with breast cancer in over 500,000 women aged 18 to 64 from the National Cancer Data Base with stage I-III breast cancer. They found that black patients were more likely to present with HR- tumors diagnosed at a later stage, with the tumors having grown larger and more aggressive. Their statistical analysis indicated that black women with HR+ breast

cancer had a 76.3% increased risk of death compared to white women. Insurance status accounted for over 30% of this increased risk of death (Figure 6). Jemal and colleagues found that after matching patients based on tumor characteristics (e.g. stage, tumor size, grade, histological type and hormone receptor status) over 20% of the excessive risk was eliminated. Comorbidities also played a significant role contributing 11.3% of the increased risk of death for HR+ and 3.8% for HR- breast cancer patients. Differences in treatment contributed to 4.8% and 3.6% of the increased risk of death from HR+ and HR- breast cancer respectively (Jemal et al. 2017).

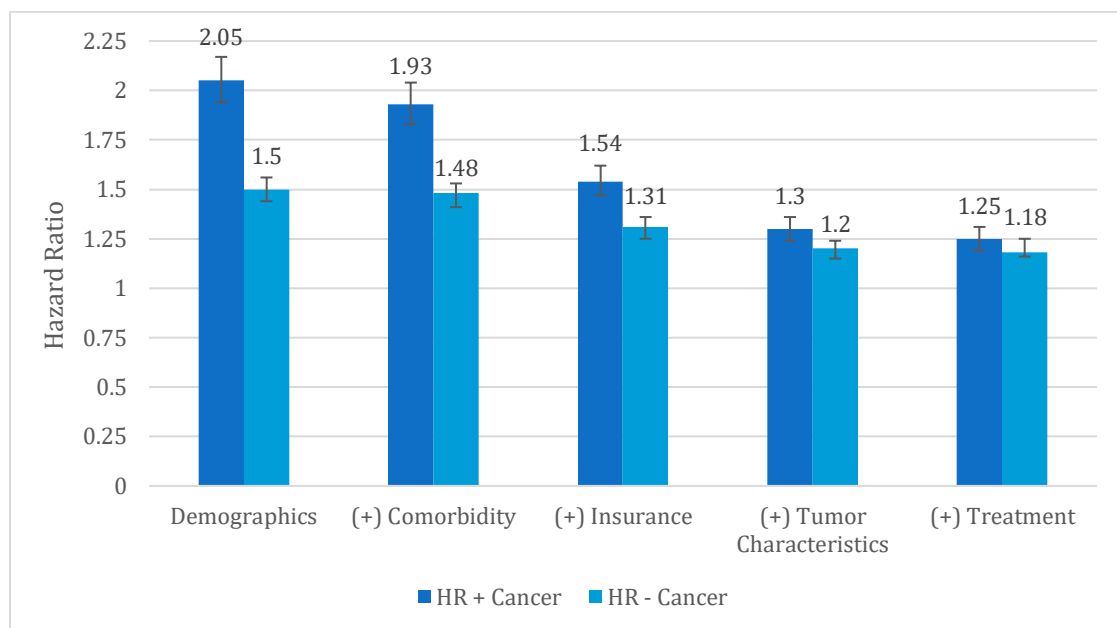


Figure 6: Effect of Adding Matched Variables on Breast Cancer Hazard Ratio for Black Women Versus White Women (Jemal et al. 2017). Matched variables included demographics (age and residence at diagnosis), patient’s comorbidities, insurance status, tumor characteristics (stage, size, and grade), and treatment received (surgery, radiation, chemotherapy, and/or hormone therapy). Error bars indicate a 95% Confidence Interval. Adding matched variables reduced the disparities between black and white women but did not fully eliminate differences.

The previously noted study published by Silber et al. in 2013 corroborates partial findings of Jemal and colleagues. Based on the SEER-Medicare database, researchers found that 12.6 % of black patients did not receive treatment for breast cancer while only 5.9% of white patients did not receive treatment (Silber et al. 2013). Furthermore, the mean time to treat in demographically matched patients was 29.2 days for black women versus 22.5 for white women. Ultimately, two times as many black women did not receive treatment within three months compared to white women with similar tumor characteristics. (Silber et al. 2013). Additional studies have confirmed that black women tend to receive treatment delays that are longer than their white peers (Brawley 2013). Hoppe and colleagues published a study on patients with stage I breast cancer from the National Cancer Data Base analyzing time to treatment. They also found that black women had significant delays in time to treatment compared to white women with an average delay of 7.4 days (Figure 7) (Hoppe et al. 2018). Breast cancer continues to be a disease in which time to treatment is critical for positive outcomes (Chavez-MacGregor et al. 2016).

