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ORIGINAL ARTICLE

Mammography screening and risk factor prevalence by sexual identity: A comparison of two national surveys

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Abstract

Background: Emerging research suggests that lesbian, gay, bisexual, and queer (LGBQ) women face barriers to breast cancer screening. The authors sought to quantify sexual identity disparities in mammography screening, health care access, and lifestyle-related risk factors using two national surveys.

Methods: Data from the 2018, 2019, and 2021 National Health Interview Survey (NHIS) and the 2018, 2020, and 2022 Behavioral Risk Factor Surveillance System (BRFSS) survey were analyzed. The authors performed meta-analyses to determine the relative risks (RRs) of self-reported, up-to-date mammography for women identifying as LGBQ versus those identifying as straight. Differences in health care access and lifestyle-related breast cancer risk factors were also assessed by sexual identity.

Results: LGBQ women reported lower up-to-date mammography (pooled RR [pRR], 0.95; 95% confidence interval [CI], 0.92–0.98) versus straight women, driven by differences among bisexual/queer women (pRR, 0.91; 95% CI, 0.87–0.95) and those entering screen-eligibility at ages 40–49 years (pRR, 0.86; 95% CI, 0.80–0.91) and

50–59 years (pRR, 0.93; 95% CI, 0.88–0.98). LGBQ women were more likely than straight women to be uninsured (BRFSS survey [8.6%; 95% CI, 6.5%–11.2%] vs. NHIS [5.1%; 95% CI, 4.8%–5.4%]) and to experience financial barriers to care (BRFSS survey [13.8%; 95% CI, 11.6%–16.3%] vs. NHIS [8.9%; 8.5%–9.2%]). Lifestyle-related breast cancer risk factors were more common among LGBQ women versus straight women, including current smoking (BRFSS survey [19.0%; 17.1%–21.2%] vs. NHIS [13.9%; 13.6%–14.3%]).

Conclusions: LGBQ women were more likely than straight women to be exposed to breast cancer risk factors, which were compounded by lower screening and facing health care access barriers. It is crucial to identify interventions for screening and risk reduction that are accessible and effective for LGBQ women, particularly bisexual/queer women and those aging into screen-eligibility.

KEYWORDS
breast cancer, cancer screening, health disparities, mammography, sexual identity

INTRODUCTION

Screening mammography can reduce mortality from breast cancer by detecting disease at an earlier stage.[1] Overall, breast cancer screening rates in the United States are close to the 80% Healthy People 2030 goal,[2] but there are still groups for whom screening rates are below targets.[3] This includes women who identify as lesbian, gay, bisexual, or queer (LGBQ), who studies suggest may have lower mammography screening rates than their straight counterparts.[4–6] Some evidence suggests that lower screening, particularly in the context of an increased prevalence of lifestyle-related risk factors for breast cancer, may lead to later diagnosis and higher breast cancer mortality among LGBQ women.[7–9]

Lower mammography use in LGBQ women is not fully understood. Numerous studies indicate that LGBQ women encounter barriers in accessing health care, including lower rates of health insurance coverage[10–12] and lower use of preventive services.[13,14] Several studies have suggested lower mammogram use for LGBQ women overall, but less is known about how this varies by age or race/ethnicity and when LGBQ subgroups are disaggregated from one another (e.g., lesbian/gay from bisexual/queer). Some studies suggest that bisexual/queer women, but not lesbian/gay women, have lower rates of mammography screening compared with straight women; however, there are variations in these patterns by data source and across race and ethnicity.[4,6,15]

Along with differences in care access, higher prevalence of known lifestyle-related breast cancer risk factors, including smoking,[16] alcohol consumption,[17] and obesity,[18] may further exacerbate differences in breast cancer outcomes among LGBQ women. A 2007 study used data from the Nurses' Health Study and a predictive model informed by key risk factors for straight and LGBQ women and found an increased predicted risk of breast cancer for both lesbian/gay and bisexual/queer respondents compared with straight repondents.[19] Contextualizing these risk profiles in the landscape of differential care access and screening use is important for fully understanding the implications of these patterns for improving breast cancer screening rates and reducing mortality.

In the current study, we sought to better inform interventions to improve access to breast cancer screening and reduce the mortality of breast cancer in an underserved population by synthesizing evidence from multiple sources. We evaluated differences in mammography screening rates, barriers to preventive care access, and the prevalence of available lifestyle-related breast cancer risk factors in LGBQ versus straight women across two large national surveys in the United States.

MATERIALS AND METHODS

Data sources

We analyzed the National Health Interview Survey (NHIS) and the Behavioral Risk Factor Surveillance System (BRFSS) survey, both of which are ongoing, cross-sectional, nationally representative surveys in the United States. We used the most recent survey periods that included modules for breast cancer screening (NHIS: 2018, 2019 and 2021; BRFSS survey: 2018, 2020, and 2022) to ensure comparability. Details of the survey design and sampling strategies of the NHIS and BRFSS surveys are described in respective documentation[20–25] and are briefly summarized below.

