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Associations between experiences of discrimination and quality of life in Black breast cancer survivors

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Abstract

Background: Racial discrimination has been associated with decreased health-related quality of life (QOL) in the general population; however, its impact on QOL in cancer survivors is unclear. This study aims to examine how experiences of discrimination (EOD) impact QOL in breast cancer survivors and whether these associations vary by individual- and structural-level factors.

Methods: The association of EOD assessed at baseline (~12 months post-diagnosis) was assessed in the Women's Circle of Health Follow-up Study, a population-based longitudinal cohort study of Black breast cancer survivors in New Jersey. QOL was assessed at follow-up (~24 months postdiagnosis) using the Functional Assessment of Cancer Therapy – Breast (FACT-B). Multivariable linear regression models adjusted for confounders assessed the association of EOD (none, low, high) with QOL. We also examined statistical interaction by individual-level factors (coping and spirituality) and structural-level factors (neighborhood socioeconomic status and residential segregation).

Results: Of 216 study participants, 74% reported experiencing discrimination. In fully adjusted models, women with high EOD had lower overall QOL (no discrimination, mean FACT-B: 114.8; 95% CI, 107.9–121.7; high discrimination, mean FACT-B: 101.1; 95% CI, 94.2–108.0). Although no evidence was observed of statistically significant interaction, women with high spirituality had better overall QOL, regardless of EOD (high spirituality/low discrimination: 128.2; 95% CI, 121.9–134.5; high spirituality/high discrimination: 115.4; 95% CI, 108.5–122.3; low spirituality/no discrimination: 103.5; 95% CI, 93.8–113.2).

Conclusions: Among Black breast cancer survivors, discrimination was associated with poorer QOL. Spirituality may mitigate the harmful effects, as women with high spirituality, even in the context of high discrimination, reported higher QOL.

N.Z. and M.P. contributed equally to this work.

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KEYWORDS

quality of life, discrimination, breast cancer, survivorship, racism, spirituality

There are well-documented racial disparities in breast cancer (BC) risk and mortality, with Black women having a 41% increased risk for mortality following a BC diagnosis compared to non-Hispanic White women.¹ Racism and racial discrimination are critical social determinants of health that have been associated with poorer overall, mental, and physical health in the general population.^{2–4} Racism operates through several complex pathways at the structural, psychosocial, and behavioral levels, including reduced access or denial of access to resources (e.g., housing, education, employment); psychosocial stress and the resulting physiological response (including activation of the hypothalamic-pituitary-adrenal axis, inflammation, accelerated aging); or physical injury and violence.^{3–7}

Self-reported racial and ethnic discrimination has been associated with decreased health-related quality of life (QOL) in the general population; however, there are limited studies examining the impact of discrimination in individuals with a history of cancer.^{4,5,8–11} Black/African American women (hereafter referred to as Black women) diagnosed with BC tend to have worse QOL compared to their White counterparts.¹² However, few studies have examined the impact of discrimination on QOL, specifically in Black women with a history of cancer. Only one prior study examined self-reported discrimination and QOL in BC survivors and reported higher discrimination associated with poorer QOL.¹⁰ This study also reported lower QOL among women who employed passive coping strategies or resided in high socioeconomic status neighborhoods. Additionally, for non-Hispanic Black women, living in neighborhoods with high levels of segregation was associated with lower QOL compared to low/moderately segregated neighborhoods.¹⁰

Understanding the impact of racial and ethnic discrimination on QOL in breast cancer survivors is an important research gap because QOL assessments are essential during cancer survivorship follow-up care and are often used as prognostic factors for cancer survival. In addition, they are important for designing interventions to improve survivorship outcomes.¹³ The aim of this study was to examine the association of self-reported racial and ethnic discrimination and QOL in a population-based cohort of Black BC survivors and to understand whether these associations differ by individual level (spirituality and coping) and structural level (neighborhood socioeconomic status (nSES) and residential segregation) factors.