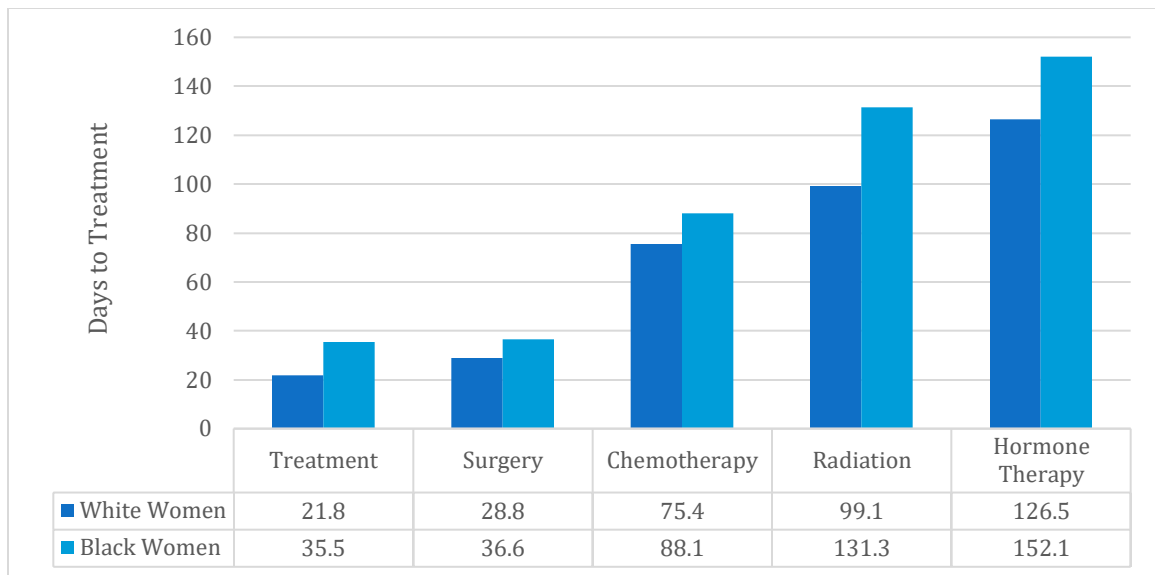


Figure 7: Delays in Initiation of Breast Cancer Treatment (Adapted from Hoppe et al. 2018). Black women experienced an average delay of 7.4 days in initiation of treatment compared to white women. Black women receiving surgery had the shortest delay in treatment initiation of 36.6 days while black women receiving radiation therapy had the longest delay in treatment relative to white women of 32.2 days.

Additionally, Chen and Li published another SEER database study on the receipt of treatment in women aged 20 -70 years old with primary invasive stage I/II breast cancer and tumors less than 2 cm in size. For the study’s purposes, guideline concordant treatment was defined as mastectomy or breast conserving surgery followed by radiation therapy. The data indicated that black women were 30-40% more likely to receive treatment inconsistent with given guidelines than white women across all breast cancer subtypes (Figure 8). Black women were 30-60% less likely to receive guideline concordant treatment for all breast cancers apart from HER2+ enriched breast cancer than white women (Chen and Li 2015). Ultimately, black women had a higher probability of being diagnosed later and receiving improper treatment.

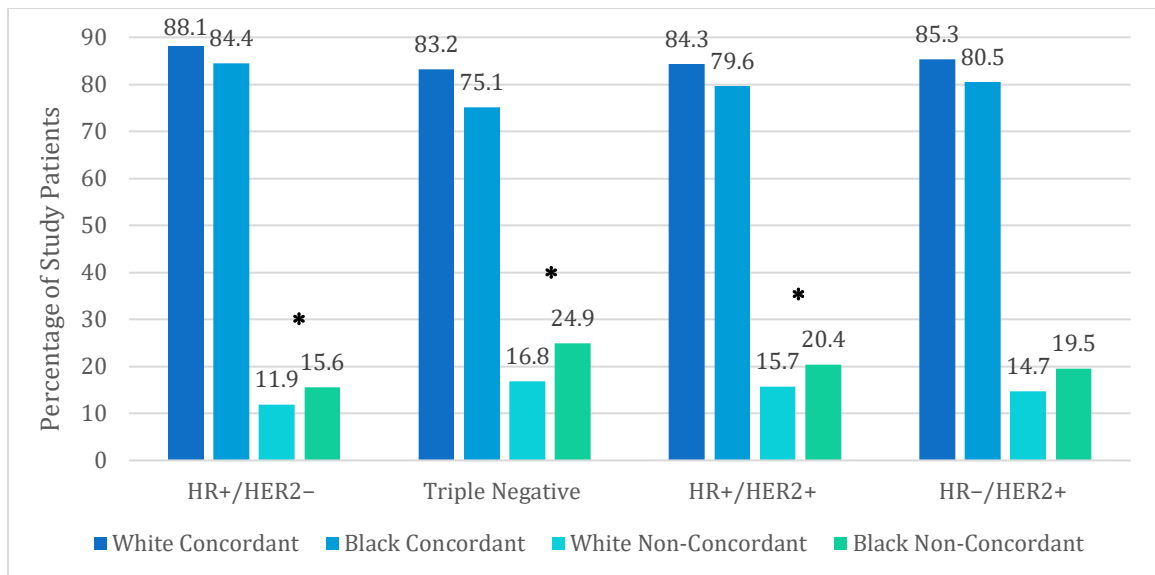


Figure 8: Percent of SEER Patients Receiving Guideline Concordant Treatment (Adapted from Chen and Li 2015). Percentage of patients receiving concordant and non-concordant treatment by breast cancer subtype. The different rates of non-concordant treatment between black and white women was statistically significant in all subtypes except HR-/HER2+. Asterisk indicates a statistically significant Odds Ratio (OR) with p-value < 0.5.

Surgery

For most patients with early-stage breast cancer, surgery is the first line of treatment. Depending on the size of the tumor, patients will either receive breast conserving surgery for smaller tumors or mastectomy for larger tumors. Black women are less likely to receive surgery including breast conserving surgery, mastectomy, prophylactic mastectomy and reconstruction when diagnosed with cancer (Foy et al. 2018). In fact, 93.8% of white women have surgery compared to only 90.4% of black women, a statistically significant difference (Foy et al. 2018). This evidence indicates that black women are less likely to receive even standard treatments when first diagnosed with breast cancer.

Furthermore, the previously discussed study by Jemal et al. found that in the patient cohort with HR+ cancer, a greater portion of white patients received surgery compared to black patients (Jemal et al. 2017). In a study drawing on a population of military patients from the Department of Defense Central Cancer Registry and Military Health Systems (MHS) Data Repository, Eaglehouse and colleagues examined the average time to surgical treatment for women diagnosed with early stage breast cancer. The study team found that there was delay of 3.6 days and 9.4 days for black women compared to white women at the 75th percentile and 95th percentile for treatment times respectively. Although these length of delays may appear short, the patients in this study all had equal access to treatment via insurance so should present with minimal to no differences in time to treatment (Eaglehouse et al. 2019). There is a growing body of literature that indicates black women are not receiving adequate care, especially first line treatment such as surgery.

