Mammogram Screening Differences at the Intersection of Sexual Orientation, Race and Ethnicity, and Rurality

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Introduction

Many breast cancer screening guidelines recommend mammogram screening as effective in the early detection of breast/chest[1] cancer for average risk women[2] aged 40 to 74 years (*Breast Cancer Screening Guidelines for Women*, 2020; *Cancer Facts & Figures 2023*, 2023; Monticciolo, 2020). However, recent studies yield mixed results as to whether sexually minoritized women (SMW) (women who identify as lesbian or gay, bisexual, queer, asexual, having same-sex sexual attraction, behaviors, or relationships, or as not exclusively heterosexual) are as likely to receive mammograms compared to their heterosexual counterparts (Agénor et al., 2020; Austin et al., 2013; Barefoot et al., 2017; Bazzi et al., 2015; Ceres et al., 2018; Charkhchi et al., 2019; Clavelle et al., 2015; Gilbert et al., 2020; Heer et al., 2023; Herriges et al., 2022; Lee et al., 2020; Lin et al., 2023; Malone et al., 2019; Meads & Moore, 2013; Siegel et al., 2017; Solazzo et al., 2017; Williams et al., 2020). An array of research shows higher prevalence of risk factors for breast cancer, such as higher body weight and substance use; yet these many of these risk factors are attributable to stress from sexual orientation-related stigma and discrimination (Austin et al., 2012; Boehmer & Bowen, 2009; Boehmer & Case, 2007; Case et al., 2004; Cochran et al., 2001; Lehavot & Simoni, 2011; Lick et al., 2013; McCabe et al., 2009; Quinn et al., 2015; Zaritsky & Dibble, 2010). Breast/chest cancer incidence and mortality among SMW is understudied, though prior research suggests heightened mortality among SMW (Boehmer et al.,

[1] Breast/chest terminology will be used throughout this paper in order to reflect gender-neutral terminology (Goldberg et al., 2018; Mehta et al., 2023).

[2] The use of "women" is in alignment with the literature describing breast cancer screening for women. In this paper I will use "people" or gender-neutral terminology to describe my results and future recommendations in recognition that people of all genders are at risk for breast cancer yet may not identify as women.

2013; Brown & Tracy, 2008; Case et al., 2004; Cathcart-Rake, 2018; Cochran et al., 2001; Cochran & Mays, 2012; Dibble et al., 2004; Hart & Bowen, 2009; Hutchinson et al., 2006; Zaritsky & Dibble, 2010). Given this knowledge it remains crucial to understand SMW's breast/chest cancer screening usage.

Prior research examining racial and ethnic disparities in breast/chest cancer screening, which are notable, has more widely examined racial and ethnic disparities separately from sexual orientation. There are mixed results of the breast/chest cancer screening rates among Black, Hispanic, and white populations (Ayanian et al., 2013; Brawarsky et al., 2012; Calo et al., 2016; Elewonibi et al., 2018; Hirth et al., 2016; Miranda et al., 2012; National Cancer Institute, 2021; Sauer et al., 2018; Stapleton et al., 2018). Previous findings also indicate that mammography is less likely among groups marginalized by race and ethnicity, including Native Hawaiian, Pacific Islander, Indigenous, and multi-racial populations (Chancellor et al., 2023). Studies that examine mammogram usage with particular attention to the intersection of sexual orientation with race and ethnicity are rare, and even more rare is focus on those marginalized by both structural heterosexism and racism[3] (Agénor et al., 2020; Lin et al., 2023; Malone et al., 2019).

Yet another understudied area of preventive breast/chest cancer research is a focus on differences in mammogram usage by rural populations. Similar to research highlighting racial and ethnic disparities in breast/chest cancer screening, research on mammogram usage at the intersections of rurality and sexual orientation are also sparse. Breast/chest cancer screening rates differ by geography, with lower rates among rural residents compared with their urban counterparts (Bennett et al., 2012b, 2012a; Berkowitz et al., 2019; Davis et al., 2012; Doescher

[3] Though there is no congruent definition of structural racism, scholars define structural racism as being "produced and reproduced by laws, rules, and practices, sanctioned and even implemented by various levels of government, and embedded in the economic system as well as in cultural and societal norms" (Bailey et al., 2020).

& Jackson, 2009; Heller et al., 2018; Henry et al., 2014; Nuño et al., 2012; Orwat et al., 2017; Tran & Tran, 2019). Other studies suggest that breast cancer incidence rates are higher in urban areas compared to rural areas; however, this may be indicative of increased early detection and utilization of mammography (Leung et al., 2014; Zahnd, Fogleman, et al., 2018; Zahnd, James, et al., 2018). A more recent study examined the intersections of sexual orientation and rurality and identified that screening rates for breast/chest, cervical, and colorectal cancer are lowest among rural and lesbian, bisexual, gay, and queer populations compared with urban and heterosexual populations (Lee et al., 2020). Despite the presence of complexities affecting uptake among sexually, racially and ethnically minoritized and rural populations, little to no research documents breast/chest cancer screening uptake at the intersection of sexual orientation, race and ethnicity, and rurality.

Mammography is recommended by a number of organizations for women at average risk of breast/chest cancer as early as age 40, though there is little consensus on whether screening is evidenced to reduce breast/chest cancer mortality in women 40-49 years of age (American Cancer Society, 2018; *Breast Cancer Screening Guidelines for Women*, 2020). Yet these organizations highlight the association of earlier detection with a greater chance for successful treatment of breast/chest cancer (National Cancer Institute, 2015, 2023; Siu, 2016). Given this association, it raises the question of whether mammogram screening is uniform in uptake across sexual orientation, race and ethnicity, and rural and urban environments. Building on previous findings, this study aims to shed light on mammogram rates at the intersection of sexual orientation, race and ethnicity, and rurality and provide recommendations for next steps in improving health services related to breast/chest cancer screening and care for sexually and racially and ethnically minoritized and rural populations.

To assess mammogram usage by the intersections of sexual orientation, race and ethnicity, and rurality, an intersectional theoretical approach is required. Intersectionality, first articulated by feminist and queer scholars of color (Anzaldúa, 1987; Collins, 2019; Combahee River Collective, 1995; Crenshaw, 1990; hooks, 1981, 1984, 1989; Lorde, 1984; Moraga & Anzaldúa, 1981), is best articulated by Lisa Bowleg, who describes it as a "theoretical framework that posits that multiple social categories (e.g. race, ethnicity, gender, sexual orientation…) intersect at the micro-level of individual experience to reflect multiple interlocking systems of privilege and oppression at the macro, social-structural level (e.g. racism, sexism, heterosexism)" (Bowleg, 2012). What is crucial about using an intersectional lens in examining sexually minoritized people's mammogram usage is that it enables us to document inequities within intersectional groups and map how privilege and oppression shape access to breast/chest cancer screening. More specifically, this study uses two quantitative intersectionality approaches known as intercategorical and intracategorical complexity. Intercategorical complexity entails using existing analytical categories, such as those of race and sexual orientation, to document relationships of inequality among social groups (McCall, 2005) Intracategorical complexity recognizes these existing analytical categories while also being critical of them and focusing on within-group complexities (McCall, 2005). This study employs intercategorical complexity by using already established social categories within BRFSS to examine mammogram usage at the intersections of minoritized sexual orientations, including being lesbian or gay, bisexual, or something else other than lesbian, gay or bisexual, with race and ethnicity, and rurality.

Further, a structural intersectionality lens is critical for assessing mammogram usage at the intersections of sexual orientation, race and ethnicity, and rurality because these micro-level

dimensions are historically and currently intertwined with each other as well as multiple and overlapping macro-level systems of power, including structural cisheterosexism, racism, and urbanism.[4] As noted in Chapter 1, racialization, which can be understood as an ideological process of extending racial meaning to a social practice or group, is intertwined with the historical development of categories of gender and sexuality (Somerville, 2000). A core aspect of intersectionality is to engage with relationality and complexity such that the inextricable links between sexuality and race and ethnicity are amplified, and, consequently, health services researchers are able to investigate health inequities within and between social groups at these intersections as well as the power relations, cisheterosexism and racism among them, that structure health inequities. Most health services empirical research has used social groupings, such as sexual orientation and race and ethnicity, as proxies for forms of structural heterosexism and racism. This study engages with the examination of the intersections of sexual orientation, race and ethnicity, and rurality in order to explicitly name differences in breast/chest cancer screening that have rarely been documented. Further, this study closely examines mammogram usage among marginalized populations at the intersections of sexual orientation, race and ethnicity, and rurality previously neglected in health services research. As noted above, there are marked inequities in mammogram usage by sexual orientation, race and ethnicity, and rurality separately. As such, a structural intersectionality approach is required to not only name inequities in mammogram usage at these intersections but also to point toward the multiple and overlapping

[4] Structural urbanism is defined as a "bias toward large population centers, stemming from three factors: a market orientation in health care, which necessitates a critical mass of paying customers to make services viable; a public health focus on changing outcomes at the population level, which differentially allocates funding toward large population centers; and the innate inefficiencies of low-population and remote settings, in which even equal funding can never translate into equitable funding" (Probst et al., 2019).

systems of oppression that maintain inequities for populations most burdened by breast/chest cancer.

The overall goal of this study is to document mammogram usage by sexual orientation, race and ethnicity, and rurality at the individual level and at their intersections. Further, this study uses intracategorical complexity by examining within-group differences in mammogram usage for sexually minoritized people and critically examines the limitations of current analytical categories used in the Behavioral Risk Factor Surveillance System (BRFSS), the largest population-based surveys on health and health service use in the U.S. These approaches provide insight into current inequities in breast/chest cancer screening and how we can improve our measurement of these inequities such that we are in a better position to alleviate them. To the best of the author's knowledge, this is the first study to explore mammogram usage across the intersections of sexual orientation, race and ethnicity, and rurality.

Methods

Data and sample

This analysis uses 2022 BRFSS data to examine rural-urban and racial and ethnic differences in sexually minoritized people's mammogram usage. Beginning in 1984, BRFSS, a survey administered by the Centers for Disease Control and Prevention (CDC), began collecting surveillance data at the state-level to represent the U.S. non-institutionalized population aged 18 and over. Collected through telephone-based methods starting in 2011, BRFSS surveys include core questions on health-related behaviors, chronic health conditions, health care access, and use of preventive services as well as optional modules offered to states, including one on sexual orientation and gender identity (SOGI). In 2022, 30 states (Alaska, Colorado, Connecticut, Delaware, Georgia, Hawaii, Illinois, Indiana, Kansas, Louisiana, Maryland, Massachusetts,

Michigan, Minnesota, Missouri, Montana, Nevada, New Mexico, North Carolina, North Dakota, Ohio, Pennsylvania, Rhode Island, Texas, Utah, Vermont, Virginia, Washington, West Virginia, and Wisconsin) participated in collecting respondents' SOGI information. Thus this study is able to collect information on respondents' mammogram usage by sexual orientation, race and ethnicity, and rural-urban location as well as other important sociodemographic and health-related characteristics.

