

Queering and Intersectionalizing Health Services Research:  
Structural Influences on Minoritized Sexual and Gender Populations' Mammogram Usage

A Dissertation

SUBMITTED TO THE FACULTY OF THE UNIVERSITY OF MINNESOTA

BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR  
THE DEGREE OF DOCTOR OF PHILOSOPHY

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2024

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## Acknowledgements

My utmost gratitude goes to the family, friends, faculty, staff, and fellow students who have guided and supported me through this difficult journey of earning my doctoral degree. This journey started when my mom was diagnosed with breast cancer and will continue in an effort to make the world better for her and other 2SLGBTQIA+ people. I would not be who or where I am without my moms' unconditional love and support. Next, thank you to my dissertation committee (Drs. Carrie Henning-Smith, Rachel Hardeman, Anne Blaes, Stuart Grande, and Helen Parsons) and co-authors for the second chapter (Drs. Donna McAlpine and Janette Dill) for your thoughtful feedback and consistent support throughout this process. Thank you to my research assistant, Jayne Adole, who helped collect state-level policies and related literature. A special thank you to Dr. Dori Cross for not only being a mentor in research and teaching but also a dear friend. Thank you to my friends and colleagues on the Elsie team, Ali Ecklund, Ben Weideman, Nic Rider, and Rhea Alley for their enduring support during my final year of tenure as a PhD candidate. Last but certainly not least, thank you to my partner, Jacob, who, among being supportive in many other ways, often sat next to me in the evenings while I worked on my dissertation. I am so grateful for your love and belief in me.

## **Dedication**

This dissertation is dedicated to my moms, Sue and Debbie.

## **Abstract**

Breast/chest cancer screening, such as mammography, is recommended to detect breast/chest cancer in its earlier stages; a growing body of research on breast/chest cancer screening suggests that sexually and gender minoritized (SGM) populations experience unique barriers to timely detection of breast/chest cancer screening. A notable barrier to preventive health service use among SGM communities is cisheteropatriarchy, yet many SGM people also have overlapping experiences of oppression from structural racism and urbanism. Little research explores how structural oppression manifests for mammogram usage among those with minoritized sexual orientations, gender identities and races and ethnicities and marginalized by rurality. Using 2022 Behavioral Risk Factor Surveillance System (BRFSS) data, this research is among the first to explore the relationship between mammogram usage and the intersections of sexual orientation, gender identity, rurality, race and ethnicity. This dissertation presents results on mammogram usage for these populations; further, it aims to bring critical social theories, including queer theory and intersectionality, into conversation with health services research. Lastly, I construct a composite measure of state-level structural cisheteropatriarchy and examine its relationship to mammogram usage with specific attention to the impact of structural cisheteropatriarchy on SGM communities. This research proposes a structural intersectionality approach to studying inequities in mammogram usage for minoritized sexual and gender populations.

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## Chapter 1. Introduction

### Introduction

Breast/chest cancer screening is recommended to detect breast/chest cancer<sup>1</sup> in its earlier stages. A growing body of research on breast/chest cancer screening indicates that sexually and gender minoritized (SGM)<sup>2</sup> populations experience unique barriers to timely detection of breast/chest cancer screening (Agénor et al., 2020; Austin et al., 2013; Barefoot et al., 2017; Bazzi et al., 2015; Bennett et al., 2012a; Brown & Tracy, 2008; Case et al., 2004; Ceres et al., 2018; Charkhchi et al., 2019; Clarke et al., 2022; Cochran et al., 2001; Gilbert et al., 2020; Hart & Bowen, 2009; Heer et al., 2023; Herriges et al., 2022; Hoy-Ellis et al., 2022; Hutchinson et al., 2006; Lee et al., 2020; Lin et al., 2023; Luehmann et al., 2022; Malone et al., 2019; Monticciolo, 2020; Narayan et al., 2017; Oladeru et al., 2022; Ramsey et al., 2023; Roznovjak et al., 2021; Siegel et al., 2017; Solazzo et al., 2017; Tabaac et al., 2018; A. D. Williams et al., 2020; Zaritsky & Dibble, 2010). Recent research suggests mixed results as to whether sexually minoritized women (SMW)<sup>3</sup> are as likely to receive breast/chest cancer screening as their heterosexual counterparts (Agénor et al., 2020; Austin et al., 2013; Barefoot et al., 2017; Bazzi et al., 2015; *Breast Cancer Screening Guidelines for Women*, 2020; Ceres et al., 2018; Charkhchi et al., 2019;

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

<sup>2</sup> Sexual and gender minoritized communities include lesbian, gay, bisexual, asexual, intersex, transgender, gender non-binary, gender nonconforming, and queer people; SGM communities also include people who have same-sex attractions, behaviors, or relationships, such as men who have sex with men (MSM), women who have sex with women (WSW), and those who identify as not exclusively heterosexual/straight.

<sup>3</sup> 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.

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; A. D. Williams et al., 2020). Much of the research on breast cancer occurrence in SGM populations has focused on risk and behavioral factors associated with increased breast cancer incidence, many of which are attributable to stress from sexual orientation-related stigma and discrimination (Austin et al., 2012; Boehmer & Bowen, 2009; Boehmer & Case, 2007; Cochran et al., 2001; Lehavot & Simoni, 2011; Lick et al., 2013; McCabe et al., 2009; Quinn et al., 2015; Zaritsky & Dibble, 2010). Research on the impact of structural oppression on breast/chest cancer screening for SGM communities is extremely lacking. One such form of structural oppression is structural cisheteropatriarchy. Through the following chapters, this dissertation will fill gaps in research on the impacts of structural cisheteropatriarchy on the provision of breast/chest screening and preventive healthcare services for SGM people. The ultimate aim of this research is to alleviate breast cancer health inequities and the cancer burden among this underserved community.

## *Chapter 2. Queering Health Services Research*

The influence of structural oppression in health services research (HSR) is understudied, and a comprehensive literature review and theoretical formulation of how HSR may counteract structural oppression of SGM communities through shifting research practice in HSR is needed. As such, for Chapter 2, I will draw on sociological theory and empirical research to answer the following research questions:

- 1) How are gender, sex, and sexual orientation socially constructed and medicalized cultural categories within health services research?

- a) How do social construction and medicalization as frameworks provide health services researchers a lens through which to view structural oppression of SGM communities?
- 2) How do queer theory and intersectionality contribute to shifting health services research's analytical, conceptual, and methodological orientations toward gender, sex, and sexual orientation so as to improve care for SGM populations?

*Chapter 3. Mammogram Screening Differences at the Intersection of Sexual Orientation, Race and Ethnicity, and Rurality*

Using Chapter 2 as a model for research practice in health services research, I examine inequities in breast cancer screening among and between sexually minoritized and heterosexual people. Using quantitative intersectionality approaches and queer theory in my approach, my research questions are:

- 1) How does mammogram screening usage differ between SM and heterosexual women?
  - a) How does this relationship vary at intersections of race and ethnicity and rurality?

*Chapter 4. State-Level Structural Cisheteropatriarchy Policies and Factors and Their Impact on Mammogram Usage Across Sexual Orientation and Gender Identities*

In Chapter 4 I examine how structural cisheteropatriarchy influences mammogram screening for SGM people. My research questions are:

- 1) What is the relationship between structural cisheteropatriarchy and mammogram usage?
  - a) How does this relationship vary at intersections of sexual orientation, gender identity, race and ethnicity, and rurality?

- b) How does a queer methodological and intersectional lens shift our interpretation of mammogram usage?

### *Data and Methods*

My dissertation research enhances previous research through combining emerging critical social theory, specifically queer theory and intersectionality, with quantitative analysis of 2022 Behavioral Risk Factor Surveillance System (BRFSS) data. Chapter 2 includes a review of the top health services research journals across the past five years (2017-2022) in order to describe current approaches to studying the LGBTQ+ population in HSR and propose queer theory and intersectionality as interventions in HSR. Using the integration of queer theory and intersectionality into research practices as a model from Chapter 2, Chapter 3 includes descriptive analyses of differences in mammogram screening between SM and heterosexual people ages 40-74 years. I also use logistic regression and predicted probabilities to estimate the likelihood of receiving a mammogram. I conduct inter- and intra-categorical group analyses to examine how mammogram usage differs at the intersections of sexual orientation, race and ethnicity, and rurality. In Chapter 4 I continue to use 2022 BRFSS data to examine the relationship between structural cisheteropatriarchy and mammogram usage among those ages 50-74 years. As in Chapter 3, I conduct inter- and intra-categorical group analysis to examine how mammogram usage differs at the intersections of sexual orientation, gender identity, race and ethnicity, and rurality. Throughout each of these chapters I weave queer methodology and intersectionality to provide alternative interpretations of results from the 2022 BRFSS analyses conducted in Chapter 3 and 4.

## Background

Cisheterosexism<sup>4</sup> and other intersecting mechanisms of oppression, including structural racism, ableism, and classism, affect the frequency with which individuals in the lesbian, gay, bisexual, transgender, and queer (LGBTQ<sup>5</sup>) communities visit health care providers, disclose their sexual orientation and/or gender identity, and engage with health care services (Baptiste-Roberts et al., 2017; J. Fish, 2006; Goins & Pye, 2013; Macapagal et al., 2016; Suen et al., 2022). While HSR's current research captures the context in which heteronormative practices and policies in our healthcare system limit LGBTQ+ individuals' engagement with healthcare services, I argue that health services research (HSR) as an organizational context has failed to counteract cisheteronormativity and cisheterosexism within our own discipline and, consequently, in the healthcare system.

In exploring how HSR upholds cisheteronormativity and cisheterosexism, I first examine how the social construction and medicalization of gender and sexuality, and their intersection with race<sup>6</sup> (all categories that structure and are structured by health and healthcare delivery), are rarely interrogated in HSR. For example, HSR methodology has rarely engaged sexuality and gender as fluid and dynamic social constructions; rather, sexual orientation and gender identity

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<sup>4</sup> "Cis," shortened terminology for cisgender, references the alignment of an individual's gender identity with their given biological sex at birth (Safer & Tangpricha, 2019; Schilt & Lagos, 2017; Sumerau et al., 2016). Cisheterosexism privileges being cisgender and heterosexual as the cultural norm. Heteronormativity, a term coined in 1991 by Michael Warner, is the dominant system of cultural expectations for gender and sexual identity and practice in the US context.

<sup>5</sup> Previous health services research uses "sexual and gender minority individuals" to refer to lesbian, gay, bisexual, transgender, and queer-identified (LGBTQ) individuals. As discussed in this paper, there are limitations to using both of these terminologies.

<sup>6</sup> LaVeist (1994) discusses race as a social construction and cautions its unquestioned use as a variable in quantitative models in health services research (LaVeist, 1994).

are used as stagnant demographic features. The use of this limited methodological approach highlights HSR's inability to question how the social construction and medicalization of gender and sexuality influence our research questions, interventions, and consequent healthcare delivery. My aim in examining medical, social, and cultural constructions of gender and sexuality is to leverage alternative understandings of gender and sexuality and propose cultural change, including shifts in knowledge production, within HSR.

Sociological theories like social constructionism highlight the importance of examining how knowledge production about gender and sexuality within HSR is influenced by and continues to ingrain patriarchal culture. HSR has failed to deeply question the influence of patriarchal culture on how we frame gender and sexuality in our research processes. In this paper I argue that patriarchal culture depends on these institutionalized framings of gender and sexuality, especially through medicalization, to structure access to healthcare services. If left unchallenged, the cisheterosexism embedded in HSR will remain in the the healthcare system, perpetuating stigmatization<sup>7</sup> of the LGBTQ+ communities and influencing the quality and frequency of healthcare service usage.

In response I interweave queer theory and intersectionality frameworks as paradigmatic approaches that have the potential to improve how HSR and our healthcare system frame and care for LGBTQ+ communities. Queer theory presents an intervention in the legacy of medicalization of gender and sexuality within the structuring and delivery of healthcare services. Queer theory has emerged as a critical social theory that offers health services researchers a

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<sup>7</sup> Stigma is described as a “social process, experienced or anticipated, characterized by exclusion, rejection, blame, or devaluation that results from experience, perception, or reasonable anticipation of an adverse social judgment about a person or group” (Scambler, 2009).

foundation in which to challenge the cisheteronormativity ingrained in the field (Collins, 2019; Wiegman & Wilson, 2015). Intersectionality shifts HSR's framing of gender and sexuality by deconstructing the multiple systems of power and oppression in our healthcare system (Cho et al., 2013; Crenshaw, 1989). Specifically, intersectionality provides HSR with a lens to see how interlocking mechanisms of power and oppression, such as cisheterosexism and racism, shape access to healthcare services. By expanding our usage of queer theory and intersectionality in our research, health services research has the potential to epistemologically shift its own cultural framings of how queer<sup>8</sup> individuals and queerness are approached and engaged in healthcare and health-related research.

Using this theoretical framework as a model for research practice in health services research, I examine inequities in breast/chest cancer screening for SGM people. Disparities in health and access to care, including for cancer, are well-documented by rurality and sexual orientation; however, little research explores the convergence of rurality, sexual orientation, gender identity, and race and ethnicity with access to cancer screening. This research is among the first to use Behavioral Risk Factor Surveillance System (BRFSS) data to explore the intersections of mechanisms of structural oppression and analyze mammography utilization in relation to sexual orientation, gender identity, and race and ethnicity, and rurality.

Most breast cancer screening guidelines recommend mammogram screening as effective in the early detection of breast cancer for women with average risk aged 40 to 74 years (*Breast Cancer Screening Guidelines for Women*, 2020; *Cancer Facts & Figures 2023*, 2023;

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<sup>8</sup> "Queer" is terminology used to reclaim a derogatory term to "reject the mainstream cultural norms of sexuality and gender." (Baptiste-Roberts et al., 2017)



Monticciolo, 2020). Mammography is recommended by a number of organizations for women at average risk of breast cancer as early as age 40, though there is little consensus on whether screening is evidenced to reduce breast cancer mortality in women 40-49 years of age (American Cancer Society, 2018; *Breast Cancer Screening Guidelines for Women*, 2020). Additionally, shared decision-making with a clinician is recommended for women to weigh the benefits and harms of screening. Overall, these organizations recommend earlier detection as associated with a greater chance for successful treatment of breast cancer (National Cancer Institute, 2015; Siu, 2016). However, recent studies yield mixed results as to whether SMW 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; *Breast Cancer Screening Guidelines for Women*, 2020; 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; A. D. Williams et al., 2020). Given the array of research reporting higher prevalence of breast cancer risk factors, breast cancer incidence, and mortality rates among SMW, it remains crucial to understand SMW's breast/chest cancer screening usage (Brown & Tracy, 2008; Case et al., 2004; Cochran et al., 2001; Hart & Bowen, 2009; Hutchinson et al., 2006; Zaritsky & Dibble, 2010).

Breast/chest cancer screening at the intersection of sexual orientation and rurality is an understudied area of research. Breast/chest cancer screening rates differ by geography, with lower uptake among rural residents compared with their urban counterparts (Bennett et al., 2012a; Berkowitz et al., 2019; Doescher & Jackson, 2009; Heller et al., 2018a; Henry et al., 2014; Nuño et al., 2012; Orwat et al., 2017a; Tran & Tran, 2019). Previous 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). One recent study examining screening rates for breast, cervical, and colorectal cancer found that they are lowest among rural and LGBTQ<sup>9</sup> populations compared with urban and heterosexual populations (Lee et al., 2020). Research on mammogram usage for SGM and rural populations separately is rare, and research at these intersections remains highly limited.

Disparities in mammogram usage by racial and ethnic background have mostly been studied separately from sexual orientation, yet an intersectional understanding of mammogram decision-making and uptake remains an important aspect of cancer screening and prevention. Racial and ethnic- and sexual orientation-related disparities in mammogram screening are an important intersection to take into account; there are mixed results of the screening rates across Black, Hispanic, and white populations (Ahmed et al., 2017; 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). Perceptions of breast cancer screening for racial and ethnic minoritized populations are affected by healthcare system distrust (Mouslim et al., 2020). Despite the presence of complexities affecting uptake among sexually and racially & ethically minoritized and rural populations, little research documents breast/chest cancer screening rates at the intersections of sexual orientation, race and ethnicity, and rurality. Chapter 3 aims to shed light on mammogram rates at the intersections of sexual orientation, race and ethnicity, and rurality and provide recommendations for next steps in

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<sup>9</sup> This terminology is reflective of the population described in the literature.

improving health services for sexually and racially & ethnically minoritized and rural populations.

Structural features of the healthcare system, specifically the perpetuation of oppression and distrust, influence SGM people's uptake of healthcare services related to breast/chest health and breast/chest cancer screening. Healthcare system distrust affects SM 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). Furthermore, Lastly, Malone et al. (2019) identify Black SMW's distrust of healthcare practitioners and the broader medical community as intertwined with multiple intersecting forms of oppression of homophobia and racism (Malone et al., 2019). Understanding multiple forms of structural forms of oppression and their relationship to mammogram usage is an essential focus of this research.

As noted above, SGM people have an elevated risk of breast/chest cancer and limited engagement with breast cancer screening due to a range of structural and behavioral factors. These behaviors include "higher prevalence of nulliparity (i.e. never having children) and older age at first live birth," higher alcohol consumption, and smoking (Ceres et al., 2018; Meads & Moore, 2013). Research on structural barriers to breast cancer screening for SGM populations is extremely lacking. The breast/chest cancer health inequities generated by structural barriers and behavioral factors underscore the necessity of research focusing on breast/chest cancer risk assessment and screening among SGM communities. While behavioral risk factors contribute to SGM people's elevated risk of breast/chest cancer, the goal of Chapter 4 is to evaluate how

structural factors within the healthcare system, specifically the perpetuation of cisheteropatriarchy, influence SGM people's rates of mammogram usage.

### *Theoretical Framework*

As highlighted above, my first aim in examining cultural constructions of gender and sexuality is to leverage alternative understandings of gender and sexuality within HSR. In order to examine cultural constructions of gender and sexuality more fully, I outline the patriarchal culture that produces, maintains, and influences constructions of gender and sexuality within the U.S. The theoretical foundations of social constructionism articulate the narrow confines of gender and sexuality within patriarchal culture. Further, social constructionism highlights the importance of examining how knowledge production about gender and sexuality within HSR is influenced by and continues to reingrain patriarchal culture.

Despite the spreading awareness of gender and sexuality as socially constructed categories, gender, sex, and sexuality are often conflated and linked in ways that underpin investment in patriarchal cultural constructions of gender and sexuality. Cecilia L. Ridgeway describes gender, as a set of “shared cultural expectations associated with being male or female”, or, more extensively, as a “system of social practices within society that constitutes distinct, differentiated sex categories, sorts people into these categories, and organizes relations between people on the basis of the differences defined by their sex category” (Ridgeway, 2011). It is worth noting that this framing of gender focuses on gender as culturally and socially generated but does not contest the biological derivation of sex categorization, as other scholars have (Butler, 1990; Karkazis, 2008; Kessler & McKenna, 1978; Laqueur, 1990; McKenna & Kessler, 2000). The emphasis on binary gender differences also serves as a means of constructing normative sexuality, in which

heterosexual relations that center sexual reproduction are perceived as natural (Vance, 1991; Weeks, 2003, 2006). The precise ways in which sexuality is socially constructed are contested; however, sexuality is a cultural and historical product and process that may reflect behaviors, identity, and/or sexual acts: “social construction approaches adopt the view that physically identical sexual acts may have varying social significance and subjective meaning depending on how they are defined and understood in different cultures and historical periods” (Baldwin et al., 2017; Vance, 1991). Given these definitional accounts of gender and sexuality, in the next section I outline theories of culture and the power of patriarchal culture in shaping cultural conceptions of gender, sex, and sexuality and the U.S. healthcare system and associated services.

### *Patriarchal Culture*

Cultural sociologists and anthropologists have varying conceptions about what culture encompasses and the power of culture in shaping institutions and actors in society (Geertz, 1973; Harlow & Hearn, 1995; Schudson, 1989; Sewell, 1999; Swidler, 1986). Clifford Geertz championed the thick description theory of culture, defining culture as a context of “socially established structures of meaning” encompassing social events, behaviors, institutions or processes” (Geertz, 1973). Culture may function as institutional spheres of meaning-making, learned behaviors, agency, systems of symbols and meaning linked, and practices (Sewell, 1999). Alternatively, culture, in the concrete sense, represents linked systems and practices with shared meaning (Sewell, 1999). In contrast with Geertz, William H. Sewell defines culture as a product of power, pointing toward the causal nature of culture. In interrogating how culture shapes action Ann Swidler (1986) describes culture as “symbolic vehicles of meaning, including beliefs, ritual practices, art forms, and ceremonies, as well as informal cultural practices such as

language, gossip, stories, and rituals of daily life” (Swidler, 1986). In Swidler’s framing culture is a toolkit used to guide strategies of action. Likewise, culture “link[s] structural aspects of society to our most individual sense of self, identity, and action”(Rahman & Jackson, 2010c). Though there is no consistent definition of culture or whether culture autonomously guides modes of behavior, as opposed to shaping actions through other structural systems, culture is imbued with shared meanings about and influential in framing understandings of an array of social constructions, including gender, race, sexuality, and ability.

When viewed as an interface between societal structures and individual actions and constructs of identity, patriarchal culture constrains and shapes beliefs about and expressions of gender and sexuality. Patriarchal culture is based in biological essentialism, in which the dichotomous split of women and men is viewed as valid and normal, and sexes and genders that defy this binary are characterized as pathological, deviant, and unnatural (Rahman & Jackson, 2010b). Like other disciplines and institutions, HSR’s conceptualization of gender and sexuality is rooted in biological essentialism. In its intellectual proximity to the healthcare system, HSR often relies on medical models of gender and sexuality, thus reinforcing biological essentialism in our shared knowledge and culture. Western medicine, “engender[s] a naturalizing logic and rhetoric,” and portrays gender and sexuality as depoliticized categories under its own purview; further, Western medicine is itself an ideological system that draws on and reinforces patriarchal culture (Argüello, 2016). This “biology as ideology” framework translates into scientific knowledge production and thereby attempts to justify social inequities based on gender and sexuality (Rahman & Jackson, 2010a). These are indications that the foundations of HSR’s essentialist constructions of gender and sexuality are steeped in patriarchal culture.

### *Patriarchal Culture and Cisheterosexism in Healthcare and Services*

Situated within a patriarchal culture, HSR may also be envisioned as having a distinct organizational culture that replicates essentialist constructions of gender and sexuality and also produces new and shifting cultural categories. Briefly, one articulation of organizational theory describes organizations as systems of knowledge, patterns of symbolic discourse, and manifestations of unconscious processes that facilitate shared meanings among organization members (Harlow & Hearn, 1995). I argue that HSR's organizational culture mirrors the narrow constructions of gender and sexuality within our patriarchal culture. Indeed, Harlow and Hearn (1995) note, "gender/sexuality are themselves culture—that is, they are constructed in and as culture. They are not just culturally explainable: they are cultural products" (Harlow & Hearn, 1995). I propose that through the production and reproduction of patriarchal constructions of gender and sexuality within HSR's organizational context, HSR perpetuates cisheterosexism within research about health care delivery and services.

Many scholars have questioned the gender binary, specifically whether there are two biologically-based "normal" genders, proposed how gender is socially constructed, and offered rich and nuanced critiques of narrow patriarchal constructions of gender and sexuality (Butler, 1999; Connell, 1987; Fausto-Sterling, 1992, 2000; Lorber & Farrell, 1991; West & Zimmerman, 1987; Westbrook & Schilt, 2014). Feminist scholars have recognized the generation of social structure through human and environmental relationships that depend upon and produce gender differentiation and gender as a "category of individual identity and the focus of symbolic constructions" (Thorne, 1993). In many ways understandings of biology related to gender, sex, and sexuality are socially constructed, yet these sociocultural influences are seldom recognized

within science and medicine (Fausto-Sterling, 1992; Karkazis, 2008; Katz, 2007; McKenna & Kessler, 2000; Somerville, 2000a, 2000b). It is essential for science, medicine, and public health to recognize how gender is socially constructed if we hope to remediate the harm that has been caused by devaluing those who do not conform to particular cultural conceptions of the gender binary that are reproduced by and within our research practices.

These scholars have expanded our definitions of gender and sexuality and offered us a perspective that views gender as relational, in which genders and sexuality span a spectrum as opposed to the normative binary constructions. In refuting essentialist ideology about gender and sexuality these scholars highlight how “science cannot produce neutral knowledge, precisely because its biases include accepting social categories—such as masculine, feminine, homosexual, heterosexual—as natural, biological facts and then seeks out differences to justify this categorization” (Rahman & Jackson, 2010a). We embody these constructions of gender and sexuality, and the study of our biology is often used as the basis of the gender binary; further, the study of our biology is culturally influenced and utilizes hierarchies and stereotypes that produce limitations on what genders and gender presentations are socially *and scientifically* acceptable.

Cisheterosexism and cisheteronormativity are ingrained in how we frame and approach gender and sexuality within our research, which has innumerable effects on the conceptualization structure and delivery of health services. Cisheteronormativity has significant effects on the structure of our healthcare system by involving the expectation of opposite sex relationships as the norm and thus hierarchically organizing gender and sexuality (Chance, 2013; J. Fish, 2008). Heterosexuality is never questioned nor has the need to be explained, while queerness has been historically interrogated yet consequently silenced in the process. As articulated by Diana Fuss,



“heterosexuality secures its self-identity and shores up its ontological boundaries by protecting itself from what it sees as the continual predatory encroachments of its contaminated other, homosexuality” (Rahman & Jackson, 2010a). Furthering this perspective, the privilege that heterosexuality has as the norm creates oppressive conditions within the healthcare system, manifesting itself in such a way that enables healthcare personnel and ideologies to completely ignore queerness and the needs of queer individuals.

Heterosexism has been and is perpetuated by the health care system and health services research through heterosexist beliefs, attitudes, and practices that marginalize non-normative genders and sexualities (J. Fish, 2006; Goins & Pye, 2013). Specifically, heterosexism is embedded within the medical system by, but not limited to, these several factors: automatic and routine presumptions of heterosexuality, the silencing of sexual identities through ignorance, whether purposeful or not, of the many sexualities and genders individuals claim, and language and discourse, including lack of respect for an individual’s gender pronouns (J. Fish, 2006). The stigmatization around these identities remains “influential in the education of health care providers, the quality of health care they deliver, their comfort in interacting with clients, and the institutional policies under which they work” (Stevens & Hall, 1991). Heterosexism and the pathologizing of queerness by healthcare professionals and researchers have detrimental effects on patient care by intentionally or unintentionally ignoring the systems of oppression that perpetuate harm.

Cisheterosexism and homophobia, among other forms of oppression, are closely weaved together throughout U.S. medical history. Western medicine has functioned as a supposedly objective source of knowledge that legitimated the construction of homosexuality as a sin, crime,

and result of sickness and insanity that could be cured and controlled through the practice of medicine (Drescher, 2015; Rosario, 1997; Stevens & Hall, 1991). Medicinal techniques (one could say “services”), such as castration, hypnotherapy, psychoanalysis, drugs, and conversion therapy, contributed to and perpetuated a hierarchical social order through construction of homosexuality as deviant. Homosexuality has been historically regarded as biologically, psychologically, genetically, morally, emotionally, and sexually inferior to heterosexuality within the healthcare system; therefore, queer understandings of the social construction of gender and sexuality are needed to expand on the ways in which the medical system has sought to generate and maintain certain bodies and identities while stigmatizing others. By reinforcing cisheteronormativity, HSR and the healthcare system have distorted health and health services and failed to provide an environment, services, and resources that are conducive to genuinely meeting the needs of individuals and communities with non-normative genders and sexualities.

### *Medicalization of Gender and Sexuality*

The medicalization of gender and sexuality continues to be a double-edged sword, so to speak, and, as illustrated above, has the potential to inflict immense damage. Peter Conrad’s definitional account of medicalization focuses on “defining a problem in medical terms, usually as an illness or disorder, or using a medical intervention to treat it” (Conrad, 2005). In one respect, medicalization of gender and sexuality has facilitated access to health services, such as gender affirming surgery (Spade, 2003). However, access to these health services is monitored by health insurance companies, who often may not cover the costs of these surgeries without confirmation from a licensed psychologist or clinician. Another instance of the medicalization of gender and sexuality are medical interventions for those with disorders of sex development

(DSD), or intersex individuals (Kessler, 1998). Through the “discourse of medical management,” intersexuality has been transformed into a site of medical intervention with little regard for questioning the sexed and gendered cultural motivations for diagnostic classification and treatment (Karkazis, 2008). The gatekeeping structures in place for these health services serve as ways to closely monitor LGBTQ+ individuals and ensure gender and sexuality are medically affirmed and categorized accordingly. They also function as a way to create dependency on the medical institution in order to gain access to these health services. The medical apparatus continues to construe and control gender and sexuality in ways that not only limit access to health services but also limit conceptions of gender and sexuality as fluid and dynamic.

The medicalization of gender and sexuality has contributed and continues to contribute to the pathologization of LGBTQ+ individuals (Drescher, 2015; Stevens & Hall, 1991), and health services research perpetuates cisheterosexism through reinforcing medicalization of gender and sexuality. Medicalization has expanded “medical surveillance and the medical gaze,” thereby implicating the regulation of gender and sexuality as within the purview of medical institutions (Conrad, 2005). As Argüello notes, patients are “forced into liminal spaces when it becomes clear that their bodies, desires, and sex/ualities are not easily represented in the minds and technologies of the providers and the industry tasked to help them. It is too often in clinical practice that sex/uality and gender are indexed through social and health disparities such as HIV, through (psychiatric) diagnostic schema, or embodied via identitarian-based categories, such as lesbian, gay, bisexual, transgender, or queer” (Argüello, 2016). Similarly, there is a social process intertwined with medicalization, coined by Ian Hacking as a looping effect, “in which the creation of new social norms, medicalization, quantifying, and other related processes

produce new categories of people, which are then reclaimed as bases for identity” (Saguy, 2013a). There is a price of pathologization, and as illustrated by the historical trajectory of gender and sexuality as medicalized cultural categories, there is a danger in bringing social issues into public health and medical contexts (Busfield, 2017; Meyer & Schwartz, 2000; Saguy, 2013b).

