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Health care Facilities as a Predictor of Breast Cancer Survival Rates

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This is to certify that the doctoral dissertation by

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Abstract

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Abstract

The disparity between survival rates for Black and White women with breast cancer is well documented and has been examined in terms socioeconomics, environment, tumor type, and genetics. However, there is little examination of the role of health care facilities in cancer disparities. Health care facilities are representative of societal norms and beliefs that include location, quality of care, finance, policies, and staffing; therefore, they are a proxy for social justice and social change. The purpose of this study was to examine correlations between health care facility type; social determinants of cancer such as poverty, culture, and social justice; and breast cancer survival rates. Using the social determinants of cancer theoretical framework, the breast cancer survival rate of 4,087 Black and White women in Georgia between the ages of 45 and 69 was studied. The relationship between breast cancer survival and predictors including race, income, health care facility type, grade, and tumor type (4 sub-variables) were examined using the Kaplan-Meier Method, log-rank test, and Cox proportional hazard model. The log-rank test suggested no statistically significant difference in the survival functions among patients in different health care facilities ($\chi^2(2) = 0.0150$, $p = 0.9926$). The Cox proportional hazard model suggested no statistically significant relationship between breast cancer survival and health care facility type, after controlling for other predictors ($\chi^2(2) = 0.3647$, $p = 0.8333$). This result indicates that healthcare facilities do not influence breast cancer survival rates, however given the persistent health outcome disparities further research in the area is warranted.

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Dedication

I would like to dedicate my dissertation to the following people, many of whom are no longer with me:

- My grandmother Alexzandrina Webster, who grew up picking sugar cane and never imagined that someone in her family would ever achieve a PhD.
- My father Emanuel Webster, who stopped schooling in the second grade to support the family.
- My grandfather Alphonso Caporaso who sailed from Naples, Italy to the U.S as a cobbler to create a better life for those who came after him.
- My grandmother Jean Caporaso that passed away from breast cancer.
- My mother Catherine Caporaso, who stopped her schooling at high school because that is what women did then.
- My brother Steven Webster, who passed away from Lymphoma.
- Finally, to my daughter Chloe Jacqueline Emanuel Webster-Wilkins, whose constant refrain of "Mommy I believe in you. You can do it" got me through many tough days.

Thank you for being proud of me. Thank you for letting me stand on your shoulders and the shoulders of those that came before you. I am the manifestation of your hopes, dreams, and aspirations.

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Chapter 1: Introduction to the Study

> Of all the forms of inequality, injustice in health is the most shocking and the most inhuman because it often results in physical death
>
> —Martin Luther King, Jr., 1966

In 2014, the Center for Reproductive Rights cited accounts of discrimination in the health care system, leading to adverse health outcomes. However, when surveyed, most physicians have responded that their personal biases do not affect their ability to respond and treat patients of diverse backgrounds (Blair et al., 2014). Despite these responses, data has indicated that physician bias is inversely related to quality of decisions regarding treatment and communication with Black patients, especially regarding diseases associated with minority patient groups (Moskowitz, Stone, & Childs, 2012).

Although the incidence rate in Georgia for female breast cancer for Black women is lower than White women, the estimated 5-year survival probability for White women is 0.8648 compared to 0.7833 for Black women. The difference in mortality rates is a significant health disparity (Hunt et al., 2013); however, it can be studied using the social determinants framework of Freeman and Chu (2005). Three primary social determinants—poverty, culture, and social justice—influence early detection, diagnosis, treatment, posttreatment quality, and survival mortality of cancer. Poverty leads to a lack of resources and information in addition to inadequate living conditions and risky behaviors, culture shapes people's environments and perceptions and actions of their environments, and social justice dictates principles of equity and justice. Thus, these

three factors were investigated because they may influence disparities in breast cancer survival rates between Black and White women in Georgia.

In this study, income was used as a proxy for poverty, race was a proxy for culture, and the hospital demographic of control/ownership type was the proxy for social justice. Data were collected from the Georgia Center for Cancer Statistics, which is the Surveillance, Epidemiology, and End Results database for the state of Georgia, and the American Hospital Association. Chapter 2 contains a review of the literature surrounding this topic. The methods used to answer the research questions are outlined in Chapter 3.

Background

Researchers have suggested that since the establishment of the U.S. health care system in the 19th century, there have been conscious efforts to structure the system to be racially and socially separate (Feagin & Bennefield, 2014; Krieger, 2014; White, Haas, & Williams, 2012; Williams & Mohammed, 2013). For example, prior to 1960, there was an institutional mandate that Blacks and Whites should receive care on separate floors (White et al., 2012). The 1964 Civil Rights Act, Title IV was designed to end the practice of separate and unequal health care systems through the mandate of equal access for all races (Yearby, 2014). But the remnants of institutionalized discrimination remain from decades of structural racism (Feagin & Bennefield, 2014; Krieger, 2014; Molina, Silva, & Rauscher, 2015; Viruell-Fuentes, Miranda, & Abdulrahim, 2012). Despite legal assurances, the health care system has institutionalized policies that result in racial disparities due to unequal access for Blacks compared to Whites, resulting in racial disparities in health care. For example, the ability of the American Medical Association

to control the market supply of physicians through profit maximization (Friedman, 1962; Kessel, 1958) or quality control among physicians (Arrow, 1963; Leffler, 1978) has been noted since the late 1950s. These regressive policies have led to medically underserved areas, and racial inequalities have endured because of race-based socioeconomic differences (Phelan & Link, 1995).

Overall, the health status of Americans has improved in recent years; however, racial inequities in the United States continue to persist (Akinboro et al., 2015; Anderson, 2012; Chen & Li, 2015; Molina et al., 2015). Racial inequity in the health care system violates principles of social justice (Rivera, 2014; Roux, 2012; Smedley & Myers, 2014) in addition to increasing the United State's economic burden. The United States currently spends $2.7 trillion on health care costs, which is an estimated 18% of U.S. gross domestic product (Moses et al., 2013). Annually, the United States loses $200 billion due to premature deaths related to racial health care disparities (Ayanian, 2015).

The elimination of racial inequities in the health care system is one of the four key goals of Healthy People 2020 (U.S. Department of Health and Human Services, 2012). Recommendations and strategies to address racial inequities have been focused on the promotion of awareness of disparities in the public and medical sector (U.S. Department of Health and Human Services, 2012). Despite the emphasis on awareness, the United States has been unable to eradicate racial inequalities in the health care system. The 2014 Agency for Healthcare Research and Quality, National Healthcare Quality and Disparities Report found that as of 2012, disparities in quality of care not only failed to

decrease but certain disparities, such as breast cancer among Black women, increased (U.S. Department of Health & Human Services, 2015).

To address racial inequalities in health care, it is important to understand how systems are structured within the context of norms and policies. The socioeconomic status paradigm has in many ways placed the burden to fix the system on those who have been disenfranchised by the health care system. Bronfenbrenner (1977) recognized in the model of social ecology that the relationship between individuals and their environmental system are interdependent. Individuals do not typically act outside of their environment's system and system constraints, and reciprocally, individuals are a reflection of the individuals that comprise the system. In this context, the different levels and components (structures and institutions) of the system are a proxy for individual beliefs and norms.

Previous studies have established that racism occurs on several levels of society (Feagin & Bennefield, 2014; Jones, 2002; Matthew, 2015). Jones (2002) defined racism as

> A system of structuring opportunity and assigning value based on the social interpretation of how we look that unfairly disadvantages other individuals and communities and unfairly advantages other individuals and communities, and saps the strength of the whole society through the waste of human resource. (p. 9)

Jones's system-based definition of institutionalized racism is derived from the structures of a system such as policies and norms that sometimes prevent access based on race. In contrast to institutionalized racism, structural racism is defined at system macro levels. Structural racism has been defined as racism that influences socioecological levels and

does not require the involvement or intent of individuals (Bonilla-Silva, 1997); it is self-sustaining (Link & Phelan, 1995), and if individual and interpersonal discrimination were eliminated, the racial inequities resulting from structural racism would remain due to its self-sustaining nature (Jones, 2002). Consequently, interventions that target individual awareness will have minimal impact on racial inequities resulting from structural racism. Therefore, there needs to be a paradigm shift from an examination of individuals to an examination of the health care system in terms of delivery and quality of care to address racial inequalities (Baron et al., 2014; Feagin & Bennefield, 2014; Jones, 2002; Wheeler, Reeder-Hayes, & Carey, 2013).

Several studies since 2010 have addressed the awareness of racial inequities in the medical community with the purpose of assessing individual belief paradigms (Greysen et al., 2011; Haider et al., 2015; Medina-Walpole, Mooney, Lyness, Lambert, & Lurie, 2012; Paradies, Troung, & Priest, 2014; People, 2013; Roux, 2012; Williams & Mohammed, 2013). However, there is a need for research on the relationships between system-level issues and their impact on addressing timeliness in detection (Molina et al., 2015); the impact of multisystem, multifactorial approaches (Chen & Li, 2015); and the influence of institutionalized policy on the distribution of and access to health resources (Smedley & Myers, 2014).

Addressing issues with the health care system is especially important to examine the disparities in mortality rates between Black and White women. For example, the disparate breast cancer mortality outcomes for Black women have been well documented (Chen & Li, 2015; Molina et al., 2015; Tatalovich et al., 2015). Studies on the

relationship between social determinants and disparate breast cancer mortality outcomes for Black women suggest that economic and social barriers are related to Black women breast cancer outcomes (Januszewski, Tanna, & Stebbing, 2014; Reeder-Hayes, Wheeler, & Mayer, 2015; Wheeler et al., 2013). The difference in mortality rates is notable because White women are more frequently diagnosed with breast cancer (Siegal, Miller, & Jamal, 2015). Despite research and interventions in addressing these differences in mortality rates, it remains an issue. Researchers need to examine outcomes determined by interactions within the health system, particularly the points of service represented by health care facilities, because of the disparity between treatments and outcomes (Carpenter et al., 2011; Wheeler et al., 2012a, 2012b, 2013).

Problem Statement

Breast cancer is currently the most common form of cancer diagnosed among women in the United States, with 1 in 3 cancers attributable to breast cancer (DeSantis, Ma, Bryan, & Jemal, 2014). The estimated 2013 incidence was 296,980 new cases of breast cancer and 39,620 related deaths (DeSantis et al., 2014). The incidence rate from 2006–2010 of female breast cancer per 100,000 women in Georgia was 124.0 for White women and 120.9 for Black women (DeSantis et al., 2014). However, during the same period, the death rate per 100,000 of White females was 21.9, while the death rate of Black females was 29.6 (DeSantis et al., 2014). Although the incidence rate for female breast cancer for Black women is lower than White women, the estimated 5-year survival probability for White woman is 0.8648 compared to 0.7833 for Black women (DeSantis et al., 2014).

It was not until the early 1970s that surveillance of breast cancer was institutionalized (Yamauchi et al., 2012), which brought more awareness to the differences in breast cancer rates based on race. For instance, White, Daling, Norsted, and Chu (1987) conducted a study that revealed a higher incidence of breast cancer in Black women (as cited in Krieger, 1988), though their concern was with an increased incidence of breast cancer in women's decision to delay childbearing. In recent years, the reason for the higher mortality rate of Black women has been examined to determine cause (Hunt et al., 2013). For example, Chen and Li (2015) examined treatment variations based on type of breast cancer and found that certain racial and ethnic groups were behind Whites in receiving early diagnosis and recommended treatments. Racial disparities in breast cancer mortality may exist due to Black women's lower access to preventive screenings and treatment and lower quality care due to issues like comorbid diseases, provider–patient miscommunication, and mistrust (Hunt et al., 2013). Additionally, there might be a link between the health care facility and social determinants such as median household income, racial segregation, and financial inequality that leads to discontinuity in breast care evaluation and treatment (Daly & Olopade, 2015; Hunt et al., 2013). Regardless of why, the racial disparity in care affects health outcomes and survival rates (Daly & Olopade, 2015).

Though there is attention on genetic solutions to the disparity in breast cancer mortality, equal access to quality early detection and treatment can address the racial disparities in mortality rates (Hunt et al., 2013). Higher rates of late stage breast cancer are more probable in areas with predominant Black populations where screening

availability is low (Tatalovich et al., 2015). In addition, previous research has been focused on patient-level factors but less is known about what role health care facilities play in breast cancer care (Molina et al., 2015). Therefore, this study was conducted to address the problem of racially disparate mortality rates and determine how type of health care facility and social determinants such as median household income, racial segregation, and financial inequality affect breast cancer care.

Purpose Statement

The purpose of this quantitative study was to determine if the social determinants of poverty, culture, and social justice factors outlined in the health inequalities framework correlate to the breast cancer survival rate of Black and White women in Georgia. Data were collected from the Surveillance, Epidemiology, End Results national cancer database, the Georgia Center for Cancer Statistics, and the American Hospital Association. The data were analyzed using Kaplan Meir method, log-rank tests, and Cox proportional hazards model (see Kleinbaum & Klein, 2012) to examine the relationship between the breast cancer survival rate of Black and White women in Georgia and the predictors of race, income, health care facility type, grade, and tumor type.

Research Questions

The following research question was designed to guide this study: Do poverty, culture, and social justice affect the breast cancer survival rate of Black and White women in Georgia? The following are research questions and hypotheses based on answering this central question:

Research Question 1: Is poverty (income) a determinant of the breast cancer survival rate of Black and White women in Georgia?

$H_0$1: Poverty is not a determinant of the breast cancer survival rate of Black and White women in Georgia.

H_a1: Poverty is a determinant of the breast cancer survival rate of Black and White women in Georgia.

Research Question 2: Is culture (race) a determinant of the breast cancer survival rate of Black and White women in Georgia?

$H_0$2: Culture is not a determinant of the breast cancer survival rate of Black and White women in Georgia.

H_a2: Culture is a determinant of the breast cancer survival rate of Black and White women in Georgia.

Research Question 3: Is social justice (type of health care facility) a determinant of the breast cancer survival rate of Black and White women in Georgia?

$H_0$3: Social justice is not a determinant of the breast cancer survival rate of Black and White women in Georgia.

H_a3: Social justice is a determinant of the breast cancer survival rate of Black and White women in Georgia.

Research Question 4: What is the relationship between poverty, culture, and social justice as a determinant of the breast cancer survival rate of Black and White women in Georgia?

$H_0$4: None of the independent variables (poverty, culture, and social justice) have a statistically significant relationship on breast cancer survival rates of Black and White women in Georgia.

H_a4: The independent variables (poverty, culture, and social justice) have a statistically significant relationship on breast cancer survival rates of Black and White women in Georgia.

Theoretical Framework

The theoretical framework for the study was the social determinants of health inequalities framework as outlined by Marmot (2005). However, the cancer-related social determinants framework as described by Freeman and Chu (2005) was also applied. In general, the social determinants of health correlate disease to social settings. In the context of cancer outcomes, the social determinants of poverty, culture, and social justice influence early detection, diagnosis, treatment, posttreatment quality, and survival rates. For example, poverty leads to a lack of resources and information (Freeman & Chu, 2005). In the study, income was a proxy for poverty. In addition, culture, which can be defined as behavior that has been developed and passed on through generations (Mead, 1963) as well as the knowledge and behavior shared by a group (Peoples & Baily, 2012), was determined in this study by race. Finally, social justice can be defined as a point in time when societal power allows for the distribution of outcomes that does not result in an exploiter or victim (Walster et al., 1975). In this study, the type of a health care facility was the proxy for social justice. These three factors were investigated regarding disparities in breast cancer survival rates between Black and White women.

There is a need to address established health disparities through health inequities rooted in social issues (culture), poverty (economics), and the direct effect of structural racism (social justice; Rice, Nadig, Simpson, Ford, & Goodwin, 2014). It is through these mechanisms that health inequities exist. However, several studies on racial discrimination in health care include the perspective that Blacks' genetic predisposition (Dietze, Sistrunk, Miranda-Carboni, O'Regan, & Seewaldt, 2015), personal choices (Slattery et al., 2014), or personal responsibility (Geers et al., 2013; Newson et al., 2013; Voigt, 2013) results in a higher disease rate than Whites. Key examples of these perspectives can be found in breast cancer research (Anderson, Mackison, Boath, & Steele, 2013; Paxton, Taylor, Chang, Courneya, & Jones, 2013; Weber, Solomon, & Meyer, 2013). This assumes the concept of risk and does not examine the role of structural or institutionalized discrimination in increasing the disease incidence or mortality rate. Therefore, this study was conducted to examine how poverty (income), culture (race), and social justice (type of health care facility) affect cancer rates among White and Black women.

