




Barriers to breast cancer screening in Atlanta, GA: results from the Pink Panel survey at faith-based institutions

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Abstract

Purpose Our research sought to describe barriers to mammography screening among a sample of predominantly Black women in metropolitan Atlanta, Georgia.

Methods The Pink Panel project convened community leaders from faith-based institutions to administer an offline survey to women via convenience sampling at fourteen churches in Atlanta in late 2019 and early 2020. With the COVID-19 pandemic, the research team switched to an online survey. The survey included seven questions about breast cancer awareness, barriers to breast cancer screening, and screening status. We used residence information to attain the 9-digit zip code to link to the Area Deprivation Index at the Census Block Group neighborhood level. We report results as descriptive statistics of the barriers to mammography screening.

Results The 643 women represented 21 counties in Georgia, predominantly from metropolitan Atlanta, and 86% identified as Black. Among women aged 40 and older, 90% have ever had a mammogram. Among all women, 79% have ever had a mammogram, and 86% indicated that they would get a mammogram if offered in their neighborhood. The top barriers to mammography screening were lack of health insurance and high cost. Barriers to mammography screening did not differ substantially by Area Deprivation Index.

Conclusion Among metropolitan Atlanta women aged 40+, nearly all reported ever having a mammogram. However, addressing the barriers, including lack of health insurance and high cost, that women reported may further improve mammography screening rates.

Keywords Barriers · Mammography · Health disparities · Breast cancer

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Introduction

In both the U.S. and in Atlanta, Georgia, the breast cancer mortality rate is higher among Black women than White women [1–3]. In Atlanta, from 2014 to 2018, the rate of breast cancer deaths in Fulton County, the county that makes up most of the city of Atlanta, was 31.5 deaths per 100,000 among Black women versus 16.8 among White women [4]. In neighboring Dekalb County, the breast cancer death rate was 28.9 per 100,000 among Black women compared with 16.5 among White women. These statistics underscore significant disparities in breast cancer mortality. Based on the most recent 2020 data from the Behavioral Risk Factor Surveillance System, among women aged 40 or older in Georgia, 70% of White, non-Hispanic women and 76% of Black, non-Hispanic have had a mammogram in the past 2 years [5, 6]. Similarly, among women aged 50–74 years in Georgia, 77% of white women and 81% of Black women had a mammogram in the past 2 years [6]. While the breast cancer mortality rate is substantially higher among Black women, mammography screening rates are on par and even exceed those of White women in Georgia.

Previous research has pointed to multiple factors contributing to the high breast cancer mortality among Black women. In metropolitan Atlanta, non-Hispanic Black women diagnosed with breast cancer tend to be younger and had later-stage, node-positive, and triple-negative tumors compared with their non-Hispanic White counterparts [7]. A diagnosis of triple-negative breast cancer means fewer therapeutic options and indicates a hereditary susceptibility for breast cancer [8]. While genetic factors likely contribute to the higher breast cancer mortality among Black women, researchers have also pointed to socioeconomic disadvantage and environmental factors as key in understanding the higher breast cancer mortality among Black women [8]. Research to understand these interrelated factors is critical, and mammography screening, however, continues to be one of the most important tools to detect breast cancer early for better prognoses and treatment outcomes.

Despite higher mammography screening rates among Black women in Georgia compared with White women per the Behavioral Risk Factor Surveillance System, understanding the barriers to mammography screening is still important. Roughly 1 in 4 Black women aged 40 or older have not had a mammogram in the past 2 years in Georgia [6]. Given the high breast cancer mortality rate in Georgia, assessing the barriers to mammograms among Black women in Atlanta is urgent given the poor prognosis of late-stage tumors of which Black women are disproportionately diagnosed. The collective research to date

has identified several barriers to breast cancer screening, finding that Black women frequently report psychological/knowledge-related barriers, including pain/discomfort and fear, and financial/logistical barriers [9]. Research among underserved women found that health care cost and having no health insurance were the most common barriers reported [10].