The medicalization of gender and sexuality has connections with Michel Foucault’s notions of biopower and knowledge-power, which highlight the link between the sociomedical management of gender and sexuality, amongst other medicalized social classifications of bodies (e.g. race), power dynamics, and the discursive production of knowledge about gender and sexuality. Biopower involves controlling, monitoring, organizing, and classifying life in order to control the quality and aesthetics of the bodies existing in and being born into the population (Foucault, 1978; Rabinow & Rose, 2006). Biopower alludes to modern society’s historical break with the past and rests on the belief in human control of our own bodies, other humans, and nature through rational thoughts, technology, science and medicine. Foucault’s conception of knowledge-power describes knowledge production as always intertwined with power relations and reflexively interacting with society (Foucault, 1978). Both describe the production of social management through scientific knowledge and the intertwining political-scientific ways societies are managed by managing life. According to Foucault, “at the juncture of the ‘body’ and the ‘population,’ sex became a crucial target of a power organized around the management of life”(Foucault, 1978). Importantly, power *produces* categories of normative and perverse sexuality through discourses of knowledge—“they define the truth of our sexualities by virtue of the legitimacy and authority accorded to expert knowledge” (Rahman & Jackson, 2010a).

Through this view, individual life as well as population life are seen as always linked with political, cisheterosexist, racist, and ableist agendas, including the eugenics movement in the early 20<sup>th</sup> century, aimed at valuing and reproducing some lives while discarding and marginalizing others. These frameworks are useful in analyzing the public health system and health service delivery as one form of controlling, monitoring, and classifying life, with regulatory and disciplinary implications. The control over the life and livelihood of marginalized communities articulated by the facets of biopower and knowledge-power are of primary interest to health services research because they reflect how gender, race, class, ability, and various other axes of cultural categories have been used as scapegoats for unequal power distributions and, therefore, systems of structural oppression targeting queer communities have generated rampant health inequities.

Our current conceptions of gender and sexuality have been historically influenced both by the intertwined processes of medicalization and racialization furthered by various medical “experts” in human sexuality in the late nineteenth and early twentieth centuries. Racialization, which can be understood as an ideological process of extending racial meaning to a social practice or group, is an important construct to consider in understanding the historical development of categories of gender and sexuality (Somerville, 2000a). Sexual orientation developed as a bifurcated category of homosexual and heterosexual identity, and, specifically, homosexuality became a category of identity representing pathologized sexual behaviors and desires. Somerville argues the “historically specific production” of homosexuality is inseparable from the process of racialization in the “racially segregated culture” of the late nineteenth century, thereby giving rise to homosexuality as a form of difference (Somerville, 2000a).

Further, the medicalization of sexuality is simultaneously tangled with the process of racialization prominent in the eugenics movement, in which the classification of homosexual bodies as different and abnormal became codified as objective truth in medical practice. Tracing the historically intertwined development of racial and sexual difference, Somerville notes, “two tabooed types of desire—interracial and homosexual— became linked in sexological and psychological discourse through the model of “abnormal” sexual object choice” (Somerville, 2000b).

Somerville’s articulation of the invention of homosexuality as a racialized process is notable in itself, but it also offers a lens through which social construction of gender, race and sexuality can be viewed as inextricably intertwined, pointing toward how queer and intersectional lenses are necessary to understand the complexity of the intersections of health, identity, and systems of power; furthermore, the production of knowledge about gender, race, and sexuality is enmeshed in a patriarchal cultural context in which systems of oppression (i.e. sexism, racism, homophobia) are granted validity through the power and authority of medical classification. This cultural orientation endures in health services research, which relies on categorical classifications of social constructs. Indeed, “particular meanings of socially constructed identities gain currency through repetition, resistance, and appropriation” (Somerville, 2000a).

### *Queer Theory and HSR*

Queer theory presents an intervention in the legacy of medicalization of gender and sexuality within the structuring and delivery of healthcare services. In highlighting queerness as an important site of inquiry, queer theory has evolved as a political platform to question and

challenge cisheteronormativity (Collins, 2019; Duong, 2012; Sedgwick, 1990; Wiegman & Wilson, 2015). Queer theory “is a positionality vis-à-vis the normative...an active strategy to apprehend difference as relational” and disentangle “naturalizing cultural categories” (Argüello, 2016; Halberstam et al., 2005). In theorizing sexuality Foucault blazed queer theory’s path by positing that “the domain of sex/uality and its multiple identities are not essential personal and private attributes, but instead discursive productions arising from available cultural categories and the effects of power networks” (Argüello, 2016). Further, queer theory has emerged as a theoretical basis in which to resist biological essentialism for all axes of cultural categories in patriarchal culture.

“Queer theory denaturalizes identities, exposing the essentializing residue of positivism that typically is at the heart of identity and its politics. It seeks further understanding of identities as intersectional and diasporic, reconceptualizing relations and (social) locations in terms of queerness, affiliation, and social contingency, rather than ethnic dispersion, filiation, and biological traceability”(Argüello, 2016).

In counteracting cisheteronormative discourse, queer theory challenges all cultural categories derived from binary constructions in patriarchal culture and even interrogates its own role and limitations in knowledge production. Challenges to binary constructions of gender and sexuality have enormous implications for health services research. For example,

“Queer theory functions both as a mode of analysis and as a strategy of opposition that critiques normativities imbricated within a wide range of social categories and social

institutions, including, but not limited to the body, gender, healthcare, reproductive politics, the family, and citizenship, in addition to, and alongside, sexuality” (Spurlin, 2019).

Building on this, queer theory’s potential as an intervention in HSR is its focus on research practices and discourses that structure how gender and sexuality are approached in health services. Gender and sexuality, when viewed through a queer theoretical lens, are fluid and context dependent cultural constructions (Eliason & Schope, 2007; Goins & Pye, 2013).

Expanding on queer theory further, to “queer” health services research means approaching “queer as a verb as much as a noun” (Chan et al., 2019). Queering gender and sexuality in HSR may then translate to “realizing many interpretations and experiences can coexist outside of claimed identities” and a critical examination of “manifestations of power determined by binaries and identity categories” (Chan et al., 2019; McCann, 2016). Queer methodology in HSR involves problematizing current knowledge structures, engaging reflexivity, and practicing empirical approaches that center queerness, like that of queer reading, ethnography, and community-based participatory research (J. N. Fish & Russell, 2018; McCann, 2016; Sedgwick, 1993, 1997; Valocchi, 2005).

Another importance of queer theory to HSR lies in its practical significance in connecting experiences of gender and sexuality with the healthcare system and health services to the communities harmed by cisheteronormativity and cisheterosexism within these contexts. “Queer theory looks at risk in *lived* contexts, which are confluences of knowledge, meaning, and ir-/rationality...fundamentally, this stance questions how we engage in practice, who we serve, to what ends, and what the stakes are” (Argüello, 2016). Furthermore, queer theory highlights the importance of engaging queerness and those with non-normative genders and sexualities as



active participants in knowledge production about their own lives and communities. In practice, “examining how identity is communicated in the health care context is important for understanding the symbolic and material consequences of socially constructed norms of sexuality” (Goins & Pye, 2013). By centering them as *subjects* of study rather than as *objects* of study, researchers convey the importance of these communities’ lives and experiences in their own right (Schilt & Lagos, 2017). Queer theory may be used in practice to reflect on the power inevitably intertwined with discourses about gender and sexuality within HSR.

Health services researchers currently use fixed categories of gender and sexuality, as well as other axes of identity, in order to detect meaningful patterns of inequality. Sociological critiques of queer theory highlight the problematic nature of dissolving and rejecting these axes of cultural categories, noting queer theory’s “inability to account for the evident social structural foundations of gender and sexuality and the lack of attention to the ways in which identity categories give meaning to everyday practices and experiences” (Rahman & Jackson, 2010a). Possible mechanisms for gender and sexuality to be measured more dynamically over time in ways that enable health services researchers to detect meaningful differences across groups include refining queer methodological approaches discussed above. Health services research has the potential to question cisheteronormativity and give meaning to gender and sexuality in lived contexts through our practice. However, given the lack of integration of queer theory currently within healthcare, much needs to be done beyond acknowledging the power relations that produce cisheteronormative environments and research. Changes in HSR’s knowledge production and organizational culture are needed to counteract cisheteronormativity and connect with communities marginalized and stigmatized within the healthcare system.

### *Intersectionality and HSR*

Intersectionality, first articulated by feminist and queer scholars of color, arose as a way to authentically consider lived experiences without sacrificing any axes of identity in feminist collective movements for justice, which often erased the lived experiences of queer women, women of color, and queer women of color (Anzaldúa, 1987; Collins, 2019; Combahee River Collective, 1995; Crenshaw, 1989, 1990; hooks, 1981, 1984, 1989; Lorde, 1984; Moraga & Anzaldúa, 1983). Intersectionality is an overarching theoretical framework that expands on how power and systems come together to create unique experiences of privilege and oppression. We each have social identities that intersect, and these intersecting social identities are sites of both privilege and discrimination. The importance of intersectionality is the lens that it provides us with to examine how systems and power affect our experiences at these social intersections. Intersectionality's potential within HSR is also to examine how multiple systems of power and oppression interact to produce health inequities. In describing how intersectionality is a useful theoretical framework for public health research Lisa Bowleg writes, "intersectionality is a theoretical framework that posits that multiple social categories (e.g. race, ethnicity, gender, sexual orientation, socioeconomic status) 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). Intersectionality is a necessary frame for reflecting on the cultural and historical systems of knowledge-power that have medicalized axes of identity and shaped access to healthcare services.

Feminist principles understand healthcare as a socially constructed mechanism that should recognize and address human bodies and illnesses in a way that overcomes and resists

inequality as well as marginalization based on race, class, gender, and sexual orientation (Mullings & Schulz, 2006). Oppression, privilege, and discrimination based on identity are related systems dependent on each other and built into social injustice and inequity. “Racism and sexism, as well as other forms of oppression such as homophobia, ageism, and ableism, operate as mutually reinforcing systems of inequality” and intersect with associated health risks, healthcare delivery, and health and well-being (Schulz et al., 2006). Intersectionality reflects on the power dynamics of knowledge production and reinforces reflexivity, various sources of “knowing” and knowledge, accountability, and transparency, and questions the researcher’s positioning, positivist paradigm, and universal assumptions. Power dynamics exist between professionals and patients as well as researchers and participants due to the social and institutional hierarchies that attribute success and value to the formalized knowledge obtained through education and academia as opposed to life experiences.

Intersectionality has not yet been studied as widely as the biomedical paradigm in health services research. The biomedical paradigm has largely restricted access to equitable and holistic healthcare because of the way that gender, race, and class are filtered through the medical system to generate hierarchies in which bodies and identities are classified as less worthy of healthcare. The positivist biomedical approach focuses on purely biological factors and categorizes healthiness as freedom from pain or disease. This model, widely supported and funded for health care policy, is assumed to be more authoritative and superior than other forms of research, such as feminist research; however, there are many limitations to the quantification and measurement of bodily changes and resulting health disparities, such as the biases in health care policy that result from the narrow scientific research designs to study these biological factors (Weber,

2006). Policy formation in Congress has focused on proving cause and effect in research studies, which isolates and excludes important factors, such as social and environmental influences, in the generation of these inequities (Weber, 2006). This results in underdiagnosis, lack of care and treatment, and increased death and burden among groups who are lower in this “scientifically” formed hierarchical social order, often placing blame for health disparities on individuals rather than structures that reflect power differentials, such as lack of access to health resources and these resources themselves (Anglin, 2006).

Biomedical and policy researchers often ask whether LGBTQ+ identities are relevant to addressing health concerns. Julia Fish argues that this question perpetuates an “illness-specific approach to health” that continues dependence on a biomedical approach to health (J. Fish, 2006). This dependence on the biological focus of the biomedical model rather than supplementation with self-identification and social forces reinforces “the notion that our identity is located only in relation to some aspects of our health” (J. Fish, 2006). The implication is that LGBTQ+ identities can somehow become detached from core identities, and, therefore, being a lesbian or gay man is only related to sexual or mental health problems (J. Fish, 2006). The lack of data available on remedying LGBTQ+ health disparities has resulted in little identification of LGBTQ+ health and social care needs (J. Fish, 2006). In response an intersectional approach for researchers relies on asking questions “about intersectionality [that] focus on meaningful constructs such as stress, prejudice, discrimination rather than relying on demographic questions alone” and that “tap the interdependence and mutuality of identities” (Bowleg, 2008). Furthermore, intersectional methodological approaches in HSR that reflect on distinctions between intersecting identities, positions, processes, policies, and practices may advance health

equity by improving researchers' ability to document inequities within intersectional groups and how power and privilege interact to shape health and healthcare delivery, thereby shifting our research paradigms to those more invested in social justice (G. R. Bauer, 2014).

Intersectionality's core tenets are social inequality, social context, social power, social justice, relationality, and complexity (Collins, 2019; Collins & Bilge, 2016a; Hancock, 2016; McCall, 2005). These core tenets are foundational aspects of intersectional approaches.

Intersectionality research continues to illuminate how social inequalities are the result of intersecting systems of oppression (Cho et al., 2013; Homan et al., 2021). Social context is an important aspect of an intersectional approach because it enables researchers to investigate "heterogeneity in the degree of structural forms of intersecting systems of oppression across U.S. states" and how "variations in intersectional social contexts...affect population health" (Choo & Ferree, 2010; Gkiouleka et al., 2018; Homan, 2021; Homan et al., 2021). With regard to social power, intersectionality prompts reflection about HSR's proximity to power in the creation of research and implementation and evaluation of health services. A focus on social justice is a critical and historical aspect of intersectional research. Relationality informs the core of intersectionality by "embrac[ing] a both/and analytical framework that shifts focus from seeing categories as oppositional, for example, the differences between race and gender, to examining their interconnections (Collins & Bilge, 2016b). Intersectionality is animated by complexity in multiple ways: it exposes the complexities of the social world while also using an array of methods (qualitative, quantitative), approaches to oppression (macro, meso, and micro) and forms of oppression (structural, cultural, interpersonal) to investigate inequalities within and

between groups (Choo & Ferree, 2010; Collins & Bilge, 2016a, 2020; Homan et al., 2021; McCall, 2005).

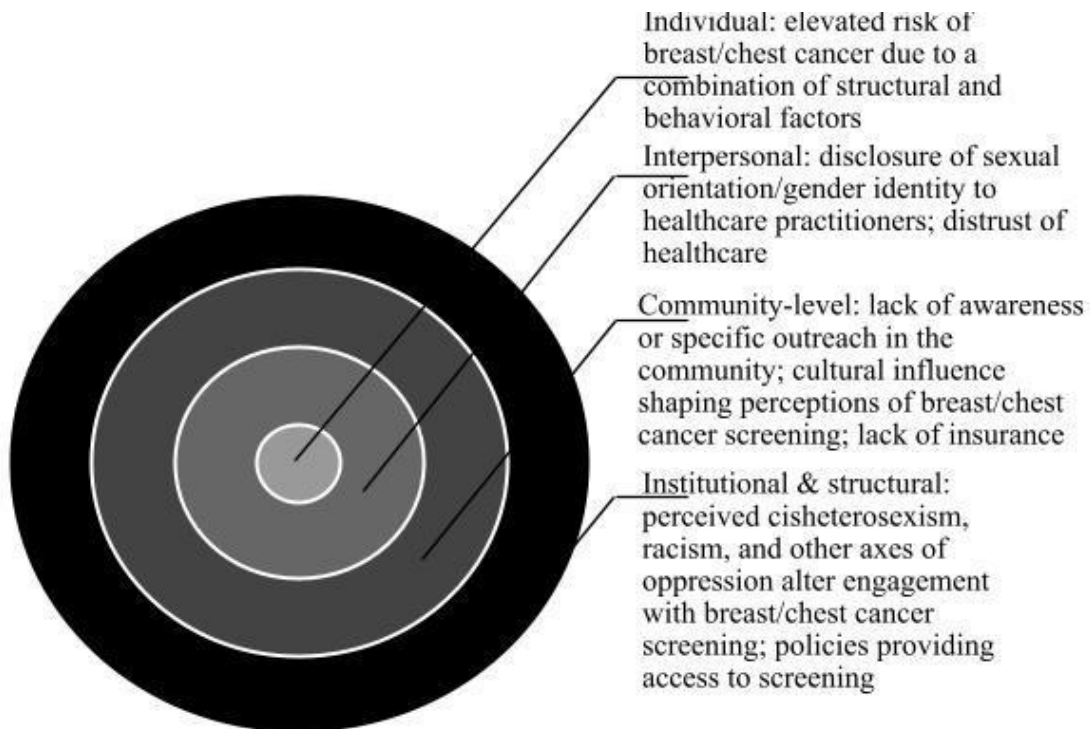
Quantitative intersectionality provides us with ways to apply these core tenets in HSR (G. R. Bauer & Scheim, 2019a, 2019b; McCall, 2005; Scheim & Bauer, 2019). Intra- and inter-categorical intersectional population health studies enable the measurement of both descriptive and causal mechanisms for structural influences on health outcomes. For example, intra-, inter-, and anti- categorical complexity are methodological approaches that enable the application of intersectionality's core tenets (McCall, 2005). Intercategorical complexity "requires that scholars provisionally adopt existing analytical categories to document relationships of inequality among social groups and changing configurations of inequality along multiple and conflicting dimensions" (McCall, 2005). Intracategorical complexity is similar to the inter-categorical approach in that it recognizes existing analytical categories while also being critical of them (McCall, 2005). This approach, however, focuses on within-group complexities, such as those living at the intersections of social groups. This dissertation uses both intra- and inter-categorical approaches to examine how social groups' mammogram usage are affected differentially by structural oppression.

### *Socio-ecological modeling*

Modeling of socio-ecological barriers (individual, intrapersonal, community, and institutional) to breast/chest cancer screening provide layers of theory necessary to understand dimensions of breast/chest cancer screening and opportunities for intervention (Figure 1). At the individual level, SGM people have an elevated risk of breast cancer due to behavioral factors (Agénor et al., 2020; Austin et al., 2013; Bazzi et al., 2015; Brown & Tracy, 2008; Case et al.,

2004; Ceres et al., 2018; Charkhchi et al., 2019; Clavelle et al., 2015; Cochran et al., 2001; Hart & Bowen, 2009; Heer et al., 2023; Herriges et al., 2022; Hutchinson et al., 2006; Lin et al., 2023; Meads & Moore, 2013; Solazzo et al., 2017; A. D. Williams et al., 2020; Zaritsky & Dibble, 2010). On the interpersonal level, barriers to screening include distrust of healthcare providers (Cochran et al., 2001; Katapodi et al., 2009; Lombardo et al., 2022). Furthermore, because SGM people may not be able to disclose their sexual orientation and/or gender identity to their healthcare practitioner(s) due to distrust and fear of discrimination, both patients and practitioners may lack full understanding of SGM people's heightened risk of breast/chest cancer (Boehmer et al., 2013; Case et al., 2004; Cathcart-Rake, 2018; Cochran & Mays, 2012; Dehart, 2008; Dibble et al., 2004; Hart & Bowen, 2009; Hutchinson et al., 2006; Zaritsky & Dibble, 2010). Beyond the healthcare system there may be lack of awareness or specific outreach at the community-level; within these communities there are cultural influences shaping perceptions of breast/chest cancer screening that may obscure the importance of breast/chest cancer detection. Lastly, cisheterosexism, racism, and other axes of oppression alter engagement with breast/chest cancer screening at the structural level (Malone et al., 2019; Poteat et al., 2021). While there are institutional policies providing access to screening and screening recommendations, these policies and recommendations are not specifically targeted toward SGM people, their heightened risk of breast cancer, or additional barriers they have to overcome to utilize healthcare services like breast/chest cancer screening. Given SGM people's disproportionate burden of breast cancer risks and mortality, socioecological modeling is essential for understanding the specific mechanisms that influence their decision-making and behaviors around breast/chest cancer screening.

Figure 1. Socioecological modeling of breast/chest cancer screening



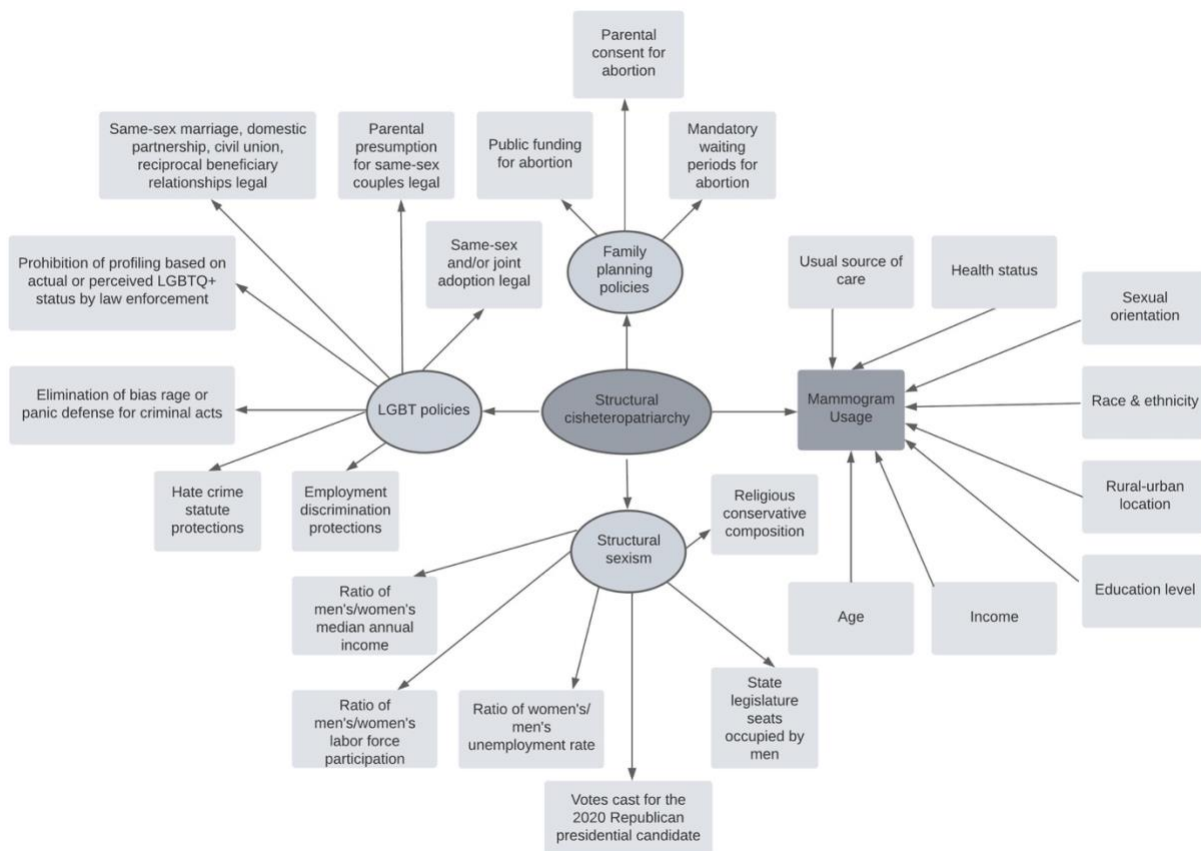
### Operationalization of Structural Oppression Measurements

This research operationalizes a structural cisheteropatriarchy measurement of structural oppression as the independent variable. I use a structural intersectionality approach, which “facilitates the conceptualization and measurement of intersecting systems of oppression” (Homan et al., 2021). Rather than focusing on one dimension of structural oppression, this research examines the intersecting effects of multiple forms of structural oppression together on mammogram usage. A structural intersectionality approach is responsive to multiple calls for refinement of how intersecting systems affect population health (Agénor, 2020; Gkiouleka et al., 2018; Green et al., 2017; Homan et al., 2021). Indeed, measurement of the intersections of structural forms of oppression is rare; most empirical studies have used social statuses, such as race, gender, and sexual orientation as proxies for racism, sexism, and homophobia (Homan et



al., 2021). Homan et al. (2021) propose that research using a structural intersectionality approach should answer at least two key questions: 1) “How do systems of oppression vary and relate to one another at a macro level?” and 2) “How do these structural inequalities jointly shape the health of various population groups defined by constellations of individual-level statuses (e.g. race, gender, class, sexuality, nativity, disability, etc.?” (Homan et al., 2021). This dissertation uses measurements of multiple intersecting forms of oppression to examine how these forms of oppression affect mammogram usage (Figure 2).

Figure 2. Conceptual model showing structural cisheteropatriarchy and sociodemographic and health-related characteristics and association with mammogram usage



## **Structural heteropatriarchy measurements**

Structural cisheteropatriarchy is a system of oppression that “reinforce[s] and reproduce[s] the dominance of heterosexual cisgender men” (Everett et al., 2022a). The concept of structural cisheteropatriarchy highlights how the oppression of minoritized sexual and gender communities is intertwined and codified into systems of regulation (Everett et al., 2022a). The development of the measure of structural cisheteropatriarchy includes state-level LGB-policies, family planning policies, and structural sexism indicators (Everett et al., 2022a). Family planning policies are included in the measure of structural cisheteropatriarchy because cisheteropatriarchy, which limits access to sexual and reproductive health services, is linked with constrained access to family planning services for people who have the capacity for pregnancy (Everett et al., 2022a; Homan, 2019). Family planning policies included in the measure of structural cisheteropatriarchy are indicators of access to sexual and reproductive health services as well as how restrictive the policy environment in a particular state is. Structural sexism is a concept that links political, social, and cultural systems together to characterize cisgender men’s systematic access to power and resources (Homan, 2019, 2021). This dissertation adopts a structural intersectionality approach that uses measurements of structural cisheteropatriarchy.

Data and Methods

### *Chapter 2*

#### Data

I used OVID MEDLINE to search and review LGBTQ+ health- related articles from the top five health services journals from the past five years (2017-2022) in order to describe current approaches to studying the LGBTQ+ population in HSR. I searched articles published on

LGBTQ+ health in the following journals: *Health Affairs*, *Health Services Research*, *Medical Care*, *Milbank Quarterly*, and the *Journal of Health Politics, Policy, and Law*. I conducted a literature review of sociological and empirical research to formulate how queer theory and intersectionality may be used to shift health services researchers' current approaches to studying LGBTQ+ populations.

### Methods

I categorized the articles from the review of the top health services journals according to three ways in which cisheteronormativity and cisheterosexism are upheld: 1) the conceptualization and measurement of gender, sex, and sexual orientation as binary, fixed, and often conflated categories; 2) the lack of grounding in sociological theoretical foundations in gender and sexual orientation contributes to the pathologization of LGBTQ+ people; and 3) the separation of gender and/or sexual orientation from other intersecting systems of advantage or disadvantage that shape health care experiences. I provide recommendations using the lenses of queer theory and intersectionality to prompt changes within health services research.

### *Chapter 3*

#### Data

This analysis used 2022 BRFSS data to examine sexual orientation differences in and racially and ethnically minoritized and rural-urban people's mammogram usage. BRFSS is a survey administered by the Centers for Disease Control and Prevention (CDC), which 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 was 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.

### Measures

#### **Mammogram usage**

I measured mammogram usage by responses from participants aged 40-74 years old to align with the breast cancer screening guidelines and assigned female at birth reporting their most recent mammogram to check for breast/chest cancer. The question about mammogram usage has two levels of response: 1) yes, received a mammogram within the past two years or 2) no, have not received a mammogram within the past two years.

#### **Sexual orientation**

I measured sexual orientation by self-reporting as lesbian or gay, bisexual, something else, or heterosexual and re-coded into a binary variable: sexually minoritized (lesbian or gay, bisexual, something else) and heterosexual.

#### **Race and ethnicity**

I captured racial and ethnic background by measuring race and ethnicity by self-report as 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.

### **Rurality**

This analysis used the National Center for Health Statistics Urban-Rural Classification Scheme for Counties, which was developed in 2013 to study the rural and urban residents' health (Ingram & Franco, 2014). Counties are grouped into six urbanization levels, four metropolitan and two nonmetropolitan, ranging from most urban to most rural. Survey weighted chi-squared tests were used to examine bivariate sexual orientation differences in mammogram usage among racially & ethnically minoritized and rural-urban participants.

### **Sociodemographic and health-related covariates**

Sociodemographic characteristics that are associated with health and health outcomes were 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).

### **Methods**

I used bivariate analysis, logistic regression, and predicted probabilities to examine mammogram usage and its relationship with sexual orientation, race and ethnicity, and rurality. I examined 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 used 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 were 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 were 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.

### **Likelihood of Receiving a Mammogram**

The likelihood of receiving a mammogram was assessed using quantitative intersectionality approaches. Specifically, differences in mammogram usage were measured intercategory and intracategory. The intercategory approach entails examining differences in mammogram usage across social groups, such as by race & ethnicity, sexual orientation, and geographic location; the intracategory approach involves examining differences in mammogram usage at the intersections of these social groups, such that I will be looking at differences within social groups.

## *Chapter 4*

### Data

Chapter 4 used 2022 BRFSS data to examine the relationship between structural cisheteropatriarchy and mammogram usage for those ages 50-74 years. This study used 2022 BRFSS data to examine mammogram usage across SOGI and other sociodemographic and health-related characteristics, including race and ethnicity, rurality, health insurance coverage, educational attainment, age, income, self-rated general health status, and length of time since last routine check-up.

### Measures

State-level 2022 data from Behavioral Risk Factor Surveillance System was used to create an index of whether states' policies are in accordance with composite measures of structural cisheteropatriarchy. More specifically, states in the dataset were categorized by whether they have policies and indicators that reflect structural cisheteropatriarchy. State-level data of BRFSS data enabled me to code a particular state as 0 or 1 based on whether it has a particular policy. I evaluated the relationship between this measure of structural oppression and mammogram usage. I conducted state-level estimates; in other words, states were indexed according to whether they have policies and indicators that reflect structural cisheteropatriarchy. My hypothesis was that states with policies and indicators that reflect structural cisheteropatriarchy will have decreased mammogram usage compared to states that do not reflect these social structures.

### **Structural Cisheteropatriarchy**

Structural cisheteropatriarchy references nineteen measures that are representative of three domains of heteropatriarchy: 1) LGBT-policy; 2) family planning policy; and 3) structural sexism (Everett et al., 2022a; Homan et al., 2021). The following structural heteropatriarchy measures are drawn from the heteropatriarchy scale developed by Everett et al. (2022) and Homan et al. (2021) (Table 1).

