Breast Cancer Knowledge, Attitude, and Screening Practices in African American College Students

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ABSTRACT

BREAST CANCER KNOWLEDGE, ATTITUDE, AND SCREENING PRACTICES IN AFRICAN AMERICAN COLLEGE STUDENTS

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Breast cancer is a significant public health problem. Globally, breast cancer is the most common form of cancer and is the leading cause of cancer-related mortality in women. The African American women population has a higher mortality rate due to breast cancer when compared to non-Hispanic White women. Additionally, breast cancer incidence rates are also relatively higher in young African American women compared to their non-Hispanic White counterparts. Early detection remains the most important strategy for combatting breast cancer that can significantly reduce the mortality rate. It has been observed that breast cancer has a more devastating effect on the younger African American population compared to non-Hispanic White, and therefore, educating younger women aged 18-49 can have a positive impact on changing behaviors and making better strides to emphasize the importance of breast cancer screening. The objectives of this research study are to understand the current knowledge and perceptions of young African American female college students regarding breast cancer and to help identify the gaps that exist in their knowledge, perceptions, health behaviors, and screening practices.

To fulfill the objectives of this study, an integrative literature review was conducted to generate systematic evidence regarding current breast cancer screening motivators and
challenges in the African American women population. Additionally, data was collected from college students regarding their knowledge and perceptions of breast cancer, screening habits, and associated health behaviors using a self-administered questionnaire. The survey questions for breast cancer-related knowledge and breast cancer-related perceptions were developed using a modified version of the prevalidated Breast Cancer Awareness Measure (BCAM) questionnaire and Champion’s revised Health Belief Model Scales (CHBMS).

The common motivators identified for breast cancer screening in African American women included knowledge about cancer, personal experiences, and other factors including ease of transportation, presence of female healthcare providers in the screening facility, and easy access to healthcare facilities. The barriers identified were categorized into five groups – lack of knowledge; concerns about screening-related costs; perceptions of breast cancer and the associated fear; individual or personal factors; and other factors, including religious and fatalistic beliefs, perceived discrimination, and accessibility.

For the survey-based study, the final sample consisted of 623 participants, of which 518 (83.1%) students were non-Hispanic Whites and 105 (16.9%) students were African Americans. Statistical analysis revealed that most of the students had moderate knowledge about breast cancer, its symptoms, and its risk factors. There was no statistically significant difference in breast cancer-related knowledge scores between the non-Hispanic White and the African American student groups after adjusting for the covariates education, income, and family history of breast cancer. Additionally, no statistically significant difference in breast cancer-related knowledge scores was observed between students who had a family history of breast cancer and students who did not have a family history of breast cancer after adjusting for the covariates education, income, and ethnicity.
The breast cancer-related perceived susceptibility scores were statistically significantly different between non-Hispanic Whites compared to the African American group \( F [1,607] = 17.184, p = < 0.001 \) after adjusting for the covariates education level, income, and family history of breast cancer. However, the effect size was small (0.028), which indicated that ethnicity only accounted for 2.8% of the variance in breast cancer-related perceived susceptibility. Similarly, there was a statistically significant difference in breast cancer-related perceived benefit scores between the non-Hispanic White and the African American student groups \( F [1,607] = 7.778, p = 0.005 \) after adjusting for the covariates education, income, and family history of breast cancer. However, the effect size was small (0.013), indicating that ethnicity only accounted for 1.3% of the variance in breast cancer-related perceived benefits. A statistically significant difference in breast cancer-related perceived susceptibility scores was observed between students who had a family history of breast cancer and students who did not have a family history of breast cancer \( F [1,607] = 58.407, p < 0.001 \), with a medium effect size (0.088) that indicated that family history accounted for 8.8% of the variance in breast cancer-related perceived susceptibility.

There was no statistically significant difference in breast cancer-related perceived barrier scores between the non-Hispanic White and the African American student groups after adjusting for the covariates education, income, and family history of breast cancer. Additionally, no statistically significant difference in breast cancer-related perceived benefit and perceived barrier scores was observed between students who had a family history of breast cancer and students who did not have a family history of breast cancer after controlling for the covariates education, income, and ethnicity.
Only 29.7% of the total students had an adequate breast cancer screening practice. However, a higher percentage of African American students had adequate screening practices (42.9%) compared to non-Hispanic White students (27%). Statistical analysis further revealed a statistically significant difference in breast cancer-related screening habits between the non-Hispanic White and the African American student groups \((F [1,607] = 13.916, p < 0.001)\) after adjusting for the covariates, although the effect size was small (0.022), which indicated that ethnicity accounted for 2.2% of the variance in breast cancer-related screening practices. It was also observed that there was a statistically significant association between screening practices and knowledge level of breast cancer \((\chi^2 [2] = 12.783, p = .002)\), although the level of association was small (0.143). There was no statistically significant difference in breast cancer-related health behaviors between the non-Hispanic White and the African American student groups after adjusting for the covariates education, income, and family history of breast cancer. Additionally, there was no statistically significant association between health behaviors and knowledge level for breast cancer.

The findings from this study will contribute to the currently limited resources that are available on the knowledge, perceptions, and screening behaviors of young African American college students. Although a higher number of interventions have been developed for this specific population over the last few years, the results from this study indicate that further research is required to understand the complex relationship between the different covariates and the knowledge, perceptions, and screening practices of breast cancer in the African American population.
BREAST CANCER KNOWLEDGE, ATTITUDE, AND SCREENING PRACTICES IN AFRICAN AMERICAN COLLEGE STUDENTS

BY

SHUBHAGATA DAS
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A DISSERTATION SUBMITTED TO THE GRADUATE SCHOOL IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE DOCTOR OF PHILOSOPHY

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DEDICATION

To all those who have been affected by breast cancer and to all the survivors who have inspired others... Have faith and keep the fight on...

&

To my dad
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CHAPTER I

BACKGROUND

Breast Cancer Statistics and Significance

Breast cancer is a significant public health problem. Globally, breast cancer is the most common form of cancer and is the leading cause of cancer-related mortality in women. According to the American Cancer Society (ACS), about one in eight women develop breast cancer in their lifetime and in 2020 approximately 2.3 million women globally were affected by breast cancer that caused about 685,000 deaths (World Health Organization, 2021). Despite treatment and diagnostic advances, the rate of breast cancer is increasing annually. In 2021, approximately 281,550 new cases of invasive breast cancer were expected to be diagnosed in the United States (U.S.), which is a 1.8% increase when compared to the 2019 data (American Cancer Society, 2021; National Breast Cancer Foundation Inc., 2020). It has further been predicted that breast cancer will be responsible for 14.8% of all new cancer cases diagnosed in the U.S. and will result in approximately 7.2% of all cancer-related deaths (National Cancer Institute, 2021).

Women diagnosed with breast cancer undergo severe physical as well as emotional distress, and clinically significant traumatic stress symptoms are relatively common in this patient population (Butler, Koopman, Classen, & Spiegel, 1999; Segrin & Badger, 2014). Initial diagnosis can evoke a state of shock, hopelessness, fear, and disbelief, creating both psychological and existential crisis (Thomas, Pandey, Ramdas, & Nair, 2002). Post-diagnosis,
the treatment for breast cancer is complex and involves multiple interventions over an extended period and is additionally associated with numerous short- and long-term side effects. Treatment for breast cancer can include local surgeries such as mastectomy and breast-conserving surgery and adjuvant therapies such as a combination of chemotherapy, radiation therapy, and hormonal treatments (Cardoso et al., 2019). Post-treatment side effects may include physical impairment involving the shoulder, trunk, and neck; extreme pain and fatigue; chemotherapy-induced peripheral neuropathy; and lymphedema that can limit the daily activity and quality of life of a patient (Binkley et al., 2012). Cross-sectional studies involving long-term breast cancer survivors have suggested that adjuvant chemotherapy is associated with overall poor physical functioning, extreme fatigue, and deteriorated quality of life (Shapiro & Recht, 2001). Breast cancer medications can cause severe short-term side effects such as alopecia, fatigue, severe pain, and weight gain (Sitzia & Huggins, 1998). It is also associated with long-term side effects such as premature ovarian failure in premenopausal women, cardiotoxicity, and cognitive dysfunction (Ashing-Giwa et al., 2004; Mehnert & Koch, 2007; Partridge, Burstein, & Winer, 2001; Tao, Visvanathan, & Wolff, 2015). Breast cancer surgeries can also cause significant body image issues, mental stress and trauma, and concerns about sexuality. It has been observed that women undergoing breast surgery felt less attractive, were more self-conscious, were dissatisfied with their overall appearance and scars, and avoided contact with other people (Anagnostopoulos & Myrgianni, 2009; Gopie et al., 2013; Helms, O'Hea, & Corso, 2008; Rosenberg et al., 2013). Also, surgery affected their self-care behavior and level of confidence and triggered depressive episodes and uncertainty (Longman, Braden, & Mishel, 1996).

Patients with breast cancer also frequently experience psychological, social, emotional, and spiritual challenges that are often neglected, misdiagnosed, and undertreated. It has been
observed that undiagnosed and untreated depressive disorders among breast cancer patients can significantly deteriorate their quality of life and overall health (Wong-Kim & Bloom, 2005).

Anxiety and depression are common in breast cancer patients and affect about 36-50% of women during the early years after diagnosis (Burgess et al., 2005; Lueboonthavatchai, 2007).

Additionally, a subset of the population may experience clinically significant depression that may require specialized psychiatric intervention (Fann et al., 2008). It has been estimated that although approximately 20-40% of breast cancer patients experience severe levels of emotional distress, only less than 10% of them are recognized by their oncologists in need for mental health counseling and psychiatric evaluation (Carroll, Kathol, Noyes Jr, Wald, & Clamon, 1993; Kadan-Lottick, Vanderwerker, Block, Zhang, & Prigerson, 2005; Zabora, BrintzenhofeSzoc, Curbow, Hooker, & Piantadosi, 2001). Depressive disorders related to breast cancer have been further correlated with factors such as ethnic minority, lower socioeconomic status, anxiety, and health-related quality of life (Ell et al., 2005). Depressive episodes not only cause mental health problems but can also cause amplification of physical symptoms, poor treatment adherence, and increased functional impairment. Additionally, depression results in poor relationships and function, familial and marital relationship challenges, loss of support system, and maladaptive problem and conflict solving and might be responsible for enhanced pain and fatigue affecting the overall quality of life.

Breast cancer and its treatments can also result in employment problems and can cause significant economic burden, including direct medical costs and indirect costs such as time lost from work, lost productivity due to premature death, and monetary losses associated with time spent receiving medical care (Bijker et al., 2018; Yabroff, Lund, Kepka, & Mariotto, 2011). It has been estimated that in 2020, the national expenditure for breast cancer care in the U.S. was
about $29.8 billion, which was the largest among all types of cancer (National Cancer Institute, 2019). Compared to the 2015 data, the expenditures for breast cancer care have increased by 10%, attributed to the aging and growth of the U.S. population. In addition to increased healthcare cost, breast cancer-related work problems are also significant but often overlooked. It has been observed that approximately 70-80% of breast cancer survivors in the U.S. return to work during the first year after diagnosis; however, it is less commonly observed in low-income and minority survivors (Blinder & Gany, 2020). Women reported negative experiences in the workplace post-diagnosis and recovery, such as job loss, demotion, unwanted changes in tasks, problems with the employer and co-workers, personal changes in attitudes to work, and diminished physical capacity (Banning, 2011; Maunsell, Brisson, Dubois, Lauzier, & Fraser, 1999). Other factors such as an increase in disease severity, recurrence of cancer, and availability of sickness and ill-health retirement benefits were also associated with the percentage of the population that retired completely from work post-diagnosis and treatment (Bradley, Bednarek, & Neumark, 2002; Molina Villaverde et al., 2008; Taskila-Åbrandt, Pukkala, Martikainen, Karjalainen, & Hietanen, 2005).

**Breast Cancer in the African American Women Population**

Over the years, there has been a drop in the breast cancer-related mortality rates due to various factors such as improved treatment and screening options; however, substantial racial disparities related to survival rates, rate of diagnosis, healthcare utilization and access, tumor biology, and cancer management still exists. Analysis of several epidemiological data has revealed that the African American women population has a higher mortality rate due to breast cancer when compared to non-Hispanic White women. According to the ACS, between the years
2012 and 2016, mortality rate due to breast cancer was 40% higher in African American women as compared to non-Hispanic White women (American Cancer Society, 2019). Compared to non-Hispanic Whites, non-Hispanic African American women have a 7% lower risk of developing breast cancer, but a 13% higher chance of dying due to breast cancer and related complications. Breast cancer incidence rates are also relatively higher in young African American women compared to their Caucasian counterparts. The median age of diagnosis is 59 for African Americans, compared to 63 for non-Hispanic White women (Noone et al., 2018). It has been observed that about 23% of African American women are diagnosed with breast cancer below the age of 50, compared to 16% of non-Hispanic White women (Stringer-Reasor, Elkhanany, Khoury, Simon, & Newman, 2021).

Clinical studies have revealed that, biologically and genetically, African American women are at higher risk of having breast cancer-related complications compared to non-Hispanic White women. It has been observed that the prevalence of triple-negative breast cancer, which is a more aggressive form of breast cancer that disproportionately affects BRCA1 mutation carriers, is more prevalent in young African American women compared to non-Hispanic White women (Dietze, Sistrunk, Miranda-Carboni, O'Regan, & Seewaldt, 2015). Clinical evidence further suggests that African American women with triple-negative breast cancer have worst outcomes compared to non-Hispanic White women having the same disease. In an extensive literature review involving genetic testing for BRCA1 and BRCA2 genes, it was observed that African American women have unique BRCA1 and BRCA2 mutations that are deleterious and pose higher risks of developing cancers that are not commonly observed within other ethnic races (Olopade et al., 2003). Additionally, racial differences exist in expression of genes that are associated with breast cancer recurrence that might contribute to the survival disparity observed
between African American and non-Hispanic White women diagnosed with breast cancer. In a study involving analysis of breast tumor samples, it was observed that compared to non-Hispanic White women, African American women had lower expression of *MUC1*, a suspected good prognosis gene, and higher expression of suspected poor prognosis genes such as *GSTT2*, *PSPHL*, *SQLE*, and *TYMS* genes. The results were reported after adjustment for age and Prediction Analysis of Microarray 50 (PAM50) subtype, a test that analyzes a tumor sample for 50 genes (Parada et al., 2017). PAM50 tests a sample of the tumor for a group of 50 genes. Similar results were observed in a study exploring the racial distribution of genotypic traits, including tumor-specific somatic mutations, subclonal intratumor genetic heterogeneity, and gene expression profiles where African Americans had more *TP53* mutations (42.9% vs. 27.6%; *p* = 0.003) and fewer *PIK3CA* mutations (20.0% vs. 33.9%; *p* = 0.008; Keenan et al., 2015). Additionally, African Americans had greater intratumor genetic heterogeneity and more basal gene expression tumors, even within triple-negative breast cancer. This indicates that African Americans have more aggressive tumor biology than non-Hispanic White women, which can contribute to racial disparity in breast cancer outcomes.

Racial disparity is also evident in terms of breast cancer screening practices. Historically, non-Hispanic White women have utilized mammography and screening services at higher rates compared to their African American women counterparts, although lately some data have suggested that screening rates are similar in both patient populations (Reisch, Barton, Fletcher, Kreuter, & Elmore, 2000). In a study, analyzing data collected from the 2000 National Health Interview Survey (NHIS) and earlier surveys to discern patterns and trends in cancer screening practices, it was observed that African American and Hispanic women have relatively lower breast cancer screening rates when compared to non-Hispanic White women (4.2% vs. 11.3%)
who are 40 years or older (Swan, Breen, Coates, Rimer, & Lee, 2003). Similarly, in a study analyzing state cancer registry data linked to socioeconomic characteristics of patients, it was observed that African American women had a significantly lower proportion of early stage cancer diagnosis despite having possibly more access to screening (Sassi, Luft, & Guadagnoli, 2006).

Studies have also revealed that racial discrepancy exists in the timeliness of diagnostic follow-up for breast abnormalities among African American and non-Hispanic White women. African American women have a significantly longer duration (median 19 days) between receiving an abnormal screening mammography and final disposition compared to non-Hispanic White women (median time 12 days; Chang et al., 1996). The difference persisted even after adjusting for patient age, family history of breast cancer, report of palpable mass, and income. Other studies confirmed that African American race and ethnicity are independent predictors of inadequate follow-up in women with abnormal or inconclusive mammograms (Elmore et al., 2005; Jones et al., 2005). Studies involving economically disadvantaged women also observed a similar trend where African American women were significantly less likely to complete their mammographic work-up than non-Hispanic White women (Adams et al., 2009; Reece, Neal, Nguyen, McIntosh, & Emery, 2021).

Overall, breast cancer-related racial disparity has been largely attributed to more advanced stage at diagnosis, prevalence of obesity and other comorbid conditions, and limited access and adherence to treatment and screening options (Daly & Olopade, 2015). Furthermore, lack of private or Medicare insurance and presence of unfavorable tumor characteristics such as triple-negative breast cancers have been identified as the most important contributing factors to breast cancer-related mortality in African American women under the age of 65 with an early
stage disease diagnosis (Jemal et al., 2018). Multiple socioeconomic factors such as access to standard care, appropriate guidelines, and timely screening have also been identified as contributing factors to overall prognosis of the disease. Additionally, African American women have lower participation rates in clinical trials investigating novel drug combinations than the non-Hispanic White population (Shavers & Brown, 2002). The lower participation has resulted in a lack of racial-specific therapeutic data that are available for the African American women population.

**Breast Cancer Screening Recommendations**

In the recent 2015 guidelines published by the ACS, it was recommended that all women should become familiar with the potential benefits, limitations, and harms associated with breast cancer screening (Oeffinger et al., 2015). Women with an average risk of breast cancer should perform regular screening mammograms starting at 45 years of age. Additionally, women between 40 to 44 years of age should have an opportunity to start their annual screening, women between 45 to 54 years of age should be annually screened, and women above 55 years of age should continue either with their annual screening or should transition to biennial screening. The ACS further recommends that women should continue screening mammography as long as their overall health is well and they have a life expectancy of 10 years or longer.

The breast cancer screening guidelines issued by the American College of Obstetricians and Gynecologists (ACOG) recommends that women at average risk of breast cancer should be offered screening mammography starting at age 40 years of age (Monticciolo et al., 2018). If they have not started screening mammography by the age of 40, they should begin screening
mammography by no later than age of 50. Additionally, women at an average risk of breast
cancer should have screening mammogram every 1-2 years after having an informed discussion
regarding the benefits and harms of annual and biennial screening. Women above 55 years of age
should receive a biennial screening and should continue screening mammography until at least
age of 75.