The final sample size for this study is n=63,517. In order to create the final sample population, respondents are included based on their indication of whether or not they received a mammogram within the past two years, are aged 40 years or older, and were assigned female at birth. Next, respondents are included if they report their sexual orientation, race and ethnicity, education, income, urban/rural location, health status, health insurance coverage status, and length of time since last routine check-up. Respondents older than 74 years of age were excluded to align with the ages recommended in breast/chest cancer screening guidelines, such that the final sample includes those assigned female at birth aged 40-74 years of age. A flow chart showing inclusion and exclusion criteria is included in the appendix (Figure 1).

Measures

Mammogram usage

The primary outcome measure is mammogram usage. This is a BRFSS calculated variable. Respondents assigned female at birth and aged 40 years and older were initially asked whether they ever had received a mammogram and how long it had been since their last mammogram. Those respondents assigned female at birth and aged 40 years and older who indicated receiving a mammogram within the past two years are included in this measure.

Sexual orientation

Sexual orientation is defined as self-reporting sexual identity as lesbian or gay, bisexual, something else, or heterosexual. Sexual orientation was initially collected by sex assigned at birth, such that those assigned female at birth are included in the sample. Sexual orientation is re-coded into two categories: sexually minoritized (lesbian or gay, bisexual, something else) and heterosexual.

Race and ethnicity

Race and ethnicity are measured as a five- level variable: non-Hispanic (NH) white, non-Hispanic Black, Hispanic origin, non-Hispanic Asian, and non-Hispanic other, which includes non-Hispanic American Indian or Alaska Native (AIAN), non-Hispanic Native Hawaiian or other Pacific Islander, and non-Hispanic multi-racial respondents.

Rural-urban location

Rural and urban populations are re-coded into two categories based on the 2013 National Center for Health Statistics (NCHS) definitions (Ingram & Franco, 2014). The 2013 NCHS Urban-Rural Classification Scheme for Counties classifies counties within six levels: four metropolitan (large central metro, large fringe metro, medium metro, and small metro) and two nonmetropolitan (micropolitan and noncore) (Ingram & Franco, 2014). The four metropolitan areas are re-coded as urban, and micropolitan and noncore areas are re-coded as rural (Ingram & Franco, 2014).

Sociodemographic and health-related covariates

Sociodemographic characteristics that are associated with health and health outcomes are also included, including health insurance coverage (at least some vs. no form of health insurance), educational attainment (less than high school, high school, some college, college graduate), annual household income (<$15,000, $15-24,000, $25-34,000, $35-49,000,

$50-99,000, $100-199,00, $200,000), age at survey (40-49 years, 50-54 years, 55-59 years, 60-64 years, 65-69 years, 70-74 years), self-rated general health status (excellent, very good, good, fair/poor), and length of time since last routine check-up (within the past year, one year but less than two years ago, two years but less than five years ago, five or more years ago, never).

Analysis

I first examine bivariate associations between sexual orientation and mammogram usage, rurality and race and ethnicity, as well as those sociodemographic aspects listed above using BRFSS survey weights. I then use logistic regression models to measure the relationship between sexual orientation and mammogram usage, adjusting for other covariates. Predicted probabilities of receiving a mammogram for sexually minoritized and heterosexual participants are generated with other covariates held at their means. Given the influence of race and ethnicity and rurality on mammogram usage and with an intersectional lens in mind, predicted probabilities are calculated for sexually minoritized and heterosexual people at the intersection of sexual orientation, race and ethnicity, and rurality, such that the predicted probabilities are within each racial and ethnic and geographic category. All analyses were conducted using Stata v.16 using BRFSS survey weights. This study is exempted from review by the University of Minnesota Institutional Review Board because it uses secondary data analysis of publicly available de-identified data.

Results

Compared with heterosexual (het) people assigned female at birth, sexually minoritized (SM) people assigned female at birth are younger (between 40-54 years of age), identify as NH Black, Hispanic, NH Asian or NH other, including AIAN, Native Hawaiian or other Pacific Islander, and multi-racial, and more likely to live in urban areas (Table 1). SM people are also

more likely to not have health insurance coverage, have lower educational attainment (less than high school education) and lower incomes (<$35,000). SM people also report poorer health (30.16% with poor/fair health versus 19.03% of heterosexual people with poor/fair health, $p<0.001$) and are less likely to have a routine check-up within the past year (80.21% versus 84.29%, $p<0.01$) than their heterosexual counterparts.

Regarding overall mammogram usage, approximately 72% of the population reports receiving a mammogram within the past two years (Table 2). SM people are less likely than heterosexual people to receive a mammogram within the past two years (64.09% versus 72.39%, $p<0.001$). SM people report lower mammogram usage within the past two years than their heterosexual peers across all races and ethnicities, urban-rural geography, health insurance coverage, general health statuses, and lengths of time since last routine check-up (Table 3). Higher mammogram usage for SM people compared to heterosexual people is for those with "less than high school" education (67.42%, $p<0.01$ vs. 59.72%, $p<0.001$), with incomes less than $15,000 (60.53%, $p>0.05$ vs. 58.30%, $p<0.001$), and ages 60-64 (77.83%, $p<0.001$ vs. 75.04%, $p<0.001$). The most significant differences in mammogram usage between SM and heterosexual people is observed among urban residents (63.83% vs. 72.57%, $p>0.05$), those with health insurance (66.10% vs. 74.14%, $p<0.0001$), those with "some college" education (54.14%, $p<0.01$ vs. 72.16%, $p<0.001$) and college degrees (71.01%, $p<0.01$ vs. 76.96%, $p<0.001$), ages 40-49 years (52.12% vs. 60.90%, $p<0.001$), ages 50-54 (68.01% vs.74.82%, $p<0.001$), ages 55-59 (70.51% vs. 76.80%, $p<0.001$), those with lower ($15-34,000) to median incomes ($35-99,000), those with "very good" or "excellent" self-rated health, and those with a routine check-up within the past year (71.01% vs. 78.36%, $p<0.001$). Although SM people are more likely to be younger, SM people report significantly lower mammogram usage among younger

people (40-59 years of age) compared to heterosexual people. Similarly, SM people are more likely to be in lower income brackets, yet they report much lower mammogram usage among those with incomes $15-34,000. In fact, SM people report much lower mammogram usage across nearly all education and income groups.

Sexually minoritized people also report lower mammogram usage across health-related measures and outcomes. Among those with “very good” health approximately 76% ($p<0.001$) of heterosexual people received a mammogram compared to slightly more than 66% of sexually minoritized people. Among those reporting “excellent” health (approximately 74%), less than 64% ($p>0.05$) of SM people report receiving a mammogram within the past two years compared to greater than 71% ($p<0.001$). This is in comparison with those who report their health as “fair/poor.” Approximately 59% ($p>0.05$) of SM people with “fair/poor” health report receiving a mammogram within the past two years compared to approximately 65% ($p<0.001$) of heterosexual people with “fair/poor” health. Further, approximately 78% ($p<0.001$) of heterosexual people who received a check-up within the past years received a mammogram within the past two years compared to approximately 71% ($p<0.001$) of their SM counterparts. In comparison, among those who never have received a routine check-up, 14% of SM people report a mammogram within the past two years compared to 30% of heterosexual people ($p<0.001$).

SM people have lower odds of receiving a mammogram within the past two years after adjusting for sociodemographic and health-related characteristics (adjusted odds ratio (AOR): 0.91; $p>0.05$; 95% confidence interval (CI): 0.76-1.08), Table 4). The logistic regression models show significant associations between sexual orientation, race and ethnicity, age, health insurance coverage, income, and general health status and receiving a mammogram within the past two years. Being heterosexual, NH Black or Hispanic, 50-74 (vs. 40-49) years of age,

having health insurance coverage, having income greater than $25,000, and having “very good” health are associated with higher odds of receiving a mammogram within the past two years, adjusting for all covariates ($p<0.001$). For both SM and heterosexual people, being 50-74 years of age is associated with higher odds of receiving a mammogram within the past two years ($p<0.001$). At a higher income ($200,000+) SM people have statistically significant higher odds of receiving a mammogram within the past two years compared to heterosexual people ($p<0.05$). Of note, SM people have higher odds of receiving a mammogram within the past two years than their heterosexual counterparts if they had a routine check-up within the past 5 years ($p<0.05$).

After adjusting for sociodemographic and health-related characteristics, SM people assigned female at birth have a 70.56% predicted probability of receiving a mammogram within the past two years, compared to 72.07% for heterosexual people assigned female at birth ($p<0.001$, Table 5). This represents a 1.51 percentage point difference in mammogram usage within the past two years between heterosexual and SM people. Predicted probabilities are calculated by race and ethnicity and rurality within sexual orientation, as well as at the intersection of these identities. Both NH Black and Hispanic SM and heterosexual people have greater predicted probabilities of receiving a mammogram than their NH white, NH Asian, and NH AIAN, Native Hawaiian or other Pacific Islander, and multi-racial counterparts. Heterosexual people have greater predicted probabilities of mammogram usage across all racial and ethnic groups with the exception of Hispanic identification, with a -0.03 percentage point difference between heterosexual and SM people. Notably, SM rural residents have a higher predicted probability of receiving a mammogram within the past two years compared to heterosexual rural residents, while SM urban residents have a lower predicted probability of receiving a mammogram within the past two years compared to their heterosexual urban peers

(Table 6). At the intersection of sexual orientation, race and ethnicity, and rurality, Hispanic, SM rural residents have the highest predicted probability of receiving a mammogram within the past two years compared to all other SM and heterosexual people (Table 7). While the NH Black population across all sexual orientations has a predicted probability of approximately 77%, NH Black, SM rural residents have the lowest predicted probability of receiving a mammogram within the past two years at almost 56%, compared with approximately 81% of NH Black, heterosexual rural residents. The differences by race and ethnicity and rurality, as well as the intersections of these, with heterosexual and SM people assigned female at birth in mammogram usage within the past two years are statistically significant at $p<0.001$.

Supplemental results

When examined by specific SM identity, people who identify as something else other than lesbian or gay, bisexual, or heterosexual are more likely to be Hispanic and NH Asian than their lesbian or gay, bisexual, and heterosexual counterparts, while those who identify as bisexual are more likely to be NH Black and AIAN, Native Hawaiian or other Pacific Islander, and multi-racial ($p<0.001$, supplemental table 2). Lesbian or gay respondents are more likely to identify as NH white than their counterparts who identify as bisexual, "something else," or heterosexual ($p<0.001$). More specifically, those who identify their sexual orientation as something else other than lesbian or gay, bisexual, or heterosexual are more likely to not have health insurance coverage, have less than a high school education and report incomes lower than $50,000 than their counterparts ($p<0.001$). Bisexual people are more likely to be younger than their counterparts (40-49 years of age) ($p<0.001$). Of note, people who identify as bisexual and something else are less likely to report their health as "excellent" or "very good" and more likely to report it as "fair/poor" compared to their lesbian or gay and heterosexual peers ($p<0.001$).

Among SM people, almost 72% of lesbian or gay respondents received a mammogram within the past two years, compared to 60% of bisexual respondents and 61% of respondents who identify as "something else" ($p<0.001$, supplemental table 3). Bisexual people with high school or "some college" education, ages 70-74 years, and who had a routine check-up within the past 2 to <5 years are least likely to receive a mammogram within the past two years compared to other SM and heterosexual peers ($p<0.05$). Across all health insurance coverage people who identify as bisexual and "something else" are least likely to receive a mammogram within the past two years ($p<0.05$). Lastly, among those who had a routine check-up within the past year, bisexual people are the least likely to receive a mammogram within the past two years at approximately 66%, compared to 77% of those who identify as lesbian or gay, 72% of those who identify as "something else," and 78% of those who identify as heterosexual ($p<0.001$).