Related to the research on barriers, the social determinants of health framework are an important lens through which we may understand barriers to mammography screening [10–12]. One strategy to assess the social determinants of health is to use the Area Deprivation Index (ADI), which scores neighborhoods for socioeconomic disadvantage at the Census Block Group level and incorporates variables such as income, education, employment, and housing quality [13]. In the US. Midwest, Kurani et al. concluded that the odds of completing the recommended breast cancer screening among women living in the most deprived census blocks (bottom 20%) were 0.51 the odds compared to women who lived in the least deprived census blocks (top 20%) [11]. Similarly, Coughlin et al. list neighborhood disadvantage as a key social determinant of health that may affect both breast cancer stage at diagnosis and survival [12]. For our study in Atlanta, we hypothesized that ADI quartile may be associated with different barriers to breast cancer screening.

To understand how Black women in Atlanta experience mammography screening and barriers to breast cancer screening, a team of researchers at Georgia State University (GSU) initiated the Pink Panel project with community leaders from faith-based institutions across the metropolitan area. The primary aim of this project was to describe the prevalence of mammography screening and barriers to breast cancer screening among a sample of predominantly Black women in Atlanta. The secondary aim was to gauge descriptively if barriers to breast cancer screening differed by ADI quartile. We include women across age groups in our study sample of predominantly Black women. Although younger women may not have undergone screening themselves, they likely hold perceptions toward mammography screening and barriers that are still valuable. Atlanta is the ninth largest metropolitan statistical area in the country, so uncovering the barriers to mammography screening could enable targeted action to eliminate these barriers in the future, impacting a large population of women [14].

Methods

Survey instrument

We used a cross-sectional survey to identify key barriers to screening for breast cancer among women in Atlanta, Georgia. The survey, developed by the research team,

included questions about breast cancer screening and factors that may affect screening status. Both epidemiologists and clinicians reviewed the survey questions. The survey consisted of seven thematic questions asking about age and race and ethnicity; residential address; whether they have ever had a mammogram; if they think they are at risk for getting breast cancer; family history of breast cancer; whether they would get a mammogram if offered in their neighborhood; and finally, a ranking of the barriers to mammography screening: no time, too high cost, no childcare, no health insurance, no transportation, and fear of having or having had bad interactions with health care workers.

Sampling technique

The research team relied on convenience sampling, with community partners administering offline or online surveys to women who attended services at fourteen churches in Atlanta, GA in late 2019 and early 2020. With the Covid-19 pandemic impacting church services, we switched to an online survey in March 2020. Overall, 663 participants completed the paper survey, and only 50 completed the online survey. Study participants received no compensation for taking the survey. The research team collected residential addresses, but names or other identifying information were not requested. The Georgia State University Institutional Review Board granted approval for this study (award H20245).

Instead of ranking the barriers, some women responded instead by making an “X” for one or multiple barriers. If a respondent marked only one barrier with an “X,” then the researcher treated the “X” as a 1 (or the top barrier). If a respondent marked two barriers with Xs, then the researcher treated both barriers as a 1 (equally tied as top barriers). If the respondent marked more than two barriers with an X, the researchers did not include in the analysis on screening barriers (16 excluded as a result). In addition, if a respondent wrote “big,” “moderate,” or “small” barrier, then the researcher assigned rankings of 1, 2, or 3, accordingly.

ADI index

We downloaded the national-level ADI from the Neighborhood Atlas and linked the individual data to the National ADI at the Census Block Group neighborhood level using the 9-digit zip code [13]. The national ADI was divided into quartiles (0–25, 26–50, 51–75, and 76–100), so each participant was assigned a national ADI quartile range if a 9-digit zip code was available for that participant.

Data analysis

We describe the characteristics of the study population and their responses using frequencies and proportions of the variables including county of residence, race, age, and questions that pertain to mammography screening and perceptions of breast cancer screening and risk. We then described key characteristics by high (equal to or above the median ADI 60), low ADI (below the median ADI 60), or missing ADI to examine differences in screening by neighborhood characteristics. In addition, we graphically represented the primary ranked barrier to screening by ADI quartile. All analyses were conducted within Excel.

Results

In total, 713 women completed the survey, but 70 women were excluded because they did not report any geographic information to confirm their residence in Georgia. Among the remaining 643 women, only 499 provided exact street addresses that could be linked to a 9-digit zip code on the United States Postal Office website. Of those 499 women, only 357 ranked the barriers to mammography screening.