Table 1. Cisheteropatriarchy index

Measure and code (0/1)	Definition	Original/added measure	Source
<b>Lesbian, gay, bisexual, and transgender (LGBT)-friendly policies</b>			
Employment discrimination protection for sexual orientation (0 if policy in place/1 if policy not in place)	A state law that prohibits discrimination in private employment on the basis of sexual orientation.	Original	<a href="#">Human Rights Campaign State Equality Index Scorecards (2022); Movement Advancement Project (2022)</a>
Employment discrimination protection for gender identity (0 if policy in place/1 if policy not in place)	A state law that prohibits discrimination in private employment on the basis of gender identity.	Added	
Hate crime statute for sexual orientation (0 if policy in place/1 if policy not in place)	A state law that specifically includes sexual orientation in hate crimes protections.	Original	
Hate crime statute for gender identity (0 if policy in place/1 if policy not in place)	A state law that specifically includes gender identity in hate crime protections.	Added	
Elimination of bias rage or panic defense for criminal acts (0 if policy in place/1 if policy not in place)	A state law that prohibits the use of a defense that uses the victim's sexual orientation or gender identity to excuse or classify the defendant's criminal charge as a lesser charge.	Added	
Prohibiting profiling based on actual or perceived LGBTQ+ status by law enforcement (sexual orientation) (0 if policy in place/1 if policy not in place)	A state statute that prohibits law enforcement from targeting a person based on their actual or perceived sexual orientation without trustworthy information	Added	



	relevant to linking that person to a crime.		
Prohibiting profiling based on actual or perceived LGBTQ+ status by law enforcement (gender identity) (0 if policy in place/1 if policy not in place)	A state statute that prohibits law enforcement from targeting a person based on their actual or perceived gender identity without trustworthy information relevant to linking that person to a crime.	Added	
Parental presumption for same-sex couples (0 if policy in place/1 if policy not in place)	The state presumes that a parental relationship exists for both parents in a same-sex marriage with regard to children born of the marriage.	Added	
Same-sex marriage/domestic partnership/civil union/reciprocal benefits relationship (0 if policy in place/1 if policy not in place)	A state has a constitutional amendment, statute or both that permits same-sex marriage or other comprehensive relationship recognition, such as domestic partnerships or civil unions, as well as reciprocal beneficiary relationships to same- and different- sex couples.	Original	
Same-sex and/or joint partner adoption (0 if policy in place/1 if policy not in place)	A second parent of the same sex may petition to adopt their partner's children, regardless of whether they are in a legally recognized relationship.	Original	
<b>Family planning policies</b>			
No public funding for abortion (0 if policy not in place/1 if policy in place)	A state does not dedicate state-only funding to cover medically necessary abortion care for Medicaid recipients. Currently states are required to provide public funding through the state Medicaid program for abortion care necessitated by life endangerment, rape, or incest.	Original	<a href="#">Guttmacher Institute (2022); Center for Reproductive Rights (2022)</a>
Mandatory waiting periods and informed consent (0 if policy not in place/1 if policy in place)	A state has law(s) that require pregnant people to wait a specified amount of time between counseling and/or ultrasound testing and abortion care.	Original	

Parental consent for abortion (0 if policy not in place/1 if policy in place)	A state has law(s) that require providers or clinics to obtain parents' or legal guardians' consent to a minor's abortion.	Original	
<b>Structural sexism</b>			
<b>Economic:</b> Ratio of men's/women's median annual income (0 if ratio is less than or equal to national average/ 1 if ratio is greater than national average)	Here women's (or men's) median annual income refers to the income level cut-off earned by women (or men) where half of women (or men) in a given geographic area earn more and half of women (or men) earn less.	Original	<a href="#">American Community Survey estimates through the U.S. Census Bureau (2022)</a>
<b>Economic:</b> Ratio of men's/women's labor force participation (0 if ratio is less than or equal to national average/ 1 if ratio is greater than national average)	Labor force participation is a participation rate that represents the number of people in the labor force as a percentage of the civilian noninstitutional population within a given geographic area. The labor force includes all people age 16 and older who are classified as either employed or unemployed. The participation rate is the percentage of the population that is either working or actively looking for work.	Original	<a href="#">U.S. Department of Labor Women's Bureau Labor Force Participation Rate by Sex, State and County (2022)</a>
<b>Economic:</b> Ratio of women's/men's unemployment rate (0 if ratio is less than or equal to national average/ 1 if ratio is greater than national average)	The unemployment rate represents the number of unemployed people as a percentage of the labor force. A person is classified as unemployed if they do not have a job, have actively looked for work in the prior 4 weeks, and are currently available for work.	Original	<a href="#">U.S. Bureau of Labor Statistics Employment Status (2022)</a>
<b>Political:</b> % of votes cast for Republican presidential candidate in 2020 (0 if majority of state population voted for Democratic presidential candidate/ 1 if majority of state population voted for Republican presidential candidate)	This measure represents the percentage of votes given to the Republican presidential candidate in 2020, Donald Trump. A person may vote in a presidential election if they are 18 years or older and a United States citizen. Each state has its own additional requirements for who may vote.	Original	<a href="#">University of California, Santa Barbara American Presidency Project (2020)</a>

<p><b>Political:</b> % of state legislature seats occupied by men (0 if % of state legislature seats occupied by men is less than the national average/ 1 if % of state legislature seats occupied by men is greater than or equal to the national average)</p>	<p>This measure represents the percentage of state legislators who are men.</p>	<p>Original</p>	<p><a href="#">National Conference of State Legislatures Women in State Legislatures for 2022 (2022)</a></p>
<p><b>Cultural:</b> % of state population composed of religious conservatives (0 if % of state population composed of religious conservatives is less than the national average/ 1 if % of state population composed of religious conservatives is greater than or equal to the national average)</p>	<p>This measure represents the percentage of the state population who are religious conservatives. Religious conservatives may be defined as those who take a conservative approach to both religion and politics, and, in this study, include evangelical Protestants or Latter Day Saints.</p>	<p>Original</p>	<p><a href="#">Pew Research Center Religious Landscape Study (2014)</a></p>

**Mammogram usage**

Mammogram usage was measured by whether respondents assigned female at birth (AFAB) received a mammogram within the past two years. In order to align with breast/chest cancer screening guidelines, age is limited to those ages 50-74 years. The question about mammogram usage has two levels of response: 1) yes, received a mammogram within the past two years or 2) no, have not received a mammogram within the past two years.

**Sociodemographic and health-related control variables and covariates**

Control variables included sexual orientation, gender identity, race and ethnicity, and rurality.

**Sexual orientation**

I measured sexual orientation by male and female respondents self-reporting as lesbian or gay, bisexual, something else, or heterosexual. Those who identify as lesbian or gay, bisexual, or something else were grouped together as sexually minoritized.

### **Gender identity**

Respondents were asked whether they consider themselves to be transgender, with the options to respond “yes, transgender, male-to-female,” “yes, transgender, female-to-male,” “yes, transgender, gender nonconforming (GNC),” “No,” “Don’t know/Not Sure,” and “Refused.” To understand the experiences of transgender and cisgender respondents, those who responded “No” to the question were categorized as non-transgender/cisgender and those who responded “Yes” are categorized as transgender or GNC. Those who were categorized as sexual and/or gender minoritized were also grouped together in a separate variable to examine the impact of occupying a minoritized sexual orientation and/or gender identity (SOGI).

### **Race and ethnicity**

Race and ethnicity were categorized as non-Hispanic (NH) white, non-Hispanic Black, Non-Hispanic Asian, Hispanic, and Non-Hispanic other, which includes American Indian or Alaska Native (AIAN), non-Hispanic Native Hawaiian or other Pacific Islander, and non-Hispanic multi-racial.

### **Rurality**

Rurality was measured using the 2013 National Center for Health Statistics (NCHS) definitions that classify counties according to metropolitan and nonmetropolitan status (Ingram & Franco, 2014). Metropolitan areas were re-coded as urban and nonmetropolitan areas are re-coded as rural.

### **Sociodemographic and health-related covariates**

Sociodemographic characteristics that are known to have an influence on health and health outcomes were included in this analysis as covariates. These include health insurance

coverage, educational attainment (less than high school, high school, some college, college graduate), income (<\$15,000, \$15-24,000, \$25-34,000, \$35-49,000, \$50-99,000, \$100-199,00, \$200,000), age (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).

### Methods

I used bivariate analysis, logistic regression, and predicted probabilities to examine mammogram usage and its relationship with cisheteropatriarchy. I calculated descriptive statistics describing the cisheteropatriarchy scale and mammogram usage by sexual orientation, gender identity, race and ethnicity, rurality, and other sociodemographic and health-related covariates. I then used logistic regression models to measure the relationship between cisheteropatriarchy and mammogram usage, adjusting for other covariates. Predicted probabilities of receiving a mammogram by cisheteropatriarchal state environment were generated with other covariates held at their means.

### **Likelihood of Receiving a Mammogram**

The likelihood of receiving a mammogram was assessed using quantitative intersectionality approaches. Specifically, differences in mammogram usage were measured intercategory and intracategory. The intercategory approach entails examining differences in mammogram usage across social groups, such as by race & ethnicity, sexual orientation, gender identity and geographic location.

### Conclusion

This dissertation examined how structural cisheteropatriarchy influences mammogram usage. Chapter 2 integrated sociological theory and empirical research to address how cisheterosexism and cisheteronormativity are present in health services research and presents queer theory and intersectionality as interventions in health services researchers' toolkit of approaches to studying minoritized sexual and gender populations. Chapter 3 built on this model by examining inequities in mammogram screening for sexually minoritized people assigned female at birth. Chapter 4 leveraged a measure of structural cisheteropatriarchy to interrogate how mammogram usage for sexually and gender minoritized people assigned female at birth varies at the intersections of this form of structural oppression. Lastly, this dissertation used critical social theory, specifically queer theory and intersectionality, to shift approaches to research about health services affecting minoritized sexual and gender populations.

## Chapter 2. Queering and Intersectionalizing Health Services Research

For decades we have known that lesbian, gay, bisexual, transgender, queer, nonbinary and gender queer (LGBTQ+) people experience excess morbidity and mortality compared to their heterosexual and/or cisgender counterparts (Institute of Medicine, 1999, 2011). People who are LGBTQ+ often have difficulty accessing needed health services, receive lower quality of care and face bias and discrimination during patient-provider interactions (Baptiste-Roberts et al., 2017; J. Fish, 2006; Macapagal et al., 2016; Suen et al., 2022) Despite the call for more research to understand and address inequities in health and health care (Institute of Medicine, 2011) these inequities persist and may have even widened (Liu & Reczek, 2021; Valdiserri et al., 2019). At the same time, the United States is immersed in conversations in both public and policy spheres about gender and sexuality—from the effective end of the national right to abortion care to banning access to gender-affirming healthcare for youth. At the center of these conversations are shifting understandings of gender and sexuality.

This commentary calls for queering health services research in order to move the conversation forward in understanding and addressing the health needs of the LGBTQ+ population, who have historically been marginalized in health services research. Queering, as a verb, means to question taken-for-granted categories of gender, sex, and sexual orientation. Queering health services research also includes reconceptualizing methodology and practices in order to center people who have been most marginalized.

We reviewed five of the top health services journals from 2017-2022 in order to describe current approaches to studying the LGBTQ+ population. We reviewed articles (excluding letters) published on LGTBQ+ health in *Health Affairs*, *Health Services Research*, *Medical Care*,

*Milbank Quarterly*, and the *Journal of Health Politics, Policy, and Law*. Two reviewers (CAS, DM) coded articles based on the dimensions outlined in Table 1.

We argue that much of health services research upholds cisheteronormativity and cisheterosexism. Cisheterosexism privileges being cisgender and heterosexual as the cultural norm. Heteronormativity, a term coined in 1991 by Michael Warner, is the dominant system of cultural expectations for gender and sexual identity and practice. Health services research maintains these in at least three important ways: 1) the conceptualization and measurement of gender, sex, and sexual orientation as binary, fixed, and often conflated categories; 2) the lack of grounding in sociological theoretical foundations in gender and sexual orientation, which contributes to the pathologization of LGBTQ+ people; and 3) the separation of gender and/or sexual orientation from other intersecting systems of advantage or disadvantage that shape health care experiences. We provide recommendations using the lenses of queer theory and intersectionality to prompt changes within health services research.

#### Current approaches



Table 2. Approaches to gender and sexual orientation in major health services research journals

Journals	Categories		
	Binary and fixed conceptualization and measurement of gender, sex, and/or sexual orientation	Lack of grounding in sociological theoretical foundations of gender and sexual orientation	Separation of gender and/or sexual orientation from other intersecting systems of advantage or disadvantage
Health Affairs (16 articles)	14	15	15
Health Services Research (9 articles)	4	8	9
Medical Care (15 articles)	3	9	15
Milbank Quarterly (2 articles)	1	2	2
Journal of Health Politics, Policy, and Law (0 articles)	0	0	0
Total (42 articles)	22	34	41

*Conceptualization and measurement of gender, sex, and sexual orientation*

First, we examine the measurement and conceptualization of gender and sexual orientation. We argue that health services research upholds cisheteronormativity and cisheterosexism by often treating sexual orientation and gender as stagnant demographic characteristics rather than as fluid and dynamic social constructions. A key strength of one article from *Health Affairs* was the explicit articulation of the limitations of the use of binary gender and fixed sexual orientation categories: "the restriction of categorizing people into identity boxes may have left out people who have a preferred sex but are not exclusively straight or gay; furthermore, the use of the binary gender due to limitations of National Health Interview Survey (NHIS) data does not reflect the diversity of gender identities" (Hsieh & Ruther, 2017). Similarly, another article considers gender along a spectrum and explicitly named trans masculine, trans feminine, and non-binary people as important populations (Hughes et al., 2021). However, just over half of the 42 articles we review rely on binary and fixed conceptualizations

and measurements of gender and/or sexual orientation. The use of a binarized and fixed methodological approach limits health services researchers' ability to question how the social construction and medicalization of gender and sexuality influence research questions, interventions, and consequent healthcare delivery.

A few studies focus on the measurement of sexual orientation or sexually minoritized status. This is an important issue as measurement reflects understandings of what sexual orientation is conceptually. However, current research on measurement does not center persons in the LGBTQ+ community in knowledge production. Health services research currently uses an array of labels to capture dimensions of sexual orientation and gender that are not authentic to the LGBTQ+ communities—for example, sexual minority women or women who have sex with women, are terms used to describe lesbian, bisexual, and queer cisgender women. The mismatch between label options and the identities individuals claim contributes to further marginalization. It is necessary for researchers to simultaneously reflect on fluidity of language across time and acknowledge and use the current preferred terminology of communities themselves. The shifting nature of sexual orientation as a “multidimensional construct” and “presumed interchangeability of sexual orientation measures,” is of concern because many of the measures conflate sexual orientation with sexual practice and identity (G. Bauer & Jairam, 2008; Young & Meyer, 2005). As noted in several articles in *Medical Care*, sexual orientation does not necessarily reflect sexual behavior; further, sexual orientation and gender identity are not necessarily stable over time (Dichter & Ogden, 2019; Ruben et al., 2017). More work is needed to accurately capture the meanings and fluidity of sexual orientation, sexual practices, and sexual and gender identities.

*Theorizing gender and sexual orientation*

Secondly, we examine the application of theories of gender and sexual orientation. Despite awareness of gender and sexuality as socially constructed categories, they are often conflated and linked in ways that reproduce patriarchal cultural constructions. In the absence of theory of what gender and sexual orientation are, health services research risks implying that both are rooted in biology. Simply correlating LGBTQ+ status with a wide range of outcomes does little to illuminate the mechanisms through which gender or sexual orientation translate into differences in health or health care (Vance, 1991; Weeks, 2003, 2006). The gender binary, which depends on the man/woman dichotomy, naturalizes heterosexual reproduction as the primary and preferred relational model and neglects to normalize other genders and sexual orientations that are not focused on sexual reproduction. The automatic and routine presumption of heterosexuality through our language and writing reproduces heterosexist beliefs, attitudes, and practices that marginalize LGBTQ+ people within health services research.

We argue that the lack of theoretical grounding in research about gender and sexual orientation risks perpetuating the pathologization of LGBTQ+ people. Health services research often relies on medical models of gender and sexuality, thus reinforcing biological essentialism. In this view, gender and sexuality become depoliticized categories, and inequities in health and healthcare may become justified based on gender and sexuality. The alternative, the use of sociological theoretical foundations in gender and sexual orientation, provides health services research with contextual and structural explanations for health inequities. In our review, 34 of the 42 articles do not engage with theoretical foundations of gender and sexual orientation. Of those that engage theory, most rely on non-queer theoretical foundations. For example, most include minority stress theory as an explanation for gender- and sexual orientation-related health

inequities (Bi et al., 2019; Blosnich et al., 2021; Bukowski et al., 2017; Ferrucci et al., 2021; Fricke et al., 2019; Ruben et al., 2021; N. D. Williams & Fish, 2020). A few also point toward the influence of structural determinants, such as homophobia and transphobia, as important explanations for the existence of LGBTQ+ health inequities. Research on gender and sexuality as structural is necessary for ultimately eliminating inequities.

*Gender and sexual orientation's separation from other intersecting systems of advantage or disadvantage*

Finally, we examine the degree to which research accounted for heterogeneity within the LGBTQ+ population by examining the intersection of different statuses - for example the intersection of race and LGBTQ+ status, that is –racism and cisheterosexism. Examining policy helps us to see the structural determinants of health and health care that produce advantage or disadvantage. Yet few of the articles specifically focused on policy, and those that do mainly focus on either policy relevant to HIV or access to health insurance. In noting how HIV prevention efforts for young men who have sex with men mostly use individual behaviors as sites for intervention, Fujimoto et al. highlight the need for organizational perspectives in HIV prevention (Fujimoto et al., 2017). Only one of the articles focuses on broader transgender-related state policies that may protect or harm access to care for transgender persons. To capture the structural nature of gender and sexuality there is a need for more research on policies such as state religious exemption legislation, anti-transgender healthcare legislation, and adoption restrictions that reflect structural components of cis-patriarchy or heteronormativity.

Although twelve of the 42 articles articulate the need for intersectional analysis, few implement a full intersectional approach in their methods. Six articles in *Medical Care* clearly focus on the

intersections of identities as important in explaining LGBTQ+ health inequities (Bi et al., 2019; Blosnich et al., 2021; Bukowski et al., 2017; Ferrucci et al., 2021; Fricke et al., 2019; Ruben et al., 2021). However, few studies examine the mechanisms through which interlocking structural determinants, such as cisheterosexism and racism, shape health and health care experiences.

### Recommendations: Queer Theory and Intersectionality as Interventions in Health Services

#### Research

Queer theory and intersectionality frameworks are paradigmatic approaches that have the potential to improve how health services research and our healthcare system frame and care for LGBTQ+ communities. Queer theory has emerged as a critical social theory that offers health services research a foundation in which to challenge the cisheteronormativity ingrained in the field (Collins, 2019; Wiegman & Wilson, 2015). Intersectionality shifts the health services research field's framing of gender and sexuality by deconstructing the multiple systems of power and oppression in all institutions, including the healthcare system (Crenshaw, 1989). By expanding our usage of queer theory and intersectionality in our research, health services research has the potential to epistemologically shift its own framings of how queer individuals and queerness, terminology used to reclaim a derogatory term, are approached and engaged in healthcare and health-related research.

#### *Expanding the measurement of gender, sex, and sexual orientation*

How we, as health services researchers, conceptualize and operationalize gender and sexuality and the methods we use matter. Queer theory allows researchers to resist biological essentialism and challenges us to look at gender and sexuality as social structures that afford some groups more status, value, prestige, opportunities and resources than others - all of which

shape health and health care. Gender and sexuality, when viewed through a queer theoretical lens, are fluid and context dependent cultural constructions (Eliason & Schope, 2007; Goins & Pye, 2013). Queer methodology in health services research involves expanding current knowledge structures, engaging reflexivity, and practicing empirical approaches that center queerness, like that of queer reading, ethnography, and community-based participatory research (J. N. Fish & Russell, 2018; McCann, 2016; Sedgwick, 1993, 1997; Valocchi, 2005).

Queer theory highlights the importance of engaging queerness and those with who are LGBTQ+ as active participants in knowledge production about their own lives and communities. Possible mechanisms for gender and sexuality to be measured more dynamically over time in ways that enable health services researchers to detect meaningful differences across groups include refining queer methodological approaches discussed above. For example, one way to center transgender populations is by using the language of “nontransgender” when describing cisgender populations—such an articulation would center and normalize transgender populations as subjects in their stories by negating the centering of cisgender people. Where data is insufficient to accurately or comprehensively capture gender or sexuality, at minimum, the limitations should be noted.

A common practice that replicates cisheteronormativity and trivializes the lived experiences of LGBTQ+ people is the methodological use of a heterosexual comparison group, which implies these experiences are only important in the context of how they compare to the (socially constructed) norm. Rather, LGBTQ+ experiences with health services are worthy of our attention in and of themselves.

*Integrating sociological theoretical foundations of gender and sexual orientation in health services research*

Another importance of queer theory to health services research lies in its practical significance in connecting experiences of gender and sexuality with the healthcare system and health services to the communities harmed by cisheteronormativity and cisheterosexism within these contexts. While documenting differences between groups in health outcomes or services utilization is important, queer theory asks us to question the production of such knowledge. Research focused on the health services research workforce, such as that conducted by Chantarat and colleagues, is necessary and should be supported (Chantarat et al., 2022). Further, measuring how structurally oppressive institutional and cultural practices and policies affect healthcare service usage is a worthy directional aspiration for health services research. For example, researchers should prioritize examining the policies, practices and ideologies that represent the mechanisms through which interlocking systems of oppression, such as cisheterosexism and racism, influence health and health services utilization.

*Intersecting gender and sexual orientation with other systems of oppression in health services research*

Intersectionality, first articulated by feminist and queer scholars of color, arose as a way to authentically consider lived experiences without sacrificing any axes of identity in feminist collective movements for justice, which often erased the lived experiences of queer women, women of color, and queer women of color (Anzaldúa, 1987; Collins, 2019; Combahee River Collective, 1995; Crenshaw, 1989, 1990; hooks, 1981, 1984, 1989; Lorde, 1984; Moraga & Anzaldúa, 1983). Intersectionality's potential within health services research is also to examine

how multiple systems of power and oppression interact to produce health inequities. Intersectionality is a useful theoretical framework for public health research because it encompasses micro-level intersections reflected at the macro structural level (Bowleg, 2012). Health services research may employ queer and intersectional frameworks to locate points of growth within power structures rather than solely within the individual's behavior and identity. When attempting to conduct intersectional research, many researchers face constraints in terms of limited data availability and smaller sample sizes that limit the generalizability and power of their studies—this is a common challenge for quantitative researchers studying LGBTQ+ health. More data that incorporates the spectrum of genders and sexualities is absolutely necessary; yet we also need to further engage alternative methods, such as those methods described in this commentary, to more fully engage with queerness from a truly intersectional lens.

Biomedical and policy researchers often ask whether LGBTQ+ identities are relevant to addressing health concerns. Julie Fish argues that this question perpetuates an “illness-specific approach to health” and reinforces “the notion that our identity is located only in relation to some aspects of our health” (J. Fish, 2006). The implication is that LGB identities can somehow become detached from core identities, and, therefore, being a lesbian or gay man is only related to, for example, sexual or mental health problems (J. Fish, 2006). In response, an intersectional approach for researchers relies on asking questions “about intersectionality [that] focus on meaningful constructs such as stress, prejudice, discrimination rather than relying on demographic questions alone” and that “tap the interdependence and mutuality of identities” (Bowleg, 2008). Furthermore, intersectional methodological approaches in health services



research that reflect inequities within intersectional groups may shift our research paradigms to those more invested in social justice (G. R. Bauer, 2014).

An epistemological and methodological cultural shift is needed in health services research. We conclude with several suggestions for health services researchers. First, researchers should avoid treating gender, sex, and sexuality as static, inherent characteristics, the measurement of which is taken for granted. Instead, they should describe how gender, sex, and sexuality are measured in the research and discuss the limitations of such measurements. Second, researchers should reject the convention that the dominant group (e.g. cisgender men and/ or people who are heterosexual) needs to be included as the standard for comparison. Third, we should explicitly conceptualize and theorize the social construction of gender, sex, and sexuality in our research. Next, alongside adopting the terminology preferred by LGBTQ+ people, we should center and elevate LGBTQ+ people in the health services workforce, academic scholarship, and research practice. We should expect research about inequities in health and health care associated with gender, sex, and sexuality to involve and prioritize the voices of LGBTQ+ people in all stages of the research process. In order to take into account the heterogeneity of health and health care for LGBTQ+ people, we should investigate the impact of intersecting systems of oppression, such as racism. Lastly, we need to prioritize research that examines the structural mechanisms through which gender, sex, and sexuality result in inequities in health and health care, including a focus on broader social policy. These are just the beginning of changes in knowledge production that will shift how inequities in health and health care associated with gender, sex, and sexuality are understood and ultimately how they can be dismantled.

## **Chapter 3. Mammogram Screening Differences at the Intersection of Sexual Orientation, Race and Ethnicity, and Rurality**

### Introduction

Many breast cancer screening guidelines recommend mammogram screening as effective in the early detection of breast/chest<sup>10</sup> cancer for average risk women<sup>11</sup> 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; Gilbert et al., 2020; Heer et al., 2023; Herriges et al., 2022; Lee et al., 2020; Lin et al., 2023; Malone et al., 2019; Siegel et al., 2017; Solazzo et al., 2017; A. D. 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,

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<sup>10</sup> Breast/chest terminology will be used throughout this paper in order to reflect gender-neutral terminology (Goldberg et al., 2018; Mehta et al., 2023).

<sup>11</sup> 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.

2010). Breast/chest cancer incidence and mortality among SMW is understudied, though prior research suggests heightened mortality among SMW (Boehmer et al., 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<sup>12</sup> (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

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<sup>12</sup> 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).

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 & Jackson, 2009; Heller et al., 2018b; Henry et al., 2014; Nuño et al., 2012; Orwat et al., 2017b; 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 intercategory and intracategory complexity. Intercategory complexity entails using existing analytical categories, such as those of race and sexual orientation, to document relationships of inequality among social groups (McCall, 2005). Intracategory 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.<sup>13</sup> 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, 2000a). 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,

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<sup>13</sup> 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).

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 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

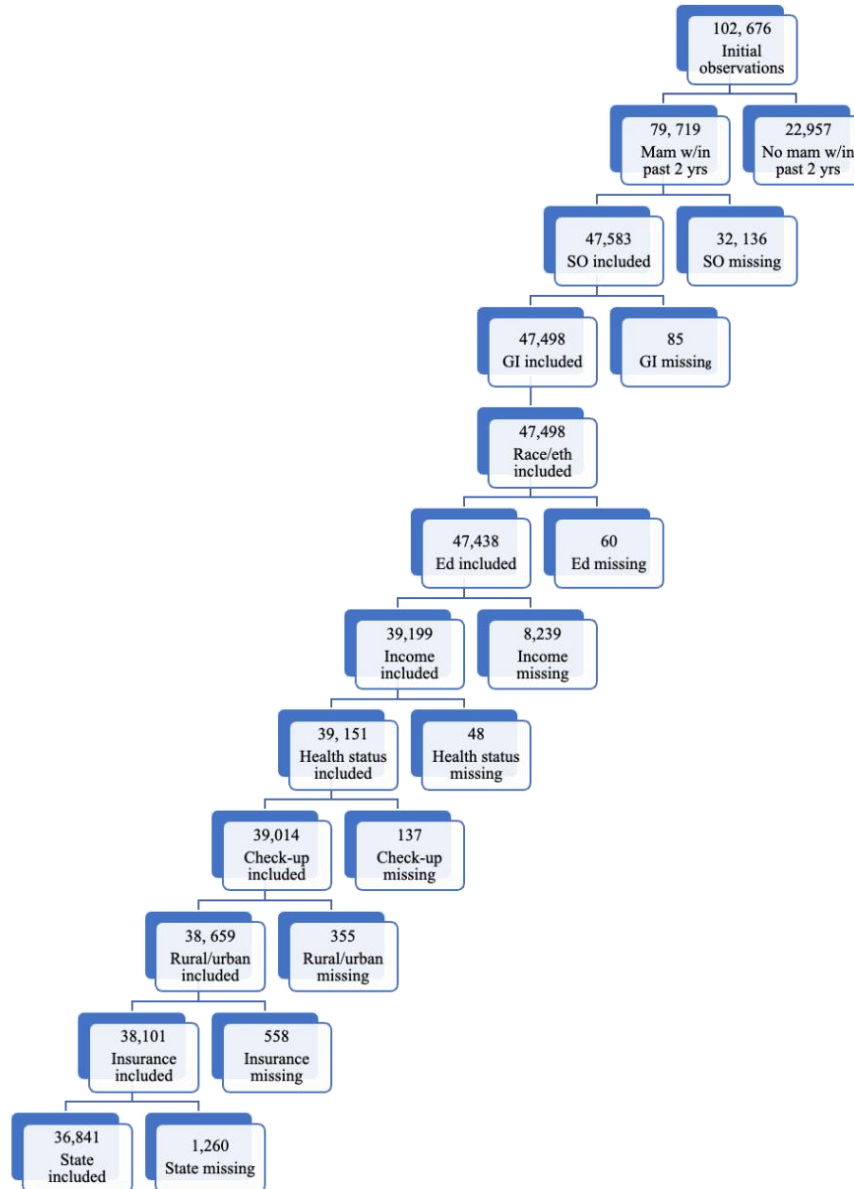


final sample includes those assigned female at birth aged 40-74 years of age. A flow chart showing inclusion and exclusion criteria is included in the appendix (Figure 3).

Figure 3. Flowchart 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.



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 3). 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.

Table 3. 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 (%)		
<b>Total</b>	63,517	3,209 (4.87%)	60,308 (95.13%)
<b>Race and ethnicity</b>			
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%)*
<b>Rurality</b>			
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%)
<b>Insurance coverage</b>			
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%)
<b>Education</b>			
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%)**
<b>Income</b>			
<\$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%***)
<b>Age</b>			
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%)*
<b>General health status</b>			
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%)*
<b>Length of time since last routine check-up</b>			
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%)*

Regarding overall mammogram usage, approximately 72% of the population reports receiving a mammogram within the past two years (Table 4). 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 5). 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.

Table 4. Reception of a mammogram within the past two years among respondents in the final sample

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

Table 5. 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 (%)		
<b>Total</b>	47,086 (71.99%)	2,095 (64.09%)*	44,991 (72.39%)*
<b>Race and ethnicity</b>			

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%)* **
<b>Rurality</b>			
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%)
<b>Insurance coverage</b>			
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%)* **
<b>Education</b>			
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%)* **
<b>Income</b>			
<\$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%)* **
<b>Age</b>			
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%)*
<b>General health status</b>			
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%)*
<b>Length of time since last routine check-up</b>			
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%)*

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 6). 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 ( $p < 0.05$ ).