Statement of the Problem

Breast cancer is one of the most common types of cancer that affects 2.3 million women
globally, causing about 685,000 deaths (World Health Organization, 2021). Considering the high
rate of mortality, the significant physical and emotional side effects, and the economic burden
associated with breast cancer, it is essential to identify preventative measures that can lower the
risk of breast cancer and mitigate the occurrence. Review of literature involving breast cancer
preventative measures has suggested that lifestyle changes along with routine screening practices
are critical to early diagnosis and treatment of breast cancer that can reduce the rate of
occurrence (Hashemi, Karimi, & Mahboobi, 2014). Several studies have reported that early
detection of breast cancer by screening mammogram can effectively reduce breast cancer-
associated mortality (Anderson, Jatoi, & Devesa, 2006; Gøtzsche & Jørgensen, 2013). The
current clinical practice guidelines recommend routine mammograms in women between 50-69
years of age; however, it has been observed that a significant number of women eligible for
screening do not comply with the recommendation (Breen & Kessler, 1994; Calle, Flanders,
Thun, & Martin, 1993; Frazier, Jiles, & Mayberry, 1996). Only 50% of women who are screened
for breast cancer return for follow-up screening, and additionally, the rate of mammography is
also significantly reduced among diabetic women (Lipscombe, Hux, & Booth, 2005; Michaelson
et al., 2002). Additionally, women who are obese, have less education, have poorer socioeconomic background, and exhibit suboptimal preventative health behaviors receive fewer mammograms when compared to women devoid of these characteristics (Maxwell, Bancej, Snider, & Vik, 2001; Paskett et al., 2004; Wee, McCarthy, Davis, & Phillips, 2000).

**Conceptual Framework**

Three primary conceptual frameworks can be used to explain the health behaviors and the breast cancer screening habits of African American women. The first theoretical framework is the ecological perspective theory that emphasizes that the interdependence and interaction of multiple factors existing in a patient’s physical and sociocultural environment can influence their health-related behaviors (Health & Services, 2018; Stokols, 1996). The multiple levels of influence include several factors such as intrapersonal or individual factors (knowledge, attitude, personality traits, and beliefs), interpersonal factors (interaction with other people such as family and friends), institutional or organizational factors (guidelines, policies, and regulations), community factors (formal and informal social norms, cultural beliefs that exist between individuals, groups and organizations), and public policy factors (local, state, and federal policies; Figure 1). For example, when a postmenopausal woman exhibits a delay in getting a recommended screening mammogram, it could be because of her fear of a cancer diagnosis (intrapersonal factor) or a delay in physician recommendation (interpersonal factor) or a conflict in scheduling (organizational factor) or existing prejudice against mammography (community factor) or an issue with insurance coverage (policy factor). According to ecological theory, significant and dynamic interrelations exist among these different levels of health determinants, and therefore an intervention is likely to be more successful when determinants from all levels
are equivalently addressed. Application of this theory can assist in providing a complete perspective of the factors that can be modified to ensure a positive health-behavioral change in a patient.

![Ecological Perspective Theory Diagram](image)

**Figure 1.** The ecological perspective theory. Adapted from (McLaren & Hawe, 2005).

The second theoretical framework is the health belief model (HBM). HBM is a psychological model that can also be used to understand the patient-related behavioral and habitual factors that might be responsible for disparities in breast cancer-related preventative measures (Hayden, 2017; Figure 2). Four major perceptions are crucial to the HBM: perceived
seriousness, perceived susceptibility, perceived benefits, and perceived barriers. The perceptions can be used alone or in combination to explain different health behaviors and address the issues with health disparity. The HBM focuses on health motivation and therefore can be useful in designing interventions that address problem behaviors related to breast cancer prevention and management in selected patient populations (alcohol intake, diet, physical inactivity, etc.).

![The health belief model. Adapted from United States Agency for International Development. Available at: https://sbccimplementationkits.org/quality-malaria-medicines/health-belief-model/](image)

The third theoretical framework is social cognitive theory (SCT), which can be used in different settings and populations to guide health-behavioral changes that improve preventative measures in African American women and reduce associated breast cancer risk (Schunk, 2020;
SCT explains the influence of personal experiences, environmental factors, and the actions of others on an individual’s health behaviors (Schunk, 2020). SCT posits that people not only learn from their personal experiences but also from their environment and by observing the actions of others. Using SCT to design behavioral modifications such as self-control, self-monitoring, setting up personal goals, and self-efficacy can be helpful in promoting positive health behaviors.

**Figure 3.** The social cognitive theory. Adapted from (Schunk & DiBenedetto, 2020).

**Factors Affecting Breast Cancer Knowledge, Perceptions, and Screening Practices**

Over the years, several studies have explored the factors that affect breast cancer-related knowledge, perceptions, and screening practices. Factors such as education level, socioeconomic background, cultural traditions, religious beliefs, family history, and social support can act as major covariables that can influence the knowledge, perceptions, and related
screening practices regarding breast cancer in women. This dissertation focuses on three major variables – education level, income level, and family history of breast cancer – as the covariates.

Several studies have explored the effect of education level as an independent variable on the attitudes, knowledge, and perceptions of women towards breast cancer. It has been observed that women with a higher education level occasionally report a higher knowledge of breast cancer and tend to be positively associated with a higher rate of breast cancer screening (Biswas, Syiemlieh, Nongrum, Sharma, & Siddiqi, 2020; Gurdal, Saracoglu, Oran, Yankol, & Soybir, 2012; Hussain, Altieri, Sundquist, & Hemminki, 2008). However, most of the studies also reported that overall better knowledge dissemination and intervention programs geared towards breast cancer and screening guidelines are required irrespective of the education levels of the women. Women with a higher education level also have a higher rate of survival following a breast cancer diagnosis (Hussain et al., 2008). Studies have also observed that consumption of alcoholic beverages and physical activity of young women were positively associated with educational level and family income (Biswas et al., 2020). Patients with lower income and education levels are also associated with a late-stage tumor diagnosis and lower rates of radiotherapy, chemotherapy, and endocrine therapy (Liu et al., 2017).

Family history is thought to play an important role in breast cancer knowledge, perceptions, and screening practices. While some studies have seen a positive association between breast cancer knowledge and women who have a family history of breast cancer, other studies have reported conflicting results, where inadequate knowledge of breast cancer risk factors and poor cancer screening practices were observed among women with a family history of breast cancer (Bird et al., 2010; Subramanian, Oranye, Masri, Taib, & Ahmad, 2013). A cross-
sectional survey-based study exploring breast cancer-related knowledge in women belonging to high-risk groups has observed that the majority of the study participants (71%) had poor knowledge of breast cancer-related risk factors, and income, relationship with a patient, and practice of breast cancer screening significantly predicted performance of mammography (Subramanian et al., 2013). In another study, the researchers did not observe any significant difference in breast cancer-related knowledge between women who had a family history of breast cancer and women who did not have a family history of breast cancer (Subramanian et al., 2013). Alternatively, some studies have observed that women who have a close relative suffering from breast cancer had more negative attitude and associated anxiety about breast cancer, had a higher perception of risk, and were more likely to engage in screening behavior compared to women without a family history of breast cancer (Hailey, Carter, & Burnett, 2000). In a descriptive cross-sectional study, it was observed that there is a significant difference between the perceived risk and educational level of the women and a significant relationship between the perceived risk and anxiety level of the women. However, breast cancer screening behavior was not affected by risk perception of the women (Seven, Bağcivan, Akyuz, & Bölükbaz, 2018).

**Purpose of the Study**

The purpose of this study was to explore the knowledge, perceptions, and breast cancer screening practices, and health behaviors in the young African American population, particularly in college students. More specifically, this study aimed to understand if there is a difference in breast cancer-related knowledge, screening, and health behavior between young non-Hispanic White and African American women. Additionally, this study aimed to examine whether other social and economic variables such as education level, income, and family history of breast cancer.
cancer had any effect on the knowledge and perceptions of the participants and whether that affected their health behaviors and screening practices in any meaningful way. It is essential to have an understanding of the breast cancer-related knowledge such as the early indicators of breast cancer and how health behaviors including healthy lifestyle and appropriate screening habits of the young African American students can affect breast cancer-related practices and overall clinical outcomes. This can provide insight on the interventions that might be needed for this specific patient population to promote early screening of breast cancer and improve health behaviors.

**Relevance of the Study**

Early detection remains the most important strategy for combatting breast cancer that can significantly reduce the mortality rate. Screening mammography and routine self-breast exam can detect breast cancer at an early stage when treatment is usually less extensive and more likely to be successful (Shulman, Willett, Sievers, & Knaul, 2010). According to the guidelines by ACS, women should be familiar with the known benefits, limitations, and potential harms linked to breast cancer screening. Additionally, women should also know how their breasts normally look and feel and report any breast changes to a healthcare provider right away.

A few studies have examined breast cancer-related knowledge, perceptions, and sociocultural beliefs in the African American population, particularly in postmenopausal women; however, there is a lack of literature that explores breast cancer-related knowledge, attitude, and screening practices in relatively younger African American women. Since breast cancer has a more devastating effect on the younger African American population, educating younger women aged 18-49 can have a positive impact on changing behaviors and making better strides to
emphasize the importance of breast cancer screening. Educating younger women before they reach screening age can improve their understanding of the disease, the associated risks, and the questions to ask that will increase their likelihood of being screened through mammography.

Significance of the Study

Considering the high rates of breast cancer-related mortality in African American women, it is particularly important to educate this patient population about the risks of breast cancer and appropriate preventative measures. Moreover, it is essential to include younger women in breast cancer-related educational programs, since younger African American women are at a higher risk of developing breast cancer compared to younger women of other ethnicities. Providing knowledge and education about early screening and effective health behaviors, developing standardized and effective guidelines for routine screening, and promoting alternate preventative care options involving lifestyle changes can effectively mitigate the risk of breast cancer in this susceptible population. This study will help to understand the current knowledge and perceptions of young African American students regarding breast cancer and help identify the gaps that exist in their knowledge, perceptions, health behaviors, and screening practices. Identifying these gaps can assist with future studies that aim to explore the underlying causes that can also help with designing appropriate interventions.

Research Questions and Hypotheses

The following research questions and hypotheses were formulated to fulfill the objective of this dissertation project.
1. What are the common motivators and barriers to breast cancer screening that have been identified in the African American women population?

2. Is there a difference in knowledge of breast cancer in female African American college students and non-Hispanic White college students after controlling for education level, income, and family history?
   - **Null Hypothesis (H₀)** – There is no difference between breast cancer-related knowledge and ethnicity after controlling for education level, income, and family history.
   - **Alternative Hypothesis (H₁)** – There is a difference between knowledge of breast cancer and ethnicity after controlling for education level, income, and family history.

3. Is there a difference in knowledge of breast cancer in students with a family history of breast cancer and students without family history of breast cancer after controlling for education level, income, and ethnicity?
   - **Null Hypothesis (H₀)** – There is no difference in breast cancer-related knowledge and family history after controlling for education level, income, and ethnicity.
   - **Alternative Hypothesis (H₁)** – There is a difference between knowledge of breast cancer and family history after controlling for education level, income, and ethnicity.

4. Is there a difference in perceptions of breast cancer in female African American college students and non-Hispanic White college students after controlling for education level, income, and family history?
• **Null Hypothesis (H₀)** – There is no difference between breast cancer-related perceptions and ethnicity after controlling for education level, income, and family history.

• **Alternative Hypothesis (H₁)** – There is a difference between perceptions of breast cancer and ethnicity after controlling for education level, income, and family history.

5. Is there a difference in perceptions of breast cancer in students with a family history of breast cancer and students without family history of breast cancer after controlling for education level, income, and ethnicity?

   • **Null Hypothesis (H₀)** – There is no difference between breast cancer-related perceptions and family history after controlling for education level, income, and ethnicity.

   • **Alternative Hypothesis (H₁)** – There is a difference between perceptions of breast cancer and family history after controlling for education level, income, and family history.

6. Is there a difference in breast cancer screening practices in female African American college students and non-Hispanic White college students after controlling for education level, income, and family history?

   • **Null Hypothesis (H₀)** – There is no difference between breast cancer screening practices and ethnicity after controlling for education level, income, and family history.
• *Alternative Hypothesis* ($H_1$) – There is a difference between breast cancer screening practices and ethnicity after controlling for the covariates (education level, income, family history).

7. Is there a difference in breast cancer health behaviors in female African American college students and non-Hispanic White college students after controlling for education level, income, and family history?
   
   • *Null Hypothesis* ($H_0$) – There is no difference between breast cancer health behaviors and ethnicity after controlling for education level, income, and family history.
   
   • *Alternative Hypothesis* ($H_1$) – There is a difference between breast cancer health behaviors and ethnicity after controlling for the covariates (education level, income, family history).

8. Is there an association between the level of knowledge and screening practices in female African American college students?
   
   • *Null Hypothesis* ($H_0$) – There is no association between the level of knowledge and screening practices in female African American students.
   
   • *Alternative Hypothesis* ($H_1$) – There is an association between the level of knowledge and screening practices in female African American students.

9. Is there an association between the level of knowledge and health behavior scores in female African American college students?
   
   • *Null Hypothesis* ($H_0$) – There is no association between the level of knowledge and health behaviors in female African American students.
• Alternative Hypothesis ($H_1$) – There is an association between the level of knowledge and health behaviors in female African American students.
References


CHAPTER II

MOTIVATORS AND BARRIERS TO BREAST CANCER SCREENING IN AFRICAN AMERICAN WOMEN: AN INTEGRATIVE REVIEW OF LITERATURE

Introduction

Breast cancer is a significant public health problem. Globally, breast cancer is the most common form of cancer and is the leading cause of cancer-related mortality in women. According to the American Cancer Society (ACS), about one in eight women globally develop breast cancer in their lifetime, and in 2020, approximately 2.3 million women globally were affected by breast cancer that caused about 685,000 deaths (World Health Organization, 2021). Despite treatment and diagnostic advances, the rate of breast cancer is increasing annually. In 2021, approximately 281,550 new cases of invasive breast cancer were expected to be diagnosed in the United States (U.S.), which is a 1.8% increase when compared to the 2019 data (American Cancer Society, 2021; National Breast Cancer Foundation Inc., 2020). It has further been predicted that breast cancer will be responsible for 14.8% of all new cancer cases diagnosed in the U.S., which will result in approximately 7.2% of all cancer-related deaths (National Cancer Institute: Surveillance, 2021).

Several epidemiological data have revealed that the African American women population has a higher mortality rate due to breast cancer when compared to women of other ethnic backgrounds. According to the estimates of the ACS, breast cancer accounts for the second largest cancer-related deaths in African American women (about 18%; American Cancer
Society, 2019). ACS has further revealed that between the years 2012 and 2016, mortality rate due to breast cancer was 40% higher in African American women as compared to non-Hispanic White women. The racial disparity has been largely attributed to more advanced stage of breast cancer diagnosis, prevalence of obesity and other comorbid conditions, and limited access and adherence to treatment and screening options (Daly & Olopade, 2015). Furthermore, lack of private/Medicare insurance and presence of unfavorable tumor characteristics such as triple-negative breast cancers have been identified as the most important contributing factors to breast cancer-related mortality in African American women under the age of 65 with an early stage disease diagnosis (Jemal et al., 2018).

Several literature and published guidelines have emphasized the importance of early detection in combatting breast cancer that can significantly reduce breast cancer-related mortality and other complications and can improve the overall clinical outcome. In a study comparing breast cancer-related deaths 20 years prior to the introduction of screening to 20 years after the introduction of screening, it was observed that mortality rate could be reduced by up to 49% in women who got screened when compared to women who didn’t get screened (Tabar et al., 2003). The use of early screening mammography for the detection of tumors less than 15 mm in dimension can usually result in a favorable outcome, especially at prepalpable and preclinical presentation (Cady & Michaelson, 2001; National Research Council, 2001, 2003; Nelson et al., 2016). However, despite recommendations of early detection, racial disparities have been observed in breast cancer screening practices. Historically, non-Hispanic White women have utilized mammography and screening services at higher rates compared to their African American women counterparts, although lately some data have suggested that screening rates are similar in both patient populations (Reisch, Barton, Fletcher, Kreuter, & Elmore, 2000). In a
study analyzing data collected from the 2000 National Health Interview Survey (NHIS) to discern patterns and trends in cancer screening practices, it was observed that African American and Hispanic women have relatively lower breast cancer screening rates when compared to non-Hispanic White women (4.2% vs. 11.3%) who are 40 years or older (Swan, Breen, Coates, Rimer, & Lee, 2003). Because disparities still exist in breast cancer presentation and related clinical outcomes in African American women, there is a need to understand the current screening behaviors and associated challenges that are unique to this population. Understanding the factors that influence screening habits, early detection of breast cancer, and care utilization can assist with developing effective intervention programs that can modify health behaviors such as healthy habits and screening practices and can reduce disparities in breast cancer outcomes. Furthermore, this approach is also aligned with the 2020 Healthy People objectives of reducing breast cancer death rates and increasing breast cancer screening in women (Office of Disease Prevention and Health Promotion, 2020a, 2020b).

**Purpose of the Review**

An integrative literature review is a comprehensive review of literature that combines the findings from both quantitative and qualitative studies such as case studies, observational studies, and meta-analyses to fully understand a specific research problem (Russell, 2005). Such a type of review can be used to evaluate the strength of the available scientific evidence, identify the existing gaps in current research, recognize the options for future research, form meaningful associations between related areas of work, identify central issues in an area, generate a research question, identify a theoretical or conceptual framework, and explore the relevant and successful research methods applicable for the specific problem (Torraco, 2005).
The purpose of this integrative literature review was to generate systematic evidence regarding current breast cancer screening motivators and challenges in the African American women population. Since early detection is deemed critical for a favorable outcome in breast cancer, it is essential to understand the factors that can motivate or act as a barrier for cancer screening in this susceptible population. Additionally, for reducing the existing racial disparities, evaluating screening motivators and barriers specifically for this population can assist with targeted intervention and future research.

Methods

The integrative literature review was guided by two specific research questions:

1. What are the current breast cancer screening motivators in the African American women population?
2. What are the current breast cancer screening barriers in the African American women population?

The integrative literature review was conducted following the methodological strategies as described by Whittemore & Knafl (2005). The review process included five distinct stages: problem identification, literature search, data evaluation, data analysis, and finally presentation of the summarized results. A literature search was conducted focusing specifically on African American women, breast cancer screening, and effect of other factors on screening using major health and medicine publication databases for scholarly articles, including PubMed, CINAHL, and ProQuest. Keywords, specific search terms, and definite inclusion and exclusion criteria were identified before commencing the database search.
A. Inclusion and Exclusion Criteria

In order to meet the primary inclusion criteria, the study had to meet the following parameters: a) focused on African American women; b) focused on breast cancer screening; c) focused on challenges and motivators that are associated with screening; d) peer-reviewed articles; e) full-text articles published in English; f) used qualitative, quantitative, or mixed-methods research; and g) published between 2010 and 2019. For this study, breast cancer screening was defined as any procedure that involved checking a woman’s breasts for cancer before there were signs or symptoms of the disease. This included procedures such as mammography, breast magnetic resonance imaging, clinical breast exam, and self-breast examination. The review focused on articles discussing the screening challenges and motivators that are observed in the African American women population. Studies involving women of other ethnicities were eliminated. Additionally, review articles, articles outside of the specified date range, and articles that were not in English were excluded.