National Health Interview Survey

The NHIS is a face-to-face household interview survey conducted annually and continuously throughout the year by the National Center for Health Statistics. Incorporating a multistage sampling design, the NHIS collects random samples of civilian noninstitutionalized households in the United States from 50 states and the District of Columbia, and all household members are asked about basic health

and demographic information. In 2018, 2019, and 2021, the final response rates were 53.1%, 59.1%, and 50.9%, for final samples of 25,417, 31,997, and 29,482 adults, respectively.[20–22]

Behavioral Risk Factor Surveillance System survey

The BRFSS survey is a random-digit–dialed telephone survey conducted annually by state and territorial health departments with assistance provided by the National Center for Chronic Disease Prevention and Health Promotion. It surveys civilian noninstitutionalized US adults (aged 18 years and older) across all 50 states, the District of Columbia, Puerto Rico, Guam, and the US Virgin Islands. One adult from each randomly selected household is asked about their health-related risk behaviors, chronic health conditions, and use of preventive services. In 2018, 2020, and 2022, the median combined landline and cell phone response rates were 49.9% (range, 38.8%–67.2%), 47.9% (34.5%–67.2%), and 45.1% (22.8%–66.8%), respectively. The sexual orientation and gender identity module was included in 30 states in 2018 (total sample size in these states, 127,988), 32 states in 2020 (total sample size, 130,078), and 34 states in 2022 (total sample size, 139,630).[23–25]

Measures

Outcome variable: Mammography/up-to-date mammography

The primary outcome was self-reported receipt of screening mammography, including: (1) having ever received and (2) being up to date with a mammogram according to the 2016 US Preventive Services Task Force (USPSTF) guidelines.[26] Variables on screening modality (*Have you ever had a mammogram?*) and time since last screening (*How long since your last mammogram?*) were combined to assess the up-to-date mammography, which was defined as receiving a mammogram within the prior 24 months for women aged 50–74 years.[26] Although most recent USPSTF recommendations suggest starting screening at age 40 years, recommendations during the period of data collection were equivocal on screening between ages 40 and 49 years, suggesting individual patient preferences and risk guide decisions on starting age. We included an analysis on screening in women ages 40–49 years as a sensitivity analysis.

Independent variable: Sexual identity

Both surveys included four mutually exclusive options: *gay or lesbian*, *straight*, *bisexual*, and *something else*. A binary indicator of identifying as LGBQ was created by combining *gay or lesbian*, *bisexual*, and *something else*, and comparing to those identified as *straight*. We further stratified analyses among lesbian/gay and bisexual/something else (which we refer to here using the umbrella term *queer*.)[27] to explore differences across these groups. The BRFSS survey separately assessed sexual orientation and gender identity, but the NHIS only asked a single binary sex question (*Are you male or female?*). For comparability across surveys, we restricted the BRFSS survey to cisgendered women, excluding 329 screen-eligible transgender or nonbinary individuals (0.2%), and we restricted the NHIS to female-identified respondents.

Covariates

Available demographic variables were the same in all years of BRFSS data but changed across years of the NHIS. Where available, we included age, race, ethnicity, education (except for 2018 NHIS, which only asked the highest level of education among all family members), geographic region, marital status, employment status, and household income (except the 2018 and 2021 NHIS). Multiple dimensions of health care access were measured in the analysis, including having any insurance (also private or public insurance for the NHIS), reporting a regular source of care, reporting a past-year wellness visit (except the 2018 NHIS), and reporting any past-year difficulty paying for care (except the 2018 NHIS). We also examined key lifestyle-related risk factors associated with breast cancer, including body mass index, tobacco smoking, physical activity (defined as having done any exercise in the last 30 days), and alcohol consumption (measured as both *heavy drinking* and *binge drinking* (except in the 2019 and 2021 NHIS). As noted below, the 2018 NHIS was not included in the multiple regression analysis because there were uncollected data for several key covariates, but we included these data in other analysis to increase statistical power in summary estimates and incorporate data on alcohol use. A summary of questions and operationalization of all variables in the two surveys are included in Table S1.

Statistical analysis

The primary analysis included women who were age-eligible for breast cancer screening according to 2016 USPSTF guidelines (aged 50–74 years). We compared the distribution of demographic variables and lifestyle-related risk factors between LGBQ and straight respondents within each survey. Weighted rates and unweighted frequencies were reported, alongside 95% confidence intervals (95% CIs) for lifestyle-related risk factors and the likelihood of mammography. Subgroup analyses were performed to examine variations in mammography screening rates among different LGBQ populations, including by age group, race and ethnicity, and separately for lesbian/gay and bisexual/queer respondents.

Poisson regressions were used to estimate the relative risks (RRs) and 95% CIs of ever and up-to-date mammography between LGBQ and straight women, including after adjusting for age differences.[28] A two-stage, individual participant data, random-effect meta-analysis was then applied to obtain the pooled RRs (pRRs) of ever and up-to-date mammography.[29] We used Poisson regressions to identity factors associated with up-to-date mammography

specifically in LGBQ women. To understand the up-to-date mammography screening patterns of LGBQ women with a higher prevalence of lifestyle-relayed breast cancer risk factors or health care access hardships, we incorporated both sets of variables into the regression analysis, as well as an indicator for sexual identity (bisexual/queer vs. lesbian/gay). Because the 2018 NHIS was missing several key variables, the multiple regression was only conducted using 2019 and 2021 NHIS data. Missing responses for all covariates were retained as an indicator in the models.