Nature of Study

My study is quantitative and involved a retrospective cohort design to study similarly situated groups that differ by a specific characteristic (see Downing et al., 2014). Using a retrospective cohort design, I examined common exposure factors such as health care facility type, income, and race to determine their influence on survival outcomes between Black and White women. This study design is consistent with the collection and analysis of numerical data collection based on mathematical methods to

prove or disprove a hypothesis (see Creswell, 2013). The traditional realist worldview advocates that the quantitative approach is used to uncover truth using objective research and methods of analysis (Creswell, 2013). This approach allowed for the objective examination of the controversial issues of race and health

Definitions

Health care facility: The study includes three ways of defining health care facilities:

- For-profit: Health care facilities that are not barred from distributing profits, typically privately owned
- Nonprofit: Health care facilities barred from distributing profits
- Government: Health care facility owned by a government entity (Bjorvatn, 2018).

Poverty: The official definition of poverty is based on economic guidelines established by the U.S. Department of Health & Human Services. For example, a family of three with a total income of $20,160 is considered to be living in poverty (Federal Register, 2016).

Social justice: There are two commonly accepted definitions of social justice. Rawls (2009) advocated that in an environment of scare resources and competing interests, people will choose to advance those interests on mutually acceptable terms and if people are kept ignorant regarding their position, then principles of justice will be chosen that are fair to all. This definition is sometimes referred to as noncomparative social justice. In contrast, Miller (1979) suggested a more pluralist approach: justice is

given through the considered relationship between the people involved. This perspective is often referred to as comparative social justice. It is this definition that Freeman and Chu (2005) adopted in the social determinants framework to address inequities in health care delivery and access particularly related to cancer, which was used in this study.

Assumptions, Limitations, and Delimitation

The study assumed that the data from the Georgia Cancer Registry and the American Hospital Association would provide definitive, up-to-date information to answer the research questions.

The limitations for the study are that the data used to analyze the research questions were collected from the Georgia Cancer Registry, which only collects data for one state. Therefore, the findings cannot be generalized nationally. Additionally, the quantitative results of the study can only demonstrate correlation and not causation.

Finally, a delimitation of this study was the breadth. The study was limited to health care facilities in Georgia and Black and White women in Georgia diagnosed with breast cancer. Data were downloaded from the Georgia Cancer Registry and the American Hospital Association. This study was only conducted to determine if there is a correlation between the three social determinants of poverty, culture, and social justice. No causal nature of any identified relationship would be able to be determined, though the study provides preliminary data that can serve as a foundation for further research that can elucidate causal relationships.

Significance

It is well documented that disparities exist for Black women regarding the prevention, diagnosis, and treatment of breast cancer (Chen & Li, 2015). If accessing a type of health care facility is positively or negatively associated with survival rates, the information derived from the study may provide information to patients and providers to make an educated choice regarding prevention and treatment. Findings from the study may also help health care facilities improve the way they work with patients, which can lead to improved health outcomes.

Social Change

Scientific pursuit sometimes needs to involve pieces of knowledge rather than cumulative knowledge (Kuhn, 2012), which represents this study's purpose of providing knowledge on disparities in mortality rates between White and Black women. In my study, I examined the effect of health care facilities on health outcomes, going beyond the variables of race, gender, and income that are commonly investigated. My approach addresses the core of public health policy—social justice. Social justice demands that public health address disparities based on health inequities to eliminate health disparities. Rather than claiming that Black women have higher mortality rates from breast cancer because they are Black and may have a lower socioeconomic status, "The causes of the causes" (p. 1101) need to be addressed (Marmot, 2005, p. 1101). Examining the institutions through which Black women receive preventative care, screening, diagnosis, and treatment is central to understanding how being Black with lower socioeconomic status influences their care in the current health care system.

Health care facilities are representative of societal norms and beliefs that include location, quality of care, finance, policies, and staffing; therefore, they can be used as a proxy for social justice. In this study, I sought to understand the role of health care facilities in disparate health outcomes. As illustrated by Frieden's (2010) health impact pyramid, addressing structural issues of socioeconomic disparities through policy will lead to lasting societal changes resulting in improved health outcomes. Therefore, this study may lead to social change through findings highlighting the effect of health care facilities on breast cancer mortality rates between Black and White women.

Summary

Although the incidence rate in Georgia for female breast cancer for Black women is lower than White women, the estimated 5-year survival probability for White women is 0.8648 compared to 0.7833 for Black women. Thus, the difference in mortality rates is a significant health disparity (Hunt et al., 2013). In this study, this health disparity was studied using the social determinants framework of Freeman and Chu (2005) with three primary social determinants: poverty, culture, and social justice, which can affect early detection, diagnosis, treatment, posttreatment quality, and survival mortality of cancer. Poverty leads to a lack of resources and information, resulting in inadequate living conditions and risky behaviors. Shared culture and the consequent transfer of knowledge and customs can further enhance or diminish the influence of poverty. Finally, social justice is reflected in the resources brought to the community through the health care facility. Thus, these three factors that can influence disparities in breast cancer survival rates between Black and White women in Georgia were investigated. In the study,

income was used as a proxy for poverty, race was a proxy for culture, and type of health care facility was the proxy for social justice. Data were collected from the Georgia Center for Cancer Statistics and the American Hospital Association. Chapter 2 contains a review of the literature surrounding this topic.

Chapter 2: Literature Review

The function of this literature review is to provide an overview of the literature pertaining to health care facilities as a predictor of breast cancer mortality rates. The literature review includes the theoretical foundation for the study and a review and synthesis of literature relevant to key concepts of the study. Currently breast cancer is the most common form of cancer for women in the United States (DeSantis et al., 2014). In Georgia, the 2013 incidence rate for female breast cancer per 100,000 women was 124.00 for White women and 120.4 for Black women, yet the mortality rate (per 100,000) during the same period for White women was 21.9 and 29.6 for Black women (DeSantis et al., 2014). This health disparity is significant (Hunt et al., 2013) and has been confirmed in peer-reviewed literature, though studies have been limited to the socioeconomics of the affected women. Although studies mention institutional factors, no studies were found that identified specific institutional causes.

Literature Search Strategy

PubMed (inclusive of Medline and CINHAL) was used online to locate peer-reviewed literature. The following search terms were used: *African American women, Black women, breast cancer, health care facilities, mammogram, access to health care, socioeconomic status, survival, screening, neighborhood, access, hospital ownership type*, and *breast cancer*. The initial keyword searches resulted in 1,286 records. Abstracts were scanned and duplicates were removed resulting in 987 articles. Backward and forward snowballing was conducted to identify new papers not included in the original set. This process was continued until no new relevant papers could be found.

Papers were reviewed for either exclusion or inclusion. The full text review for relevance resulted in a total of 987 articles. A total of 138 articles were included in the study.

Theoretical Foundation

In this study, I applied the social determinants of health and the determinants of cancer disparities (see Freeman & Chu, 2005). Whereas the social determinants of health delineate factors that affect health (World Health Organization, 2016), the social determinants of health inequalities involve social factors that lead to health inequalities (Marmot, 2005). These determinants include conditions in which people live and work, and include economic stability, availability of health care, social and community context, and education (U.S. Department of Health and Human Services, 2012). The social determinants of health inequalities include the triad of health systems, poverty/inequality, and social determinants (Marmot, 2005). The underlying premise is that poverty and inequality in all its forms can be material in its impact on health outcomes. Health system and social determinant interventions that do not address material resources (poverty) and who receives the resources (inequality) will fail to address the causes of the causes of health disparities (Marmot, 2005).

Freeman and Chu (2005) further refined the determinants of health inequalities with their focus on the social determinants of cancer disparities. They suggested that there is a lack of relationship between the medical advances (discoveries) made in cancer and the delivery (inequality), leading to a disparity in the health outcomes of cancer (Freeman & Chu, 2005). Freeman and Chu presented a three-pronged approach to understanding this lack of relationship: culture, poverty, and social injustice. Poverty can

manifest as a "lack of resources, inadequate information and knowledge, substandard living conditions, risk-promoting lifestyles, attitudes, behaviors, diminished access to health care, and poor nutrition" (Freeman & Chu, 2005, p. 656). Culture includes "an individual's or community's shared communication system, similarities in physical and social environments, common beliefs, values, traditions, and world view, and similarities in lifestyle, attitude, perceptions, and behavior" (Freeman & Chu, 2005, p. 656). Finally, social justice consists of racial discrimination that limits equal access to health care for some populations (Freeman & Chu, 2005, p. 656). It is through this perspective regarding these determinants that I viewed the impact of social determinants on prevention, screening, diagnosis, treatment, and rehabilitation regarding cancer.

Though science and medicine use race as a proxy for culture, poverty, socioeconomics, and behaviors, race within Freeman and Chu's (2005) paradigm becomes a separate social construct. Freeman and Chu proposed that there a meaningful difference between culture and race. Race as a social construct has no scientific or medical meaning, but rather a means developed by the Office of Management of the Budget to monitor and enforce civil rights laws. Freeman and Chu stated that racial categories represent a way to collect data on race and ethnicity for populations but are not anthropologically or scientifically based (p. 664). In medicine, race has been demonstrated to lead to disparate prevention, treatment, distribution of care, and false provider assumptions resulting in racial profiling (Nelson, 2002; Silber et al., 2013). Thus, Freeman and Chu provide an approach to understanding social determinants that go beyond race.

Similar to Freeman and Chu (2005), in this study, I sought to move beyond race as a proxy for understanding racial disparities in mortality rates among Black women with breast cancer. This has been supported in other research; for example, Zonderman et al. (2014) used the Freeman and Chu concept of social determinants of cancer disparities as a premise to develop a genetics-based framework that employed poverty rather than race as a premise. By doing so, Zonderman et al. recognized that poverty results in conditions correlated with health disparities more often than race. Furthermore, a study conducted by Roman et al. (2014) showed an expanded understanding of poverty, culture, and social justice. Although Roman et al. used concepts of race to categorize their results, their findings of health literacy and physician recommendations cut across race. Additionally, Gerand and Pai (2008) explicated the Freeman and Chu conceptual framework by describing specific barriers related to poverty, culture, and social justice: lack of primary care, geographical, physical access to care, comorbidities, health insurance, system level factors such as screening services, medical mistrust, and racism. This supports Freeman and Chu's premise that barriers are related to poverty, culture, and social justice.

With the guidance of Freeman and Chu's (2005) framework, I examined associations between characteristics of health care facilities and the survival rates of Black women and White women. Health care facilities are institutions that provide health care services to patients. An institution is an entity with an accepted system of practices that creates shared constructs and confers a hierarchy so that those at a higher status can perform functions than those at a lower status, thought there is collective

intentionality (Searle, 2005). As early as 1972, medicine was recognized as a social institution that makes collective judgements in the name of health. Ownership or control of hospital services is a proxy of institutionalized medicine, as a social institution in the health care system embodies the institutionalized practices, policies, and procedures of institutionalized medicine (Bjorvatn, 2018, Eskoz & Peddecord, 1985; Sloan et al., 2001). Though racial constructs are often used in medicine and science to describe the social phenomenon of poverty, culture, and social justice, the Freeman and Chu conceptual framework allows for defining more precise variables that can affect the cancer continuum.

Disparate Breast Cancer Outcomes

Despite advances in medical research, interventions, and outreach, disparities in breast cancer mortality rates continue to exist among Black and White women in the United States (Veluswamy, Kinberg, & Bickell, 2013). As of 2015, 231,840 new cases of breast cancer were diagnosed, and it is estimated that 40,290 deaths will result from these new cases (DeSantis et al., 2016). Additionally, (a) breast cancer incidence rates increased for Black women, and (b) the mortality rate gap increased between Black and White women (DeSantis et al., 2016). As of 2013 breast cancer incidence rate for Black women was less than for White women, but the mortality rate for Black women rose to 42% while the mortality rate for White women remained flat compared to previous years (DeSantis et al., 2016). In Georgia, the incidence ratio between Black and White women was .99 or no meaningful difference in incidence rates of breast cancer between Black and White women. However, the mortality rate for White women in Georgia between

2008 and 2012 was 21.2 per 100,000 women (DeSantis et al., 2016). The mortality rate for Black women in Georgia between 2008 and 2012 was 29.5 per 100,000 women (DeSantis et al., 2016). Black women in Georgia were almost 40% times more likely to die from breast cancer than White women in Georgia.

Tumor Type

For over ten years, it has been a part of routine care to test for markers of breast cancer (Anderson, Rosenberg, & Katki, 2014), yet racial disparities in breast cancer continue to exist (DeSantis et al., 2016; Wheeler et al., 2013). Black women in the United States comprise the most significant proportion of women diagnosed with HR-/HER2- (triple negative) breast cancer, whereas White women in the United States comprise the most significant proportion of women diagnosed with the most responsive form of breast cancer, HR+/HER2- (DeSantis et al., 2016).

Although there are 21 histologic types of breast cancer, only four are molecular types of breast cancer (DeSantis et al., 2016). The molecular types are based on the expression of two receptors: the hormone receptor and the human growth factor-neu receptor (HER2; Howlader et al., 2014; Kohler et al., 2015). Breast cancer type HR+/HER2+ has proteins that promote cancer cells and can be treated with hormone therapies. However, Type HR+/HER2- is the most common. It can also be treated with hormones but does not contain the protein that promotes cancer cells.

Type HR-/HER2+ is commonly referred to as inflammatory breast cancer and contains invasive ductal carcinoma. This form tends to be diagnosed at more advanced stages. This type does not respond to hormone therapy and contains the protein that

promotes growth. HR-/HER2- is also known as triple negative breast cancer. It is negative for progesterone and estrogen receptors, so it is not receptive to hormone therapy and does not contain growth-promoting proteins. Therefore, it is aggressive and often requires a combination of therapies that can include surgery, radiation, and chemotherapy (Howlader et al., 2014; Kohler et al., 2015). The fact that Black women make up a large proportion of those who are diagnosed with this type of cancer may be why the mortality rates are higher; however, research has not addressed this racial disparity.

The Role of Socioeconomics in Breast Cancer Racial Disparities

Socioeconomics play a significant role in observed breast cancer racial disparities (Wheeler et al., 2013). When biologic and clinical factors such as tumor type, hormone receptor, proficiency of prognosis, stage of diagnosis, and insurance are controlled, racial disparities are statistically significant (Wheeler et al., 2013). For example, Feinglass et al. (2015) examined statistical relationships between socioeconomics and all-cause mortality among women with breast cancer. Insurance coverage, race or ethnicity, stage of cancer, treatment modalities, personal demographics, and hospital type were controlled to determine impact. Data from 582,000 female patients between 1988 and 2006 were obtained from the National Cancer Data Base and included follow-up through 2011 on vital status (Feinglass et al., 2015). The sample included breast cancer patients from 1,630 hospitals that reported to the National Cancer Database. Patients' ages were categorized as 39 and under, 40 to 49, 50 to 69, and 70 and older. Race and ethnicity were categorized as non-Hispanic White, non-Hispanic Black, Hispanic, Asian, and other

or unknown. The TNM (tumor, node, metastasis) classification of malignant tumors was used to classify stage. Treatment included primary surgery (lumpectomy, mastectomy, or no or unknown surgery) and radiation, therapy, chemotherapy, and hormone therapy. Treating hospitals included large urban, medium urban, small urban, rural, unknown and academic, research, or community institutions (Feinglass et al., 2015).

To control for trends in treatment, three periods were included: 1998–2000, 2001–2003, and 2004–2006 (Feinglass et al., 2015). Hazard ratios were ranked for 16 combinations of income, education, and zip code. Zip codes were used as a proxy for socioeconomic status, resulting in a six-level measure for socioeconomic status, which was then grouped into five socioeconomic status categories ranging from highest income and education to lowest income and education (Feinglass et al., 2015). A final category included patients without insurance or Medicaid coverage (Feinglass et al., 2015). Hierarchal Cox, proportional hazards analysis, was used to test the significance of the socioeconomic variables when controlling for patient and hospital variables (Feinglass et al., 2015).

Feinglass et al. (2015) found that the 5-year survival rate for the highest socioeconomic status was 87.8% and 71.5% for the 10-year survival rate with a hazard ratio of 1.69. The lowest socioeconomic status had a 5-year survival rate of 79.5% and a 10-year survival rate of 61.5% with a hazard ratio of 1.27 (Feinglass et al., 2015). When comorbidities and invasive cancer types were included in the model, the results remained the same (Feinglass et al., 2015). Results showed that insurance status, cancer stage, and

race were essential components of socioeconomic status but only explained two-thirds of survival disparities (Feinglass et al., 2015).

A limitation of the Feinglass et al. (2015) study was that it examined all-cause mortality rather than cancer-specific mortality. Of note was that this significant study examined treatment modalities, hospital types, and socioeconomic status with mortality related to breast cancer. Results showed a hazard ratio of 1.04 in medium urban region hospitals and .92 for rural region hospitals when compared to large urban region hospitals (Feinglass et al., 2015). More significant were the treatment modalities. Radiation therapy had a hazard ratio of .76 when compared to no radiation (Feinglass et al., 2015). Chemotherapy had a hazard ratio of .87 when compared to no chemotherapy (Feinglass et al., 2015). Hormone therapy had a hazard ratio of .72 and receipt of no surgical interventions had a hazard ratio of 1.80 when compared to mastectomies (Feinglass et al., 2015). In addition to correlating socioeconomic status and mortality, the study demonstrated a correlation between hospitals (a type of health care facility), treatment type, and mortality.

