

Differences in Health-Related Quality of Life and Health Behaviors Among Lesbian, Bisexual, and Heterosexual Women Surviving Cancer from the 2013 to 2018 National Health Interview Survey

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Abstract

Purpose: Health-related quality of life (HRQoL) and health behaviors contribute to cancer morbidity and mortality, which are elevated in lesbian and bisexual women (LBW). The purpose of this study was to assess differences in HRQoL and health behaviors between heterosexual and lesbian women and heterosexual and bisexual women cancer survivors.

Methods: We pooled 2013–2018 National Health Interview Survey data. HRQoL comprised physical, mental, financial, and social health domains. Health behaviors included tobacco and alcohol use, physical activity, and preventive health care. Weighted, multivariable logistic regression models estimated odds ratios (ORs) with 95% confidence intervals (CIs).

Results: The sample included 10,830 heterosexual, 141 lesbian, and 95 bisexual cancer survivors. Lesbian women reported higher odds of fair/poor self-rated health (OR: 1.68, 95% CI 1.02–2.78), chronic obstructive pulmonary disease (OR: 1.98, 95% CI 1.09–3.56), and heart conditions (OR: 1.90, 95% CI 1.16–3.12) than heterosexual women. Bisexual women reported higher odds of severe psychological distress (OR: 3.03, 95% CI 1.36–6.76), heart conditions (OR: 1.98, 95% CI 1.12–3.53), and food insecurity (OR: 2.89, 95% CI 1.29–6.50) than heterosexual women. For health behaviors, lesbian women reported greater odds of current (OR: 2.34, 95% CI 1.26–4.34) and former tobacco use (OR: 1.89, 95% CI 1.21–2.96), and bisexual women had lower odds of a recent mammogram (OR: 0.42, 95% CI 0.23–0.78) than heterosexual women.

Conclusions: LBW cancer survivors reported disparities in HRQoL and health behaviors. In cancer care settings, identification of LBW patients requiring physical and mental health promotion, financial services, and supported tobacco cessation may improve health and survival.

Keywords: bisexual women, cancer survivorship, health behaviors, health-related quality of life, lesbian women

Introduction

THE NUMBER OF cancer survivors in the United States is expected to increase from ~16.9 million in 2019 to over 22 million by 2030.¹ More women than men are diagnosed with and survive cancer annually.^{1,2} Population estimates indicate that self-identified lesbian and bisexual

women (LBW) are 40%–70% more likely than heterosexual women to be diagnosed with cancer,^{3,4} and a growing body of literature documents their experiences. Cancer survivors demonstrate negative long-term sequelae from diagnosis and treatment, including physical (e.g., pain, fatigue), psychological, (e.g., anxiety, depression, fear of recurrence), and social (e.g., financial changes, feelings of isolation)

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problems.⁵ Compared to heterosexual women, LBW in general demonstrate disparate health risks (e.g., psychological distress, chronic disease burden, and tobacco and alcohol use),^{4,6,7} and these may be exacerbated in cancer survivorship.

Health-related quality of life (HRQoL) is a multidimensional construct that measures patients' perceptions of the effect of illness and treatment on psychological, physical, financial, and social health domains.^{8–10} HRQoL is associated with morbidity and mortality during and after cancer treatment.^{11,12} Cancer survivors are twice as likely to report worse physical and mental HRQoL than adults without cancer¹³ due to physical health problems,^{13,14} psychological distress,^{14,15} financial hardship,¹⁶ and financial distress.¹⁷

No nationally representative studies have comprehensively investigated HRQoL in LBW surviving cancer, and results from convenience and regional studies are mixed. In a convenience sample of breast cancer survivors, Jabson et al. found no quality of life differences between heterosexual and lesbian women across physical, psychological, social, and spiritual domains.¹⁸ Yet, a study using state-level Behavioral Risk Factor Surveillance System data found that nonheterosexual, or sexual minority women (SMW), survivors with less health care access reported poorer physical and mental quality of life than heterosexual women.¹⁹ Other studies have demonstrated differences in specific components of HRQoL, including perceived stress²⁰ and self-reported health^{21,22}; however, no published studies have assessed differences in financial or social quality of life between heterosexual and LBW cancer survivors.