R (version 4.3.2; R Foundation for Statistical Computing) was used for data analysis. All estimates incorporated survey strata, cluster, and weight using the R package *survey*,[30] and the individual participant data meta-analysis was performed using the package *metafor*.[31]

RESULTS

Sample characteristics

In both surveys, respondents who refused to disclose or did not know either their sexual identity or their history of mammogram use (4.0% in the NHIS and 7.6% in the BRFSS survey) were excluded from the sample for analysis. After these exclusions, compared with the BRFSS survey, the NHIS included a smaller unweighted sample of screen-eligible respondents (19,198 vs. 184,816, respectively; Table 1) while representing a larger weighted sample (47,011,935 vs. 26,677,190, respectively). The average age of both samples was similar (NHIS vs. BRFSS, 61.3 vs. 61.4 years). The proportion of individuals identifying as LGBQ was slightly lower in the NHIS sample than in the BRFSS sample (427 [2.0%] vs. 6584 [3.4%], respectively). In both surveys, women identifying as LGBQ were slightly younger than those identifying as straight (NHIS: 59.4 years [95% CI, 58.7–60.1 years] vs. 61.3 years [95% CI, 61.2–61.4 years]; BRFSS: 60.4 years [95% CI, 59.5–60.8 years] vs. 61.4 years [95% CI, 61.3–61.5 years]). Women identifying as LGBQ were less likely to be married or cohabitating (NHIS, 54.0% vs. 64.9%; BRFSS, 50.7% vs. 61.4%), a difference that was greater for lesbian/gay women versus bisexual/queer women (see Table S2). In the BRFSS, women identifying as LGBQ were more likely to report lower household incomes, with 35.1% earning <$35,000 compared with 25.9% among straight women. This percentage was higher among bisexual/queer women than among lesbian/gay women (40.1% vs. 25.6%). In the NHIS, bisexual/queer women were less likely to report earning >$75,000 (36.8%) compared with straight women (41.8%) and lesbian/gay women (51.4%; Table 1; see Table S2).

Mammography screening

The percentage of LGBQ women who were up to date with mammography was 73.7% (95% CI, 68.2%–78.5%) in the NHIS and 73.0% (95% CI, 70.4%–75.4%) in the BRFSS survey compared with 75.4% (95% CI, 74.6%–76.2%) and 77.5% (95% CI, 77.0%–78.0%), respectively, for straight women (Table 2; see Table S3). Overall, LGBQ women were slightly less likely to be up to date with mammography than straight women (pRR, 0.95; 95% CI, 0.92–0.98; Figure 1). However, this difference was statistically significant only in the BRFSS (RR, 0.94; 95% CI, 0.91–0.98). Among routine screening ages, differences were greatest for those aged 50–59 years (pRR, 0.93; 95% CI, 0.88-0.98). In sensitivity analysis, compared with those aged 40–49 years, the observed gap for LGBQ women versus straight women was even greater (pRR, 0.86; 95% CI, 0.80–0.91).

The observed differences in up-to-date mammography remained after adjusting for age, but there were notable differences when further stratified by sexual identity (Figure 1). Bisexual/queer women were 9% less likely to be up to date with mammography than straight women (pRR, 0.91; 95% CI, 0.87–0.95), whereas no strong difference was observed between lesbian/gay women and straight women (pRR, 1.02; 95% CI, 0.98–1.05). Stratification by race and ethnicity indicated significantly lower up-to-date mammography among LGBQ non-White women (including Hispanic women) versus straight non-White women (pRR, 0.92; 95% CI, 0.84–1.00), but not among LGBQ Hispanic women versus straight Hispanic women (pRR, 0.98; 95% CI, 0.89–1.08).

In addition, although we observed a small but statistically significant difference between LGBQ women and straight women in having ever received a mammogram in the BRFSS survey (pRR, 0.97; 95% CI, 0.95–0.99; Figure S1), this was not observed in the NHIS (pRR, 1.00; 95% CI, 0.98–1.03) or when the results were pooled (pRR, 0.98; 95% CI, 0.96–1.01).

Health care access

Although the NHIS did not show major differences in health care access measures between LGBQ and straight women, the BRFSS survey indicated that those identifying as bisexual or queer experienced more barriers to health care access compared with straight women (Table 2; see Table S4). In the BRFSS survey, LGBQ women were more likely to report being uninsured (8.6%; 95% CI, 6.5%–11.2%), with bisexual or queer women twice as likely to be uninsured (10.7%; 95% CI, 7.8%–14.5%) as straight women (5.1%; 95% CI, 4.8%–5.4%), and with no difference for lesbian/gay women compared with straight women (4.5%; 95% CI, 2.9%–7.0%). LGBQ women were more likely to report a lack of regular source of care (10.2% [95% CI, 8.7%–12.0%] vs. 7.7% [95% CI, 7.4%–8.1%]) and delayed care because of cost concerns (13.8% [95% CI, 11.6%–16.3%] vs. 8.9% [95% CI, 8.5%–9.2%]) compared with straight women. Bisexual or queer women were nearly twice as likely to delay care because of cost compared with straight women (16.4%; 95% CI, 13.3%–19.9%), whereas lesbian/gay women had a likelihood similar to that of straight women (8.9%; 95% CI, 6.9%–11.5%).

Lifestyle-related breast cancer risk factors

Lifestyle-related breast cancer risk factors were more prevalent among LGBQ women than among straight women (Table 2; see

TABLE 1 Population characteristics by survey.

