Examining the Social Dynamics of Mammograms and Their Impact on Patient Access to Cancer Treatment

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

During a routine visit, a physician assistant examined a 60-year-old woman and detected an abnormal mass, likely benign, during a physical breast examination. The physician assistant ordered a diagnostic mammogram and ultrasound. The results were interpreted as "probably benign" and a follow-up imaging appointment was scheduled 6 months out, a duration far too long given the ambiguity of the mammogram results. When the patient returned five months later for the follow-up appointment, the mass was found to have increased in size. The physician assistant then arranged for an urgent surgical appointment and biopsy of the enlarging right breast mass. The biopsy results showed invasive breast cancer, which, now seven months after the initial presentation, was found to be metastatic to the axillary nodes and spine (Weingart et al., 2020). This case is not an anomaly. Misinterpretation of results, as well as several other issues associated with mammograms and their use, led to similar cases. For background, breast cancer is a significant health concern globally, impacting millions of women each year. Each year in the United States, about 240,000 cases of breast cancer are diagnosed in women and about 42,000 women die from breast cancer (CDC, 2020). Mammography, a widely used screening tool, plays a crucial role in early breast cancer detection and diagnosis. Mammography is the most common screening test women receive for breast cancer (NCI, 2023).

This paper argues that although mammograms are generally an effective measure to screen for breast cancer, the social dynamics surrounding its use serve as barriers to receiving accurate diagnoses and cancer care, leading to poor financial, mental, and medical outcomes for patients. Misinterpretation of results, emotional distress, cultural perceptions, minority status, health literacy, overdiagnosis, and socioeconomic status, play critical roles in the effectiveness of mammograms and their impact on patient outcomes.

This paper is structured as the following: the "Research Methods" section outlines the research approach. The "Analysis of Mammography Using the SCOT Framework" section applies methods described in the Research Methods section to analyze mammography. The social dynamics surrounding mammograms are analyzed and supported with findings from external literature. Next, the "Overlapping Challenges and Recommendations" section proposes potential recommendations for policy changes and practices.

Research Methods

Mammograms and their impact can be analyzed using the Social Construction of Society (SCOT) Framework, which argues that social groups are what shape technology (Bijker et al., 2012). In the context of mammography, the relevant social groups constitute a major aspect of the SCOT Framework and are defined as members who collectively share similar meanings behind a particular technology, (Bijker et al., 2012) such as patients, physicians, racial minority patients, with low socioeconomic status patients, and patients with low health literacy. The SCOT Framework provides a methodology for analyzing the social implications of mammograms, considering the historical context, the impact on different social groups, and potential solutions to address their challenges. Delving into each topic will uncover potential interactions between social groups and reveal problems and recommendations.

Analysis of Mammography Using SCOT Framework

History of Mammograms

Mammography as a screening tool for breast cancer has a complex history, influenced by technological advancements, medical practices, and societal attitudes toward breast health. Before the 1950s, devices used for breast imaging were not dedicated to breast imaging, rather they were intended for other screening procedures such as chest X-rays. These devices did not

provide high-quality imaging for breast tissue and released high amounts of ionizing radiation (Nicosia et al., 2023). Throughout the 1960s, new methods of lower radiation X-rays were developed and applied directly to breast imaging. Further research and experimental trials throughout the 1960s and 1970s evolved the technology and its potential uses, including screening for tumors and identification of breast lesions eligible for biopsy. Between 1986 and 1992, the U.S. federal and state governments enacted laws that forced hospitals to use mammograms with standards of quality and mandatory required periodical inspections. In 2000 the Food and Drug Administration approved the introduction of digital mammography. This improved imaging quality and diagnostic accuracy significantly (Nicosia et al., 2023). The adoption of mammograms in healthcare was shaped by medical professionals, policymakers, and advocacy groups advocating for early detection strategies to improve breast cancer outcomes.

Effectiveness of Mammograms

There are two main types of mammograms: 2D digital mammograms, and 3D mammograms, also known as digital breast tomosynthesis (DBT). Several studies have found that 3D mammograms find more cancers than traditional 2D mammograms and that they also reduce the number of false positives (Breastancer.org, 2023). Therefore, many physicians recommend having a 3D mammogram. Overall, mammography correctly identifies about 87 percent of women who have breast cancer (Komen, 2022). The chance of having a false positive result after one mammogram ranges from 7-12 percent, depending on the patient's age (younger women are more likely to have false positive results). After 10 yearly mammograms, the chance of having at least one false positive result is about 50-60 percent (Komen, 2022). Breast density is also a major factor that impacts the accuracy of mammograms. For background, the breasts are made up of fatty, glandular, and connective tissues. Breast density is a measure of the

amount of dense tissue compared to fatty tissue (Yale Medicine, 2022). According to Melissa Durand, MD, an Associate Professor of Radiology & Biomedical Imaging at Yale Cancer Center, "With conventional mammography, while we can be as accurate as 98% in a fatty breast, our sensitivity can drop to as low as 30% in women with extremely dense breasts, which is why supplementary screening with ultrasound or MRI—depending on the patient's risk factors—can be such an important aid in finding breast cancer" (Yale Medicine, 2022).