B. Data Source and Search Strategy

An extensive literature search was conducted in June 2021. Three major databases, PubMed, CINAHL, and ProQuest, were searched using the following keywords: “breast cancer,” “African American” or “black women,” “cancer screening” or “mammogram.” The keywords were searched in the title and abstract of the publications. Some articles were also accessed from the references of the retrieved studies. A manual search using different combinations of each keyword was also conducted to include articles that might have been missed in the broader search. All articles generated by the searches were added to a single Excel datasheet and were
screened for duplicates. Duplicate articles and articles that did not meet the inclusion criteria were eliminated. The remaining articles were reviewed to select publications that were relevant to this integrative literature review and were included in the final analysis. Figure 4 describes in detail the process that was used for selecting the final articles that are included in this review.

Figure 4. Integrative review search process and results.
C. Theoretical Framework

Three primary theoretical frameworks guided this integrative literature review that can explain the motivating and challenging factors that are associated with breast cancer screening. The ecological perspective theory emphasizes the interdependence and interaction of multiple factors existing in a patient’s physical and sociocultural environment that can influence their health-related behaviors (Health & Services, 2018; Stokols, 1996). The multiple levels of influence include several factors such as intrapersonal or individual factors (knowledge, attitude, personality traits, and beliefs), interpersonal factors (interaction with other people such as family and friends), institutional or organizational factors (guidelines, policies, and regulations), community factors (formal and informal social norms, cultural beliefs that exist between individuals, groups, and organizations), and public policy factors (local, state, and federal policies). For example, when a postmenopausal woman exhibits a delay in getting a recommended screening mammogram, it could be because of her fear of a cancer diagnosis (intrapersonal factor) or a delay in a physician recommendation (interpersonal factor) or a conflict in scheduling (organizational factor), or existing prejudice against mammography (community factor) or an issue with insurance coverage (policy factor). According to ecological theory, significant and dynamic interrelations exist among these different levels of health determinants, and therefore an intervention is likely to be more successful when determinants from all levels are equivalently addressed. Application of this theory can assist in providing a complete perspective of the factors that can be modified to ensure a positive health-behavioral change in a patient.
Several studies have explored the implementation of social ecological theory to understand health literacy and patient engagement and how the multilevel approach of the theory can offer an array of strategic options for interventions. Ecological perspective theory has been used to explain the notion that the patient preferences for healthcare are dynamic and are embedded within multiple, interconnected layers of context (Street, Elwyn, & Epstein, 2012). The contexts can be on a broad macrolevel that includes the patient’s social, cultural, and economic factors or on a microlevel including the patient’s behavioral and motivational factors. Breast cancer screening programs based on the ecological perspective theory have been successfully implemented by including interventions that mutually influence and address predisposing, enabling, and reinforcing factors that exist in the targeted population (Earp, Altpeter, Mayne, Viadro, & O'Malley, 1995). It has been observed that together these factors form the basis for lasting social change to support increased breast cancer screening. Studies have demonstrated that the ecological perspective theory can also be used with other existing health behavior theories to explain the adherence patterns and existing barriers to breast cancer screening in different populations of women (Ahmadian & Samah, 2013; Daley et al., 2011).

The health belief model (HBM) is a psychological model that can also be used to understand the patient-related behavioral and habitual factors that might be responsible for disparities in breast cancer-related preventative measures (Hayden, 2017). Six major perceptions are crucial to the HBM: perceived seriousness, perceived susceptibility, perceived benefits, perceived barriers, cues to action, and self-efficacy. The perceptions can be used alone or in combination to explain different health behaviors and address the issues with health disparity. For example, if a woman perceives that she is susceptible or more likely to get breast cancer in her lifetime, she might be interested in obtaining a mammogram. Similarly, perceived severity
accounts for the feelings of seriousness of contacting a disease and the consequences it might impart, and along with perceived susceptibility, it can be categorized as perceived threat (Champion & Skinner, 2008). The concept of perceived benefits accounts for the fact that even if a person considers oneself to be susceptible to a disease, a behavioral change can only be influenced by a person’s beliefs regarding perceived benefits of the various available actions for reducing the disease threat. Perceived barrier explains the factors that can outweigh the perceived benefit and can impede undertaking recommended health behaviors that can reduce the risk of having the disease. The concept of cues to action and self-efficacy describes the readiness or strategies to take an action that can trigger a positive behavioral change and the confidence on one’s ability to make the necessary changes.

The HBM primarily focuses on health motivation and therefore can be useful in designing interventions that address problem behaviors related to breast cancer prevention and management in the African American women population (alcohol intake, diet, physical inactivity, etc.). Several studies have explored the utility of HBM in explaining and predicting breast cancer screening behaviors in different populations. It has been observed that perceived benefits and self-efficacy predict breast self-examination (BSE) directly and perceived barriers affect inversely (Darvishpour, Vajari, & Noroozi, 2018; Hajian-Tilaki & Auladi, 2014; Lee, Stange, & Ahluwalia, 2015). However, contradictory results have been observed in other studies where perceived susceptibility, severity, and benefits to mammography did not predict mammogram frequency (VanDyke & Shell, 2017; Yarbrough & Braden, 2001). Therefore, it has been concluded that although HBM can provide some description of the values, beliefs and behaviors in the target population that predicts health behavior, it can be inconsistent.
Social cognitive theory (SCT) can be used as a theoretical framework in different settings and populations to guide health-behavioral changes that improve preventative measures in African American women and reduce associated breast cancer risk (Schunk & DiBenedetto, 2020). SCT explains the influence of personal experiences, environmental factors, and the actions of others on an individual’s health behaviors. SCT posits that people not only learn from their personal experience, but also from their environment and by observing the actions of others. Additionally, SCT also proposes that individuals “function as contributors to their own motivation, behavior, and development within a network of reciprocally interacting influences” (Bandura, 1999 P. 29). SCT covers several key behavioral facets such as moral judgment and physiological arousal; however, the research has been primarily focused on self-efficacy, which describes one’s beliefs regarding their capabilities of successfully completing tasks or goals (Locke & Latham, 2002). Using SCT to design behavioral modifications such as self-control, self-monitoring, setting up personal goals, and self-efficacy can be helpful in promoting positive health behaviors.

Numerous breast cancer intervention programs have explored health behavioral theories to improve screening adherence; however, there are only a few programs that have used social cognitive theory to explain the process of intervention. It has been observed that most women lack self-confidence about their ability to perform a breast self-examination and self-efficacy has been positively associated with an increased rate of breast cancer screening mammography and breast self-examination (Brawley & Culos-Reed, 2000; Edgar, Judith, & Patterson, 1984; Shirazi, Champeau, & Talebi, 2006). Studies have also reported that low self-efficacy results in avoidance behavior among people, whereas a high efficacy assists with initiating behaviors that
can promote behavioral changes by overcoming personal obstacles like fear (Bandura & Adams, 1977). Furthermore, it has been observed that women were more adherent to mammography if they had greater self-efficacy compared to women who reported lower self-efficacy (Ahmadian, Samah, Redzuan, & Emby, 2012).

D. Data Analysis

Data analysis involved thorough reading of the selected articles and arranging them in a sortable list in Microsoft Excel based on the objective of the study, methods, key findings, measurements, and statistical conclusions. The study data were grouped according to the research design, sample characteristics, and study setting. Relevant data were compared to identify common themes and concepts that were included in the final analysis. The final analysis was further used to determine if any articles were not meeting the inclusion and exclusion criteria.

The studies were analyzed and assessed using the Mixed Methods Appraisal Tool (MMAT) version 2018 (Hong et al., 2018). The MMAT is a critical appraisal tool that is used to analyze the methodological quality of qualitative, quantitative, and mixed-methods studies. The MMAT permits the appraisal of the methodological quality of five categories to studies: qualitative research, randomized controlled trials, nonrandomized studies, quantitative descriptive studies, and mixed-methods studies. The selected articles were read thoroughly and were assessed using the provided screening questions. The questions consisted of a “yes,” “no,” or “cannot tell” response, and an overall score of 0%, 25%, 50%, 75%, or 100% was given to each study. A higher score indicated a better methodology for that type of study.
Results

The preliminary searches using the selected keywords in the electronic databases of PubMed, CINAHL, and ProQuest generated 284 articles. After the initial review, 36 articles were removed as 16 articles were identified as duplicates and 20 articles didn’t meet the inclusion criteria. Abstracts of the remaining 248 articles were reviewed and finally 134 articles were selected for full article review. A thorough review of those articles yielded a final count of 17 articles that were included in the analysis. There were eight qualitative studies, seven quantitative studies, and two mixed-methods studies.

a) Motivators

i. Knowledge About Cancer

Four studies identified knowledge about cancer as one of the motivators for breast cancer screening. Women who had a positive experience associated with cancer, such as family members and friends surviving cancer, were more eager to learn about the disease and exhibited a positive change in their perceptions and behavior towards the disease (Mishra, DeForge, Barnet, Ntiri, & Grant, 2012). A positive change in cancer-related health behavior was associated with the belief that there is hope for living and that people can survive after cancer. Studies reported that women preferred educational sessions about cancer in general rather than a specific type to have a better understanding of the overall disease. Information and reminders from primary care providers were deemed as a motivator. Additionally, educational print materials from physicians were found to have an encouraging impact on screening (Ndukwe, Williams, & Sheppard, 2013; Passmore, Williams-Parry, Casper, & Thomas, 2017).
“My primary just reminds me when I go for my physical. I have high blood pressure so if I go back in six months she will be like, ‘You didn't get your mammogram?’ And then I say, I'm going, and then that's it.”

Additionally, women reported that having information regarding early detection of breast cancer and specific knowledge about lifestyle behaviors that can possibly increase their chances of having breast and other type of cancer can act as a significant motivator for cancer screening and can help initiate lifestyle changes (Wells, Shon, McGowan, & James, 2017). Women receive the majority of this information from their female family members, friends, primary healthcare physician, co-workers, or through public awareness campaigns.

“I know that smoking is bad for you. The sun can cause you to have skin cancer. The sun can burn; I don’t know how that happens. These are things that can cause you to have breast cancer: being around people who smoke, the wrong diet, exercise. I am not sure if it’s all true, but it does play a part, I believe.”

ii. Personal Experiences

Personal positive experiences were identified as motivators for breast cancer screening. Women who had witnessed how cancer affected their friends or family members wanted to have a positive change in their health behaviors to avoid the struggles associated with cancer treatment (Adegboyega, Aroh, Voigts, & Jennifer, 2019; Passmore et al., 2017; Wells et al., 2017). Women who had a family history of breast cancer were observed to get screening at an earlier age. Grief and sadness due to death or diagnosis of friends and family members from cancer prompted their desire to get screened. These women were motivated by “wanting to live, “to be there for
grandchildren,” “to see,” and “getting older,” which strengthened their belief in screening and early diagnosis.

“I had two aunts, one died of skin cancer, and the other one died from liver cancer. Just seeing how it affected them, even as they were going through their treatments and up to their final day … You see somebody waste away like that and you just want to do better for yourself and for your kids.”

“I started getting one at 35. I knew I needed mammogram because my mother was getting them . . . ”

Personal experiences of cancer screening also acted as a motivator for some women. Women often avoid cancer screening based on the anecdotes of negative experiences from family and friends (Ndukwe et al., 2013). A first-hand cancer screening assists them to overcome the fear and motivated them to get screened according to the recommended guidelines. Additionally, experiencing a complication such as a lump in the breast or pain often leads women to a breast cancer screening. Women who also shared their concerns regarding abnormalities in their breast or symptoms with other women or had received encouraging feedback about mammography from their social network were more likely to get screened (Adegboyega et al., 2019; Gullatte, Brawley, Kinney, Powe, & Mooney, 2010). A positive experience with a previous healthcare visit can act as a motivator for future follow-up checkups.
iii. Other Factors

Women reported that having access to primary care providers and having recommendations from physicians acted as a motivator for breast cancer screening (Adegboyega et al., 2019). However, the long wait time during a previous visit or difficulty in scheduling an appointment often acted as a deterrent for screening. Additionally, it has been observed that other factors, such as having female healthcare providers, transportation accessibility, and having helpers with daily chores if they were sick, were significantly and positively associated with having a breast exam or a mammogram (Guo, Cheng, & Yun Lee, 2019).

Barriers and Challenges

i. Limited Knowledge

Limited knowledge was identified as a significant barrier to breast cancer screening by several studies. In two studies, women reported having some information about the benefits of early detection and how routine mammography screening can reduce breast cancer-related deaths (Watson-Johnson et al., 2011; Wells et al., 2017). Some women were also aware of the association between smoking, sun exposure, unhealthy diet, and lack of exercise with an increased risk of breast cancer. However, most of the women were unsure about the screening guidelines, how the benefits and risks associated with cancer screening vary with age, and the recommended age for routine screening (Passmore et al., 2017).

“Well, I know they keep changing the data, before 40, at 40, 10 years, every year, every other year, every third year.”
Young et al. (2011) reported that about 74% of the women population had incorrect knowledge of whether cancer is hereditary, and 54% of women were unsure about the effectiveness of mammography vs. a breast self-exam (Young, Schwartz, & Booza, 2011). Women also reported confusion regarding the association between age, race, and the risk of breast cancer, and a few women were of the opinion that breast cancer is a “White woman’s disease.” (Passmore et al., 2017).

“I think for the most part, breast cancer is seen as a White woman’s disease. So, it’s not something that we feel that is running rampant in our communities at least.”

Some women were unable to differentiate between mammogram and breast self-examination, and most of the women were uneducated regarding the mammography procedure (Adegboyega et al., 2019). The limited knowledge about the mammography procedure can be also linked to the “fear of the unknown” that often acted as a strong deterrent for breast cancer screening.

“I was thinking that a mammogram was when you do the breast exam . . . I said, I’ve been doing those [mammography] at home myself. She was like, you can’t do it at home.”

“When you said mammogram, I am thinking needle and syringe, you know that type thing, to check it. Not knowing that it is just a machine that you’re going to be standing in front of and press down.”

Three studies reported that some women perceived routine breast cancer screening as unnecessary if they did not have a family history of cancer, while some women believed that “a
healthy lifestyle,” including positive thinking, healthy diet, and exercise, can prevent the disease (Mishra et al., 2012; Watson-Johnson et al., 2011; Wells et al., 2017). However, many women were uncertain about how much lifestyle changes can contribute to mitigate breast cancer as the results are not always evident and seemed “random.” Women also believed that demographic attributes such as older age, lower socioeconomic background, and lower levels of education caused breast cancer. Additionally, it was observed that women lacked the knowledge of specific services such as free mobile mammography that deterred breast cancer screening in women who were concerned about mammography-related costs (Fayanju, Kraenzle, Drake, Oka, & Goodman, 2014).

ii. Perceptions of Fear

Several studies reported “fear” as a critical barrier to breast cancer screening. The feeling of fear was not only limited to the “fear of physical discomfort” during mammography or the “fear of pain,” but also included the “fear of the results and the unknown.” Most of the women perceived mammography screening as painful and uncomfortable, which stemmed either from their prior experiences with mammography or was based on the information obtained from other women in their social circle (Adegboyega et al., 2019; Mishra et al., 2012). Negative experiences of close family members and friends also acted as a major deterrent to mammography as revealed by participants in focus group discussions and interviews (Passmore et al., 2017).

“I was more afraid of taking one because I had heard everybody was like, oh it’s going to hurt, it’s going to hurt, and I don’t like pain.”
“The pain. When they called me for this study I told them, I said, that was my second one. She said, you haven’t had one since 2012? I said, no, and I vowed after 2012 that was my last one because it was just so painful.”

“It hurts; they smash you. It was worse, so I didn’t go back.”

The fear of “receiving bad news and the fear of the unknown” were also major reasons for avoiding screening (Byrne, Smith Glasgow, & DeShields, 2011; Fayanju et al., 2014; Passmore et al., 2017). According to the quantitative study conducted by Fayanju et al. (2014), about 10% of women recognized the fear of receiving a cancer diagnosis as a barrier to breast cancer screening. Women reported anxiety related to screening results and emotional coping issues, particularly when there is a history of cancer or cancer-related death in the family (Adegboyega et al., 2019; Wells et al., 2017). However, Fayanju et al. (2014) also proposed that the fear of receiving a cancer diagnosis can also act as a protective emotion that can ultimately compel some women to get screened.

“I don’t want to know that I have it or that I don’t have it.”

“What you don’t know won’t hurt you.”

Additionally, a few studies reported that women who had the “fear of the unknown” didn’t have an understanding of the procedural part of breast cancer screening and were concerned about being exposed to harmful radiations and potential side effects (Adegboyega et al., 2019; Watson-Johnson et al., 2011). These women believed that radiation exposure from annual mammography screening could accumulate over time and lead to breast cancer.
‘‘You take a chance on something happening to you from just the x-ray, something getting in your system that wasn’t in there before. And maybe in six months or three months later, something shows up and you wonder where it came from because you didn’t have it.’’

iii. Cost Concerns

Cost concerns or economic hardship was a common theme that resonated across eight of the reviewed articles. Results from two studies revealed that between 15-40% of interviewed women identified cost as one of the top five structural screening barriers (Fayanju et al., 2014; Young et al., 2011). Similar results were observed in another study that reported a significant negative association (adjusted odds ratio = 0.16, \( p = 0.05-0.55 \)) between cost concerns and women obtaining a mammogram in a span of two years (Best, Strane, Christie, Bynum, & Wiltshire, 2017). Most of the cost-related concerns stemmed from insurance coverage; however, the results were not always consistent, as women who had insurance not always adhered to the recommended screening guidelines (Fayanju et al., 2014). In a study exploring the key attributes that contribute to the low utilization of mammography screening and breast self-exam among African American Women, it was observed that African American women who were residing in rural areas and had health insurance coverage reported a higher rate of breast cancer screening compared to uninsured African American women (65.33% vs. 34.67%; \( p < 0.001 \); (Chowdhury et al., 2016). Similarly, (Patel et al., 2014), in their study examining the demographic and lifestyle factors that influenced the decision to get screened for breast cancer in low-income African Americans, reported that 49% of the participants were concerned about the cost of cancer screening and 59% reported the lack of health insurance as a significant barrier to screening.
Women with insurance often reported concerns regarding the copayment and deductibles (Adegboyega et al., 2019).

“...well though I have health insurance, I still have the cost of the remaining balance if I haven’t met my deductible, so I really try not to go to the doctor at all or have any extra tests run, to keep my medical costs down.”

Additionally, multilayers of other cost-related barriers such as the distance to the screening center and transportation cost and loss of wages if diagnosed with cancer were also identified as primary cost-related concerns, particularly in women who resided in the rural areas (Fayanju et al., 2014; Watson-Johnson et al., 2011; Wells et al., 2017).

“The state only pays me to see a doctor for my psychiatrist or MD related to my disability, and I don’t have any transportation and bus fare is $3 one-way, which is expensive. And they are getting ready to cut more of our resources and getting ready to cut our food stamps, which is going to make it even more difficult.”

“Cost is going to be a big factor for me. If I have a lump or something where I’m concerned about my health, then I will go. But if there is nothing and I feel okay, it’s going to be very difficult to keep once a year examination.”