Health during cancer survivorship is conditional on maintaining a healthy weight and participating in healthy behaviors. In general, lesbian women have higher rates of obesity⁶ and LBW have higher rates of sedentary behavior,²³ which are risks for cancer²⁴ and medical comorbidities.²⁵ These disparate risks have not been demonstrated in cancer survivors.²⁶ Tobacco and risky alcohol use influence survival²⁵ and are widely seen in LBW,^{4,6} possibly explaining cancer disparities.²⁵ Two population-based studies demonstrate higher odds of tobacco use in both male and female sexual minority survivors,^{21,27} and an exploratory analysis suggested that LBW may be more likely to smoke during cancer survivorship.²⁷ Although heavy alcohol use is common in the general SMW population,^{4,6} differences have not been confirmed in the cancer setting.^{21,26} The goal of this study was to add to the literature describing LBW's health during cancer survivorship, using population-representative data from the National Health Interview Survey (NHIS) to examine disparities in HRQoL and health behaviors between heterosexual women and LBW survivors. We hypothesized that LBW would report poorer HRQoL and health behaviors than heterosexual women surviving cancer.

Methods

Data

We used pooled data (2013–2018) from the NHIS, which is an annual, nationally representative, household interview survey of the adult U.S. civilian noninstitutionalized population. The NHIS assesses demographic, psychosocial, and physical characteristics and health care utilization using a probability design that permits the representative sampling

of households and noninstitutional group quarters. Detailed information about the study design and sampling frame is described elsewhere.^{28,29} We restricted our sample to women who reported cancer diagnoses. Respondents were excluded if they did not answer the sexual identity item or responded as “something else” ($n=360$, 0.34%) or “don't know” ($n=712$, 0.68%). The final analytic sample included 11,066 women with cancer diagnoses. This study was a secondary analysis of deidentified publicly available data and was exempt from Institutional Review Board review at The Ohio State University.

Measures

Sexual orientation has been reported in the NHIS since 2013 using a single measure of self-reported sexual identity: “How do you think of yourself?” Responses to this question include: “lesbian or gay,” “straight, that is, not lesbian or gay,” “bisexual,” “something else,” and “I don't know the answer.” We investigated differences between lesbian or bisexual women and heterosexual women surviving cancer.

Health-related quality of life

We defined HRQoL using individual indices within physical health, mental health, financial wellness, and social wellness. Physical health comprised the following indices: Self-rated health was rated on a 5-point Likert scale (1 = Poor, 5 = Excellent). We dichotomized self-rated health per prior studies^{21,22} as poor health (self-reported fair or poor health) versus good health (self-reported good, very good, or excellent health). Body mass index (BMI) was evaluated using standard definitions: obese (BMI ≥ 30), overweight (25–29.9), and healthy (18.5–24.9 kg/m²). Respondents reported ever diagnosis of chronic health conditions: asthma, chronic obstructive pulmonary disease (COPD), diabetes, heart conditions, hypertension, and/or stroke. Physical disability was assessed with three questions: currently requiring routine assistance (yes/no), number of bed days in the past year (<5 vs. ≥ 5), and current inability to work due to health problem (yes/no).

We assessed two indices of mental health. Self-reported psychological distress was measured as per the Kessler 6 Psychological Distress Scale (range: 0–24).³⁰ Kessler 6 was developed to measure nonspecific psychological distress within the past 30 days.³¹ The scale demonstrates high internal consistency and reliability (Cronbach's alpha = 0.89).³¹ For this study, responses were categorized as severe (score ≥ 13), moderate (5–12), and low (<5).^{31,32} These cutoffs permit the identification of respondents with serious mental illness (scores ≥ 13), which is a diagnosable psychological, behavioral, or emotional disorder that results in serious functional impairment and limits major life activities (e.g., activities of daily living).^{31–33} Moderate psychological distress (scores 5–12) is associated with impaired functioning across work, social, familial, and physical ability domains and greater mental health service utilization in prior validation studies.³² Examining disparities in moderate and severe psychological distress allows identification of populations that may need targeted intervention. We also assessed current functional limitation due to mental health (yes/no).

Financial wellness included differences in worry about specific issues (yes/no), including monthly bills, housing payment, retirement, medical costs of illness/accident, and health care costs. Food security was assessed using the

U.S. Department of Agriculture's Household Food Security Survey Module over the past 30 days. Variables were recoded as food insecure (score ≥ 3) or food secure (≤ 2).³⁴ For sensitivity analyses, we recoded variables as severely food insecure (score ≥ 6) or food secure (≤ 5).³⁴ Two indices of social wellness assessed level of difficulty in participating in social activities and going out to events. Responses were originally rated on a 5-point Likert scale (0 = not at all difficult, 4 = can't do at all). We recoded responses as "none-to-minimal difficulty" (scores 0–1) versus "difficulty" (2–4) with social participation.