The logistic regression models stratified by sexual orientation show significant associations between rurality, health insurance coverage, income, age, and length of time since last routine check-up and receiving a mammogram within the past two years (supplemental table 4). While living in a rural area is associated with slightly higher odds of receiving a mammogram within the past two years, this result is only statistically significant for those who identify their sexual orientation as something else (AOR: 2.24; $p<0.05$). Bisexual people with health insurance coverage have significantly higher odds of receiving a mammogram within the past two years compared to those without health insurance coverage (AOR: 3.56; $p<0.01$). Particularly, bisexual people have the highest statistically significant odds of receiving a mammogram at higher income ($100,000+) levels ($p<0.05$). Lesbian or gay people ages 60-69 have the highest odds of receiving a mammogram compared to other SM and heterosexual peers, while bisexual people ages 65-69 have the second highest odds of receiving a mammogram within the past two years

($p<0.001$). Those who identify as "something else" and are ages 70-74 years have the highest odds of receiving a mammogram within the past two years in this age group (AOR: 4.44; $p<0.01$). Lastly, lesbian or gay respondents who received a check-up more than five years ago have the lowest odds of receiving a mammogram within the past two years compared to all other health statutes and other SM and heterosexual respondents (AOR: 0.004; $p<0.001$).

Discussion

This research study shows important differences in mammogram usage between SM and heterosexual people across every sociodemographic and health-related characteristic, including race and ethnicity and rurality. This research suggests that SM people assigned female at birth have lower mammogram usage within the past two years than heterosexual people across every sociodemographic and health-related characteristic. Further, there are notable differences by geographic location and race and ethnicity as shown by the logistic regression and predicted probability models.

Within urban areas, the likelihood of receiving a mammogram within the past two years shifts by sexual orientation, with heterosexual people more likely to receive a mammogram within the past two years than their SM peers. Within rural spaces, SM residents have higher odds and predicted probability of receiving a mammogram within the past two years than all other counterparts across sexual orientation and rurality, indicating there may be facilitative influence present in these communities. However, disparities in mammogram usage by sexual orientation persist for those in urban areas, where SM people have a lower predicted probability of receiving a mammogram within the past two years compared to heterosexual urban and rural residents. As noted in the introduction of this paper, studies examining rural-urban differences in mammogram rates uptake have suggested that mammogram uptake and earlier detection are

higher in urban areas; however, as evidenced with these results, mammogram rates are not uniform across sexual orientation. The results of this study suggest more research is needed to examine why mammogram usage is mixed among SM people compared to heterosexual counterparts.

This study also demonstrates the importance of examining within-group differences in mammogram usage among SM people. Those who identify their sexual orientation as "something else" and live in a rural area have higher odds of receiving a mammogram within the past two years than their SM and heterosexual counterparts who reside in urban and rural areas. Given this group's high mammogram usage, it is crucial to understand what facilitative mechanisms are enabling such high usage. With further knowledge about whether these facilitative mechanisms are culturally and/or socially bound, we may promote similar culturally and socially affirming environments to have better success at early detection of breast/chest cancer through increased mammogram usage across all sexual orientations and rural areas.

Further, though, is the impetus to understand the nuances underlying those who are identifying as "something else" that may be associated with higher mammogram usage in rural areas. Recent findings highlight how a growing number of people are identifying with "something else" as their sexual orientation, including individuals who identify as queer, asexual, transgender, genderqueer, or without labels (Carlisle et al., 2023; Eliason & Streed, 2017). Other studies have named the importance of capturing the nuances of sexual orientation, which can encompass behavior, attraction, and/or identity (Bauer & Jairam, 2008; Eliason et al., 2016). Some scholars suggest that national surveys do not reflect terminology used by communities of color or regional differences (Eliason & Streed, 2017; Kim & Fredriksen-Goldsen, 2013; Pathela et al., 2006; Ridolfo et al., 2012). Given that BRFSS defers an optional module asking about

sexual identity to each state, it is possible for participating states to formulate culturally-specific SOGI questions that adapt over time for the populations they serve. While this may pose a difficulty for measuring sexual orientation at a national level due to use of differing terminology, there is a clear need to adjust survey questions about sexual orientation to be in alignment with terminology used by sexually minoritized communities themselves. To be more aligned with sexually minoritized communities, it may also be useful for surveys to ask about sexual behavior (such as the sex and gender of sexual partners) and sexual attraction as well as sexual identity (Bauer & Jairam, 2008; Germanos et al., 2015; Vrangalova & Savin-Williams, 2012). Further, it is important for health research examining SOGI to use a theoretical basis for articulating which dimensions of sexual orientation it is measuring (Eliason et al., 2016; Germanos et al., 2015; Sarkin et al., 2023). Measuring and capturing the meanings behind sexual orientation will bring us closer to understanding the nuances and influences involved in mammogram usage for these populations.

As highlighted in previous studies, a combination of structural and behavioral factors, including fear of homophobia and heterosexism within the healthcare system and distrust of healthcare practitioners, affects sexually minoritized people's frequency of visits with practitioners, disclosure of their sexual orientation, and engagement with breast/chest cancer screening and care (Agénor et al., 2020; Barefoot et al., 2017; Ceres et al., 2018; Charkhchi et al., 2019; Hart & Bowen, 2009; Lombardo et al., 2022; Malone et al., 2019; Solazzo et al., 2017). Alongside these structural aspects, SM people may experience internalized stigma and anticipated stigma that hinder disclosure of sexual identity and screening decisions, such that they delay care or do not have a usual source of care (Agénor et al., 2020; Milner & McNally, 2020). In fact, sexually minoritized people are significantly less likely than heterosexual people

to have a primary care practitioner (Ward et al., 2014). More specifically, sexually minoritized women may face cultural and geographic barriers to disclosing their sexual orientation to healthcare practitioners during breast/chest cancer diagnosis and treatment (Anderson et al., 2023). Structural features of the healthcare system, specifically the perpetuation of oppression and distrust, influence sexually minoritized people's uptake of healthcare services related to breast/chest health and breast/chest cancer screening. Healthcare system distrust affects women across the breast/chest cancer continuum, including their utilization of breast/chest cancer screening services, treatment behaviors, and quality of life (Katapodi et al., 2009). Negative healthcare experiences and distrust of the medical community contribute to lesbian and bisexual women's under-usage of mammograms (Cochran et al., 2001). Many of these previous studies, however, do not examine discrimination by healthcare practitioners through an intersectional lens. This study points toward the need to more fully understand how influential structural factors and discrimination at the point of care are on mammogram usage for minoritized populations.

Further, scholars have noted that rural culture is often associated with heteronormativity and traditional conservative values (Barefoot et al., 2015; Snively et al., 2004). Some sexually minoritized people in rural areas may travel great physical distances, often having to navigate insufficient public transportation and provider shortages, to receive culturally-affirming care, pointing toward needed investments in rural healthcare (Grundy et al., 2021; Whitehead et al., 2016). Uptake of mammogram usage for sexually minoritized women may also be moderated by "straight passing"[5] as a discrimination mitigation strategy and as a response to heteronormativity (Anderson et al., 2023; Franco-Rocha et al., 2023). Lastly, SM people may have gaps in cancer

[5] "Straight-passing" is described as "both intentional and unconscious ways [people] conceal their sexual minority status" (p.4) (Anderson et al., 2023).

screening knowledge as well as experience excess emotional and financial distress (Lombardo et al., 2022). Given these barriers in access to healthcare for rural and SM populations, sexually minoritized people in rural areas likely experience unique barriers to timely breast/chest cancer detection and diagnosis.

SM rural populations may also have unique circumstances leading to timely breast/chest cancer detection and diagnosis that may account for higher rates of mammogram usage for SM people in this study. Notably, SM people may be more likely to receive a mammogram due to an identifiable problem rather than according to mammogram screening guidelines (Williams et al., 2020). This suggests mammogram screening decisions may be attributable to perceived risk of breast/chest cancer. Findings in this study suggest that SM people have a greater likelihood of receiving a mammogram than their heterosexual peers if they have had a routine check-up within the past five years. This may also reflect that healthcare practitioners are influential in SM people's mammogram screening decisions, and nondiscrimination policies and increased education about sexually minoritized communities may improve relationships between healthcare practitioners and patients that facilitate mammogram usage (Baldwin et al., 2017; Tabaac et al., 2019).

When accounting for racial and ethnic differences in mammogram usage across sexual orientation, the results suggest that NH Black and Hispanic people assigned female at birth are more likely to receive a mammogram within the past two years than their NH Black and Hispanic racial and ethnic counterparts, though these differences are not uniform at the intersections of rurality and sexual orientation. As observed above, there is a large disparity in mammogram usage within the past two years between NH Black, sexually minoritized, rural residents compared to other groups, and especially between their NH Black, heterosexual, rural

peers. Furthermore, perceptions of breast/chest cancer screening for racial and ethnic minoritized populations are affected by healthcare system distrust (Mouslim et al., 2020). Lastly, Black sexual minority women's mistrust of healthcare practitioners and the broader medical community are intertwined with multiple intersecting forms of oppression of homophobia and anti-Black racism (Malone et al., 2019; Poteat et al., 2021). This difference is indicative of intersecting structural barriers, including anti-Black racism, heterosexism, and urbanism (Probst et al., 2019) unique to this group (Tabaac et al., 2019).

These findings highlight rural-urban differences and the necessity of targeted interventions for increasing mammogram rates and timely detection of breast/chest cancer among sexually minoritized people across both rural and urban settings. Sexually minoritized people are reporting higher mammogram usage at younger ages, and, as proposed in previous research, this reflects the finding that sexually minoritized people assigned female at birth may be at disproportionately greater risk of breast/chest cancer than their heterosexual peers (Gomez et al., 2019; Kent et al., 2019), thus prompting them to receive mammograms at earlier times in their lives. Yet, while shared decision making with a clinician is recommended for women to weigh the benefits and harms of screening (Lillie et al., 2014; Qaseem et al., 2019; Siu et al., 2016), researchers note that there may be a lack of shared decision making for mammogram screening in practice (Hoffman et al., 2014; Spring et al., 2017). Breast/chest cancer screening guidelines recommend shared decision-making between healthcare practitioners and patients as a tool for appropriate mammogram usage; however, as noted by previous research, patient-practitioner and healthcare system level barriers likely prevent many sexually minoritized people from accessing mammography screening (Agénor et al., 2020; Brown & Tracy, 2008; Ceres et al., 2018; Charkhchi et al., 2019; Hart & Bowen, 2009; Lauver et al., 1999; Malone et

al., 2019; Solazzo et al., 2017). As indicated by this study's findings, SM people may be less likely to have a usual source of care due to a range of factors, including fear of discrimination, that may pose a barrier to regular mammogram screening. Therefore, culturally-affirming efforts are needed if we hope to enhance shared decision-making between healthcare practitioners and sexually minoritized patients. Research suggests that healthcare settings signal an inclusive environment for sexually minoritized people by using mechanisms such as nonheteronormative language and inclusive intake forms as well as culturally-affirming and geographically-specific communication (Anderson et al., 2023; O'Connor et al., 2022).