Table 1 presents the summary data from the Pink Panel survey. Participants represented 22 counties in Georgia, but the most represented counties are located in the metropolitan Atlanta area: DeKalb (56%), Fulton (21%), Gwinnett (6%), Clayton (4%), and Rockdale (4%). In total, 86% of the women identified as Black; 8% as Asian; and the remaining as White, Hispanic, Multi-Racial, or unidentified. Regarding ADI quartiles, 10% resided in a census block group in the lowest national ADI quartile (indicating least deprivation); 17% in a census block group with a national ADI between 26 and 50; 33% in a census block group with a national ADI between 51 and 75; and 17% in a census block group with a national ADI between 76 and 100, indicating the highest deprivation neighborhoods.

In Table 2, we illustrate the distribution of the demographic characteristics and breast cancer screening responses stratified by high ADI (\geq median), low ADI ($<$ median), or missing ADI. Women with a missing ADI had a lower percentage of ever having a mammogram (76%) compared to women from a high ADI (81%) versus low ADI (79%). No other notable differences emerged.

Among women from all age categories, 79% of women have ever had a mammogram. Limited to only women aged 40 or older, 90% had ever had a mammogram. Further restricted to only women between age 50 and 74, 95% had ever had a mammogram. Only 20% of all women thought that they are at risk for getting breast cancer. Among all women, 86% would get a mammogram if breast cancer screenings were offered in their neighborhood.

Table 1 Pink Panel survey descriptive statistics ($n=643$)

| Variable | Count(%) |
|---|-----------|
| County of residence | |
| Dekalb county | 363 (56%) |
| Fulton county | 135 (21%) |
| Gwinnett county | 36 (6%) |
| Clayton county | 28 (4%) |
| Rockdale county | 26 (4%) |
| Other Georgia counties | 55 (9%) |
| Race | |
| Asian | 52 (8%) |
| Black | 556 (86%) |
| Hispanic | 3 (0%) |
| Multi-racial | 9 (1%) |
| White | 2 (0%) |
| Missing | 21 (3%) |
| Age categories | |
| 18–29 | 40 (6%) |
| 30–39 | 84 (13%) |
| 40–49 | 103 (16%) |
| 50–64 | 208 (32%) |
| 65+ | 188 (29%) |
| Missing | 20 (3%) |
| ADI quartile | |
| 1–25 | 63 (10%) |
| 26–50 | 111 (17%) |
| 51–75 | 214 (33%) |
| 76–100 | 110 (17%) |
| Missing | 145 (23%) |
| Have you ever had a mammogram? (all ages) | |
| Yes | 508 (79%) |
| No | 132 (21%) |
| Missing | 3 (0%) |
| Have you ever had a mammogram? (only 40+) | |
| Yes | 450 (90%) |
| No | 48 (10%) |
| Missing | 1 (0%) |
| Have you ever had a mammogram? (50–74) | |
| Yes | 318 (95%) |
| No | 15 (5%) |
| Missing | 0 (0%) |
| Do you think you are at risk for getting breast cancer? | |
| No | 328 (51%) |
| Yes | 127 (20%) |
| Don't know | 166 (26%) |
| Missing | 22 (3%) |
| If breast cancer screenings were offered in your neighborhood, would you get a mammogram? | |
| Yes | 550 (86%) |
| No | 70 (11%) |
| Missing | 23 (4%) |

Figure 1 displays how often women ranked each reason as the #1 barrier, stratified by ADI quartile. Lacking health insurance (pink bar) was consistently ranked as the top barrier for women across the ADI quartiles. Cost for screening (orange bar) was also frequently cited as the number one barrier across the ADI quartiles. As the ADI quartiles progress from least to most deprived, fear (blue bar) and child-care (yellow bar) are more frequently cited as the top barrier.

Discussion

In this study, we sought to describe the experiences and perceptions of a sample of predominantly Black women in Atlanta pertaining to mammography screening and barriers to breast cancer screening. We observed that most women in the age groups recommended to undergo screening reported having had a mammogram (90% among women 40 years and older and 95% among women aged 50–74). This finding suggests that despite the barriers to mammography screening that these women reported, almost all women in the recommended age groups from our sample have ever had a mammogram.