Health behaviors

Risk behaviors included cigarette smoking (current, former, or never smoker), smoking intensity (heavy: ≥ 20 , moderate: 10–19, and light: < 10 cigarettes/day), heavy alcohol drinking (≥ 8 drinks per week),²⁴ and binge drinking (≥ 4 drinks in one sitting).³⁵ Protective health behaviors included meeting minimum physical activity guidelines²⁴ and receipt of routine preventive health care, including past year receipt of Pap test, mammogram, obstetrics/gynecology visit, and ever receipt of human papillomavirus vaccination (yes/no).

Covariates

Covariates were selected *a priori* as potential confounders due to their associations with cancer risk and survival.³⁶ These included age, race/ethnicity, and socioeconomic status; education level and health insurance coverage were utilized as a proxy for socioeconomic status as per other studies.^{37–39} As cancer types have different treatments, risk factors, and effects on quality of life⁴⁰ and epidemiological studies indicate that LBW have greater risk for specific cancers,⁴¹ we included cancer site in multivariable analyses as reporting breast cancer only, gynecological cancer only (i.e., cervical, uterine, ovarian cancer), or other (including multiple) cancers.

Statistical analysis

We compared weighted differences in sociodemographic characteristics, HRQoL, and health behaviors between heterosexual and lesbian women and heterosexual and bisexual women cancer survivors using Rao-Scott chi-square test, a survey design-adjusted chi-square test. We reported results as weighted point estimates (percentages) with 95% confidence intervals (CIs) accompanied by test statistics and *p* values. We used binary and multinomial weighted logistic regression models to estimate odds ratios (ORs) and 95% CIs for the associations between sexual orientation and the aforementioned outcomes of interest (i.e., individual indices of HRQoL and health behaviors). In addition to including covariates that were identified *a priori*, all models were adjusted for survey year to account for unmeasured cohort effects.

We followed NHIS guidance on subsetted data analysis and variance estimation techniques for pooled analysis on combined years of data.²⁸ Sampling weights were readjusted by dividing the original weights by the number of years pooled. As our pooled data fell into two sample design periods (2006–2015, 2016–2018), we created new stratum indicators reflecting the unique sampling periods. All analyses were carried out using SAS version 9.4 (SAS Institute Inc., Cary, NC).

Results

Between 2013 and 2018, 100,568 adult females participated in the NHIS. The full sample included 97,909 heterosexual, 1424 lesbian, and 1235 bisexual women. Of this sample, 10,830 heterosexual, 141 lesbian, and 95 bisexual women reported at least one cancer diagnosis.

Demographic variables

Weighted sociodemographic comparisons indicated that the majority of our sample was non-Hispanic White (Table 1). Both LBW were younger ($p = 0.002$, $p < 0.001$) and had different marital statuses (both $p < 0.001$) than heterosexual women. Lesbian women were more educated ($p < 0.001$) and more likely to be employed ($p < 0.001$) than heterosexual women. Bisexual women were more likely to be uninsured ($p < 0.001$) and less likely to report breast cancer diagnoses than heterosexual women ($p < 0.001$); however, they reported more cervical cancer diagnoses ($p < 0.001$).

Health-related quality of life

HRQoL outcomes are detailed in Table 2. Multivariable analyses indicated that lesbian women surviving cancer had higher odds of poor self-reported health (OR: 1.68, 95% CI 1.02–2.78) and COPD (OR: 1.98, 95% CI 1.09–3.56) than heterosexual women. Yet, relative to heterosexual women cancer survivors, increased odds of heart conditions were demonstrated for both lesbian (OR: 1.90, 95% CI 1.16–3.12) and bisexual women (OR: 1.98, 95% CI 1.12–3.53). Bisexual women cancer survivors reported higher odds of severe psychological distress (OR: 3.03, 95% CI 1.36–6.76), food insecurity (OR: 2.89, 95% CI 1.29–6.50), and severe food insecurity (OR: 2.59, 95% CI 1.05–6.38) than heterosexual women.

Health behaviors

Table 3 details differences in health behaviors by sexual orientation. Compared to heterosexual women, lesbian women cancer survivors reported higher odds of current (OR: 2.34, 95% CI 1.26–4.34) and former smoking (OR: 1.89, 95% CI 1.21–2.96). Bisexual women surviving cancer reported lower odds of receiving a recent mammogram (OR: 0.42, 95% CI 0.23–0.78) than heterosexual women.