Mammogram screening does not come without risks– the risk of false positives, which are not uncommon over the course of a person's accumulation of annual mammograms, may lead to unnecessary treatments, tests, and emotional and financial harms (American Cancer Society, 2022; National Cancer Institute, 2023; Nelson et al., 2016). While organizations that provide screening guidelines note that mammograms are useful in early diagnosis, reduced breast cancer-associated mortality, and reduced treatment associated morbidity (Neal & Helvie, 2021; Siegel et al., 2019), they also offer that mammograms may not be helpful or valuable for all women, depending on their overall health (American Cancer Society, 2022). Mammogram screening is, therefore, an ethically complex health care service. Although the American Cancer Society and American Society of Clinical Oncology have worked to address the cancer burden within sexually and gender minoritized communities in recent years (Griggs et al., 2017; Wender et al., 2016), more research needs to explore the ethical complexities surrounding mammogram usage for these communities. Given that sexually minoritized populations have lower rates of primary care utilization , breast/chest cancer screening guidelines should be updated to reflect the barriers and facilitators unique to these populations. Further, more research is needed to

understand differences in preventive healthcare services usage, especially for mammograms, that may also be influenced by sociocultural aspects as yet unexplored at the intersection of sexual orientation, race and ethnicity, and rurality.

There are several limitations of this study. First, the measure of mammogram usage from BRFSS is predicated on sex assigned at birth, such that only participants assigned female at birth are asked about their mammogram usage. This method excludes participants assigned male at birth or intersex who are also at risk of breast/chest cancer. Further, with the options for mammogram usage predicated on being assigned female at birth only, researchers are unable to discern mammogram usage for participants who may occupy diverse gender identities. This limits our ability to accurately measure mammogram usage by gender identity as well as sex assigned at birth. Future directions for BRFSS and other national surveys may be to offer questions about mammogram usage to all participants–indeed, people of all genders are at risk of breast cancer (Iacoviello et al., 2021; Peters et al., 2022). Although BRFSS includes a question about being transgender and allows participants to identify as male-to-female, female-to-male, or gender nonconforming, BRFSS surveys with transgender populations are not consistent across all states, limiting the generalizability of findings (Oladeru et al., 2022). BRFSS and other surveys should use a standardized approach to include diverse gender identity options across all states. Further, with an intersectional lens in mind, questions within these surveys should also focus on measuring experiences of discrimination as well as societal norms to further identify how power, privilege, and oppression function and influence breast/chest screening outcomes and cancer care (Bowleg, 2008; Lin et al., 2023).

Conclusion

These results have implications for improving access to breast/chest cancer screening and care for sexually minoritized people across rural and urban settings as well as race and ethnicity. This study suggests that sexually minoritized people are less likely than heterosexual people to receive a mammogram within the past two years. A notable within-group difference is that those who identify their sexual orientation as "something else" and live in a rural area are likelier than other sexual orientations to receive a mammogram within the past two years. Another within-group difference is that bisexual people are more likely to receive a mammogram at higher income levels. Additionally, NH Black, sexually minoritized rural residents have the lowest predicted probability of any group of receiving a mammogram within the past years. These findings reflect the necessity of intercategorical complexity in examining mammogram usage for sexually minoritized communities. Further, these findings iterate the need for an intersectional approach to understanding breast/chest cancer screening usage. Intersecting mechanisms of structural heterosexism, racism, and urbanism may impact mammogram screening for these populations in different ways. Further, the differences in mammogram usage may also represent points of power and privilege as well as oppression. These findings also indicate another need for an intersectional lens–in order to accurately measure and document inequities in mammogram screening, state survey modules should reflect the terminology used by sexually minoritized communities with particular attention to cultural and geographic language and communication. With an intersectional approach in mind, researchers may better understand the numerous intersecting structural mechanisms that shape engagement with breast/chest cancer services for sexually minoritized populations.

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Appendix

Table 1. Sociodemographic characteristics of the BRFSS sample population
Key: n=total number in the sample, %=weighted percent, SM=weighted sexually minoritized, Het=weighted heterosexual; NH=Non-Hispanic
Note: results significant at *p<0.05, **p<0.01, ***p<0.001

Characteristic	Total	SM	Het
	n (%)		
Total	63,517	3,209 (4.87%)	60,308 (95.13%)
Race and ethnicity			
NH white	50,399 (69.02%)*	2,478 (64.67%)*	47,921 (69.24%)*
NH Black	5,280 (13.17%)*	228 (13.38%)*	5,052 (13.16%)*
Hispanic	3,890 (10.31%)*	242 (10.97%*)	3,648 (10.28%)*
NH Asian	1,380 (3.34%)*	73 (4.40%)*	1,307 (3.29%)*
NH other	2,568 (4.16%)*	188 (6.58%)*	2,380 (4.04%)*
Rurality			
Rural residents	7,611 (7.05%)	300 (5.96%)	7,311 (7.11%)
Urban residents	55,906 (92.95%)	2,909 (94.04%)	52,997 (92.89%)
Insurance coverage			
Has coverage	61,556 (95.20%)	3,077 (93.64%)	58,479 (95.28%)
No coverage	1,961 (4.80%)	132 (6.36%)	1,829 (4.72%)
Education			
Less than high school	2,315 (7.68%)**	146 (11.34%)**	2,169 (7.49%)**
High school graduate	12,420 (23.11%)**	506 (19.76%)**	11,914 (23.29%)**
Some college	18,199 (32.90%)**	827 (32.27%)**	17,372 (32.93%)**
College graduate	30,583 (36.31%)**	1,730 (36.64%)**	28,853 (36.30%)**
Income			
<$15,000	3,833 (6.49%)***	289 (10.75%)***	3,544 (6.27%)***
$15-24,000	5,649 (9.51%)***	342 (14.07%)***	5,307 (9.27%)***
$25-34,000	6,620 (10.65%)***	348 (11.25%)***	6,272 (10.62%)***
$35-49,000	7,722 (11.65%)***	350 (9.80%)***	7,372 (11.75%)***
$50-99,000	20,651 (30.69%)***	980 (28.75%)***	19,671 (30.78%)***
$100-199,000	14,624 (23.17%)***	705 (20.00%)***	13,919 (23.33%)***

$200,000+	4,418 (7.85%)***	195 (5.39%)***	4,223 (7.97%)***
Age			
40-49	14,718 (29.90%)***	1,164 (44.41%)***	13,554 (29.16%)***
50-54	8,316 (14.62%)***	467 (15.56%)***	7,849 (14.57%)***
55-59	8,845 (14.17%)***	407 (11.00%)***	8,438 (14.33%)***
60-64	10,769 (16.76%)***	470 (13.25%)***	10,299 (16.94%)***
65-69	11,100 (12.88%)***	380 (8.95%)***	10,720 (13.08%)***
70-74	9,769 (11.66%)***	321 (6.84%)***	9,448 (11.91%)***
General health status			
Excellent	9,519 (14.42%)***	394 (11.05%)***	9,125 (14.59%)***
Very good	22,628 (33.80%)***	982 (25.22%)***	21,646 (34.24%)***
Good	19,944 (32.21%)***	1,087 (33.58%)***	18,857 (32.14%)***
Fair/poor	11,426 (19.57%)***	746 (30.16%)***	10,680 (19.03%)***
Length of time since last routine check-up			
Within the past year	53,675 (84.09%)**	2,573 (80.21%)**	51,102 (84.29%)**
1 to <2 years ago	5,470 (8.70%)**	334 (9.99%)**	5,136 (8.63%)**
2 to <5 years ago	2,684 (4.35%)**	194 (5.13%)**	2,490 (4.31%)**
5+ years ago	1,570 (2.72%)**	96 (4.14%)**	1,474 (2.64%)**
Never	118 (0.15%)**	12 (0.53%)**	106 (0.13%)**

Table 2. Reception of a mammogram within the past two years among respondents within the final sample

Mammogram Usage	**n (%)**	**Weighted (%)**
No	16,431 (25.87%)	28.01%
Yes	47,086 (74.13%)	71.99%

Table 3. Reception of a mammogram within the past two years by sociodemographic and health-related characteristics

Key: n=total number in the sample, %=weighted percent, SM=weighted sexually minoritized, Het=weighted heterosexual; NH=Non-Hispanic

Note: results significant at *p<0.05, **p<0.01, ***p<0.001

Characteristic	**Total**	**SM**	**Het**
	n (%)		

Total	47,086 (71.99%)	2,095 (64.09%)***	44,991 (72.39%)***
Race and ethnicity			
NH white	37,598 (72.48%)***	1,635 (65.53%)	35,963 (72.81%)***
NH Black	4,221 (78.14%)***	165 (68.86%)	4,056 (78.62%)***
Hispanic	2,579 (66.63%)***	143 (62.82%)	2,436 (66.83%)***
NH Asian	1,017 (72.30%)***	47 (63.33%)	970 (72.91%)***
NH other	1,671 (57.37%)***	105 (42.81%)	1,566 (58.58%)***
Rurality			
Rural residents	5,441 (70.00%)	193 (68.19%)	5,248 (70.08%)
Urban residents	41,645 (72.14%)	1,902 (63.83%)	39,743 (72.57%)
Insurance coverage			
Has coverage	46,417 (73.76%)***	2,046 (66.10%)***	44,371 (74.14%)***
No coverage	669 (36.82%)***	49 (34.39%)***	620 (36.98%)***
Education			
Less than high school	1,403 (60.28%)***	86 (67.42%)**	1,317 (59.72%)***
High school graduate	8,820 (69.49%)***	318 (65.60%)**	8,502 (69.65%)***
Some college	13,200 (71.30%)***	496 (54.14%)**	12,704 (72.16%)***
College graduate	23,663 (76.67%)***	1,195 (71.01%)**	22,468 (76.96%)***
Income			
<$15,000	2,340 (58.48%)***	162 (60.53%)	2,178 (58.30%)***
$15-24,000	3,687 (63.48%)***	196 (57.65%)	3,491 (63.94%)***
$25-34,000	4,561 (66.54%)***	204 (60.80%)	4,357 (66.85%)***
$35-49,000	5,621 (70.73%)***	203 (57.03%)	5,418 (71.32%)***
$50-99,000	15,821 (74.81%)***	664 (64.89%)	15,157 (75.28%)***
$100-199,000	11,461 (75.76%)***	510 (71.35%)	10,951 (75.95%)***
$200,000+	3,595 (80.54%)***	156 (76.47%)	3,439 (80.68%)***
Age			
40-49	8,933 (60.27%)***	592 (52.12%)***	8,341 (60.90%)***
50-54	6,252 (74.46%)***	326 (68.01%)***	5,926 (74.82%)***
55-59	6,715 (76.56%)***	300 (70.51%)***	6,415 (76.80%)***
60-64	8,315 (75.14%)***	347 (77.83%)***	7,968 (75.04%)***