Most women from lower socioeconomic background were unemployed or underemployed and struggled to meet the basic necessities such as food, rent, etc. (Shelton, Goldman, Emmons, Sorensen, & Allen, 2011). These women expressed a sense of shame regarding their lack of money and the feeling of being a burden to their family members. They were highly
stressed and their economic distress greatly affected their health behaviors and adherence to recommended screening guidelines.

iv. Individual Factors

Several individual factors were identified in the published literature that posed an obstacle to the recommended breast cancer screening. Women were concerned about both their physical and social privacy. Physical privacy included concerns about the physical exposure required during the screening process, particularly receiving the service from male physicians (Adegboyega et al., 2019; Ndukwe et al., 2013; Watson-Johnson et al., 2011). A preference towards women physicians and technicians was observed across the reviewed studies. Concerns about social privacy stemmed from the perceptions of shame and stigma associated with a cancer diagnosis. In some communities, women stated that they were afraid to disclose their diagnosis to other members of the society in fear of the associated social stigma. Stigmas related to social isolation, lack of support from family members, and being in an abusive relationship were also identified as barriers to screening.

“‘Well, it’s embarrassing, period. You’re exposing your breasts to somebody other than, maybe anybody, maybe you’re not even married.’”

One of the other primary inhibitors was religious and cultural beliefs associated with cancer screening. Many women were of the belief that their faith in God will preserve their health and protect them from cancer (Gullatte et al., 2010; Ndukwe et al., 2013; Shelton et al., 2011). Some perceived cancer as a curse which is often accompanied by stigma, shame, and the
underlying belief that the patient must have committed some sin to deserve a cancer diagnosis. Another important barrier to screening adherence involved psychosocial issues. Some women believed in destiny and were under the impression that breast cancer can develop from talking, thinking, and worrying about it (Watson-Johnson et al., 2011). Fatalistic beliefs related to the lack of control one has over their diagnosis and that cancer is associated with destiny and cannot be prevented also contributed to nonadherence to recommended screening practices (Adegboyega et al., 2019).

“I’ve been smoking since I was 17… I don’t get sick… I talk to God and ‘by strife, I am healed.’”

Perceived roles of women were also identified as a barrier to cancer screening. Women often perceived themselves as the caregiver of the family, and their own health was the least of their priorities (Passmore et al., 2017; Watson-Johnson et al., 2011). Women often reported that they felt responsible for the well-being and happiness of others and found it difficult to share their diagnosis with family members. The perceived caregiving responsibilities hindered women’s abilities to balance their work, family, and household duties, and most of the women reported being stressed (Shelton et al., 2011).

“I think women in general, I think we always kind of put ourselves on the bottom of the list. Everything else comes first, and we forget about ourselves, taking care of ourselves.”
“I was saying, sometimes you just can't take that day off. When you're the only one providing for them kids, you got to make everything count. You got to take care of them kids, and you don't be thinking about yourself.”

v. Other Factors

Review of literature revealed several other factors that contributed as a significant barrier to breast cancer screening. Transportation and access to screening centers were also identified as barriers to cancer screening. Women complained that it was often difficult to obtain an appointment, or they didn’t have a means to attend the appointment (Ndukwe et al., 2013). There were additional structural barriers related to medical facilities and screening that were identified in several studies. In a cross-sectional study involving African American women with lower income, women reported long wait for the services in a mammogram facility, lack of mammogram facility in their area, and difficulty with transportation as barriers to breast cancer screening (Byrne et al., 2011; Mishra et al., 2012; Young et al., 2011). Additionally, studies revealed concerns about inconvenient location of the screening facility and being denied insurance in the future if diagnosed with breast cancer (Patel et al., 2014; Watson-Johnson et al., 2011; Wells et al., 2017). Logistical issues such as lack of childcare, getting time off from work, competing priorities, and time constraints were also mentioned as barriers to screening.

“‘What I can’t stand is the time you [take to] have the mammogram and then the time they wait to tell you. I think it should be sooner, like a week or so before – you’ve got to worry all that time.’”
Perceived discrimination along with an overall mistrust towards the healthcare system and medical research emerged as a common theme among African American women. Participants in the studies felt that the physicians did not spend adequate time with the patients, teach how to perform self-breast examination, talk about breast cancer, or make a referral to mammography. Women were suspicious regarding the efficacy of mammograms and the treatments that they received after being diagnosed with breast cancer, particularly about the hormone replacement therapy and mastectomy. Women were hesitant and did not trust their physician in disclosing enough information to them or providing them with the best possible care (Guo et al., 2019; Shelton et al., 2011; Young et al., 2011). A prior negative experience with healthcare providers, including experiences and stories shared by friends and families, projected a mistrust towards the system and physicians.

“Medical procedures and hormones and all that they’re injecting in this person. I do think it could cause cancer. I do.”

“I believe in my mind once you open the person up and expose them to the air, then [cancer] starts to take it on. I think being cut on, that feeds the cancer.”

“One of my acquaintances had a mammogram done, and 6 months later, she was detected with cancer. So, I don’t believe in the effectiveness of mammograms.”

“You know, especially over the history of medicine, they’ve always used minorities in their experiments, in their procedures…and that goes way back now, a stretch.”
Discussion

In this study, an integrative literature review of relevant qualitative, quantitative, and mixed-methods empirical research was conducted to understand the current breast cancer screening motivators and challenges in the African American women population. Literature search using the preselected keywords and inclusion and exclusion criteria generated 17 articles for final review that were included in the study. The common motivators identified for breast cancer screening in the African American women population included knowledge about cancer, personal experiences, and other factors including ease of transportation, presence of female healthcare provider in the screening facility, and easy access to healthcare facilities. The barriers identified were categorized into five groups: lack of knowledge, concerns about screening-related cost, perceptions about breast cancer and the associated fear, individual or personal factors, and other factors including religious and fatalistic belief, perceived discrimination, and accessibility.

Knowledge was a common factor that was identified as both a barrier and motivator for breast cancer screening. Women who had more knowledge about cancer in general and were aware of the guidelines or had recommendations and referrals from their primary healthcare provider were more likely to get screened. Alternatively, women who had limited knowledge about cancer were less likely to get screened. Limited knowledge included lack of information about lifestyle behaviors such as smoking, drinking, unhealthy diet, etc., that can cause cancer; procedures and effectiveness of screening practices; and demographic and genetic factors that can predispose an individual to breast cancer. Lack of knowledge can be related to the second major barrier to breast cancer screening, which is fear. The perception of fear was not only
limited to physical discomfort or pain but also included the fear of the unknown and the fear of receiving bad news. Cost was another common concern that can act both as an enabler and a barrier to screening. Women with adequate health insurance were more likely to get screened compared to women who didn’t have insurance or were from a lower socioeconomic background. Additionally, the distance to the screening center, the cost of transportation, along with the fear of loss of wages were also contributing factors to limited breast cancer screening. Personal factors such as religious and fatalistic beliefs were also an obstacle to breast cancer screening. Issues with physical and social privacy, in addition to shame and stigma, were common screening deterrents that were identified in the literature. Personal factors could also act as a motivator depending on the prior experiences of the individual. Women who had friends and family diagnosed with breast cancer tend to have a different outlook towards the disease. They wanted to avoid the same suffering for themselves and had a positive outlook towards life. Additionally, they wanted to gain more knowledge about the disease and bring a change to their health behaviors.

In this study, the themes identified as motivators and barriers to breast cancer screening is reflective of the primary theoretical framework that guided this integrative literature review. Barriers such as knowledge, personal experiences, and beliefs are interdependent on each other and resonate with the principle of ecological perspective theory. Similarly, knowledge and personal experiences also play a significant role in determining an individual’s perceived severity, perceived susceptibility, perceived benefits, and perceived barriers towards a disease which are crucial to the principles of the HBM. Educating women about the disease and teaching
them ideal screening practices, guidelines, and appropriate lifestyle changes can modify their perceptions towards the disease and can initiate positive changes.

The strength of this study is that it comprises different types of empirical research and covers a large sample size within the population of interest. The studies provided correlations between the demographic variables and the constructs of the barriers. From a methodological perspective, one of the major strengths of an integrative literature review is that it helps identify gaps in the current research. Since integrative literature review is guided by specific questions, it assists with identification of a central theme and recognizes opportunities for future research. Such type of review can also help in identifying what research method and interventions have been conducted so far.

One of the major limitations of this study is that most of the studies reviewed lacked supporting evidence that were related to the established barriers or motivators. For example, lack of physician recommendation was identified as a barrier; however, no specific correlation was reported in the studies that justified the claim. A second limitation is that although the study population included the African American population, demographically, the population was diverse in terms of their age, socioeconomic background, and education. The discrepancy could have an impact on the interpretation of the themes identified as barriers and motivators in this population.

**Recommendations for Future Research**

The evidence obtained from this integrative literature review indicates that despite the current screening guidelines, access to mobile mammography platforms, and increased
awareness, there are still significant barriers associated with breast cancer screening in the African American women population. Future research should explore these barriers in depth and identify the root cause that can help eliminate the obstacles. Researchers should focus on why primary care physicians are not recommending mammograms according to the guidelines or why there is a discrepancy between patient behavior and physician recommendation. Healthcare providers should be included in future studies along with the target population of interest to identify patterns in behavior and strategies that can motivate patients to obtain a screening. From an organizational perspective, research should be undertaken to understand scheduling conflicts and how to prioritize patients based on their needs.

Since knowledge was identified as a key barrier and motivator, future research should focus on appropriate dissemination of knowledge to the target population through educational programs. It is important to understand how educational programs can be personalized based on the community and demographic characteristic for it to be most effective. Additionally, researchers should focus on measuring the effectiveness of the program to modify and alter parameters as needed. Future studies should also focus on understanding the interrelationship of the barriers and how to combat these obstacles with an interdisciplinary approach. More studies are needed to understand the overall health behavior patterns of this population and how to design interventions to improve not only the breast cancer-related screening practices, but the overall health and health-related behavior in the African American women population.
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CHAPTER III

CURRENT BREAST CANCER-RELATED KNOWLEDGE AND PERCEPTIONS IN FEMALE AFRICAN AMERICAN COLLEGE STUDENTS

Introduction

Breast cancer is the most common form of cancer and is one of the primary causes of cancer-related mortality in women worldwide. According to the American Cancer Society (ACS), about one in eight women develop breast cancer in their lifetime, and in 2020, approximately 2.3 million women globally were affected by breast cancer that caused about 685,000 deaths (World Health Organization, 2021). Several studies have reported that periodic screening with mammography as per the recommended guidelines is the most effective way to detect breast cancer at an early stage, which can decrease mortality and the chances of worst clinical outcomes (Coleman, 2017; Ginsburg et al., 2020). It has been observed that women tend to disregard the recommended screening guidelines and the overall breast cancer screening rates are still below the Healthy People 2020 target of 81.1% (Centers for Disease Control and Prevention, 2012).

Studies have reported that having an extensive health knowledge is important and has a positive impact on the overall survival and quality of life in many diseases, including cancer. Individuals who are knowledgeable about the benefits of having a healthy diet and exercise and are aware of the disease risks that they are predisposed to are more likely to lead a healthy
lifestyle (Fitzgerald, Singleton, Neale, Prasad, & Hess, 1994; Pirouznia, 2001). Furthermore, being knowledgeable about the disease, its symptoms, the associated health risks, and the preventative measures enables an individual to participate actively in effective decision making regarding medical care and treatment options. It also promotes early screening and detection that can improve the clinical outcome for a patient.

It has been observed that overall knowledge and perceptions regarding breast cancer are relatively poorer in African American women compared to women of other ethnicities. Several studies have reported that breast cancer-related knowledge is relatively lower in African American women who have been diagnosed with breast cancer when compared to women of other ethnicities (Fagerlin et al., 2006; Freedman, Kouri, West, & Keating, 2015; Katz, Lantz, & Zemencuk, 2001; Sepucha, Ozanne, Silvia, Partridge, & Mulley, 2007). African American women have also demonstrated lower adherence rate to breast cancer screening guidelines, which can be attributed to lower socioeconomic background, limited access to healthcare, and poorer overall education. Additionally, factors such as age and family history of breast cancer can contribute to decreased perceptions of susceptibility in this population, and conflicting information from family, media, and health providers can also affect their risk perceptions regarding breast cancer (Allicock, Graves, Gray, & Troester, 2013).

Although several studies have explored the racial differences in breast cancer-related knowledge and perceptions, there is a paucity of literature that examines the breast cancer-related knowledge and perceptions of educated African American populations, such as college students (Harris, Miller, & Davis, 2003; Hawley, Fagerlin, Janz, & Katz, 2008; Miller & Champion,
It has been observed that education is an important factor that affects the knowledge and perceptions of breast cancer in a population. Therefore, exploring how breast cancer-related knowledge and perceptions differ between ethnicities in an educated sample cohort can provide insights into other related factors that might contribute to racial disparities. The aim of this study was to evaluate the current breast cancer-related knowledge of African American college students and whether that is different from the knowledge of non-Hispanic White students. Additionally, this study also evaluated the breast cancer-related perceived susceptibility, perceived benefits, and perceived susceptibility in African American college students and how that differed from the knowledge and perceptions of non-Hispanic White students after adjusting for three different covariables: education level, income level, and family history of breast cancer.

Materials and Methods

A. Sample Population and Data Collection

The intended population for this study was female college students who self-identified as African American and non-Hispanic White. The data for the study was collected using a self-administered survey questionnaire that was distributed via email to all female students who attended Northern Illinois University (NIU), DeKalb, IL. Participants were recruited by emails and flyers posted on the campus-specific organizational platforms. The approximate time required to complete the questionnaire was about 8-10 minutes and participation in the survey was voluntary. The survey answers were completely anonymous and the responses were not connected to individual participants or identifiers. Participants were eligible for a one-time drawing for a $50 Amazon gift card, which was an incentive to participate and respond to the
survey. Ten such Amazon gift cards were randomly sent to participants who fully completed the survey.

To ensure the protection of human participants, an Institutional Review Board (IRB) form was submitted and approved by the NIU IRB before the commencement of any data collection and is included in Appendix A. Only the data from those participants who completed the questionnaire in its entirety were used in the final statistical analyses.

**B. Instrumentation**

The survey questions for breast cancer-related knowledge and breast cancer-related perceptions were developed using a modified version of the prevalidated Breast Cancer Awareness Measure (BCAM) questionnaire and the revised Champion’s Health Belief Model Scales (CHBMS; Champion, 1999; Linsell et al., 2010). The BCAM questionnaire was developed by Cancer Research UK, King’s College London and University College London, in 2009 and was validated with the support of Breast Cancer Care and Breakthrough Breast Cancer. The CHBMS is a valid tool to measure beliefs about breast cancer and screening methods. The questionnaire modification was conducted and additional questions regarding breast cancer-related screening habits and health practices were added from other validated questionnaires after an extensive literature search to fit the research aims (Appendix B). The final survey questionnaire had four sections: 1) sociodemographic variables, 2) knowledge and perceptions of breast cancer, 3) screening practices, and 4) health behaviors.

The survey consisted of a total of 24 major questions with multiple items or subparts. The demographic questionnaire consisted of six questions that covered required information
regarding gender, age, ethnicity, education, income, and family history. A total of 24 questions were asked to evaluate breast cancer-related knowledge in the participants. Twelve of these questions were formatted on a 5-point Likert scale with responses listed as strongly agree, somewhat disagree, neither agree or disagree, somewhat disagree, and strongly disagree. Studies evaluating the construct validity and internal consistency of the BCAM questionnaire reported Cronbach’s alpha ranging from 0.67 (0.63–0.71) to 0.882 (0.78–0.86) at 95% confidence interval for women, which demonstrated an admissible level of internal consistency (Abdou, Van Hal, & Dille, 2020; Heidari & Feizi, 2018). The other questions required yes/no/do not know responses or selection of a correct response from the available options. Perceived susceptibility, perceived benefit, and perceived barriers were assessed using a 15-item questionnaire that was formatted on a 5-point Likert scale with responses listed as strongly agree, somewhat disagree, neither agree or disagree, somewhat disagree, and strongly disagree. Studies evaluating the construct validity and internal consistency of the CHBMS questionnaire reported Cronbach’s alpha ranging from 0.84 to 0.88, which demonstrated an admissible level of internal consistency and reliability (Htay et al., 2021; Moreira et al., 2020). Screening habits were assessed using six questions that were selected from the guidelines and literature that required yes/no/do not know responses or selection of a correct response from the available options. Health behavior was assessed using seven questions that required yes/no/do not know responses, or selection of a correct response from the available options.

C. Data Analysis

In this study, the factor evaluated was race/ethnicity (African American and non-Hispanic White), the dependent variables evaluated were Knowledge scores and Perception scores
(comprised of the subscales: perceived susceptibility, perceived benefits, and perceived barriers), and the covariates were education level, income, and family history. The responses were entered into a spreadsheet and descriptive statistics was conducted to analyze the demographic variables including ethnicity, age, income, education, and family history for all participants. A one-way analysis of covariance (ANCOVA) test was used to determine whether there were any statistically significant differences in means between the independent factors (African American and non-Hispanic White) based on the dependent variable Knowledge after controlling for education, income, and family history of breast cancer. A second ANCOVA test was used to determine whether there were any statistically significant differences in means between the independent factors (family history of breast cancer and no family history of breast cancer) based on the dependent variable Knowledge after controlling for education, income, and ethnicity. A third ANCOVA test was used to determine whether there were any statistically significant differences in means between the independent factors (African American and non-Hispanic White) based on the dependent variable Perception scores after controlling for education, income, and family history of breast cancer. A fourth ANCOVA test was used to determine whether there were any statistically significant differences in means between the independent factors (family history of breast cancer and no family history of breast cancer) based on the dependent variable Perception scores after controlling for education, income, and ethnicity. Sample sizes for the statistical tests were calculated using the G*Power analysis software for an alpha level of 0.05, an effect size of 0.5, and to achieve a power level of 0.80. The G*Power software calculated a minimum sample size of 90 participants to meet the above-mentioned criteria. All statistical analyses were conducted using IBM SPSS (version 26), Chicago, IL, with assistance from the NIU Department of Statistics and Actuarial Science.
Results

A total of 997 participants recorded their responses to the online survey. Among the total responses, 92 (9.2%) responses were partial or incomplete and were deleted from the final data analysis. There were three responses from male participants that were removed from the final analysis as the population of interest was female college students. Of the final 902 selected responses, 889 (98.6%) of the students identified themselves as “female” and 13 (1.4%) of the students identified themselves as “other,” which were removed from the final analysis. Of the 889 female responses selected, 518 (58.3%) responses were from non-Hispanic White students, 156 (17.5%) responses were from Hispanic students, 105 (11.8%) responses were from African American students, 84 (9.5%) responses were from Asian students, and 26 (2.9%) responses were from students who belonged to either Pacific Islander or Alaska Native or other ethnicity. For the final data analysis, only the African American and non-Hispanic White responses were selected, which contributed to the final sample size of 623 respondents.