Discussion

We investigated differences in HRQoL and health behaviors between heterosexual and LBW cancer survivors using a nationally representative, population-based sample. We hypothesized that LBW surviving cancer would report poorer HRQoL across physical, psychological, financial, and social domains. Our hypothesis was partially supported: Lesbian women were more likely than heterosexual women to report COPD, and both LBW were more likely than heterosexual women to report heart conditions, reflecting known disparities in chronic conditions. In general, LBW are more likely than heterosexual women to have pulmonary diseases^{7,42} and cardiovascular disease risk factors, including tobacco use, risky alcohol use,^{4,43–45} and obesity.^{4,7,43,44,46} Consistent with this existing literature, lesbian cancer survivors reported greater relative odds of

TABLE 1. WEIGHTED SAMPLE CHARACTERISTICS OF WOMEN SURVIVING CANCER BY SELF-REPORTED SEXUAL ORIENTATION: NATIONAL HEALTH INTERVIEW SURVEY, 2013–2018 (N=11,066)

	<i>Heterosexual</i>		χ^2		<i>Bisexual</i>		p^a	
	<i>Lesbian</i>				<i>Unweighted n</i>			
	<i>Unweighted n</i>		<i>Heterosexual vs. lesbian</i>		<i>Weighted %</i>		<i>Heterosexual vs. bisexual</i>	
Total	10,830 (97.9)	141 (1.2)			95 (0.9)			
Race/ethnicity			17.8	<0.001			2.5	0.473
White, non-Hispanic	9042 (84.6)	117 (81.0)			77 (83.2)			
Black, non-Hispanic	766 (6.0)	6 (1.7)			9 (9.5)			
Hispanic	372 (3.4)	2 (2.3)			3 (1.3)			
Multiple races	650 (6.0)	16 (15.0)			6 (6.0)			
Age (years)			23.3	0.002			283.7	<0.001
18–24	61 (0.8)	1 (1.9)			4 (1.6)			
25–34	352 (3.6)	9 (6.3)			31 (36.0)			
35–44	650 (7.5)	15 (12.1)			21 (28.6)			
45–54	1254 (14.2)	32 (23.7)			12 (10.7)			
55–64	2403 (24.6)	37 (26.3)			10 (11.4)			
65–74	2933 (25.0)	38 (23.9)			11 (5.9)			
75–84	2154 (16.8)	8 (5.5)			4 (4.9)			
85+	1023 (7.6)	1 (0.3)			2 (0.8)			
Educational level			34.8	<0.001			4.3	0.119
High school/GED or less	4166 (37.8)	25 (15.7)			32 (28.6)			
Some college/AA degree	3532 (32.1)	38 (27.5)			39 (44.9)			
College graduate or more	3095 (30.1)	78 (56.8)			24 (26.5)			
Marital status			287.9	<0.001			75.1	<0.001
Married	4298 (54.1)	38 (33.8)			23 (31.8)			
Living with partner	333 (3.8)	32 (32.6)			15 (19.1)			
Widowed	2936 (19.7)	3 (0.9)			5 (5.0)			
Divorced/separated	2340 (15.9)	24 (14.0)			28 (20.1)			
Never married	876 (6.5)	43 (18.8)			24 (24.0)			
Insurance type			5.3	0.072			17.6	<0.001
Private	6436 (62.4)	87 (61.7)			47 (51.2)			
Public	3955 (33.5)	8 (29.4)			10 (32.8)			
Uninsured	427 (4.1)	46 (8.9)			38 (16.0)			
Employment status			17.4	<0.001			—	—
Employed, for pay	3352 (34.3)	70 (50.9)			50 (65.6)			
Employed, not for pay	97 (1.0)	2 (0.6)			0 (0)			
Unemployed	7377 (64.7)	69 (48.5)			45 (34.4)			
Cancer site								
Breast	3480 (31.7)	50 (34.4)	0.3	0.556	12 (10.4)	13.6	<0.001	
Cervical	1043 (10.0)	16 (10.7)	0.04	0.830	31 (30.0)	28.3	<0.001	
Ovarian	437 (4.2)	7 (4.5)	0.02	0.877	7 (4.5)	0.02	0.895	
Uterine	804 (7.2)	12 (7.7)	0.02	0.885	4 (6.6)	0.02	0.888	
Head and neck	160 (1.4)	1 (0.7)	0.5	0.467	0 (0)	—	—	
Lung	332 (2.8)	3 (2.0)	0.3	0.558	1 (0.5)	0.4	0.512	
Colon	557 (4.8)	1 (2.7)	0.4	0.541	3 (3.5)	0.2	0.643	
Other	4450 (42.0)	56 (41.1)	0.03	0.853	38 (44.8)	0.2	0.656	

Significant ($p \leq 0.05$) results are bolded. Heterosexual women served as the reference group in all analyses. Column percentages might not always add up to 100% due to rounding.

^a p Value for Rao-Scott Chi-square test for the difference.