Radiation Therapy

Following surgery, radiation therapy is often the next line of treatment as an adjuvant therapy to prevent cancer recurrence. A study conducted at the James Cancer Center in Columbus, Ohio by Foy and colleagues found that black women were 13.7% less likely to receive radiation therapy than white women among patients with regional disease (Foy et al. 2018). Similarly, analyzing SEER data from 2000 to 2006, Ooi and colleagues determined that black women with stage I or II breast cancer had a higher chance of not receiving radiation treatment following BCS (Ooi, Martinez, and Li 2011).

Additional research confirmed that after BCS, black women are 11% less likely to receive RT than white women (Bickell et al. 2006). A study of patients from the SEER-Medicare Database similarly concluded that 53% of black patients and 61% of white patients received RT post-mastectomy (Fang et al. 2018). Jemal and colleagues also published consistent data, indicating that a greater portion of white patients with HR+ breast cancer received radiation therapy than black patients (Jemal et al. 2017).

In a study based on SEER data of women aged 65+ with stage I-III breast cancer that received BCS, black women experienced the greatest delays in receiving RT. Black women had an odds ratio of 0.62 for initiation of RT within 12 months compared to white women. However, after adjusting for patient characteristics, geographic distance to RT was one of the greater predictors of RT initiation (Wheeler et al. 2012). Radiation therapy is a crucial step in the treatment of breast cancer, the dramatic disparities presented throughout the literature can have a profound impact on patient outcomes.

Chemotherapy

Chemotherapy is typically given as an adjuvant therapy after surgery, as a neoadjuvant therapy before surgery or as a systemic therapy for cancer that is wide spread. If given after surgery, adjuvant chemotherapy should be started within 3-4 weeks (Harbeck and Gnant 2017). Based on data from over 10,000 patients in the SEER-Medicare database, only 3.7% of black women received anthracycline and taxane chemotherapy medication compared to 5.0% of white women matched on initial presentation (Silber et al. 2013). Additionally, black women are less likely to receive

adjuvant chemotherapy than white women with an odds ratio of 0.87 according to data from over 400,000 patients in the National Cancer Database (Freedman et al. 2011).

However, not all studies have found that black women are less likely to receive chemotherapy than white women. In fact, a study of patients with stage I breast cancer from the National Cancer Data Base concluded that black women underwent chemotherapy more often than white women at a rate of 31.1% vs 21.9% respectively (Hoppe et al. 2018). However, this finding was among women with stage I breast cancer for which surgery is the standard treatment course (Harbeck and Gnant 2017).

Additionally, a study of women diagnosed in 2012 with stage IIB-IV cancer from the National Cancer Institute (NCI) Patterns of Care Study found that after adjusting for covariates such as age at diagnosis, there was no difference in the receipt of chemotherapy based on race for patients with stage IIB-C breast cancer. Black women with stage IV cancer even had a slightly higher chance of receiving chemotherapy (Enewold et al. 2018). Furthermore, analysis of adjuvant chemotherapy received at the Henry Ford Health Systems in Detroit, Michigan between 1996 and 2005 by Simon and colleagues indicated that, overall, black women were 5% more likely to receive adjuvant chemotherapy than white women. However, black women experienced a statistically significant delay in the initiation of adjuvant chemotherapy of 5.3 days and white women were more likely to be treated within 60 days (Simon et al. 2012). Additionally, a meta-analysis by Green and colleagues found that black patients and white patients received the same dosing for chemotherapy (Green et al. 2018). The receipt of chemotherapy is a

complex component of breast cancer treatment and one that requires additional studies to determine the extent of racial disparities.

Hormone Therapy

Endocrine therapy is one of the major forms of treatment for HR+ breast cancer, the most prevalent form of breast cancer across all races. Nonadherence to endocrine therapy can have dire outcomes including faster times to recurrence, increased medical costs and overall reduced quality of life (McCowan et al. 2013). Based on patients that completed a two year follow up for Phase III of the Carolina Breast Cancer Study, 23.7% of black women reported underuse of ET, compared to only 15.9% of white women. Black women were also two times as likely to be non-adherent to ET (Wheeler et al. 2018). Furthermore, black women have a lower chance of starting adjuvant endocrine therapy (AET) within a year of diagnosis than white women (Farias and Du 2017). Additional SEER data has demonstrated that white women have an odds ratio of 3.63 compared to black women for initiation of AET but race did not significantly impact adjuvant endocrine therapy persistence (Friese et al. 2013). Based on data from OptumInsurance claims, black women were 32% less likely to be adherent to hormonal therapy. This disparity, however, was reduced to 19% when adjusting for net worth (Hershman et al. 2015). Additional studies have found that black women with HR+ breast cancer were 9% less likely to have ET than white women (Bickell et al. 2006). This statistic is particularly startling as patients with HR+ breast cancer are the most responsive to endocrine therapy treatments.

Nevertheless, not all published research has supported the above findings that black women are receiving delayed or guideline non-concordant endocrine therapy. For instance, the previously mentioned study by Foy et al. found that black women were more likely to receive hormonal therapy than white women (Foy et al. 2018). Additionally, multiple studies have published that black women are less likely to discontinue endocrine therapy than white women (Farias and Du 2017; Wheeler et al. 2018). These contrasting results ultimately indicate that further research needs to be conducted regarding the initiation and continued use of endocrine therapy across races/ethnicities.

Targeted Therapy

The discovery of targeted therapy for HER2+ breast cancer, dramatically improved the chances of survival for women diagnosed with an aggressive subtype of cancer. This treatment advancement, however, has not been equally shared among all breast cancer patients. For instance, one study found that 40% of black patients with HER2+ cancer received trastuzumab within a year of diagnosis compared to 50% of white patients. This disparity was widened in stage III disease with 76% of white women receiving treatment and only 56% of black women. After adjusting for tumor characteristics, black women were 25% less likely to receive trastuzumab compared to white women (Reeder-Hayes et al. 2016). Trastuzumab and similar targeted treatments are the most effective treatment options for HER2+ breast cancer. The fact that not all

women are receiving the same rates of trastuzumab treatment sets a concerning precedent as trastuzumab is the standard of care for HER2+ breast cancer (Lukong 2017).