The Role of the Health care System in Breast Cancer Racial Disparities

As recently as 2016, the Office of Civil Rights and Health and Human Services clarifying previous rulings by stating that, "Discrimination on the basis of race, color, national origin, sex, age, or disability" in health programs is prohibited (Federal Register, 2016). Yet discrimination in health care facilities and among health care professionals is well documented and has been litigated since the establishment of the United States health care system (Yearby, 2014). Yearby (2015) explored how the health care system

has been affected by racial bias implemented through structural racism, institutional racism, and interpersonal racism. Yearby cited Jones in defining racial bias as

> A system of structuring opportunity and assigning value based on the social interpretation of how we look (which is what we call 'race'), that unfairly disadvantages some individuals and communities, and saps the strength of the whole society through the waste of human resources. (Yearby, 2015, p. 3)

Racial bias has led to a government-sponsored separate and unequal health care system (Yearby, 2015). The health care system maintained separate and unequal health care systems at the societal (structural) level through the establishment of an ability to pay system that provided a lesser quality of care to those who could not pay (Yearby, 2015). Social biases were augmented through organizational (institutional) structures that prescribed racial biases through policy by exempting physicians and by extension their health care facilities from requirements of Title VI (Yearby, 2015). If Black patients are able to overcome structural and institutional barriers to health care, they are likely to encounter physicians' (interpersonal) implicit and explicit biases that have resulted in Black patients either being denied cared, delayed care, or provided less than recommended care (Yearby, 2015).

Health care Facilities as Barriers to Care

Despite the abundant number of studies addressing health disparities and inequities in health care, structural forms of discrimination and their effect on health care delivery continues to be understudied (Krieger, 2012; Molina et al., 2015; Viruell-Fuentes et al., 2012). Racism influences lives through segregation (Cozier et al., 2014),

education (Wheeler, 2015), employment (Wiecek & Hamilton, 2013), and health (Phelan & Link, 2015). There is a need to shift the focus of study from individual causes (biology and culture) to societal level causes (racism) and how they affect the institutions that deliver care (Gee & Ford, 2011).

A 2018 Norwegian study of hospital performance related to hospital ownership found that hospital ownership significantly impacted emergency services, specialization, selection of patients and quality of care (Bjorvatn, 2018). Private hospitals compared other ownership types had reduced emergency services due to cost, increased more profitable specialization offerings, are slightly more likely to treat patients with more co-morbidities, have shorter waits, shorter stays and have more elective admissions (Bjorvatn, 2018). This study was particularly impressive. Although the results were mixed, it did provide a prospective different ownership types while controlling for race (cultural differences) due to the relative heterogeneity of the Norwegian population.

Institutional Racism: Medically Underserved Areas

Massey and Denton (1993) stated that "Racial/ethnic segregation refers to the degree to which two or more groups live separately from one another in a geographic area." Racial residential segregation results from a combination of socioeconomic drivers: (a) education, income, and wealth, which can either increase or limit access to neighborhoods with resources; (b) racial and ethnic differences based on individual preferences to live among what is culturally identifiable; and (c) stratification resulting from White aversion to living with minority groups; thereby reinforcing discriminatory practices in housing (Crowder & Krysan, 2016). Whatever the driver, primary

segregation rates between White and Black populations persistently remain high, leading to inequitable neighborhood resources (Crowder & Krysan, 2016). Limited educational and employment opportunities resulting from residential segregation creates pockets of poverty that can limit access to health care resources (Butler, Petterson, Phillips, & Bazemore, 2013). Less advantaged segregated neighborhoods are challenged economically and socially to attract and retain qualified physicians and create medically underserved areas (Rice, Nadig, Simpson, Ford, & Goodwin, 2014). Medically underserved areas have been used the federal health agencies categorize areas of need according to the physician to population ratios based on poverty and mortality rates (Rice et al., 2014).

Historically, within the broader context of racial segregation, segregation has played a significant role in the establishment and allocation of health care resources, specifically health care facilities (Ko, Needleman, Derose, Laugesen, & Ponce, 2014; Yearby, 2014). Examples of health care facility segregation, reflecting the cancer continuum and based on location continue to be reported in geographic access to preventative screenings such as mammograms (Khan-Gates, Ersek, Eberth, Adams, & Pruitt, 2015), availability of breast cancer surgeons (Freedman, Kouri, West, & Keating, 2015), timely receipt of adjuvant therapy (surgery followed by chemotherapy) (Freedman, He, Winer, & Keating, 2013), receipt of radiation therapy (Feinstein et al., 2013), geographic variations in health care spending (Newhouse & Garber, 2013) and access to health care resources (Akinyemiju et al., 2013) despite the enactment of Title VI which was enacted to prevent racial discrimination in health care (Yearby, 2014).

Structural Discrimination: Discriminatory Policies and Practices

Federal and state policies and practices have aided in the maintenance of separate and unequal health care system (Yearby, 2015). This has been achieved through medical redlining (Beyer et al., 2016; Yearby, 2014; Yearby, 2015) or economic credentialing, the practice of rating physicians using economic criteria unrelated to quality or qualifications (Byrd & Clayton, 2012; Chakravarty, 2015; Rauch et al., 2012), excessive wait times for screening, diagnosis, and treatment (Bleicher et al., 2015; Downing, Twelves, Forman, Lawrence, & Gilthorpe, 2014; Hamel et al., 2014; Nolan et al., 2014), insurance coverage or the ability to pay in advance for access to health care (Gorey et al., 2013; Gorey et al., 2015; Haji-Jama, Gorey, Luginaah, Balagurusamy, & Hamm, 2013), lack of continuity of care (Nolan et al., 2014; Weinstein, LaNoue, Hurley, Sifri, & Myers, 2015).

America's piecemeal approach to addressing health care disparities in race, gender, class, and region, has resulted in separate and unequal access in the delivery of health care (Hoffman, 2012). Hospital policies of refusing to admit patients without a physician with admitting privileges served to restrict access further. (Casalino, 2013; Powers, Oriol, & Jain, 2015; Rosenbaum & Sager, 2015). The Hill-Burton Act prevented discrimination in health care but allowed for separate and equal facilities that upon review were under resourced. The few hospitals that did allow Black patients did not allow Black physicians (Smith, 2015).

The Hill-Burton Act and Title VI of the Civil Rights Act failed to define discrimination clearly (Smith, 2015). While acts of overt discrimination such as giving privileges to physicians of color and admitting Black patients were clear, the more

insidious forms of discrimination, defined as *disparate impact* were less easily monitored or addressed (Smith, 2015). Disparate impact can include the relocation of a health care facility from a poorer neighborhood to a more affluent neighborhood for business reasons or more subtle forms of disparate impact such as the United States having the lowest bed count to population ratio than any other country (Smith, 2015). On its face, this policy appears neutral until you consider that a lower bed count means shorter hospital stays. Shorter hospital stays require patients to have the resources available in their neighborhood for adequate home care. Lower income patients, typically Black and Hispanic patients, have less access to adequate home care than more affluent, typically White, patients do (Smith, 2015).

Intrapersonal Discrimination: Lack of Culturally Competent Care

Physician bias repeatedly has been shown to be inversely related to poor health outcomes a reflection of ineffective communication, treatment decisions, and biased perceptions (Chapman, Kaatz, & Carnes, 2013; Cooper et al., 2012; Sabin & Greenwald, 2012; Staats & Patton, 2013; Zestcott, Blair, & Stone, 2016). The studies, however, ignore structural and institutionalized racism as a factor in contributing to implicit and explicit biases. This commonly accepted sociological approach misses the forest because it is too intently focused on the tree suggesting that an individual within a system can act independently of the system. Notwithstanding the overwhelming evidence illustrating that adverse health outcomes are inversely correlated with physician bias, two notable studies suggested that physician bias has no meaningful impact on health outcomes (Blair et al., 2014; Penner, Blair, Albrecht, & Dovidio, 2014). Their findings suggest that

physicians are capable of concurrently holding implicit biases while behaving explicitly as egalitarians.

Unique Experience of Black Women

Black women have a unique experience in the health care system. Patients who are members of more than one social category experience *intersectionality* (Bowleg, 2012). Although it has been demonstrated that individual social groups experience adverse health outcomes resulting from racial bias in health care, few studies have examined how belonging to multiple social categories, such as being both Black and female, can affect health outcomes, (Bowleg, 2012; Hankivsky, 2012). Originating in the Black feminist movement, *intersectionality* attempted to address how Black women fared differently in social institutions than being solely a woman or solely Black (Bowleg, 2012). Black women even with higher social achievement still do not fare as well as White women with equivalent social achievement, indicating that other factors are involved (Klassen, Pankiewicz, & Curriero, 2013; Klassen, Pankiewicz, Hsieh, Ward, & Curriero, 2015). Black women are subjected to a two-fold health outcome setback due to a combination of two adverse characteristics subjected to both racial and sexual bias (Klassen et al., 2013; Klassen et al., 2015).

Summary

A racially biased social and political system has led to health care facilities that reflect institutional bias through medically underserved areas, structural discrimination through discriminatory policies and practices, and interpersonal discrimination through culturally incompetent care. When social and political factors are compounded by

socioeconomics and tumor type, the result is disparate breast mortality outcomes between Black and White women. Using data from the Georgia Center for Cancer Statistics and the American Hospital Association, in the proposed study I will examine the influence of selected characteristics of health care facilities on the disparate breast mortality outcomes between Black and White women. The methods that will be used to answer the research question are outlined in Chapter 3.

Chapter 3: Methodology

The purpose of this study was to determine whether selected characteristics of health care facilities can predict breast cancer survival rates. Race was a proxy for culture, income was a proxy for poverty, and hospital ownership/control was a proxy for social justice factors. Culture, poverty, and social justice were factors chosen from Freeman and Chu's (2005) framework for social determinants of health inequalities for cancer. The research questions for the study were designed to examine variables as predictors of breast cancer mortality rates and explain which variables exert significant influences. Based on the criteria of the study, a quantitative research design was chosen. To examine the relationship between breast cancer survival and predictors of race, income, health care facility type, grade, and tumor type (four subvariables), the following analyses were performed: Kaplan-Meier method, log-rank tests, and Cox proportional hazards model (see Kleinbaum & Klein, 2012).

This chapter includes a discussion of the quantitative methods related to research design, population demographics, sampling procedure, ethical considerations, research questions and hypotheses, data collection, the operationalization of variables, and description of data analysis used to address the research objectives.

Research Design

The approach in this study was quantitative with a retrospective cohort design, which was used to study whether the common exposure factors of health care facilities, income, and race are predictive of breast cancer survival outcomes between Black and White women. The population, sampling procedure, ethics, study questions, data

collection, the operationalization of variables, and data analysis will be outlined in the following sections.

Population

The population for this study consisted of White women and Black women between the ages of 45 and 69 residing in the state of Georgia who were diagnosed with breast cancer between January 1, 2009, and December 31, 2014. If there were two or more diagnoses of breast cancer (indicating relapse), only the initial diagnosis was used. Records were excluded if they were incomplete, such as missing relevant demographic or survival information. This population was chosen because the incidence of breast cancer increases significantly in both Black and White women at the age of 45 and peaks at 69, with the median age being 65 (Howlader, Noone, & Krapcho, 2016). The initial diagnosis was examined because a patient in relapse indicates a patient already in treatment versus a woman entering the health care system to be diagnosed. Additionally, identification of stages at diagnosis helps to clarify when patients are being diagnosed.

Data of 6,178 patients were provided. The following observations were removed from the analysis

- Observations with unwanted categories for variables related to breast cancer survival (i.e., observations with responses = “4” for grade).
- Observations with missing/unknown values for variables related to breast cancer survival, including
    - Responses = “9” for race and grade,

- Responses = “996” (Test ordered, results not interpretable), “997” (Test ordered, results not in chart), “998” (Test not done (not ordered or performed)), “988” (Not applicable: Information not collected for this case), and “999” (Unknown, no information provided) for the four variables for tumor type.

The final data set contained 4,087 patients.

Sampling and Sampling Procedures

Records were extracted from the Georgia Cancer Registry based on defined criteria. Criteria for inclusion were race (White, Black) gender (female) age (45-69), year of initial diagnosis (2009-20014), and cancer grades (I, II, III). Additional criteria included diagnostic confirmation method (microscopically, positive laboratory test/marker study, direct visualization without microscopic confirmation, radiography without microscopic confirm, clinical diagnosis only), reporting source (hospital; radiation treatment center/medical oncology center, hospital affiliated; laboratory, hospital affiliated,;other hospital outpatient units/surgery centers), SEER summary stage 2000 (in situ, localized, regional, distant site node), molecular subtype, census tract poverty indicator, marital status, cause of death, and treatment variables. I restricted the analysis to only those cancers meeting the above criteria where a single hospital was involved in both the diagnosis and first course treatment of the cancer patient. Finally, I linked registry records to an AHA Georgia hospital list using National Provider Identifier numbers for my variable of interest (control/ownership type).

Data Access

To access the data of the Georgia Cancer Registry, I completed an online form and submitted to the Georgia Department of Public Health. This required initial contact with Emory University. Emory University acts as the principal investigator for the Georgia Cancer Registry. The process is to submit an initial application and study abstract to Emory University for review. Included in the application is the requested data and data parameters.

Ethical Considerations

This study required approval from the Institutional Review Board (IRB) of Walden University. An application was submitted for IRB approval before data collection. In addition to IRB approval from Walden University), IRB approval from the Georgia State Department of Public Health (approval no. 108609) was obtained to access the data stored in the Georgia Cancer Registry. Additionally, I signed the registry's Data Use Agreement to access and govern the use of the data. Although there was no direct contact with human subjects, personal protected information patient data were used and therefore required IRB approval.

Several measures were implemented to ensure the protection of human subjects. First, HIPAA protected data were stored in an encrypted laptop. I used Bitlocker, which is a full disk encryption using AES encryption algorithm using a 256-bit key, to encrypt my entire laptop. Second, per 45 CFR 164.528 I will retain records for a minimum of 6 years. After the required retention period stored data will be destroyed using Eraser, an advanced security tool for Windows that completely removes sensitive data from the hard

drive by overwriting it several times. The laptop will then be taken to a county government facility for electronic hardware destruction. I have been educated on HIPAA regulations and how to handle personal health information. No identifiable information will be used in the dissertation. No codes will be created that could link a subject to the data collected and recorded. Any patient lists created will be destroyed at the earliest opportunity consistent with the conduct of the research. I was the only one with access to the data.

Research Questions and Hypothesis

The central research question was: Do poverty, culture, and social justice affect the breast cancer survival rate of Black and White women in Georgia? The following are the research questions and hypotheses that guided the study?

Research Question 1: Is poverty (income) a determinant of the breast cancer survival rate of Black and White women in Georgia?

$H_0$1: Poverty is not a determinant of the breast cancer survival rate of Black and White women in Georgia.

H_a1: Poverty is a determinant of the breast cancer survival rate of Black and White women in Georgia.

Research Question 2: Is culture (race) a determinant of the breast cancer survival rate of Black and White women in Georgia?

$H_0$2: Culture is not a determinant of the breast cancer survival rate of Black and White women in Georgia.

H_a2: Culture is a determinant of the breast cancer survival rate of Black and White women in Georgia.

Research Question 3: Is social justice (a type of health care facility) a determinant of the breast cancer survival rate of Black and White women in Georgia?

H_03: Social justice is not a determinant of the breast cancer survival rate of Black and White women in Georgia.

H_a3: Social justice is a determinant of the breast cancer survival rate of Black and White women in Georgia.

Research Question 4: What is the relationship between poverty, culture, and social justice as a determinant of the breast cancer survival rate of Black and White women in Georgia?

H_04: None of the independent variables (poverty, culture, and social justice) have a statistically significant relationship on breast cancer survival rates of Black and White women in Georgia.

H_a4: The independent variables (poverty, culture, and social justice) have a statistically significant relationship on breast cancer survival rates of Black and White women in Georgia.

Data Collection

This is a secondary data analysis. Data were analyzed using SAS version 9.4 (SAS Institute Inc., Cary, NC). The data for this study will be collected from the Georgia Cancer Registry and the American Hospital Association. The Georgia Cancer Registry is a cancer registry managed by Emory University. The Georgia Cancer Registry contains

comprehensive population data on stage of cancer, patient survival, and patient demographics specific to the state of Georgia.

Operationalization of Variables

The following are the study variables and how they will be operationalized in the study.