A. Demographic Variables

Of the 623 respondents selected for the final analysis, 428 (68.7%) students belonged to the 18-25 years age group, 128 (20.5%) students belonged to the 26-40 years age group, 62 (10%) students belonged to the 41-59 years age group, and 5 (0.8%) students belonged to the above 60 years age group. The age data when further analyzed on the basis of ethnicity revealed that in the 18-25 years age group, there were 351 non-Hispanic Whites and 77 African Americans; in the 26-40 years age group, there were 105 non-Hispanic Whites and 23 African Americans;
Americans; in the 41-59 years age group, there were 57 non-Hispanic Whites and 5 African Americans; and in the above 60 age group, all five students were non-Hispanic Whites.

The highest level of education recorded was for students having a doctorate degree and the lowest level was undergraduate freshman. Of the 623 respondents, 487 (78.1%) students were undergraduates, 111 (17.8%) students had a master’s degree, 21 (3.3%) students had a doctoral degree, and 4 (0.6%) students had other technical education. Analysis based on ethnicity revealed that 399 non-Hispanic White and 88 African American students were undergraduates, 96 non-Hispanic White and 15 African Americans had a master’s degree, 19 non-Hispanic Whites and 2 African Americans had a doctoral degree, and all 4 students with technical education were non-Hispanic Whites.

Out of the 623 respondents, 57 (9.1%) students reported having a total income less than $9,999. Of these 57 students, 38 were non-Hispanic Whites and 19 were African American students. A total income between $10,000 - $19,999 was reported by 58 (9.3%) students, of which 43 were non-Hispanic Whites and 15 were African American students. A total income between $20,000 - $29,999 was reported by 47 (7.5%) students, of which 30 students were non-Hispanic Whites and 17 students were African American. A total income between $30,000 - $49,999 was reported by 70 (11.3%) students, of which 56 students were non-Hispanic Whites and 14 students were African American. A total income between $50,000 - $99,999 was reported by 156 (25%) students, of which 141 students were non-Hispanic Whites and 15 students were African American. A total income between $100,000 - $149,999 was reported by 91 (14.6%) students, of which 82 students were non-Hispanic Whites and 9 students were African American. A total income greater than $150,000 was reported by 53 (8.5%) students, of which 51 students
were non-Hispanic Whites and 2 students were African American. Ninety-one respondents comprising 77 non-Hispanic Whites and 14 African Americans did not prefer to answer their income in the survey.

Of the 623 respondents, 398 (63.9%) of the students had someone in their close friends and family who had breast cancer and 225 (36.1%) of the students had no family history of breast cancer. Of the 398 students who reported having a family history of breast cancer, 336 students were non-Hispanic Whites, and 62 students were African American. Table 1 demonstrates details of the demographic statistics for the sample population that were selected for final data analysis.

Table 1

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<th>Variable</th>
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<th>Percentage (%)</th>
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<tr>
<td>African American</td>
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<td>18-25</td>
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<td>Undergraduate - Junior</td>
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<td>$50,000 - $99,999</td>
<td>156</td>
<td>25.0</td>
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Demographic analysis by ethnicity revealed that a higher proportion of the African American students were undergraduates compared to non-Hispanic Whites (83.81% vs. 77.04%). Analysis of income data revealed that 52.9% of the non-Hispanic White students reported an income higher than $50,000 compared to 24.76% of African American students. A lower proportion of African American students had a family history of breast cancer (59.05%) compared to non-Hispanic White students (64.86%). Table 2 demonstrates details of the demographic statistics for the sample population based on the ethnicities of the students.

Table 2

| Demographic Characteristics of Sample Population by Ethnicity (N = 623) |
|-------------------------------------------------|-----------------|-----------------|-----------------|
| Variables                                      | Non-Hispanic White | African American |
| Age                                            |                  |                  |
| 18-25                                          | 351              | 67.8             | 77              | 73.3            |
| 26-40                                          | 105              | 20.3             | 23              | 21.9            |
| 41-59                                          | 57               | 11               | 5               | 4.8             |
| Above 60                                       | 5                | 0.9              | 0               | -               |
| Education                                      |                  |                  |
| Undergraduate - Freshman                       | 58               | 11.20            | 27              | 25.71           |
| Undergraduate - Sophomore                      | 58               | 11.20            | 11              | 10.48           |
| Undergraduate - Junior                         | 110              | 21.24            | 20              | 19.05           |
| Undergraduate - Senior                         | 173              | 33.40            | 30              | 28.57           |
| Master's Degree                                | 96               | 18.53            | 15              | 14.29           |
### B. Breast Cancer-Related Knowledge

The maximum score obtained for the breast cancer-related knowledge was 98, the minimum score was 23, and the average score was \( M = 66.91 \pm 15.21 \) as calculated for the entire sample population of 623 students. Of the 623 student participants, 218 students (35%) scored above 75 in the knowledge section and were deemed to have a higher knowledge about breast cancer, its symptoms, and risk factors. Of the 218 students, 189 students (86.7%) were non-Hispanic White and 29 students (13.3%) were African American. It was observed that 372 students (59.7%) of the students had a moderate knowledge about breast cancer, its symptoms, and risk factors, of which 308 students (82.8%) were non-Hispanic Whites and 64 students (17.2%) were African American. Only 33 students (5.3%) had low knowledge about breast cancer, its symptoms, and risk factors, of which 21 students (63.6%) were non-Hispanic Whites and 12 students were (36.4%) African American. Among the 518 non-Hispanic White students, 189 students (36.5%) had high knowledge, 308 students (59.5%) had medium knowledge, and 21

<table>
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<tr>
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students (4.1%) had low knowledge. Among the 105 African American students, 29 students (27.6%) had high knowledge, 64 students (61%) had medium knowledge, and 12 students (11.4%) had low knowledge (Figure 5).

![Graph showing the distribution of knowledge scores by ethnicity]

*Figure 5. Sample distribution based on knowledge score category and ethnicity.*

The average breast cancer-related knowledge score was $M = 67.67 \pm 14.78$ for non-Hispanic White students, and the average score was $M = 63.21 \pm 16.77$ for the African American students. After adjusting for the covariates education level, income, and family history, the breast cancer-related knowledge scores were greater in the non-Hispanic Whites $M = 67.052$, $SE = 1.282$ compared to the African American group $M = 65.261$, $SE = 1.855$. Table 3 illustrates the adjusted and unadjusted means for the breast cancer-related knowledge scores with education, income, and family history of breast cancer as covariates.
A one-way ANCOVA was conducted to determine if there was a statistically significant difference between ethnicities on breast cancer-related knowledge scores after controlling for the covariates education, income, and family history of breast cancer. It was observed that there was no statistically significant difference in breast cancer-related knowledge scores between the non-Hispanic White and the African American student groups, $F(1,607) = 1.180, p = 0.278$, after adjusting for the covariates education, income, and family history of breast cancer.

Table 3

<table>
<thead>
<tr>
<th>Sample</th>
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<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
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<tr>
<td>Non-Hispanic White</td>
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<td>67.67</td>
</tr>
<tr>
<td>African American</td>
<td>105</td>
<td>63.21</td>
</tr>
</tbody>
</table>

A second ANCOVA was conducted to determine if there was a statistically significant difference between family history and breast cancer-related knowledge after controlling for the covariates education, income, and ethnicity. It was observed that there was no statistically significant difference in breast cancer-related knowledge scores between students who had a family history of breast cancer and students who did not have a family history of breast cancer, $F(1,607) = 1.367, p = 0.243$, after adjusting for the covariates education, income, and ethnicity.

C. Breast Cancer-Related Perceptions

The average perceived susceptibility score observed among all 623 students was $M = 7.37 \pm 3.15$, the perceived benefit score was $M = 7.63 \pm 2.24$, and the perceived barrier score was $M = 9.59 \pm 7.1$. In non-Hispanic White students the average perceived susceptibility score was
$M = 7.61 \pm 2.9$, the perceived benefit score was $M = 7.76 \pm 2.12$, and the perceived barrier score was $M = 9.35 \pm 7.1$). In African American students, the average perceived susceptibility score was $M = 6.16 \pm 3.94$, the perceived benefit score was $M = 6.97 \pm 2.34$, and the perceived barrier score was $M = 10.76 \pm 7.14$. After adjusting for the covariates education level, income, and family history, the breast cancer-related perceived susceptibility scores were statistically significantly ($p < 0.001$) greater in the control group, non-Hispanic Whites ($M = 7.743, SE = 0.258$), compared to the African American group ($M = 6.365, SE = 0.374$). The adjusted means for the breast cancer-related perceived benefit scores were statistically significantly ($p < 0.001$) greater in the control group, non-Hispanic Whites ($M = 7.767, SE = 0.194$), compared to the African American group ($M = 7.071, SE = 0.281$). However, the breast cancer-related perceived barrier scores were lower in the control group, non-Hispanic Whites ($M = 8.775, SE = 0.585$), compared to the African American group ($M = 8.791, SE = 0.847$). Table 4 illustrates the adjusted and unadjusted means for the breast cancer-related perceived susceptibility, perceived benefit, and perceived barrier scores with education, income, and family history of breast cancer as covariates.

Table 4

**Adjusted and Unadjusted Means for the Breast Cancer-Related Perceived Susceptibility, Perceived Benefit, and Perceived Barrier Scores with Education, Income, and Family History of Breast Cancer as Covariates**

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<thead>
<tr>
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<td>African American</td>
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</table>

**Perceived Benefit**
A one-way ANCOVA was conducted to determine if there was a statistically significant difference between ethnicities on breast cancer-related perceived susceptibility, perceived benefit, and perceived barrier scores after controlling for the covariates education, income, and family history of breast cancer. It was observed that there was a statistically significant difference in breast cancer-related perceived susceptibility scores between the non-Hispanic White and the African American student groups, $F(1,607) = 17.184, p = < 0.001$, partial $\eta^2 = 0.028$, after adjusting for the covariates education, income, and family history of breast cancer. The partial eta-squared value indicated that for perceived susceptibility, the effect size was small (0.028), where ethnicity only accounted for 2.8% of the variance in breast cancer-related perceived susceptibility. There was a statistically significant difference in breast cancer-related perceived benefit scores between the non-Hispanic White and the African American student groups, $F(1,607) = 7.778, p = 0.005$, partial $\eta^2 = 0.013$, after adjusting for the covariates education, income, and family history of breast cancer. The partial eta-squared value indicated that for perceived benefit, the effect size was small (0.013), where ethnicity only accounted for 1.3% of the variance in breast cancer-related perceived benefits. There was no statistically significant difference in breast cancer-related perceived barrier scores between the non-Hispanic

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White and the African American student groups, $F(1,607) = 0.000, p = 0.983$, after adjusting for the covariates education, income, and family history of breast cancer.

An ANCOVA was conducted to determine if there was a statistically significant difference between family history and breast cancer-related perceptions after controlling for the covariates education, income, and ethnicity. It was observed that there was a statistically significant difference in breast cancer-related perceived susceptibility scores between students who had a family history of breast cancer and students who did not have a family history of breast cancer, $F(1,607) = 58.407, p < 0.001$, partial $\eta^2 = 0.088$, after adjusting for the covariates education, income, and ethnicity. The partial eta-squared value indicated that for perceived susceptibility, the effect size was medium (0.088), where ethnicity accounted for 8.8% of the variance in breast cancer-related perceived susceptibility. There was no statistically significant difference in breast cancer-related perceived benefit scores between students who had a family history of breast cancer and students who did not have a family history of breast cancer, $F(1,607) = 0.831, p = 0.362$. There was no statistically significant difference in breast cancer-related perceived barrier scores between students who had a family history of breast cancer and students who did not have a family history of breast cancer, $F(1,607) = 1.603, p = 0.206$.

Discussion

In this study, we evaluated the current breast cancer-related knowledge in African American college students and how that differed from the knowledge of non-Hispanic White students. We further explored the breast cancer-related perceived susceptibility, perceived
benefits, and perceived susceptibility in African American college students and how that differed from the knowledge of non-Hispanic White students after adjusting for different covariates.

The average knowledge score was higher in non-Hispanic White students when compared to the African American students; however, the difference was not statistically significant after adjusting for the education level, income, and family history variables. Similarly, the knowledge was not statistically significantly different between students who had a family history of breast cancer and students who did not have a family history of breast cancer, after controlling for income, education, and ethnicity variables. A statistically significant difference in perceived susceptibility and perceived benefit was observed between the non-Hispanic White and the African American students, where perceived susceptibility and perceived benefit was higher in non-Hispanic Whites compared to the African American student population. However, there was no statistically significant difference in breast cancer-related perceived barrier scores between the non-Hispanic White and the African American student groups, although the average barrier score was higher in African American population. The perceived susceptibility and benefit scores were statistically significantly different between students who had a family history of breast cancer and students who did not have a family history of breast cancer; however, the perceived barrier scores were not statistically significantly different between the groups.

The findings of this study are relatively consistent with the findings of the literature reviews, where studies have observed significantly higher breast cancer-related knowledge in non-Hispanic Whites when compared to African Americans (Freedman et al., 2015; Hawley et al., 2008). Breast cancer-related knowledge levels varied between the population based on their
education and income levels and it has been reported than women belonging to minority communities, lower socioeconomic background, and lower education levels have less knowledge compared to their counterparts. In this study, we evaluated the knowledge in population pursuing higher education and therefore it is possible that there was no statistically significant difference between the average knowledge scores between the non-Hispanic White and the African American ethnicities.

Studies evaluating breast cancer-related perceptions have reported that African American women usually consider themselves at a lower risk for developing breast cancer compared to non-Hispanic Whites (Lannin, Mathews, Mitchell, & Swanson, 2002; Olsen & Frank-Stromborg, 1994; Price, Desmond, Slenker, Smith, & Stewart, 1992; Vernon, Vogel, Halabi, & Bondy, 1993). Similar trends were observed in this study, where the average score for perceived susceptibility was substantially lower in African American students than non-Hispanic Whites when adjusted for education, income, and family history. The average score of perceived susceptibility was also substantially higher in the population who had a family history of breast cancer compared to the population who did not, when adjusted for ethnicity, education, and income. This aligns with the findings from studies that have reported that predictors including demographic, health status, health behavior, knowledge, and subjective norm variables change over time, which can contribute to the change in perceived susceptibility; however, breast cancer symptoms and cancer worry remain as a consistent predictor (McQueen, Swank, Bastian, & Vernon, 2008). Therefore, increasing knowledge about the symptoms and risks of breast cancer can act as an effective intervention method to promote screening habits and following recommended guidelines.
The average score of perceived benefit was lower in African American students than non-Hispanic Whites when adjusted for education, income, and family history. However, the average score of perceived benefit was not statistically significantly different on education, income, and family history levels when adjusted for the covariates. This perception of invulnerability can be attributed to the cultural norm observed in the African American population wherein communication regarding breast cancer incidents existing within the community is scarce (Phillips, Cohen, & Tarzian, 2001). Additionally, religious beliefs in African American communities can also contribute to the decreased perception of risk.

As expected from the literature reviews, the perceived barriers were higher in the African American population, although the difference was not statistically significant after controlling for the covariates education level, income, and family history. Socioeconomic variables including income levels and education have contributed to racial disparities regarding breast cancer-related perceptions and barriers. Additionally, spirituality, attitude, access to care, competing priorities, and medical mistrust are a few of the essential contributors that have been identified as barriers to breast cancer screening in the African American population (Freeman & Chu, 2005; Johnson, Elbert-Avila, & Tulsky, 2005; Lacey, 1993; LaVeist & Carroll, 2002; Wolff et al., 2003). Further research is required in the African American community to observe how the socioeconomic and other variables impact breast cancer-related perceived susceptibility, benefit, and barriers, particularly in the young college-educated female population, to design effective future interventions to initiate preventative screening at an appropriate age.
Conclusion

The findings from this study concluded that the overall knowledge of breast cancer, including the related risk factors and symptoms, is similar in both African American and non-Hispanic White female college students after controlling for the covariates education level, income level, and family history of breast cancer. Additionally, the knowledge was also the same between the students who had a family history of breast cancer and students who did not have a family history of breast cancer, after controlling for the covariates education level, income level, and ethnicity. However, it was observed that there was a significant difference between the perception of susceptibility and benefit between students of the two ethnicities, and the perception of susceptibility and benefit was higher in non-Hispanic Whites compared to the African American student population. Similarly, the perceived susceptibility and benefit scores were significantly different between students who had a family history of breast cancer and students who did not have a family history of breast cancer. For perceived barriers, although the score was higher in African American students; however, the difference was not significant between the groups. Further research is required in this population to understand the interplay of other factors such as spiritual and cultural beliefs and sociodemographic variables to understand in depth how breast cancer-related perceptions are affected. Specific intervention in this population is needed to improve the overall knowledge of breast cancer so that early screening can be promoted in the younger population, particularly in the high-risk groups who are more susceptible to the disease.
References


CHAPTER IV
CURRENT BREAST CANCER-RELATED SCREENING PRACTICES AND HEALTH BEHAVIORS IN AFRICAN AMERICAN COLLEGE STUDENTS

Introduction

Breast cancer is a significant public health problem. Globally, breast cancer is the most common form of cancer and is the leading cause of cancer-related mortality in women. Annually, approximately 2.1 million women are affected by breast cancer, and in 2018, about 627,000 women died from the disease globally (World Health Organization, 2021). According to the American Cancer Society (ACS), about one in eight women develop breast cancer in their lifetime, and approximately 268,600 new cases of invasive breast cancer were identified in the United States (U.S.) in 2019 (DeSantis et al., 2019). Despite treatment and diagnostic advances, the rate of breast cancer is increasing annually. In 2020, approximately 276,480 new cases of invasive breast cancer were expected to be diagnosed in the U.S., which is a 3.2% increase when compared to the 2019 data (American Cancer Society, 2021b; DeSantis et al., 2019). It has further been predicted that breast cancer will be responsible for 14.8% of all new cancer cases diagnosed in the U.S. and will result in approximately 7.2% of all cancer-related deaths (National Cancer Institute, 2021).

Early detection and timely treatment are the two most critical strategies that may improve breast cancer-related clinical outcomes and reduce mortality. Early breast cancer screening methods involve employing simple tests such as self-breast examination that can often detect
abnormal tissue lumps even before symptoms start appearing. It has been observed that the breast cancer stage at diagnosis, which refers to the extent of a cancer in the body, is critical in determining the treatment options and has a strong influence on the length of survival of the patient. According to the estimates of the National Cancer Institute (NCI), the overall 5-year survival rate is approximately 90% for all women diagnosed with breast cancer (National Cancer Institute, 2018). However, the survival rates are even higher (>98%) when breast cancer is diagnosed at an early stage, Stages 1 and 2, when the cancer is localized and is limited to only one part of the body where it originally started. In the later stages, Stages 3 and 4 (regional and distant stages) when the breast cancer spreads to other parts of the body, the 5-year survival rate is reduced dramatically by 13%-72%.