Another factor that is important to consider in the use of HER2-targeted therapies is the risk of cardiotoxicity, often observed as a decrease in the left ventricular ejection fraction. Litvak and colleagues examined the racial differences in cardiotoxicity among 216 patients with stage I - III HER2+ breast cancer treated at the Sidney Kimmel Comprehensive Cancer Center at Johns Hopkins. They discovered that black women had a higher rate of cardiotoxicity than white women. Overall, 10.2% of the study patients had to stop treatment due to cardiotoxicity which included 22% of black patients and 5.7% of white patients. Ultimately, black patients had an odds ratio of 4.61 for not completing 52 weeks of therapy compared to white women (Litvak et al. 2018). Cardiotoxicity is an important concern when treating patients with HER2+ breast cancer that could potentially contribute to racial disparities in the receipt of targeted treatments among women.

Clinical Disparities

In addition to racial disparities in treatment options and initiation, black women are subject to different experiences in the clinic and as they interact with their healthcare providers. One aspect of care that is consistently under acknowledged is the direct impact of physicians on racial differences in the quality of care. One of the few studies analyzing the effect of physician variations on breast cancer care was conducted by Popescu and colleagues using the SEER-Medicare Database. The study indicated that physicians

treating majority black patient populations provided less guideline concordant care to all their patients than physicians who treat no black patients. Popescu et al. also found that differences in care between physicians accounted for less than 20% of the variation seen in treatment quality and did not account for the racial differences in observed care. However, variation in treatment provided by one physician for different patients accounted for over 70% of the differences in the applicable treatments (Popescu et al. 2016). Additionally, Penner and colleagues conducted a study on oncologists and their black patients with breast, colorectal and lung cancer. Of the participants, 84% were breast cancer patients. Before meeting with patients for the first time, oncologists completed the Implicit Association Test (IAT) which screens for implicit racial bias. They found a negative association between providers' implicit racial bias and the length of interactions with patients and ratings of supportive care. Providers with higher IAT scores were perceived as being less patient centered while communicating with black patients by independent observers and patients (Penner et al. 2016). It is important to recognize the potential impact that physician variation can have on racial disparities in breast cancer treatment.

Notably, there are also racial differences in the patient populations of research studies. Research suggests that black women are less likely to be enrolled in clinical trials (Wheeler, Reeder-Hayes, and Carey 2013). This reduced enrollment in clinical trials may be the result of a complex history between medical institutions and black communities or possibly due to lower rates of outreach to black women for enrollment. Additionally, data from the Women Health Initiative Study found that larger portions of black women were

lost to follow up than white women during research (Livaudais et al. 2013). Nevertheless, the fact remains that if black women are not enrolled in clinical trials at the same rate as white women, they may not have access to the newest and most innovative treatments. Furthermore, due to this decreased enrollment of black women, the results of these clinical trials may not be applicable across all demographics.

Individual-Level Barriers in Access to Quality Treatment

In addition to barriers that patients face at the clinical level, patients also encounter barriers at the individual level. Cited barriers to care include diminished social support, medical mistrust, and financial obstacles (Ko et al. 2016). In 2014, Katz and colleagues published a study analyzing data from 1,995 patients with breast cancer from the Patient Navigation Research Program. Two thirds of these patients had at least one barrier to care and patients with at least one barrier to care had longer times to diagnostic resolution (Katz et al. 2014). Barriers included comorbidities, insurance, financial problems, housing issues, traveling, issues finding care for other adult's in the patient's life, and inaccessibility of care (Figure 9).

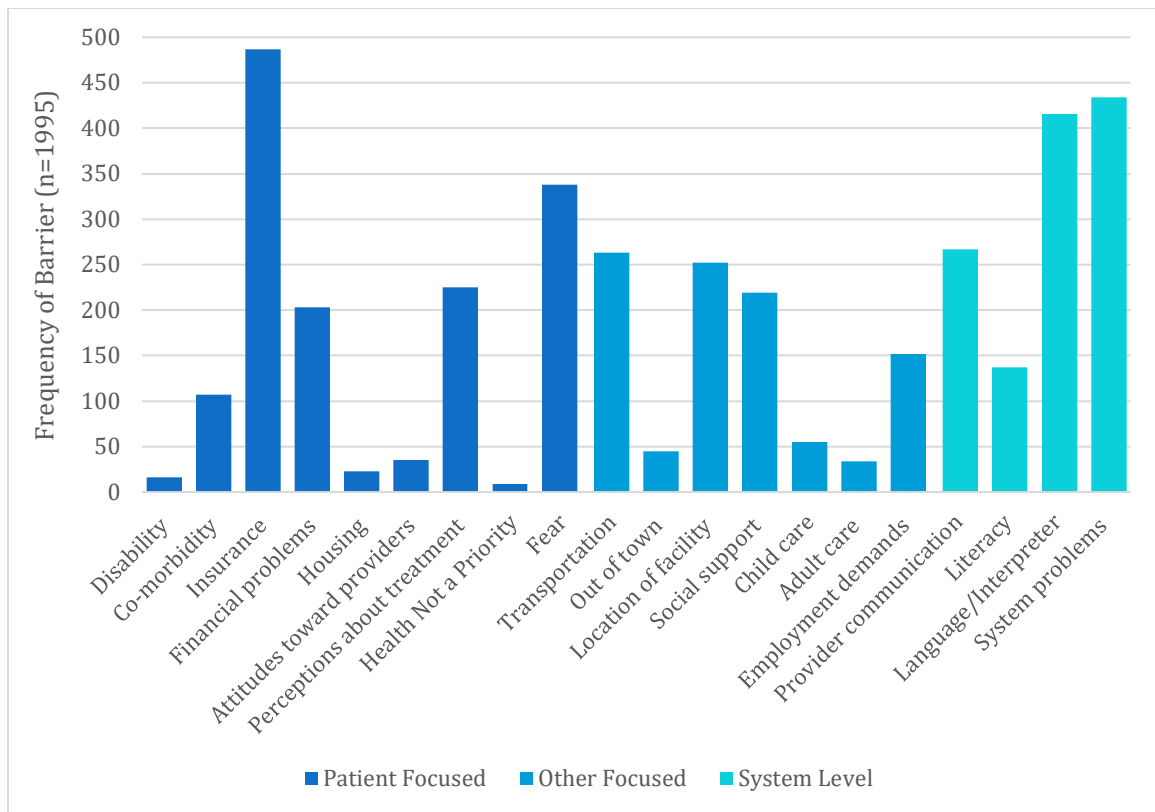


Figure 9: Frequency of Unique Barriers Among Breast Cancer Patients (Adapted from Katz et al. 2014).