METHODS

Study population

We used data from women enrolled in the Women's Circle of Health Follow-Up Study (WCHFS), an ongoing longitudinal population-based

cohort study of Black BC survivors. Detailed recruitment and data collection methods for the WCHFS have been described elsewhere.^{14–20} In brief, participants in 10 counties in New Jersey (NJ) were identified through rapid case ascertainment by the NJ State Cancer Registry (NJSCR). Eligibility criteria included self-identified Black women with histologically confirmed ductal carcinoma in situ or invasive BC, aged 20–75 years at diagnosis, were English-speaking, and had no prior cancer history except nonmelanoma skin cancer. As previously described, distributions of clinical characteristics (including tumor stage and grade) were similar for participants and all eligible breast cancer cases identified by the NJSCR. This similarity suggests that tumor characteristics of WCHFS participants are representative of Black breast cancer survivors in NJ.¹⁴ The institutional review boards at Rutgers University and Roswell Park Comprehensive Cancer Center approved the study protocols. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology reporting guideline for cohort studies.

At the baseline home visit approximately 12 months after BC diagnosis, participants completed an interviewer-administered questionnaire that collected information on relevant factors, including demographics such as place of birth, individual socioeconomic (SES) characteristics (household income, educational attainment, insurance), lifestyle factors (alcohol consumption, cigarette smoking, physical activity), comorbidities, and medical history. Anthropometric measurements and blood pressure measurements were also collected. Clinical and tumor characteristics information, such as tumor stage, were abstracted from pathology reports and linkages to NJSCR files. At the follow-up home visit, approximately 24 months BC postdiagnosis, trained interviewers again administered questionnaires, collecting information regarding QOL, resilient coping, spirituality, and updated medical history.¹⁴

Experiences of discrimination (EOD) questions were added to the baseline questionnaire in May 2017 and, therefore, are available in a subset of the cohort. Of 245 participants who completed both baseline and follow-up visits since May 2017, we excluded 29 women with missing data for EOD (7.8%), QOL (2.9%), and covariates (1.2%), leading to a final analytic sample of 216 women diagnosed between 2015 and 2019.

Self-reported baseline experiences of racial discrimination

The baseline questionnaire assessed “ever” exposure to racial/ethnic discrimination using the validated EOD instrument, which captures both interpersonal and institutional experiences of racial discrimination.²¹ This nine-item measure asks about ever experiencing racial

discrimination in different domains, including education, housing, and medical care. Specifically, participants were asked: "Have you ever experienced discrimination, been prevented from doing something, or been hassled or made to feel inferior in any of the following situations because of your race, ethnicity, or color? (1) at school; (2) getting hired or getting a job; (3) at work; (4) getting housing; (5) getting medical care; (6) getting service in a store or restaurant; (7) getting credit, bank loans, or mortgage; (8) on the street or in a public setting; (9) from the police or in the courts." Cronbach's α for the study population was 0.83, suggesting high internal consistency across items. Participants responded either yes or no to these questions, and a discrimination score was computed as an average of the responses based on the total number of items answered. Women who were missing responses for all nine questions were considered missing.

Health-related QOL at follow-up

QOL was measured during follow-up visits (~24 months following diagnosis) using the Functional Assessment of Cancer Therapy – Breast (FACT-B), a validated QOL measure tailored to individuals diagnosed with BC.²² This measure includes an overall score and five subscales: emotional, physical, functional, social/family wellbeing, and a BC-specific scale. The overall FACT-B score is computed as the sum of the scores on the five subscale scores (emotional, physical, functional, social/family wellbeing, and BC-specific scale), and the overall scale ranges from 0 to 148 points. The physical, social, and functional subscales range from 0 to 28, the emotional subscale ranges from 0 to 24, and the BC-specific subscale ranges from 0 to 40. Higher scores indicated higher QOL, and a 7-point difference has been determined to be a clinically meaningful difference/minimally important difference for the overall FACT-B score, whereas a 2- to 3-point difference is clinically meaningful for the subscales.^{23,24} The Cronbach's α for all five FACT-B subscales was above 0.70 for the study sample.

Effect modifiers

We examined effect modifiers at the individual (spirituality and coping) and neighborhood levels (nSES and residential segregation measures). Coping was assessed at the follow-up visit using the Brief Resilient Coping Scale, a validated 4-item measure designed to assess the ability to cope with stress in an adaptive manner using flexible and active strategies.²⁵ The higher the score, the greater the resilience. We grouped women as having high-resiliency coping if they were above the median score and low-resiliency coping if they were at or below the median, similar to prior studies.²⁵ Cronbach's α for the Brief Resilient Coping Scale was 0.69.