Impact on Social Groups

The social groups identified below contain a multitude of overlapping experiences with mammography. Understanding how each social group views mammography financially, socially, culturally, and medically is crucial for effective SCOT Framework analysis. For this paper, I will be analyzing the social dynamics of mammograms on female patients only, due to the rarity (<1%) of breast cancer in men (Anderson et al., 2010), and rarity of breast imaging being used in cases of male breast abnormalities (Safak, 2015).

Physicians

The first social group involved in mammography is physicians. Physicians bear the responsibility of providing patients with the appropriate screenings and subsequent diagnoses given the patients' current health conditions. If a physician orders a mammogram for a patient, the physician is responsible for providing an accurate interpretation of the mammogram results. This involves distinguishing between benign and malignant findings and then conveying these results to the patient effectively. This is followed by recommendations for future screenings or follow-up care and treatment. Missed and delayed breast cancer malpractice claims are a regular occurrence. In a study of 562 breast cancer malpractice claims from 2009-2014, the most common contributing factors to diagnostic delays were:

- misinterpretation of diagnostic studies (49%),
- delay or failure in ordering diagnostic tests (27%),
- failure or delay in obtaining a consultation (17%),
- miscommunication between patient/family and providers (16%), and miscommunication among providers (12%) (Greenberg et al., 2015, as cited in Weingart et al., 2020).

To reduce the frequency of malpractice instances, physicians must maintain a high standard of implementing protocols and checklists to reduce diagnostic errors. Physicians may also further their medical education to stay up to date with the latest guidelines, technological advancements, and diagnostic skills. Physicians must also weigh the potential risks that patients may encounter when undergoing a mammogram screening. Deciding on whether to get a mammogram is a difficult decision, even in cases when the patient does not have breast cancer. Decisions to get a mammogram typically vary from one woman to another depending on her level of anxiety about cancer and/or recall, her values, and her philosophy about health care (Brennan et al., 2016). Screening offers the potential benefit of avoiding advanced cancer and subsequent cancer death. It also produces the harms of false alarms and overdiagnosis:

- False positive result – anxiety and unnecessary workup and/or biopsy caused by recall for a benign lesion (may also lead to open surgical biopsy of a non-malignant lesion). A false positive result occurs in up to 10% of screened women over time.
- False negative result – false reassurance that there is no cancer when cancer is present – estimated at 1.0–1.5/1000 in a single screen (Brennan et al., 2016).

For patients who have a strong family history or personal history of cancer or other risk factors, genetic testing can be utilized to better understand the risks/benefits of getting a mammogram. (NCI, 2023). The complex interactions between the potential costs and benefits of getting a

mammogram, as well as the patient's risk factors, financial status, and emotional state, may increase the complexity of physician recommendations.

Patients

The second social group involved in mammography is patients. Breast cancer, the second leading cause of cancer death among women (CDC, 2020), often leads to delayed diagnosis and treatment due to its highly negative perception. Though early detection has led to an increased survival rate for those diagnosed with breast cancer, perceptions of cancer treatment (including surgery, radiation, and chemotherapy) and its side effects may prevent a patient from undergoing recommended further diagnostic testing (McCorkle, 2022). Patients undergoing mammograms may also encounter issues such as false positives, false negatives, or misdiagnoses, leading to additional medical procedures, emotional distress, and potential delays in receiving appropriate treatment. Furthermore, the subsequent treatments prescribed to breast cancer-positive patients such as chemotherapy or radiation therapy may be extremely costly. The stigma surrounding breast cancer and the potential financial burdens of a diagnosis may discourage women from undergoing mammogram scans.

Racial Minority Patients

A social sub-group of patients is racial minority patients. Minority women, including Black, Hispanic, and Indigenous women, often experience disparities in access to mammography services. Breast cancer is the most commonly diagnosed cancer in Hispanic women, and is also the leading cause of cancer death in this population. Moreover, breast cancer in Hispanic women is less likely to be diagnosed compared to non-Hispanic white women. Hispanic women are also less likely than non-Hispanic whites to receive appropriate and timely breast cancer treatment (American Cancer Society, 2020). Cultural beliefs and perceptions surrounding breast cancer

also impact the tendency of women of certain ethnic backgrounds. Cultural perspectives can impact survival, as they may prevent people from seeking necessary testing or treatment because of reliance on fatalism or folk healing methods (Press et al., 2008).