Furthermore, Freedman and colleagues conducted a qualitative analysis in which they interviewed 18 women treated for breast cancer at the Dana-Farber Cancer Institute and Columbia University Medical Center about their cancer care, treatment, and education. The research team found that 38.9% of the patients experienced treatment non-initiation or delay due to reasons other than their provider suggesting they stop treatment. Major stated barriers for these women included transportation and childcare (Freedman et al. 2017). Patients also reported side effects from the medication as a key factor in early termination or missed treatment (Freedman et al. 2017). Furthermore, Jones and

colleagues conducted a systemic review of primary research published from 1991 to 2013 examining barriers to diagnosis in black women. Black women across the studies were less familiar with the symptoms and risk factors of breast cancer and thus had lower perceptions of their risk for developing breast cancer than white women (Jones et al. 2014). The study results also indicated that there was a correlation between the previous misdiagnosis of breast cancer symptoms in black women and a lack of confidence in their medical providers (Jones et al. 2014).

Similarly, Paranjpe and colleagues completed a literature review of reported barriers to oral endocrine therapy adherence and continuation for patients with HR+ breast cancer. Results indicated that non-adherence and early discontinuation were strongly correlated to poor patient-provider relationships (Paranjpe et al. 2018) On the other hand, increased feelings of self-efficacy were correlated with higher rates of medication adherence. Ultimately, one of the largest reported barriers was the number of side effects from oral endocrine therapy (Paranjpe et al. 2018). Moreover, Wheeler and colleagues determined, based on data from the Carolina Breast Cancer Study, that lacking feelings of shared decision making and the belief that ET nonadherence does not impact health were highly predictive of ET underuse (Wheeler et al. 2018). Gallups and colleagues conducted research focused on black women with early stage breast cancer receiving chemotherapy in the ACTS (Adherence, Communication, Treatments and Support) Intervention Study. They found that comorbidities and employment status predicted treatment delays with unemployed patients having more treatment delays than employed patients (Gallups et al. 2018).

Among the barriers expressed by patients, insurance and financial concerns continue to be of high importance. Zafar and colleagues conducted a study on patients with solid tumors receiving chemotherapy or hormonal therapy, recruited from Duke University Medical Center and the HealthWell Foundation. Among the study patients, 71% had breast cancer, 86% were women and 80% were white. Of the patients that completed diaries about their monthly costs, 55% were underinsured. Over 20% of patients reported not taking a prescription, underusing a prescription or only filling part of a prescription to help save money (Zafar et al. 2013). Underinsured patients and breast cancer patients overall are reporting concerning trends in access to care due to financial and insurance barriers.

McGee and colleagues examined data from Phase III of the Carolina Breast Cancer Study for women with primary breast cancer and concluded that determinants of breast cancer treatment delay differ based on race (McGee et al. 2013). There was an association between immediate reconstruction surgery and delay for both white and black women. Other factors, however, such as losing one's job and household size were associated with delays among the white women, while for black women, the delay was associated with the first course of treatment. Nonetheless, black women ages 20 to 49 were three times as likely to experience delays than white women (McGee et al. 2013). Evidently, further research into the precise barriers affecting breast cancer treatment and their impact on racial disparities is warranted.

Interventions to Reduce Racial Disparities

As inequities in the receipt of care across all patient demographics continue to persist, public health officials have developed interventions to help mitigate these disparities. Providing patients with resources via patient navigators serves as a promising tactic for reducing disparities. The role of a patient navigator is to help patients throughout the process of their cancer treatment by offering assistance with transportation, interpreter services, child care, care coordination, financial resources and addressing other patient specific barriers to care (Paranjpe et al. 2018). Katz and colleagues documented the actions frequently taken by patient navigators on behalf of patients. Breast cancer patients most often needed assistance from navigators with scheduling appointments, helping with arrangements and making referrals (Figure 10).