Spirituality was measured using the validated Functional Assessment of Chronic Illness Therapy-Spiritual Wellbeing Scale (FACIT-Sp-12) assessed at the follow-up visit and asking about the

past month, and comprising two subscales, meaning/peace and faith.²⁶ The overall FACIT-Sp-12 scale ranges from 0 to 48 points, and higher scores indicate higher spiritual wellbeing. Cronbach's α for the FACIT-Sp-12 was 0.89. Like coping, we classified women into high and low spirituality based on the median score, and similar to prior studies.²⁶

The residential address at breast cancer diagnosis was geocoded by the NJSCR. Coordinates were then spatially joined to the 2010 census tract files. Census tract-level nSES was obtained from the National Cancer Institute's Surveillance Research Program, estimated using median household income, median house value, median rent, education index, percent working class, percent unemployed, and percent below 150% of the poverty line; a higher score indicates higher nSES.^{16,27} The Gini coefficient and Isolation index measured census tract-level African American residential segregation, measures that have been previously used to examine residential segregation,^{28,29} and were calculated from 2010 decennial census data and ranged from 0 (low) to 1 (high).³⁰ The Gini coefficient assesses evenness by comparing block-level distributions of non-Hispanic Black and non-Hispanic White populations within a census tract, whereas the Isolation index measures exposure, specifically gauging the degree to which non-Hispanic Black populations are exposed solely to one another.

Additionally, we examined whether the associations between EOD and QOL scores differed by tumor stage at diagnosis.

Covariates

We selected potential confounders based on the literature and using a directed acyclic graph (Supporting Information S1: Figure S1). Based on the directed acyclic graph, we adjusted all models for the minimal sufficient adjustment sets, which included age (years; continuous), body mass index at baseline (BMI; kg/m², continuous), education at baseline (\leq high school degree, some college, or college graduate), annual household income at baseline ($<$ \$15,000, \geq \$15,000, unknown), insurance at baseline (private, other), cigarette smoking status at the time of diagnosis (current, former, never smokers), and nSES based on the residential address at diagnosis (high/low based on median).

Statistical analysis

We categorized experience of racial/ethnic discrimination as a three-level (none, low, or high) variable in all analyses, similar to prior studies.¹⁰ Women who reported any experience of discrimination were categorized as experiencing either low or high discrimination based on the median summary score (0.43). This cutoff is similar to the median score used in the Pathways study (0.45).¹⁰ We examined the association of experience of discrimination and QOL as measured by FACT-B using linear regression models. We examined overall FACT-B and the five individual subscales as outcomes. These

associations were estimated using a model that minimally adjusted for age and a model that additionally adjusted for confounders described earlier. We examined statistical interaction using cross-product terms between discrimination and nSES, measures of segregation, resilient coping strategy, and levels of spirituality. For interaction analyses, variables of interest (resilient coping strategy, levels of spirituality, and segregation measures, nSES) were dichotomized into low and high categories using the median. Trend tests were performed by treating the categorical predictor as an ordinal-level variable. For linear trend tests and tests of heterogeneity, a p value was reported from the two-sided Wald test. We performed sensitivity analyses by excluding ductal carcinoma in-situ cases (stage 0). Statistical significance was set at $p < .05$. All analyses were performed using SAS, version 9.4 (Cary, NC).

RESULTS

Overall, 74% of women reported experiencing any discrimination. The highest levels of discrimination were reported in the setting of getting service in a store or restaurant (65%), whereas the lowest levels of discrimination were reported in getting medical care (15%) (Table 1). QOL scores for overall FACT-B ranged from 29.2 to 148.0, with a median of 117 points. Compared to participants who reported no discrimination, women reporting any or high levels of discrimination were older (<61 years), had a higher annual household income ($\geq \$30,000$), were more likely to have a college/postgraduate education, and were more likely to be US born (Table 2).