AA, associate in arts; GED, general educational development.

tobacco use,^{21,26,27} which may partially explain differences in chronic conditions, increase complications from cancer treatment, and influence survival.⁴⁷

Lesbian women reported worse self-rated health than heterosexual women. This is consistent with existing evidence: A national study found that sexual minority cancer survivors were 60% less likely to report their current health status as

good compared to heterosexual survivors.²¹ Similarly, a state-level study demonstrated that LBW survivors were twice as likely to report their current health status as fair or poor compared with heterosexual female survivors.²²

The higher relative odds of severe psychological distress among bisexual women cancer survivors contradict existing literature.^{48,49} In a systematic review, Gordon et al. noted

TABLE 2. UNADJUSTED AND ADJUSTED MODELS MEASURING DISPARITIES IN HEALTH-RELATED QUALITY OF LIFE AMONG WOMEN SURVIVING CANCER BY SELF-REPORTED SEXUAL ORIENTATION: NATIONAL HEALTH INTERVIEW SURVEY, 2013–2018 (N=11,066)

	Heterosexual		Lesbian		χ^2 vs. lesbian	p ^a	Bisexual		χ^2 vs. bisexual	p ^a	Lesbian		Bisexual
	Weighted % (95% CI)		Weighted % (95% CI)				Weighted % (95% CI)				aOR ^b (95% CI)		
Mental health													
Psychological distress	77.2 (76.8–77.6)	70.4 (67.3–73.40)	24.9	<0.001	337.9	<0.001	48.5 (44.6–52.4)	Ref.	Ref.		1.55 (0.98–2.46)	1.38 (0.73–2.64)	Ref.
Low distress	18.8 (18.4–19.2)	24.1 (21.2–27.0)					39.0 (35.3–42.7)				0.98 (0.41–2.36)	3.03 (1.36–6.76)	
Moderate distress	4.0 (3.8–4.2)	5.5 (4.2–6.8)					12.5 (10.1–14.9)				1.41 (0.66–3.01)	1.58 (0.63–4.03)	
Severe distress	15.6 (14.6–16.1)	31.5 (23.5–39.5)	25.9	<0.001	142.4	<0.001	47.5 (40.3–54.7)						
Functional limitation due to mental health													
Physical health													
Fair/Poor self-rated health	13.3 (13.0–13.6)	13.8 (11.3–16.3)	0.2	0.678	0.5	0.481	14.2 (11.6–16.7)				1.68 (1.02–2.78)	0.73 (0.40–1.34)	
Chronic condition													
Asthma	14.4 (14.1–14.7)	21.6 (18.8–24.2)	35.3	<0.001	55.6	<0.001	24.7 (21.4–28.0)				1.45 (0.89–2.37)	1.40 (0.74–2.66)	
COPD	3.3 (3.2–3.5)	2.7 (1.8–3.7)	1.2	0.273	5.2	0.023	2.0 (1.2–2.9)				1.98 (1.09–3.56)	1.44 (0.64–3.25)	
Diabetes	9.3 (9.0–9.5)	8.7 (6.8–10.7)	0.3	0.590	3.9	0.049	6.8 (4.7–8.9)				0.97 (0.47–2.00)	0.73 (0.30–1.74)	