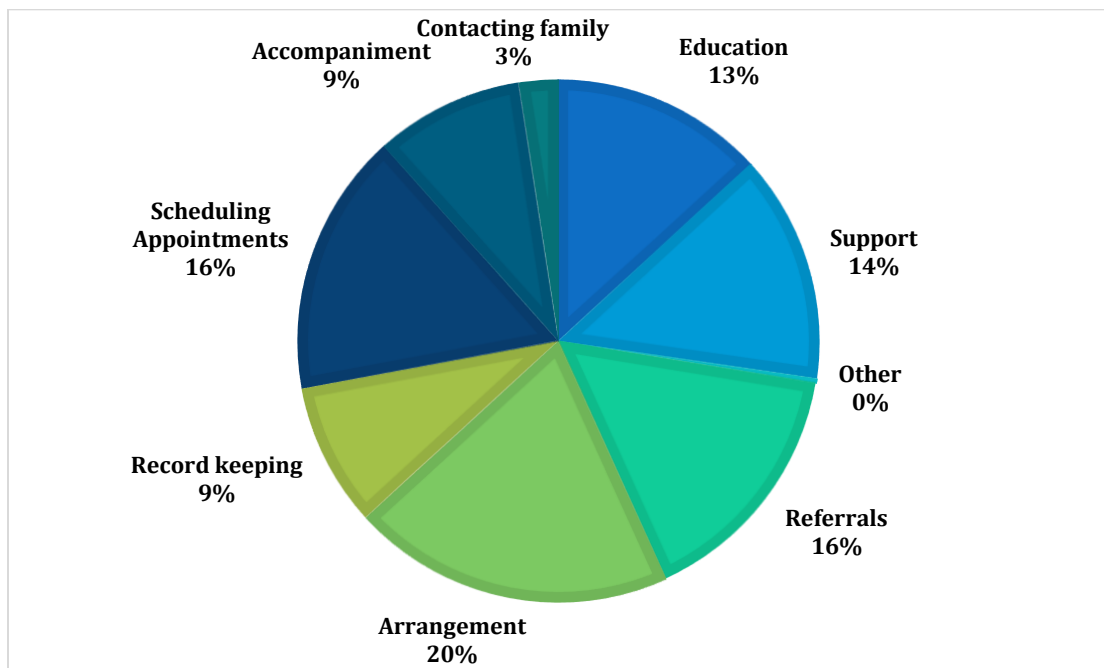


Figure 10: Patient Navigator Actions for Patients with Breast Cancer (Adapted from Katz et al. 2014).

A prospective meta-analysis by Battaglia and colleagues was conducted at six medical centers from the Patient Navigation Research Program, analyzing the impact of patient navigation on diagnostic resolution at 60, 180 and 365 days. Women that had an abnormal breast cancer scan (mammogram, ultrasound, MRI or breast mass indicative of cancer) were treated as usual or assigned to the patient navigator intervention (Battaglia et al. 2016). Navigation had no statistically significant effect at 60 or 180 days on achieving diagnostic resolution but patients in the navigation arm were twice as likely to achieve diagnostic resolution at 365 days than patients in the control arm (Battaglia et al. 2016). The research team found that the patient navigation intervention was helpful across all races/ethnicities and likely beneficial for patients that might have been lost to follow up (Battaglia et al. 2016). In a similar study, Ko and colleagues analyzed data from seven Patient Navigator Research Program centers. Patients in the data set had a diagnosis of breast, colorectal, prostate or cervical cancer and 54% of the patients in the control arm and 48% in the navigation arm had breast cancer. For black patients, median days to resolution in the control group was 108, compared to 97 in the navigation arm. Black patients experienced a statistically significant delay in both the control group and navigation group, while there was no statistical difference between the non-Hispanic white group and Hispanic groups (Ko et al. 2016). Although additional research must be conducted, patient navigators serve as a promising initial step in the effort to reduce racial disparities.

Another potential intervention to mediate racial disparities in breast cancer treatment is physician bias training. For example, Nelson and colleagues implemented a

training module of three 2-hour sessions to address the topics of race, racism, and whiteness in medicine. The study involved nineteen residents, the majority of which had received less than an hour of training regarding racism in medicine prior to the study. Following the training, 100% of the providers felt racism impacted health care delivery and white participants reported feeling less equipped to care for patients of color than prior to the intervention (Nelson, Prasad, and Hackman 2015). Similarly, Zeidan and colleagues implemented an educational intervention for twenty-one emergency medicine residents, including a grand round lecture on implicit bias, completing the IAT and a facilitated discussion of bias in emergency medicine. After the intervention, residents exhibited a 33.3% increase in awareness of their own implicit bias (Zeidan et al. 2019). While both these studies were conducted on a small scale, physician trainings on implicit bias and racism in medicine represent interventions with the potential to make a large positive impact.

Lastly, city-wide initiatives focused on reducing the impact of healthcare disparities is another promising intervention. The city of Chicago can serve as a model for the potential of large-scale measures to make advancements in health equity. In the 1980's, breast cancer mortality rates were equal for black and white women in Chicago, but from the 1990's until 2005, mortality rates diverged until black women were twice as likely to die from breast cancer than white women (Ansell et al. 2009). City officials, therefore, implemented the Metropolitan Chicago Breast Cancer Taskforce to elucidate the cause of higher rates of mortality for black women. They set out to determine if the disparity was due to lower rates of mammograms, poorer quality mammograms or

different treatments for black women with breast cancer. The task force determined that the primary issues included unequal access to screening, insufficient education and reduced quality of care (Ansell et al. 2009). Black women were more likely to have their mammograms performed at public institutions while white women were more likely to have them performed at private and academic medical facilities and have their mammograms read by radiology specialists (Ansell et al. 2009). To combat this growing disparity, the state of Illinois implemented a series of interventions including the Illinois Breast and Cervical Cancer Screening Program to pay for all mammograms and treatment of uninsured women, employing patient navigators and advocates, encouraging physicians to engage with black communities and remind women to get mammograms, targeting populations with educational media campaigns, increasing access and distribution of screening and treatment centers, creating a system for diagnostic follow up and training additional mammography specialists (Metropolitan Chicago Breast Cancer Taskforce. 2007). Approximately ten years later, Sighoko and colleagues analyzed the impact of the Metropolitan Chicago Breast Cancer Taskforce on healthcare disparities in Chicago compared to nine other cities across the US. They found that Chicago's breast cancer mortality disparity reversed from increasing 3.9% annually in the years 1999 to 2005 to decreasing 3.1% during the years 2006 to 2013. Excess deaths for black women from breast cancer decreased by 29% in Chicago while they increased by 22% in the US as whole in the years 2006-2013 compared to 1999-2005 (Sighoko et al. 2017). The city of Chicago serves as an example of the impact of powerful interventions on patient health outcomes.

DISCUSSION

The black-white racial disparity in the treatment of women with breast cancer is an important and complex issue. As the cancer affecting over 3.4 million women in the US, identifying the underlying causes of racial discrimination in breast cancer is essential to ensuring equal treatment of all patients (“Female Breast Cancer - Cancer Stat Facts” 2018). Previous and ongoing research has identified numerous risk factors for breast cancer that impact minority populations disproportionately. Some of these risk factors are preventable, such as obesity or alcohol use, while others are more systemic such as the interplay between access to quality care and cancer survival outcomes. Black women tend to experience undue burden as a result of many factors, including insurance status, delays in treatment initiation and adherence, receiving guideline non-concordant care, and ultimately physician bias.