Although not directly comparable since our survey question asked if women ever had a mammogram instead of just in the last two years, the screening levels among the women in our sample exceed those reported by the most recent survey data in the Behavioral Risk Factor Surveillance System [6]. Collectively this implies that more needs to be done, beyond a focus on mammography screening, to address the high breast cancer mortality rates among Black women in Atlanta. We recognize this as a key implication of this study, yet identifying and working to remove the barriers to breast cancer screening that these women identified is still important. Although these barriers did not prevent most of these women from receiving a screening, the barriers reported by the women in our sample may have prevented other women in their community from getting a breast cancer screening and may deter the women included in this study from getting a screening in the future.

The most frequently cited barriers in our study were high cost and lack of health insurance. Women across all levels of community adversity frequently ranked both these barriers as the most significant. Our results corroborate findings from previous research that financial barriers, including health care cost and no health insurance, were frequently reported barriers to breast cancer screening among Black and underserved women [9, 10]. The fear-related barrier in our study, “fear of having or having had bad interactions with health care workers,” was less often ranked as one of the top barriers, but women from ADI quartiles of higher deprivation more frequently cited this fear as a barrier compared to women from the ADI quartile of least deprivation.

Table 2 Pink Panel survey Descriptive statistics—high vs low ADI relative to the sample median ADI 60 ($n=643$)

| Variable | High ADI (\geq median ADI 60) count (column %) | Low ADI ($<$ median ADI 60) count (column %) | Count (column %) for missing ADI |
|--|--|--|-------------------------------------|
| County of residence | | | |
| Dekalb county | 167 (67%) | 113 (45%) | 83 (58%) |
| Fulton county | 52 (21%) | 58 (23%) | 25 (17%) |
| Gwinnett county | 8 (3%) | 17 (7%) | 11 (8%) |
| Clayton county | 12 (5%) | 10 (4%) | 6 (4%) |
| Rockdale county | 2 (1%) | 16 (6%) | 8 (6%) |
| Other georgia counties | 9 (4%) | 35 (14%) | 11 (8%) |
| Race | | | |
| Asian | 24 (10%) | 17 (7%) | 11 (8%) |
| Black | 215 (86%) | 218 (88%) | 123 (85%) |
| Hispanic | 1 (0%) | 1 (0%) | 1 (1%) |
| Multi-racial | 3 (1%) | 3 (1%) | 3 (2%) |
| White | (0%) | 2 (1%) | (0%) |
| Missing | 7 (3%) | 8 (3%) | 6 (4%) |
| Age categories | | | |
| 18–29 | 13 (5%) | 18 (7%) | 9 (6%) |
| 30–39 | 30 (12%) | 37 (15%) | 17 (12%) |
| 40–49 | 34 (14%) | 46 (18%) | 23 (16%) |
| 50–64 | 79 (32%) | 74 (30%) | 55 (38%) |
| 65+ | 87 (35%) | 68 (27%) | 33 (23%) |
| Missing | 7 (3%) | 6 (2%) | 7 (5%) |
| Have you ever had a mammogram? (all ages) | | | |
| Yes | 202 (81%) | 197 (79%) | 109 (76%) |
| No | 47 (19%) | 51 (20%) | 34 (24%) |
| Missing | 1 (0%) | 1 (0%) | 1 (1%) |
| Have you ever had a mammogram? (only 40+) | | | |
| Yes | 182 (91%) | 174 (93%) | 94 (85%) |
| No | 18 (9%) | 14 (7%) | 16 (14%) |
| Missing | (0%) | (0%) | 1 (1%) |
| Have you ever had a mammogram? (50–74) | | | |
| Yes | 134 (98%) | 116 (97%) | 68 (89%) |
| No | 3 (2%) | 4 (3%) | 8 (11%) |
| Do you think you are at risk for getting breast cancer? | | | |
| No | 126 (50%) | 132 (53%) | 70 (49%) |
| Yes | 51 (20%) | 50 (20%) | 26 (18%) |
| Don't know | 63 (25%) | 63 (25%) | 40 (28%) |
| Missing | 10 (4%) | 4 (2%) | 8 (6%) |
| If breast cancer screenings were offered in your neighborhood, would you get a mammogram? | | | |
| Yes | 213 (85%) | 211 (85%) | 126 (88%) |
| No | 29 (12%) | 27 (11%) | 14 (10%) |
| Missing | 8 (3%) | 11 (4%) | 4 (3%) |