65-69	8,925 (80.59%)***	287 (77.13%)***	8,638 (80.72%)***
70-74	7,946 (79.32%)***	243 (78.83%)***	7,703 (79.33%)***
General health status			
Excellent	7,248 (73.78%)***	275 (63.73%)	6,973 (74.17%)***
Very good	17,590 (75.90%)***	674 (66.06%)	16,916 (76.27%)***
Good	14,600 (71.32%)***	702 (66.92%)	13,898 (71.55%)***
Fair/poor	7,648 (65.01%)***	444 (59.41%)	7,204 (65.46%)***
Length of time since last routine check-up			
Within the past year	42,682 (78.02%)***	1,851 (71.01%)***	40,831 (78.36%)***
1 to <2 years ago	3,343 (55.94%)***	180 (54.21%)***	3,163 (56.04%)***
2 to <5 years ago	795 (26.69%)***	47 (23.92%)***	748 (26.86%)***
5+ years ago	232 (11.47%)***	16 (9.87%)***	216 (11.60%)***
Never	34 (27.69%)***	1 (14.05%)***	33 (30.43%)***

Table 4. Odds of receiving a mammogram within the past two years, controlling for rurality, race and ethnicity, health insurance, education, age, income, health status, and length of time since last routine check-up
Key: AOR=adjusted odds ratio; CI=confidence interval; SM=sexually minoritized, Het=heterosexual; NH=Non-Hispanic

Note: results significant at *p<0.05, **p<0.01, ***p<0.001

	Total		**SM only**		**Het only**	
	AOR	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**
SM	0.91	(0.76,1.08)				
Characteristics						
Rurality (ref: urban)						
Rural	1.02	(0.90,1.16)	1.34	(0.83,2.16)	1.01	(0.89,1.16)
Race and ethnicity (ref: NH white)						
NH Black	1.54***	(1.35,1.75)	1.42	(0.75,2.70)	1.54***	(1.34,1.75)
Hispanic	1.39***	(1.15-1.69)	1.24	(0.70,2.22)	1.40***	(1.14,1.72)
NH Asian	0.98	(0.75,1.28)	0.76	(0.23,2.47)	1.00	(0.76,1.31)
NH other	0.64***	(0.51,0.79)	0.53	(0.26,1.08)	0.65***	(0.52,0.82)

Insurance coverage (ref: no insurance coverage)						
Yes, coverage	2.15***	(1.58,2.93)	1.60	(0.82,3.13)	2.18***	(1.57,3.02)
Education (ref: less than high school)						
High school graduate	0.98	(0.74,1.31)	0.89	(0.39,2.07)	1.00	(0.74,1.35)
Some college	1.02	(0.76,1.36)	0.52	(0.22,1.22)	1.06	(0.78,1.44)
College graduate	1.19	(0.89,1.58)	0.86	(0.38,1.95)	1.22	(0.90,1.64)
Age in years (ref: 40-49)						
50-54	2.01***	(1.77,2.29)	2.05**	(1.25,3.37)	2.01***	(1.76,2.29)
55-59	2.37***	(2.08,2.70)	2.16***	(1.35,3.45)	2.38***	(2.07,2.73)
60-64	2.18***	(1.90,2.51)	3.42***	(2.00,5.84)	2.13***	(1.85,2.46)
65-69	2.77***	(2.42,3.17)	3.45***	(1.69,7.03)	2.74***	(2.38,3.15)
70-74	2.40***	(2.00,2.87)	3.17***	(1.84,5.45)	2.37***	(1.97,2.84)
Income (ref: <$15,000)						
$15-24,000	1.23	(0.95,1.60)	0.88	(0.40,1.91)	1.27	(0.96,1.67)
$25-34,000	1.37**	(1.11,1.69)	1.07	(0.53,2.16)	1.40**	(1.13,1.75)
$35-49,000	1.56***	(1.27,1.91)	0.93	(0.48,1.83)	1.63***	(1.31,2.01)
$50-99,000	1.85***	(1.53,2.24)	1.45	(0.76,2.78)	1.90***	(1.56,2.33)
$100-199,000	2.03***	(1.65,2.49)	1.87	(0.92,3.80)	2.06***	(1.66,2.56)
$200,000+	2.78***	(2.17,3.56)	3.38*	(1.01,11.30)	2.80***	(2.16,3.62)
General health status (ref: excellent)						
Very good	1.04	(0.91,1.18)	1.21	(0.65,2.28)	1.03	(0.90,1.18)
Good	0.83**	(0.73,0.96)	1.40	(0.74,2.66)	0.81**	(0.71,0.94)
Fair/poor	0.68***	(0.58,0.79)	1.24	(0.64,2.38)	0.66***	(0.56,0.77)
Length of time since last routine check-up (ref: within the past year)						
1 to < 2 years ago	0.38***	(0.33,0.44)	0.54*	(0.31,0.94)	0.37***	(0.32,0.43)
2 to <5 years ago	0.11***	(0.09,0.14)	0.15***	(0.08,0.29)	0.11***	(0.09,0.13)
5+ years ago	0.04***	(0.03,0.06)	0.05***	(0.02,0.13)	0.04***	(0.03,0.06)
Never	0.15***	(0.07,0.30)	0.09***	(0.03,0.30)	0.16***	(0.07,0.33)

Table 5. Predicted probability of mammogram usage within the past two years by sexual orientation and race and ethnicity

Note: Data are from the 2022 Behavioral Risk Factor Surveillance System data and include those aged 40-74 years and assigned female at birth. The differences between heterosexual and sexually minoritized people assigned female at birth in mammogram usage within the past two years are significant at $p<0.001$ for the full sample and across race and ethnicity categories; all covariates held at their means

	Sexually minoritized		Heterosexual		Difference
	Predicted probability	95% CI	Predicted probability	95% CI	Heterosexual-sexually minoritized
Full sample	70.56%	(0.68-0.73)	72.07%	(0.71,0.73)	1.51%
Race and ethnicity					
NH white	69.54%	(0.66,0.73)	70.88%	(0.70,0.72)	1.34%
NH Black	76.69%	(0.68,0.85)	77.59%	(0.76,0.79)	0.90%
Hispanic	76.43%	(0.69,0.83)	76.13%	(0.73,0.79)	-0.03%
NH Asian	65.42%	(0.44,0.86)	70.84%	(0.66,0.75)	5.42%
NH other	55.14%	(0.40,0.70)	63.01%	(0.59,0.67)	7.87%

Table 6. Predicted probability of mammogram usage within the past two years by sexual orientation and rurality

Note: Data are from the 2022 Behavioral Risk Factor Surveillance System data and include those aged 40-74 years and assigned female at birth. The differences between heterosexual and sexually minoritized people assigned female at birth in mammogram usage within the past two years are significant at $p<0.001$ for the full sample and across rurality; all covariates held at their means

	Sexually minoritized		Heterosexual		Difference
	Predicted probability	95% CI	Predicted probability	95% CI	Heterosexual-sexually minoritized
Full sample	70.19%	(0.67,0.73)	72.09%	(0.71,0.73)	1.90%
Rurality					
Rural	75.02%	(0.68,0.83)	71.65%	(0.70,0.74)	-3.37%
Urban	69.81%	(0.67,0.73)	72.12%	(0.71,0.73)	2.31%

Table 7. Predicted probability of mammogram usage within the past two years by sexual orientation, race and ethnicity, and rurality

Note: Data are from the 2022 Behavioral Risk Factor Surveillance System data and include those aged 40-74 years and assigned female at birth. The differences between heterosexual and sexually minoritized people assigned female at birth in mammogram usage within the past two years are significant at $p<0.001$ for the full sample and across rurality and race and ethnicity; all covariates held at their means

	Sexually minoritized		Heterosexual		Difference
	Predicted probability	95% CI	Predicted probability	95% CI	Heterosexual-sexually minoritized
Full sample	Not estimable		72.08%	(0.71,0.73)	
Rurality					
Rural	Not estimable		71.70%	(0.69,0.74)	
Urban	70.25%	(0.67,0.73)	72.06%	(0.71,0.73)	1.81%
Race and ethnicity					
NH White	69.54%	(0.66,0.73)	70.88%	(0.70,0.72)	1.34%
NH Black	75.70%	(0.67,0.84)	77.71%	(0.76,0.79)	2.01%
Hispanic	76.71%	(0.70,0.84)	76.11%	(0.73,0.79)	-0.6%
NH Asian	Not estimable		69.32%	(0.65,0.74)	–
NH other	55.49%	(0.41,0.70)	63.08%	(0.59,0.67)	7.59%
Race and ethnicity and rurality					
NH white, Urban	69.15%	(0.66,0.72)	70.84%	(0.70,0.72)	1.69%
NH Black, Urban	77.22%	(0.68,0.86)	77.43%	(0.76,0.79)	0.21%
Hispanic, Urban	75.80%	(0.68,0.83)	76.10%	(0.73,0.79)	0.30%
NH Asian, Urban	64.18%	(0.43,0.85)	71.23%	(0.67,0.76)	7.05%
NH other, Urban	54.84%	(0.40, 0.70)	63.76%	(0.59,0.68)	8.92%
NH white, Rural	74.52%	(0.66,0.83)	71.45%	(0.69,0.74)	-3.07%
NH Black, Rural	55.83%	(0.31,0.80)	81.32%	(0.74,0.89)	25.49%
Hispanic, Rural	88.30%	(0.78,0.99)	76.21%	(0.64,0.88)	-12.09%
NH Asian, Rural	Not estimable	–	44.13%	(0.16,0.72)	–
NH other, Rural	64.01%	(0.40,0.88)	54.17%	(0.45,0.64)	-.9.84%

Figure 1. Flow chart showing the final sample population
Key: Mam=mammogram; SO=sexual orientation; Race/eth=race and ethnicity; Ed=education; Check-up=length of time since last routine check-up
Note: Data are from the 2022 Behavioral Risk Factor Surveillance System data and include those aged 40-74 years and assigned female at birth.