- Survival time (days): a continuous variable, computed as the difference between "date of last contact" and "date of diagnosis."
- Status: a categorical variable with two levels (1 (event or death) vs. 0 (censored)) - According to the data set provided, the study time ended at 2018/02/19. Thus, (1) a patient did not experience the event (death) before the study ended, and (2) a person was lost to follow-up during the study period, were both considered "censored."
- Race: a categorical variable with two levels (Black vs. White)
- Income: a categorical variable with 4 levels based on Census Track Poverty Indicator (1 = 0% - < 5% poverty, 2 = 5% - <10% poverty, 3 = 10% - <20% poverty, 4 = 20% - 100% poverty)
- Health care facility type, a categorical variable with three levels (Nonprofit, for-profit, and government)
- Grade: a categorical variable with three levels (I, II, and III)
- Tumor type: 4 variables were considered, including
    - Estrogen receptor (ER) assay (luminal A breast cancer), a categorical variable with two levels (ER positive vs. Not ER positive)

- Progesterone receptor (PR) assay (luminal B breast cancer), a categorical variable with two levels (PR positive vs. Not PR positive)
- HER2 results (HER2 type breast cancer): a categorical variable with two levels (HER2 positive vs. Not HER2 positive)
- Combinations of ER, PR, and HER2 results (triple-negative breast cancer), a categorical variable with two levels (Triple negative vs. Not triple negative)

Data Analysis

Data were analyzed using SAS version 9.4 (SAS Institute Inc., Cary, NC). Demographic profiles of each hospital type were summarized using frequency tables.

To examine the relationship between breast cancer survival and predictors of interest, including race, income, health care facility type, grade, and tumor type (4 sub-variables), the following analyses were performed, including, Kaplan-Meier method, log-rank tests, and Cox proportional hazards model (Kleinbaum and Klein, 2012).

For each predictor, without considering the effects of other predictors, Kaplan-Meier method was used to estimate and graph the survival curves for different groups (ex: for race, there were two groups, Black and White). Log-rank tests were used to test if there was a statistically significant difference in the survival functions. For predictors with more than two categories, i.e., income, health care facility type, and grade, if the results of log-rank tests were significant, pairwise comparisons were performed to see which two categories had statistically significantly different survival curves. To control

for the family wise error rate, the multiple comparison procedure, the Tukey-Kramer method (Kramer, 1956), was implemented.

A Cox, proportional hazards model, was implemented to determine the effect of each predictor on breast cancer survival after considering the effects of other predictors. Wald chi-square tests were used to determine if the effects of the predictors were significant. For predictors with more than two categories, i.e., income, health care facility type, and grade, if the results were significant, pairwise comparisons were performed to see which two categories had statistically significantly different survival curves. To control for the family wise error rate, the multiple comparison procedure, the Tukey-Kramer method (Kramer, 1956), was implemented. Hazard ratios and the associated 95% confidence intervals were reported as a measure of the effect of each predictor. The proportional hazards assumption was examined using the graphical method of Lin, Wei, and Ying (1993) for checking the adequacy of the Cox, regression model. The assumption was satisfied. For all tests, a p-value less than 0.05 was considered significant.

Threats to Validity

Several primary variables of interest race and income are ascertained either through medical record or respondent survey; therefore, some self-reporting bias may exist. However, the magnitude of the study should limit the impact of this bias. Another important threat to validity is that the Georgia Cancer Registry does not report adjuvant therapies such as chemo-therapy and hormone therapy. As stated in the literature review, both of these therapies should be offered to women with breast cancer per national

recommendations; therefore, inequitable access to these adjuvant therapies could potentially lead to disparate survival rates.

Summary

The purpose of Chapter 3 was to delineate the methodology of the study. This chapter contains a description of the research design, target population, sampling and sampling procedures, ethical considerations, research questions and hypothesis, data collection, the operationalization of variables, data analysis, and threats to validity. Chapter 4 will present findings from the analysis of data.

Chapter 4: Results

The purpose of this study was to determine breast cancer survival and race, income, health care facility type, grade, and tumor type. I also examined the demographic profile of each health care facility type. The current chapter will present the data and its analyses. First, the chapter will include the study variables and the demographic variables collected from the Georgia Cancer Registry. Then the data analysis methods will be presented before the data analysis results. This analysis allowed for the examination of the impact of health facilities on breast cancer survival rates of Black and White women in Georgia.

Data Collection

The study variables related to breast cancer survival were as follows:

- Survival time (days): a continuous variable, computed as the difference between "date of last contact" and "date of diagnosis."
- Status: a categorical variable with two levels (1 [event or death] and 0 [censored])
    - According to the data set provided, the study time ended at 2018/02/19. Thus, (a) a patient did not experience the event (death) before the study ended, and (b) a person was lost to follow-up during the study period, were both considered "censored."
- Race: a categorical variable with two levels (Black and White)

- Income: a categorical variable with 4 levels based on Census Track Poverty Indicator (1 = 0% - < 5% poverty, 2 = 5% - <10% poverty, 3 = 10% - <20% poverty, 4 = 20% - 100% poverty
- Health care facility type, a categorical variable with three levels (nonprofit, for-profit, and government)
- Grade: a categorical variable with three levels (I, II, and III)
- Tumor type: four variables were considered, including
    - Estrogen receptor (ER) assay (luminal A breast cancer), a categorical variable with two levels (ER positive vs. Not ER positive)
    - Progesterone receptor (PR) assay (luminal B breast cancer), a categorical variable with two levels (PR positive vs. Not PR positive)
    - HER2 results (HER2 type breast cancer): a categorical variable with two levels (HER2 positive vs. Not HER2 positive)
    - Combinations of ER, PR, and HER2 results (triple-negative breast cancer), a categorical variable with two levels (Triple negative vs. Not triple negative)

The demographic variables of interest were as follows:

- Personal demographics: martial status, race, age at diagnosis, income, and laterality
- Grade: grade and diagnosis confirmation
- Tumor type: luminal A breast cancer, luminal B breast cancer, HER2 type breast cancer, triple-negative breast cancer

- Treatment summary: type of surgery to the primary site performed, chemotherapy given as part of the first course of treatment, sequencing of radiation and surgery given as part of the first course of treatment, whether systemic hormonal agents were administered as first-course treatment at any facility, whether immunotherapeutic (biologic response modifiers) agents were administered as first course treatment at all facilities

Methods

Data were analyzed using SAS version 9.4. Demographic profiles of each hospital type were summarized using frequency tables. To examine the relationship between breast cancer survival and race, income, health care facility type, grade, and tumor type (four subvariables), the following analyses were performed: Kaplan-Meier method, log-rank tests, and Cox proportional hazards model (see Kleinbaum & Klein, 2012). For each predictor, without considering the effects of other predictors, Kaplan-Meier method was used to estimate and graph the survival curves for different groups (e.g., for race, there were two groups: Black and White). Log-rank tests were used to test if there was a statistically significant difference in the survival functions. For predictors with more than two categories (i.e., income, health care facility type, and grade) if the results of log-rank tests were significant, pairwise comparisons were performed to see which two categories had statistically significantly different survival curves. To control for the family wise error rate, the multiple comparison procedure, the Tukey-Kramer method was implemented (see Kramer, 1956).

A Cox, proportional hazards model, was implemented to determine the effect of each predictor on breast cancer survival after considering the effects of other predictors. Wald chi-square tests were used to determine if the effects of the predictors were significant. Hazard ratios and the associated 95% confidence intervals were reported as a measure of the effect of each predictor. The proportional hazards assumption was examined using the graphical method of Lin, Wei, and Ying (1993) for checking the adequacy of the Cox, regression model. The assumption was satisfied. For all tests, a p-value less than 0.05 was considered significant.

Analysis Results

Tables 1-4 present the demographic profiles of each hospital type. Regarding personal demographics (Table 1), for each hospital type, over half of the patients were married (61.72% for for-profit, 55.12% for nonprofit, and 50.44% for government), a majority of the patients were White (73.42% for for-profit, 69.26% for nonprofit, and 60.62% for government), and slightly under half of the patients were over 60 years-old (46.20% for for-profit, 45.90% for nonprofit, and 45.48% for government). For for-profit hospitals, 39.56% of the patients were 10% - <20% poverty; for nonprofit hospitals, 52.25% of the patients were 20%-100% poverty; and for government-run hospitals, 40.72% of the patients were 20%-100% poverty. Regarding laterality, over half of the patients were 1 for for-profit hospitals (52.22%) and 2 for nonprofit hospitals (53.89%) and government-run hospitals (52.54%).

Regarding grade (Table 2), for each hospital type, the distributions of patients were almost equal among the three levels of tumor grade. Almost all patients' diagnosis

confirmation was based on positive histology (100% for for-profit, 99.80% for nonprofit, and 99.39% for government).

Regarding tumor type (Table 3), regarding the test results of luminal A breast cancer, for each hospital, most of the patients were ER positive (83.54% for for-profit, 78.69% for nonprofit, and 78.86% for government). Regarding the test results of luminal B breast cancer, around 70% of the patients were PR positive (68.35% for for-profit, 69.06% for nonprofit, and 67.93% for government). Regarding the test results of HER2 type breast cancer, over 80% of the patients were not HER2 positive (81.65% for for-profit, 81.15% for nonprofit, and 82.24% for government). Regarding test results of triple-negative breast cancer, approximately 10-15% of the patients were triple negative (10.76% for for-profit, 13.52% for nonprofit, and 14.74% for government).

Regarding treatment summary (Table 4), for each hospital, over 90% of patients had surgery to the primary site performed (93.99% for for-profit, 95.08% for nonprofit, and 91.90% for government). Regarding chemotherapy, over 60% of the patients in for-profit hospitals (64.87%) were not given chemotherapy, whereas only around half of the patients in the nonprofit (48.77%) and government-run hospitals (53.55%) were not given chemotherapy. A slightly higher percentage of patients in the for-profit hospitals were not given sequencing of radiation, in comparison to patients in the nonprofit and government-run hospitals (55.38% for for-profit, 44.06% for nonprofit, and 49.41% for government). A slightly higher percentage of patients in the for-profit hospitals were not given systemic hormonal agents, in comparison to patients in the nonprofit and government-run hospitals (48.10% for for-profit, 36.89% for nonprofit, and 36.22% for

government). A majority of the patients were not given immunotherapeutic agents (94.30% for for-profit, 92.01% for nonprofit, and 92.72% for government).

Table 1

Demographic Profiles (Personal Demographics) by Hospital Type

		For-profit (*N* = 316)	Nonprofit (*N* = 488)	Government (*N* = 3283)
Marital status	Single	37 (11.71)	51 (10.45)	605 (18.43)
	Married	195 (61.72)	269 (55.12)	1656 (50.44)
	Separated	1 (0.32)	5 (1.02)	74 (2.25)
	Divorced	48 (15.19)	81 (16.60)	527 (16.05)
	Widowed	26 (8.23)	47 (9.63)	288 (8.77)
	Unknown	8 (2.53)	35 (7.17)	129 (3.93)
Race	White	232 (73.42)	338 (69.26)	1990 (60.62)
	Black	84 (26.58)	150 (30.74)	1293 (39.38)
Age	45-49	40 (12.66)	72 (14.75)	495 (15.08)
	50-54	63 (19.94)	86 (17.62)	581 (17.70)
	55-59	67 (21.20)	106 (21.72)	714 (21.75)
	60+	146 (46.20)	224 (45.90)	1493 (45.48)
Income	0% - <5% poverty	24 (7.59)	12 (2.46)	394 (12.00)
	5% - <10% poverty	90 (28.48)	40 (8.20)	593 (18.06)
	10% - <20% poverty	125 (39.56)	181 (37.09)	959 (29.21)
	20% - 100% poverty	77 (24.37)	255 (52.25)	1337 (40.72)
Laterality	1	165 (52.22)	224 (45.90)	1558 (47.46)
	2	150 (47.47)	263 (53.89)	1725 (52.54)
	4	1 (0.32)	0	0
	Unknown	0	1 (0.20)	0

Table 2

Demographic Profiles (Grade) by Hospital Type

		For-profit (*N* = 316)	Nonprofit (*N* = 488)	Government (*N* = 3283)
Grade	I	75 (23.73)	117 (23.98)	743 (22.63)
	II	122 (38.61)	173 (35.45)	1408 (42.89)
	III	119 (37.66)	198 (40.57)	1132 (34.48)
Diagnosis confirmation	Positive histology	316 (100.0)	487 (99.80)	3263 (99.39)
	Positive cytology, no positive histology	0	0	20 (0.61)
	Unknown whether or not microscopically confirmed	0	1 (0.20)	0

Table 3

Demographic Profiles (Tumor Type) by Hospital Type

		For-profit (*N* = 316)	Nonprofit (*N* = 488)	Government (*N* = 3283)
ER assay	ER positive	264 (83.54)	384 (78.69)	2589 (78.86)
	Not ER positive	52 (16.46)	104 (21.31)	694 (21.14)
PR assay	PR positive	216 (68.35)	151 (30.94)	1053 (32.07)
	Not PR positive	100 (31.65)	337 (69.06)	2230 (67.93)
HER2 results	HER2 positive	58 (18.35)	92 (18.85)	583 (17.76)
	Not HER2 positive	258 (81.65)	396 (81.15)	2700 (82.24)
Combination of ER, PR, and HER2	Triple negative	34 (10.76)	66 (13.52)	484 (14.74)
	Not triple negative	282 (89.24)	422 (86.48)	2799 (85.26)

Table 4

Demographic Profiles (Treatment summary) by Hospital Type

		For-profit (*N* = 316)	Nonprofit (*N* = 488)	Government (*N* = 3283)
Surgery to the primary site performed	No	19 (6.01)	24 (4.92)	266 (8.10)
	Yes	297 (93.99)	464 (95.08)	3017 (91.90)
	Unknown	0	0	0
Chemotherapy	No	205 (64.87)	238 (48.77)	1758 (53.55)
	Yes	111 (35.13)	249 (51.02)	1518 (46.24)
	Unknown	0	1 (0.2)	7 (0.21)
Sequencing of radiation	No	175 (55.38)	215 (44.06)	1622 (49.41)
	Yes	141 (44.62)	273 (55.94)	1661 (50.59)
	Unknown	0	0	0
Systemic hormonal agents	No	152 (48.10)	180 (36.89)	1189 (36.22)
	Yes	155 (49.05)	286 (58.61)	1953 (59.49)
	Unknown	9 (2.85)	22 (4.51)	141 (4.29)
Immunotherapeutic agents	No	298 (94.30)	449 (92.01)	3044 (92.72)
	Yes	18 (5.70)	38 (7.79)	236 (7.19)
	Unknown	0	1 (0.20)	3 (0.09)

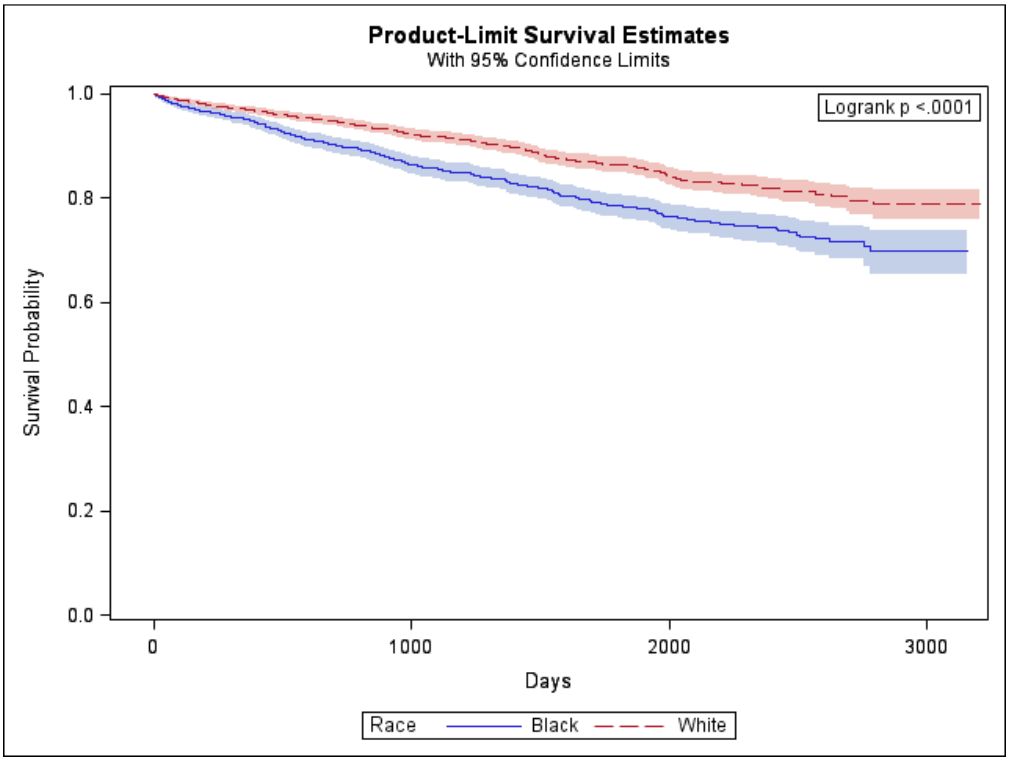

Figure 1. Kaplan-Meier survival curves, by race.