Table 6. Odds of receiving a mammogram within the past two years

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
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	AOR	95% CI	AOR	95% CI	AOR	95% CI
SM	0.91	(0.76,1.08)				
<b>Characteristics</b>						
<b>Rurality (ref: urban)</b>						
Rural	1.02	(0.90,1.16)	1.34	(0.83,2.16)	1.01	(0.89,1.16)
<b>Race and ethnicity (ref: NH white)</b>						
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)
<b>Insurance coverage (ref: no insurance coverage)</b>						
Yes, coverage	2.15***	(1.58,2.93)	1.60	(0.82,3.13)	2.18***	(1.57,3.02)
<b>Education (ref: less than high school)</b>						
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)
<b>Age in years (ref: 40-49)</b>						
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)
<b>Income (ref: &lt;\$15,000)</b>						
\$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)
<b>General health status (ref: excellent)</b>						
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)
<b>Length of time since last routine check-up (ref: within the past year)</b>						
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)

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 7). 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 (Table 8, Figure 4). 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 8, Figure 5). 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 9, Figure 6). 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  $p < 0.001$ .

**Table 7. 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%
<b>Race and ethnicity</b>					
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 8. 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%
<b>Rurality</b>					
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%

Figure 4. 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

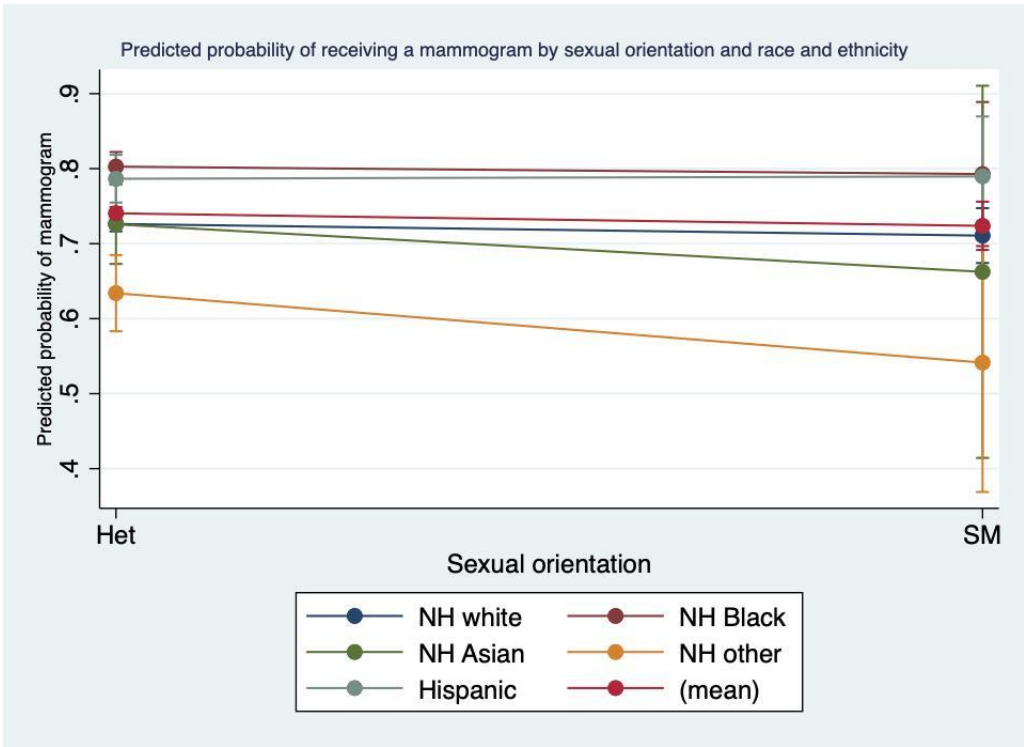


Figure 5. Predicted probability of mammogram usage within the past two years by sexual orientation and rurality  
 Key: SM=sexually minoritized, Het=heterosexual  
 Note: results significant at p<0.001

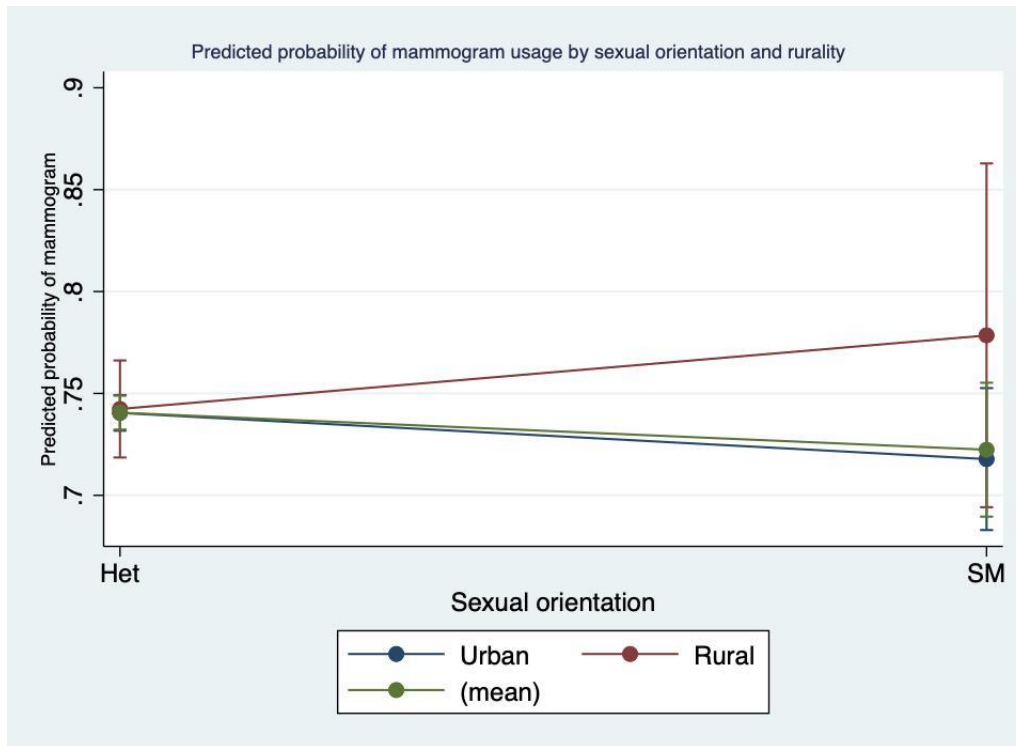


Table 9. Predicted probability of mammogram usage within the past two years by sexual orientation, race and ethnicity, and rurality

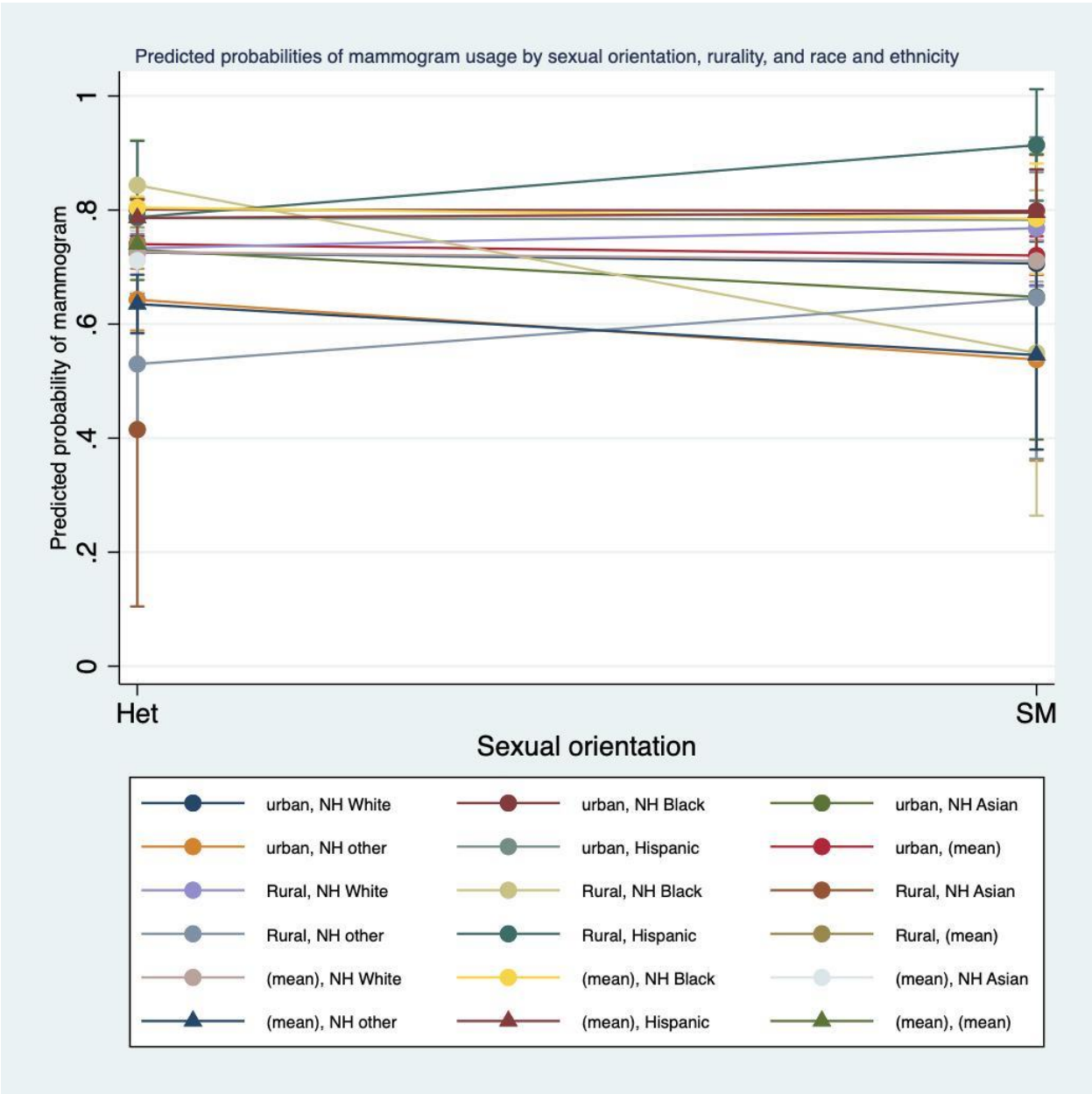
Note: Data are from the 2022 Behavioral Risk Factor Surveillance System data and include those aged 40-74 years and assigned female at birth. The differences between heterosexual and sexually minoritized people assigned female at birth in mammogram usage within the past two years are significant at  $p < 0.001$  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)	
<b>Rurality</b>					
Rural	Not estimable		71.70%	(0.69,0.74)	
Urban	70.25%	(0.67,0.73)	72.06%	(0.71,0.73)	1.81%
<b>Race and ethnicity</b>					
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%
<b>Race and ethnicity and rurality</b>					
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 6. 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 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 1 and 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 statuses 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 (G. 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 (G. 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”<sup>14</sup> 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 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.

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<sup>14</sup> “Straight-passing” is described as “both intentional and unconscious ways [people] conceal their sexual minority status” (p.4) (Anderson et al., 2023).



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 (A. D. 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 intercategory 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.

## **Chapter 4. Structural Cisheteropatriarchal State-Level Policies and Factors and Their Impact on Mammogram Screening Across Sexual Orientation and Gender Identity**

### Introduction

Recent research has examined the impact of state-level policies on health services usage and access for sexual and/or gender minoritized (SGM)<sup>15</sup> populations (Agénor et al., 2022; Carpenter et al., 2021; Du Bois et al., 2018; English et al., 2021; Everett & Agénor, 2023; Gleason et al., 2016; Goldenberg et al., 2020; Gonzales et al., 2022; Hatzenbuehler, 2014; Hatzenbuehler et al., 2012; Kail et al., 2015). State-level policies protective of sexual orientation and gender identity (SOGI), such as those legalizing same-sex marriage or instituting nondiscrimination, are among the structural factors that these scholars have identified as impactful on health equity among marginalized communities. As structural factors have been examined in the context of health services usage, access, and outcomes, structural measurements focused on particular facets of structural oppression have been developed. Namely, structural sexism, heterosexism, and heteropatriarchy are beginning to be examined in research spanning reproductive justice, maternal and child health, and preventive health services (Cross et al., 2022; Dore et al., 2024; Everett et al., 2022a; Homan, 2019, 2021; Homan & Burdette, 2021, 2021; Lane, 2019; Letiecq, 2024; Rapp et al., 2022). More specifically, in relation to structural sexism these researchers complicate the meaning of structural sexism in relation to health (Homan 2019, 2021) and its limitations with respect to health care access and quality among women (Rapp et

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<sup>15</sup> Sexual and gender minoritized communities include lesbian, gay, bisexual, asexual, intersex, transgender, gender non-binary, gender nonconforming, and queer people; SGM communities also include people who have same-sex attractions, behaviors, or relationships, such as men who have sex with men (MSM), women who have sex with women (WSW), and those who identify as not exclusively heterosexual/straight.

al., 2022), self-rated health among women who attend sexist religious institutions (Homan & Burdette, 2021), and use of preventive health services for women and men (Dore et al, 2024); additionally, these researchers expand our understandings of family and child outcomes by interlinking structural racism, white supremacy and heteropatriarchy (Cross et al., 2022; Letiecq, 2024) and reproductive justice (Lane, 2019) and birth outcomes (Everett et al., 2022a) in light of heteropatriarchy. In this study I build on this research by proposing a new measure of structural cisheteropatriarchy.<sup>16</sup>

Mammogram screening is a preventive health service understudied in relation to structural sexism, heterosexism, or heteropatriarchy measurements. Mammogram screening is generally recommended as effective in the early detection of breast/chest<sup>17</sup> cancer for average risk cisgender women<sup>18</sup> aged 40 to 74 years, though these guidelines continue to change (Curtis, 2023). There is little to no consensus on recommendations for breast/chest cancer screening guidelines for transgender and non-binary people (Santora, 2023). Current guidelines from the American College of Radiology (ACR) recommend mammograms for transgender and non-

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<sup>16</sup> “Cis” references “cisgender,” which is defined as those “who conform to the gender binary by interpreting their gender identity as congruent with the sex they were assigned by society” or at birth (Sumerau et al., 2016). The gender binary references “the social and biological classification of sex and gender into two distinct oppositional forms of masculine and feminine selfhood” (Sumerau et al., 2016). Cisheteropatriarchy is a system of oppression that “sustains a set of political, cultural, and [socio]economic systems that favor cisgender men and diminish access to power and resources among women” and minoritized sexual and gender people” (Cross et al., 2022).

<sup>17</sup> Breast/chest terminology will be used throughout this paper in order to reflect gender-neutral terminology (Goldberg et al., 2018; Mehta et al., 2023).

<sup>18</sup> 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.

binary people assigned male at birth (AMAB) who are 40 years and older of average risk with more than five years of hormone use (Lockhart & Kamaya, 2022). The ACR's guidelines for mammogram screening for transgender and non-binary people assigned female at birth (AFAB) are dependent on whether they have had gender-affirming top surgery (also known as chest masculinization surgery, it is the removal of a majority of the breast tissue) (Cortina, 2023; Lockhart & Kamaya, 2022). Given that cancer research has shown a higher prevalence of risk factors, incidence, and mortality for breast/chest cancer among SGM people compared to cisgender and/or heterosexual people, mammogram screening remains an important preventive service to study in relation to SGM health equity (Agénor et al., 2020; Austin et al., 2013; Bazzi et al., 2015; Brown & Tracy, 2008; Case et al., 2004; Ceres et al., 2018; Charkhchi et al., 2019; Cochran et al., 2001; Hart & Bowen, 2009; Heer et al., 2023; Herriges et al., 2022; Hutchinson et al., 2006; Lin et al., 2023; Solazzo et al., 2017; A. D. Williams et al., 2020; Zaritsky & Dibble, 2010). Furthermore, recent studies have mixed findings on whether SGM people are as likely to receive mammograms compared to cisgender and/or heterosexual people (Agénor et al., 2020; Austin et al., 2013; Barefoot et al., 2017; Bazzi et al., 2015; Bennett et al., 2012b; Ceres et al., 2018; Charkhchi et al., 2019; Cochran et al., 2001; Gilbert et al., 2020; Heer et al., 2023; Herriges et al., 2022; Lee et al., 2020; Lin et al., 2023; Malone et al., 2019; Siegel et al., 2017; Solazzo et al., 2017; A. D. Williams et al., 2020). In this study I develop a composite measure of structural cisheteropatriarchy, defined in more detail below, based on state-level sexual orientation- and gender identity- related policies and indicators and examine its impact on mammogram usage across SOGI as well as other important sociodemographic characteristics related to health services usage and access.



The current study relies on previously developed measurements of structural heteropatriarchy rooted in theoretical conceptualizations of structural sexism, heterosexism, and gender binarism. Scholars studying the relationship between structural sexism and health define structural sexism as a systematic and disproportionate allocation of power and resources generative of gender inequality in particular social contexts (Dore et al., 2024; Homan, 2019). Heterosexism similarly involves the systematic and disproportionate allocation of power and resources away from those who express same-sex desire or attraction, behavior, or identity, based on assumptions of heterosexual identity and ideology that heterosexuality is the only natural sexual orientation (Krieger, 2020). More recently, scholars have proposed that structural sexism and heterosexism are important determinants of health inequities (Everett et al., 2022b; Homan, 2019, 2021; Homan & Burdette, 2021; Krieger, 2020).

The structural cisheteropatriarchy measurement developed here also incorporates policies that are indicative of or counter to gender binarism, identified as another important determinant of population health (Krieger, 2020). Gender binarism is premised on the ideology that gender identities that do not conform to biological sex assigned at birth are unnatural, and similar to the oppressive mechanisms of structural sexism and heterosexism, gender binarism disproportionately distributes power and resources to those whose gender identity or expression aligns with their assigned sex at birth (non-transgender/cisgender) (Krieger, 2020). The measurement of structural cisheteropatriarchy in this study is thereby defined by these understandings of structural sexism, heterosexism, and gender binarism and posits that these systems act together to constrain access to power and resources to those who do not engender masculine, heterosexual, and/or cisgender norms.

The measurement of structural cisheteropatriarchy evaluated in this research was conceptualized through an intersectional lens. Intersectionality, first articulated by feminist and queer scholars of color (Anzaldúa, 1987; Bowleg, 2012; Collins, 2019; Combahee River Collective, 1995; Crenshaw, 1989, 1990; hooks, 1981, 1984, 1989; Lorde, 1984; Moraga & Anzaldúa, 1981), is a theoretical approach that describes how people inhabit multiple social positionalities (e.g. gender identity, sexual orientation, race) with individual experiences that are reflective of intersecting and interwoven systems of privilege and oppression (e.g. sexism, gender binarism, heterosexism, racism) (Bowleg, 2012).

An intersectional lens is useful for the measurement of structural cisheteropatriarchy for several reasons. First, an intersectional approach to a structural cisheteropatriarchy measurement enables the examination of how multiple systems reflective of privilege and oppression, specifically sexism, heterosexism, and gender binarism, are interlinked and entrenched in policy and state-level socioeconomic, legal, political, and cultural contexts. Second, with an understanding of the intertwined and reinforcing nature of systems of privilege and oppression, researchers are better equipped to identify, and thus alleviate, health inequities present at these intersections of structural cisheteropatriarchy among SGM communities. Lastly, this measurement of structural cisheteropatriarchy is explicitly focused on how structural forces, particularly the intersection of the macro-level systems listed above, may translate to impacting micro-level health outcomes, access, and usage, particularly mammogram screening. In this way, this research aims to advance the body of health services research quantifying intersectional approaches to healthcare for SGM communities across the breast cancer continuum.

In order to operationalize this measurement of structural cisheteropatriarchy I develop a composite index, or a collection of state-level sexual orientation- and gender identity- related policies and factors. This index builds on previous research on structural heteropatriarchy and sexism by refining state-level policies and factors highlighting three sexual orientation- and gender-related domains: LGBT-friendly policies, family planning-friendly policies, and structural sexism indicators of socioeconomic, legal, political, and cultural inequality. This structural cisheteropatriarchy composite measure reflects nineteen state-level dimensions of these three domains that were coded and linked to 2022 Behavioral Risk Factor Surveillance System (BRFSS) data to examine mammogram screening usage across SOGI and other sociodemographic and health-related characteristics. This research makes a novel contribution to the literature by being the first of its kind to name structural cisheteropatriarchy as a potential key determinant of care across the breast/chest cancer continuum. Further, it employs an intersectional lens to explore the association between multiple dimensions of structural cisheteropatriarchy and breast/chest cancer screening and quantify differences in mammogram screening across SOGI. This study represents an important progression in identifying structural mechanisms generative of cancer-related health inequities impacting SGM populations.

## Methods

### *Data and sample*

This study uses 2022 BRFSS data to examine mammogram usage across SOGI and other sociodemographic and health-related characteristics, including race and ethnicity, rurality, health insurance coverage, educational attainment, age, income, self-rated general health status, and length of time since last routine check-up. BRFSS data, obtained from the largest publicly

sourced survey administered by the Centers for Disease Control and Prevention (CDC), is useful for representing the U.S. non-institutionalized population aged 18 and over and their health-related behaviors, chronic health conditions, health care access, and use of preventive services. BRFSS surveys are conducted through both landline telephone- and cellular telephone- based methods. BRFSS also collects information on SOGI in an optional survey module. 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. The response rate for BRFSS in 2022 was 45.1%, represented as the median rate for all states and territories (District of Columbia, Puerto Rico, the US Virgin Islands, and Guam) (National Center for Chronic Disease Prevention and Health Promotion, Division of Population Health, 2023). The response rate was calculated using standards set by the American Association for Public Opinion Research (AAPOR), and the response rate for each state and territory is accessible through the "2022 Summary Data Quality Report" (National Center for Chronic Disease Prevention and Health Promotion, Division of Population Health, 2023). I linked 2022 BRFSS data with a state-level index of structural cisheteropatriarchy to assess the association between a composite measure of structural cisheteropatriarchy and mammogram usage.

### *Measures*

#### *Mammogram usage*

In this analysis, mammogram usage was measured by whether respondents received a mammogram within the past two years. Because mammogram usage in BRFSS is only collected for those assigned female at birth, mammogram usage cannot be measured in this analysis for respondents assigned male at birth, including respondents who are cisgender men and transgender male-to-female. This is a limitation that BRFSS and other national surveys should address in order for health service researchers and providers to have knowledge of how and whether these populations are receiving timely screening services for breast/chest cancer. Mammogram usage within the past two years was a binary variable coded as yes (“1”) or no (“0”; referent).

### *Structural cisheteropatriarchy*

This study’s measurement of structural cisheteropatriarchy is a composite index comprising nineteen dimensions of state-level LGBT-policies, family planning policies, and structural sexism indicators (Table 1). Previous research operationalizing a measure of structural heteropatriarchy focuses on LGB policies, family planning policies, and structural sexism (Everett et al., 2022b; Homan et al., 2021). The measures by Everett et al. (2022b) for LGB policies incorporate four sexual orientation-related state laws targeting unemployment discrimination protections, hate crime protections, same-sex marriage/civil unions/domestic partnerships/reciprocal beneficiary relationships, and same-sex adoption. The family planning measures proposed by Everett et al. (2022b) include state-level laws regarding public funding of abortion, mandatory waiting periods and informed consent for abortion, and parental consent for abortion as well as county-level estimates of abortion providers. Lastly, the structural sexism indicators proposed by Everett et al. (2022b) and Homan et al. (2021) hone in on county-level

ratios of men’s to women’s median income, labor force participation, and poverty, women’s to men’s unemployment rate, percentage of votes cast for the Republican president, percentage of state legislature seats occupied by men, and religious conservative denomination adherents (evangelical Protestant or Latter Day Saints) per capita. The structural cisheteropatriarchy composite measure in this study is adapted from the measures defined in the previous research described above.

Table 1. Cisheteropatriarchy index

Measure and code (0/1)	Definition	Original/added measure	Source
<b>Lesbian, gay, bisexual, and transgender (LGBT)-friendly policies</b>			
Employment discrimination protection for sexual orientation (0 if policy in place/1 if policy not in place)	A state law that prohibits discrimination in private employment on the basis of sexual orientation.	Original	<a href="#">Human Rights Campaign State Equality Index Scorecards (2022);</a> <a href="#">Movement Advancement Project (2022)</a>
Employment discrimination protection for gender identity (0 if policy in place/1 if policy not in place)	A state law that prohibits discrimination in private employment on the basis of gender identity.	Added	
Hate crime statute for sexual orientation (0 if policy in place/1 if policy not in place)	A state law that specifically includes sexual orientation in hate crimes protections.	Original	
Hate crime statute for gender identity (0 if policy in place/1 if policy not in place)	A state law that specifically includes gender identity in hate crime protections.	Added	
Elimination of bias rage or panic defense for criminal acts (0 if policy in place/1 if policy not in place)	A state law that prohibits the use of a defense that uses the victim’s sexual orientation or gender identity to excuse or classify the defendant’s criminal charge as a lesser charge.	Added	
Prohibiting profiling based on actual or perceived LGBTQ+ status by law	A state statute that prohibits law enforcement from targeting a	Added	

enforcement (sexual orientation) (0 if policy in place/1 if policy not in place)	person based on their actual or perceived sexual orientation without trustworthy information relevant to linking that person to a crime.		
Prohibiting profiling based on actual or perceived LGBTQ+ status by law enforcement (gender identity) (0 if policy in place/1 if policy not in place)	A state statute that prohibits law enforcement from targeting a person based on their actual or perceived gender identity without trustworthy information relevant to linking that person to a crime.	Added	
Parental presumption for same-sex couples (0 if policy in place/1 if policy not in place)	The state presumes that a parental relationship exists for both parents in a same-sex marriage with regard to children born of the marriage.	Added	
Same-sex marriage/domestic partnership/civil union/reciprocal benefits relationship (0 if policy in place/1 if policy not in place)	A state has a constitutional amendment, statute or both that permits same-sex marriage or other comprehensive relationship recognition, such as domestic partnerships or civil unions, as well as reciprocal beneficiary relationships to same- and different- sex couples.	Original	
Same-sex and/or joint partner adoption (0 if policy in place/1 if policy not in place)	A second parent of the same sex may petition to adopt their partner's children, regardless of whether they are in a legally recognized relationship.	Original	
<b>Family planning policies</b>			
No public funding for abortion (0 if policy not in place/1 if policy in place)	A state does not dedicate state-only funding to cover medically necessary abortion care for Medicaid recipients. Currently states are required to provide public funding through the state Medicaid program for abortion care necessitated by life endangerment, rape, or incest.	Original	<a href="#">Guttmacher Institute (2022)</a> ; <a href="#">Center for Reproductive Rights (2022)</a>
Mandatory waiting periods and informed consent (0 if policy not in place/1 if policy in place)	A state has law(s) that require pregnant people to wait a specified amount of time between counseling and/or ultrasound	Original	

	testing and abortion care.		
Parental consent for abortion (0 if policy not in place/1 if policy in place)	A state has law(s) that require providers or clinics to obtain parents' or legal guardians' consent to a minor's abortion.	Original	
<b>Structural sexism</b>			
<b>Economic:</b> Ratio of men's/women's median annual income (0 if ratio is less than or equal to national average/ 1 if ratio is greater than national average)	Here women's (or men's) median annual income refers to the income level cut-off earned by women (or men) where half of women (or men) in a given geographic area earn more and half of women (or men) earn less.	Original	<a href="#">American Community Survey estimates through the U.S. Census Bureau (2022)</a>
<b>Economic:</b> Ratio of men's/women's labor force participation (0 if ratio is less than or equal to national average/ 1 if ratio is greater than national average)	Labor force participation is a participation rate that represents the number of people in the labor force as a percentage of the civilian noninstitutional population within a given geographic area. The labor force includes all people age 16 and older who are classified as either employed or unemployed. The participation rate is the percentage of the population that is either working or actively looking for work.	Original	<a href="#">U.S. Department of Labor Women's Bureau Labor Force Participation Rate by Sex, State and County (2022)</a>
<b>Economic:</b> Ratio of women's/men's unemployment rate (0 if ratio is less than or equal to national average/ 1 if ratio is greater than national average)	The unemployment rate represents the number of unemployed people as a percentage of the labor force. A person is classified as unemployed if they do not have a job, have actively looked for work in the prior 4 weeks, and are currently available for work.	Original	<a href="#">U.S. Bureau of Labor Statistics Employment Status (2022)</a>
<b>Political:</b> % of votes cast for Republican presidential candidate in 2020 (0 if majority of state population voted for Democratic presidential candidate/ 1 if majority of state population voted for Republican presidential candidate)	This measure represents the percentage of votes given to the Republican presidential candidate in 2020, Donald Trump. A person may vote in a presidential election if they are 18 years or older and a United States citizen.	Original	<a href="#">University of California, Santa Barbara American Presidency Project (2020)</a>



	Each state has its own additional requirements for who may vote.		
<b>Political:</b> % of state legislature seats occupied by men (0 if % of state legislature seats occupied by men is less than the national average/ 1 if % of state legislature seats occupied by men is greater than or equal to the national average)	This measure represents the percentage of state legislators who are men.	Original	<a href="#">National Conference of State Legislatures Women in State Legislatures for 2022 (2022)</a>
<b>Cultural:</b> % of state population composed of religious conservatives (0 if % of state population composed of religious conservatives is less than the national average/ 1 if % of state population composed of religious conservatives is greater than or equal to the national average)	This measure represents the percentage of the state population who are religious conservatives. Religious conservatives may be defined as those who take a conservative approach to both religion and politics, and, in this study, include evangelical Protestants or Latter Day Saints.	Original	<a href="#">Pew Research Center Religious Landscape Study (2014)</a>

**LGBT-friendly policies** (Table 10): LGBT-friendly measures are included in the composite measure of structural cisheteropatriarchy to reflect the interconnectedness of SOGI to power and resources, or lack thereof, through policies. The additional measures adapted to this study’s structural cisheteropatriarchy measurements for LGBT-policies, described in more detail below, reflect state-level gender identity-related policies focused on unemployment discrimination protections and hate crime statute protections and sexual orientation and gender identity-related policies focused on elimination of bias rage or panic defense for criminal acts, prohibition of profiling on actual or perceived LGBTQ+ status by law enforcement, and parental presumption (Table 1). LGBT-policies encapsulated 10 state-level dimensions related to sexual orientation and gender identity: 1) unemployment discrimination protections for sexual orientation; 2) unemployment discrimination protections for gender identity; 3) hate crime

statute protections for sexual orientation; 4) hate crime statute protections for gender identity; 5) elimination of bias rage or panic defense for criminal acts; 6) prohibition of profiling based on actual or perceived LGBTQ+ status by law enforcement for sexual orientation; 7) prohibition of profiling based on actual or perceived LGBTQ+ status by law enforcement for gender identity; 8) parental presumption; 9) legalization of same-sex marriage, domestic partnership, civil union, or reciprocal beneficiary relationships; and 10) same-sex joint and/or second partner adoption. Each dimension is coded as 0 if the state has the affirmative of that policy and 1 if the state does not. These dimensions are summed up on a scale of 0-10 by state.