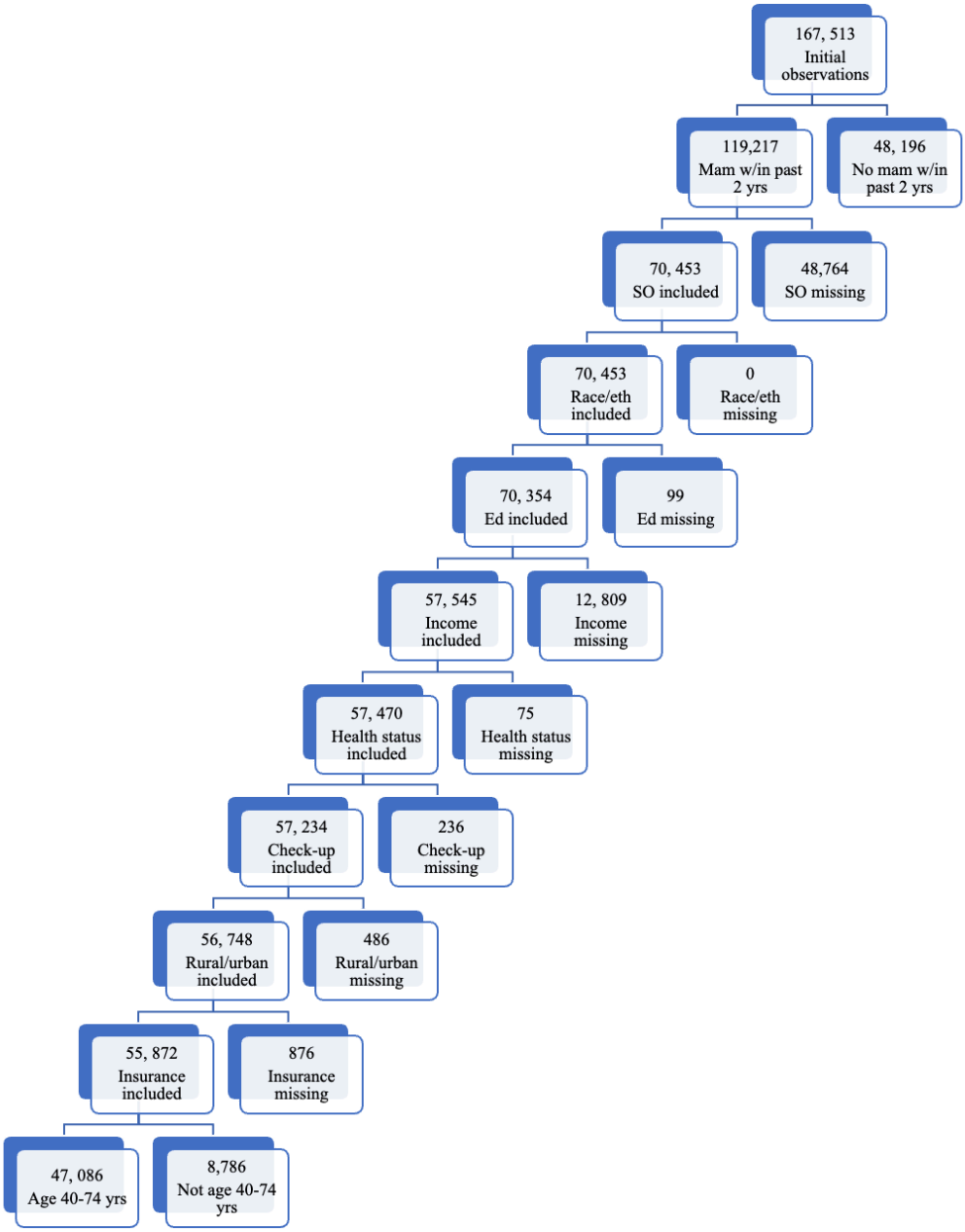


Figure 2. Predicted probability of mammogram usage within the past two years by sexual orientation and race and ethnicity

Key: SM=sexually minoritized, Het=heterosexual; NH=Non-Hispanic

Note: results significant at $p<0.001$

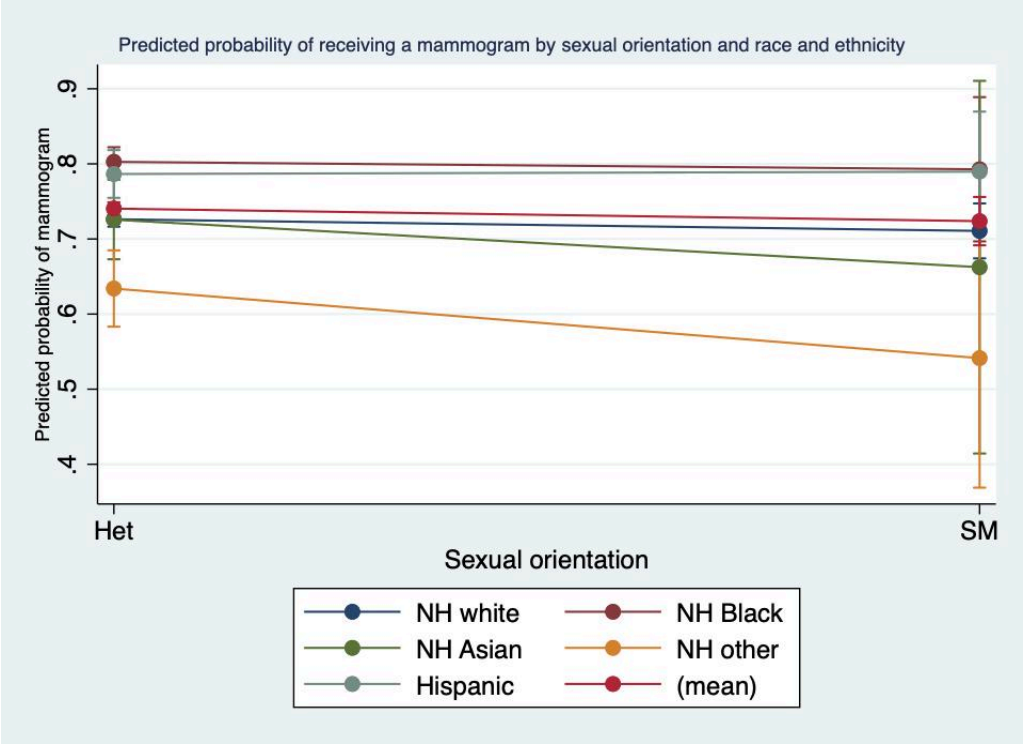


Figure 3. Predicted probability of mammogram usage within the past two years by sexual orientation and rurality

Key: SM=sexually minoritized, Het=heterosexual

Note: results significant at p<0.001

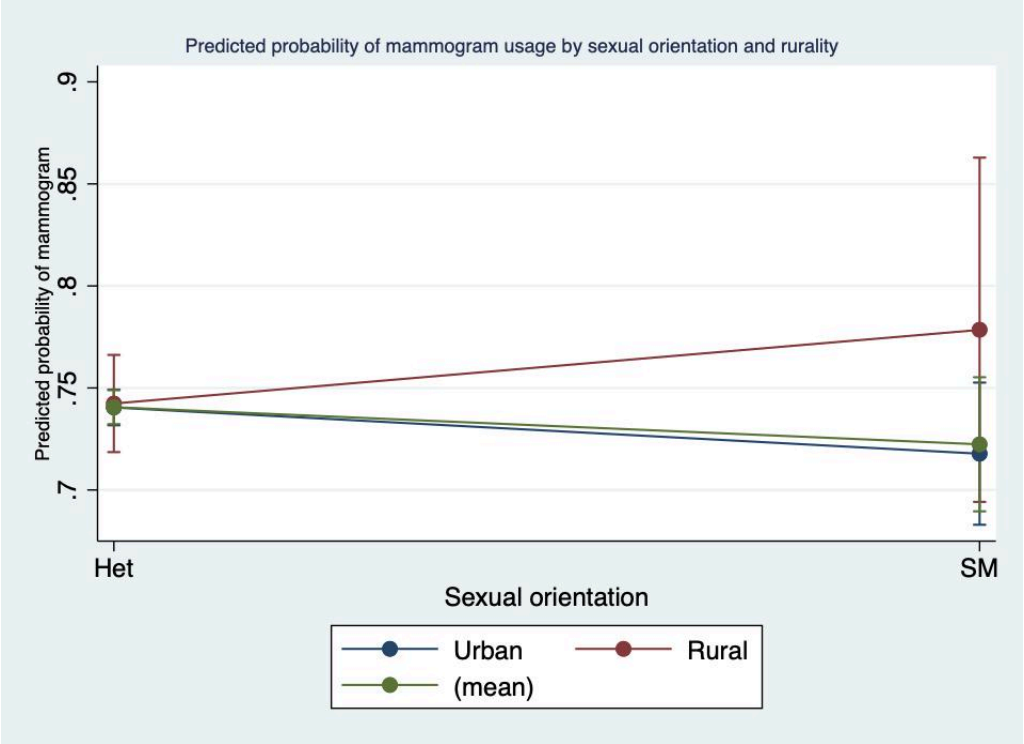
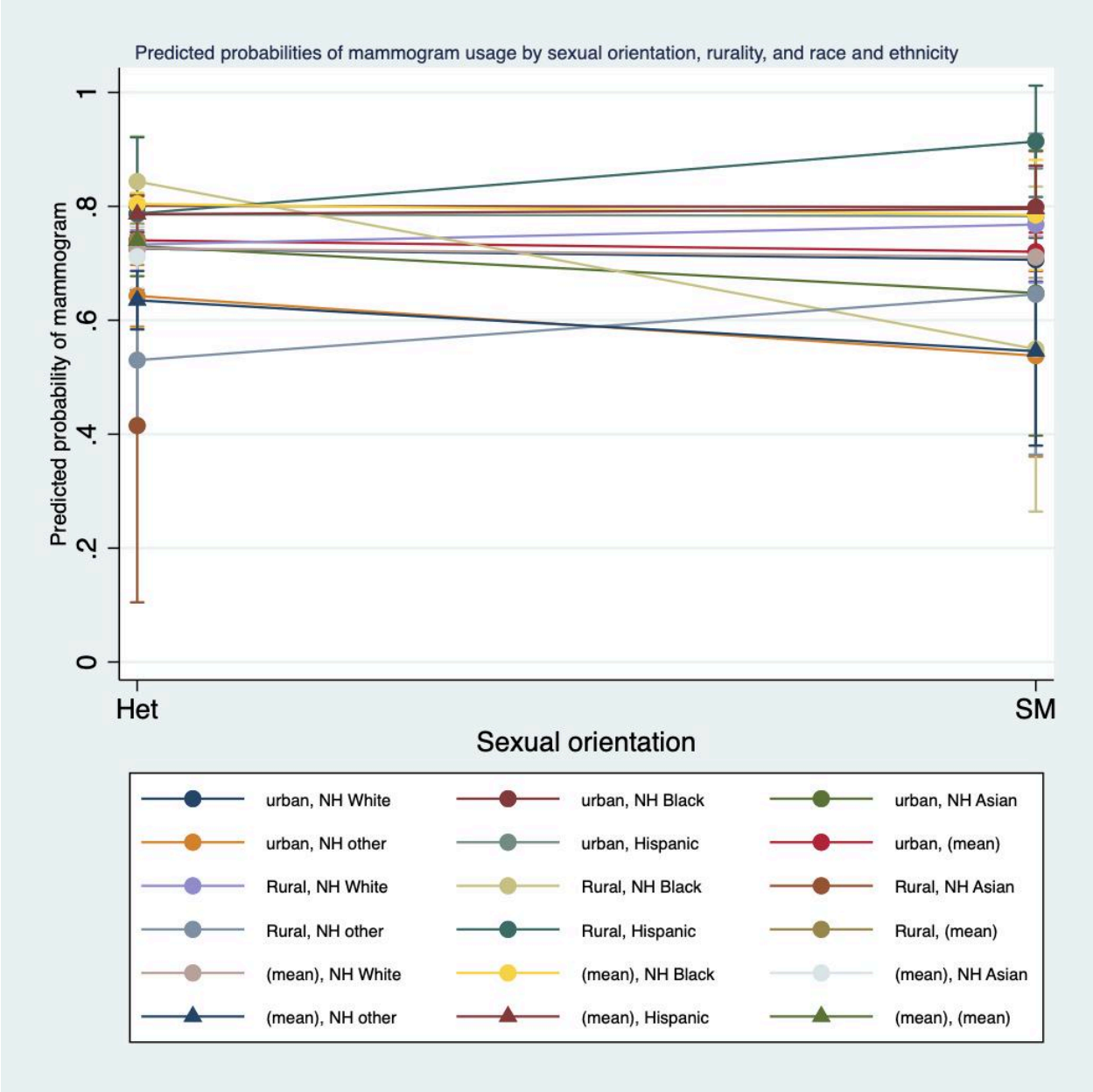