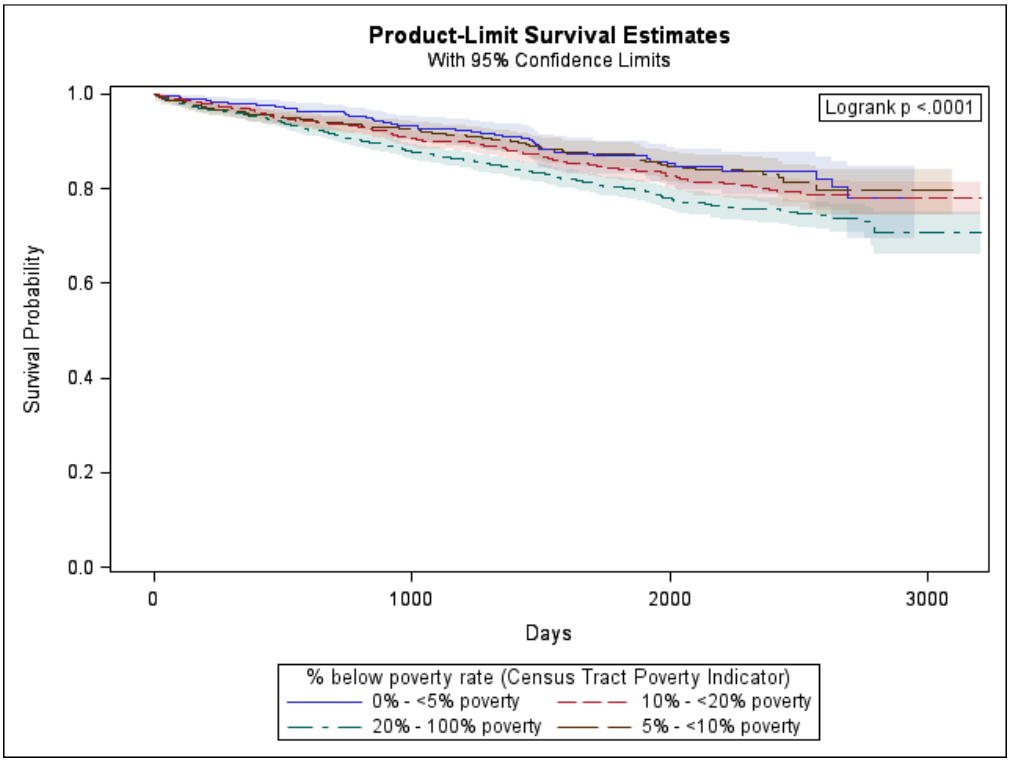

Figure 2. Kaplan-Meier survival curves, by income.

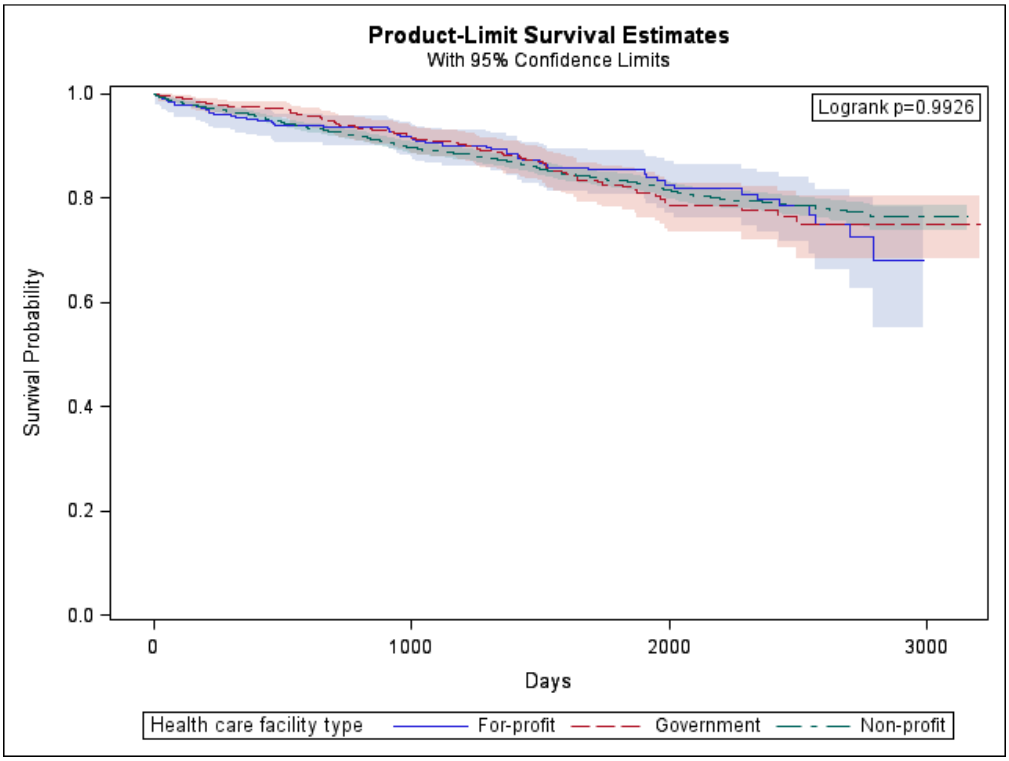

Figure 3. Kaplan-Meier survival curves, by health care facility type.

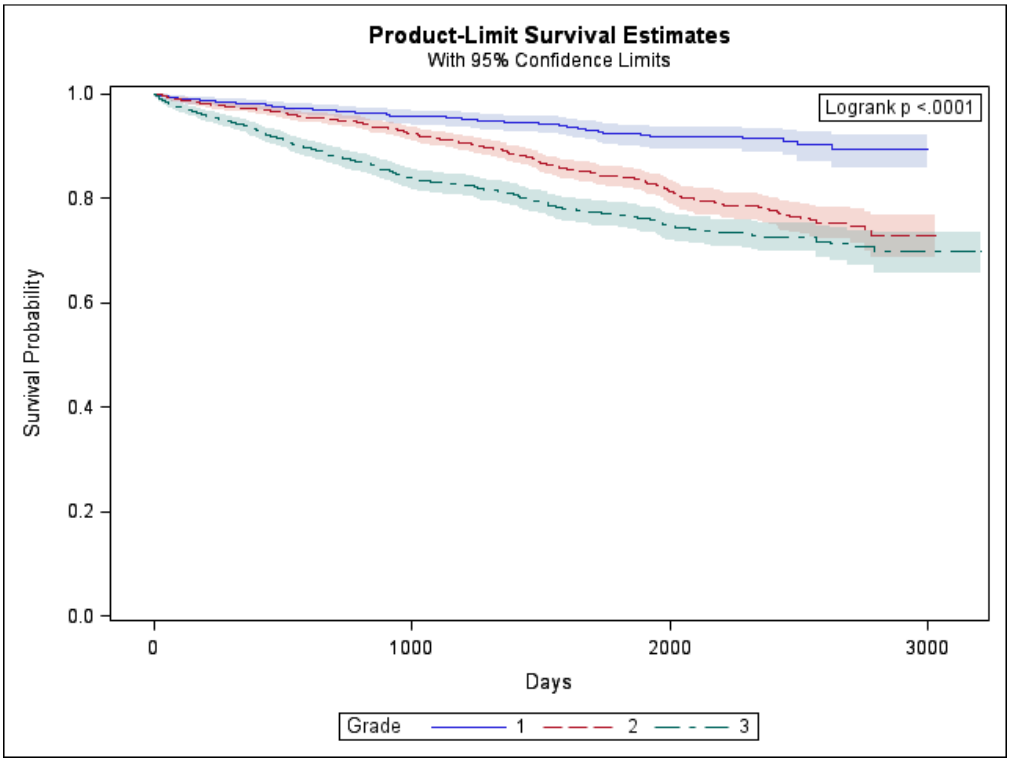

Figure 4. Kaplan-Meier survival curves, by grade.

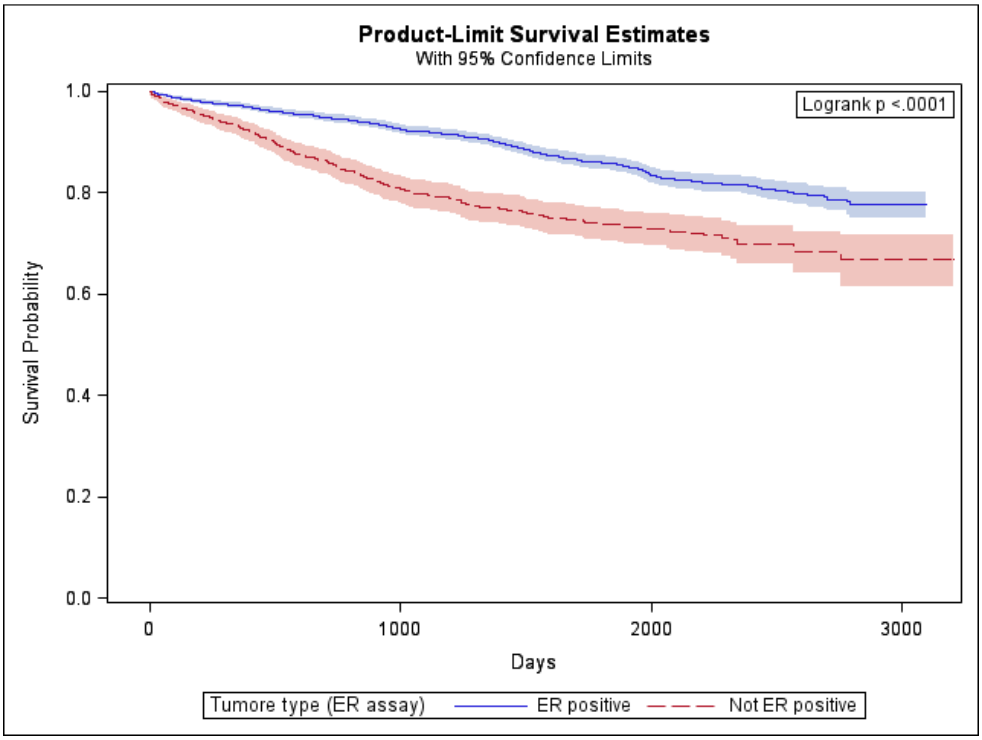

Figure 5. Kaplan-Meier survival curves, by tumor type (ER assay).

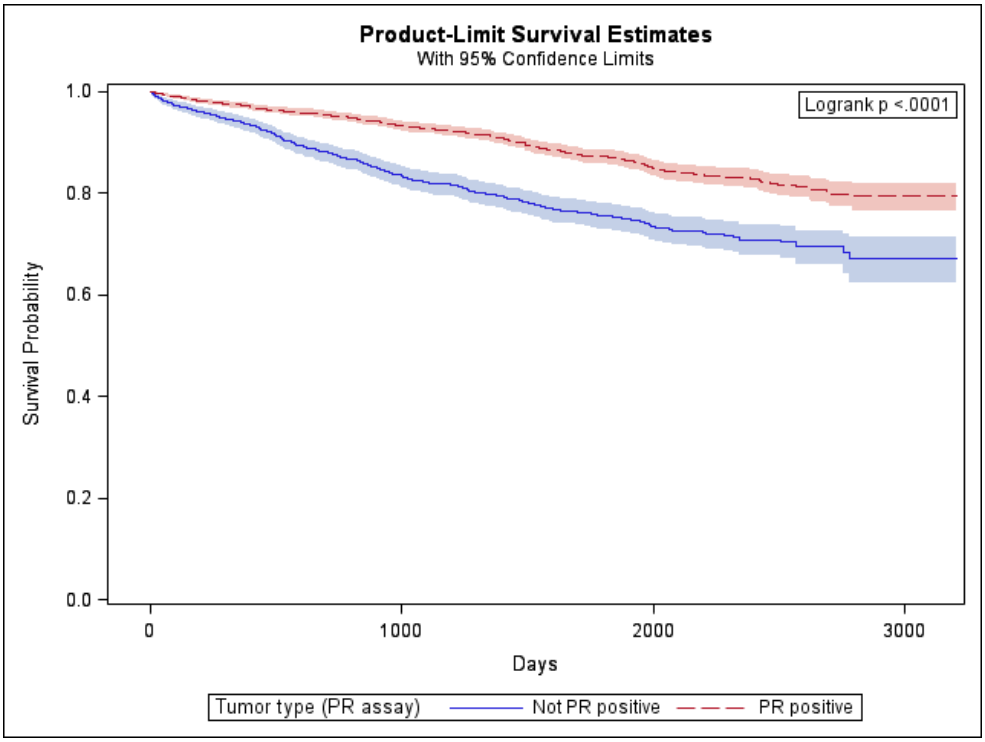

Figure 6. Kaplan-Meier survival curves, by tumor type (PR assay).

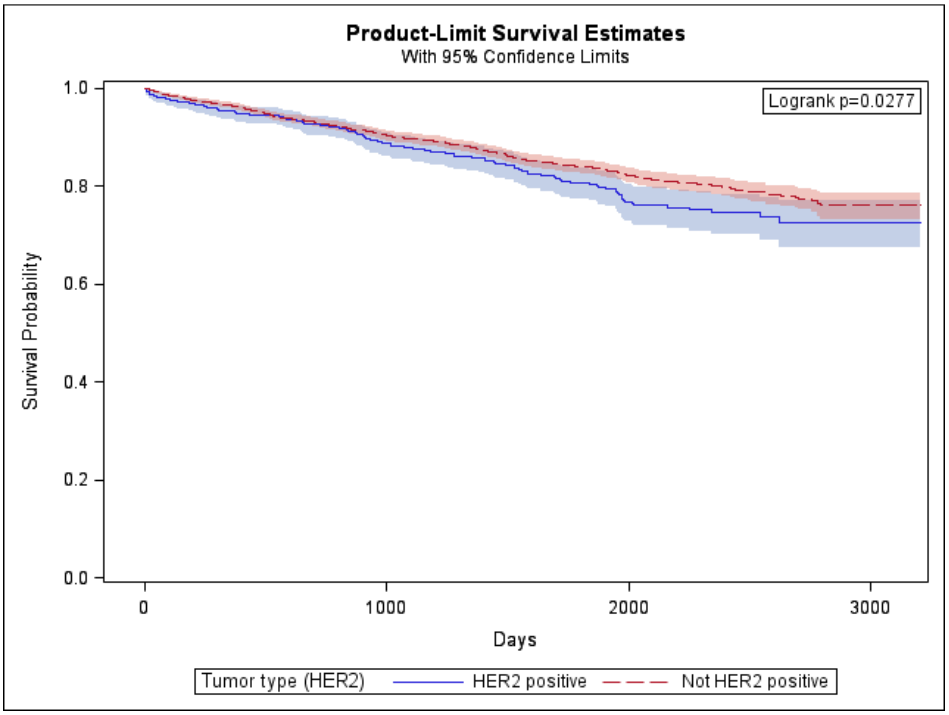

Figure 7. Kaplan-Meier survival curves, by tumor type (HER2).

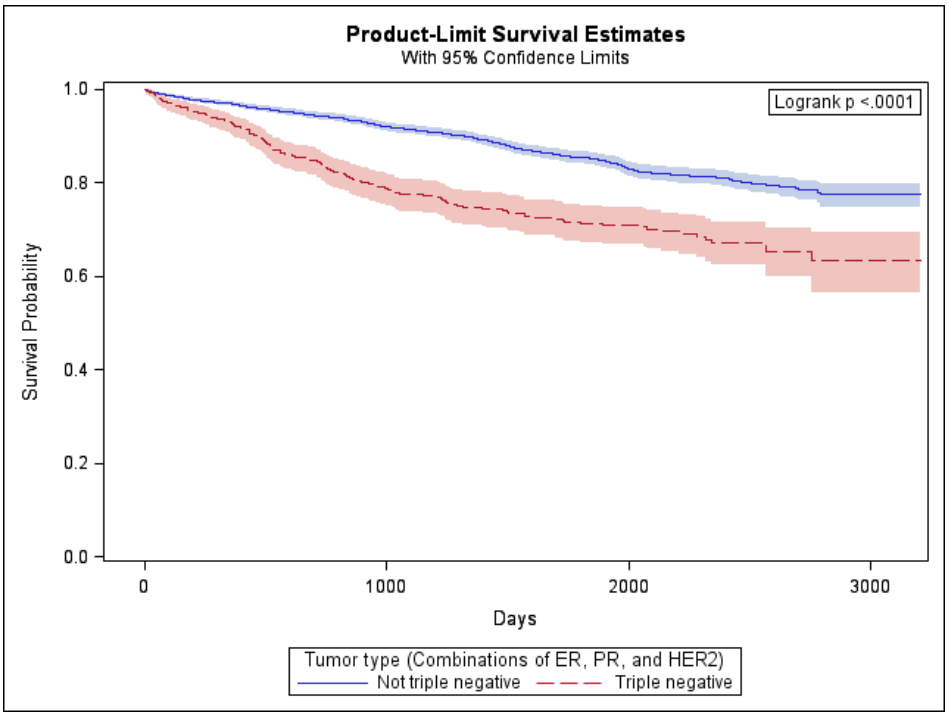

Figure 8. Kaplan-Meier survival curves, by tumor type (triple negative).