Of stated risk factors, insurance status continues to pose a large barrier in access to equality in care. The research indicates that over 30% of the observed racial disparity can be attributed to differences in insurance status (Jemal et al. 2017). Hershman and colleagues found that on average, among patients with early stage breast cancer, black women were 4.1% more likely to have a higher copay than white patients for hormonal therapy medications (Hershman et al. 2015). Additionally, the data indicates that uninsured white women have higher rates of locoregional therapy than privately insured black women (Freedman et al. 2011). Lack of access to health insurance remains a

crippling source of racial disparities in treatments and outcomes. Healthcare disparities will persist as long as there is unequal access to quality care and insurance.

Another important aspect of breast cancer care that often differs along racial lines is tumor biology and characteristics. Black women consistently present with later stage, more aggressive tumors that have spread distally (Livaudais et al. 2013). This leads to the question – are black women being screened for breast cancer less often? There is some conflicting research as to whether black and white women have equal rates of mammography in this country. The most recently published literature, however, indicates that women are being screened equally for breast cancer across all races/ethnicities (Miller et al. 2017). This along with the molecular subtype distribution differences across races supports the conclusion that black women’s tumor biology is different (DeSantis et al. 2017). The concept of racial differences in tumor biology has been reinforced by research indicating that black women with West African heritage have a higher likelihood of developing TNBC (Newman and Kaljee 2017). Based on the interplay of breast cancer risk factors such as early menarche and increased parity, black women have a higher risk of developing aggressive, late stage breast cancer even with regular screening (Brawley 2013).

Although the use of mammography appears to be equal amongst black and white women, axillary and sentinel lymph node biopsy is not. Sentinel lymph node biopsy after a positive mammogram has been the standard of care since the 1990’s (K. E. Reeder-Hayes et al. 2011). SLNB continues to be an essential step in the staging process of a breast cancer diagnosis. Black women, however, are not receiving SLNB at the same

rates as their white counterparts (Bickell et al. 2006). The reduced rates of SLNB could result in an inaccurate diagnosis and, therefore, treatment course for patients' specific breast cancer. Increasing rates of SLNB to guideline standards should be a priority for decreasing racial disparities in breast cancer care.

Across all regularly used treatment options, the medical literature has identified racial disparities in some but not all breast cancer treatments. One treatment option in which there is strong evidence to indicate that black women are not receiving the same caliber of care is surgery, including breast conserving surgery and mastectomy. The published literature reveals that black women are less likely to receive surgery than their white counterparts (Foy et al. 2018; Jemal et al. 2017). Moreover, black women experience longer delays until the initiation of surgical treatment (Eaglehouse et al. 2019). The literature presents a clear racial disparity in the receipt of surgery amongst black breast cancer patients.

Radiation therapy is another aspect of breast cancer care that is being systemically underutilized in the treatment of black women. An extensive backdrop of literature confirms that black women categorized by stage and cancer subtype are less likely to receive guideline concordant radiation therapy than their white peers (Foy et al. 2018; Ooi, Martinez, and Li 2011). Across ages, subtypes and stages, black women are less likely to receive radiation therapy after BCS or mastectomy and they experience a higher probability of delayed access to radiation therapy (Wheeler et al. 2012). Wheeler and colleagues also suggest that part of the racial disparity in receipt of radiation therapy involves distance to a clinic or hospital offering radiation therapy. It is possible that black

patients whom tend to be of lower SES live in communities that are not equipped with the latest oncological technology so they must travel further, experiencing transportation barriers that prevent them from accessing radiation therapy in a timely manner.

Chemotherapy is one of the oldest forms of treatment for all cancers including breast cancer. Because chemotherapy has been used to treat cancer for many decades, its implementation is widespread. Although some of the published literature has deemed black women less likely to receive chemotherapy or adjuvant chemotherapy, the majority of research has indicated the opposite. In fact, several studies have found that black women were equally if not slightly more likely to receive chemotherapy treatment than white women (Hoppe et al. 2018; Enewold et al. 2018; Simon et al. 2012). The widespread adoption of chemotherapy can serve as a guide for establishing equal access to care across all races/ethnicities.

One of the largest treatment disparities is the underuse or non-guideline concordant administration of endocrine therapy for HR+ breast cancer. Previous research has identified the primary treatment issues as including delayed initiation, underuse and non-adherence, all problems extensively documented in several studies' black patient populations (Wheeler et al. 2018; Farias and Du 2017; Bickell et al. 2006). Some aspects of ET underuse can be attributed to the finding that patients were more likely to miss or underuse ET if they did not believe it had any effect on recurrence of breast cancer (Wheeler et al. 2018). Wheeler and colleagues found the belief among patients that ET adherence does not impact health predicted nonadherence to treatment (Wheeler et al. 2018). This further iterates the point that patient education is of the utmost importance

and health care providers must equip patients with the resources to adhere to treatment regimes.

At the moment, targeted therapy is the frontline of breast cancer treatment. The utilization of targeted therapy can represent the accessibility of novel treatment options for black patients. The use of targeted therapy by black women, however, does not offer promising statistics. Black women are significantly less likely to receive targeted therapy such as trastuzumab, and of those whom did, there were significant delays in treatment initiation (K. Reeder-Hayes et al. 2016). Additionally, black patients experienced higher rates of cardiotoxicity which likely result in treatment delays and discontinuation (Litvak et al. 2018). There are currently very few publications focusing on the racial differences in the use of HER2-inhibitors and targeted therapy. The racial disparities in the access to this novel treatment should serve as a focus of future research as it provides a unique insight on the implementation of newly developed treatment options.

Individual barriers to care serve as one of the most concerning aspects of racial disparities in the treatment of women with breast cancer. Major cited barriers to care among women with breast cancer include transportation, childcare, side effects from medications, familiarity with symptoms and risk factors of breast cancer, provider mistrust and miscommunication, lacking feelings of shared decision making, comorbidities, unemployment, financial concerns and insurance coverage (Freedman et al. 2017; Jones et al. 2014; Paranjpe et al. 2018; Wheeler et al. 2018; Gallups et al. 2018; Zafar et al. 2013). Although not all referenced studies specifically focused on black

women, these stated barriers provide useful insight regarding aspects of care to target with individual and system-level interventions.