	Weighted % (unweighted no.)			
	NHIS: 2018, 2019, 2021		BRFSS survey: 2018, 2020, 2022	
Characteristic	Straight	LGBQ	Straight	LGBQ
Total	98.0 (18,771)	2.0 (427)	96.6 (178,232)	3.4 (6584)
Estimated no.	46,091,764	920,171	25,776,971	900,219
Age: Weighted mean [95% CI], years	61.3 [61.2–61.4]	59.4 [58.7–60.1]	61.4 [61.3–61.5]	60.4 [59.5–60.8]
Age group, years				
50–59	42.7 (7017)	54.9 (203)	41.9 (62,610)	48.9 (2804)
60–69	54.9 (8163)	35.9 (168)	41.2 (78,898)	36.6 (2697)
70–74	15.9 (3591)	9.2 (56)	16.9 (36,724)	14.5 (1083)
Race				
White	77.5 (14,789)	82.5 (357)	77.1 (147,381)	73.3 (5272)
Black/African American	11.6 (2223)	6.7 (30)	12.8 (14,915)	12.8 (488)
Asian only	0.9 (153)	0.5 (2)	2.9 (3574)	3.4 (129)
AI/AN only	5.3 (810)	1.8 (6)	1.3 (2742)	1.8 (129)
Others	1.7 (330)	4.3 (21)	3.6 (6336)	5.5 (367)
Missing	3.1 (466)	4.2 (11)	2.4 (3284)	3.2 (199)
Ethnicity				
Hispanic	11.8 (1801)	12.7 (41)	8.9 (7820)	12.3 (414)
Non-Hispanic	88.2 (16,970)	87.3 (386)	90.2 (169,099)	86.6 (6,096)
Missing	0.0 (0)	0.0 (0)	0.8 (1313)	1.1 (74)
Geographic region				
Northeast	18.8 (3223)	24.0 (107)	17.9 (36,174)	20.0 (1657)
South	37.8 (6964)	31.1 (125)	37.8 (52,556)	36.9 (1611)
Midwest	21.3 (4212)	15.2 (62)	28.4 (50,999)	27.0 (1734)
West	22.2 (4372)	29.7 (133)	15.8 (37,267)	16.0 (1521)
Missing	0.0 (0)	0.0 (0)	0.1 (1236)	0.1 (61)
Education[a]				
<High school	10.3 (1103)	7.8 (15)	9.7 (8455)	14.5 (443)
High school/GED	26.7 (3280)	16.6 (46)	26.1 (42,883)	21.1 (1317)
Some college/associate's degree	30.0 (4136)	31.1 (87)	33.2 (52,558)	30.9 (1675)
>College graduate	32.5 (4713)	42.9 (153)	30.8 (73,934)	33.3 (3129)
Missing	0.5 (46)	1.6 (3)	0.3 (402)	0.1 (20)
Marital status				
Married/cohabitating	64.9 (9828)	54.0 (175)	61.4 (102,999)	50.7 (3221)
Divorced/separated/widowed	27.9 (7184)	27.0 (143)	30.3 (60,262)	31.4 (2059)
Never married	6.9 (1705)	19.0 (109)	7.5 (13,876)	16.9 (1223)
Missing	0.2 (54)	0.0 (0)	0.7 (1095)	1.0 (81)
Employment status				
Employed	49.6 (8889)	54.9 (226)	62.4 (113,961)	63.8 (4117)
Unemployed	50.2 (9849)	44.6 (199)	37.0 (63,196)	35.1 (2413)
Missing	0.2 (33)	0.5 (2)	0.7 (1075)	1.1 (54)

(Continues)

TABLE 1 (Continued)

	Weighted % (unweighted no.)			
	NHIS: 2018, 2019, 2021		BRFSS survey: 2018, 2020, 2022	
Characteristic	Straight	LGBQ	Straight	LGBQ
Household income[b]				
<$35,000	26.9 (2192)	24.0 (40)	25.9 (46,519)	35.1 (2148)
$35,000 to <$75,000	31.3 (2137)	32.4 (40)	24.2 (46,029)	20.9 (1529)
≥$75,000	41.8 (2576)	43.6 (47)	31.0 (53,968)	27.0 (1927)
Missing	0.0 (0)	0.0 (0)	18.8 (31,716)	17.0 (980)

Abbreviations: AI/AN, American Indian/Alaska Native; BRFSS, Behavioral Risk Factor Surveillance System; CI, confidence interval; GED, General Education Degree; LGBQ, lesbian, gay, bisexual or queer; NHIS, National Health Interview Survey.

[a]NHIS data include 2019 and 2021 only (straight, $n = 13{,}278$; LGBQ, $n = 304$).

[b]NHIS data include 2019 only (straight, $n = 6905$; LGBQ, $n = 127$).

Table S4). Both NHIS and BRFSS survey responses indicated that current smoking was more prevalent among LGBQ women compared with straight women (LGBQ women: NHIS [20.3%, 95% CI, 16.2%–25.1%] vs. BRFSS survey [13.1%; 95% CI, 2.5%–13.8%]; straight women: BRFSS survey [19.0%; 95% CI, 17.1%–21.2%] vs. NHIS [13.9%; 95% CI, 13.6%–14.3%]). Data on body mass index and alcohol use varied by survey, with larger and generally statistically significant differences seen among BRFSS respondents. Notably, in the BRFSS survey, LGBQ women versus straight women were more likely to engage in both binge drinking (10.9% [95% CI, 9.3%–12.7%] vs. 7.3% [95% CI, 7.0%–7.5%], respectively) and heavy drinking (7.7% [95% CI, 6.5%–9.0%] vs. 5.7% [95% CI, 5.5%–6.0%], respectively; Table 2). When further disaggregating according to sexual identity, both lesbian/gay women (12.6%; 95% CI, 10.0%–15.6%) and bisexual/queer women (10.0%; 95% CI, 8.1%–12.4%) were more likely to engage in binge drinking than straight women (7.3%; 95% CI, 7.0%–7.5%); and lesbian/gay women were more likely to engage in heavy drinking compared with straight women (10.2% [95% CI, 7.9%–12.9%] vs. 5.7% [95% CI, 5.5%–6.0%], respectively; see Table S4).