Table 10. LGBT policy dimensions of structural cisheteropatriarchal composite index performance by each state within the sample

Key:

UnemploySO=unemployment discrimination protections for sexual orientation

UnemployGI=unemployment discrimination protections for gender identity

HateSO=hate crime statute protections for sexual orientation

HateGI=hate crime statute protections for gender identity

BiasDef=elimination of bias rage or panic defense for criminal acts

ProfilingSO=prohibition of profiling based on actual or perceived LGBTQ+ status by law enforcement for sexual orientation

ProfilingGI=prohibition of profiling based on actual or perceived LGBTQ+ status by law enforcement for

Parent=parental presumption

Adoption=same-sex joint and/or second partner adoption

Relation=same-sex marriage, domestic partnership, civil union, or reciprocal beneficiary relationship

◇ Less cisheteropatriarchal than the average

◆ More cisheteropatriarchal than the average

	LGBT-friendly policy dimensions										
	Unemploy SO	Unemploy GI	Hate SO	Hate GI	BiasDef	Profiling SO	Profiling GI	Parent	Adoption	Relation	Total
State											
Alaska ◇	0	0	1	1	1	1	1	0	0	0	5
Colorado ◇	0	0	0	0	0	1	1	0	0	0	2

Connecticut ◇	0	0	0	0	0	0	1	0	0	1	2
Delaware ◇	0	0	0	0	1	1	1	0	0	0	3
Georgia ◆	1	0	0	0	1	1	1	1	1	0	6
Hawaii ◇	0	0	0	0	0	1	1	0	1	0	3
Illinois ◇	0	0	0	0	0	1	1	0	0	1	3
Indiana ◆	1	1	1	1	1	1	1	0	0	1	8
Kansas ◆	0	0	0	1	1	1	1	0	1	1	6
Louisiana ◆	1	1	0	1	1	1	1	0	0	1	7
Maryland ◇	0	0	0	0	1	1	1	1	0	0	4
Massachusetts ◇	0	0	0	0	1	1	1	1	0	0	4
Michigan ◆	1	1	1	1	1	1	1	0	1	0	8
Minnesota ◇	0	0	0	0	1	1	1	0	0	0	3
Missouri ◆	1	1	0	0	1	1	1	1	0	1	7
Montana ◆	1	1	1	1	1	1	1	1	0	1	9
Nevada ◇	0	0	0	0	0	1	1	0	0	0	2
New Mexico ◇	0	0	0	0	1	0	0	0	1	1	3
North Carolina ◆	1	1	1	1	1	1	1	0	1	0	8
North Dakota ◆	0	0	1	1	1	1	1	1	1	0	7
Ohio ◆	1	1	1	1	1	1	1	1	1	0	9
Pennsylvania ◆	0	0	1	1	1	1	1	1	0	1	7
Rhode Island	0	0	0	1	0	1	1	0	0	1	4

◇											
Texas ◆	0	0	0	1	1	1	1	0	1	1	6
Utah ◆	0	0	0	0	1	1	1	0	1	0	4
Vermont ◇	0	0	0	0	0	1	1	0	0	0	2
Virginia ◇	0	0	0	0	0	1	1	1	1	1	5
Washington ◇	0	0	0	0	0	1	1	1	1	0	4
West Virginia ◆	1	1	1	1	1	1	1	1	1	0	9
Wisconsin ◇	0	1	0	1	1	1	1	0	0	0	5

**Family planning policies (Table 11):** The family planning dimension in this iteration of structural cisheteropatriarchy uses state-level laws regarding abortion. Laws regarding abortion may constrain this reproductive health service are a reflection of cisheteropatriarchal systems. The family planning policies include 3 state-level dimensions: 1) public funding for abortion; 2) informed consent laws and unenforced/enforced waiting periods; and 3) unenforced/enforced parental consent laws. Each dimension is coded as 0 if the state has the affirmative of that policy and 1 if the state does not. These dimensions are summed up on a scale of 0-3 by state.

Table 11. Family planning policies dimensions of cisheteropatriarchal composite index performance by each state within the sample

Key:

Nopublic=no public funding for abortion

Waiting=informed consent laws & enforced/unenforced waiting period

Parental=parental consent laws & enforced/unenforced parental consent laws

◇ Less cisheteropatriarchal than the average

◆ More cisheteropatriarchal than the average

	<b>Family planning policy dimensions</b>
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	Nopublic	Waiting	Parental	Total
<b>State</b>				
Alaska ◇	0	1	1	2
Colorado ◇	1	0	1	2
Connecticut ◇	0	1	1	2
Delaware ◇	1	0	1	2
Georgia ◆	1	1	1	3
Hawaii ◇	0	0	0	0
Illinois ◇	0	0	0	0
Indiana ◆	1	1	1	3
Kansas ◆	1	1	1	3
Louisiana ◆	1	1	1	3
Maryland ◇	0	0	1	1
Massachusetts◇	0	0	1	1
Michigan ◆	1	1	1	3
Minnesota ◇	0	1	0	1
Missouri ◆	1	1	1	3
Montana ◆	0	0	1	1
Nevada ◇	1	1	1	3
New Mexico ◇	0	0	1	1
North Carolina ◆	1	1	1	3
North Dakota ◆	1	0	1	2
Ohio ◆	1	1	1	3
Pennsylvania ◆	1	1	1	3

Rhode Island ◇	0	1	1	2
Texas ◆	1	1	1	3
Utah ◆	1	1	1	3
Vermont ◇	0	0	0	0
Virginia ◇	1	0	1	2
Washington ◇	0	0	0	0
West Virginia ◆	1	1	1	3
Wisconsin ◇	1	1	1	3

**Structural sexism indicators (Table 12):** The structural sexism dimension is adapted from the structural sexism measures described in Homan et al. (2021) and Everett et al. (2022b) and examines all structural sexism indicators at the state level. Structural sexism is included in this composite measure of structural cisheteropatriarchy as a reflection of socioeconomic, legal, political, and cultural constraints on access to power and resources for women and SGM communities. Structural sexism includes 6 dimensions: 1) state-level ratio of men’s to women’s median income; 2) state-level ratio of men’s to women’s labor force participation; 3) state-level ratio of women’s to women’s unemployment rate; 4) percentage of votes in the state cast for the Republican presidential candidate in 2020; 5) percentage of state legislature seats occupied by men; and 6) percentage of the state population composed of religious conservatives (evangelical Protestant or Latter Day Saints). Each dimension is averaged across all states and dichotomized as “0” or “1”; those states whose values are below the average were categorized as “0” and those with values above the average are categorized as “1.” These dimensions are summed up on a scale of 0-6 by state.

Table 12. Structural sexism indicator dimensions of cisheteropatriarchal composite index performance by each state within the sample

Key:

Income=ratio of men’s to women’s median annual income

Labor=ratio of men’s to women’s labor force participation

Unemployment=ratio of women’s to men’s unemployment rate

Presidential=percentage of votes cast for the Republican presidential candidate in 2020

Legislature=percentage of state legislature seats occupied by men

Conservative=percentage of the state population composed of religious conservatives

◇ Less cisheteropatriarchal than the average

◆ More cisheteropatriarchal than the average

	Structural sexism indicator dimensions						
	Income	Labor	Unemployment	Presidential	Legislature	Conservative	Total
State							
Alaska ◇	0	0	0	1	0	0	1
Colorado ◇	0	1	0	0	0	0	1
Connecticut ◇	0	1	0	0	0	0	1
Delaware ◇	0	0	0	0	0	0	0
Georgia ◆	0	1	1	0	0	1	3
Hawaii ◇	0	1	1	0	0	1	3
Illinois ◇	1	1	0	0	0	1	3
Indiana ◆	0	1	1	1	1	1	5
Kansas ◆	0	1	1	1	1	1	5
Louisiana ◆	1	1	0	1	1	1	5
Maryland ◇	0	1	1	0	0	0	2
Massachusetts◇	0	0	0	0	1	0	1
Michigan ◆	1	1	1	0	0	0	3
Minnesota ◇	1	0	0	0	0	0	1

Missouri ♦	0	1	1	1	1	1	5
Montana ♦	0	0	0	1	1	1	3
Nevada ◇	0	1	1	0	0	1	3
New Mexico ◇	0	1	0	0	0	1	2
North Carolina ♦	0	1	1	1	1	0	4
North Dakota ♦	1	1	1	1	1	1	6
Ohio ♦	0	1	1	1	1	1	5
Pennsylvania ♦	0	1	0	0	1	0	2
Rhode Island ◇	0	0	0	0	0	1	1
Texas ♦	0	1	0	1	1	1	4
Utah ♦	1	1	1	1	1	1	6
Vermont ◇	0	0	0	0	0	0	0
Virginia ◇	1	0	1	0	1	0	3
Washington ◇	0	1	0	0	0	0	1
West Virginia ♦	1	1	0	1	1	0	4
Wisconsin ◇	0	1	0	0	1	0	2

To generate the composite index of structural cisheteropatriarchy, shown in more detail in Table 5, all dimensions are dichotomized as “0” or “1” then summed across each state. In order to dichotomize nine LGBT-friendly policy dimensions for each state, a state is labeled as “0” if the policy was in place and “1” if the policy was not in place in 2022. For the three family planning policies, dimensions are dichotomized as “0” if the policy was not in place and “1” if the policy was in place in 2022. The three economic dimensions of the structural sexism indicators include the ratio of men’s to women’s median annual income, ratio of men’s to



women's labor force participation, and ratio of women's to men's unemployment rate, which are dichotomized as "0" if the ratio is less than or equal to the national average and "1" if the ratio is greater than the national average in 2022. There are two political dimensions of the structural sexism indicators, the first of which is the percentage of votes cast for the Republican presidential candidate in 2020; this dimension was dichotomized as "0" if the majority of the state population voted for the Democratic presidential candidate and "1" if the majority of the state population voted for the Republican presidential candidate. The second political dimension of the structural sexism indicators is the percentage of state legislature seats occupied by men; this dimension is dichotomized as "0" if the percentage of state legislature seats occupied by men is less than the national average or "1" if the percentage of the state legislature seats occupied by men is greater than or equal to the national average in 2022. Lastly, the cultural dimension of the structural sexism indicators is the percentage of the state population composed of religious conservatives, and this dimension was dichotomized as "0" if the percentage of the state population composed of religious conservatives is less than the national average and "1" if the percentage of the state population composed of religious conservatives is greater than or equal to the national average in 2014. The final score for each state was then averaged across all states in the sample (n=30). States that had a score below the average were coded as 0 (less cisheteropatriarchal than the average), and states that had a score above the average were coded as 1 (more cisheteropatriarchal than the average). The full value of each state on the index is available in Table 13. States were dichotomized as less or more cisheteropatriarchal than the average rather than left at their full value on the index in order to generate an adequate sample size such that one state, which may be an outlier, could not significantly impact the overall trend;

rather, the dichotomization presents an opportunity to examine how states that have similar cisheteropatriarchal sociocultural environments may perform with regard to mammogram usage.

Table 13. LGBT-friendly policies, family planning policies, and structural sexism indicators contribution to composite structural cisheteropatriarchy index performance by each state within the sample

Key:

◇ Less cisheteropatriarchal than the average

◆ More cisheteropatriarchal than the average

	Composite structural cisheteropatriarchy index			
	LGBT-friendly policies (10)	Family planning policies (3)	Structural sexism indicators (6)	Total (19)
State				
Alaska ◇	5	2	1	8
Colorado ◇	2	2	1	5
Connecticut ◇	2	2	1	5
Delaware ◇	3	2	0	5
Georgia ◆	6	3	3	12
Hawaii ◇	3	0	3	6
Illinois ◇	3	0	3	6
Indiana ◆	8	3	5	16
Kansas ◆	6	3	5	14
Louisiana ◆	7	3	5	15
Maryland ◇	4	1	2	7
Massachusetts◇	4	1	1	6
Michigan ◆	8	3	3	14
Minnesota ◇	3	1	1	5
Missouri ◆	7	3	5	15

Montana ♦	9	1	3	13
Nevada ◇	2	3	3	8
New Mexico ◇	3	1	2	6
North Carolina ♦	8	3	4	15
North Dakota ♦	7	2	6	15
Ohio ♦	9	3	5	17
Pennsylvania ♦	7	3	2	12
Rhode Island ◇	4	2	1	7
Texas ♦	6	3	4	13
Utah ♦	4	3	6	13
Vermont ◇	2	0	0	2
Virginia ◇	5	2	3	10
Washington ◇	4	0	1	5
West Virginia ♦	9	3	4	16
Wisconsin ◇	5	3	2	10

*Sociodemographic and health-related control variables and covariates*

Control variables include sexual orientation, gender identity, race and ethnicity, and rurality. BRFSS collects data on sexual orientation by asking about sexual identity. Sexual orientation is measured by male and female respondents self-reporting as lesbian or gay, bisexual, something else, or heterosexual. In order to gain a better understanding of the impact of sexually minoritized positionality on mammogram usage, those who identify as lesbian or gay, bisexual, or something else are grouped together. With regard to respondents’ gender identity,

respondents are then asked whether they consider themselves to be transgender, with the options to respond “yes, transgender, male-to-female,” “yes, transgender, female-to-male,” “yes, transgender, gender nonconforming (GNC),” “No,” “Don’t know/Not Sure,” and “Refused.” For the purpose of understanding the experiences of transgender and cisgender respondents, those who responded “No” to the question are categorized as non-transgender/cisgender and those who responded “Yes” are categorized as transgender or GNC. Those who were categorized as sexual and/or gender minoritized are also grouped together in a separate variable to examine the impact of occupying a minoritized sexual orientation and/or gender identity (SOGI). Race and ethnicity are measured by an imputed 5-level variable that categorized respondents as non-Hispanic (NH) white, non-Hispanic Black, Non-Hispanic Asian, Hispanic, and Non-Hispanic other, which includes American Indian or Alaska Native (AIAN), non-Hispanic Native Hawaiian or other Pacific Islander, and non-Hispanic multi-racial. Rurality is measured using the 2013 National Center for Health Statistics (NCHS) definitions that classify counties according to metropolitan and nonmetropolitan status (Ingram & Franco, 2014). Metropolitan areas are re-coded as urban and nonmetropolitan areas are re-coded as rural. Lastly, sociodemographic characteristics that are known to have an influence on health and health outcomes are included in this analysis as covariates. These include health insurance coverage, educational attainment (less than high school, high school, some college, college graduate), income (<\$15,000, \$15-24,000, \$25-34,000, \$35-49,000, \$50-99,000, \$100-199,00, \$200,000), age (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). The

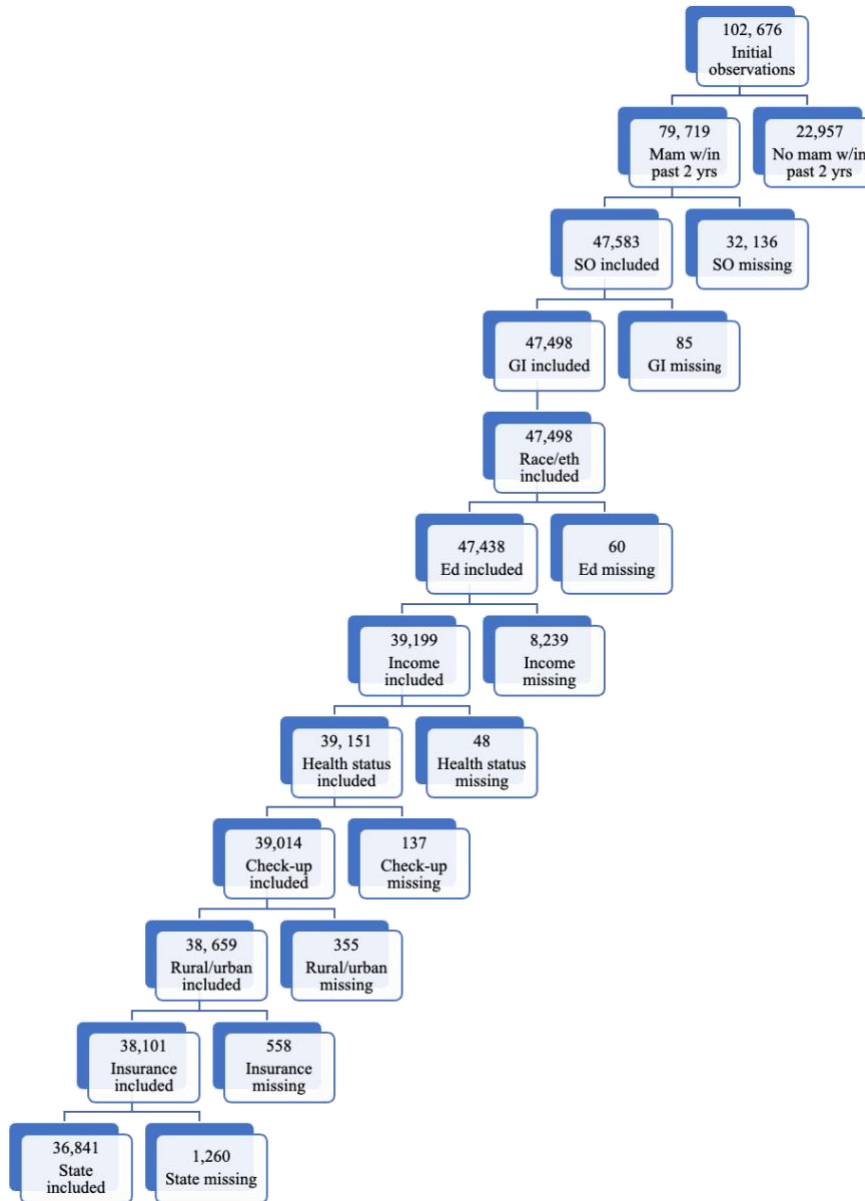
full sample (n=36,841) includes respondents aged 50-74 years to align with breast/chest cancer screening guidelines (see Figure 7 for flowchart of final sample).

Figure 7. Flowchart showing the final sample population

Key: Mam=mammogram; SO=sexual orientation; GI=gender identity; 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 50-74 years and assigned female at birth.



Analysis

In order to contextualize my results, I compare mammogram usage in 2017-2019 to 2020-2022 for states within my sample. I then calculate descriptive statistics for the total sample. These descriptive statistics describe the mean value or percentage on the cisheteropatriarchy scale and the measures that compose the cisheteropatriarchy scale (LGBT-friendly policies, abortion-friendly policies, and structural sexism indicators). These descriptive statistics also describe the average composition of all states included in the sample by mammogram usage within the past two years, sexual orientation, gender identity, and additional covariates, including rurality, race and ethnicity, health insurance coverage, educational attainment, age, income, self-rated general health status, and length of time since last routine check-up. Next, I examine bivariate associations between mammogram usage within the past two years and SOGI by sociodemographic characteristics listed above across all states. Bivariate associations between mammogram usage within the past two years and SOGI are also examined by individual states included in the sample (n=30). These states are then dichotomized into states that had more cisheteropatriarchal policies than the average (n=14) and less cisheteropatriarchal policies than the average (n=16). Then I examine bivariate associations between mammogram usage within the past two years and SOGI and covariates separately by states that had more cisheteropatriarchal policies and less cisheteropatriarchal policies than the average. I use logistic regression to estimate the relationship between cisheteropatriarchal policies and mammogram usage, with particular attention to SOGI positionality. Lastly, I calculate predicted probabilities of receiving a mammogram across cisheteropatriarchal environments using the margins command in Stata and holding all covariates at their means. All analyses were conducted with Stata v. 16 using BRFSS survey weights. This study was exempted from review by the

University of Minnesota Institutional Review Board because it uses secondary data analysis of publicly available de-identified data.

## Results

### *Mammogram usage by cisheteropatriarchy index and sociodemographic characteristics*

First, I examine how mammogram usage may have shifted pre-COVID-19 pandemic and Trump presidency years (2016-2020). Figure 8 shows mammogram usage within the past two years by state within the 2022 BRFSS sample. A majority of states in this sample (n=24) saw increased mammogram usage between 2020-2022 compared to 2017-2019 (National Cancer Institute, 2024). An equal number of the states are considered less cisheteropatriarchal environments than average (Alaska, Connecticut, Delaware, Hawaii, Maryland, Massachusetts, Minnesota, Nevada, Rhode Island, Virginia, Washington, and Wisconsin) and more cisheteropatriarchal environments than average (Indiana, Kansas, Louisiana, Michigan, Missouri, Montana, North Carolina, North Dakota, Ohio, Pennsylvania, Texas, and West Virginia). The less cisheteropatriarchal states that have higher rates of mammogram usage between 2017-2019 compared to 2020-2022 are Colorado, Illinois, New Mexico, and Vermont, while the more cisheteropatriarchal states that have higher rates of mammogram usage between 2017-2019 compared to 2020-2022 are Georgia and Utah (Table 14). Between 2017-2019 the average rate of mammogram usage for less cisheteropatriarchal states was 75.16% compared to 74.81% for more cisheteropatriarchal states; however, between 2020-2022 the average rate of mammogram usage for less cisheteropatriarchal states was 77.56% compared to 77.04% for more cisheteropatriarchal states. Thus, while mammogram rates have increased overall for all states included in the sample, less cisheteropatriarchal states saw a 2.4% increase in mammogram

usage within the past two years compared to a 2.23% increase across more cisheteropatriarchal states.

Figure 8. Mammogram usage within the past two years by state within the 2022 BRFSS sample

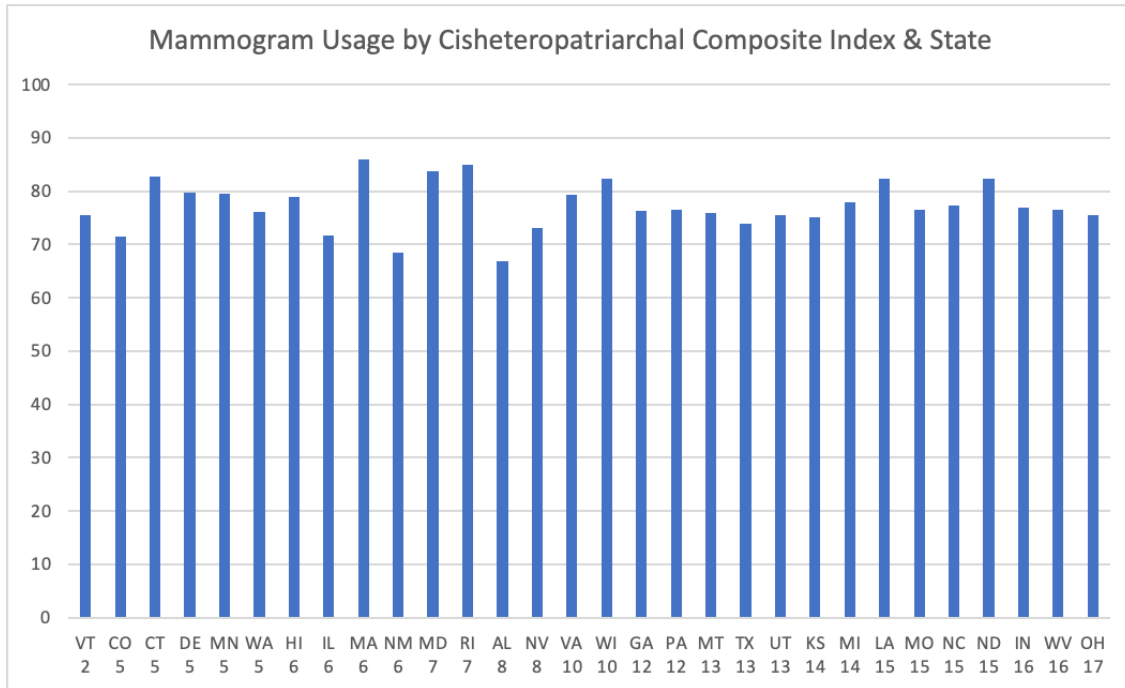


Table 14. Mammogram usage within the past two years for those 50-74 years of age by state from 2017-2019

Key: CI=confidence interval

◇ Less cisheteropatriarchal than the average

◆ More cisheteropatriarchal than the average

State	% who received a mammogram	CI
Alaska◇	64.2%	(58.4,70.1)
Colorado◇	74.5%	(70.1,78.8)
Connecticut◇	76.9%	(72.0,81.7)
Delaware◇	77.7%	(72.9,82.3)
Georgia◆	77.1%	(73.8,80.4)
Hawaii◇	78.4%	(73.3,83.3)



Illinois◇	75.0%	(71.0,78.9)
Indiana◆	71.4%	(66.6,76.0)
Kansas◆	71.3%	(66.2,76.3)
Louisiana◆	76.5%	(71.9,80.9)
Maryland◇	76.5%	(72.2,80.8)
Massachusetts◇	79.1%	(75.1,83.0)
Michigan◆	75.8%	(72.0,79.6)
Minnesota◇	75.9%	(71.4,80.5)
Missouri◆	75.9%	(71.2,80.4)
Montana◆	75.0%	(70.4,79.4)
Nevada◇	71.7%	(67.0,76.2)
New Mexico◇	68.6%	(63.7,73.4)
North Carolina◆	77.2%	(74.0,80.5)
North Dakota◆	75.6%	(69.6,81.4)
Ohio◆	74.0%	(70.3,77.6)
Pennsylvania◆	76.2%	(72.7,79.6)
Rhode Island◇	80.1%	(74.8,85.3)
Texas◆	71.3%	(67.8,74.7)
Utah◆	77.2%	(72.3,81.9)
Vermont◇	78.6%	(72.7,84.2)
Virginia◇	75.9%	(71.3,80.3)
Washington◇	72.1%	(68.3,75.9)
West Virginia◆	72.8%	(66.9,78.7)
Wisconsin◇	77.3%	(74.4,80.2)

Next, I describe state-level cisheteropatriarchal characteristics of the sample in Table 15. The mean value on the cisheteropatriarchy index is 10.91 for all states within the sample. The mean value for LGBT-friendly policies is 5.64 on a scale of 0-10. A majority of respondents who received a mammogram within the past two years reside in states with employment discrimination protections for sexual orientation (64.81%) and gender identity (66.76%), hate crime protections for sexual orientation (68.40%), legal same-sex marriage/unions, etc. (51.45%), and parental presumption (58.05%). It is less common for respondents who received a mammogram within the past two years to live in states with hate crime protections for gender identity (47.61%), legal same-sex/joint second partner adoption (49.13%), elimination of bias rage or panic defense for criminal acts (24.69%), and prohibition of profiling by law enforcement based on actual or perceived sexual orientation (3.40%) or gender identity (1.25%). The mean value for abortion-friendly policies is 2.23 on a scale of 0-3. Fewer mammograms occur in states with public funding for abortion (29.40%), no informed consent/mandatory waiting period (31.65%), and no parental informed consent/mandatory waiting period (15.84%). The structural sexism indicators mean value is 3.04 on a scale of 0-6.

Table 15. Descriptive statistics showing state-level cisheteropatriarchal characteristics among those who received a mammogram within the past two years

Key: M=mean; %= percent; SE=standard error

Characteristics	Total	
	M/%	SE
<b>Cisheteropatriarchy scale (overall 0-19)</b>	<b>10.91</b>	<b>0.02</b>
<b>LGBT-friendly policies (0-10)</b>	<b>5.64</b>	<b>0.01</b>
Employment discrimination protections for sexual orientation	64.81%	
Employment discrimination protections for gender identity	66.76%	

Hate crime protections for sexual orientation	68.40%	
Hate crime protections for gender identity	47.61%	
Same-sex marriage/union/etc. Relationships legal	52.18%	
Same-sex/ joint partner adoption legal	49.13%	
Elimination of bias rage or panic defense for criminal acts	24.69%	
Prohibiting profiling based on actual or perceived LGBTQ+ status by law enforcement (sexual orientation)	3.40%	
Prohibiting profiling based on actual or perceived LGBTQ+ status by law enforcement (gender identity)	1.25%	
Parental presumption	58.05%	
<b>Abortion-friendly policies (0-3)</b>	<b>2.23</b>	<b>0.01</b>
No public funding for abortion	70.60%	
No informed consent/mandatory waiting period	31.65%	
No parental informed consent/mandatory waiting period	15.84%	
<b>Structural sexism indicators (0-6)</b>	<b>3.04</b>	<b>0.01</b>
Ratio of men's/women's median income	0.26	0.00
Ratio of men's/women's labor force participation	0.85	0.00
Ratio of women's/men's unemployment rate	0.45	0.00
% of state legislature seats occupied by men	0.59	0.00
% of votes cast for Republican president in 2020	0.40	0.00
% of state population composed of religious conservatives	0.49	0.00

Descriptive statistics describing state-level cisheteropatriarchal characteristics among those who did not receive a mammogram within the past two years are shown in Table 16. The mean value on the cisheteropatriarchy index is 10.98 for those states where people did not receive a mammogram within the past two years. The mean value for LGBT-friendly policies is 5.63 on a scale of 0-10. Similar to those who received a mammogram within the past two years, a majority of those who did not receive a mammogram within the past two years live in states

with employment discrimination protections for sexual orientation (65.29%) and gender identity (68.40%), hate crime protections for sexual orientation (68.08%), and parental presumption (61.02%). It is less common for respondents who did not receive a mammogram within the past two years to live in states with hate crime protections for gender identity (47.07%), legal same-sex marriage/unions, etc. (49.03%), legal same-sex/joint partner adoption (46.47%), elimination of bias rage or panic defense for criminal acts (26.81%), and prohibition of profiling by law enforcement based on actual or perceived sexual orientation (3.40%) or gender identity (1.91%). The mean value for abortion-friendly policies is 2.23 on a scale of 0-3. Similar to those states where people received mammograms within the past two years, a majority of those where people did not receive a mammogram within the past two years had no public funding for abortion (72.22%), and fewer mammograms occurred in states with no informed consent/mandatory waiting period (31.41%) and no parental informed consent/mandatory waiting period (17.73%). The structural sexism indicators mean value was slightly higher for those states within which people did not receive a mammogram within the past two years compared to those states where people did (3.12 on a scale of 0-6).