Minority patients also face a higher risk of not being notified of breast abnormalities. The median number of days to diagnostic follow-up after an abnormal mammogram was greater for African American (20 days) and Hispanic (21 days) women compared with non-Hispanic white (14 days) women (Press et al., 2008). According to *Malignant: How Cancer Becomes Us* by S. Lochlann Jain, racial disparity in cancer mortality is "inconsistent with the notion that [it] is a function of differential biology." Lack of access to mammography, poorer quality of mammograms (in both machinery and reading of the results), lack of follow-up regarding results (black women are twice as likely not to be notified about an abnormal result), inability to interpret information received, and lack of access to treatment are factors that tend not to be taken into account in studies that attribute mortality differences to race and tumor biology (Whitman et al., 2010, as cited in Jain, 2013).

Minority populations are also more likely to be uninsured, making it more difficult for them to receive mammograms and cancer treatments. American Indian and Alaskan Native people had an uninsured rate of 19.1%, Hispanic people had an uninsured rate of 18%, Native Hawaiian or Pacific Islander people had an uninsured rate of 12.7%, Black people had an uninsured rate of 10%, and White people had an uninsured rate of 6.6%. This disparity in insurance coverage by race makes it more difficult for certain minority populations to receive cancer screenings and treatments (Hill et al., 2024). Minority individuals face similar barriers to mammography as other social groups, including patients with low socioeconomic status and low health literacy discussed below.

Low Socioeconomic Status Patients

Patients from low socioeconomic backgrounds may struggle with financial barriers to accessing mammograms, including costs associated with screenings, follow-up tests, and treatment. The rate of uninsured individuals is highest among those of lower socioeconomic status, thus disproportionately affecting those most in need. Even among individuals with insurance, higher financial burdens from copayments or coinsurance programs could lead to difficult choices for individual patients and also influence the decisions of physicians (Meropol et al., 2007). The average cost of mammograms for people without insurance coverage is $400 and $658 for 2D mammogram screenings and 3D diagnostic mammograms, respectively (Lusk, 2023). For patients with private health insurance or Medicare, mammograms are covered with no out-of-pocket costs under the Affordable Care Act (ACA). According to the ACA, private plans must cover breast cancer mammography screening every 2 years for women ages 50 and older and as recommended by a provider for women ages 40 to 49 at higher risk of breast cancer. Medicare Part B covers breast imaging in the following manner:

- A baseline mammogram for women ages 35 to 39
- Annual mammograms for women ages 40 and older with no out-of-pocket costs
- Diagnostic mammograms more than once a year if medically necessary; patients pay 20% of the Medicare-approved amount after the Part B deductible is met
- Breast cancer ultrasounds when medically necessary and ordered by a provider