Association of sexual identity, access measures, and lifestyle-related risk factors with up-to-date mammography for LGBQ women

We explored lifestyle-related breast cancer risk factors and access measures that potentially could affect the rates of up-to-date mammography among LGBQ women (Table 3). In the univariate analysis, the only statistically significant predictor in the NHIS was receiving a wellness visit in the past 12 months (NHIS: RR, 1.56; 95% CI, 1.13–2.17). In contrast, sexual identity as well as access and risk factors were associated with up-to-date mammography in univariate analysis for the BRFSS survey. Lower rates of up-to-date mammography were observed among women identifying as bisexual or queer (vs. lesbian or gay; RR, 0.89; 95% CI, 0.84–0.95), uninsured women (RR, 0.71; 95% CI, 0.53–0.94), those who reported the lack of a regular source of care (RR, 0.57; 95% CI, 0.46–0.71), those who reported no past-year wellness visit (RR, 0.52; 95% CI, 0.44–0.62), those who reported difficulty paying for care (RR, 0.73; 95% CI, 0.61–0.87), current smokers (vs. never smokers: RR, 0.82; 95% CI, 0.74–0.91), those who reported a lack of physical exercise (RR, 0.89; 95% CI, 0.83–0.96), and younger LGBQ individuals (aged 50–59 vs. 70–74 years: RR, 0.82; 95% CI, 0.74–0.91).

In models that included both health care access measures and lifestyle-related risk factors (Table 3), we observed that identifying as bisexual or queer, reporting a regular source of care, receiving a past-year wellness visit, experiencing difficulties paying for care, and reporting as a current smoker remained significant in the BRFSS survey with similar magnitude. In both data sources, a past-year wellness visit remained a strong predictor of up-to-date mammography using either data source in fully adjusted models (NHIS: RR, 1.57 [95% CI, 1.11–2.22]; BRFSS: RR, 1.65 [95% CI, 1.38–1.96]).

DISCUSSION

By using two large nationally representative surveys, we identified a small but persistent disparity in up-to-date mammography screening among LGBQ women compared with straight women, with larger disparities observed in younger age groups and for bisexual or queer women. We also observed differences in lifestyle-related factors that may elevate LGBQ women's risks of developing breast cancer. LGBQ women were more likely to be current smokers, engage in binge or heavy drinking, and have obesity. Our findings further revealed significant disparities in health care access among LGBQ women, especially bisexual or queer women. LGBQ women were more likely to report facing barriers to care, several of which were significantly associated with up-to-date mammography in regression models.

Prior work has generally demonstrated lower screening in LGBQ women, but the results have been mixed and vary across racial and ethnic groups and screening guidelines used.[4,6,15] Extending these studies, the current study was strengthened by incorporating data from both the NHIS and the BRFSS survey, allowing us to pool results from both surveys, thereby increasing statistical power to examine differences within and between surveys. Importantly, we demonstrated that the magnitude of sexual identity disparities varied by age.

TABLE 2 Prevalence of health care access and lifestyle-related breast cancer risk factors, by sexual identity and survey.

	Percentage (95% CI)			
	NHIS: 2018, 2019, 2021		BRFSS survey: 2018, 2020, 2022	
Risk factor	Straight, *n* = 18,771	LGBQ, *n* = 427	Straight, *n* = 178,232	LGBQ, *n* = 6584
Ever screened mammography	94.9 (94.4–95.3)	94.9 (91.9–96.8)	96.1 (95.9–96.3)	93.3 (90.9–95.0)
Up to date mammography	75.4 (74.6–76.2)	73.7 (68.2–78.5)	77.5 (77.0–78.0)	73.0 (70.4–75.4)
Insurance status[a]				
Uninsured	6.0 (5.5–6.6)	6.5 (3.5–11.8)	5.1 (4.8–5.4)	8.6 (6.5–11.2)
Public	26.5 (25.5–27.4)	28.2 (22.2–35.0)	—	—
Private	61.8 (60.7–62.9)	58.9 (51.9–65.5)	—	—
Other coverage	5.5 (5.1–6.1)	6.5 (3.7–11.2)	—	—
Missing	0.2 (0.1–0.3)	0.0 (0)	—	—
Regular source of care				
No	4.1 (2.8–4.5)	3.3 (1.8–6.0)	7.3 (7.0–7.6)	9.3 (7.8–11.0)
Past-year wellness visit[a]				
No	13.7 (13.0–14.4)	14.9 (10.2–21.1)	14.0 (13.6–14.5)	14.6 (12.8–16.7)
Difficulty paying for care[a]				
Yes	9.6 (9.1–10.3)	10.6 (7.0–15.7)	8.9 (8.5–9.2)	13.8 (11.6–16.3)
BMI, kg/m^2				
<18, underweight	1.6 (1.4–1.8)	1.4 (0.6–3.6)	1.8 (1.6–1.9)	3.3 (2.2–4.8)
≥18.5 to <25, normal	31.3 (30.4–32.3)	28.2 (23.3–33.8)	30.3 (29.8–30.8)	28.8 (25.9–31.8)
≥25 to <30, overweight	29.2 (28.5–30.1)	29.9 (25.0–35.4)	31.5 (30.9–32.0)	28.2 (25.2–31.4)
≥30, obese	33.3 (32.4–34.2)	38.4 (32.8–44.3)	36.5 (35.9–37.1)	39.6 (36.8–42.5)
Missing	0.4 (0.4–0.5)	2.0 (1.0–4.0)	—	—
Alcohol consumption[b]				
Binge drinking	7.0 (6.2–7.8)	6.8 (2.7–16.1)	7.3 (7.0–7.5)	10.9 (9.3–12.7)
Heavy drinking	5.7 (5.0–6.4)	9.6 (4.8–18.3)	5.7 (5.5–6.0)	7.7 (6.5–9.0)
Cigarette smoking status				
Current	13.1 (2.5–13.8)	20.3 (16.2–25.1)	13.9 (13.6–14.3)	19.0 (17.1–21.2)
Former	24.6 (23.8–25.5)	33.6 (28.3–39.5)	27.3 (26.8–27.8)	28.7 (26.5–31.0)
Never	61.2 (61.1–63.1)	46.0 (40.3–51.9)	58.4 (57.9–58.9)	52.1 (49.3–54.9)
Missing	0.1 (0.1–0.2)	0.0 (0–0)	0.0 (0.0–0.1)	0.1 (0.0–0.1)
Physical exercise				
No	—	—	27.4 (26.9–27.9)	29.7 (27.4–32.2)