While analyzing the published literature, it is important to take several key points and limitations into consideration. First of all, much of the data presented in the literature was collected prior to 2011. It can be difficult to evaluate the current trends in treatment utilization and patient outcomes from years past. It may require additional time for guidelines to be implemented so there could be a substantial delay in the receipt of guideline-concordant therapy. Nevertheless, if a racial disparity in the treatment of breast cancer was present several years prior to research publication, it is not unreasonable to conclude that such racial differences are likely still present. Therefore, it is important to note the years from which a publication's data is derived but understand that the implications are still widely applicable.

Furthermore, much of the published research places an emphasis on an older patient population. Many studies drew from the SEER-Medicare database which predominantly includes patients 65 years of age and older. While this is a useful tool in minimizing the impact of insurance on witnessed disparities, it fails to capture younger patients in the analysis. This younger demographic is particularly important when analyzing racial disparities in the treatment of breast cancer primarily because black women have a higher occurrence of aggressive TNBC at a younger age. It is particularly important that this population of young black women is included in research to help elucidate factors contributing to the unequal distribution of breast cancer subtypes. Additionally, younger patients overall have more variability in their insurance status and

a patient's insurance coverage ultimately has a substantial impact on their treatment course. Therefore, it is important to analyze the impact of insurance status on care. As a result, there is a greater need for breast cancer research focusing on younger patient populations as opposed to older patients found in the SEER-Medicare Database.

Additionally, one of the largest limiting factors pertaining to racial disparity research is the retrospective nature of most studies. A large portion of the research on racial disparities and breast cancer in the US stems from the SEER or SEER-Medicare databases. Extensive use of the SEER databases means a majority of the published research is retrospective and correlational. Retrospective studies can help guide the research to formulate hypotheses on which factors contribute to racial disparity in the treatment of breast cancer, but there is a need for prospective studies in the field. Additional prospective trials will ultimately prove the most effective by focusing on interventions such as patient navigation to alleviate established racial differences in care. It is important to advance breast cancer research beyond the widely accessible SEER databases to explore causation in breast cancer racial disparities.

Furthermore, there are specific areas of the published literature that need be expanded upon. Foremost, future research should concentrate on the receipt of HER2+ therapy and hormone receptor testing. As targeted therapy for HER2+ breast cancer is a newer treatment option, there is ample room to study new interventions to mitigate the trend of racial inequality in healthcare. Specifically, research should ensure that black women are receiving the same access to care, and if not, explore effective interventions to help eliminate this issue. Another area of research that should be further explored is the

rate of hormone receptor testing across all races/ethnicities. Freedman and colleagues did find high rates of hormone receptor testing across all races and ethnicities analyzing data from 1998 – 2005 (Freedman et al. 2011). However, since hormone receptor testing is such an essential component of the breast cancer diagnosis it must be studied further. If patients are not being tested for hormone receptors, they are put at an inherent disadvantage and become unlikely to receive the most effective treatment course for their cancer.

While many systemic factors contribute to racial differences in quality of care such as tumor biology, insurance status and comorbidities, the role of physicians' implicit bias or explicit bias when treating minority patients has been demonstrated to contribute to poor outcomes among black women. Popescu and colleagues found that differences in how physicians treat individual patients accounted for almost 80% of the treatment variations for breast cancer patients (Popescu et al. 2016). Similarly, prospective trials indicated that oncologists with higher ratings of implicit bias spent less time with their patients and objectively provided less supportive, patient-centered care (Penner et al. 2016). The effect of physician bias on the treatment of patients across all races/ethnicities deserves further attention. Preliminary research demonstrated that after implementing physician bias training, residents reported increased awareness of the impact of racism in medicine and the effects of their own implicit bias (Zeidan et al. 2019; Nelson, Prasad, and Hackman 2015). Future research should prospectively introduce physician trainings on racial bias and analyze the impact of such interventions on healthcare disparities. Racial disparities in the treatment of black women with breast cancer have persisted for

decades, and have even widened in recent years with breast cancer incidence rates increasing for black women (DeSantis et al. 2017). Eliminating racial disparities in the clinic should serve as a focus of future research and interventions. Opportunities for reducing these disparities include both systemic and provider-based approaches.

Ultimately, one of the most important areas of future research is the impact of extensive interventions on mitigating racial disparities. For example, patient navigators serve a vital role in ensuring equal access to care by working to keep patients previously lost to follow up within the medical system (Battaglia et al. 2016). Patient navigators can also work with patients on an individual level to address many of the previously discussed barriers to breast cancer treatment (Katz et al. 2014). As patient navigators become more prominent in the field of oncology, future studies should aim to identify vulnerable populations most in need of assistance and the patient navigator actions most effective in reducing racial disparities. Equally promising in the field of public health is the potential of city-wide initiatives and referendums to address inequities as demonstrated by the reversal in mortality rates among black women in the city of Chicago (Ansell et al. 2009; Sighoko et al. 2017). Public health officials and research teams aiming to reduce racial disparities should note the profound impact that city-wide initiatives had on reducing health inequities. The city of Chicago can serve as a model for future research on mitigating racial disparities in diverse communities. Patient navigators and city-led initiatives are two promising interventions on the path to health equity.

CONCLUSION

Despite years of study, racial disparities in the treatment of black women with breast cancer continue to persist. There is an extensive body of published literature indicating racial disparities in the use of sentinel lymph node biopsy, surgery, radiation therapy, hormone therapy and targeted therapy. The equal receipt of chemotherapy and screening mammography offer promise of future equity as these two treatments are uniquely implemented across all races/ethnicities. The effective application of patient navigators, physician bias training and city-wide initiatives to address racial disparities should serve as guidelines for future interventions. Racial disparities in healthcare are a complex topic. Nevertheless, as long as inequities exist in the treatment of patients along racial/ethnic divisions, the study of racial disparities in healthcare must continue.

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CURRICULUM VITAE