Table 16. Descriptive statistics showing state-level cisheteropatriarchal characteristics among those who did not receive a mammogram within the past two years

Key: M=mean; %= percent; SE=standard error

Characteristics	Total	
	M/%	SE
<b>Cisheteropatriarchy scale (overall 0-19)</b>	<b>10.98</b>	<b>0.05</b>
<b>LGBT-friendly policies (0-10)</b>	<b>5.63</b>	<b>0.03</b>
Employment discrimination protections for sexual orientation	65.29%	
Employment discrimination protections for gender identity	68.40%	

Hate crime protections for sexual orientation	68.08%	
Hate crime protections for gender identity	47.07%	
Same-sex marriage/civil union/etc. relationships legal	49.03%	
Same-sex/ joint partner adoption legal	46.47%	
Elimination of bias rage or panic defense for criminal acts	26.81%	
Prohibiting profiling based on actual or perceived LGBTQ+ status by law enforcement (sexual orientation)	3.40%	
Prohibiting profiling based on actual or perceived LGBTQ+ status by law enforcement (gender identity)	1.91%	
Parental presumption	61.02%	
<b>Abortion-friendly policies (0-3)</b>	<b>2.23</b>	<b>0.02</b>
No public funding for abortion	72.22%	
No informed consent/mandatory waiting period	31.41%	
No parental informed consent/mandatory waiting period	17.73%	
<b>Structural sexism indicators (0-6)</b>	<b>3.12</b>	<b>0.01</b>
Ratio of men's/women's median income	0.26	0.01
Ratio of men's/women's labor force participation	0.89	0.00
Ratio of women's/men's unemployment rate	0.43	0.01
% of state legislature seats occupied by men	0.58	0.01
% of votes cast for Republican president in 2020	0.42	0.01
% of state population composed of religious conservatives	0.54	0.01

I describe individual-level sociodemographic characteristics of the sample in Table 17. The majority of those who received a mammogram within the past two years are heterosexual (96.28%) and/or non-transgender/cisgender (99.80%), reside in an urban area (93.15%), identify as NH white (71.98%), have health insurance coverage (98.46%), and received a routine check-up within the past year (92.22%). Descriptive statistics describing individual-level sociodemographic characteristics among those who did not receive a mammogram within the

past two years are shown in Table 18. There are notable sociodemographic differences between those who received a mammogram within the past two years and those who did not. While the majority of those who did not receive a mammogram within the past two years are also heterosexual (95.57%) and/or non-transgender/cisgender (99.60%), reside in an urban area (91.59%), identify as NH white (73.96%), have health insurance coverage (90.14%), and received a routine check-up within the past year (67.49%), the population is more likely to identify as sexually minoritized, transgender or gender non-conforming, and NH white and less likely to reside in an urban area, have health insurance coverage, and have received a routine check-up within the past year than those who report receiving a mammogram within the past two years.

Table 17. Descriptive statistics showing individual-level sociodemographic characteristics among those who received a mammogram within the past two years

Characteristics	Total (%)
<b>Sexual orientation</b>	
Sexually minoritized	3.72%
Heterosexual	96.28%
<b>Gender identity</b>	
Transgender	0.20%
Not transgender (cisgender)	99.80%
<b>Sexual orientation and gender identity (SOGI)</b>	
Sexually and/or gender minoritized	3.88%
Heterosexual and cisgender	96.12%
<b>Additional covariates</b>	

<b>Race and ethnicity</b>	
Non-Hispanic (NH) white	71.98%
Non-Hispanic (NH) Black	14.47%
Non-Hispanic (NH) Asian	2.81%
Hispanic	7.68%
Non-Hispanic (NH) other	3.07%
<b>Rurality</b>	
Urban	93.15%
Rural	6.85%
<b>Health insurance coverage</b>	
Yes, coverage	98.46%
No coverage	1.54%
<b>Educational attainment</b>	
Less than high school	5.90%
High school graduate	24.02%
Some college	33.81%
College graduate	36.26%
<b>Age</b>	
50-54	20.23%
55-59	20.14%
60-64	23.30%
65-69	19.18%
70-74	17.14%
<b>Income</b>	
<\$15,000	5.65%

\$15-24,000	9.06%
\$25-34,000	10.36%
\$35-49,000	12.42%
\$50-99,000	32.50%
\$100-199,000	22.44%
\$200,000+	7.58%
<b>Self-rated general health status</b>	
Excellent	14.13%
Very good	35.08%
Good	32.23%
Fair/poor	18.56%
<b>Length of time since last routine check-up</b>	
Within the past year	92.22%
1 to <2 years ago	6.02%
2 to <5 years ago	1.39%
5+ years ago	0.32%
Never	0.05%

Table 18. Descriptive statistics showing individual-level sociodemographic characteristics among those who did not receive a mammogram within the past two years

<b>Characteristics</b>	<b>Total (%)</b>
<b>Sexual orientation</b>	
Sexually minoritized	4.43%
Heterosexual	95.57%



<b>Gender identity</b>	
Transgender	0.40%
Not transgender (cisgender)	99.60%
<b>Sexual orientation and gender identity (SOGI)</b>	
Sexually and/or gender minoritized	4.67%
Heterosexual and cisgender	95.33%
<b>Additional covariates</b>	
<b>Race and ethnicity</b>	
Non-Hispanic (NH) White	73.96%
Non-Hispanic (NH) Black	8.46%
Non-Hispanic (NH) Asian	2.48%
Hispanic	8.70%
Non-Hispanic (NH) other	6.41%
<b>Rurality</b>	
Urban	91.59%
Rural	8.41%
<b>Health insurance coverage</b>	
Yes, coverage	90.14%
No coverage	9.86%
<b>Educational attainment</b>	
Less than high school	10.92%
High school graduate	28.86%
Some college	32.86%
College graduate	27.36%
<b>Age</b>	

50-54	23.11%
55-59	20.67%
60-64	25.80%
65-69	15.59%
70-74	14.84%
<b>Income</b>	
<\$15,000	11.64%
\$15-24,000	14.88%
\$25-34,000	13.34%
\$35-49,000	12.90%
\$50-99,000	26.80%
\$100-199,000	16.50%
\$200,000+	3.94%
<b>Self-rated general health status</b>	
Excellent	11.65%
Very good	27.72%
Good	33.19%
Fair/poor	27.44%
<b>Length of time since last routine check-up</b>	
Within the past year	67.49%
1 to <2 years ago	12.77%
2 to <5 years ago	10.50%
5+ years ago	8.95%
Never	0.30%

Across all states within the sample 76.90% of respondents (n=36,841) report receiving a mammogram within the past two years (Table 19). SM, GM, and SGM respondents have lower mammogram usage than heterosexual, cisgender, and cishet respondents across all state environments. NH Black respondents have the highest mammogram usage across all racial and ethnic groups (85.06%), followed by NH Asian respondents (79.08%), NH white respondents (76.42%), Hispanic respondents (74.61%), and NH AIAN, Native Hawaiian or other Pacific Islander, and multi-racial respondents (61.44%) (p<0.001). Urban residents report higher mammogram usage within the past two years than rural residents across all states within the sample (77.20% vs. 73.07%, p<0.01). Across all state environments, those aged 65-69 years, with health insurance coverage, more education, higher incomes, “very good” health status, and a routine check-up within the past year report much higher mammogram usage within the past two years (p<0.001).

Table 19. Mammogram usage within the past two years by sexual orientation and gender identity across all states in the sample

Key: N=36,841; %=percent; SM=sexually minoritized weighted; GM=gender minoritized weighted; Het=heterosexual weighted; Cis=cisgender weighted; SGM=sexually and/or gender minoritized weighted; Cishet=cisgender and heterosexual weighted; NH=Non-Hispanic  
 Note: Results significant at \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; SM compared to Het, GM compared to Cis, SGM compared to Cishet

Mammogram usage across all states in the sample							
	Total	SM	Het	GM	Cis	SGM	Cishet
	N (%)						
Total	n=36,841 (76.90%)	n=1,466 (73.65%)	n=35,375 (77.04%)	n=72 (62.40%)*	n=36,769 (76.94%)*	n=1,521 (73.43%)	n=35,320 (77.05%)

<b>Race and ethnicity</b>							
NH White	29,842 (76.42%)*	1,162 (72.17%)*	28,680 (76.58%)*	56 (60.96%)	29,786 (76.46%)*	1,208 (71.97%)*	28,634 (76.60%)*
NH Black	3,331 (85.06%)*	111 (82.94%)*	3,220 (85.14%)*	7 (90.61%)	3,324 (85.05%)*	118 (83.51%)*	3,213 (85.12%)*
NH Asian	731 (79.08%)*	25 (89.31%)*	706 (78.54%)*	–	730 (79.16%)*	25 (87.34%)*	706 (78.64%)*
Hispanic	1,696 (74.61%)*	97 (77.73%)*	1,599 (74.42%)*	5 (32.85%)	1,691 (74.76%)*	99 (76.47%)*	1,597 (74.49%)*
NH other	1,241 (61.44%)*	71 (51.13%)*	1,170 (61.96%)*	3 (94.59%)	1,238 (61.38%)*	71 (52.03%)*	1,170 (61.96%)*
<b>Rurality</b>							
Rural	4,250 (73.07%)*	140 (74.79%)*	4,110 (73.01%)*	12 (75.79%)*	4,238 (73.06%)*	150 (75.68%)*	4,100 (72.97%)*
Urban	32,591 (77.20%)*	1,326 (73.57%)*	31,265 (77.35%)*	60 (61.38%)*	32,531 (77.24%)*	1,371 (73.26%)*	31,220 (77.37%)*
<b>Health insurance coverage</b>							
Yes, coverage	36,436 (78.43%)*	1,435 (75.05%)*	35,001 (78.57%)*	71 (63.16%)*	36,365 (78.47%)*	1,490 (74.80%)*	34,946 (78.58%)*
No coverage	405 (34.27%)*	31 (48.07%)*	374 (33.42%)*	–	404 (34.28%)*	31 (47.56%)*	374 (33.44%)*
<b>Educational attainment</b>							
Less than high school	1,069 (64.28%)*	69 (81.82%)*	1,000 (62.92%)*	5 (100.00%)	1,064 (64.22%)*	71 (81.97%)*	998 (62.89%)*
High school graduate	7,338 (73.49%)*	238 (75.64%)*	7,100 (73.42%)*	10 (42.49%)*	7,328 (73.58%)*	248 (73.21%)*	7,090 (73.50%)*

Some college	10,653 (77.41%)* **	330 (62.23%)* **	10,323 (77.95%)* **	20 (58.44%)	10,633 (77.44%)* **	344 (62.76%)* **	10,309 (77.95%)* **
College graduate	17,781 (81.53%)* **	829 (78.89%)* **	16,952 (81.64%)* **	37 (75.60%)	17,744 (81.54%)* **	858 (79.14%)* **	16,923 (81.63%)* **
<b>Age</b>							
50-54	6,064 (74.45%)* **	317 (68.08%)	5,747 (74.80%)* **	9 (26.77%)	6,055 (74.55%)* **	325 (67.14%)	5,739 (74.87%)* **
55-59	6,482 (76.45%)* **	295 (70.30%)	6,187 (76.69%)* **	16 (65.90%)	6,466 (76.49%)* **	305 (70.38%)	6,177 (76.70%)* **
60-64	8,029 (75.05%)* **	335 (77.72%)	7,694 (74.94%)* **	15 (90.97%)	8,014 (75.02%)* **	346 (78.30%)	7,683 (74.91%)* **
65-69	8,583 (80.38%)* **	280 (77.14%)	8,303 (80.50%)* **	22 (51.60%)	8,561 (80.46%)* **	297 (76.46%)	8,286 (80.53%)* **
70-74	7,683 (79.37%)* **	239 (79.35%)	7,444 (79.37%)* **	10 (79.48%)	7,673 (79.37%)* **	248 (79.24%)	7,435 (79.37%)* **
<b>Income</b>							
<\$15,000	1,948 (61.75%)* **	121 (69.16%)	1,827 (61.31%)* **	6 (33.88%)	1,942 (61.84%)* **	124 (68.77%)	1,824 (61.32%)* **
\$15-24,000	3,090 (66.97%)* **	154 (74.36%)	2,936 (66.52%)* **	9 (41.05%)	3,081 (67.07%)* **	160 (72.18%)	2,930 (66.64%)* **
\$25-34,000	3,812 (72.10%)* **	161 (64.82%)	3,651 (72.48%)* **	16 (74.62%)	3,796 (72.09%)* **	176 (66.03%)	3,636 (72.45%)* **
\$35-49,000	4,698 (76.22%)* **	143 (69.29%)	4,555 (76.44%)* **	5 (63.17%)	4,693 (76.26%)* **	146 (68.97%)	4,552 (76.46%)* **
\$50-99,000	12,718 (80.15%)* **	466 (71.83%)	12,252 (80.46%)* **	21 (76.63%)	12,697 (80.15%)* **	482 (72.17%)	12,236 (80.45%)* **
\$100-199,000	8,193 (81.91%)* **	332 (83.75%)	7,861 (81.85%)* **	13 (67.81%)	8,180 (81.95%)* **	342 (83.84%)	7,851 (81.84%)* **

\$200,000+	2,382 (86.5%)*	89 (90.20%)	2,293 (86.42%)*	2 (63.83%)	2,380 (86.52%)*	91 (89.03%)	2,291 (86.44%)*
<b>General Health Status</b>							
Excellent	5,425 (80.15%)*	203 (69.23%)	5,222 (80.53%)*	6 (45.88%)	5,419 (80.19%)*	207 (69.23%)	5,218 (80.54%)*
Very good	13,668 (80.82%)*	462 (71.61%)	13,206 (81.10%)*	27 (59.28%)	13,641 (80.89%)*	483 (70.31%)	13,185 (81.16%)*
Good	11,466 (76.38%)*	476 (81.13%)	10,990 (76.19%)*	16 (52.21%)	11,450 (76.42%)*	489 (81.17%)	10,977 (76.18%)*
Fair/poor	6,282 (69.25%)*	325 (69.30%)	5,957 (69.25%)*	23 (76.13%)	6,259 (69.22%)*	342 (69.79%)	5,940 (69.22%)*
<b>Length of time since last routine check-up</b>							
Within the past year	33,626 (81.98%)*	1,324 (80.38%)*	32,302 (82.05%)*	67 (72.55%)*	33,559 (82.01%)*	1,375 (80.30%)*	32,251 (82.05%)*
1 to < 2 years ago	2,477 (61.07%)*	114 (63.93%)*	2,363 (60.95%)*	5 (56.05%)*	2,472 (61.08%)*	118 (63.69%)*	2,359 (60.96%)*
2 to <5 years ago	560 (30.66%)*	21 (17.80%)*	539 (31.15%)*	0 (0.00%)*	560 (30.77%)*	21 (17.41%)*	539 (31.18%)*
5+ years ago	152 (10.67%)*	7 (6.19%)*	145 (11.03%)*	0 (0.00%)*	152 (10.76%)*	7 (5.62%)*	145 (11.11%)*
Never	26 (35.98%)*	0 (0.00%)*	26 (37.14%)*	—	26 (35.98%)*	0 (0.00%)*	26 (37.14%)*

*Mammogram usage by sociodemographic characteristics across cisheteropatriarchal state environments*

Next, I analyze mammogram usage within the past two years by state. Table 20 shows mammogram usage within the past two years by each state within the sample. There are 30 total

states included in the sample. The sample is analyzed at the state-level to examine average mammogram usage within the past two years and to look for any potential outliers across all SOGI groups. There are no significant outliers across SOGI groups. Massachusetts has the highest total mammogram usage within the past two years at 86.06% ( $p < 0.001$ ), and Alaska has the lowest total mammogram usage within the past two years at 66.93% ( $p < 0.001$ ). The sample states are dichotomized by whether they have more or less cisheteropatriarchal policies than the average, and mammogram usage is examined within these state-level environments.

Table 20. Mammogram usage within the past two years by state and sexual orientation and gender identity within the sample

Key: N=36,841; %=percent; SM=sexually minoritized weighted; GM=gender minoritized weighted; Het=heterosexual weighted; Cis=cisgender weighted; SGM=sexually and/or gender minoritized weighted; Cishet=cisgender and heterosexual weighted

◇ Less cisheteropatriarchal than the average

◆ More cisheteropatriarchal than the average

Note: Results significant at \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ ; SM compared to Het, GM compared to Cis, SGM compared to Cishet

	Total***	SM	Het***	GM	Cis***	SGM	Cishet***
	N (%)						
Total	n=36,841	n=1,466	n=35,375	n=72	n=36,769	n=1,521	n=35,320
Alaska ◇	666 (66.93%)	30 (73.57%)	636 (66.64%)	2 (100.00%)	664 (66.90%)	32 (74.26%)	634 (66.60%)
Colorado ◇	1,026 (71.57%)	51 (59.71%)	975 (72.24%)	–	1,025 (71.72%)	51 (59.71%)	975 (72.24%)
Connecticut ◇	1,316 (82.71%)	83 (85.86%)	1,233 (82.50%)	2 (53.43%)	1,314 (82.78%)	85 (86.06%)	1,231 (82.48%)
Delaware ◇	617 (79.77%)	21 (75.72%)	596 (79.88%)	–	617 (79.77%)	21 (75.72%)	596 (79.88%)
Georgia ◆	1,244 (76.33%)	45 (77.29%)	1,199 (76.30%)	–	1,243 (76.37%)	46 (76.42%)	1,198 (76.33%)
Hawaii ◇	1,212 (78.96%)	52 (73.58%)	1,160 (79.16%)	2 (22.69%)	1,210 (79.21%)	53 (67.69%)	1,159 (79.43%)

Illinois ◇	449 (71.71%)	13 (63.24%)	436 (71.91%)	0 (0.00%)	449 (71.87%)	13 (57.72%)	436 (72.08%)
Indiana ◆	1,372 (76.9%)	60 (75.97%)	1,312 (76.95%)	–	1,371 (76.95%)	61 (75.57%)	1,311 (76.97%)
Kansas ◆	1,596 (75.02%)	36 (60.59%)	1,560 (75.43%)	2 (62.92%)	1,594 (75.03%)	38 (60.68%)	1,558 (75.44%)
Louisiana ◆	823 (82.25%)	24 (84.00%)	799 (82.18%)	–	823 (82.25%)	24 (84.00%)	799 (82.18%)
Maryland ◇	2,470 (83.82%)	91 (80.49%)	2,379 (83.97%)	5 (76.45%)	2,465 (83.83%)	95 (80.13%)	2,375 (83.99%)
Massachusetts ◇	1,415 (86.06%)	75 (84.42%)	1,340 (86.15%)	5 (51.21%)	1,410 (86.21%)	80 (81.79%)	1,335 (86.31%)
Michigan ◆	1,495 (77.99%)	46 (75.85%)	1,449 (78.06%)	3 (62.27%)	1,492 (78.02%)	48 (76.31%)	1,447 (78.05%)
Minnesota ◇	2,149 (79.57%)	85 (69.32%)	2,064 (79.95%)	8 (77.95%)	2,141 (79.58%)	92 (70.08%)	2,057 (79.95%)
Missouri ◆	986 (76.59%)	25 (74.55%)	961 (76.64%)	4 (100.00%)	982 (76.52%)	29 (78.01%)	957 (76.56%)
Montana ◆	996 (75.86%)	44 (89.19%)	952 (75.28%)	3 (100.00%)	993 (75.84%)	46 (89.35%)	950 (75.26%)
Nevada ◇	377 (73.07%)	16 (53.87%)	361 (74.24%)	0 (0.00%)	377 (73.19%)	16 (53.87%)	361 (74.24%)
New Mexico ◇	695 (68.56%)	36 (55.39%)	659 (69.44%)	2 (52.14%)	693 (68.58%)	37 (55.03%)	658 (69.49%)
North Carolina ◆	540 (77.25%)	12 (55.93%)	528 (77.84%)	4 (100.00%)	536 (77.12%)	15 (63.08%)	525 (77.72%)
North Dakota ◆	573 (82.41%)	13 (58.18%)	560 (83.09%)	–	572 (82.40%)	13 (58.18%)	560 (83.09%)
Ohio ◆	1,990 (75.45%)	67 (68.03%)	1,923 (75.77%)	3 (79.52%)	1,987 (75.44%)	70 (69.93%)	1,920 (75.70%)
Pennsylvania ◆	587 (76.49%)	8 (58.36%)	579 (76.94%)	–	586 (76.47%)	9 (59.6%)	578 (76.92%)
Rhode Island ◇	985 (85.01%)	45 (89.23%)	940 (84.84%)	–	985 (85.01%)	45 (89.23%)	940 (84.84%)
Texas ◆	1,491 (73.92%)	71 (84.55%)	1,420 (73.36%)	3 (20.77%)	1,488 (74.01%)	74 (83.67%)	1,417 (73.39%)
Utah ◆	967 (75.52%)	24 (67.43%)	943 (75.81%)	–	966 (75.48%)	24 (67.43%)	943 (75.81%)



Vermont ◇	1,410 (75.49%)	85 (71.01%)	1,325 (75.81%)	–	1,409 (75.46%)	85 (71.01%)	1,325 (75.81%)
Virginia ◇	1,384 (79.24%)	40 (74.77%)	1,344 (79.39%)	2 (100.00%)	1,382 (79.15%)	41 (76.31%)	1,343 (79.35%)
Washington ◇	3,602 (76.14%)	186 (73.40%)	3,416 (76.29%)	9 (93.47%)	3,593 (76.10%)	190 (73.51%)	3,412 (76.29%)
West Virginia ◆	852 (76.61%)	22 (84.11%)	830 (76.42%)	2 (46.00%)	850 (76.80%)	24 (77.00%)	828 (76.60%)
Wisconsin ◇	1,556 (82.39%)	60 (78.27%)	1,496 (82.57%)	4 (38.57%)	1,552 (82.58%)	64 (76.34%)	1,492 (82.67%)

Several tables describe the differences in mammogram usage by state-level cisheteropatriarchal environment. Table 21 shows mammogram usage within the past two years within states with more cisheteropatriarchal policies than the average by SOGI and across sociodemographic and health-related characteristics. Table 22 shows mammogram usage within the past two years within states with less cisheteropatriarchal policies than the average also by SOGI and across covariates. Overall, states with more cisheteropatriarchal policies than the average have slightly lower mammogram usage within the past two years than states with less cisheteropatriarchal policies than the average (76.30% vs. 77.76%,  $p>0.05$ ).

Table 21. Mammogram usage within the past two years within states with more cisheteropatriarchal policies than the average

Key: N=15,512; %=percent; SM=sexually minoritized weighted; GM=gender minoritized weighted; Het=heterosexual weighted; Cis=cisgender weighted; SGM=sexually and/or gender minoritized weighted; Cishet=cisgender and heterosexual weighted; NH=Non-Hispanic

Note: Results significant at \* $p<0.05$ , \*\* $p<0.01$ , \*\*\* $p<0.001$  SM compared to Het, GM compared to Cis, SGM compared to Cishet

	States with more cisheteropatriarchal policies than the average						
	n (%)	SM	Het	GM	Cis	SGM	Cishet
<b>Total</b>	<b>n=15,512 (76.30%)</b>	<b>n=497 (74.79%)</b>	<b>n=15,015 (76.36%)</b>	<b>n=29 (71.04%)</b>	<b>n=15,483 (76.32%)</b>	<b>n=521 (75.14%)</b>	<b>n=14,991 (76.35%)</b>

<b>Race and ethnicity</b>							
NH white	12,722 (75.66%)*	394 (71.41%)	12,328 (75.81%)*	20 (79.10%)	12,702 (75.65%)*	412 (72.23%)	12,310 (75.78%)*
NH Black	1,751 (84.36%)*	46 (82.55%)	1,705 (84.43%)*	5 (87.49%)	1,746 (84.35%)*	51 (82.94%)	1,700 (84.42%)*
NH Asian	71 (73.86%)*	3 (97.37%)	68 (71.87%)*	–	71 (73.86%)*	3 (97.37%)	68 (71.87%)*
Hispanic	580 (74.68%)*	31 (76.22%)	549 (74.58%)*	3 (25.83%)	577 (74.93%)*	32 (74.35%)	548 (74.70%)*
NH other	388 (58.12%)*	23 (81.35%)	365 (57.21%)*	–	387 (58.11%)*	23 (81.35%)	365 (57.21%)*
<b>Rurality</b>							
Rural	2,253 (75.11%)	67 (81.44%)	2,186 (74.84%)	8 (93.58%)*	2,245 (75.06%)	74 (82.13%)	2,179 (74.80%)
Urban	13,259 (76.41%)	430 (74.14%)	12,829 (76.49%)	21 (68.80%)*	13,238 (76.43%)	447 (74.45%)	12,812 (76.49%)
<b>Health insurance coverage</b>							
Yes, coverage	15,298 (78.14%)*	478 (75.63%)	14,820 (78.23%)*	28 (70.60%)	15,270 (78.15%)*	502 (75.96%)	14,796 (78.22%)*
No coverage	214 (33.74%)*	19 (55.34%)	195 (32.92%)*	–	213 (33.69%)*	19 (55.34%)	195 (32.92%)*
<b>Educational attainment</b>							
Less than high school	497 (62.24%)*	34 (84.35%)	463 (60.34%)*	2 (100.00%)	495 (62.20%)*	35 (84.47%)	462 (60.32%)*
High school or GED	3,609 (72.80%)*	99 (74.73%)	3,510 (72.74%)*	5 (53.26%)	3,604 (72.84%)*	104 (73.81%)	3,505 (72.77%)*
Some college	4,746 (78.32%)*	133 (64.37%)	4,613 (78.78%)*	6 (64.76%)	4,740 (78.33%)*	138 (64.85%)	4,608 (78.78%)*
College graduate	6,660 (80.94%)*	231 (79.13%)	6,429 (81.01%)*	16 (81.54%)	6,644 (80.93%)*	244 (80.37%)	6,416 (80.96%)*
<b>Age</b>							
50-54	2,556 (73.15%)*	107 (72.28%)	2,449 (73.19%)*	3 (50.91%)	2,553 (73.16%)*	110 (72.47%)	2,446 (73.18%)*
55-59	2,618 (76.41%)*	93 (67.70%)	2,525 (76.71%)*	7 (81.38%)	2,611 (76.39%)*	99 (69.61%)	2,519 (76.66%)*
60-64	3,321 (73.90%)*	120 (79.51%)	3,201 (73.69%)*	7 (92.90%)	3,314 (73.88%)*	126 (79.96%)	3,195 (73.66%)*
65-69	3,647 (79.98%)*	108 (76.17%)	3,539 (80.12%)*	8 (33.21%)	3,639 (80.13%)*	113 (74.49%)	3,534 (80.20%)*

70-74	3,370 (79.62%)**	69 (80.16%)	3,301 (79.61)**	4 (95.17%)	3,366 (79.59%)**	73 (81.30%)	3,297 (79.57%)**
<b>Income</b>							
<\$15,000	1,000 (61.45%***	57 (70.49%)	943 (60.93%***	3 (33.95%)	997 (61.55%***	60 (70.90%)	940 (60.89%***
\$15-24,000	1,558 (67.41%***	72 (79.30%)	1,486 (66.70%***	5 (67.47%)	1,553 (67.41%***	75 (78.77%)	1,483 (66.71%***
\$25-34,000	1,835 (71.16%***	62 (68.26%)	1,773 (71.30%***	8 (95.15%)	1,827 (71.05%***	70 (70.56%)	1,765 (71.19%***
\$35-49,000	2,170 (77.16%***	50 (65.31%)	2,120 (77.47%***	2 (38.20%)	2,168 (77.27%***	51 (63.46%)	2,119 (77.55%***
\$50-99,000	5,222 (79.95%***	147 (70.86%)	5,075 (80.25%***	7 (100.00%)	5,215 (79.93%***	153 (71.73%)	5,069 (80.23%***
\$100-199,000	2,942 (81.85%***	94 (88.31%)	2,848 (81.65%***	4 (76.21%)	2,938 (81.86%***	97 (88.48%)	2,845 (81.63%***
\$200,000+	785 (86.68%***	15 (95.08%)	770 (86.56%***	–	785 (86.68%***	15 (95.08%)	770 (86.56%***
<b>General Health Status</b>							
Excellent	1,906 (79.30%***	54 (74.51%)	1,852 (79.45%***	–	1,905 (79.35%***	54 (73.51%)	1,852 (79.45%***
Very good	5,416 (80.23%***	131 (64.57%)	5,285 (80.66%***	11 (92.21%)*	5,405 (80.21%***	140 (66.31%)	5,276 (80.64%***
Good	5,094 (76.41%***	165 (82.84%)	4,929 (76.18%***	8 (61.41%)*	5,086 (76.44%***	172 (83.04%)	4,922 (76.17%***
Fair/poor	3,096 (68.88%***	147 (74.47%)	2,949 (68.53%***	9 (66.19%)*	3,087 (68.89%***	155 (74.33%)	2,941 (68.52%***
<b>Length of time since last routine check-up</b>							
Within the past year	14,459 (81.66%***	452 (81.86%***	14,007 (81.65%***	28 (76.60%)	14,431 (81.67%***	475 (81.88%***	13,984 (81.65%***
1 to < 2 years ago	816 (55.34%***	38 (57.42%***	778 (55.22%***	–	815 (55.31%***	39 (57.87%***	777 (55.20%***
2 to <5 years ago	164 (25.10%***	6 (20.24%***	158 (25.27%***	0 (0.00%)	164 (25.23%***	6 (20.24%***	158 (25.27%***
5+ years ago	60 (10.64%***	–	59 (10.84%***	–	60 (10.64%***	–	59 (10.84%***
Never	13 (28.21%***	0 (0.00%***	13 (29.20%***	–	13 (28.21%***	0 (0.00%***	13 (29.20%***

Table 22. Mammogram usage within the past two years within states with less cisheteropatriarchal policies than the average

Key: N=21,329, N=number, %= weighted percent; SM=sexually minoritized weighted; GM=gender minoritized weighted; Het=heterosexual weighted; Cis=cisgender weighted; SGM=sexually and/or gender minoritized weighted; Cishet=cisgender andheterosexual weighted; NH=Non-Hispanic