Heart condition	7.8 (7.6–8.1)	7.3 (5.6–9.0)	0.4	0.541	0.05	0.821	7.6 (5.8–9.5)				1.90 (1.16–3.12)	1.98 (1.12–3.53)	
Hypertension	30.2 (29.7–30.6)	22.6 (19.9–25.3)	25.1	<0.001	44.9	<0.001	18.8 (15.9–21.6)				0.93 (0.62–1.41)	1.41 (0.86–2.30)	
Stroke	2.9 (2.7–3.0)	2.9 (1.8–4.0)	0.003	0.956	8.6	0.004	1.4 (0.7–2.1)				2.19 (0.94–5.09)	1.16 (0.78–2.84)	
Requires routine assistance	5.4 (5.2–5.5)	5.4 (3.7–7.1)	0.001	0.983	3.7	0.054	4.0 (2.8–5.2)				1.42 (0.70–2.88)	1.07 (0.48–2.36)	
No. of bed days past year	11.1 (10.8–11.4)	14.8 (12.1–17.4)	8.8	0.003	33.9	<0.001	17.5 (14.9–20.0)				1.41 (0.81–2.46)	1.13 (0.66–1.96)	
Unable to work due to health problem	8.5 (8.3–8.8)	11.0 (8.7–13.3)	5.5	0.019	5.5	0.019	10.9 (8.7–13.2)				1.55 (0.88–2.71)	0.66 (0.36–1.20)	
BMI ^c			29.8	<0.001	22.9	<0.001							
Healthy weight	39.0 (38.6–39.5)	32.9 (29.5–36.4)					36.4 (32.6–41.1)	Ref.	Ref.		1.20 (0.69–2.10)	0.97 (0.50–1.89)	
Overweight	28.7 (28.3–29.1)	25.4 (22.3–28.5)					22.2 (19.2–25.3)				1.62 (0.97–2.71)	1.25 (0.62–2.52)	
Obese	29.7 (29.3–30.2)	39.2 (35.7–42.7)					38.9 (35.0–42.9)						
Financial health													
Worry—monthly bills	56.2 (55.6–56.8)	60.0 (56.3–63.6)	4.1	0.044	32.7	<0.001	66.6 (63.2–69.9)				1.02 (0.68–1.53)	1.22 (0.74–2.00)	
Worry—housing payment	48.3 (47.7–50.0)	50.6 (47.1–54.2)	1.6	0.205	13.8	<0.001	55.6 (51.8–59.3)				1.03 (0.67–1.58)	1.11 (0.68–1.82)	
Worry—retirement	71.5 (71.0–72.0)	75.6 (72.2–78.9)	5.1	0.025	11.6	<0.001	77.9 (74.5–81.3)				1.23 (0.81–1.87)	1.56 (0.96–2.53)	
Worry—costs of illness/accident	68.7 (68.2–69.2)	72.4 (68.9–75.9)	3.9	0.049	22.5	<0.001	76.9 (73.8–80.0)				1.23 (0.82–1.85)	1.00 (0.61–1.63)	
Worry—costs of health care	57.0 (56.4–57.6)	60.0 (56.4–63.7)	2.6	0.108	7.6	0.006	62.2 (58.6–65.8)				1.12 (0.78–1.62)	1.01 (0.58–1.77)	
Food insecurity	10.0 (9.7–10.3)	12.0 (10.0–14.0)	4.2	0.040	113.9	<0.001	21.7 (18.8–24.6)				1.43 (0.70–2.90)	2.89 (1.29–6.50)	
Severe food insecurity	4.2 (4.0–4.4)	6.4 (4.9–8.0)	12.2	<0.001	103.0	<0.001	11.6 (9.3–13.9)				2.24 (0.99–5.04)	2.59 (1.05–6.38)	
Social health													
Difficulty participating in social activities	6.6 (6.4–6.8)	8.3 (6.1–10.4)	2.7	0.099	16.5	<0.001	10.4 (8.2–12.6)				1.89 (0.86–4.14)	1.01 (0.40–2.56)	
Difficulty going to events	8.2 (8.0–8.5)	9.3 (7.0–11.6)	1.1	0.306	1.0	0.328	7.2 (5.3–9.1)				1.41 (0.65–3.07)	0.94 (0.42–2.11)	