According to the World Cancer Research Fund (WCRF) and ACS cancer prevention guidelines, women should maintain a healthy weight, perform at least 150 minutes of moderate exercise in a week, limit their alcohol consumption, and follow a healthy, preferably plant-based diet (American Cancer Society, 2019; World Cancer Research Fund/American Institute for Cancer Research, 2018). Several studies have reported an association between obesity, being overweight, and adult weight gain as a risk for postmenopausal breast cancer in women (Eliassen, Colditz, Rosner, Willett, & Hankinson, 2006; Hou et al., 2013; Huang et al., 1997; Ligibel, 2011). Additionally, alcohol consumption can increase the risk of breast cancer by altering hormone levels and the associated biological pathways, including the metabolism of ethanol resulting in carcinogens, and the inhibition of the one carbon metabolism pathway (Chen, Rosner, Hankinson, Colditz, & Willett, 2011; Shield, Soerjomataram, & Rehm, 2016; Willett et al., 1987). Even low and moderate levels of drinking of alcohol have been associated
with an elevated risk of breast cancer. Adopting healthy habits like physical activity and having a healthy plant-based diet can alleviate the risk of breast cancer in pre- and postmenopausal women. It has been reported that physical activity is associated with a reduced risk of both estrogen receptor (ER)-positive and ER-negative breast cancer, even among women with a family history of breast cancer (Lynch, Neilson, & Friedenreich, 2010; Wu, Zhang, & Kang, 2013).

The objective of this study is to explore the current screening practices and health behaviors of college students and whether there is a significant difference in these variables based on the ethnicity of the student. Additionally, the study aims to explore whether there is any association between knowledge regarding breast cancer and screening practices and health behaviors.

Materials and Methods

A. Sample Population and Data Collection

The intended population for this study was female college students who self-identified as African American and non-Hispanic White. The data for the study was collected using a self-administered survey questionnaire that was distributed via email to all female students who attended Northern Illinois University (NIU), DeKalb, IL. Participants were recruited by emails and flyers posted on the campus-specific organizational platforms. The approximate time required to complete the questionnaire was about 8-10 minutes and participation in the survey was voluntary. The survey answers were completely anonymous and the responses were not connected to individual participants or identifiers. Participants were eligible for a one-time
drawing for a $50 Amazon gift card, which was an incentive to participate and respond to the survey. Ten such Amazon gift cards were randomly sent to participants who fully completed the survey.

To ensure the protection of human participants, an Institutional Review Board (IRB) form was submitted and approved by the NIU IRB before the commencement of any data collection and is included in Appendix A. Only the data from those participants who completed the questionnaire in its entirety were used in the final statistical analyses.

**B. Instrumentation**

The survey questions for breast cancer-related knowledge and breast cancer-related perceptions were developed using a modified version of the prevalidated Breast Cancer Awareness Measure (BCAM) questionnaire and the revised Champion’s Health Belief Model Scales (CHBMS; (Champion, 1999; Linsell et al., 2010). The BCAM questionnaire was developed by Cancer Research UK, King’s College London and University College London, in 2009 and was validated with the support of Breast Cancer Care and Breakthrough Breast Cancer. The CHBMS is a valid tool to measure beliefs about breast cancer and screening methods. The questionnaire modification was conducted and additional questions regarding breast cancer-related screening habits and health practices were added from other validated questionnaires after an extensive literature search to fit the research aims (Appendix B). The final survey questionnaire had four sections: 1) sociodemographic variables, 2) knowledge and perceptions of breast cancer, 3) screening practices, and 4) health behaviors.
The survey consisted of a total of 24 major questions with multiple items or subparts. The demographic questionnaire consisted of six questions that covered required information regarding gender, age, ethnicity, education, income, and family history. A total of 24 questions were asked to evaluate breast cancer-related knowledge in the participants. Twelve of these questions were formatted on a 5-point Likert scale with responses listed as strongly agree, somewhat disagree, neither agree or disagree, somewhat disagree, and strongly disagree. Studies evaluating the construct validity and internal consistency of the BCAM questionnaire reported Cronbach’s alpha ranging from 0.67 (0.63–0.71) to 0.882 (0.78–0.86) at 95% confidence interval for women, which demonstrated an admissible level of internal consistency (Abdou, Van Hal, & Dille, 2020; Heidari & Feizi, 2018). The other questions required yes/no/do not know responses or selection of a correct response from the available options. Perceived susceptibility, perceived benefit, and perceived barriers were assessed using a 15-item questionnaire that was formatted on a 5-point Likert scale with responses listed as strongly agree, somewhat disagree, neither agree or disagree, somewhat disagree, and strongly disagree. Studies evaluating the construct validity and internal consistency of the CHBMS questionnaire reported Cronbach’s alpha ranging from 0.84 to 0.88, which demonstrated an admissible level of internal consistency and reliability (Htay et al., 2021; Moreira et al., 2020). Screening habits were assessed using six questions that were selected from the guidelines and literature that required yes/no/do not know responses or selection of a correct response from the available options. Health behavior was assessed using seven questions that required yes/no/do not know responses, or selection of a correct response from the available options.
C. Data Analysis

In this study, the independent variable evaluated was Race/Ethnicity (African American and non-Hispanic White), the dependent variables evaluated were breast cancer Screening Practices scores and Health Behavior scores, and the covariates were education level, income, and family history. The responses were entered into a spreadsheet and descriptive statistics were conducted to analyze the demographic variables including ethnicity, age, income, education, and family history for all participants. A one-way analysis of covariance (ANCOVA) test was used to determine whether there were any statistically significant differences between the independent factor (African American and non-Hispanic White) based on the dependent variable Screening Practices after controlling for education, income, and family history of breast cancer. A second ANCOVA test was used to determine whether there are any statistically significant differences between the factor (African American and non-Hispanic White) based on the dependent variable Health Behavior after controlling for education, income, and family history of breast cancer. A 2 (Screening) x 3 (Knowledge) chi-square test was used to determine if there was an association between the knowledge level and screening practices in African American college students. Similar calculations were performed for the non-Hispanic White control group to observe if the strength of association changed between groups. A 3 (Knowledge levels) x 2 (Health Behaviors) chi-square test was used to determine if there was an association between the knowledge level and health behaviors in African American college students. Similar calculations were performed for the non-Hispanic White control group to observe if there were association changes between groups. Sample sizes for the statistical tests were calculated using the G*Power analysis software for an alpha level of 0.05, an effect size of 0.5, and to achieve a power level of 0.80. For the
ANCOVA model, the G*Power software calculated a minimum sample size of 90 participants to meet the above-mentioned criteria. For the chi-square model, the G*Power software calculated a minimum sample size of 88 participants to meet an alpha level of 0.05, an effect size of 0.3, and to achieve a power level of 0.80. All statistical analyses were conducted using IBM SPSS, Chicago, IL, with assistance from the NIU Department of Statistics and Actuarial Science.

Results

A total of 997 participants recorded their responses to the online survey. Among the total responses, 92 (9.2%) responses were partial or incomplete and were deleted from the final data analysis. There were three responses from male participants that were removed from the final analysis as the population of interest was female college students. Of the final 902 selected responses, 889 (98.6%) of the students identified themselves as “female” and 13 (1.4%) of the students identified themselves as “other,” which were removed from the final analysis. Of the 889 female responses selected, 518 (58.3%) responses were from non-Hispanic White students, 156 (17.5%) responses were from Hispanic students, 105 (11.8%) responses were from African American students, 84 (9.5%) responses were from Asian students, and 26 (2.9%) responses were from students who belonged to either Pacific Islander or Alaska Native or other ethnicity. For the final data analysis, only the African American and non-Hispanic White responses were selected, which contributed to final sample size of 623 respondents.

A. Demographic Variables

Of the 623 respondents selected for the final analysis, 428 (68.7%) students belonged to the 18-25 years age group, 128 (20.5%) students belonged to the 26-40 years age group, 62
(10%) students belonged to the 41-59 years age group, and 5 (0.8%) students belonged to the above 60 years age group. The data for age, when further analyzed on the basis of ethnicity, revealed that in the 18-25 years age group, there were 351 non-Hispanic Whites and 77 African Americans; in the 26-40 years age group, there were 105 non-Hispanic Whites and 23 African Americans; in the 41-59 years age group, there were 57 non-Hispanic Whites and 5 African Americans; and in the above 60 age group, all 5 students were non-Hispanic White students.

The highest level of education recorded was students having a doctorate degree and the lowest level was undergraduate freshman. Of the 623 respondents, 487 (78.1%) students were undergraduates, 111 (17.8%) students had a master’s degree, 21 (3.3%) students had a doctoral degree, and 4 (0.6%) students had other technical education. Analysis based on ethnicity revealed that 399 non-Hispanic White and 88 African American students were undergraduates, 96 non-Hispanic White and 15 African Americans had a master’s degree, 19 non-Hispanic Whites and 2 African Americans had a doctoral degree, and all 4 students with technical education were non-Hispanic Whites.

Out of the 623 respondents, 57 (9.1%) students reported having a total income less than $9,999. Of the 57 students, 38 were non-Hispanic Whites and 19 were African American students. A total income between $10,000 - $19,999 was reported by 58 (9.3%) students, of which 43 were non-Hispanic Whites and 15 were African American students. A total income between $20,000 - $29,999 was reported by 47 (7.5%) students, of which 30 students were non-Hispanic Whites and 17 students were African American. A total income between $30,000 - $49,999 was reported by 70 (11.3%) students, of which 56 students were non-Hispanic Whites and 14 students were African American. A total income between $50,000 - $99,999 was reported
by 156 (25%) students, of which 141 students were non-Hispanic Whites and 15 students were African American. A total income between $100,000 - $149,999 was reported by 91 (14.6%) students, of which 82 students were non-Hispanic Whites and 9 students were African American. A total income greater than $150,000 was reported by 53 (8.5%) students, of which 51 students were non-Hispanic Whites and 2 students were African American. Ninety-one respondents comprising 77 non-Hispanic Whites and 14 African Americans did not prefer to answer their income in the survey.

Of the 623 respondents, 398 (63.9%) of the students had someone in their close friends and family who had breast cancer and 225 (36.1%) of the students had no family history of breast cancer. Of the 398 students who reported having a family history of breast cancer, 336 students were non-Hispanic Whites and 62 students were African American. Table 5 demonstrates details of the demographic statistics for the sample population that were selected for final data analysis.

Table 5
Demographic Characteristics of Sample Population (N= 623)

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>518</td>
<td>83.1</td>
</tr>
<tr>
<td>African American</td>
<td>105</td>
<td>16.9</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-25</td>
<td>428</td>
<td>68.7</td>
</tr>
<tr>
<td>26-40</td>
<td>128</td>
<td>20.5</td>
</tr>
<tr>
<td>41-59</td>
<td>62</td>
<td>10.0</td>
</tr>
<tr>
<td>Above 60</td>
<td>5</td>
<td>0.8</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Undergraduate - Freshman</td>
<td>85</td>
<td>13.6</td>
</tr>
<tr>
<td>Undergraduate - Sophomore</td>
<td>69</td>
<td>11.1</td>
</tr>
<tr>
<td>Undergraduate - Junior</td>
<td>130</td>
<td>20.9</td>
</tr>
<tr>
<td>Undergraduate - Senior</td>
<td>203</td>
<td>32.6</td>
</tr>
<tr>
<td>Master's Degree</td>
<td>111</td>
<td>17.8</td>
</tr>
</tbody>
</table>
Demographic analysis by ethnicity revealed that a higher proportion of the African American students were undergraduates compared to non-Hispanic Whites (83.81% vs. 77.04%). Analysis of income data revealed that 52.9% of the non-Hispanic White students reported an income higher than $50,000 compared to 24.76% of African American students. A lower proportion of African American students had a family history of breast cancer (59.05%) compared to non-Hispanic White students (64.86%). Table 6 demonstrates details of the demographic statistics for the sample population based on the ethnicities of the students.

Table 6

<table>
<thead>
<tr>
<th>Demographic Characteristics of Sample Population by Ethnicity (N = 623)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Age 18-25</td>
</tr>
<tr>
<td>Age 26-40</td>
</tr>
<tr>
<td>Age 41-59</td>
</tr>
<tr>
<td>Age Above 60</td>
</tr>
</tbody>
</table>
B. Breast Cancer Screening Practices

The maximum score obtained for the breast cancer screening practices was 24, the minimum score was 4, and the average score was $M = 15.98 \pm 3.35$ as calculated for the entire sample population of 623 students. Of the 623 student participants, 185 students (29.7%) demonstrated adequate screening practices, whereas 438 students (70.3%) demonstrated inadequate screening practices. Of the 185 students with adequate screening practices, 140 students (75.6%) were non-Hispanic White and 45 students (24.3%) were African American. Of the 438 students who had inadequate screening practices, 378 students (86.3%) were non-
Hispanic Whites and 60 students (13.7%) were African American. Among 518 non-Hispanic White students, 140 students (27%) had adequate screening practices and 378 students (73%) had inadequate screening practices. Among the 105 African American students, 45 students (42.9%) had adequate screening practices, whereas 60 students (57.1%) had inadequate screening practices (Figure 6).

The average breast cancer-related screenings score was $M = 6.52 \pm 3.31$ for non-Hispanic White students, and the average score was $M = 7.37 \pm 3.45$ for the African American students. After adjusting for the covariates education level, income, and family history, the breast cancer-related screening practices scores were lower in the control group, non-Hispanic Whites ($M = 6.075$, $SE = 0.279$), compared to the African American group ($M = 7.412$, $SE = 0.403$). Table 7 illustrates the adjusted and unadjusted means for the breast cancer-related screening practices scores with education, income, and family history of breast cancer as covariates.

![Figure 6. Sample distribution based on screening practices and ethnicity.](image-url)
A one-way ANCOVA was conducted to determine if there is a statistically significant difference between ethnicities on breast cancer-related screening practices after controlling for the covariates education, income, and family history of breast cancer. It was observed that there was a statistically significant difference in breast cancer-related screening practices between the non-Hispanic White and the African American student groups, $F(1,607) = 13.916$, $p < 0.001$, partial $\eta^2 = 0.022$, after adjusting for the covariates education, income, and family history of breast cancer. The $\eta^2$ value indicated that for ethnicity the effect size was small (0.022), which means that ethnicity accounted for 2.2% of the variance in breast cancer-related screening practices.

A 2 (Screening) x 3 (Knowledge) chi-square test was used to determine if there was an association between the knowledge level and screening practices of African American college students. Similar calculations were performed for the non-Hispanic White control group to observe whether the strength of association changed between groups. It was observed that there was a statistically significant association between screening practices and knowledge level for breast cancer, $\chi^2(2) = 12.783$, $p = .002$. The effect size for the chi-square model indicated that there was a small association between knowledge level and screening practices for breast cancer, $\phi_c = 0.143$, $p = .002$. From the stacked bar chart, it can be further interpreted that students with
higher breast cancer-related knowledge will have more adequate screening practices. About 38.53% of the students with high knowledge of breast cancer had adequate screening practices compared to 25.27% of the students with moderate knowledge of breast cancer and 21.21% students with low knowledge of breast cancer (Figure 7).

![Figure 7](image)

**Figure 7.** Stacked bar percent of knowledge score category against screening practices score category

**C. Breast Cancer-Related Health Behaviors**

The average breast cancer-related health behaviors score was $M = 16.02 \pm 3.31$ for non-Hispanic White students, and the average score was $M = 15.76 \pm 3.57$ for the African American students. After adjusting for the covariates education level, income, and family history, the breast cancer-related health behaviors scores were higher in the control group, non-Hispanic Whites ($M = 16.014, SE = 0.292$), compared to the African American group ($M = 15.752, SE = 0.423$).
Table 8 illustrates the adjusted and unadjusted means for the health behaviors scores with education, income, and family history of breast cancer as covariates.

An ANCOVA was run to determine the effect of ethnicity on breast cancer-related screening practices after controlling for the covariates education, income, and family history of breast cancer. It was observed that there was no statistically significant difference in breast cancer-related screening practices between the non-Hispanic White and the African American student groups, $F(1,607) = 0.485, p = 0.487$, after adjusting for the covariates education, income, and family history of breast cancer.

Table 8

Adjusted and Unadjusted Means for the Breast Cancer-Related Health Behaviors Scores with Education, Income, and Family History of Breast Cancer as Covariates

<table>
<thead>
<tr>
<th>Sample</th>
<th>$N$</th>
<th>$M$</th>
<th>$SD$</th>
<th>$M$</th>
<th>$SE$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Hispanic White</td>
<td>518</td>
<td>16.02</td>
<td>3.31</td>
<td>16.014</td>
<td>0.292</td>
</tr>
<tr>
<td>African American</td>
<td>105</td>
<td>15.76</td>
<td>3.57</td>
<td>15.752</td>
<td>0.423</td>
</tr>
</tbody>
</table>

A 2 (Health Behaviors) x 3 (Knowledge) chi-square test was used to determine if there was an association between the knowledge level and health behaviors in African American college students. Similar calculations were performed for the non-Hispanic White control group to observe if the strength of association changed between groups. It was observed that there was no statistically significant association between health behaviors and knowledge level for breast cancer, $\chi^2(2) = 5.044, p = .080$. From the stacked bar chart, it can be further interpreted that there was no apparent association between knowledge level and health behaviors. About 37.61% of
the students with high knowledge had healthy behaviors compared to 31.72% of the students with moderate knowledge and 48.48% students with low knowledge (Figure 8).

![Stacked Bar Percent of Awareness/Knowledge Score Category by Health Score Category](image)

*Figure 8. Stacked bar percent of knowledge score category against health behaviors score category*

**Discussion**

In this study, we evaluated the current breast cancer-related screening practices and health behaviors in African American college students and how that differed from the screening practices and health behaviors of non-Hispanic White students after adjusting for different covariables. We further explored whether there is an association between knowledge levels and breast cancer screening practices and health behaviors in African American college students and non-Hispanic White students. The average breast cancer screening practices score was
significantly lower in non-Hispanic White students compared to African American students after adjusting for education level, family history, and income level.

Studies examining racial differences in breast cancer screening utilization has observed that over the years, primary care clinicians recommend screening mammogram significantly more often for African American women than non-Hispanic Whites, and irrespective of ethnicity, the screening rates are similar in both populations (American Cancer Society, 2021a; Reisch, Barton, Fletcher, Kreuter, & Elmore, 2000). However, observational data suggests that although there has been significant improvement in mammography screening utilization, African American women may still not be receiving the benefits at their full potential (Jones, Patterson, & Calvocoressi, 2003; Smith-Bindman et al., 2006). The results from this study showed contradictory evidence that the non-Hispanic White population had less adequate screening practices compared to the African American students. This can probably be attributed to the increased breast cancer knowledge and education-related intervention targeted towards this population or the fact that the sample population for this study included educated young African American students. Meta-analysis conducted on the effects of clinical trials in breast cancer screening for African American women reported that targeted intervention in this population have had a positive effect on improving screening practices, specifically studies that aimed towards addressing the perceived risk of breast cancer in this population (Copeland, Kim, & Eack, 2018). However, further research is required to understand the other factors that might play an essential role in improving screening practices in the young African American population.
The effect of knowledge on breast cancer screening has been studied on different populations and it has been observed that higher knowledge directly affects screening practices (Sadler et al., 2007; Sim, Seah, & Tan, 2009). Women with poorer knowledge of breast cancer usually did not perceive breast cancer as a fatal disease and were less likely to follow the recommended screening guidelines (Consedine, Magai, Spiller, Neugut, & Conway, 2004; McDonald, Thorne, Pearson, & Adams-Campbell, 1999). The findings from this study are similar to the available literature that demonstrates a positive association between knowledge and screening practices.