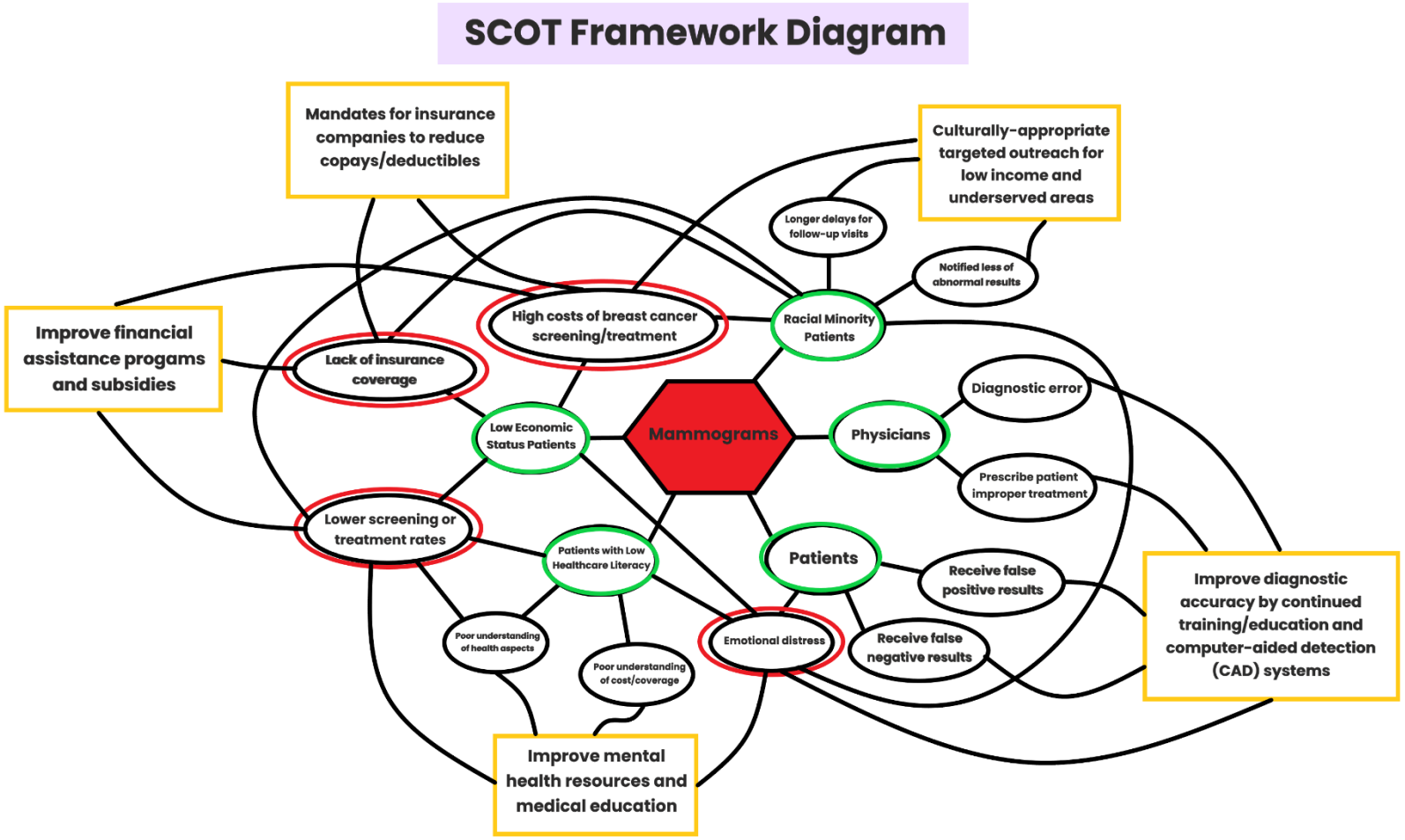
Most Medicaid programs also cover screening mammograms as preventive care and diagnostic mammograms as needed. Some states have laws that eliminate out-of-pocket costs for women who need diagnostic mammograms following their screenings. These efforts are intended to remove barriers to follow-up tests for timely breast cancer diagnosis and treatment (Lusk,

2023). If a screening mammogram shows an abnormality, patients could face costs associated with a subsequent treatment, such as a diagnostic mammogram, breast ultrasound, breast MRI, breast biopsy, surgeon's fee, facility costs, or lost income from time off work (Lusk, 2023). Additionally, uninsured women and those with no usual care have the lowest rates of reported mammogram use. Only 50 percent of uninsured women reported having a mammogram within the prior 2 years, a rate 23.7 percent lower than that of insured women (Peek et al., 2004). Women lacking supplemental health insurance were at particularly high risk of failing to undergo mammography (Blustein, 1995).

Low Health Literacy Patients

The last social group I will cover is patients with low health literacy (PLHL). Limited health literacy can hinder patients' understanding of breast health and mammography guidelines. According to Breast Cancer Screening Barriers from the Woman's Perspective, the most important barriers were lack of knowledge, access barriers (financial, geographical, cultural), fear (of results and pain), performance of service providers, women's beliefs, procrastination of screening, embarrassment, long wait for getting an appointment, language problems, and previous negative experiences (Azami-Aghdash et al., 2015). Greater than half of the women who needed a mammogram identified cost as a barrier to mammography; however, 40 percent of these women had an inappropriate perception of their insurance coverage. Underestimating or not knowing the level of mammography coverage was strongly associated with reporting cost-related difficulty, regardless of true coverage levels (McAlearney et al., 2005). Moreover, cost acted as a barrier to screening mammography for 53 percent of the participants. 52 percent of these women, however, overestimated the cost of a screening mammogram, and the overestimation of the cost was significantly related to mentioning cost as a barrier. Higher

estimates of out-of-pocket costs were associated with reporting costs as a barrier to mammography (McAlearney et al., 2005). Overestimation of the cost of a screening mammogram is an example of a lack of health literacy and its potential to be a barrier to mammogram screening.



The SCOT Framework Diagram above highlights social groups (circled green) and their respective challenges with mammograms. Red circles signify overlapping challenges faced by multiple social groups. Squares describe the potential solutions to these challenges.