Note: Results significant at \*p<0.05, \*\*p<0.01, \*\*\*p<0.001; SM compared to Het, GM compared to Cis, SGM compared to Cishet

	States with less cisheteropatriarchal policies than the average						
	n (%)	SM	Het	GM	Cis	SGM	Cishet
<b>Total</b>	<b>n=21,329</b> (77.76%***)	<b>969</b> (72.24%)**	<b>20,360</b> (78.00%)***	<b>n=43</b> (53.00%)	<b>n=21,286</b> (77.83%)***	<b>1,000</b> (71.31%)**	<b>n=20,329</b> (78.06%)***
<b>Race and ethnicity</b>							
NH white	17,120 (77.53%***)	768 (73.04%)**	16,352 (77.72%)***	36 (45.75%)	17,084 (77.63%)***	796 (71.66%)**	16,324 (77.79%)***
NH Black	1,580 (86.37%***)	65 (83.76%)**	1,515 (86.36%)***	2 (98.68%)	1,578 (86.34%)***	67 (84.71%)**	1,513 (86.42%)***
NH Asian	660 (81.48%***)	22 (81.28%)**	638 (81.49%)***	–	659 (81.61%)***	22 (77.79%)**	638 (81.62%)***
Hispanic	1,116 (74.50%***)	66 (80.35%)**	1,050 (74.18%)***	2 (69.07%)	1,114 (74.50%)***	67 (80.19%)**	805 (74.18%)***
NH other	853 (64.11%***)	48 (38.36%)**	805 (65.89%)***	2 (94.40%)	851 (64.01%)***	48 (38.25%)**	1,049 (65.90%)***
<b>Rurality</b>							
Rural	1,997 (69.12%***)	73 (57.72%)	1,924 (69.48%)***	4 (40.23%)	1,993 (69.19%)***	76 (58.58%)	1,921 (69.46%)***
Urban	19,332 (78.31%***)	896 (72.89%)	18,436 (78.55%)***	39 (53.66%)	19,293 (78.38%)***	924 (71.87%)	18,408 (78.61%)***
<b>Health insurance coverage</b>							
Yes, coverage	21,138 (78.85%***)	957 (74.32%)	20,181 (79.04%)***	43 (54.89%)	21,095 (78.92%)***	988 (73.33%)	20,150 (79.09%)***
No coverage	191 (35.52%***)	12 (42.33%)	179 (34.69%)***	0 (0.00%)	191 (35.66%)***	12 (41.52%)	179 (34.77%)***
<b>Educational attainment</b>							
Less than high school	572 (68.49%***)	35 (74.85%)*	537 (68.09%)***	3 (100.00%)	569 (68.39%)***	36 (75.12%)	536 (68.07%)***
High school or GED	3,729 (74.75%***)	139 (76.89%)*	3,590 (74.67%)***	5 (32.95%)	3,724 (74.94%)***	144 (72.42%)	3,585 (74.85%)***
Some college	5,907 (76.14%***)	197 (59.69%)*	5,710 (76.79%)***	14 (53.79%)	5,893 (76.20%)***	206 (60.28%)	5,701 (76.78%)***

College graduate	11,121 (82.20%)*	598 (78.66%)*	10,523 (82.37%)*	21 (65.02%)	11,100 (82.24%)*	614 (77.97%)	10,507 (82.41%)*
<b>Age</b>							
50-54	3,508 (76.29%)*	210 (62.97%)	3,298 (77.09%)	6 (21.24%)	3,502 (76.52%)	215 (60.92%)	3,293 (77.26%)
55-59	3,864 (76.50%)*	202 (73.05%)	3,662 (76.67%)	9 (45.11%)	3,855 (76.63%)	206 (71.24%)	3,658 (76.77%)
60-64	4,708 (76.73%)*	215 (75.33%)	4,493 (76.79%)	8 (89.12%)	4,700 (76.70%)	220 (76.07%)	4,488 (76.76%)
65-69	4,936 (80.94%)*	172 (78.65%)	4,764 (81.01%)	14 (92.76%)	4,922 (80.92%)	184 (79.47%)	4,752 (80.99%)
70-74	4,313 (79.00%)*	170 (78.50%)	4,143 (79.02%)	6 (52.47%)	4,307 (79.05%)	175 (76.95%)	4,138 (79.08%)
<b>Income</b>							
<\$15,000	948 (62.37%)*	64 (66.55%)	884 (62.11%)*	3 (33.66%)	945 (62.45%)*	64 (64.61%)	884 (62.23%)*
\$15-24,000	1,532 (66.08%)*	82 (64.41%)	1,450 (66.18%)*	4 (25.34%)	1,528 (66.37%)*	85 (59.74%)	1,447 (66.51%)*
\$25-34,000	1,977 (73.84%)*	99 (59.13%)	1,878 (74.65%)*	8 (46.49%)	1,969 (74.00%)*	106 (58.52%)	1,871 (74.76%)*
\$35-49,000	2,528 (74.75%)*	93 (73.70%)	2,435 (74.79%)*	3 (98.91%)	2,525 (74.67%)*	95 (75.13%)	2,433 (74.73%)*
\$50-99,000	7,496 (80.41%)*	319 (72.83%)	7,177 (80.72%)*	14 (53.55%)	7,482 (80.44%)*	329 (72.62%)	7,167 (80.74%)*
\$100-199,000	5,251 (81.99%)*	238 (79.67%)	5,013 (82.08%)*	9 (58.80%)	5,242 (82.05%)*	245 (79.56%)	5,006 (82.09%)*
\$200,000+	1,597 (86.32%)*	74 (87.86%)	1,523 (86.27%)*	2 (63.83%)	1,595 (86.46%)*	76 (86.32%)	1,521 (86.32%)*
<b>General Health Status</b>							
Excellent	3,519 (81.10%)*	149 (66.16%)*	3,370 (81.73%)*	5 (70.12%)	3,514 (81.11%)*	153 (66.24%)	3,366 (81.75%)*
Very good	8,252 (81.57%)*	331 (78.97%)*	7,921 (81.65%)*	16 (35.09%)	8,236 (81.75%)*	343 (74.43%)	7,909 (81.82%)*
Good	6,372 (76.32%)*	311 (79.01%)*	6,061 (76.19%)*	8 (31.42%)	6,364 (76.38%)*	317 (78.78%)	6,055 (76.20%)*
Fair/poor	3,186 (69.89%)*	178 (60.44%)*	3,008 (70.49%)*	14 (88.44%)	3,172 (69.80%)*	187 (61.99%)	2,999 (70.41%)*
<b>Length of time since last routine check-up</b>							
Within the	19,167	872	18,295	39	19,128	900	18,267

past year	(82.45%)*	(78.60%)*	(82.62%)*	(67.33%)*	(82.49%)*	(78.34%)*	(82.64%)*
1 to < 2 years ago	1,661 (68.09%)*	76 (77.54%)*	1,585 (67.79%)*	4 (36.06%)*	1,657 (68.13%)*	79 (75.47%)*	1,582 (67.85%)*
2 to <5 years ago	396 (37.13%)*	15 (15.45%)*	381 (38.05%)*	0 (0.00%)*	396 (37.20%)*	15 (14.81%)*	381 (38.12%)*
5+ years ago	92 (10.71%)*	6 (5.13%)*	86 (11.29%)*	0 (0.00%)*	92 (10.94%)*	6 (4.33%)*	86 (11.51%)*
Never	13 (52.37%)*	0 (0.00%)*	13 (53.76%)*	–	13 (52.37%)*	0 (0.00%)*	13 (53.76%)*

SM, GM, and SGM respondents have lower mammogram usage than heterosexual, cisgender, and cishet respondents across all state environments; however, SM, GM, and SGM groups report higher mammogram usage in states with more cisheteropatriarchal policy environments than their SM, GM, and SGM counterparts in states with less cisheteropatriarchal policy environments. SGM people have higher odds of receiving a mammogram within the past two years than cishet people residing in more cisheteropatriarchal environments (AOR: 1.22,  $p > 0.05$ , Table 23). As shown in Table 24, SGM people have lower odds of receiving a mammogram within the past two years than cishet people residing in less cisheteropatriarchal state environments (AOR: 0.85,  $p > 0.05$ ). Further, those living within more cisheteropatriarchal state environments have a greater predicted probability of mammogram usage for SGM people, with a 4.74 percentage point difference between more cisheteropatriarchal and less cisheteropatriarchal state environments (Table 25, Figure 9).

Table 23. Odds of receiving a mammogram within the past two years within states with more cisheteropatriarchal policies than the average by sexual orientation and gender identity, controlling for rurality, race and ethnicity, health insurance, education, age, income, health status, time since last routine check-up, and region

Key: SGM=sexually and/or gender minoritized weighted; Cishet=cisgender and heterosexual weighted; NH=Non-Hispanic; SW=southwest; MW=midwest; SE=southeast; NE=northeast

Note: Results significant at \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

	Total		SGM		Cishet	
	AOR	95% CI	AOR	95% CI	AOR	95% CI
SGM	1.22	(0.85,1.75)				
<b>Characteristics</b>						
<b>Rurality (ref: urban)</b>						
Rural	1.09	(0.90, 1.33)	1.67	(0.70, 3.97)	1.07	(0.88, 1.31)
<b>Race and ethnicity (ref: NH White)</b>						
NH Black	1.96***	(1.55, 2.47)	1.98	(0.55, 7.12)	1.92***	(1.53, 2.42)
Hispanic	1.56*	(1.07, 2.27)	1.03	(0.35, 3.07)	1.58*	(1.08, 2.32)
NH Asian	0.83	(0.44, 1.56)	7.89	(0.70, 89.16)	0.84	(0.44, 1.62)
NH other	0.56***	0.39, 0.80)	1.40	(0.56, 3.51)	0.54***	(0.37, 0.77)
<b>Insurance coverage (ref: no insurance coverage)</b>						
Yes, coverage	3.85***	(2.39, 6.20)	1.21	(0.34, 4.30)	3.98***	(2.42, 6.54)
<b>Education (ref: less than high school)</b>						
High school graduate	1.19	(0.76, 1.87)	0.61	(0.15, 2.39)	1.25	(0.79, 1.98)
Some college	1.39	(0.88, 2.21)	0.40	(0.12, 1.39)	1.50	(0.93, 2.42)
College graduate	1.35	(0.86, 2.12)	0.69	(0.21, 2.28)	1.45	(0.92, 2.30)
<b>Age in years (ref: 50-54)</b>						

55-59	1.26*	(1.01, 1.57)	0.96	(0.41, 2.28)	1.27*	(1.01, 1.60)
60-64	1.11	(0.89, 1.38)	2.18	(0.82, 5.80)	1.07	(0.86, 1.35)
65-69	1.35**	(1.09, 1.67)	1.48	(0.53, 4.12)	1.34**	(1.08, 1.66)
70-74	1.19	(0.91, 1.56)	1.32	(0.46, 3.82)	1.17	(0.89, 1.55)
<b>Income (ref: &lt;\$15,000)</b>						
\$15-24,000	1.21	(0.82, 1.78)	1.18	(0.48, 2.91)	1.16	(0.77, 1.73)
\$25-34,000	1.37*	(1.00, 1.88)	1.02	(0.32, 3.23)	1.38	(0.99, 1.92)
\$35-49,000	1.81***	(1.32, 2.49)	0.68	(0.25, 1.88)	1.81***	(1.31, 2.52)
\$50-99,000	1.97***	(1.47, 2.62)	2.14	(0.82, 5.63)	1.95***	(1.44, 2.62)
\$100-199,000	2.21***	(1.60, 3.07)	4.84*	(1.45, 16.32)	2.11***	(1.51, 2.96)
\$200,000+	3.37***	(2.08, 5.46)	23.25	(0.20, 2693.11)	3.22***	(1.97, 5.25)
<b>General health status (ref: excellent)</b>						
Very good	0.97	(0.75, 1.25)	0.50	(0.12, 2.04)	1.00	(0.77, 1.30)
Good	0.73*	(0.56, 0.95)	1.05	(0.26, 4.27)	0.73*	(0.56, 0.96)
Fair/poor	0.56***	(0.43, 0.75)	0.94	(0.22, 4.00)	0.56***	(0.42, 0.75)
<b>Length of time since last routine check-up (ref: within the past year)</b>						
1 to < 2 years ago	0.28***	(0.21, 0.35)	0.24**	(0.09, 0.63)	0.28***	(0.22, 0.36)
2 to <5 years ago	0.07***	(0.05, 0.10)	0.04***	(0.02, 0.09)	0.07***	(0.05, 0.10)



5+ years ago	0.03***	(0.02, 0.04)	0.02***	(0.01, 0.09)	0.03***	(0.02, 0.04)
Never	0.08***	(0.02, 0.25)	–	–	0.08***	(0.03, 0.27)
<b>Region (ref: West)</b>						
SW	0.92	(0.71, 1.19)	1.28	(0.32, 5.12)	0.91	(0.70, 1.18)
MW	1.02	(0.86, 1.22)	0.74	(0.20, 2.77)	1.05	(0.88, 1.25)
SE	1.05	(0.85, 1.30)	0.91	(0.24, 3.46)	1.08	(0.87, 1.34)
NE	1.00	(0.73, 1.38)	0.27	(0.05, 1.54)	1.05	(0.76, 1.45)

Table 24. Odds of receiving a mammogram within the past two years within states with less cisheteropatriarchal policies than the average controlling for rurality, race and ethnicity, health insurance, education, age, income, health status, time since last routine check-up, and region  
Key: SGM=sexually and/or gender minoritized weighted; Cishet=cisgender and heterosexual weighted; NH=Non-Hispanic; SW=southwest; MW=midwest; SE=southeast; NE=northeast  
Note: Results significant at \*p<0.05, \*\*p<0.01, \*\*\*p<0.001

	Total		SGM		Cishet	
	AOR	95% CI	AOR	95% CI	AOR	95% CI
SGM	0.85	(0.65, 1.11)				
<b>Characteristics</b>						
<b>Rurality (ref: urban)</b>						
Rural	0.81	(0.64, 1.02)	0.79	(0.35, 1.80)	0.81	(0.64, 1.03)
<b>Race and ethnicity (ref: NH White)</b>						

NH Black	1.99***	(1.52, 2.62)	2.14	(0.50, 9.12)	1.97***	(1.49, 2.60)
Hispanic	1.62***	(1.26, 2.08)	3.12*	(1.28, 7.60)	1.58***	(1.22, 2.05)
NH Asian	1.21	(0.89, 1.64)	0.88	(0.21, 3.69)	1.21	(0.89, 1.66)
NH other	0.63*	(0.41, 0.99)	0.36	(0.12, 1.07)	0.69	(0.43, 1.10)
<b>Insurance coverage (ref: no insurance coverage)</b>						
Yes, coverage	3.07***	(2.16, 4.37)	1.69	(0.54, 5.26)	3.29***	(2.27, 4.77)
<b>Education (ref: less than high school)</b>						
High school graduate	1.02	(0.73, 1.41)	1.10	(0.27, 4.47)	1.01	(0.72, 1.41)
Some college	1.01	(0.73, 1.38)	0.72	(0.19, 2.79)	1.02	(0.74, 1.40)
College graduate	1.16	(0.84, 1.60)	1.17	(0.27, 5.00)	1.14	(0.82, 1.59)
<b>Age in years (ref: 50-54)</b>						
55-59	1.10	(0.92, 1.32)	1.06	(0.55, 2.04)	1.09	(0.90, 1.31)
60-64	1.11	(0.91, 1.37)	1.52	(0.70, 3.28)	1.09	(0.88, 1.34)
65-69	1.38**	(1.11, 1.70)	2.05*	(1.01, 4.19)	1.34**	(1.08, 1.67)
70-74	1.15	(0.90, 1.46)	1.55	(0.73, 3.32)	1.12	(0.87, 1.43)
<b>Income (ref: &lt;\$15,000)</b>						
\$15-24,000	1.10	(0.75, 1.61)	0.71	(0.26, 1.93)	1.13	(0.77, 1.68)
\$25-34,000	1.57**	(1.15, 2.13)	1.09	(0.36, 3.32)	1.62**	(1.18, 2.23)

\$35-49,000	1.61**	(1.16, 2.23)	1.62	(0.52, 5.07)	1.63**	(1.16, 2.29)
\$50-99,000	2.08***	(1.55, 2.80)	1.22	(0.42, 3.54)	2.16***	(1.60, 2.92)
\$100-199,000	2.20***	(1.59, 3.04)	1.95	(0.65, 5.78)	2.25***	(1.61, 3.13)
\$200,000+	2.96***	(1.96, 4.45)	2.71	(0.42, 17.70)	3.00***	(1.97, 4.55)
<b>General health status (ref: excellent)</b>						
Very good	1.04	(0.82, 1.31)	1.96	(0.87, 4.41)	0.99	(0.78, 1.27)
Good	0.74*	(0.57, 0.95)	1.89	(0.86, 4.16)	0.70**	(0.54, 0.91)
Fair/poor	0.66**	(0.50, 0.89)	1.40	(0.58, 3.34)	0.63**	(0.47, 0.86)
<b>Length of time since last routine check-up (ref: within the past year)</b>						
1 to < 2 years ago	0.46***	(0.37, 0.57)	0.87	(0.42, 1.82)	0.44***	(0.36, 0.55)
2 to <5 years ago	0.12***	(0.09, 0.16)	0.06***	(0.02, 0.16)	0.12***	(0.09, 0.16)
5+ years ago	0.03***	(0.02, 0.05)	0.02***	(0.00, 0.07)	0.03***	(0.02, 0.05)
Never	0.41***	(0.12, 1.41)	–	–	0.43	(0.12, 1.52)
<b>Region (ref: West)</b>						
SW	0.89	(0.69, 1.15)	0.54	(0.20, 1.41)	0.93	(0.72, 1.21)
MW	1.02	(0.84, 1.24)	1.01	(0.57, 1.80)	1.01	(0.83, 1.24)
SE	1.16	(0.99, 1.36)	1.13	(0.50, 2.57)	1.17	(0.99, 1.37)
NE	1.54***	(1.31, 1.80)	1.45	(0.72, 2.94)	1.52***	(1.29, 1.78)

Table 25. Predicted probability of mammogram usage within the past two years by structural cisheteropatriarchal state environment for those 50-74 years of age

Key: SOGI=sexual orientation and gender identity; SGM=sexually and/or gender minoritized; Cishet=cisgender and heterosexual

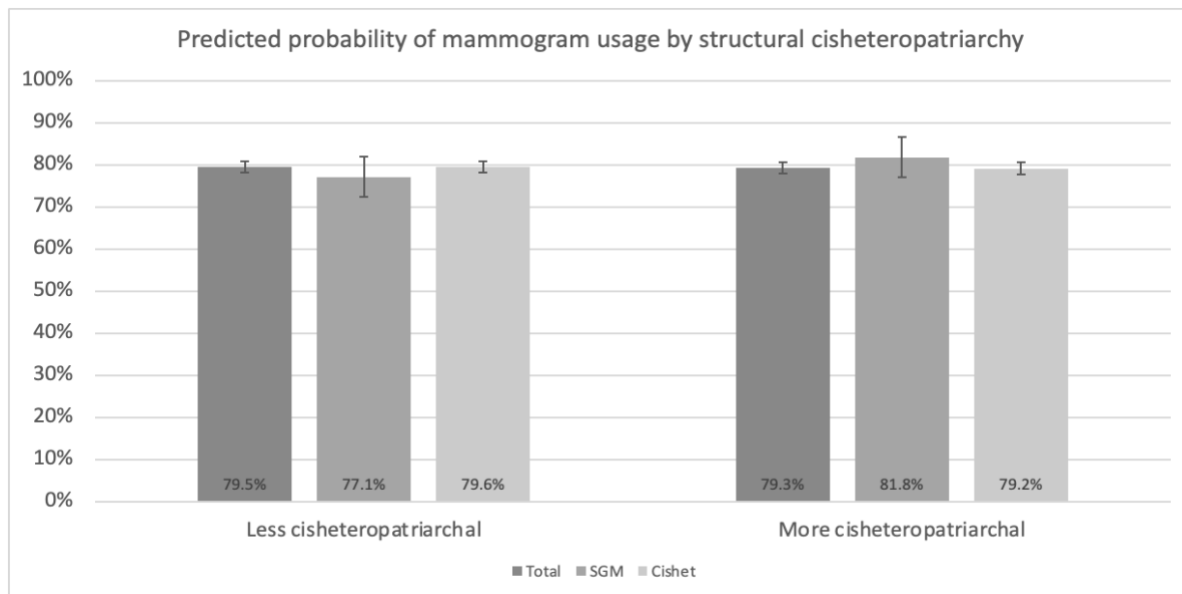
Note: Data are from the 2022 Behavioral Risk Factor Surveillance System data and include those aged 50-74 years and assigned female at birth. The differences between mammogram usage within the past two years in more cisheteropatriarchal state environments and less cisheteropatriarchal state environments is significant at  $p < 0.001$  for the full sample and across SOGI categories.

	More cisheteropatriarchal		Less cisheteropatriarchal		Difference
	Predicted probability	95% CI	Predicted probability	95% CI	
Full sample	79.27%***	(0.78, 0.80)	79.46%***	(0.78, 0.81)	-0.19%
<b>SOGI</b>					
SGM	81.84%***	(0.77, 0.87)	77.10%***	(0.72, 0.82)	4.74%
Cishet	79.16%***	(0.78, 0.80)	79.56%***	(0.78, 0.81)	-0.40%

Figure 9. Predicted probability of mammogram usage within the past two years by structural cisheteropatriarchy for those 50-74 years of age

Key: SGM=sexually and/or gender minoritized; Cishet=cisgender and heterosexual

Note: Data are from the 2022 Behavioral Risk Factor Surveillance System data and include those aged 50-74 years and assigned female at birth. The differences between mammogram usage within the past two years in more cisheteropatriarchal state environments and less cisheteropatriarchal state environments is significant at  $p < 0.001$  for the full sample and across SOGI categories.



Comparisons between SOGI, race and ethnicity, and rurality show differences in mammogram usage between less cisheteropatriarchal and more cisheteropatriarchal state environments. NH white, Black, Asian, and AIAN, Native Hawaiian or other Pacific Islander, or multi-race respondents report higher mammogram usage within the past two years in states with less cisheteropatriarchal environments than their racial and ethnic counterparts in states with more cisheteropatriarchal environments ( $p < 0.001$ ). As shown in Table 21, urban residents report slightly higher mammogram usage than rural residents in more cisheteropatriarchal states ( $p > 0.05$ ). Like urban residents within more cisheteropatriarchal states, urban residents within less cisheteropatriarchal states also report much higher mammogram usage than rural residents (78.31% vs. 69.12%,  $p < 0.001$ , Table 22).

Less cisheteropatriarchal state environments show higher mammogram usage across several notable sociodemographic characteristics, including health insurance, education, income, age, health status, and length of time since last routine check-up. Those without health insurance

coverage in less cisheteropatriarchal states report slightly higher mammogram usage than those without health insurance coverage in more cisheteropatriarchal states (35.52% vs. 33.74%,  $p < 0.001$ ). Those living in less cisheteropatriarchal states report higher mammogram usage than those living in more cisheteropatriarchal states across all education levels, except for those with “some college,” those aged 50-69 years, those with incomes  $< \$15,000$ ,  $\$25-35,000$ , and  $\$50-199,000$ , all health statuses, except for “good,” and all lengths of time since the last routine check-up.

#### *Mammogram usage by minoritized sexual orientation (SM)*

I examine mammogram usage among those with minoritized sexual orientations across race and ethnicity and rurality in the sample (Table 19). Those categorized as sexually minoritized (SM) are less likely than their heterosexual peers to report receiving a mammogram within the past two years (73.65% vs. 77.04%,  $p > 0.05$ ). NH Black respondents report the highest mammogram usage within the past two years (85.06%,  $p < 0.001$ ), with heterosexual Black respondents reporting the highest mammogram usage (85.14%,  $p < 0.001$ ) compared to SM counterparts (82.94%,  $p < 0.05$ ). Heterosexual NH white, NH Black, and NH AIAN, Native Hawaiian or other Pacific Islander, and multi-racial respondents have higher mammogram usage than their SM peers, while SM NH Asian (89.31%,  $p < 0.05$ ) and Hispanic (77.73%,  $p < 0.05$ ) respondents have higher mammogram usage than their heterosexual peers (78.54% and 74.42%,  $p < 0.001$ , respectively). Heterosexual urban residents have higher mammogram usage within the past two years (77.35%,  $p < 0.01$ ) than heterosexual rural counterparts (73.01%,  $p < 0.01$ ), while SM rural residents report slightly higher mammogram usage within the past two years (74.79%,

$p > 0.05$ ) compared to SM urban counterparts (73.57%,  $p > 0.05$ ), though these results are not statistically significant.

Across other sociodemographic and health-related characteristics within the total sample, SM people report lower mammogram usage within the past two years than heterosexual people among the insured, those with greater than “some college” education, those aged 50-59 years and between 65-74 years, those with incomes between \$25–99,000, those with “excellent” and “very good” health, and those who received a routine check-up within the past year or greater than two years ago. More specifically, among those with insurance coverage, approximately 75% ( $p < 0.05$ ) of SM respondents report receiving a mammogram within the past two years, compared to almost 79% ( $p < 0.001$ ) of heterosexual respondents. Interestingly, among the uninsured, SM respondents report much higher mammogram usage (48.07%,  $p < 0.05$ ) than heterosexual peers (33.42%,  $p < 0.001$ ). Across all state environments SM respondents with “some college” education have lower mammogram usage than other education groups ( $p > 0.05$ ). There is a stark difference in mammogram usage within the past two years between SM and heterosexual respondents among those with the lowest educational attainment. Specifically, among those with less than a high school education, approximately 82% ( $p < 0.01$ ) of SM people report receiving a mammogram within the past two years compared to approximately 63% of heterosexual people ( $p < 0.001$ ). Respondents with incomes \$200,000 and greater have the highest mammogram usage across all other income groups ( $p < 0.001$ ), and within this higher income grouping, close to 90% of SM respondents ( $p > 0.05$ ) report receiving a mammogram within the past two years compared to approximately 86% heterosexual counterparts ( $p < 0.001$ ). Yet within incomes \$25-99,000, SM people report much lower mammogram usage within the past two years ( $p > 0.05$ ) compared to

heterosexual respondents ( $p < 0.001$ ). Lastly, all SOGI groups who received a routine check-up within the past year report higher mammogram usage within the past two years than those who had received a routine check-up greater than one year ago or never received a check-up. Curiously, among those who had a routine check-up between one and two years ago, almost 64% of SM respondents report receiving a mammogram within the past two years ( $p < 0.001$ ) compared to approximately 61% of heterosexual respondents ( $p < 0.001$ ). Across all state environments, those with health insurance coverage, more education, higher incomes, and a routine check-up within the past year report much higher mammogram usage within the past two years ( $p < 0.001$ ). As described briefly above, this trend differs for SM respondents across all state environments by educational attainment and income.

*Mammogram usage by minoritized sexual orientation (SM), race and ethnicity, and cisheteropatriarchal environment*

Overall mammogram usage differs by minoritized sexual orientation, race and ethnicity and cisheteropatriarchal policy environment. SM respondents living in states with less cisheteropatriarchal environments have higher mammogram usage than SM respondents in more cisheteropatriarchal environments among NH white, NH Black, and Hispanic racial and ethnic groups. SM NH white, Black, Asian, and AIAN, Native Hawaiian or other Pacific Islander, and multi-racial respondents within states with less cisheteropatriarchal policies report lower mammogram usage within the past two years ( $p < 0.01$ ) than heterosexual peers ( $p < 0.001$ ), while Hispanic respondents report higher mammogram usage ( $p < 0.01$ ) than heterosexual peers ( $p < 0.001$ ) (Table 22). Within states with fewer cisheteropatriarchal policies, NH AIAN, Native Hawaiian or other Pacific Islander, and multi-racial SM groups ( $n=48$ ) have the lowest



mammogram usage among all racial and ethnic SM groups, with approximately 38% of them reporting receiving a mammogram within the past two years ( $p < 0.01$ ) (Table 22). Within states with more cisheteropatriarchal policies (Table 21), SM NH white and Black respondents report lower mammogram usage within the past two years ( $p > 0.05$ ) than their heterosexual counterparts ( $p < 0.001$ ), while SM NH Asian and NH AIAN, Native Hawaiian or other Pacific Islander, and multi-racial groups, and SM Hispanic respondents report higher mammogram usage within the past two years ( $p > 0.05$ ) compared to heterosexual counterparts ( $p < 0.001$ ).

*Mammogram usage by minoritized sexual orientation (SM), rurality, and cisheteropatriarchal environment*

Mammogram usage within the past two years is documented by minoritized sexual orientation (SM) and rurality within these state policy environments. Urban residents living in less cisheteropatriarchal states report much higher mammogram usage than rural residents (78.31% vs. 69.12%,  $p < 0.001$ , Table 22). Yet while overall mammogram usage within the past two years is highest for urban residents in less cisheteropatriarchal states compared to overall mammogram usage in both urban and rural settings within more cisheteropatriarchal states, there are differences in mammogram usage depending on the SOGI of residents. SM urban residents report lower mammogram usage ( $p > 0.05$ ) than heterosexual counterparts ( $p < 0.001$ ), and much less than the overall mammogram usage for all urban residents within less cisheteropatriarchal states ( $p < 0.001$ ). Further, rural SM residents in less cisheteropatriarchal states report lower mammogram usage than SM urban peers (57.72% vs. 72.89%,  $p > 0.05$ , Table 22). This is in contrast with SM rural residents in more cisheteropatriarchal states, who have higher

mammogram usage within the past two years (81.44%) than SM urban residents (74.14%) and heterosexual rural (74.84%) and urban (76.49%) residents ( $p>0.05$ ).