There was no statistically significant difference in health behaviors scores between the non-Hispanic White and the African American student groups after adjusting for education levels, income, and family history of breast cancer. It was further interpreted that students with higher breast cancer-related knowledge will have more adequate screening practices.

The findings regarding health behaviors are similar to the study that explored racial disparities in healthy behaviors and cancer screening in women ≥ 40 years of age using the data from 2005 National Health Interview Survey (Yaghjyan, Wolin, Chang, & Colditz, 2014). It was observed that although non-Hispanic White breast cancer survivors are less likely to smoke compared to their cancer-free counterparts, most of the existing healthy behavior differences were observational and did not have any statistical significance. Similarly, other studies have reported that there are some racial and ethnic differences in healthy behaviors; however, the findings do not explain disparities that exist in the clinical outcome of the disease (Redmond, Baer, & Hicks, 2011). In addition, there is not a substantive body of literature that has explored the racial differences in breast cancer-related healthy behaviors in the population pursuing higher
education after controlling for variables such as age, socioeconomic status, etc., and therefore, requires further research.

**Conclusion**

The findings from this study indicated that the average breast cancer screening practices score was significantly lower in non-Hispanic White students compared to African American students after adjusting for education level, family history, and income level. However, there was no statistically significant difference in health behaviors scores between the two groups after adjusting for education levels, income, and family history of breast cancer. Additionally, it was observed that there was a statistically significant association between screening practices and knowledge level for breast cancer; however, the level of association was small. It was further inferred that students with higher breast cancer-related knowledge will have more adequate screening practices. The results of this study imply that improving breast cancer-related knowledge in the younger African American population can assist with better screening practices, leading to early detection of breast cancer that can improve survivability and clinical outcomes in this population. Further research is required to understand the health behaviors in this population and associated factors that can contribute to positive health behaviors for designing population-specific intervention programs.
References


CHAPTER V

DISCUSSION

Summary of the Research

This research study aimed to examine the breast cancer-related knowledge, attitude, and screening practices in African American college students, particularly exploring the disparities between non-Hispanic White students and African American students. Additionally, this study aimed to examine whether other variables such as a family history of breast cancer had any association with the knowledge and perceptions of the participants and whether that altered their health behaviors and screening practices in any meaningful way. This study also examined the available literature to generate systematic evidence regarding current breast cancer screening motivators and challenges in the African American women population.

The following research questions and hypotheses were formulated to fulfill the objective of this dissertation project:

1. What are the common motivators and barriers to breast cancer screening that have been identified in the African American women population?

2. Is there a difference in knowledge of breast cancer in female African American college students and non-Hispanic White college students after controlling for education level, income, and family history?
• Null Hypothesis ($H_0$) – There is no difference between breast cancer-related knowledge and ethnicity after controlling for education level, income, and family history.

• Alternative Hypothesis ($H_1$) – There is a difference between knowledge of breast cancer and ethnicity after controlling for education level, income, and family history.

3. Is there a difference in knowledge of breast cancer in students with a family history of breast cancer and students without family history of breast cancer after controlling for education level, income, and ethnicity?

• Null Hypothesis ($H_0$) – There is no difference in breast cancer-related knowledge and family history after controlling for education level, income, and ethnicity.

• Alternative Hypothesis ($H_1$) – There is a difference between knowledge of breast cancer and family history after controlling for education level, income, and ethnicity.

4. Is there a difference in perceptions of breast cancer in female African American college students and non-Hispanic White college students after controlling for education level, income, and family history?

• Null Hypothesis ($H_0$) – There is no difference between breast cancer-related perceptions and ethnicity after controlling for education level, income, and family history.
• **Alternative Hypothesis (H₁)** – There is a difference between perceptions of breast cancer and ethnicity after controlling for education level, income, and family history.

5. Is there a difference in perceptions of breast cancer in students with a family history of breast cancer and students without family history of breast cancer after controlling for education level, income, and ethnicity?

  • **Null Hypothesis (H₀)** – There is no difference between breast cancer-related perceptions and family history after controlling for education level, income, and ethnicity.

  • **Alternative Hypothesis (H₁)** – There is a difference between perceptions of breast cancer and family history after controlling for education level, income, and family history.

6. Is there a difference in breast cancer screening practices in female African American college students and non-Hispanic White college students after controlling for education level, income, and family history?

  • **Null Hypothesis (H₀)** – There is no difference between breast cancer screening practices and ethnicity after controlling for education level, income, and family history.

  • **Alternative Hypothesis (H₁)** – There is a difference between breast cancer screening practices and ethnicity after controlling for the covariates (education level, income, family history).
7. Is there a difference in breast cancer health behaviors in female African American college students and non-Hispanic White college students after controlling for education level, income, and family history?
   
   - **Null Hypothesis ($H_0$)** – There is no difference between breast cancer health behaviors and ethnicity after controlling for education level, income, and family history.
   
   - **Alternative Hypothesis ($H_1$)** – There is a difference between breast cancer health behaviors and ethnicity after controlling for the covariates (education level, income, family history).

8. Is there an association between the level of knowledge and screening practices in female African American college students?
   
   - **Null Hypothesis ($H_0$)** – There is no association between the level of knowledge and screening practices in female African American students.
   
   - **Alternative Hypothesis ($H_1$)** – There is an association between the level of knowledge and screening practices in female African American students.

9. Is there an association between the level of knowledge and health behavior scores in female African American college students?
   
   - **Null Hypothesis ($H_0$)** – There is no association between the level of knowledge and health behaviors in female African American students.
   
   - **Alternative Hypothesis ($H_1$)** – There is an association between the level of knowledge and health behaviors in female African American students.
Summary of the Study Findings

The first part of the study involved an integrative literature review that included 17 articles in the final analysis that focused on the motivators and barriers to breast cancer screening that have been observed in the African American women population. The common motivators identified for breast cancer screening in African American women included knowledge about cancer, personal experiences, and other factors including ease of transportation, presence of female healthcare providers in the screening facility, and easy access to healthcare facilities. The barriers identified were categorized into five groups: lack of knowledge, concerns about screening-related costs, perceptions of breast cancer and the associated fear, individual or personal factors, and other factors, including religious and fatalistic beliefs, perceived discrimination, and accessibility.

The second part of the study involved collecting data from college students regarding their knowledge and perceptions of breast cancer, screening habits, and associated health behaviors using a self-administered questionnaire. The participants selected were female college students who attended Northern Illinois University. The self-administered questionnaire, which had a series of questions related to demographics, breast cancer risk factors, breast cancer knowledge, current screening practices, breast cancer-related perceptions, and health behaviors, was used to collect data for this study. The final sample consisted of 623 participants, of which 518 (83.1%) students were non-Hispanic Whites and 105 (16.9%) students were African Americans. Most of the participants were either undergraduate students (78.1%) or graduate master’s (17.8%) students. The remaining 4.1% of students were pursuing either a doctoral degree or other technical education. Out of the 623 participants, most of the students belonged to
the 18-25 age group (68.7%), followed by students belonging to 26-40 years age group (20.5%). About 10% of the students belonged to the 41-59 years age group, and only 0.8% of the students were in the 60 and over age group. Most of the students reported a total family income between $50,000-$99,999 (25%). About 52.9% of non-Hispanic White students reported an income higher than $50,000 compared to 24.76% of African American students. Most of the students (63.9%) reported that someone in their close family and friends had breast cancer in the past, of which 64.8% were non-Hispanic Whites and 59.05% were African American students.

It was observed that most of the students (59.7%) had moderate knowledge about breast cancer, its symptoms, and its risk factors. About 35% of the students had high knowledge about the disease, whereas only 5.3% of the students were found to have low knowledge about the disease. Overall, 36.5% of non-Hispanic White students had a higher knowledge of breast cancer compared to 27.6% of African American students. An equivalent percentage of students had moderate knowledge of breast cancer, 59.5% of non-Hispanic Whites and 61% of African Americans, but a larger proportion of African American students (11.4%) demonstrated a low level of breast cancer-related knowledge when compared to non-Hispanic Whites (4.1%). However, statistical analysis of data revealed that there was no statistically significant difference in breast cancer-related knowledge scores between the non-Hispanic White and the African American student groups after adjusting for the covariates education, income, and family history of breast cancer. Additionally, no statistically significant difference in breast cancer-related knowledge scores was observed between students who had a family history of breast cancer and students who did not have a family history of breast cancer after adjusting for the covariates education, income, and ethnicity.
The perceptions of breast cancer included three major constructs: perceived susceptibility, perceived benefit, and perceived barriers in accordance with Champion's Health Belief Model Scale (CHBMS). The CHBMS is a valid instrument developed for American women to measure beliefs about breast cancer and breast self-examination. The breast cancer-related perceived susceptibility scores were significantly different between non-Hispanic Whites compared to the African American group after adjusting for the covariates education level, income, and family history of breast cancer. However, the effect size was small, which indicated that ethnicity only accounted for 2.8% of the variance in breast cancer-related perceived susceptibility. Similarly, there was a statistically significant difference in breast cancer-related perceived benefit scores between the non-Hispanic White and the African American student groups after adjusting for the covariates education, income, and family history of breast cancer. However, the effect size was small, indicating that ethnicity only accounted for 1.3% of the variance in breast cancer-related perceived benefits. A statistically significant difference in breast cancer-related perceived susceptibility scores was observed between students who had a family history of breast cancer and students who did not have a family history of breast cancer, with a medium effect size that indicated that family history only accounted for 8.8% of the variance in breast cancer-related perceived susceptibility.

There was no statistically significant difference in breast cancer-related perceived barrier scores between the non-Hispanic White and the African American student groups after adjusting for the covariates education, income, and family history of breast cancer. Additionally, no statistically significant difference in breast cancer-related perceived benefit and perceived barrier scores were observed between students who had a family history of breast cancer and students...
who did not have a family history of breast cancer after controlling for the covariates education, income, and ethnicity.

The breast cancer screening practices questions aimed to capture whether students follow the recommended screening and self-breast examination guidelines. It was observed that only 29.7% of the total students had an adequate breast cancer screening practice. However, a higher percentage of African American students had adequate screening practices (42.9%) compared to non-Hispanic White students (27%). Statistical analysis further revealed a significant difference in breast cancer-related screening habits between the non-Hispanic White and the African American student groups after adjusting for the covariates, although the effect size was small. Additionally, it was observed that there was a statistically significant association between screening practices and knowledge level for breast cancer, although the level of association was small. It was further interpreted that students with higher breast cancer-related knowledge had more adequate screening practices, and about 38.53% of the students with high knowledge had adequate screening practices compared to 25.27% of the students with moderate knowledge and 21.21% students with low knowledge.

The breast cancer-related health behavior questionnaire aimed to understand the health-related behavioral habits of students and included information about their body mass index, alcohol consumption, smoking habits, physical activity, and eating habits. It was observed that there was no statistically significant difference in breast cancer-related health behaviors between the non-Hispanic White and the African American student groups, after adjusting for the covariates education, income, and family history of breast cancer. Additionally, there was no statistically significant association between health behaviors and knowledge level for breast
cancer, and it was further interpreted that there was no obvious association between knowledge level and health behaviors. About 37.61% of the students with breast cancer-related high knowledge had healthy behaviors compared to 31.72% of the students with moderate knowledge and 48.48% of students with low knowledge.

Discussion of Key Findings and Hypotheses

Research Question 2

For Research Question 2, we examined whether there was a difference in knowledge of breast cancer in female African American college students and non-Hispanic White college students after controlling for education level, income, and family history. It was hypothesized that there is a difference between knowledge of breast cancer and ethnicity after controlling for the covariables. The study results revealed that there was no significant difference between breast cancer-related knowledge in African American and non-Hispanic White female college students after adjusting for the covariates education, income, and family history of breast cancer.

The knowledge of breast cancer construct included the overall awareness about breast cancer, its symptoms, and associated risk factors. Previous studies exploring breast cancer-related knowledge in African American women had observed that knowledge regarding breast cancer is usually lower in this population compared to women of other ethnicities (Harris, Miller, & Davis, 2003; McDonald, Thorne, Pearson, & Adams-Campbell, 1999; Sadler et al., 2007). Most of the participants in these studies demonstrated a lack of basic knowledge about breast cancer, and when compared to the non-Hispanic White population, these participants were also less aware of breast cancer screening tests. However, compliance or adherence to screening was
higher among the African American women population who were aware of the screening tests compared to women of other ethnicities. Additionally, in the elderly African American population, it has been observed that women between 65-74 years were more likely to recognize the risk factors and symptoms associated with breast cancer compared to women above 74 years of age (Jones et al., 2003).

Several studies have explored the association between variables such as socioeconomic factors, demographic factors, educational levels, and breast cancer-related knowledge. Results from these studies suggest that women with a lower educational level and a lower household income were more likely to have a lower awareness of breast cancer symptoms, risk factors, and the increased risk with age (Hvidberg, Pedersen, Wulff, & Vedsted, 2014; Opoku, Benwell, & Yarney, 2012). However, studies in educated populations have reported that less than 50% of the study population exhibited a low knowledge about breast cancer, but almost 71-75% of the participants believed that the best possible way to control breast cancer is through early detection (Ahmed, Zahid, Ladiwala, Sheikh, & Memon, 2018; Seven, Bağcivan, Akyuz, & Bölükbash, 2018). In these educated participants, the lack of knowledge was mostly related to how to perform breast self-examinations efficiently.

Based on the available literature, it can be concluded that breast cancer-related knowledge varies between the population who are highly educated and the population who have lower educational backgrounds. The findings of this research study are consistent with the available literature since the participants of this research study are attending university and pursuing higher education. Therefore, it can be assumed that the female college students participating in this research study have higher knowledge about breast cancer compared to the
African American women with lower educational backgrounds. Hence, we did not observe any significant difference in knowledge scores between the two ethnicities after controlling for the covariates.

*Research Question 3*

For Research Question 3, we examined if there was a difference in knowledge of breast cancer in students with a family history of breast cancer and students without a family history of breast cancer, after controlling for education level, income, and ethnicity. It was hypothesized that there is a difference between knowledge of breast cancer and family history after controlling for the covariates. The study results revealed that there was no significant difference between breast cancer-related knowledge in female college students who had a family history of breast cancer and those who did not have a family history of breast cancer, after adjusting for the covariates education, income, and ethnicity.

The findings were similar as observed in the limited number of studies that have explored the relationship between family history of breast cancer and breast cancer-related knowledge, perceptions, and screening practices. Women with a family history of breast cancer have a significantly higher risk of developing breast cancer in their lifetime and belong to a high-risk group (Collaborative Group on Hormonal Factors in Breast Cancer, 2001; Egan et al., 1998; Mavaddat et al., 2010; Phipps et al., 2011). In a cross-sectional study involving 137 Hispanic women, it was observed that women who had a family history of breast cancer had similar knowledge and perceptions when compared to women who did not have a family history of breast cancer (Bird et al., 2010). Similar results were also observed in a study involving 266
African American women, where women with a family history of breast cancer exhibited a higher perception of breast cancer risks and concerns compared to women without a family history of breast cancer (Lipkus, Iden, Terrenoire, & Feaganes, 1999). However, there was no significant difference in the knowledge level between the two groups. Additionally, in another cross-sectional study, including 150 women belonging to the high-risk group, it was observed that women with a family history of breast cancer had inadequate knowledge about the disease (Subramanian, Oranye, Masri, Taib, & Ahmad, 2013).

Based on the findings of this study and previously conducted research, it can be concluded that even though women with a family history of breast cancer are predisposed to a higher risk of having breast cancer in their lifetime, they still do not possess adequate knowledge about the disease and the associated risk factors. Specific breast cancer knowledge related to interventions geared toward this high-risk population, including knowledge about genetic counseling, is required to promote early screening that can contribute to an improved clinical outcome.

Research Question 4

For Research Question 4, we examined if there was a difference in perceptions of breast cancer in female African American college students and non-Hispanic White college students after controlling for education level, income, and family history of breast cancer. The perceptions of breast cancer included three major constructs according to Champion’s Health Belief Model: perceived susceptibility, perceived benefit, and perceived barriers. It was hypothesized that there is a difference between the perceptions of breast cancer and ethnicity after controlling for the
covariables. The study results revealed a significant difference between perceived susceptibility scores and perceived benefit scores between African American and non-Hispanic White students after adjusting for the covariates education, income, and family history of breast cancer. However, there was no statistically significant difference in breast cancer-related perceived barrier scores between the non-Hispanic White and the African American student groups after adjusting for covariates.

Several studies have explored the ethnic differences in risk perception among women regarding breast cancer. It has been observed that perceived benefit and perceived susceptibility account for the largest percentage of the variance between women who wanted a screening mammogram versus women who did not (Price, Desmond, Slenker, Smith, & Stewart, 1992). A higher perception of susceptibility is associated with a higher desire to obtain a breast cancer screening. In women 35 years and older, it has been observed that African Americans are significantly less likely to report heightened perceptions of personal risk of breast cancer than non-Hispanic Whites, even if they have a family history of breast cancer (Hughes, Lerman, & Lustbader, 1996). African American women also reported a greater barrier to breast cancer-related discussions with their friends and family and reported higher psychological distress. Similar results were observed in a survey-based study including African American and non-Hispanic White women between 40-69 years of age (Haggstrom & Schapira, 2006). Compared to non-Hispanic Whites, African American women were more likely to accurately perceive breast cancer survival and perceive the benefit of screening mammography. However, contradictory results were observed in a prospective study involving 1,229 African American and non-Hispanic White women, where women with a higher perceived susceptibility were less
likely to adhere to recommended screening guidelines compared to women who had a moderate perceived susceptibility (Calvocoressi et al., 2004). Such findings suggest that there is a more complex relationship between perceived susceptibility to breast cancer and screening that should be considered before developing interventions.

As expected from the literature reviews, the perceived barriers were higher in the African American population, although the difference was not statistically significant after controlling for the covariates education level, income, and family history. Socioeconomic variables, including income levels and education, have contributed to racial disparities regarding breast cancer-related perceptions and barriers. Additionally, spirituality, attitude, access to care, competing priorities, and medical mistrust are a few of the essential contributors that have been identified as barriers to breast cancer screening in the African American population (Freeman & Chu, 2005; Johnson, Elbert-Avila, & Tulsky, 2005; Lacey, 1993; LaVeist & Carroll, 2002; Wolff et al., 2003).