In age-adjusted models, women who reported high levels of discrimination had lower QOL as measured by the overall FACT-B (no discrimination, mean overall FACT-B: 117.6; 95% CI, 112.3–122.8; high discrimination, mean overall FACT-B: 106.7; 95% CI, 102.0–111.4) (Table 3). We observed a similar association in the fully adjusted model with a nearly 14-point difference in QOL score between those reporting no discrimination and high discrimination (no discrimination, mean overall FACT-B: 114.8; 95% CI, 107.9–121.7; high discrimination, mean overall FACT-B: 101.1; 95% CI, 94.2–108.0). Similarly, higher levels of reported discrimination were associated with lower QOL across all five subscales examined (Table 4). For example, for the functional wellbeing subscale, higher reported discrimination was associated with a lower subscale score (no discrimination, mean Functional Wellbeing score: 21.7; 95% CI, 19.8–23.6; high discrimination, mean Functional Wellbeing score: 17.5; 95% CI, 15.6–19.4) (Table 4). Further, we observed evidence of a dose-response relationship where increasing EOD was associated with lower overall and subscale QOL scores (p for linear trend: $.1 < .01$). For example, for women with low EOD, the mean overall FACT-B was 113.9 (95% CI, 107.6–120.2), whereas for those reported high EOD, the mean overall FACT-B was 101.1 (95% CI, 94.2–108.0).

We did not observe statistically significant interactions between racial/ethnic discrimination score and the potential effect modifiers:

TABLE 1 Distribution of baseline self-reported experiences of discrimination among breast cancer survivors in the Women's Circle of Health Follow-up Study, $n = 216$.

Self-reported discrimination status, score, and setting	%
Racial/ethnic discrimination ^a	
None	26
Any	74
Discrimination score ^{b,c}	
Low	55
High	45
Discrimination setting ^b	
At school	38
Getting hired or getting a job	44
At work	54
Getting housing	32
Getting medical care	15
Getting service in store or restaurant	65
Getting credit, bank loans, or mortgage	26
On the street or in public setting	57
From the police and the courts	26

^aRacial and ethnic discrimination was measured at baseline visits (~12 months postdiagnosis) using the validated experiences of discrimination instrument.

^bAmong those experiencing any racial/ethnic discrimination.

^cLow = less than the median racial/ethnic discrimination (<0.43); high = median racial/ethnic discrimination score or higher (≥ 0.43).

resilient coping strategy, spirituality, nSES, and neighborhood segregation (Gini coefficient and Isolation index) (Figure 1 and Supporting Information S1: Table S1). Although we did not observe evidence of statistically significant interaction for any effect modifiers examined (p -interaction: $.53$ – $.92$), women with higher spirituality reported better overall QOL than those with low spirituality, regardless of EOD. For example, women with high spirituality had higher QOL than those with low spirituality and no discrimination (high spirituality/low discrimination: 128.2; 95% CI, 121.9–134.5; high spirituality/high discrimination: 115.4; 95% CI, 108.5–122.3; low spirituality/no discrimination: 103.5; 95% CI, 93.8–113.2) (Figure 1, Supporting Information S1: Table S1). Similar to the overall findings, we also observed evidence of a dose-response relationship within each level of spirituality, with increasing EOD being associated with lower QOL (p for linear trend: $.02$ – $<.01$). We also did not observe statistically significant interaction by tumor stage (p interaction $>.52$); stratified models by tumor stage are presented in Supporting Information S1: Table S2. Sensitivity analyses excluding women with ductal carcinoma in situ (stage 0 tumors) were similar to the overall findings of higher discrimination associated with lower QOL in fully adjusted models (Supporting Information S1: Table S3).

TABLE 2 Distribution of study characteristics by baseline self-reported experiences of discrimination among breast cancer survivors in the Women's Circle of Health Follow-up Study.