Figures 1-8 present the Kaplan-Meier survival curves, by race, income, health care facility, grade, and tumor types. The results of log-rank tests (Table 5) suggested that there was a statistically significant difference in the survival functions between White and Black ($\chi^2(1) = 37.9244$, $p < 0.0001$). The estimated 5-year survival probability was 0.8648 for White and 0.7833 for Black.

There was a statistically significant difference in the survival functions among patients with different income level ($\chi^2(3) = 21.5580$, $p < 0.0001$). The estimated 5-year survival probability was 0.8698 for 0-<5% poverty, 0.8731 for 5-<10% poverty, 0.8418 for 10-<20% poverty, and 0.8020 for 20-100% poverty. The results of pairwise comparisons (Table 6) further suggested that there was a statistically significant difference in the survival functions between 0% - <5% poverty and 20% - 100% poverty ($\chi^2(1) = 18.8820$, $p < 0.0001$). There was a statistically significant difference in the survival functions between 10% - <20% poverty and 20% - 100% poverty ($\chi^2(1) = 10.8893$, $p < 0.0001$). There was a statistically significant difference in the survival functions between 5% - <10% poverty and 20% - 100% poverty ($\chi^2(1) = 17.9979$, $p < 0.0001$).

There was no statistically significant difference in the survival functions among patients in different health care facilities ($\chi^2(2) = 0.0150$, $p = 0.9926$). There was a statistically significant difference in the survival functions among patients with different tumor grade ($\chi^2(2) = 101.5461$, $p < 0.0001$).

The estimated 5-year survival probability was 0.9235 for tumor grade I, 0.8409 for tumor grade II, and 0.7686 for tumor grade III. The results of pairwise comparisons

(Table 6) further suggested that there was a statistically significant difference in the survival functions between patients with tumor grade I and patients with tumor grade II ($\chi^2(1) = 9.4944$, $p = 0.0058$). There was a statistically significant difference in the survival functions between patients with tumor grade I and patients with tumor grade III ($\chi^2(1) = 110.4$, $p < 0.0001$). There was a statistically significant difference in the survival functions between patients with tumor grade IIII and patients with tumor grade II ($\chi^2(1) = 39.5249$, $p < 0.0001$).

There was a statistically significant difference in the survival functions between patients who were ER positive and patients who were not ER positive ($\chi^2(1) = 70.9905$, $p < 0.0001$). The estimated 5-year survival probability was 0.8588 for patients who were ER positive and 0.7392 for patients who were not ER positive. There was a statistically significant difference in the survival functions between patients who were PR positive and patients who were not PR positive ($\chi^2(1) = 84.1358$, $p < 0.0001$). The estimated 5-year survival probability was 0.8712 for patients who were PR positive and 0.7549 for patients who were not PR positive. There was a statistically significant difference in the survival functions between patients who were HER2 positive and patients who were not HER2 positive ($\chi^2(1) = 4.8464$, $p = 0.0277$). The estimated 5-year survival probability was 0.8081 for patients who were HER2 positive and 0.8394 for patients who were not HER2 positive. There was a statistically significant difference in the survival functions between patients who were triple negative and patients who were not triple negative ($\chi^2(1) = 72.5394$, $p < 0.0001$). The estimated 5-year survival probability was 0.7136 for patients who were triple negative and 0.8547 for patients who were not triple negative.

Table 5

Results of Log-Rank Tests

			Results of log-rank test		
		5-year (1825 days) survival probability	χ^2	DF	p
Race	White	0.8648	37.9244	1	< 0.0001*
	Black	0.7833			
Income	0% - <5% poverty	0.8698	21.5580	3	< 0.0001*
	5% - <10% poverty	0.8731			
	10% - <20% poverty	0.8418			
	20% - 100% poverty	0.8020			
Facility	Nonprofit	0.8333	0.0150	2	0.9926
	For-profit	0.8540			
	Government	0.8207			
Grade	I	0.9235	101.5461	2	< 0.0001*
	II	0.8409			
	III	0.7686			
Tumor type (ER assay)	ER positive	0.8588	70.9905	1	< 0.0001*
	Not ER positive	0.7392			
Tumor type (PR assay)	PR positive	0.8712	84.1358	1	< 0.0001*
	Not PR positive	0.7549			
Tumor type (HER2 assay)	HER2 positive	0.8081	4.8464	1	0.0277*
	Not HER2 positive	0.8394			
Tumor type (triple negative)	Triple negative	0.7136	72.5394	1	< 0.0001*
	Not triple negative	0.8547			

Note. * indicates significance at the 0.05 level.

Table 6

Results of Pairwise Comparisons

	Pairwise comparison	χ^2	DF	p
Income	0% - <5% poverty vs. 10% - <20% poverty	0.0059	1	0.9998
	0% - <5% poverty vs. 20% - 100% poverty	18.8820	1	< 0.0001*
	0% - <5% poverty vs. 5% - <10% poverty	0.2765	1	0.9529
	10% - <20% poverty vs. 20% - 100% poverty	10.8893	1	0.0053*
	10% - <20% poverty vs. 5% - <10% poverty	0.2237	1	0.9650
	20% - 100% poverty vs. 5% - <10% poverty	17.9979	1	< 0.0001*
Grade	I vs. II	9.4944	1	0.0058*
	I vs. III	110.4	1	< 0.0001*
	II vs. III	39.5249	1	< 0.0001*

Note. * indicates significance at the 0.05 level.

The results of the Cox proportional odds model are displayed in Table 7 and 8. The analysis results of the Cox model indicated that

- There was a statistically significant relationship between breast cancer survival and race, after controlling for other predictors ($\chi^2(1) = 8.0432$, $p = 0.0046$; Table 7). In particular, the hazard of death for Black was 1.2703 times of the hazard for White (Hazard ratio = 1.2703, 95% CI = 1.0767, 1.4987; Table 8).
- There was no statistically significant relationship between breast cancer survival and income, after controlling for other predictors ($\chi^2(3) = 7.0416$, $p = 0.0706$; Table 7).

- There was no statistically significant relationship between breast cancer survival and health care facility type, after controlling for other predictors ($\chi^2(2) = 0.3647$, $p = 0.8333$; Table 7).
- There was a statistically significant relationship between breast cancer survival and tumor grade, after controlling for other predictors ($\chi^2(2) = 43.6036$, $p < 0.0001$; Table 7). In particular, the hazard of death for patients with grade I tumor was 0.4442 times of the hazard for patients with grade II tumor (Hazard ratio = 0.4442, 95% CI = 0.3205, 0.6155); the hazard of death for patients with grade I tumor was 0.3797 times of the hazard for patients with grade III tumor (Hazard ratio = 0.3797, 95% CI = 0.2680, 0.5380; Table 8).
- There was no statistically significant relationship between breast cancer survival and tumor type (ER assay), after controlling for other predictors ($\chi^2(1) = 0.5658$, $p = 0.4520$; Table 7).
- There was a statistically significant relationship between breast cancer survival and tumor type (PR assay), after controlling for other predictors ($\chi^2(1) = 8.1559$, $p = 0.0043$; Table 7). In particular, the hazard of death for patients who were PR positive was 1.3858 times of the hazard for patients who were not PR positive (Hazard ratio = 1.3858, 95% CI = 1.1078, 1.7337; Table 8).
- There was no statistically significant relationship between breast cancer survival and tumor type (HER2 assay), after controlling for other predictors ($\chi^2(1) = 0.2073$, $p = 0.6489$; Table 7).

- There was no statistically significant relationship between breast cancer survival and tumor type (triple negative), after controlling for other predictors ($\chi^2(1) = 3.0748$, $p = 0.0795$; Table 7).

Table 7

Testing Results of the Cox Model

Variable	DF	Wald chi-square	p
Race	1	8.0432	0.0046*
Income	3	7.0416	0.0706
Facility	2	0.3647	0.8333
Grade	2	43.6036	< 0.0001*
Tumor type (ER assay)	1	0.5658	0.4520
Tumor type (PR assay)	1	8.1559	0.0043*
Tumor type (HER2 assay)	1	0.2073	0.6489
Tumor type (triple negative)	1	3.0748	0.0795

Note. * indicates significance at the 0.05 level.

Table 8

Hazard Ratios

Variable	Category	Reference category	Hazard ratio	95% CI
Race	Black	White	1.2703	(1.0767, 1.4987)*
Income	0% - <5% poverty	10% - <20% poverty	0.9689	(0.6472, 1.4505)
	0% - <5% poverty	20% - 100% poverty	0.8010	(0.5395, 1.1891)
	0% - <5% poverty	5% - <10% poverty	1.0381	(0.6692, 1.6106)
	10% - <20% poverty	20% - 100% poverty	0.8267	(0.6511, 1.0496)
	10% - <20% poverty	5% - <10% poverty	1.0714	(0.7745, 1.4822)
	20% - 100% poverty	5% - <10% poverty	1.2961	(0.9487, 1.7705)
Facility	For-profit	Government	1.0613	(0.7454, 1.5110)
	For-profit	Nonprofit	1.0891	(0.8185, 1.4492)
	Government	Nonprofit	1.0262	(0.8062, 1.3063)
Grade	I	II	0.4442	(0.3205, 0.6155)*
	I	III	0.3797	(0.2680, 0.5380)*
	II	III	0.8548	(0.6876, 1.0627)
Tumor type (ER assay)	ER positive	Not ER positive	1.1411	(0.8090, 1.6097)
Tumor type (PR assay)	PR positive	Not PR positive	1.3858	(1.1078, 1.7337)*
Tumor type (HER2 assay)	HER2 positive	Not HER2 positive	1.0569	(0.8329, 1.3410)
Tumor type (triple negative)	Triple negative	Not triple negative	0.7090	(0.4827, 1.0413)

Note. CI = confidence interval. 95% *CI* was adjusted by the Tukey-Kramer method. * indicates hazard ratio was significantly different from 1 at the 0.05 level.

The Cox proportional odds model assumes that the hazard ratio comparing any two specifications of predictors is constant over time (Kleinbaum and Klein, 2012). The proportional hazards assumption was examined using the graphical method of Lin, Wei, and Ying (1993) for checking the adequacy of the Cox regression model.

For each covariate, a graphical display of the empirical score process was created, which is based on the martingale residuals. Figures 9-20 display the graphs for the covariates in the Cox model. For each figure, the solid line is the observed empirical score process. The dashed lines are empirical score processes based on 20 random simulations that embody the proportional hazards assumption. If the observed process deviates markedly from the simulated processes, it is evidence against the proportional hazards assumption. Among the 12 figures, the observed process for, Facility (government vs. nonprofit; Figure 14), Grade (II vs. III; Figure 16), Tumor type (ER assay (ER positive vs. not ER positive; Figure 17), Tumor type (PR assay (PR positive vs. not PR positive; Figure 18), and Tumor type (triple negative (triple negative vs. not triple negative; Figure 20), was more extreme than the simulated processes. However, as recommended by Kleinbaum and Klein (2012), one should use a conservative strategy for this decision by assuming the proportional odds assumption is satisfied unless there is strong evidence of nonparallelism of observed and simulated processes are strongly discrepant. Therefore, using a conservative strategy, we concluded that the proportional odds assumption was satisfied and the use of the Cox model was appropriate for the study.

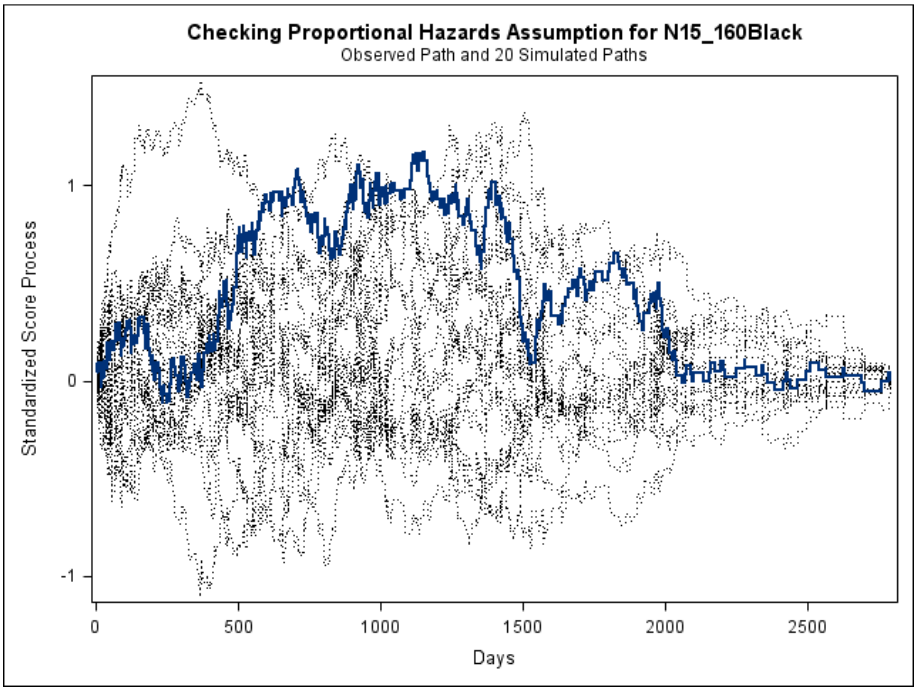

Figure 9. Race (Black vs. White).

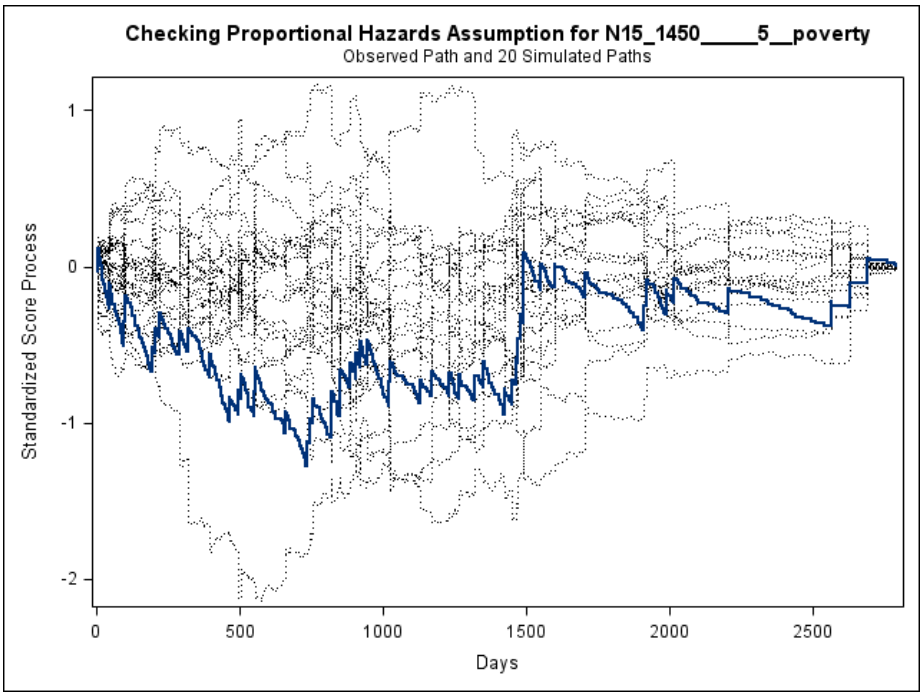

Figure 10. Income (0%-<5% poverty vs. 5% - <10% poverty).

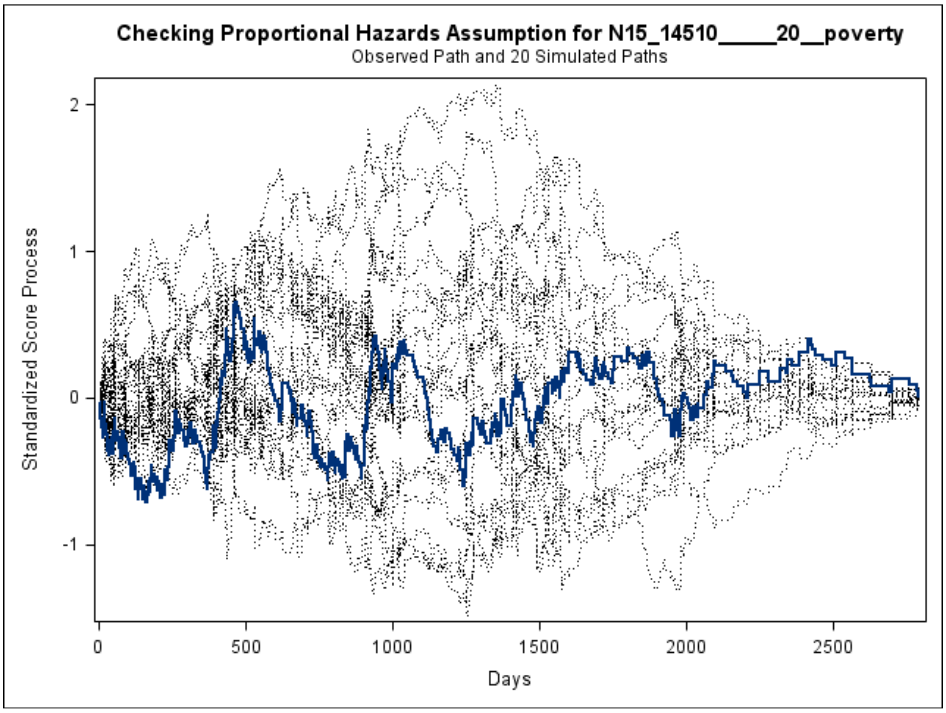

Figure 11. Income (10%-<20% poverty vs. 5% - <10% poverty).