Abbreviations: BMI, body mass index; BRFSS, Behavioral Risk Factor Surveillance System; CI, confidence interval; LGBQ, lesbian, gay, bisexual or queer; NHIS, National Health Interview Survey.

[a]NHIS data include 2019 and 2021 only (straight, *n* = 13,278; LGBQ, *n* = 304).

[b]NHIS data include 2018 (straight, *n* = 5,493; LGBQ, *n* = 123). Binge drinking was defined as having four or more drinks per occasion. Heavy drinking was defined as having eight or more drinks per week.

Not only were the up-to-date mammography screening rates the lowest for women aged 50–59 years of age, but the magnitude of disparities was also the highest at this age group. When analyzing the subset of women aged 40–49 years, we observed even lower overall screening rates and larger disparities in both ever and up-to-date mammography. Because the USPSTF recently published their updated guidelines to recommend screening initiation at age 40 years, it is important to understand the barriers of up-to-date mammography at younger ages and continue to monitor disparities in screening initiation.[32]

Even when accounting for their younger average age, we found that LGBQ disparities in up-to-date mammography were driven by a

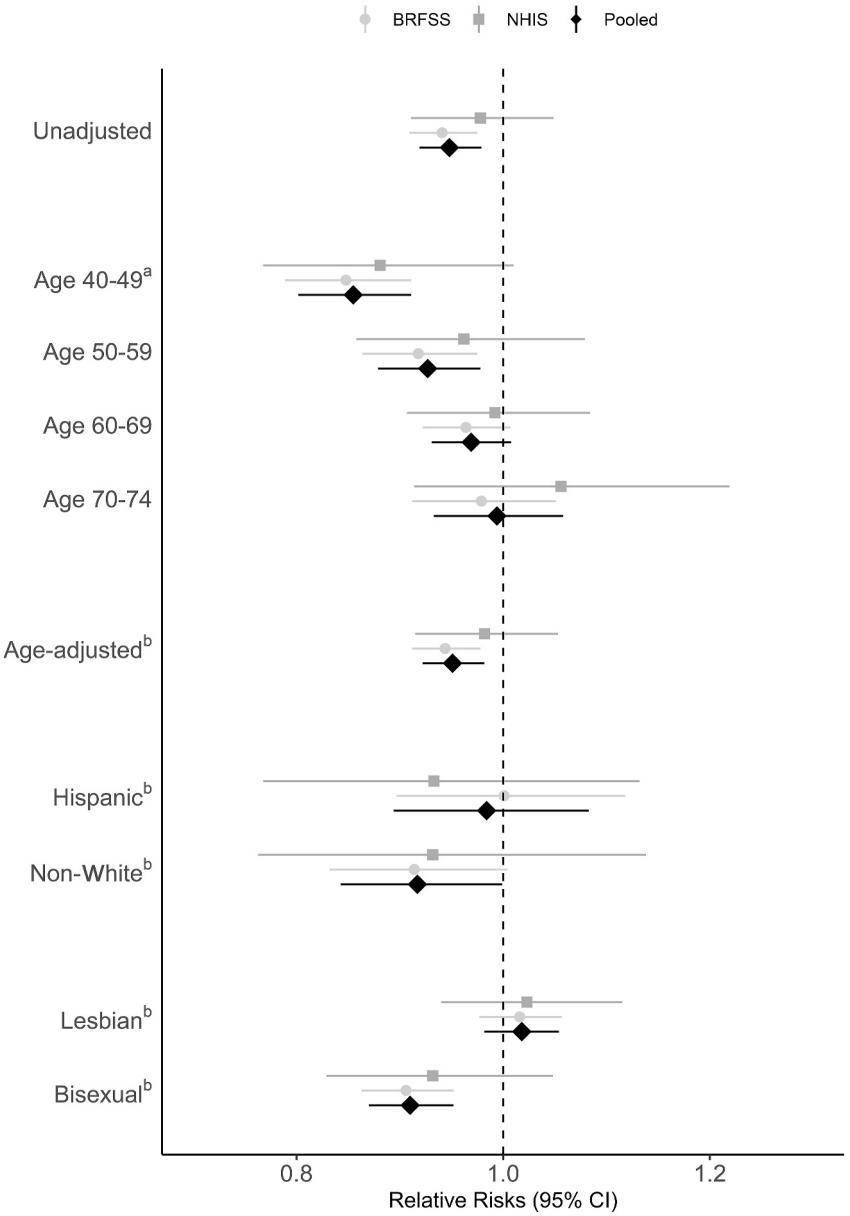

FIGURE 1 Relative risks of up-to-date mammography screening LGBQ versus straight, across two national surveys. Data from NHIS 2018, 2019, and 2021 (straight, $n = 19{,}198$; lesbian/gay, $n = 241$, n bisexual/queer, $n = 186$); and BRFSS 2018, 2020, and 2022 (straight, $n = 184{,}816$; lesbian/gay, $n = 2473$; bisexual/queer, $n = 4111$). [a]Women aged 40–49 years were not included in the unadjusted or age-adjusted estimates (NHIS: straight, $n = 6207$; LGBQ, $n = 250$; BRFSS: straight, $n = 45{,}478$; LGBQ, $n = 2982$). [b]Estimates were adjusted for categorical age (groups aged 50–59, 60–69, and 70–74 years). BRFSS indicates Behavioral Risk Factor Surveillance System survey; CI, confidence interval; LGBQ, lesbian, gay, bisexual, queer; NHIS, National Health Interview Survey.

significant disparity for bisexual or queer women compared with straight women. Lesbian/gay women had no difference in screening use compared with straight women. This mirrors the findings of several other studies that have compared differences within sexual identity groups.[6,11] Within the context of both lower care access and higher prevalence of lifestyle-related breast cancer risk factors, bisexual or queer women are an important priority population for breast cancer prevention and early detection interventions.