Significant ($p \leq 0.05$) results are bolded. Heterosexual women served as the reference group in all analyses. Regression models were adjusted for differences in age, race/ethnicity, education level, insurance type, cancer site (breast, gynecologic, and other), and survey year.

^ap Value for Rao-Scott Chi-square test for the difference.

^bRegression models estimate aORs using logistic and multinomial regression models.

^cEstimates comparing underweight BMI with healthy weight were suppressed due to unreliability.

aOR, adjusted odds ratio; BMI, body mass index; CI, confidence interval; COPD, chronic obstructive pulmonary disease.

TABLE 3. UNADJUSTED AND ADJUSTED MODELS MEASURING DISPARITIES IN HEALTH RISK AND PROTECTIVE BEHAVIORS AMONG WOMEN SURVIVING CANCER BY SELF-REPORTED SEXUAL ORIENTATION: NATIONAL HEALTH INTERVIEW SURVEY, 2013–2018 (N=11,066)

	Lesbian		Bisexual		χ^2	p ^a	Lesbian		Bisexual	
	Weighted % (95% CI)	χ^2 vs. lesbian	Weighted % (95% CI)	χ^2 vs. bisexual			aOR ^b (95% CI)	aOR ^b (95% CI)		
Tobacco use		77.6		60.6		<0.001				
Current smoker	13.3 (12.9–13.7)	21.3 (18.4–24.3)	23.0 (19.9–26.1)							1.27 (0.68–2.39)
Former smoker	18.9 (18.5–19.3)	25.4 (22.3–28.5)	18.2 (15.6–20.9)							1.82 (0.91–3.64)
Never smoker	67.8 (67.3–68.3)	53.2 (49.6–56.8)	58.8 (55.3–62.4)							Ref.
Heavy drinking	6.5 (6.3–6.8)	11.8 (9.5–14.1)	13.4 (10.9–15.9)			<0.001				2.06 (0.88–4.81)
Binge drinking	29.6 (29.0–30.3)	43.6 (39.5–47.8)	55.1 (50.7–59.6)			<0.001				1.65 (0.96–2.84)
Meeting physical activity guidelines	33.7 (33.1–34.3)	42.3 (38.8–45.7)	44.9 (41.1–48.6)			<0.001				0.93 (0.56–1.50)
Preventive health care										
Pap	44.2 (43.7–44.8)	41.1 (37.4–44.9)	42.1 (38.1–46.1)			0.113				0.60 (0.31–1.16)
Mammogram	45.1 (44.5–45.7)	44.8 (40.6–49.0)	29.2 (24.4–34.0)			0.887				1.06 (0.66–1.70)
Visit with ob/gyn	39.6 (39.1–40.1)	33.7 (30.5–36.9)	42.0 (38.0–46.0)			<0.001				0.75 (0.45–1.24)
HPV vaccine	13.6 (13.2–14.0)	16.3 (13.0–19.5)	38.0 (34.1–42.0)			0.084				0.76 (0.15–3.92)

Significant ($p \leq 0.05$) results are bolded. Heterosexual women serve as the reference group in all analyses. Regression models were adjusted for differences in age, race/ethnicity, education level, insurance type, cancer site (breast, gynecologic, and other), and survey year.

^ap Value for Rao-Scott Chi-square test for the difference.

^bRegression models estimate aORs using logistic and multinomial regression models. HPV, human papillomavirus; ob/gyn, obstetrician/gynecologist.

mental health disparities in male, but not female, sexual minority survivors.⁴⁸ Many studies assessing psychological health in females evaluated breast cancer survivors^{20,50–53} and reported no significant differences^{50–53}; however, Jabson and Bowen found that SMW breast cancer survivors reported higher perceived stress than heterosexual women.²⁰ These studies use varied measures of psychological health (e.g., perceived stress, anxiety, and depression).

Among LBW in the oncologic setting, worse mental health has been associated with younger age and lower socioeconomic status.⁵¹ Our bisexual women cohort was younger and more likely to be uninsured, a marker of low socioeconomic status, than heterosexual women. This may reflect the higher risk of poverty endured by bisexual people.^{51,54} In the general population, bisexual women report myriad risk factors for psychological distress. Bisexual women are more likely than heterosexual and lesbian women to experience traumatic events, including childhood abuse,⁵⁵ sexual assault, stalking, and domestic violence.⁵⁶ Bisexual women also face biphobia from the general society and within the LGBT community.⁵⁷ This “dual discrimination” may lead to excess stress and decreased access to social support for bisexual women, which may exacerbate psychological distress generally and during cancer survivorship.

Lesbian cancer survivors in our study did not evidence disparities in psychological distress. It is possible that lesbian cancer survivors experience unique protective factors (e.g., social support, resilience, and coping skills),^{50,53,58} which may reduce distress. We were unable to fully test this hypothesis using NHIS data. For example, our measures of social health were limited to challenges participating in social activities. It is likely that other social factors, including presence and type of social support, may vary for LBW, thus, accounting for differences in psychological health.

Consistent with existing literature and our *a priori* hypothesis that LBW would be less likely to engage in preventive health care, bisexual women reported lower odds of receiving a recent mammogram.^{59,60} Given survivors’ risk for recurrence and developing second primary cancers, regular preventive screening is needed.²⁵ Our evaluation of financial health revealed that heterosexual and LBW cancer survivors were similarly concerned about finances. This finding is surprising as research indicates that sexual minority adults are more likely to live in poverty than heterosexual adults,^{54,61} which may be attributed to workplace discrimination, limited employment opportunities, decreased earning potential, and less accumulated savings.^{62–64}

This study establishes food insecurity as a critical problem for bisexual women surviving cancer. This is especially concerning as nutrition influences cancer treatment effects,⁶⁵ BMI, quality of life, and survival.^{65,66} Thus, maintaining adequate nutrition is critical for cancer patients. In the general population, LBW demonstrate greater prevalence of food insecurity and severe food insecurity than heterosexual women.^{67,68} The over twice relative odds of food insecurity and severe food insecurity seen in the bisexual cohort may reflect elevated food insecurity and poverty rates experienced by bisexual adults more generally,⁵⁴ as poverty is a primary risk factor for food insecurity.³⁴ One explanation is that biphobia, discrimination, and destabilized social support result in less social and economic opportunities for bisexual women, leading to elevated poverty levels that drive food insecurity.