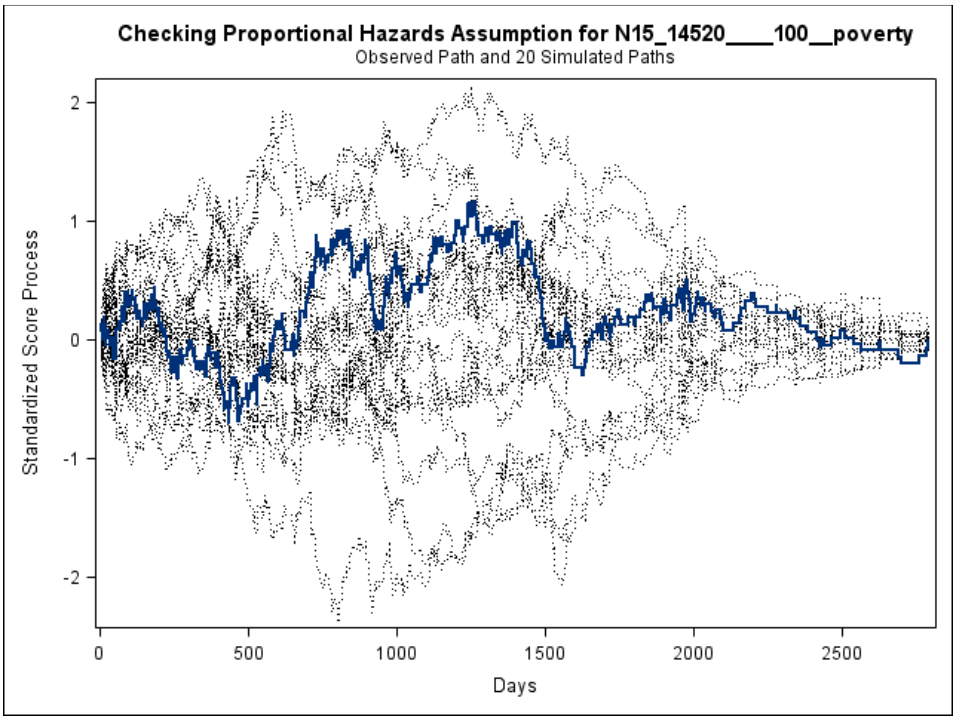

Figure 12. Income (20%-100% poverty vs. 5% - <10% poverty).

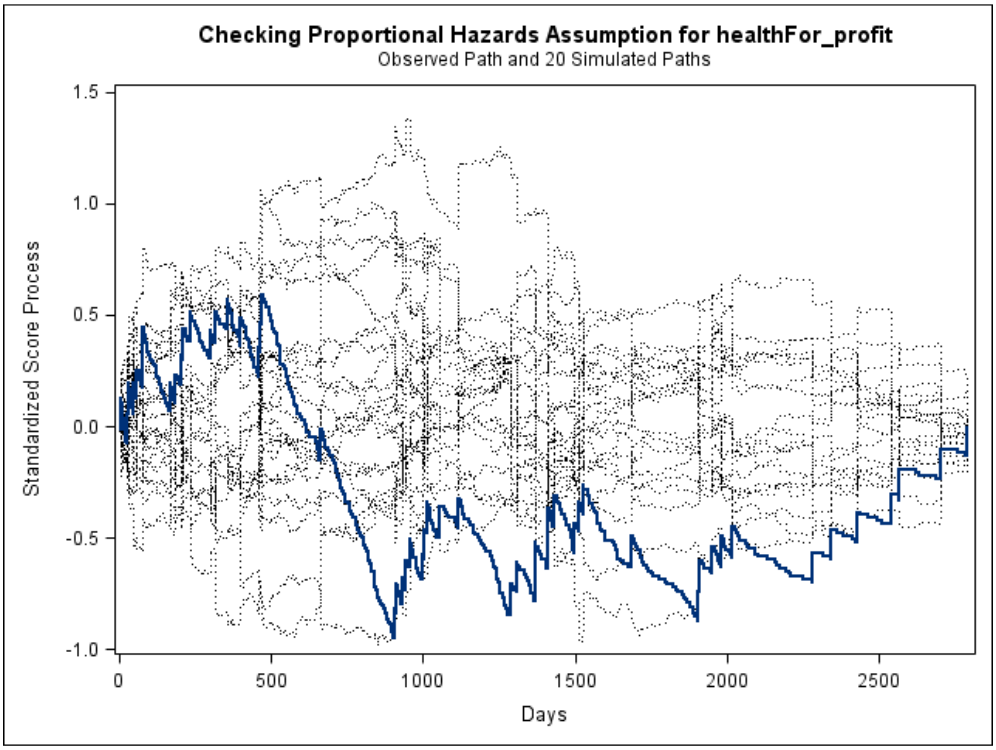

Figure 13. Facility (for-profit vs. nonprofit).

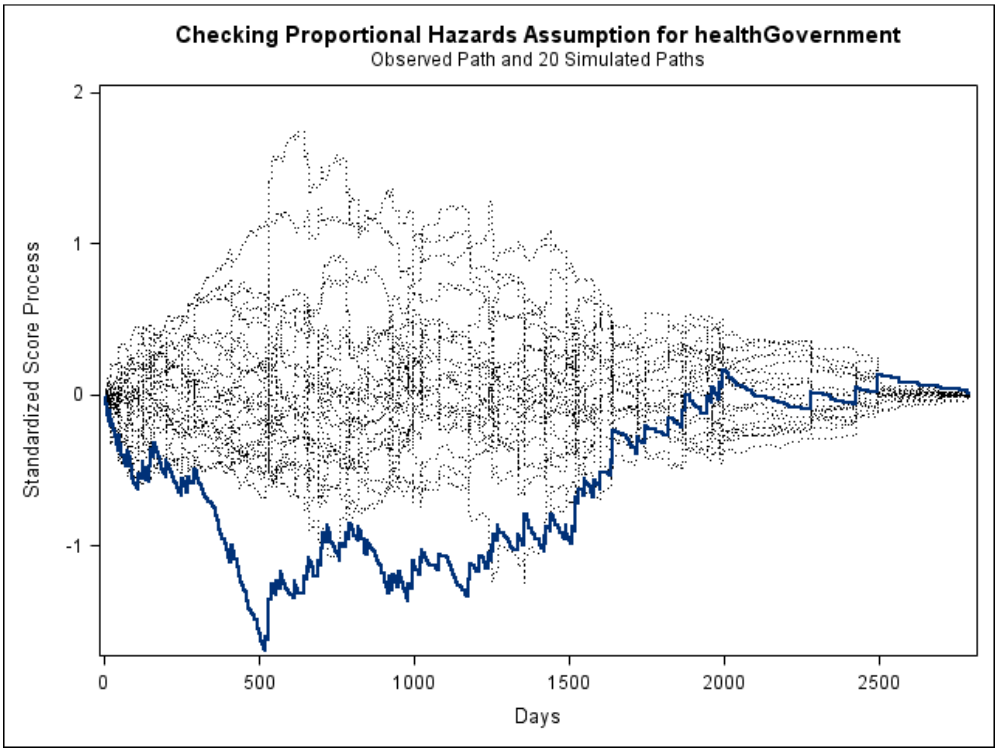

Figure 14. Facility (government vs. nonprofit).

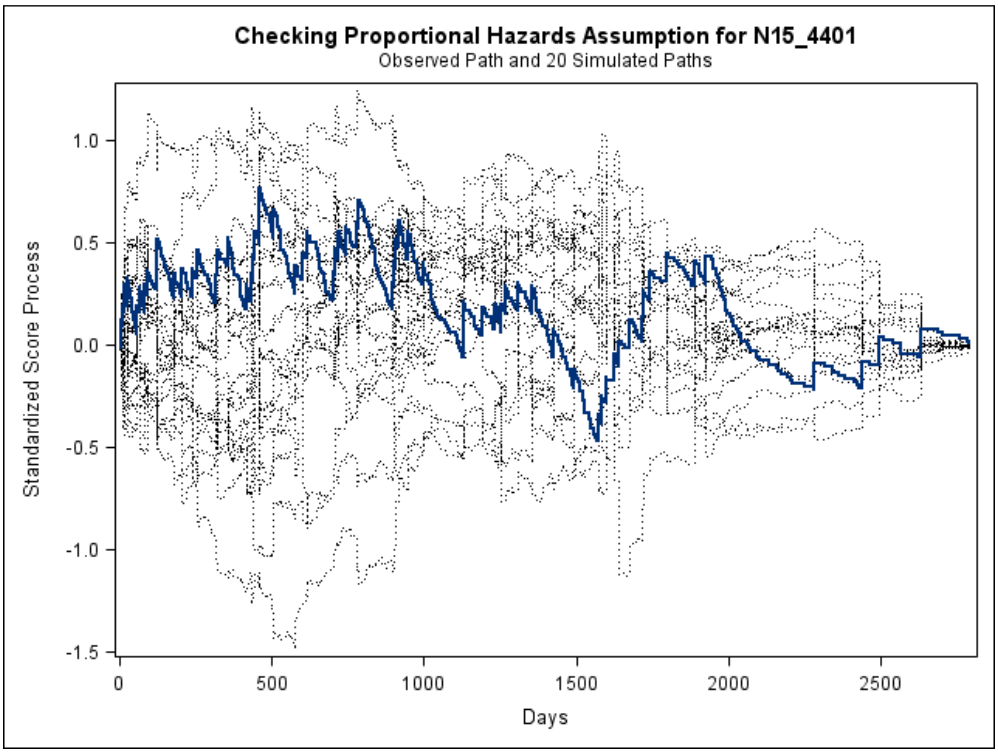

Figure 15. Grade (I vs. III).

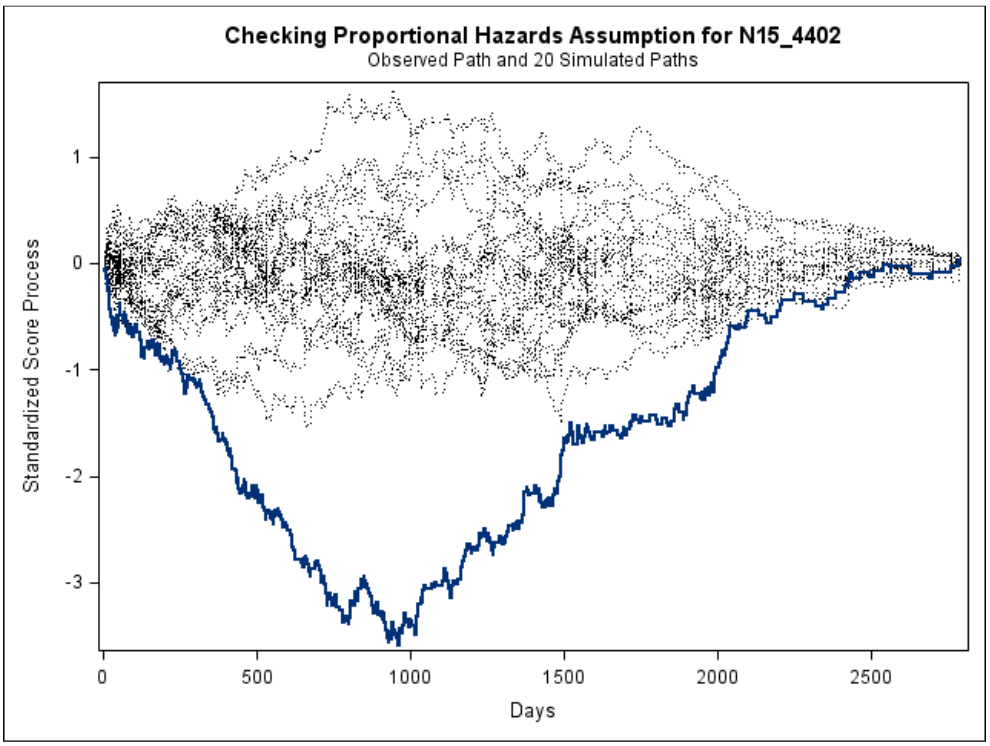

Figure 16. Grade (II vs. III).

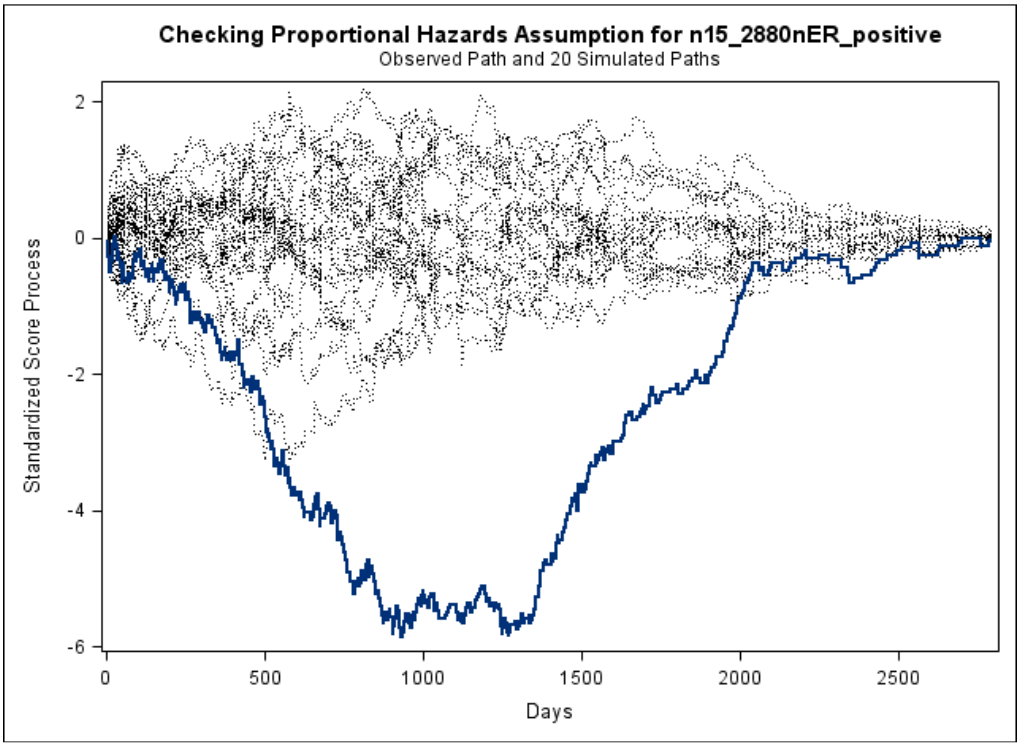

Figure 17. Tumor type (ER assay [ER positive vs. not ER positive]).

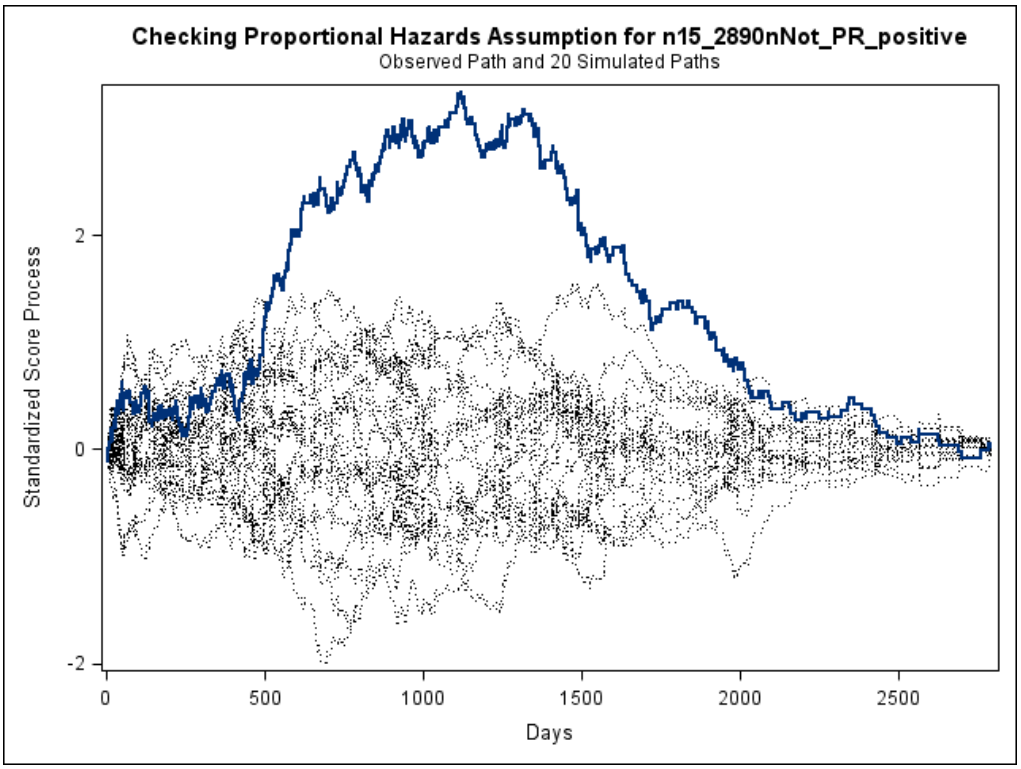

Figure 18. Tumor type (PR assay [PR positive vs. not PR positive]).