Characteristic	Experiences of discrimination ^a			Overall (N = 216) n (%)
	None (N = 57) n (%)	Low ^a (N = 87) n (%)	High ^a (N = 72) n (%)	
Age at diagnosis (years, mean SD)	55.5 (10.7)	56.3 (10.8)	58.4 (10.1)	56.8 (10.6)
Age at diagnosis (years)				
21–40	2 (3.5)	7 (8.1)	4 (5.6)	13 (6.0)
41–60	36 (63.2)	44 (50.6)	35 (48.6)	115 (53.2)
61–75	19 (33.3)	36 (41.4)	33 (45.8)	88 (40.7)
Tumor stage at diagnosis				
0	6 (10.5)	14 (16.1)	14 (19.4)	34 (15.7)
I	22 (38.6)	33 (37.9)	28 (38.9)	83 (38.4)
II	21 (36.8)	28 (32.2)	22 (30.6)	71 (32.9)
III and IV	5 (8.8)	9 (10.3)	5 (6.9)	19 (8.8)
Unknown	3 (5.3)	3 (3.5)	3 (4.2)	9 (4.2)
nSES quartiles ^b				
Q1	16 (28.1)	12 (13.8)	16 (22.2)	44 (20.4)
Q2	16 (28.1)	23 (26.4)	21 (29.2)	60 (27.8)
Q3	11 (19.3)	28 (32.2)	13 (18.1)	52 (24.1)
Q4	14 (24.6)	24 (27.6)	22 (30.6)	60 (27.8)
Marital status				
Married	28 (49.1)	31 (35.6)	21 (29.2)	80 (37.0)
Widowed	1 (1.8)	7 (8.1)	7 (9.7)	15 (6.9)
Divorced/separated	5 (8.8)	21 (24.1)	27 (37.5)	53 (24.5)
Single/never married	23 (40.4)	28 (32.2)	17 (23.6)	68 (31.5)
Household income (inflation-adjusted)				
<\$15,000	16 (28.1)	25 (28.7)	18 (25.0)	59 (27.3)
\$15,000–\$29,999	23 (40.4)	31 (35.6)	15 (20.8)	69 (31.9)
≥\$30,000	11 (19.3)	23 (26.4)	29 (40.3)	63 (29.2)
Unknown	7 (12.3)	8 (9.2)	10 (13.9)	25 (11.6)
Educational attainment				
≤High school graduate	33 (57.9)	31 (35.6)	14 (19.4)	78 (36.1)
>High school graduate	24 (42.1)	56 (64.4)	58 (80.6)	138 (63.9)
Foreign born				
US born	42 (73.7)	73 (83.9)	66 (91.7)	181 (83.8)
Foreign born	15 (26.3)	14 (16.1)	6 (8.3)	35 (16.2)
Insurance				
Private	32 (56.1)	48 (55.2)	42 (58.3)	122 (56.5)
Medicare/Medicaid	20 (35.1)	33 (37.9)	25 (34.7)	78 (36.1)
Uninsured	2 (3.5)	2 (2.3)	4 (5.6)	8 (3.7)
Other/missing	3 (5.3)	4 (4.6)	1 (1.4)	8 (3.7)
Smoking status				
Never	38 (66.7)	57 (65.5)	45 (62.5)	140 (64.8)
Former	6 (10.5)	21 (24.1)	23 (31.9)	50 (23.2)
Current	13 (22.8)	9 (10.3)	4 (5.6)	26 (12.0)

(Continues)

TABLE 2 (Continued)

Characteristic	Experiences of discrimination ^a			
	None (N = 57) n (%)	Low ^a (N = 87) n (%)	High ^a (N = 72) n (%)	Overall (N = 216) n (%)
Current BMI (kg/m ²)				
Underweight/normal (<25)	9 (15.8)	13 (14.9)	7 (9.7)	29 (13.4)
Overweight (25–30)	8 (14.0)	24 (27.6)	19 (26.4)	51 (23.6)
Obese (>30)	40 (70.2)	50 (57.5)	46 (63.9)	136 (63.0)
Diabetes				
No	45 (79.0)	73 (83.9)	53 (73.6)	171 (79.2)
Yes	12 (21.1)	14 (16.1)	19 (26.4)	45 (20.8)
Hypertension				
No	19 (33.3)	40 (46.0)	26 (36.1)	85 (39.4)
Yes	38 (66.7)	47 (54.0)	46 (63.9)	131 (60.7)
Meeting physical activity guidelines				
Yes	26 (45.6)	28 (32.2)	41 (56.9)	95 (44.0)
No	31 (54.4)	59 (67.8)	31 (43.1)	121 (56.0)
FACT-B QOL overall score ^c				
Low	25 (43.9)	39 (44.8)	46 (63.9)	110 (50.9)
High	32 (56.1)	48 (55.2)	26 (36.1)	106 (49.1)
Resilient coping ^d				
Low	31 (59.6)	43 (51.8)	34 (48.6)	108 (52.7)
High	21 (40.4)	40 (48.2)	36 (51.4)	97 (47.3)
Spirituality ^e				
Low	27 (50.0)	47 (55.3)	41 (56.9)	115 (54.5)
High	27 (50.0)	38 (44.7)	31 (43.1)	96 (45.5)
Segregation, Gini coefficient ^f				
Low	25 (43.9)	46 (52.9)	39 (54.2)	110 (50.9)
High	32 (56.1)	41 (47.1)	33 (45.8)	106 (49.1)
Segregation, Isolation index ^g				
Low	27 (47.4)	45 (51.7)	45 (62.5)	117 (54.2)
High	30 (52.6)	42 (48.3)	27 (37.5)	99 (45.8)