Miller et al. found that psychological/knowledge-related barriers, particularly pain/discomfort and fear, were key barriers among Black women [9], and our study suggests that this barrier may manifest differently among women based on level of neighborhood disadvantage. In our study, compared

with women residing in the least deprived neighborhoods, women from highly deprived areas more frequently cited fear of having or having had bad interactions with health care workers as the top barrier to getting a mammogram. This finding signals the importance of understanding how

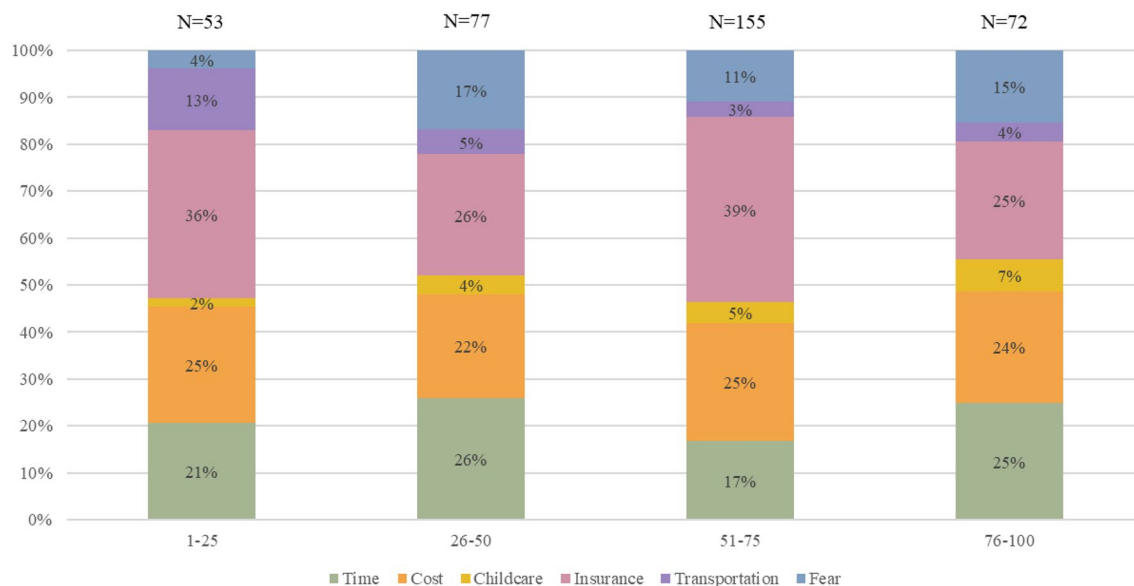


Fig. 1 Top barrier to breast cancer screening by national ADI quartile ($n=357^*$). *Only 357 women provided a residential address that could be linked to the national ADI and ranked the #1 barrier to breast cancer screening. (Color figure online)

fear of interactions with health care workers, and perhaps psychological barriers more broadly, may be associated with neighborhood disadvantage.

Another key finding from our study is that 86% of women, across all age groups, would choose to get screened if a mammogram were offered in their neighborhood. This high willingness to get screened represents an important opportunity and implies that younger women under age 40 would also choose to get screened if offered. The American College of Radiology called for all women, but especially Black women, to be evaluated for breast cancer risk by age 30 to identify those at high risk [15]. Oppong et al. more recently wrote that “Black women should fundamentally be considered high risk” in terms of breast cancer risk [16]. While our study provides no evidence for or against earlier screening, our findings signal a high willingness to undergo screening among our sample of predominantly Black women in Atlanta, including women younger than age 40. This implies that the women surveyed are aware of breast cancer risk, even if only 20% indicated that they think they are at risk for getting breast cancer.

To overcome the barriers reported by the women in our sample, one possible strategy to offer convenient access to breast cancer screening is mobile mammograms. Recent research has evaluated the effectiveness of mobile mammograms among underserved women, finding that mobile mammograms have reached women from racial and ethnic minorities who lacked health insurance and were low income [17]. In metropolitan Atlanta, Northside Hospital has begun the initiative ScreenAtlanta, a community service offering mobile mammograms on a year-round basis at grocery stores

throughout metropolitan Atlanta [18]. Expanded mobile mammography offerings can ensure that women have convenient access to breast cancer screening.