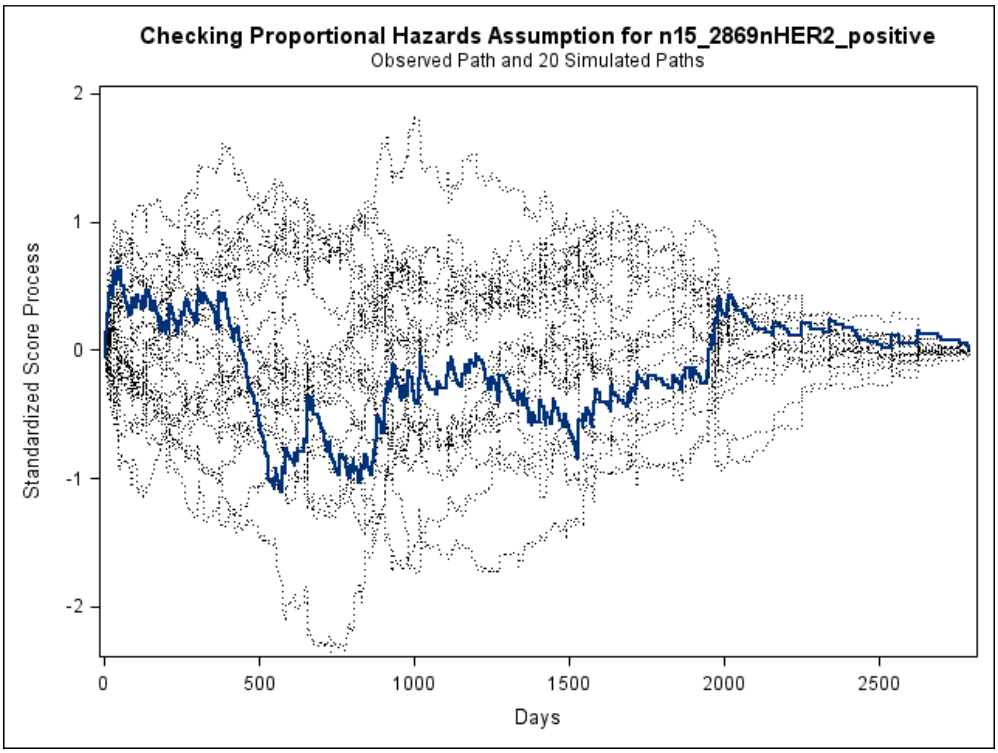

Figure 19. Tumor type (HER2 assay [HER2 positive vs. not HER2 positive]).

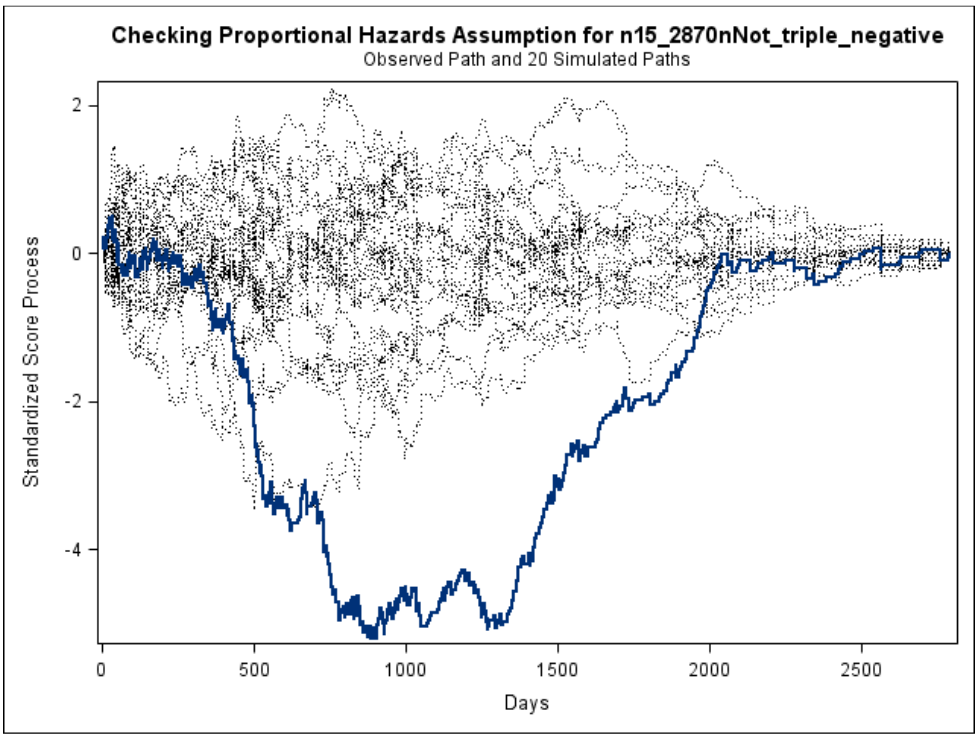

Figure 20. Tumor type (triple negative [triple negative vs. not triple negative]).

Summary

Black women continue to suffer increased mortality compared to White woman, despite socioeconomic interventions. Chapter 4 presented the results of the study. The results showed that there is no statistically significant difference in the survival function among patients in different health care facilities. The results did confirm previously published correlations between race, income, and tumor grade. Chapter 5 interprets the findings, limitations of the study, social implications, and recommendations for further research.

Chapter 5: Summary, Conclusion, and Recommendations

Moya Zakia Bailey (2013) in her graduate thesis coined the term *Misogynor*. She used the term to refer to the intersectionality of sex and race of Black women:

> Misogynoir is a term I created during my exams to express the specific ways in which Black women (cis and trans) are targeted within popular culture. The term is a combination of misogyny, the hatred of women and noir, which means black but also carries film and media connotations. It is the particular amalgamation of anti-black racism and misogyny in popular media and culture that targets black trans and cis women. (p. 26)

Although the term misogynoir was used by Bailey to discuss how Black woman are negatively targeted by media, the term is appropriate in other settings where Black women suffer adverse consequences resulting from a combined bias against their gender and race—for example, Serena Williams's health concerns being dismissed (Salam, 2018). In relation to the current study, Black women with breast cancer report having to advocate to obtain information regarding treatment-related symptoms and treatment risks as well as for medication to treat symptoms (Samuel et al., 2018). Additionally, Black women are more likely to chemotherapy delays, which further delays surgery (Yung, 2018). Although evidence suggests that structural and systemic racism plays a role in negative health outcomes from Black women, the present study did not reveal a statistically significant correlation between breast cancer survival and health care facilities.

Interpretation

The purpose of this study was to determine whether poverty, culture, and social justice affect the breast cancer survival rate of Black and White women in Georgia. To consider this question, the theoretical concepts of poverty, culture, and social justice were operationalized using proxy variables that could be measured. Income was used as a proxy for poverty and operationalized as a categorical variable with four levels based on the Census Track Poverty Indicator (1 = 0% - < 5% poverty, 2 = 5% - <10% poverty, 3 = 10% - <20% poverty, 4 = 20% - 100% poverty). Race was used as a proxy for culture and operationalized as a categorical variable with two levels (Black and White). Health care facility type was used as a proxy for social justice and operationalized as a categorical variable with three levels (nonprofit, for-profit, and government). Tumor type and grade was also considered in recognition that health care facilities are not able to control the health status of patients entering their facility.

Research Question 1

Research Question 1: Is poverty (income) a determinant of the breast cancer survival rate of Black and White women in Georgia?

$H_0$1: Poverty is not a determinant of the breast cancer survival rate of Black and White women in Georgia.

H_a1: Poverty is a determinant of the breast cancer survival rate of Black and White women in Georgia.

The results suggested that survival functions among patients with different income levels were statistically significant. The Census Tract Poverty Indicator in relation to the

Georgia Cancer Registry indicates the level of poverty in the patient's area at the time of diagnosis. A woman with breast cancer in a census tract with 0-<5% poverty (0.8698) has a slightly higher 5-year survival probability than a woman with breast cancer in a census tract with 20-100% poverty (0.8020). When levels of poverty were compared there was a statistically significant difference in the survival function between the lower percentages of poverty and higher percentages of poverty. The findings suggest that women with breast cancer in areas of increased poverty will have significantly poorer health outcomes than woman in areas of low poverty.

These findings confirm Freeman and Chu's (2005) view that poverty has a significant impact on incidence, access, and treatment. Lack of health insurance, being underinsured, poor diet, exposure to toxic environments, and the lack of information and education related to health influence health seeking behaviors as well as compliance. These factors can result in delayed treatment of a more advanced stage of breast cancer. The Freeman and Chu model of social determinants of cancer also suggests that health care providers may not be as competent or lack board-certification, resulting in failure to adhere to recommended treatment guidelines.

Research Question 2

Research Question 2: Is culture (race) a determinant of the breast cancer survival rate of Black and White women in Georgia?

$H_0$2: Culture is not a determinant of the breast cancer survival rate of Black and White women in Georgia.

H_a2: Culture is a determinant of the breast cancer survival rate of Black and White women in Georgia.

There was a statistically significant difference in the survival function between White and Black women with breast cancer. The 5-year survival probability of White women with breast cancer as 0.8648 and 0.7833 for Black women with breast cancer. Therefore, race is a significant determinant of breast cancer survival probability.

Although Freeman and Chu (2005) acknowledged that race and culture are not always synonymous, in health care settings race is often used as both a proxy for culture and poverty. According to Freeman and Chu, culture can act as a way to interpret information and respond to diagnosis. Culture can also influence health related behaviors such as drinking, smoking, and diet.

Research Question 3

Research Question 3: Is social justice (type of health care facility) a determinant of the breast cancer survival rate of Black and White women in Georgia?

H_03: Social justice is not a determinant of the breast cancer survival rate of Black and White women in Georgia.

H_a3: Social justice is a determinant of the breast cancer survival rate of Black and White women in Georgia.

There was no statistically significant difference in the survival function of patients in different health care facilities. Freeman and Chu (2005) viewed social justice in terms of racism, discrimination, and bias. They recognized that this type of social (in)justice can influence everything from screening to treatment. The report "Unequal Treatment:

Confronting Racial and Ethnic Disparities in Health Care" by The Institute of Medicine showed evidence of racial bias along the spectrum of cancer care. Whether conscious or implicit, providers were shown to adhere to standards of care (Nelson, 2002).

Research Question 4

Research Question 4: What is the relationship between poverty, culture, and social justice as a determinant of the breast cancer survival rate of Black and White women in Georgia?

$H_0$4: None of the independent variables (poverty, culture, and social justice) have a statistically significant relationship on breast cancer survival rates of Black and White women in Georgia.

H_a4: The independent variables (poverty, culture, and social justice) have a statistically significant relationship on breast cancer survival rates of Black and White women in Georgia.

When breast cancer survival was compared to race there was a statistically significant relationship. The hazard of death for a Black woman with breast cancer was 1,270 times the hazard if White women. However, there was no statistically significant relationship between breast cancer survival and income or health care facility. There was a statistically significant relationship between breast cancer and tumor grade. Specifically, the hazard of death for patients with grade I tumor was 0.4442 times of the hazard for patients with grade II tumor and the hazard of death for patients with grade I tumor was 0.3797 times of the hazard for patients with grade III tumor. This may suggest that Race may more appropriately be a biological proxy than a socio-economic proxy.

Limitations

The data used to analyze the research questions will be collected from the Georgia Cancer Registry which collects data for one state and the American Hospital Association. Therefore, the findings cannot be generalized nationally. Additionally, the quantitative results of the study can only demonstrate correlation and not causation.

This study was limited to the study of health care facilities in Georgia and to Black and White women in Georgia diagnosed with breast cancer. The study will analyzed only data downloaded from Georgia Cancer Registry and the American Hospital Association. This study sought to determine if there is a correlation between the stated variables. The study did not determine the causal nature of any identified relationship. It provided preliminary data that can serve as a foundation for further research that can elucidate causal relationships.

The study was also limited by the cost of the data. Hospital data is considered proprietary and therefore is sold to researchers. The limited database I was able to purchase cost several hundred dollars. The addition of additional variables of interest such as insurance types accepted, training facility, breast cancer technology available would have resulted in a database that cost thousands rather than hundreds of dollars.

A further limitation is that Georgia State does not encourage data analysis of specific hospitals, therefore all analysis was limited to health care facility type. A supplementary analysis of how the type of breast cancer screening services and treatments offered could potential influence on survival probability was limited by the scope of the data provided.

Recommendations

The findings of the study suggest that health care facility type as defined by control/ownership type does not influence breast cancer survival rates in the state of Georgia. However, as discussed in the literature review, previous studies have demonstrated racial bias by physicians and perceived racial bias by Black patients. Given the well-documented history of institutionalized racism within the health care system towards Black patients, the results were unexpected but not surprising considering the unwillingness of both hospitals and the State of Georgia to permit a resource detailed, hospital-specific study of racial bias related to breast cancer survival outcomes.

The first recommendation would be to expand the hospital variables to include factors such as bed size, rural/urban, teaching status, community partnerships, patient population, cancer services/technology available, payment types, and hospital demographics. The above variables could provide additional insight into the availability of services available in different types of communities as well as the training and more specifically the availability of well-trained physicians.

The second recommendation is to expand the size of the study. This study only included data for a single state, Georgia, so the results cannot be generalized. Data should be gathered from the Surveillance, Epidemiology, and End Results database with a national sample and aligned with the American Hospital Association data on hospitals. The health disparity of breast cancer survival rates between Black and White women is nationwide. For results that are meaningful, the sample should be drawn nationally.

A third recommendation is a mixed methods study as a prospective cohort. Although a quantitative study can demonstrate correlation, it cannot illustrate causation. The study was a quantitative study and therefore is limited to correlations of data, a quantitative study will not explain the why. Quantitative finding coupled with findings from qualitative interviews of both patients and physicians and reviews of records may help to guide the understanding of racial disparities in breast cancer survival rates.

Implications

At the core of this study is the question, what is the best option for care for a woman with breast cancer, particularly Black women with demonstrated higher mortality rates. This is socially significant because if the survival probability can increase based on where they are getting care, then there are actions that can be taken that can improve care for all breast cancer patients. For example, if Black women were to have better outcomes in government owned and controlled hospitals, further research could determine the best practices for improved survival for all patients, not just Black women.

A study of this type can also have policy implications. If hospital type influences breast cancer mortality rate, do we need to examine the way insurance handles referrals. Should referrals be based on race, tumor, grade and hospital type? Do we use this information to justify how health insurance is allocated? How resources are allocated.

Conclusion

The study results suggest that there is no relationship between healthcare facility type and breast cancer survival probability. This result was unexpected given the number of studies illustrating racial disparities in treatment. This may imply that all hospital

types perform poorly in the treatment of Black women and therefore the problem is systemic and needs to be examined using a different method. Another implication may be that given the disparate mortality rates for Black women there may be a need to differentiate the treatment protocol to specifically address the health needs of Black women.

It is interesting to note the even though Black women experience poorer breast cancer survival rates when compared to their peers, there has not been a corresponding uptick in breast cancer awareness programs that specifically target Black women. Most breast cancer awareness programs are noticeably race neutral. The studies have been conducted demonstrating the health disparity of breast cancer survival rates, the studies have been conducted demonstrating that Black women are more frequently diagnosed with triple negative breast cancer, which is the worst type of breast cancer, yet most breast cancer programs remain race neutral, along with screening recommendations, and insurance handling of referrals.

Although the results of this study did not suggest that health care facility type influence breast cancer survival rates, perhaps the failure to demonstrate any correlation is the most damaging evidence of institution racial bias. Given the plethora of evidence-based information revealing a race-based health disparity, health care facilities should be doing more to positively influence health outcomes for Black women.

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