Research Question 5

For Research Question 5, we examined if there was a difference in perceptions of breast cancer in students with a family history of breast cancer and students without a family history of breast cancer after controlling for education level, income, and ethnicity. It was hypothesized that there is a difference between the perceptions of breast cancer and family history after controlling for the covariates. The study results revealed a significant difference between perceived susceptibility scores between students with a family history of breast cancer and students without a family history of breast cancer, after adjusting for the covariates education,
income, and ethnicity. However, the effect size was small (0.013), which described that ethnicity only accounted for 1.3% of the variance in breast cancer-related perceived benefits. There was no statistically significant difference in breast cancer-related perceived benefit and perceived barrier scores between students with a family history of breast cancer and students without a family history of breast cancer, after adjusting for covariates.

A few studies have explored the association between family history of breast cancer and perception of risk in women. In a pilot study involving 155 women with a family history of breast cancer, it was observed that only 11% of women were able to identify the correct population risk, and more than half were unable to assess their own lifetime risk (Evans, Burnell, Hopwood, & Howell, 1993). Alternatively, in a cross-sectional study including 117 women, it was observed that women with a family history of breast cancer had a moderate knowledge of the disease, and almost 51% of them ranked their perceived risk as moderate for breast cancer (Seven et al., 2018). The study further noted a significant difference between the perceived risk and educational level and a significant association between the perceived risk and worry level of women. In a study that involved 6,706 women between 46 and 74 years of age, it was observed that participants with a family history of breast cancer held higher risk perception levels (36%–51%, more likely) than those with a family history of other cancer (12%–22%, more likely) and those with no family cancer history (8%–11%, more likely; Haber, Ahmed, & Pekovic, 2012).

The findings of this study were consistent with the available literature where women with a family history of breast cancer exhibited a higher perception of susceptibility or risk regardless of age, ethnicity, income, or educational level. However, the perceived benefit and barriers scores were equivalent between the two groups, indicating that there might be a more complex
relationship between risk perception and family history. An individual’s relationship with a family member with breast cancer can also be a significant factor that dictates perceptions in women. Additionally, personal beliefs, culture, and religious factors might also play a role in risk perception that requires further studies and evaluation.

Research Question 6

For Research Question 6, we examined if there was a difference in breast cancer screening practices in female African American college students and non-Hispanic White college students after controlling for education level, income, and family history. It was hypothesized that there is a difference between breast cancer screening practices and ethnicity after controlling for the covariables. The results of the study revealed that the average screening practices score were higher for the African American population and there was a statistically significant difference in breast cancer-related screening practices between the non-Hispanic White and the African American student groups after adjusting for the covariates education, income, and family history of breast cancer.

Studies exploring the breast cancer screening trends in different ethnic populations have observed that African American women have lower rates of adherence to recommended breast cancer screening guidelines (Reiter & Linnan, 2011; Roberson, 1994; Sadler et al., 2007). However, in recent years, it has been observed that a higher percentage of African American women are receiving screening mammograms irrespective of their educational level, employment status, and income level compared to White females, although geographical location still remains a factor for screening disparity (Doescher & Jackson, 2009; Miranda, Tarraf, González, Johnson-Jennings, & González, 2012; Ross, 2015). The findings from this
study were consistent with the latest trends in which researchers have observed an increased awareness and improved screening behavior in the African American population over recent years. This might be because several breast cancer education programs and fundraising campaigns have been developed for African American women over the years that have improved the awareness and screening practices in this specific population.

*Research Questions 7 and 8*

For Research Question 7, we examined if there was an association between the level of knowledge and screening practices in female African American college students. It was hypothesized that there is an association between the level of knowledge and screening practices in female African American students. The study results revealed a statistically significant association between screening practices and knowledge level for breast cancer, even though the level of association was small. Additionally, it was further interpreted that students with higher breast cancer-related knowledge will have more adequate screening practices.

For Research Question 8, we examined if there was an association between the level of knowledge and health behavior scores in female African American college students. It was hypothesized that there is an association between the level of knowledge and health behavior scores in female African American students. The study results revealed that there was no statistically significant association between health behaviors and knowledge level for breast cancer.

Several studies have explored the association between breast cancer-related knowledge and screening practices in women populations belonging to different ethnicities. It has been
observed that breast cancer screening and adherence to recommended guidelines are usually lower in African American women with low educational attainment, low cancer knowledge, and no usual source of care (Harris et al., 2003). Additionally, according to some studies, factors such as education level and family history of breast cancer can impact knowledge and screening practices in women. In a cross-sectional analysis involving approximately 900 women, it was observed that there were no statistically significant differences in screening practices between women with family history and women without a family history of breast cancer (Bird et al., 2011; Heidari, Mahmoudzadeh-Sagheb, & Sakhavar, 2008). Higher levels of education have also been associated with a better understanding of the disease, and improved perception has been significantly associated with improved screening practices (Opoku et al., 2012).

In this study, we observed a significant association between breast cancer-related knowledge and screening behaviors. The findings are consistent with existing literature that suggests higher knowledge about breast cancer and associated risk factors, along with the recommended guidelines, can positively affect screening habits (Douglass, Bartolucci, Waterbor, & Sirles, 1995; Fox & Stein, 1991; Kelsey & Bernstein, 1996; Price, 1994; Taylor et al., 1998). This is suggestive of the fact that there is a need for adequate educational interventions for the population who have lower breast cancer knowledge to promote early detection, thereby improving clinical outcomes.

**Strengths and Limitations**

The strength of the integrative literature review is that it comprises different types of empirical research and covers a large sample size within the population of interest. The studies
provided correlations between the demographic variables and the constructs of the barriers. From a methodological perspective, one of the major strengths of an integrative literature review is that it helps identify gaps in the current research. Since specific questions guide an integrative literature review, it assists in identifying a central theme and recognizing opportunities for future research. Such a type of review can also help identify what research methods and interventions have been conducted so far.

One of the major limitations of the integrative literature review is that most of the studies reviewed lacked supporting evidence related to the established barriers or motivators. For example, lack of physician recommendation was identified as a barrier; however, no specific correlation was reported in the studies that justified the claim. A second limitation is that although the study population included the African American population, demographically, the population was diverse in terms of their age, socioeconomic background, and education. The discrepancy could have had an impact on the interpretation of the themes identified as barriers and motivators in this population.

The major strength of the survey-based study was the utilization of the prevalidated BCAM questionnaire and the CHBMS questionnaire. The BCAM questionnaire was developed by Cancer Research UK, King’s College London, and University College London in 2009 and was validated with the support of Breast Cancer Care and Breakthrough Breast Cancer. The BCAM questionnaire includes measures of breast cancer awareness and explores the risk factors responsible for poor cancer awareness, which can be used to develop and evaluate interventions for the promotion of breast cancer-related knowledge. The CHBMS is a valid and reliable tool to measure beliefs about breast cancer and screening methods. The CHBMS questionnaire is based
on the psychosocial HBM model that measures the perceived susceptibility, benefits, and barriers to breast cancer screening. It can also be used to explain the intended health behavior of women and the factors that determine their breast cancer screening behaviors. The quantitative design of this study further contributes to its strength as it can measure whether the association and differences that exist in breast cancer-related knowledge, perceptions and screening practices between African American and non-Hispanic White college students are statistically significant.

The only limitation identified for this study is that the participants were all from NIU and therefore they symbolize a representative sample of female college students, which is a threat to the external validity. Larger scale population-based studies might be required to identify whether the study results would differ in other geographical locations across the country.

**Recommendations for Future Studies**

Literature review and the findings from this study suggest that future research should explore the current barriers and motivators related to breast cancer screening in the African American women population, particularly younger women between 18-49 years of age. Studies should focus on determining whether there is a discrepancy between breast cancer screening recommendations by primary care physicians or whether there is a discrepancy between patient behavior and physician recommendation. Healthcare providers should be included in future studies along with the study population of interest to identify patterns in behavior and strategies that can motivate patients to obtain screening. From an organizational perspective, research should be conducted to understand scheduling conflicts and how to prioritize patients based on their needs.
The integrative literature review identified knowledge as a key barrier and motivator to breast cancer screening, and according to the findings from the survey-based study, higher knowledge is associated with improved screening practices in the African American women population. Therefore, future research should focus on the appropriate dissemination of knowledge to the study population through educational programs. It is important to understand how educational programs can be personalized based on the community and demographic characteristics for it to be most effective. Additionally, researchers should focus on measuring the effectiveness of educational programs to modify and alter parameters as needed. Future studies should also focus on understanding the interrelationship of the barriers and how to combat these obstacles with an interdisciplinary approach. More studies are needed to understand the overall health behavior patterns of the African American population and how to design interventions to improve not only the breast cancer-related screening practices but the overall health and health-related behavior in the African American women population.

Future research should also focus on understanding the impact of other covariables such as level of education, socioeconomic factors, family history, and cultural and religious beliefs on knowledge, perception, and screening practices. Most of the current research is qualitative in nature. Quantitative research is mostly based on data analysis of national surveys, and therefore in the future, large populations-based quantitative studies exploring these covariables are needed. The results from these studies, specifically for the African American population, can help with the design of appropriate interventions. Additionally, the impact of cultural backgrounds along with geographical locations should also be studied to have a full understanding of African American women’s attitudes and behaviors regarding breast cancer screening.
Conclusion

The objective of this research study was to explore the breast cancer-related knowledge, perceptions, and screening habits in African American female college students and how it is different from non-Hispanic Whites. The study also explored the breast cancer screening motivators and barriers in African American women. The research study was based on three theoretical frameworks: ecological perspective theory, social cognitive theory, and the health belief model that guided the research design and interpretation and discussion of the study findings.

The findings of the study indicated that knowledge is both a motivator and a significant barrier for breast cancer screening, and improving breast cancer-related knowledge can assist with higher screening rates. Perceptions of fear, including the fear of physical discomfort or pain, fear of the unknown, and the fear of receiving bad news, also acted as a major barrier for African American women. Additionally, the distance to the screening center, the cost of transportation, along with the fear of loss of wages were also contributing factors to limited breast cancer screening. Personal factors such as religious and fatalistic beliefs were also an obstacle to breast cancer screening. Issues with physical and social privacy, in addition to shame and stigma, were common screening deterrents that were identified in the literature. Personal factors could also act as a motivator depending on the prior experiences of the individual.

The findings of the study indicated that specifically in younger college students pursuing higher education, there is no significant difference between breast cancer-related knowledge between African American and non-Hispanic White ethnic groups. The results further indicated
that women with a family history of breast cancer, although they lack the essential knowledge about breast cancer screening, have a higher perception of susceptibility and benefit compared to women without a family history.

The findings from this study will contribute to the currently limited resources that are available on the knowledge, perceptions, and screening behaviors of young African American college students. Although a higher number of interventions have been developed for this specific population over the last few years, the results from this study indicated that further research is required to understand the complex relationship between the different covariables and the knowledge, perceptions, and screening practices of breast cancer in the African American population.
References


APPENDIX A

NIU INSTITUTIONAL REVIEW BOARD APPROVAL LETTER
Exempt Determination

12-Nov-2021
Shubhabhata Das (Z183150)
Schl of Intrdsclpry Hlt Hlth Prf

RE: Protocol # HS22-0155 "Breast cancer knowledge, attitude, and screening practices in African American college students"

Dear Shubhabhata Das,

Your application for institutional review of research involving human subjects was reviewed by the Office of Research Compliance, Integrity, and Safety on 12-Nov-2021 and it was determined that it meets the criteria for exemption.

Although this research is exempt, you have responsibilities for the ethical conduct of the research and must comply with the following:

Amendments: You are responsible for reporting any amendments or changes to your research protocol that may affect the determination of exemption and/or the specific category. This may result in your research no longer being eligible for the exemption that has been granted.

Record Keeping: You are responsible for maintaining a copy of all research related records in a secure location, in the event future verification is necessary. At a minimum these documents include: the research protocol, all questionnaires, survey instruments, interview questions and/or data collection instruments associated with this research protocol, recruiting or advertising materials, any consent forms or information sheets given to participants, all correspondence to or from the IRB, and any other pertinent documents.

Please include the protocol number (HS22-0155) on any documents or correspondence sent to the IRB about this study.

If you have questions or need additional information, please contact the Office of Research Compliance, Integrity, and Safety at 815-753-8588.

Please see the RIPS website for guidance on the impact of COVID-19 on research(including face-to-face data collection) https://www.niu.edu/divresearch/covid/index.shtml
APPENDIX B

BREAST CANCER AWARENESS, PERCEPTION, AND BEHAVIORS

SURVEY QUESTIONNAIRE
BREAST CANCER AWARENESS, PERCEPTION, AND BEHAVIORS SURVEY

You are being invited to take part in a research study. The below survey will take approximately 10 minutes or less to complete. Please take time to read the following information carefully.

What is the purpose of the study?
This study is using a survey to assess awareness of breast cancer risk factors, and signs and symptoms. The results will be used to understand how to develop better and more effective guidelines, communications, and services to help increase the early diagnosis of cancer.

Why have I been invited to take part?
We are asking all female students 18 years of age or older to complete this survey.

Rewards
If you fully complete the survey, then you will be eligible to enter a drawing. Ten winners will be randomly selected and each of them will receive a $50 Amazon gift card.

Confidentiality
All the information that is collected will be anonymous and kept strictly confidential.
Demographic Questions

Please check the box that is applicable below:

1. Gender
   - Male
   - Female
   - Other

2. Age
   - 18-25
   - 26-40
   - 40-59
   - 60 +

3. Ethnicity
   - White
   - Black or African American
   - Asian
   - Hispanic or Latino
   - Native American
   - Other

4. What is the highest level of education/qualification you have obtained so far?
   - Undergraduate
     - Freshman
     - Sophomore
     - Junior
     - Senior
   - Master's degree
   - Doctoral degree
   - Other technical education

5. What is your total combined family income for the past 12 months, before taxes, from all sources, wages, public assistance/benefits, help from relatives, alimony, and so on? Please estimate to the best of your ability.
   - Less than $9,999
   - $10,000 - $19,999
   - $20,000 - $29,999
   - $30,000 - $49,999
   - $50,000 - $99,999
   - $100,000 - $149,999
   - More than $150,000
   - Prefer not to answer
6. Have you, your family or close friends had breast cancer?
   - Yes
   - No

**Health Behaviors**

7. What is your weight?
   _____ lbs

8. What is your height?
   ___ ft ___ inches or ____ cm

9. Please check the box that is applicable below:
   a. How often do you exercise for fitness (such as walking, running, gym, yoga, etc. for at least 30 minutes)?
      - 5+ days/week
      - 3-4 days a week
      - 1-2 days a week
      - I do not exercise

   b. How often do you consume alcoholic drinks?
      - Never
      - Monthly or less
      - 2 to 4 times a month
      - 2 to 3 times a week
      - 4 or more times a week

   c. How many drinks containing alcohol do you have on a typical day when you are drinking?
      - 1 or 2
      - 3 or 4
      - 5 or 6
      - 7 to 9
      - 10 or more
      - Not applicable

   d. How often do you eat fast food (such as burgers, fries, pizza, cake, pastries, etc.)?
      - Almost Everyday
      - Once every week
      - 2-3 times a week
      - 2-3 times in a month
      - 1 time in a month
e. Do you smoke or use any tobacco products?
   - Yes
   - No

Awareness/Knowledge Questions

10. Do you think any of the following is a warning sign of breast cancer or not?

<table>
<thead>
<tr>
<th>Condition</th>
<th>Yes</th>
<th>No</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>A lump or thickening under your armpit</td>
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<tr>
<td>Bleeding or discharge from your nipple</td>
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<td>Pulling in of your nipple</td>
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<td>Change in the position of your nipple</td>
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<td>A rash on or around your nipple</td>
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<tr>
<td>Redness of your breast skin</td>
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<td>A change in the size of your breast or nipple</td>
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<td>A change in the shape of your breast or nipple</td>
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<td>Pain in one of your breasts or armpit</td>
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<td>Dimpling of the breast skin</td>
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<td>A lump or thickening in your breast</td>
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11. Which of the following age ranges do you think has a higher chance of developing breast cancer?
   - A woman between 20-30 years of age
   - A woman between 31-39 years of age
   - A woman between 40-49 years of age
   - A 50+ year old woman

12. Are you aware of the current breast cancer screening guidelines?
   - Yes
   - No
   - Somewhat aware
13. Which of the following factors do you think could increase the chance of developing breast cancer?

SA = Strongly Agree; A = Agree; N = Neutral; D = Disagree’ SD = Strongly Disagree

<table>
<thead>
<tr>
<th></th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
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</thead>
<tbody>
<tr>
<td>Having a past history of breast cancer</td>
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<td>Using HRT (Hormone Replacement Therapy)</td>
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<td>Drinking more than 1 glass of alcohol a day</td>
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<td>Being obese (BMI 30 and above)</td>
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<tr>
<td>Having a close relative or family member with breast cancer</td>
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<td>Having children later on in life or not at all</td>
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<td>Having an early age menstruation (period)</td>
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<td>Having a late menopause</td>
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<tr>
<td>Sedentary lifestyle (too little physical activity)</td>
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<tr>
<td>Genetic makeup of an individual</td>
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<tr>
<td>Smoking</td>
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<tr>
<td>Breastfeeding</td>
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**Perception**

14. Please answer the following based on the scale provided below?

SA = Strongly Agree; A = Agree; N = Neutral; D = Disagree’ SD = Strongly Disagree

<table>
<thead>
<tr>
<th></th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
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<tr>
<td>I feel I will get breast cancer sometime during my life</td>
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<td>My chances of getting breast cancer in next few years is high</td>
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<tr>
<td>My chances of getting breast cancer in relation to any other women is higher</td>
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<td>If I get a mammogram and nothing is found, I do not worry as much about breast cancer</td>
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<td>Having a mammogram will help me find breast lumps early</td>
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<td>If I find a lump through a mammogram, my treatment for breast cancer may not be as bad</td>
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<td>Having a mammogram is the best way for me to find a very small lump</td>
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<td>Having a mammogram will decrease my chances of dying from breast cancer</td>
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<tr>
<td>I am afraid to have a mammogram because I might find out something is wrong</td>
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I am afraid to have a mammogram because I don’t understand what will be done

I don’t know how to go about getting a mammogram

Having a mammogram is too embarrassing

Having a mammogram takes too much time

Having a mammogram is too painful

People doing mammograms are rude to women

Having a mammogram exposes me to unnecessary radiation

I have other problems more important than getting a mammogram

### Screening Practices

15. How often do you check your breasts for signs of breast cancer?
   - Never
   - At least once a week
   - At least once a month
   - At least once every 6 months

16. Are you confident you would notice a change in your breasts?
   - Not at all confident
   - Not very confident
   - Fairly confident
   - Very confident

17. Have you ever visited a specialist about a change you have noticed in one of your breasts?
   - Yes
   - No
   - Never noticed a change in my breast

18. If you found a change in your breast, how soon would you contact your doctor?
   - Immediately/ As soon as possible
   - I will wait for my next scheduled appointment
   - Whenever I get time since it is nothing serious
   - Never

19. Have you been recommended breast cancer screening by your primary care physician?
   - Yes
   - No
   - I do not have a primary care physician
20. Have you done any of the following in the last year (mark all that apply)?
    • Self-breast examination
    • A clinical breast exam by a doctor or nurse
    • Mammogram
    • Breast Magnetic Resonance Imaging (MRI)
    • None