Abbreviations: BMI, body mass index; FACT-B, Functional Assessment of Cancer Therapy - Breast; nSES, neighborhood socioeconomic status; QOL, quality of life; SD, standard deviation.

^aRacial and ethnic discrimination was measured at baseline visits (~12 months postdiagnosis) using the validated experiences of discrimination instrument. Low = less than the median racial/ethnic discrimination (<0.43); high = median racial/ethnic discrimination score or higher (≥0.43).

^bnSES quartiles based on full cohort of 1934 women: Q1 = 8186–8722; Q2 = 8723–9214; Q3 = 9219–10 049; Q4 = 10 052–11 825.

^cLow = median FACT-B QOL score or lower (≤118); high = greater than the FACT-B QOL score (>118).

^dResilient Coping was scored using a 4-question scale with scores ranging from 4 to 28; low = median coping score or lower (≤22); high = greater than the median coping score (>22); 11 women were excluded due to missing.

^eSpirituality is from the FACIT-Sp-12 questionnaire with scores ranging from 0 to 48; low = median spirituality or lower (≤44); high = greater than the median spirituality (>44); 5 women excluded for missing spirituality information.

^fThe Gini coefficient is a measure of racial residential segregation; low = median score or lower (≤0.579); high = greater than median score (>0.579).

^gIsolation index is a measure of racial residential segregation; low median score or lower (≤0.514); high = greater than median score (>0.514).

TABLE 3 Association between baseline racial/ethnic discrimination and overall quality of life among breast cancer survivors in the Women's Circle of Health Follow-up Study.

Racial and ethnic discrimination score ^a	Low FACT-B QOL ^b (n)	High FACT-B QOL ^b (n)	FACT-B QOL overall score		p for linear trend
			Mean	95% CI	
Model 1 ^c					<.01
None	25	32	117.6	112.3–122.8	
Low	39	48	119.3	115.0–123.5	
High	46	26	106.7	102.0–111.4	
Model 2 ^d					.02
None	25	32	116.6	111.0–122.2	
Low	39	48	117.6	112.8–122.4	
High	46	26	104.5	99.1–109.9	
Model 3 ^e					<.01
None	25	32	116.0	110.1–121.9	
Low	39	48	115.0	109.8–120.3	
High	46	26	102.5	96.7–108.3	
Model 4 ^f					.10
None	25	32	114.8	107.9–121.7	
Low	39	48	113.9	107.6–120.2	
High	46	26	101.1	94.2–108.0	

Abbreviations: BMI, body mass index; FACT-B, Functional Assessment of Cancer Therapy - Breast; nSES, neighborhood socioeconomic status; QOL, quality of life.

^aRacial and ethnic discrimination was measured at baseline visits (~12 months postdiagnosis) using the validated experiences of discrimination instrument. Low = less than the median racial/ethnic discrimination (<0.43); high = median racial/ethnic discrimination score or higher (≥0.43).

^bFACT-B was measured at follow-up visits (~24 months postdiagnosis) and is categorized as low and high using the median scores. The overall score ranges from 0 to 148).

^cModel 1 adjusted for age at diagnosis.

^dModel 2 is adjusted for age at diagnosis, educational attainment, household income, insurance, and nSES.

^eModel 3 is adjusted for age at diagnosis, educational attainment, household income, insurance, nSES, smoking status, and BMI.

^fModel 4 is adjusted for age at diagnosis, educational attainment, household income, insurance, nSES, smoking status, BMI, and tumor stage at diagnosis.