Figure 4. Predicted probability of mammogram usage within the past two years by sexual orientation, race and ethnicity, and rurality
Key: SM=sexually minoritized, Het=heterosexual; NH=Non-Hispanic
Note: results significant at p<0.001



Supplemental table 1. Number of people at the intersection of race and ethnicity, sexual orientation, and rurality
Key: n=total number in the sample, %=weighted percent, SM=weighted sexually minoritized, Het=weighted heterosexual; NH=Non-Hispanic
Note: results significant at *p<0.05, **p<0.01, ***p<0.001

	SM	Het	Total

	n (%)		
Race and ethnicity and rurality			
NH white, Urban	2,229 (63.98%)*	41, 462 (68.14%)*	43,691 (67.94%)*
NH Black, Urban	216 (13.56%)*	4,844 (13.67%)*	5,060 (13.66%)*
Hispanic, Urban	228 (11.16%)*	3,453 (10.69%)*	3,681 (10.72%)*
NH Asian, Urban	71 (4.60%)*	1,285 (3.49%)*	1,356 (3.54%)*
NH other, Urban	165 (6.70%)*	1,953 (4.01%)*	2,118 (4.14%)*
NH white, Rural	249 (75.60%)	6,459 (83.60%)	6,708 (83.27%)
NH Black, Rural	12 (10.52%)	208 (6.52%)	220 (6.69%)
Hispanic, Rural	14 (7.97%)	195 (4.83%)	209 (4.96%)
NH Asian, Rural	2 (1.24%)	22 (0.67%)	24 (0.70%)
NH other, Rural	23 (4.68%)	427 (4.37%)	450

Supplemental table 2. Sociodemographic characteristics of the BRFSS sample population by all sexual orientations

Key: n=total number in the sample, %=weighted percent, SM=weighted sexually minoritized, Het=weighted heterosexual; NH=Non-Hispanic

Note: results significant at *p<0.05, **p<0.01, ***p<0.001; SM compared to Het, Lesbian or gay compared to Het, Bisexual compared to Het, something else compared to Het

Characteristic	**Total**	**SM**	**Lesbian or gay**	**Bisexual**	**Something else**	**Het**
	n (%)					
Total	63,517	3,209 (4.87%)	1,063 (1.54%)	1,353 (2.11%)	793 (1.22%)	60,308 (95.13%)
Race and ethnicity						
NH white	50,399 (69.02%)*	2,478 (64.67%)*	862 (70.20%)***	1,052 (66.11%)***	564 (55,20%)***	47,921 (69.24%)*
NH Black	5,280 (13.17%)*	228 (13.38%)*	76 (13.89%)***	93 (14.23%)***	59 (11.27%)***	5,052 (13.16%)*
Hispanic	3,890 (10.31%)*	242 (10.97%)*	66 (9.55%)***	93 (7.65%)***	83 (18.50%)***	3,648 (10.28%)*
NH Asian	1,380 (3.34%)*	73 (4.40%)*	14 (2.30%)***	24 (3.67%)***	35 (8.31%)***	1,307 (3.29%)*
NH other	2,568 (4.16%)*	188 (6.58%)*	45 (4.07%)***	91 (8.34%)***	52 (6.73%)***	2,380 (4.04%)*
Rurality						
Rural residents	7,611 (7.05%)	300 (5.96%)	76 (4.95%)	127 (5.52%)	97 (8.00%)	7,311 (7.11%)

Urban residents	55,906 (92.95%)	2,909 (94.04%)	987 (95.05%)	1,226 (94.48%)	696 (92.00%)	52,997 (92.89%)
Insurance Coverage						
Has coverage	61,556 (95.20%)	3,077 (93.64%)	1,035 (96.82%)***	1,305 (94.18%)***	737 (88.69%)***	58,479 (95.28%)***
No coverage	1,961 (4.80%)	132 (6.36%)	28 (3.18%)***	48 (5.82%)***	56 (11.31%)***	1,829 (4.72%)***
Education						
Less than high school	2,315 (7.68%)**	146 (11.34%)**	20 (4.95%)***	57 (11.29%)***	69 (19.50%)***	2,169 (7.49%)**
High school graduate	12,420 (23.11%)**	506 (19.76%)**	139 (19.94%)***	199 (18.14%)***	168 (22.31%)***	11,914 (23.29%)**
Some college	18,199 (32.90%)**	827 (32.27%)**	239 (28.09%)***	386 (36.70%)***	202 (29.91%)***	17,372 (32.93%)**
College graduate	30,583 (36.31%)**	1,730 (36.64%)**	665 (47.03%)***	711 (33.87%***	354 (28.28%)***	28,853 (36.30%)**
Income						
<$15,000	3,833 (6.49%)***	289 (10.75%)***	69 (8.10%)***	118 (10.79%)***	102 (14.04%)***	3,544 (6.27%)***
$15-24,000	5,649 (9.51%)***	342 (14.07%)***	77 (9.23%)***	155 (14.58%)***	110 (19.33%)***	5,307 (9.27%)***
$25-34,000	6,620 (10.65%)***	348 (11.25%)***	95 (7.91%)***	144 (12.62%)***	109 (13.10%)***	6,272 (10.62%)***
$35-49,000	7,722 (11.65%)***	350 (9.80%)***	104 (8.68%)***	139 (8.16%)***	107 (14.03%)***	7,372 (11.75%)***
$50-99,000	20,651 (30.69%)***	980 (28.75%)***	346 (31.98%)***	426 (29.44%)***	208 (23.49%)***	19,671 (30.78%)***
$100-199,000	14,624 (23.17%)***	705 (20.00%)***	286 (25.85%)***	287 (19.41%)***	132 (13.62%)***	13,919 (23.33%)***
$200,000+	4,418 (7.85%)***	195 (5.39%)***	86 (8.27%)***	84 (5.01%)***	25 (2.39%)***	4,223 (7.97%)***
Age (years)						
40-49	14,718 (29.90%)***	1,164 (44.41%)***	257 (33.75%)***	652 (57.10%)***	255 (35.96%)***	13,554 (29.16%)***
50-54	8,316 (14.62%)***	467 (15.56%)***	139 (14.90%)***	223 (15.74%)***	105 (16.10%)***	7,849 (14.57%)***
55-59	8,845 (14.17%)***	407 (11.00%)***	194 (16.19%)***	135 (8.30%)***	78 (9.10%)***	8,438 (14.33%)***
60-64	10,769 (16.76%)***	470 (13.25%)***	192 (16.37%)***	144 (9.88%)***	134 (15.11%)***	10,299 (16.94%)***
65-69	11,100 (12.88%)***	380 (8.95%)***	151 (11.17%)***	117 (6.25%)***	112 (10.79%)***	10,720 (13.08%)***

70-74	9,769 (11.66%)***	321 (6.84%)***	130 (7.63%)***	82 (2.73%)***	109 (12.94%)***	9,448 (11.91%)***
General Health Status						
Excellent	9,519 (14.42%)***	394 (11.05%)***	158 (17.27%)***	149 (7.33%)***	87 (9.61%)***	9,125 (14.59%)***
Very good	22,628 (33.80%)***	982 (25.22%)***	367 (28.69%)***	416 (24.50%)***	199 (22.08%)***	21,646 (34.24%)***
Good	19,944 (32.21%)***	1,087 (33.58%)***	352 (31.02%)***	458 (32.57%)***	277 (38.55%)***	18,857 (32.14%)***
Fair/poor	11,426 (19.57%)***	746 (30.16%)***	186 (23.02%)***	330 (35.60%)***	230 (29.77%)***	10,680 (19.03%)***
Length of Time Since Last Routine Check-Up						
Within the past year	53,675 (84.09%)**	2,573 (80.21%)**	899 (86.61%)***	1,063 (76.15%)***	611 (79.12%)***	51,102 (84.29%)**
1 to < 2 years ago	5,470 (8.70%)**	334 (9.99%)**	93 (6.47%)***	157 (13.81%)***	84 (7.86%)***	5,136 (8.63%)**
2 to <5 years ago	2,684 (4.35%)**	194 (5.13%)**	44 (3.81%)***	96 (6.24%)***	54 (4.90%)***	2,490 (4.31%)**
5+ years ago	1,570 (2.72%)**	96 (4.14%)**	25 (2.85%)***	34 (3.36%)***	37 (7.10%)***	1,474 (2.64%)**
Never	118 (0.15%)**	12 (0.53%)**	2 (0.25%)***	3 (0.44%)***	7 (1.03%)***	106 (0.13%)**

Supplemental table 3. Reception of a mammogram within the past two years by sociodemographic and health-related characteristics across all sexual orientations

Key: n=total number in the sample, %=weighted percent, SM=weighted sexually minoritized, Het=weighted heterosexual; NH=Non-Hispanic

Note: results significant at *p<0.05, **p<0.01, ***p<0.001; SM compared to Het, Lesbian or gay compared to Het, Bisexual compared to Het, something else compared to Het

Characteristic	**Total**	**SM**	**Lesbian or gay**	**Bisexual**	**Something else**	**Het**
	n (%)					
Total	47,086 (71.99%)	2,095 (64.09%)***	774 (71.74%)***	828 (60.05%)***	493 (61.39%)***	44,991 (72.39%)***
Race and ethnicity						
NH white	37,598 (72.48%)***	1,635 (65.53%)	633 (72.65%)	645 (60.78%)	357 (63.94%)	35,963 (72.81%)***
NH Black	4,221 (78.14%)***	165 (68.86%)	57 (74.49%)	65 (67.14%)	43 (63.82%)	4,056 (78.62%)***
Hispanic	2,579 (66.63%)***	143 (62.82%)	45 (69.69%)	53 (62.34%)	45 (58.67%)	2,436 (66.83%)***