While our study did not assess genetic testing, testing for BRCA1/2 variants and discovery of other pathogenic variants to inform risk could be additional approaches to address the higher breast cancer mortality rates among Black women. The US Preventive Services Task Force recommends that primary care clinicians use a familial risk assessment tool among women with a personal or family history of breast, ovarian, tubal, or peritoneal cancer or an ancestry linked to BRCA 1/2 gene mutations and provide genetic testing among those who screen positive [19]. Risk for breast cancer increases with mutations in the BRCA1/2 genes, so identifying women with these mutations ideally spurs risk management actions [19]. Recent research has shown that Black women under age 50 had lower odds of undergoing BRCA1/2 testing after a breast cancer diagnosis compared to White women [20, 21]. This disparity likely contributes to the higher breast cancer mortality rates among Black women.

We recognize that our study has limitations due to the relatively small number of participants and because the convenience sample limits the generalizability of the results. Women who attended church services in Atlanta undoubtedly differ in important ways from women who did not, and the COVID-19 impact disrupted the initial survey distribution disrupting participant recruitment. For example, in our survey, almost one-third of the women were 65 years of age or older. In the five counties most represented in our survey (DeKalb, Fulton, Gwinnett, Clayton, and Rockdale counties),

however, only 12% of the female population were 65 years of age or older in 2020 [22]. In addition, the lack of compensation for taking the survey likely resulted in participation bias. Although the survey was short, participants who chose to participate for no compensation probably differed from women who chose not to participate. Importantly, our survey asked only if women have ever had a mammogram, so we did not gather information on if they are up-to-date on their screening. Previous research has found that black women who were screened and later diagnosed at Emory Healthcare in Atlanta, GA, had two times the odds of delay to diagnostic evaluation [23]. The ever had a mammogram variable in our study would not capture whether a woman received timely care after an abnormal screening, a driver of disparities in stage at diagnosis.

Conclusion

Among the women in metropolitan Atlanta that participated in this survey, predominantly from Black communities, most have ever had a mammogram (79% among all ages; 90% among women age 40 and older; 95% among women age 50–74). The women surveyed responded that lack of health insurance and high cost emerged as the top barriers to mammography screening among women regardless of the neighborhood deprivation. Given the high breast cancer mortality among Black women compared to White women in Atlanta, addressing these barriers to ensure all women have access to screening and adhere to the recommended biennial screening is an important public health priority. Lastly, when asked if they would get a mammogram if offered in their neighborhood, 86% of women answered affirmatively. This indicates a high willingness among Black women in Atlanta to undergo mammography screening, so addressing these barriers could enable even higher screening levels.

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Data availability The dataset analyzed in the current study is available upon reasonable request to the corresponding author.

Declarations

Competing interests The authors have no conflicts of interest to disclose.

Ethical approval All relevant ethical safeguards have been met in relation to patient or subject protection. The research has complied with the World Medical Association Declaration of Helsinki.