It is also possible that bisexual women cancer survivors experience syndemic disparities. For example, studies of women in the general population point to a bidirectional relationship between food insecurity and poor health (i.e., mental⁶⁹ or physical⁷⁰). Bisexual women cancer survivors, who were also more likely to report heart conditions and severe psychological distress than their heterosexual counterparts, may thus experience syndemic food insecurity. While future longitudinal studies are needed to ascertain the complex relationships among poverty, mental and physical health, and food insecurity for bisexual women surviving cancer, our results underscore the need to comprehensively screen cancer survivors—especially bisexual women—for economic, mental, and physical health needs to provide appropriate intervention.

Limitations

We acknowledge several limitations; despite the use of a large, population-based dataset, our sample size of LBW cancer survivors was relatively small. Use of the NHIS limits the definition of sexual orientation to identity only. We excluded participants who responded to the sexual identity question as “not sure/other,” as studies indicate that these groups are heterogeneous^{71,72} and may not solely represent nonheterosexual people^{72,73}; furthermore, best practices caution against comparing these respondents to other sexual orientation groups.⁷⁴ NHIS relies on self-reported data, which can lead to response and recall bias regarding sociodemographic data and medical diagnoses. Consequently, cancer diagnoses may be underreported.⁷⁵ We cannot estimate differences in underreporting in the NHIS by sexual orientation because sexual orientation data are not collected by cancer registries.⁷⁶ Although we included individual indices of HRQoL, we acknowledge that we may not have fully captured this construct. For example, we were unable to measure self-reported pain or fatigue, which are used in other studies.¹⁰ Finally, we could not control for disease-related variables that may be associated with differences in HRQoL; patients with late-stage or rapidly progressing cancers may report worse HRQoL^{77,78} and be less likely to participate in national surveys.

Future directions

Our results point to several areas for intervention: First, screening for sexual orientation in the cancer setting is critical for identifying LBW who may be at risk for poor health during treatment and survivorship. Unfortunately, physicians do not regularly ask about sexual orientation,⁷⁹ and LGB people report feeling unwelcome when accessing health care.⁸⁰ Routine assessment of sexual orientation may strengthen the patient–clinician relationship, create a safe environment for health care discussions, and foster healthy behaviors.^{81,82} Inclusive intake forms help standardize sexual orientation and gender identity assessment.⁸³ Because a majority of oncologists do not feel competent to treat LGBT patients^{79,84,85} and sexual minority patients who do not have an LGBT-competent oncologist report higher rates of stress,⁸⁶ we recommend that oncology practices implement mandatory training in LGBT competence. Health care providers may review national guidelines to learn about caring for sexual minority individuals with cancer.^{83,87}

The psychological distress reported by bisexual women cancer survivors warrants attention. Prolonged distress can negatively affect health behaviors,⁸⁸ gene and immune function,⁸⁹ chronic inflammation,⁸⁹ tumor progression,⁸⁹ and survival.⁹⁰ Bisexual women's disparate distress after cancer diagnosis may be complicated by minority stress,⁹¹ which is associated with worse physical health⁹² and participation in health risk behaviors.^{93,94} Although existing support services may facilitate minority stress,⁹⁵ resilience⁵⁰ and involvement of social support (e.g., partners, family, and friends)⁸² may protect LGBT individuals in the cancer setting.^{82,96} Especially for lesbian women, development and testing of culturally congruent interventions to foster resiliency and facilitate smoking cessation are warranted. Finally, processes for screening patients for food insecurity and connecting food insecure women to welcoming and accessible food providers are also critical intervention opportunities. Primary care clinics have established community partnerships to increase food access for food insecure patients.⁹⁷ Similar solutions may be implemented in the cancer clinic.

Conclusion

LBW cancer survivors report poor indices of HRQoL and health behaviors. These factors may contribute to excess morbidity and mortality; however, future longitudinal studies are needed to assess prospective risk. In the cancer setting, fostering a culture of LGBT competence and routine assessment of sexual orientation may identify patients at risk for poor physical and psychological effects, financial strain, tobacco use, and risky alcohol use. At the population level, continued fights against discrimination and for legal protection of sexual minority populations may reduce disparities.

Authors' Contributions

M.L.H. conceived the project, prepared the original draft of the article and figures, and edited and reviewed the final article draft. A.A.T. determined the methodology, performed statistical analyses, prepared tables, and edited and reviewed the article. L.M. prepared, reviewed, and edited the article. J.G.P. conceived the project, determined the methodology, and prepared, reviewed, and edited the article. All authors reviewed and approved the final article.

Disclaimer

The HRQoL results were published previously as an abstract.⁹⁸ The content of the current article is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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