Overlapping Challenges and Recommendations

Mammography, a life-saving technology for diagnosing breast cancer in thousands of women globally, is impacted by complex and sometimes harmful social dynamics. The utility of mammograms is hindered by diagnostic misinterpretations, physician malpractice, and technological ineffectiveness due to breast density, age, and other factors. Furthermore, obstacles to accessing mammography, including issues like health literacy, minority status, socioeconomic factors, insurance coverage, and emotional distress, contribute to disparities in healthcare equity. On the other hand, determining whether women should receive mammograms in the first place is difficult due to its inherent risks (false positive/negative results, negative mental effects, and cost). Choosing whether to receive a mammogram is an unclear decision many women must make on a case-by-case basis, depending on age, genetic predisposition, personal values, breast density, and more. The challenges faced by different social groups in mammography can be addressed through three primary approaches: improving affordability through insurance mandates and financial assistance programs, improving access in underserved populations through outreach and health education, and improvements in mammography diagnostic results through improved training/education and technological advancements such as computer-aided detection (CAD) and artificial intelligence (AI) based systems.

Improving Financial Barriers

Major financial barriers to mammography include insurance coverage, the high cost of screening, and potential follow-up treatments such as ultrasounds, MRIs, biopsies. Lack of insurance coverage is a major burden to patients who want to receive mammograms because the out-of-pocket costs are significantly higher for uninsured patients than insured patients. Minority and low socioeconomic status individuals also face similar financial challenges including the

costs of mammograms, potential follow-up treatments, and a higher rate of being uninsured. Due to this overlap of social groups, the two following approaches may help relieve financial burden: improved financial assistance programs and subsidies for low socioeconomic and minority populations. Research has shown that laws mandating insurance coverage for breast cancer screening services have helped reduce financial barriers and increase screening rates. Individuals who previously faced challenges due to the cost of screening can now access these services without incurring significant out-of-pocket expenses. As a result, previously underserved populations can now undergo regular breast cancer screening, leading to earlier detection and improved outcomes (Nayyar et al., 2023).

Improving Health Literacy and Emotional Stress

Low health literacy is a major problem that leads to delays and avoidance of receiving mammograms. A lack of knowledge of eligibility for mammography and risk factors such as age and race lead many women to avoid receiving mammograms. Low health literacy, the burden of emotional stress, and negative cultural perceptions of mammography observed in minority populations serve as major barriers to mammogram screening. The social groups facing these challenges include all patient subgroups. To successfully implement interventions that overcome [barriers to mammograms], the emerging consensus is that such initiatives need to be culturally tailored to the specific group of individuals in need. Interventions should also involve the local community and should be related to each aspect of the described barriers that may be contributing to the delays in follow-up. Studies that have looked at the efficacy of these types of interventions, in both cancer and other diseases, have shown them to be useful (Press). Approaches to improving health literacy and emotional distress should be implemented through improved medical education/awareness and mental health resources such as counseling services,

support groups, and guidance consultations. This has the potential to improve decision-making and medical outcomes for several of the social groups discussed, including low socioeconomic status, minority, and low health literacy patients.

Improving the Accuracy of Mammography

Many of the emotional stresses involved in receiving mammogram screenings are involved with the potential of false positive/negative results. Improving the accuracy of mammography screenings is the responsibility of physicians and the developers of technology that can improve breast abnormality detection accuracy. Additional residency training and targeted continuing medical education for physicians may help reduce the number of work-ups of benign lesions while maintaining high cancer detection rates (Miglioretti et al., 2009). CAD and AI technology may also be utilized to reduce the risk of inaccurate mammogram results. AI-CAD detected 17.9% of additional cancers on screening mammography that were initially overlooked by the radiologists (Jung et al., 2023).

Conclusion

The complicated overlap of social groups and their challenges facing the accuracy, benefits, and risks of mammograms makes the analysis of social dynamics and their impacts on potential recommendations difficult. The SCOT framework has provided valuable insights into the complex social dynamics surrounding mammograms, especially including physicians, racial minority patients, low economic status patients, low health literacy patients, and overall patients facing barriers to access. By analyzing how societal factors shape the perception, adoption, and utilization of mammography, I have identified key challenges such as mammogram screening risks, high costs, lack of insurance coverage, low screening rates, and mental barriers. The recommendations proposed, including medical education, improved diagnostic methods, cost

reduction policies, community outreach, and policy advocacy, aim to address these challenges and promote health equity in breast cancer screening. Through technological advancements, policy changes, and a focus on providing underserved populations with improved healthcare access, we can strive towards a healthcare system that ensures equal access to life-saving mammogram screenings for all individuals, regardless of social status or background.

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