References

1. DeSantis CE, Ma J, Goding Sauer A, Newman LA, Jemal A (2017) Breast cancer statistics, 2017, racial disparity in mortality by state. *CA Cancer J Clin* 67(6):439–448. <https://doi.org/10.3322/caac.21412>
2. Hunt BR, Hurlbert MS (2016) Black:white disparities in breast cancer mortality in the 50 largest cities in the United States, 2005–2014. *Cancer Epidemiol* 45:169–173. <https://doi.org/10.1016/j.canep.2016.07.018>
3. Georgia Department of Health. Georgia Cancer Data Report 2016. <https://dph.georgia.gov/document/document/georgia-cancer-data-report-2016/download>
4. Centers for Disease Control and Prevention (2021) United States Cancer Statistics – Cancer Burden – Dekalb and Fulton County, Georgia. Female Breast, 2014–2018. <https://gis.cdc.gov/Cancer/USCS/#/StateCounty/>
5. Centers for Disease Control and Prevention (2020) BRFSS survey data and documentation 2021. https://www.cdc.gov/brfss/annual_data/annual_2020.html
6. Centers for Disease Control and Prevention (2020) Behavioral Risk Factor Surveillance System Data 2020. <https://nccd.cdc.gov/weat/#/analysis>
7. Collin LJ, Jiang R, Ward KC, Gogineni K, Subhedar PD, Sherman ME et al (2019) Racial disparities in breast cancer outcomes in the Metropolitan Atlanta Area: new insights and approaches for health equity. *JNCI Cancer Spectr*. <https://doi.org/10.1093/jncics/pkz053>
8. Newman LA, Kaljee LM (2017) Health disparities and triple-negative breast cancer in african american women: a review. *JAMA Surg* 152(5):485–493. <https://doi.org/10.1001/jamasurg.2017.0005>
9. Miller BC, Bowers JM, Payne JB, Moyer A (2019) Barriers to mammography screening among racial and ethnic minority women. *Soc Sci Med* 239:112494. <https://doi.org/10.1016/j.socscimed.2019.112494>
10. Henderson LM, O’Meara ES, Haas JS, Lee CI, Kerlikowski K, Sprague BL et al (2020) The role of social determinants of health in self-reported access to health care among women undergoing screening mammography. *J Womens Health* 29(11):1437–1446. <https://doi.org/10.1089/jwh.2019.8267>
11. Kurani SS, McCoy RG, Lampman MA, Doubeni CA, Finney Rutten LJ, Inselman JW et al (2020) Association of neighborhood measures of social determinants of health with breast, cervical, and colorectal cancer screening rates in the us midwest. *JAMA Netw Open* 3(3):e200618. <https://doi.org/10.1001/jamanetworkopen.2020.0618>
12. Coughlin SS (2019) Social determinants of breast cancer risk, stage, and survival. *Breast Cancer Res Treat* 177(3):537–548. <https://doi.org/10.1007/s10549-019-05340-7>
13. University of Wisconsin School of Medicine and Public Health. Area Deprivation Index 2021. <https://www.neighborhoodatlas.medicine.wisc.edu/>
14. Metro Atlanta Chamber. Profile of Metro Atlanta – Population 2021. <https://www.metroatlantachamber.com/resources/reports-and-information/executive-profile>
15. Monticciolo DL, Newell MS, Moy L, Niell B, Monsees B, Sickles EA (2018) Breast cancer screening in women at higher-than-average risk: recommendations from the ACR. *J Am Coll Radiol* 15(3):408–414. <https://doi.org/10.1016/j.jacr.2017.11.034>
16. Oppong BA, Obeng-Gyasi S, Relation T, Adams-Campbell L (2021) Call to action: breast cancer screening recommendations for Black women. *Breast Cancer Res Treat* 187(1):295–297. <https://doi.org/10.1007/s10549-021-06207-6>

17. Vang S, Margolies LR, Jandorf L (2018) Mobile mammography participation among medically underserved women: a systematic review. *Prev Chronic Dis* 15:E140. <https://doi.org/10.5888/pcd15.180291>
18. Northside Hospital. Screen Atlanta Mobile Mammography 2022. <https://www.northside.com/docs/default-source/cancer-institute/screenatlanta.pdf>
19. U. S. Preventive Services Task Force (2019) Risk assessment, genetic counseling, and genetic testing for BRCA-related cancer: US preventive services task force recommendation statement. *JAMA* 322(7):652–665. <https://doi.org/10.1001/jama.2019.10987>
20. Pace LE, Ayanian JZ, Wolf RE, Knowlton R, Gershman ST, Hawkins SS et al (2022) BRCA1/2 testing among young women with breast cancer in Massachusetts, 2010–2013: an observational study using state cancer registry and all-payer claims data. *Cancer Med*. <https://doi.org/10.1002/cam4.4648>
21. Cragun D, Weidner A, Lewis C, Bonner D, Kim J, Vadaparampil ST et al (2017) Racial disparities in BRCA testing and cancer risk management across a population-based sample of young breast cancer survivors. *Cancer* 123(13):2497–2505. <https://doi.org/10.1002/cncr.30621>
22. Female population: 65 and over (American community survey 5-year estimates). Social Explorer 2020
23. Miller-Kleinhenz JM, Collin LJ, Seidel R, Reddy A, Nash R, Switchenko JM et al (2021) Racial disparities in diagnostic delay among women with breast cancer. *J Am Coll Radiol* 18(10):1384–1393. <https://doi.org/10.1016/j.jacr.2021.06.019>

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