We observed a substantial relation between health care access and mammography screening adherence. Those with health insurance, a place to go for care, and a past-year wellness visit were all more likely to be up to date with screening. Health care barriers faced by the LGBQ population are well documented and persistent.[5,33–35] In further stratification, we found bisexual/queer women, but not lesbian/gay women, were more likely to experience health care access hardships, including higher rates of uninsurance, being less likely to report a regular source of care, and more challenges affording care, compared with straight women. This disparity may stem from socioeconomic disadvantage because our study aligns with others demonstrating that bisexual/queer women reported lower household incomes.[36–38] Bisexual or queer women reported health care access hardships that were significantly associated with

TABLE 3 Association of sexual identity, lifestyle-related risk factors, and access measures to up-to-date mammography for lesbian, gay, bisexual, or queer women by survey.

	RR (95% CI)			
	NHIS: 2019, 2021		BRFSS survey: 2018, 2020, 2022	
Variable	Univariate, $n = 301$	Adjusted, $n = 301$	Univariate, $n = 5977$	Adjusted, $n = 5977$
Sexual identity				
Lesbian/gay	Ref	Ref	Ref	Ref
Bisexual/queer	0.98 (0.84–1.14)	1.01 (0.87–1.18)	0.89 (0.84–0.95)[a]	0.93 (0.88–0.99)[a]
Age, years				
70–74	Ref	Ref	Ref	Ref
60–69	1.04 (0.84–1.29)	1.07 (0.86–1.32)	0.97 (0.89–1.05)	1.03 (0.96–1.11)
50–59	0.98 (0.78–1.23)	1.02 (0.81–1.29)	0.89 (0.81–0.98)[a]	0.98 (0.91–1.05)
Insurance status				
Private	Ref, private	Ref, private	Ref, any	Ref, any
Uninsured	0.64 (0.32–1.27)	0.52 (0.31–1.07)	0.71 (0.53–0.94)[a]	0.78 (0.55–1.11)
Public	0.90 (0.75–1.08)	0.88 (0.73–1.07)	—	—
Others	0.96 (0.73–1.26)	0.96 (0.72–1.28)	—	—
Regular source of care				
No: Ref, yes	0.83 (0.42–1.64)	0.93 (0.57–1.51)	0.57 (0.46–0.71)[a]	0.73 (0.59–0.91)[a]
Past-year wellness visit				
No: Ref, yes	0.64 (0.46–0.89)[a]	0.64 (0.45–0.90)[a]	0.52 (0.44–0.62)[a]	0.61 (0.51–0.72)[a]
Difficulty paying for care				
Yes: Ref, no	1.01 (0.80–1.29)	1.27 (1.01–1.59)[a]	0.73 (0.61–0.87)[a]	0.83 (0.70–0.98)[a]
BMI, kg/m^2				
≥18.5 to <25	Ref	Ref	Ref	Ref
≥30	0.99 (0.82–1.20)	1.02 (0.85–1.22)	1.05 (0.95–1.15)	1.04 (0.96–1.12)
≥25 to <30	1.00 (0.83–1.22)	1.02 (0.86–1.20)	1.07 (0.98–1.17)	1.06 (0.98–1.13)
<18	0.74 (0.25–2.16)	0.74 (0.30–1.80)	1.00 (0.81–1.24)	1.15 (0.86–1.56)
Cigarette smoking status				
Never	Ref	Ref	Ref	Ref
Former	1.12 (0.96–1.31)	1.10 (0.93–1.28)	0.95 (0.89–1.03)	0.93 (0.87–0.99)[a]
Current	0.94 (0.74–1.19)	0.96 (0.76–1.22)	0.82 (0.74–0.91)[a]	0.85 (0.78–0.93)[a]
Binge drinking[b]				
Yes: Ref, no	0.70 (0.28–1.76)	—	0.96 (0.86-1.07)	1.06 (0.95-1.19)
Heavy drinking[b]				
Yes: Ref, no	0.90 (0.50–1.60)	—	0.92 (0.82–1.04)	0.93 (0.82–1.05)
Physical exercise				
No: Ref, yes	—	—	0.89 (0.83–0.96)[a]	0.90 (0.84–0.97)[a]