NH Asian	1,017 (72.30%)***	47 (63.33%)	8 (21.78%)	17 (62.08%)	22 (78.78%)	970 (72.91%)***
NH other	1,671 (57.37%)***	105 (42.81%)	31 (79.70%)	48 (39.15%)	26 (22.45%)	1,566 (58.58%)***
Rurality						
Rural residents	5,441 (70.00%)	193 (68.19%)	55 (77.78%)	78 (61.03%)	60 (69.23%)	5,248 (70.08%)
Urban residents	41,645 (72.14%)	1,902 (63.83%)	719 (71.43%)	750 (59.99%)	433 (60.71%)	39,743 (72.57%)
Insurance Coverage						
Has coverage	46,417 (73.76%)***	2,046 (66.10%)***	762 (72.40%)	814 (62.23%)**	470 (64.53%)*	44,371 (74.14%)***
No coverage	669 (36.82%)***	49 (34.39%)***	12 (51.74%)	14 (24.72%)**	23 (36.81%)*	620 (36.98%)***
Education						
Less than high school	1,403 (60.28%)***	86 (67.42%)**	16 (85.04%)	32 (71.71%)*	38 (57.48%)	1,317 (59.72%)***
High school graduate	8,820 (69.49%)***	318 (65.60%)**	97 (75.31%)	116 (57.27%)*	105 (66.31%)	8,502 (69.65%)***
Some college	13,200 (71.30%)***	496 (54.14%)**	159 (59.93%)	218 (50.33%)*	119 (55.33%)	12,704 (72.16%)***
College graduate	23,663 (76.67%)***	1,195 (71.01%)**	502 (75.88%)	462 (68.18%)*	231 (66.61%)	22,468 (76.96%)***
Income						
<$15,000	2,340 (58.48%)***	162 (60.53%)	46 (64.67%)	53 (56.14%)	63 (63.35%)	2,178 (58.30%)***
$15-24,000	3,687 (63.48%)***	196 (57.65%)	50 (72.03%)	92 (60.77%)	54 (44.92%)	3,491 (63.94%)***
$25-34,000	4,561 (66.54%)***	204 (60.80%)	64 (73.96%)	75 (57.09%)	65 (56.92%)	4,357 (66.85%)***
$35-49,000	5,621 (70.73%)***	203 (57.03%)	68 (62.55%)	75 (44.78%)	60 (64.99%)	5,418 (71.32%)***
$50-99,000	15,821 (74.81%)***	664 (64.89%)	254 (73.53%)	269 (55.33%)	141 (70.73%)	15,157 (75.28%)***
$100-199,000	11,461 (75.76%)***	510 (71.35%)	220 (73.61%)	199 (72.37%)	91 (63.41%)	10,951 (75.95%)***
$200,000+	3,595 (80.54%)***	156 (76.47%)	72 (73.09%)	65 (78.71%)	19 (83.20%)	3,439 (80.68%)***
Age (years)						
40-49	8,933 (60.27%)***	592 (52.12%)***	136 (56.19%)***	326 (50.88%)***	130 (50.71%)	8,341 (60.90%)***

50-54	6,252 (74.46%)***	326 (68.01%)***	110 (78.01%)***	154 (69.72%)***	62 (53.45%)	5,926 (74.82%)***
55-59	6,715 (76.56%)***	300 (70.51%)***	155 (71.98%)***	93 (71.23%)***	52 (66.05%)	6,415 (76.80%)***
60-64	8,315 (75.14%)***	347 (77.83%)***	154 (86.53%)***	103 (73.78%)***	90 (70.51%)	7,968 (75.04%)***
65-69	8,925 (80.59%)***	287 (77.13%)***	118 (85.19%)***	91 (77.49%)***	78 (66.24%)	8,638 (80.72%)***
70-74	7,946 (79.32%)***	243 (78.83%)***	101 (76.36%)***	61 (72.40%)***	81 (83.01%)	7,703 (79.33%)***
General health status						
Excellent	7,248 (73.78%)***	275 (63.73%)	120 (63.53%)	103 (72.73%)	52 (52.35%)	6,973 (74.17%)***
Very good	17,590 (75.90%)***	674 (66.06%)	271 (77.97%)	273 (58.85%)	130 (60.30%)	16,916 (76.27%)***
Good	14,600 (71.32%)***	702 (66.92%)	256 (73.89%)	271 (58.71%)	175 (71.83%)	13,898 (71.55%)***
Fair/poor	7,648 (65.01%)***	444 (59.41%)	127 (67.23%)	181 (59.48%)	136 (51.61%)	7,204 (65.46%)***
Length of Time Since Last Routine Check-Up						
Within the past year	42,682 (78.02%)***	1,851 (71.01%)***	699 (77.04%)***	712 (65.59%)***	440 (71.68%)***	40,831 (78.36%)***
1 to < 2 years ago	3,343 (55.94%)***	180 (54.21%)***	59 (55.36%)***	86 (58.98%)***	35 (38.56%)***	3,163 (56.04%)***
2 to <5 years ago	795 (26.69%)***	47 (23.92%)***	14 (36.29%)***	22 (17.49%)***	11 (25.86%)***	748 (26.86%)***
5+ years ago	232 (11.47%)***	16 (9.87%)***	2 (1.50%)***	7 (20.57%)***	7 (5.37%)***	216 (11.60%)***
Never	34 (27.69%)***	1 (14.05%)***	0 (0.00%)***	1 (38.95%)***	0 (0.00%)***	33 (30.43%)***

Supplemental table 4. Odds of receiving a mammogram within the past two years by sexual orientation, controlling for rurality, race and ethnicity, health insurance, education, age, income, health status, and length of time since last routine check-up

Key: AOR=adjusted odds ratio; CI=confidence interval; SM=sexually minoritized, Het=heterosexual; NH=Non-Hispanic

Note: results significant at *p<0.05, **p<0.01, ***p<0.001

	Total		**SM only**		**Lesbian or gay only**		**Bisexual only**		**Something else only**		**Het only**	
	AOR	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**	**AOR**	**95% CI**

SM	0.91	(0.76,1.08)										
Characteristics												
Rurality (ref: urban)												
Rural	1.02	(0.90,1.16)	1.34	(0.83,2.16)	1.47	(0.67, 3.24)	1.30	(0.65,2.59)	2.24*	(1.06,4.72)	1.01	(0.89, 1.16)
Race and ethnicity (ref: Non-Hispanic White)												
Non-Hispanic Black or African American	1.54***	(1.35,1.75)	1.42	(0.75,2.70)	1.66	(0.58, 4.72)	1.28	(0.55,2.95)	1.37	(0.53,3.58)	1.54***	(1.34, 1.75)
Hispanic	1.39***	(1.15-1.69)	1.24	(0.70,2.22)	1.12	(0.39, 3.24)	1.12	(0.52,2.44)	2.48	(0.84,7.26)	1.40***	(1.14, 1.72)
Non-Hispanic Asian	0.98	(0.75,1.28)	0.76	(0.23,2.47)	0.10	(0.00, 3.76)	0.64	(0.14,2.93)	2.08	(0.32,13.30)	1.00	(0.76, 1.31)
Non-Hispanic other	0.64***	(0.51,0.79)	0.53	(0.26,1.08)	2.17	(0.53, 8.82)	0.51	(0.15,1.70)	0.21*	(0.05,0.93)	0.65***	(0.52, 0.82)
Insurance coverage (ref: no insurance coverage)												
Yes, coverage	2.15***	(1.58,2.93)	1.60	(0.82,3.13)	1.07	(0.37, 3.10)	3.56**	(1.34,9.42)	1.25	(0.37,4.22)	2.18***	(1.57, 3.02)
Education (ref: less than high school)												
High school graduate	0.98	(0.74,1.31)	0.89	(0.39,2.07)	0.72	(0.06, 8.12)	0.55	(0.14,2.09)	1.49	(0.58,3.81)	1.00	(0.74, 1.35)
Some college	1.02	(0.76,1.36)	0.52	(0.22,1.22)	0.32	(0.03, 3.47)	0.31	(0.09,1.07)	1.50	(0.58,3.83)	1.06	(0.78, 1.44)
College graduate	1.19	(0.89,1.58)	0.86	(0.38,1.95)	0.51	(0.04, 6.02)	0.61	(0.16,2.24)	1.91	(0.73,4.98)	1.22	(0.90, 1.64)
Age in years (ref: 40-49)												
50-54	2.01***	(1.77,2.29)	2.05***	(1.25,3.37)	2.66***	(1.30, 5.44)	2.42**	(1.33,4.39)	1.55	(0.51,4.67)	2.01***	(1.76, 2.29)
55-59	2.37***	(2.08,2.70)	2.16****	(1.35,3.45)	2.55*	(1.06, 6.14)	2.18	(0.96,4.96)	1.99	(0.98,4.06)	2.38***	(2.07, 2.73)
60-64	2.18***	(1.90,2.51)	3.42****	(2.00,5.84)	4.86****	(2.20, 11.68)	2.67*	(1.04,6.83)	3.66**	(1.35,9.93)	2.13***	(1.85, 2.46)
65-69	2.77***	(2.42,3.17)	3.45****	(1.69,7.03)	4.83****	(1.93, 12.08)	4.82****	(2.20,10.57)	1.75	(0.83,3.68)	2.74***	(2.38, 3.15)
70-74	2.40***	(2.00,2.87)	3.17****	(1.84,5.45)	2.32	(0.79, 6.76)	2.45*	(1.14,5.28)	4.44**	(1.72,11.46)	2.37***	(1.97, 2.84)
Income (ref: <$15,000)												
$15-24,000	1.23	(0.95,1.	0.88	(0.40,1.	0.77	(0.27,	1.80	(0.64,5.	0.45	(0.15,1.	1.27	(0.96,

		60)		91)		2.19)		04)		32)		1.67)
$25-34,000	1.37**	(1.11,1.69)	1.07	(0.53,2.16)	1.33	(0.31, 5.63)	1.34	(0.48,3.71)	1.11	(0.39,3.18)	1.40**	(1.13, 1.75)
$35-49,000	1.56***	(1.27,1.91)	0.93	(0.48,1.83)	0.84	(0.27, 2.67)	1.11	(0.41,3.01)	0.87	(0.25,3.03)	1.63***	(1.31, 2.01)
$50-99,000	1.85***	(1.53,2.24)	1.45	(0.76,2.78)	1.62	(0.71, 3.72)	1.62	(0.64,4.08)	1.38	(0.47,4.01)	1.90***	(1.56, 2.33)
$100-199,000	2.03***	(1.65,2.49)	1.87	(0.92,3.80)	1.28	(0.46, 3.59)	3.34*	(1.16,9.57)	1.22	(0.38,3.91)	2.06***	(1.66, 2.56)
$200,000+	2.78***	(2.17,3.56)	3.38*	(1.01,11.30)	3.50	(0.53, 23.20)	5.67*	(1.32,24.26)	6.07	(0.41,89.94)	2.80***	(2.16, 3.62)
General health status (ref: excellent)												
Very good	1.04	(0.91,1.18)	1.21	(0.65,2.28)	1.55	(0.55, 4.41)	0.74	(0.28,1.99)	0.90	(0.32,2.54)	1.03	(0.90, 1.18)
Good	0.83**	(0.73,0.96)	1.40	(0.74,2.66)	1.17	(0.41, 3.39)	0.92	(0.32,2.68)	1.70	(0.61,4.71)	0.81**	(0.71, 0.94)
Fair/poor	0.68***	(0.58,0.79)	1.24	(0.64,2.38)	0.73	(0.24, 2.25)	0.96	(0.31,3.02)	1.07	(0.40,2.85)	0.66***	(0.56, 0.77)
Length of time since last routine check-up (ref: within the past year)												
1 to < 2 years ago	0.38***	(0.33,0.44)	0.54*	(0.31,0.94)	0.38*	(0.16, 0.92)	0.83	(0.43,1.60)	0.27**	(0.12,0.61)	0.37***	(0.32, 0.43)
2 to <5 years ago	0.11***	(0.09,0.14)	0.15***	(0.08,0.29)	0.17**	(0.04, 0.67)	0.12***	(0.05,0.31)	0.19*	(0.04,0.82)	0.11***	(0.09, 0.13)
5+ years ago	0.04***	(0.03,0.06)	0.05***	(0.02,0.13)	0.004***	(0.00, 0.02)	0.11**	(0.03,0.44)	0.02***	(0.01,0.08)	0.04***	(0.03, 0.06)
Never	0.15***	(0.07,0.30)	0.09***	(0.03,0.30)	–	–	0.17***	(0.07,0.45)	–	–	0.16***	(0.07, 0.33)