*Mammogram usage across minoritized sexual orientation (SM), sociodemographic and health-related characteristics and cisheteropatriarchal environment*

Lastly, for those with minoritized sexual orientations, I review sociodemographic and health-related characteristics by cisheteropatriarchal environment. SM insured respondents across these state environments report lower mammogram usage within the past two years than heterosexual counterparts and the average ( $p>0.05$ ). SM residents living in more cisheteropatriarchal environments report higher mammogram usage across all educational groups except those with high school level education than SM residents in less cisheteropatriarchal states ( $p>0.05$ ). SM people living in more cisheteropatriarchal environments report higher mammogram usage across those with incomes between \$35-99,000 compared to SM people living in less cisheteropatriarchal environments ( $p>0.05$ ). Conversely, SM people with incomes between \$35-99,000 have higher mammogram usage within less cisheteropatriarchal states compared to SM people of that same income residing in more cisheteropatriarchal states ( $p>0.05$ ). Within more cisheteropatriarchal states SM people with incomes between \$35-49,000 have the lowest mammogram usage compared to other income groups, while SM people with incomes between \$25-34,000 in less cisheteropatriarchal states have the lowest mammogram usage of all income groups ( $p>0.05$ ). In more cisheteropatriarchal states SM respondents with “very good” health report the lowest mammogram usage compared to other health status groups. Further, SM respondents with “very good” health in more cisheteropatriarchal states report lower mammogram usage within the past two years (64.57% and 66.31%,  $p>0.05$ ) than SM

respondents with “very good” health in less cisheteropatriarchal states (78.97%,  $p < 0.05$ , and 74.43%,  $p > 0.05$ ). SM respondents with “fair/poor” health living in less cisheteropatriarchal states report the lowest mammogram usage among those with “fair/poor” health (60.44%,  $p < 0.05$ ).

#### *Mammogram usage by minoritized gender identity (GM)*

Those with minoritized gender identities are less likely to report receiving a mammogram within the past two years compared to their cisgender counterparts (62.40% vs. 76.94%,  $p < 0.05$ , Table 19). Because the sample size for GM respondents across all states is small ( $n=72$ ), it is difficult to examine mammogram usage for GM respondents and also compare with cisgender respondents ( $n=36,769$ ). However, there are statistically significant results for GM respondents by length of time since the last routine check-up. As noted above, all SOGI groups who received a routine check-up within the past year report higher mammogram usage within the past two years than those who had received a routine check-up greater than one year ago or never received a check-up. Approximately 56% of GM within this group report receiving a mammogram within the past two years ( $p < 0.01$ , Table 19).

#### *Mammogram usage by minoritized gender identities (GM), race and ethnicity, and cisheteropatriarchal environment*

GM respondents report lower mammogram usage within less cisheteropatriarchal state environments than within more cisheteropatriarchal environments (53.00% vs. 71.04%  $p > 0.05$ ). The sample size for GM respondents living in states with less cisheteropatriarchal environments ( $n=43$ ) and living in states with more cisheteropatriarchal environments ( $n=29$ ) limits

conclusions about mammogram usage by GM, race and ethnicity, and cisheteropatriarchal environment.

*Mammogram usage by minoritized gender identities (GM), rurality, and cisheteropatriarchal environment*

While the small sample sizes also limit conclusions about mammogram usage about GM, rurality, and cisheteropatriarchal environment, there are statistically significant findings for GM respondents living in more cisheteropatriarchal states. Within more cisheteropatriarchal states, GM rural residents report higher mammogram usage within the past two years ( $p < 0.05$ ) than their cisgender rural peers ( $p > 0.05$ ) as well as GM urban residents ( $p < 0.05$ ). Notably, GM rural residents have statistically significant higher mammogram usage than all other SOGI groups and across rural and urban settings. Within more cisheteropatriarchal states mammogram usage for urban residents differs slightly, with the exception of GM urban residents, who have much lower mammogram usage than other urban residents ( $p < 0.05$ ). GM urban residents report lower mammogram usage within the past two years ( $p > 0.05$ ) than cisgender urban counterparts ( $p < 0.001$ ), and much less than the overall mammogram usage for all urban residents within less cisheteropatriarchal states ( $p < 0.001$ ).

*Mammogram usage across minoritized gender identities (GM), sociodemographic and health-related characteristics and cisheteropatriarchal environment*

Despite small sample sizes for GM respondents, there are statistically significant findings for GM respondents living in more cisheteropatriarchal states across health-related characteristics. Curiously, GM respondents with “very good” health living in more cisheteropatriarchal states report the highest mammogram usage (92.21%,  $p < 0.05$ ) compared to

all other SOGI and health status groups across all state environments. GM respondents with “fair/poor” health living in states with more cisheteropatriarchal policies report the lowest mammogram usage among those with “fair/poor” health (66.19%,  $p<0.05$ ).

*Mammogram usage by minoritized sexual orientation and/or gender identity (SGM)*

Lastly, I examine mammogram usage among those with minoritized sexual orientations and/or gender identities (SGM) across race and ethnicity in the sample (Table 19). Respondents grouped as SGM are less likely than their cisgender and heterosexual (cishet) counterparts to receive a mammogram within the past two years (73.43% vs. 77.05%,  $p>0.05$ ). SGM NH Asian (87.34%,  $p<0.05$ ) and Hispanic (76.47%,  $p<0.05$ ) respondents report higher mammogram usage than their cishet counterparts (78.64% and 74.49%,  $p<0.001$ ), while SGM NH white (71.97%,  $p<0.05$ ), NH Black (83.51%,  $p<0.05$ ), and NH AIAN, Native Hawaiian or other Pacific Islander, and multi-racial (52.03%,  $p<0.05$ ) respondents have lower mammogram usage within the past two years than their cishet NH white (76.60%,  $p<0.001$ ), NH Black (85.12%,  $p<0.001$ ), and NH AIAN, Native Hawaiian or other Pacific Islander, and multi-racial (61.96%,  $p<0.001$ ) counterparts.

As highlighted above, across all state environments, those with health insurance coverage, higher education, and a routine check-up within the past year report much higher mammogram usage within the past two years ( $p<0.001$ ). More specifically, among those with insurance coverage, approximately 75% of the SGM group (74.80%,  $p<0.05$ ) report receiving a mammogram within the past two years compared to almost 79% of the cishet group (78.58%,  $p<0.001$ ). Interestingly, among the uninsured, SGM respondents report much higher mammogram usage (47.56%,  $p<0.05$ ) than cishet peers (33.44%,  $p<0.001$ ). The trend described

above differs for SGM respondents across all state environments by educational attainment ( $p < 0.01$ ). Across all state environments SGM respondents with “some college” education have lower mammogram usage than other education groups ( $p < 0.01$ ). There is a large difference in mammogram usage within the past two years between SGM and cishet respondents among those with less educational attainment. Specifically, among those with less than a high school education, approximately 82% of the SGM group reports receiving a mammogram within the past two years ( $p < 0.01$ ) compared to approximately 63% of the cishet group ( $p < 0.001$ ). As noted above, all SOGI groups who received a routine check-up within the past year report higher mammogram usage within the past two years than those who had received a routine check-up greater than one year ago or never received a check-up. Among those who had a routine check-up between one and two years ago, almost 64% of SGM respondents report receiving a mammogram within the past two years ( $p < 0.001$ ) compared to approximately 61% of cishet respondents ( $p < 0.001$ ).

*Mammogram usage by minoritized sexual orientation and gender identity (SGM), race and ethnicity, and cisheteropatriarchal environment*

Overall mammogram usage differs by minoritized sexual orientation and gender identity (SGM), race and ethnicity and cisheteropatriarchal policy environment. Within states with more cisheteropatriarchal policies (Table 21), SGM NH white and Black respondents report lower mammogram usage within the past two years ( $p > 0.05$ ) than their cishet counterparts ( $p < 0.001$ ), while SGM NH Asian and NH AIAN, Native Hawaiian or other Pacific Islander, and multi-racial groups report higher mammogram usage within the past two years ( $p > 0.05$ ) compared to cishet respondents ( $p < 0.001$ ). SGM NH white and Black respondents within states with less

cisheteropatriarchal policies also report lower mammogram usage within the past two years ( $p < 0.01$ ) than cishet peers ( $p < 0.001$ ), yet SGM NH Asian and AIAN, Native Hawaiian or other Pacific Islander, and multi-racial respondents also report lower mammogram usage ( $p < 0.01$ ) than cishet peers ( $p < 0.001$ ) (Table 22). SGM Hispanic respondents residing in less cisheteropatriarchal states have statistically significant higher odds of receiving a mammogram within the past two years than NH white cishet respondents (Table 24).

*Mammogram usage by minoritized sexual orientation and gender identity (SGM), rurality, and cisheteropatriarchal environment*

Mammogram usage within the past two years is documented by minoritized sexual orientation and gender identity (SGM) and rurality within these state policy environments. There are differences in mammogram usage depending on the SOGI of residents, though these differences are not statistically significant for the SGM group. Within more cisheteropatriarchal states, SGM rural residents report higher mammogram usage within the past two years than their cishet rural peers as well as SGM urban residents ( $p > 0.05$ ). SGM urban residents report lower mammogram usage ( $p > 0.05$ ) than cishet urban counterparts ( $p < 0.001$ ), and much less than the overall mammogram usage for all urban residents within less cisheteropatriarchal states ( $p < 0.001$ ). Rural SGM residents in less cisheteropatriarchal states have less mammogram usage than SGM urban peers ( $p > 0.05$ ). This is in contrast with rural SGM residents in more cisheteropatriarchal states, who have higher mammogram usage than SGM urban residents.

*Mammogram usage across minoritized sexual orientation and gender identity (SGM), sociodemographic and health-related characteristics and cisheteropatriarchal environment*

There are statistically significant findings for SGM respondents living in less and more cisheteropatriarchal states across health-related characteristics, specifically length of time since last routine check-up. SGM respondents living in less cisheteropatriarchal state environments report lower mammogram usage within the past two years than their SGM peers in more cisheteropatriarchal state environments among those who received a routine check-up within the past year (78.34% vs. 81.88%,  $p < 0.001$ ). Among those who received a routine check-up within the past year living in more cisheteropatriarchal state environments, SGM residents report slightly higher mammogram usage within the past two years than cishet residents (81.88% vs. 81.65%,  $p < 0.001$ , Table 21). Within more cisheteropatriarchal states SGM residents also report higher mammogram usage within the past two years than cishet residents among those who received a routine check-up within the past two years. However, among those who received a routine check-up more than two years but less than five years ago within more cisheteropatriarchal state environments, SGM residents have lower mammogram usage within the past two years than cishet residents (20.24% vs. 25.27%,  $p < 0.001$ , Table 21). This trend is also apparent for SGM and cishet residents living in less cisheteropatriarchal states (14.81% vs. 38.12%,  $p < 0.001$ , Table 22). Further, among those who have had a routine check-up within the past two years residing in more cisheteropatriarchal states, SGM respondents have much lower odds of receiving a mammogram within the past two years compared to their cishet counterparts (AOR: 0.24,  $p < 0.01$ , Table 23).

*Mammogram usage by heterosexual orientation and cisgender identity and cisheteropatriarchal environment*



While not the sole focus of this paper, it is important to examine the impacts of cisheteropatriarchy on heterosexual, cisgender, and cishet people's mammogram usage. Heterosexual, cisgender, and cishet insured respondents in states with less cisheteropatriarchal environments report slightly higher mammogram usage within the past two years than heterosexual, cisgender, and cishet insured counterparts in more cisheteropatriarchal environments ( $p < 0.001$ ). Across NH white, Black, Asian, and AIAN, Native Hawaiian or other Pacific Islander, and multi-racial people, heterosexual, cisgender, and cishet people have higher rates of mammography in less cisheteropatriarchal states. Heterosexual, cisgender, and cishet rural residents in less cisheteropatriarchal states have lower mammogram usage within the past two years compared to their rural counterparts in more cisheteropatriarchal states, while heterosexual, cisgender, and cishet urban residents in less cisheteropatriarchal states have higher mammogram usage within the past two years compared to their urban counterparts in more cisheteropatriarchal states. Heterosexual, cisgender, and cishet urban residents across all state environments have higher mammogram usage within the past two years compared to rural counterparts. Across all state environments, those with health insurance coverage, higher education, higher incomes, "very good" health status, and a routine check-up within the past year report much higher mammogram usage within the past two years ( $p < 0.001$ ). This trend is similar for all heterosexual, cisgender, and cishet groups across all state environments ( $p < 0.001$ ). Lastly, heterosexual, cisgender, and cishet people in less cisheteropatriarchal states are more likely to report receiving a mammogram within the past two years across all health coverage groups, those with "high school or less" educations and college degrees, those aged 50-54 and between 60-69 years, incomes less than \$15,000, between \$25-34,000, and between \$50-199,000, those

with “excellent,” “very good,” and “fair/poor” health, and all routine check-up groups. Another way to phrase this is that heterosexual, cisgender, and cishet people in more cisheteropatriarchal states have higher mammogram usage among those with some college, ages 55-59 and 70-74 years, incomes between \$15-24,000 and greater than \$200,000, or “good” health.

### Discussion

These findings offer novel insights into preventive health services usage at the intersections of sexual orientation and gender identity, race and ethnicity, and rurality, as well as other sociodemographic and health-related characteristics, and have important implications for how systems of oppression, specifically cisheteropatriarchy, codified through policies and socioeconomic, political, and cultural constructs, influence breast/chest cancer screening. Across all states included in the sample, SM, GM, and SGM people have lower mammogram usage within the past two years compared to their heterosexual, cisgender, and cishet counterparts. While the results show that SM, GM, and SGM people within less cisheteropatriarchal states have lower mammogram usage overall than SM, GM, and SGM people in more cisheteropatriarchal states, these findings are tempered by racial and ethnic differences in mammogram usage within the past two years. SM respondents living in states with less cisheteropatriarchal policies have higher mammogram usage than SM respondents in more cisheteropatriarchal environments across all racial and ethnic groups except for NH AIAN, Native Hawaiian or other Pacific Islander, and multi-racial respondents, and Asian respondents. A possible explanation for these findings may be that the sample sizes for these racial and ethnic groups within more cisheteropatriarchal state environments are fairly small, with a total of 3 SM non-Hispanic Asian and 23 SM NH AIAN, Native Hawaiian or other Pacific Islander, and multi-race respondents

reporting receiving a mammogram within the past two years. The findings suggest that mammogram usage is higher for SM people within less cisheteropatriarchal states across NH white, Black, and Hispanic racial and ethnic groups compared to SM people living in more cisheteropatriarchal states. These differences by race and ethnicity and SGM positionality suggest a more thorough understanding of the impact of the intersections of structural racism<sup>19</sup> and cisheteropatriarchy on mammogram usage is needed.

As highlighted in the introduction, scholars who study multiple and overlapping forms of structural oppression characterize the generative nature of using an intersectionality approach to population health. The findings in this study suggest that more research is needed at the intersections of structural racism and cisheteropatriarchy and their influence on breast/chest cancer screening. The focus on the intersections of these forms of structural oppression is crucial—a structural intersectionality approach highlighting the intersections of structural racism and cisheteropatriarchy shifts attention from race and ethnicity, sexual orientation, and gender identity to the joint power structures and social contexts responsible for generating and maintaining health inequities. Those marginalized both by structural racism and cisheteropatriarchy have different experiences of accessing breast/chest cancer screening than those not living at the intersections of those power structures. As noted by Homan et al. (2021), a challenge for intersectionality researchers is to connect macro-level inequalities to individual

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<sup>19</sup> 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).

health and well-being; thus more research is needed to disentangle how racist and cisheteropatriarchal power relations structure breast/chest cancer screening access.

Next, findings focused on cisheteropatriarchal policy environment and rurality suggest that although less cisheteropatriarchal states have the highest mammogram usage within the past two years for urban residents, there is a sizable gap in mammogram usage between urban and rural settings for all people of all sexual orientations and gender identities. Further, SOGI and rurality matter differently for those living in less cisheteropatriarchal states compared with those living in more cisheteropatriarchal states. SM, GM, and SGM rural residents in more cisheteropatriarchal states have higher mammogram usage than their SM, GM, and SGM rural and urban counterparts in less cisheteropatriarchal states as well as heterosexual, cisgender, and cishet rural and urban counterparts in more cisheteropatriarchal states. Yet, the significantly lower mammogram usage reported by GM urban residents compared to other SOGI groups within more cisheteropatriarchal states suggests that the state policy environment may impact people with minoritized gender identities quite differently. These findings suggest that more research is needed to understand how cisheteropatriarchy effects mammogram usage at the intersection of rurality and SOGI. As noted in Chapter 3, scholars have noted that rural culture is often associated with heteronormativity and traditional conservative values (Barefoot et al., 2015; Snively et al., 2004). Given this restrictive culture, rural residents may be less likely to identify as SGM altogether, suggesting cultural change is needed for us to fully understand SGM rural residents' breast/chest cancer screening access. Additionally, future research could, for

example, assess how both structural urbanism<sup>20</sup> and cisheteropatriarchy interact to produce gaps in preventive services like mammogram screening for marginalized populations.

Similarly, the intersection of education, income, and general health status seems to matter more for SM, GM, and SGM people across all state policy environments than their heterosexual, cisgender, and cishet counterparts. While heterosexual, cisgender, and cishet respondents followed the overall trend of higher mammogram usage among more education, income, and health status, SM, GM, and SGM people differ notably in their mammogram usage at these intersections. Mammogram usage is lower for SM and SGM groups with middle incomes in more cisheteropatriarchal states, while it is lower for lower income SM and SGM groups in less cisheteropatriarchal states. This may suggest that in states with more cisheteropatriarchal policies a middle income does not necessarily mitigate the impact of occupying a minoritized SOGI positionality on mammogram usage. Further, mammogram usage differs according to minoritized SOGI status among those with “fair/poor” health across the different state environments. As mentioned in the results, SM respondents with “fair/poor” health living in less cisheteropatriarchal states report the lowest mammogram usage within the past two years among those with “fair/poor” health, while GM respondents with “fair/poor” health living in states with more cisheteropatriarchal policies report the lowest mammogram usage within the past two years among those with “fair/poor” health.

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<sup>20</sup> 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).

These results also suggest that whether a state's environment is more or less cisheteropatriarchal matters for heterosexual, cisgender, and cishet people too. Amongst almost all racial and ethnic groups, educational attainments, health statuses, and all insurance statuses, heterosexual, cisgender, and cishet people report higher usage in less cisheteropatriarchal states compared to more cisheteropatriarchal states. Yet those with incomes \$200,000 or greater within more cisheteropatriarchal states have higher mammogram usage compared to those with the same income in less cisheteropatriarchal states, suggesting that very high income is important for mammogram usage in more cisheteropatriarchal states. The rural/urban divide in mammogram usage is also apparent all across state environments for heterosexual, cisgender, and cishet people, with urban people more likely to report receiving a mammogram within the past two years. Even more, heterosexual, cisgender, and cishet urban residents in less cisheteropatriarchal states are more likely to receive a mammogram within the past two years compared to their urban peers in more cisheteropatriarchal states. These findings may be indicative of how a less cisheteropatriarchal environment may prove beneficial for those already accorded more power and resources by sexual orientation and gender identity and place of residence.

Another potential policy explanation for the increase in uptake of mammography in recent years may be Medicaid expansion. Research on Medicaid expansion and mammogram usage have found that mammogram rates among 50-74 years old women from lower-income households are higher in states with expanded Medicaid coverage compared with non-expansion states (Toyoda et al., 2020). Key findings indicate that SGM people are less likely to be privately insured and more likely to have Medicaid coverage than non-SGM counterparts (Dawson et al., 2023). States that have adopted and implemented Medicaid expansion in this paper's sample

after 2019 but before 2022 include Missouri (2021), Utah (2020), and Virginia (2019). Missouri and Virginia both saw increased mammogram uptake between 2020-2022 compared to 2017-2019. More research examining the impact of Medicaid expansion on SGM populations' mammogram usage across time and space is needed. Notably, Kansas and Texas, both categorized as more cisheteropatriarchal in this sample, have increased mammogram uptake from 2020-2022 compared to 2017-2019 but have not adopted Medicaid expansion. This suggests that the higher rates in those states may be due to other factors. Some states in the sample, for example, may have dropped COVID-19 restrictions sooner than other states and have higher mammogram rates than those who continued with COVID-19 restrictions within the 2020-2022 time frame. Thus more research is needed to understand what factors may be driving mammogram usage for SGM populations in more cisheteropatriarchal states that have not adopted Medicaid expansion. Indeed, as some researchers have pointed out, more granular, demographic-level analyses should be conducted when comparing state-level cancer prevention outcomes (Eom et al., 2023).

This research has several limitations that future research may be better positioned to address. First, this study uses cross-sectional BRFSS data spanning one year. Scholars have noted that this limits our ability to assess trends and examine causal effects of sexual orientation and gender- related state laws on SGM health (Agénor et al., 2022). Future research should use longitudinal study designs to better assess how structural cisheteropatriarchy impacts mammogram screening over time. Second, as noted for the mammogram usage measure, mammogram usage is only collected for those assigned female at birth, so our knowledge of mammogram usage for those assigned male at birth, such as cisgender men and transgender

male-to-female, is limited. As all genders are at risk of breast/chest cancer, these are important groups to examine in future research on mammogram usage. Lastly, the sample is limited to states who participated in collecting SOGI information in an optional module in 2022. This means that there are twenty states for whom we do not have data on mammogram usage across SOGI, including states like Florida and Tennessee, which have proposed sweeping anti-LGBTQ+ legislation in the past few years. Inclusion of these states in future BRFSS research is necessary to have a fuller understanding of how cisheteropatriarchy may impact mammogram usage across all SOGI groups, but especially for SGM populations, who bear a disproportionate amount of the cancer burden. Further, because of the limited SOGI data, this BRFSS data may not be fully representative of the population. With this in mind, however, researchers should use caution when grouping the data of those with minoritized sexual orientations and gender identities together—while there are commonalities in preventive health services usage and access across SGM populations, experiences of oppression, including of cisheteropatriarchy, vary widely at these intersections.

### Conclusion

The results discussed in this study have important implications for understanding how cisheteropatriarchy is constructed and its impact on mammogram usage across the intersections of those with diverse sexual orientations, gender identities, racial and ethnic identities, and geographic locations. Those minoritized by sexual orientation and gender identity have lower mammogram usage than those who are heterosexual and/or cisgender. Intersecting racial and ethnic identity and rurality as well as cisheteropatriarchal environment also matter for mammogram usage. Future research should continue to refine this composite measure of



structural cisheteropatriarchy to be in tune with the socioeconomic, legal, political, and cultural dimensions of oppression. With the previous discussion and limitations in mind, future research should explore mammogram usage among and within SGM populations across expanded units of time and space to assess the complicated relationship between mammogram usage and cisheteropatriarchy.

## **Chapter 5. Conclusion**

The aim of this research is to augment research on structural cisheteropatriarchy and its influence on mammogram usage for SGM populations. It contributes to our current epistemological approaches and knowledge in several ways: first, it prioritizes SGM populations within health services research and urges researchers to incorporate and conceptualize sociological theoretical constructions of gender, sex, and sexuality, specifically those voiced by SGM people. The measurements of sexual orientation and gender identity should continue to be shifted such that they reflect the cultural and geographic language used by SGM people. These measurements should also be included in surveys focused on health services usage and access in order to more fully serve SGM communities. Additionally, the findings from this research reflect the need to examine within-group differences among SGM communities and at the intersections of other positionalities, especially those, like race and ethnicity and rurality, that have already marked health inequities. Alleviation of these health inequities, specifically those in mammogram usage, are best approached through a queer and structural intersectionality lens.

Second, this research points to the necessity of examining multiple forms of structural oppression as a mechanism impacting preventive health services, including breast/chest cancer screening. Structural cisheteropatriarchy, the mechanism of oppression detailed in this research, is an important determinant of health and healthcare access. The findings in this research indicate that the relationship between structural cisheteropatriarchy and mammogram usage is incredibly complex and impacts those at the intersections of sexual orientation, gender identity, race and ethnicity, and rurality differently. Health services researchers should continue to refine the measurement of structural cisheteropatriarchy and its association with preventive health services.

In addition, health services researchers should examine the intersections of structural cisheteropatriarchy with other forms of oppression, including structural racism and urbanism, which are also important determinants of health and healthcare access.

Lastly, it is critical that researchers actively engage with critical social theories, including queer theory and intersectionality, and research among the SGM communities to inform work on structural oppression. The findings on mammogram usage from this research need to be contextualized and informed directly by SGM people. Through SGM community- based and generated research expanded across time and space, future researchers may be better positioned to alleviate the disproportionate cancer burden among SGM populations by identifying the structural mechanisms that animate breast/cancer screening usage and access.

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## Appendices

### 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 (%)		
<b>Race and ethnicity and rurality</b>			
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 (%)					
<b>Total</b>	63,517	3,209 (4.87%)	1,063 (1.54%)	1,353 (2.11%)	793 (1.22%)	60,308 (95.13%)
<b>Race and ethnicity</b>						
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%)*
<b>Rurality</b>						
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%)
<b>Insurance Coverage</b>						
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%)*
<b>Education</b>						
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%)**
<b>Income</b>						
<\$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%)**
<b>Age (years)</b>						
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%)**
<b>General Health Status</b>						
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%)* **
<b>Length of Time Since Last Routine Check-Up</b>						
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
	<b>n (%)</b>					
<b>Total</b>	47,086 (71.99%)	2,095 (64.09%)* **	774 (71.74%)* **	828 (60.05%)* **	493 (61.39%)* **	44,991 (72.39%)* **
<b>Race and ethnicity</b>						
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%)* **
<b>Rurality</b>						
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%)
<b>Insurance Coverage</b>						
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%)* **
<b>Education</b>						
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%)* **
<b>Income</b>						
<\$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%)*
<b>Age (years)</b>						
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%)*
<b>General health status</b>						
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%)*
<b>Length of Time Since Last Routine Check-Up</b>						
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)										
<b>Characteristics</b>												
<b>Rurality (ref: urban)</b>												
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)
<b>Race and ethnicity (ref: Non-Hispanic white)</b>												
NH Black	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)
NH 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)
NH 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)

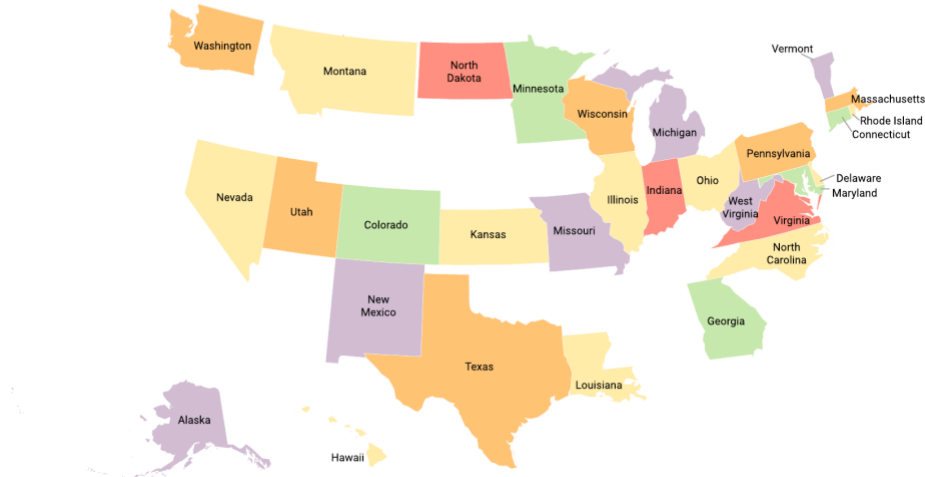
<b>Insurance coverage (ref: no insurance coverage)</b>												
Yes, coverage	2.15** *	(1.58,2.93)	1.60	(0.82,3.13)	1.07	(0.37,3.10)	3.56**	(1.34,9.42)	1.25	(0.37,4.22)	2.18** *	(1.57,3.02)
<b>Education (ref: less than high school)</b>												
High school graduate	0.98	(0.74,1.31)	0.89	(0.39,2.07)	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)
<b>Age in years (ref: 40-49)</b>												
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)
<b>Income (ref: &lt;\$15,000)</b>												
\$15-24,000	1.23	(0.95,1.60)	0.88	(0.40,1.91)	0.77	(0.27,2.19)	1.80	(0.64,5.04)	0.45	(0.15,1.32)	1.27	(0.96,1.67)
\$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)
<b>General health status (ref: excellent)</b>												
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)
<b>Length of time since last routine check-up (ref: within the past year)</b>												
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)

Supplemental figure 1. U.S. states that collected sexual orientation and gender identity (SOGI) for 2022 BRFSS Survey

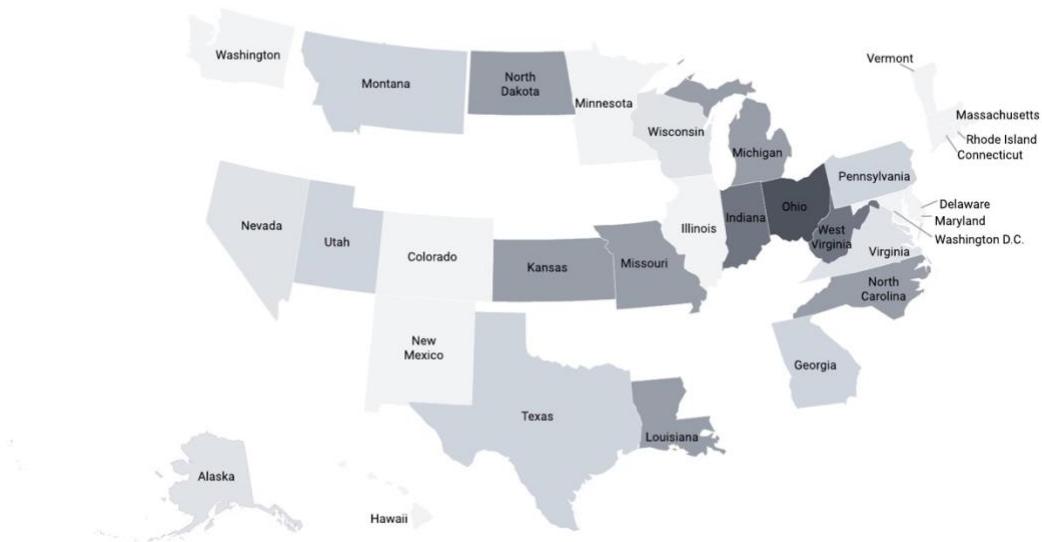
**U.S. States That Collected Sexual Orientation and Gender Identity (SOGI) for 2022 BRFSS Survey**



Supplemental figure 2. Map of U.S. states within the 2022 BRFSS sample according to structural cisheteropatriarchy index score

Note: Darker shades of grey indicate a higher score

**Structural Cisheteropatriarchy Map of the U.S.**



Supplemental figure 3. Map of U.S. states within the 2022 BRFSS sample according to structural cisheteropatriarchy index dichotomized score

Note: Darker grey indicates states that have a more cisheteropatriarchal environment than the national average

**Structural Cisheteropatriarchy Map of the U.S.**