Note: Models were adjusted for "Missing" factors, but only explainable factors were included here.

Abbreviations: BMI, body mass index; BRFSS, Behavioral Risk Factor Surveillance System; CI, confidence interval; LGBQ, lesbian, gay, bisexual or queer; NHIS, National Health Interview Survey; Ref, reference category; RR, relative risk.

[a]These values indicate that the effects are statistically significant from zero at the 95% confidence level.

[b]Univariate regression models for binge and heavy drinking only used 2018 NHIS data ($n = 121$).

the receipt of up-to-date screening, underscoring the need to improve access to high-quality care as a necessary step toward improving mammography screening rates.[39–41]

Similar to previous studies, our findings have also indicated substantially higher likelihoods of cigarette smoking and heavy drinking behaviors (defined as having eight or more drinks per week) among LGBQ women.[42–44] Studies demonstrate that even small amounts of regular alcohol consumption can increase the risk of breast cancer.[45,46] Therefore, assessing alcohol intake among LGBQ women and providing support for those who wish to reduce their drinking are crucial for addressing breast cancer. Tobacco use is another key risk factor for breast cancer, including both current and former active smoking.[47–49] Although lesbian or gay women did not have differential screening use compared with straight women, their higher prevalence of multiple lifestyle-related risk factors merits further attention.

When comparing findings from the NHIS and the BRFSS survey, although the magnitude of screening disparities was similar across both surveys, NHIS estimates were not statistically significant in subgroup analyses or regression models. However, differences in care access variables that generally were large and significant in the BRFSS survey were smaller or nonexistent in the NHIS. This inconsistency may be attributed to the relatively small sample of LGBQ women in the NHIS screening-eligible cohort or variations in survey design and data collection mechanisms.[50] Researchers interested in addressing LGBQ health disparities must weigh the advantages and disadvantages of these data sources, including that the NHIS reflects a smaller total sample but that some BRFSS survey modules, including sexual identity, vary across states.

Several limitations of this study should be acknowledged when interpreting the findings. First, self-reported status on mammography screening, lifestyle-related risk factors, and health care access may introduce response and recall bias.[51] Second, we could not assess the effects of other important risk factors of breast cancer, including breast density, parity, and family history of breast cancer. Measures specific to LGBQ individuals, including experiences of discrimination in health care settings, would also be important for a more complete understanding of the barriers to care. Finally, because the NHIS did not distinguish sex and gender identity questions, we excluded transgender individuals from BRFSS data to obtain a more comparable estimate. Prior studies using BRFSS data indicated that transgender individuals have lower mammogram use than cisgender women,[52,53] underscoring the importance of collecting consistent and high-quality data on gender identity separately from sex assigned at birth to allow for the accurate assessment of screening needs in key populations.

CONCLUSIONS

Women identifying as LGBQ, particularly those who identify as bisexual or queer, have small but significant disparities in up-to-date mammography screening compared with straight women. LGBQ women also have a higher prevalence of lifestyle-related breast cancer risk factors and increased barriers to health care access. These results underscore the need for tailored interventions to improve mammography screening equity. These efforts may focus on improving accessibility to preventive services, such as annual wellness visits, which are particularly needed for bisexual or queer women, while also increasing attention on risk reduction, including interventions to address heavy drinking and tobacco use. Addressing these disparities requires future research on the underlying needs and perceptions of LGBQ women in mammography screening to ensure equitable health care access, close the gaps in screening utilization, and reduce breast cancer mortality.

AUTHOR CONTRIBUTIONS

Hanwen Zhang: Investigation; formal analysis; writing—review and editing; writing—original draft. **Brittany M. Charlton:** Conceptualization; writing—review and editing. **Phillip W. Schnarrs:** Conceptualization; writing—review and editing. **Amy Trentham-Dietz:** Conceptualization; writing—review and editing. **Felicitas Kuehne:** Conceptualization; writing—review and editing. **Uwe Siebert:** Conceptualization; writing—review and editing. **Navkiran K. Shokar:** Conceptualization; writing—review and editing. **Michael P. Pignone:** Conceptualization; writing—review and editing. **Jennifer C. Spencer:** Conceptualization; writing—original draft; writing—review and editing; funding acquisition; supervision.

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CONFLICT OF INTEREST STATEMENT

Felicitas Kuehne reports personal/consulting fees from Pfizer outside the submitted work. The remaining authors disclosed no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available from the US Centers for Disease Control and Prevention's National Health Interview Survey (https://www.cdc.gov/nchs/nhis/index.html) and Behavioral Risk Factor Surveillance System at https://www.cdc.gov/brfss/index.html.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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