DISCUSSION

In this prospective study of Black BC survivors in NJ, ever experiencing racial and ethnic discrimination was associated with lower overall QOL, independent of clinical factors at diagnosis, demographic factors, lifestyle factors, and nSES. We found clinically meaningful differences in lower overall QOL and four QOL subscales (functional wellbeing, social and family wellbeing, physical wellbeing, and BC-specific subscale) for women reporting high racial and ethnic discrimination compared to those who reported none. Our study used the EOD instrument to capture experiences that respondents perceive as discrimination and assess whether perceived racial and ethnic discrimination occurred. Measures of perceived discrimination have been recognized as having important predictive value when examining the impact of discrimination on health outcomes.³¹

Health-related QOL is an important multidimensional measure that captures physical, social, functional, and emotional wellbeing and

is a central prognostic health outcome for cancer survivorship. Further, poor QOL has been associated with increased mortality risk in cancer survivors,^{13,32–34} so understanding factors that impact QOL is critical for developing targeted cancer survivorship plans. Despite this, there are limited data on the impact of racial/ethnic discrimination and QOL in BC survivors. The Pathways study is the only other prospective cohort study examining the impact of racial and ethnic discrimination on QoL in a cohort of racially and ethnically diverse BC survivors in Northern California,¹⁰ including 3991 BC survivors, of which nearly 8% were non-Hispanic Black women ($n = 308$). The Pathways study used the same instruments as our study to measure discrimination and QOL, the EOD, and FACT-B. Although overall, 31% of women enrolled in Pathways reported EOD, these findings varied by race and ethnicity, with 82% of non-Hispanic Black women reporting EOD, similar to our study population (74% reporting EOD). Our findings are consistent with the Pathways study, which reported lower QOL of life with increasing reports of

TABLE 4 Association between baseline racial/ethnic discrimination and quality of life subscales among breast cancer survivors in the Women's Circle of Health Follow-up Study.

Racial/Ethnic discrimination Score ^a	Low FACT-B QOL ^b (n)	High FACT-B QOL ^b (n)	Model 1 ^c			Model 2 ^d		
			Mean	95% CI	p for linear trend	Mean	95% CI	p for linear trend
Emotional wellbeing (0–24)					.02			<.01
None	21	36	20.7	19.8–21.7		20.1	18.9–21.3	
Low	44	43	20.8	20.0–21.5		20.1	19.0–21.2	
High	43	29	19.5	18.7–20.3		18.6	17.4–19.8	
Functional wellbeing (0–28)					<.01			<.01
None	24	33	22.7	21.2–24.2		21.7	19.8–23.6	
Low	40	47	21.7	20.5–22.9		20.1	18.4–21.9	
High	48	24	19	17.7–20.4		17.5	15.6–19.4	
Social and family wellbeing (0–28)					.10			.01
None	31	26	22.8	21.4–24.3		22.6	20.7–24.4	
Low	40	47	23.5	22.4–24.7		22.5	20.8–24.2	
High	45	27	21.6	20.3–22.9		20.3	18.4–22.1	
Physical wellbeing (0–28)					<.01			<.01
None	30	27	22.7	21.3–24.0		22.2	20.4–24.0	
Low	40	47	23.1	22.0–24.2		22.0	20.4–23.6	
High	51	21	20.5	19.3–21.7		19.8	18.0–21.5	
Breast cancer subscale (0–40)					<.01			<.01
None	24	33	28.7	26.9–30.4		27.9	25.5–30.2	
Low	42	45	29.8	28.4–31.2		28.9	26.8–31.1	
High	49	23	25.5	23.9–27.1		24.5	22.2–26.8	

Abbreviations: BMI, body mass index; FACT-B, Functional Assessment of Cancer Therapy - Breast; nSES, neighborhood socioeconomic status; QOL, quality of life.

^aRacial and ethnic discrimination was measured at baseline visits (~12 months postdiagnosis) using the validated experiences of discrimination instrument. Low = less than the median racial/ethnic discrimination (<0.43); high = median racial/ethnic discrimination score or higher (≥0.43).

^bFACT-B was measured at follow-up visits (~24 months postdiagnosis). Subscales were categorized as low and high using the median scores.

^cModel 1 adjusted for age at diagnosis.

^dModel 2 adjusted for age, tumor stage at diagnosis, educational attainment, household income, smoking status, insurance, BMI, and nSES.

discrimination.¹⁰ Among non-Hispanic Black women in Pathways, there was a clinically meaningful 9-point difference in QOL score between those reporting no discrimination and high discrimination. Moreover, similar to findings for Black women in the Pathways study, we found the most frequently reported setting of experiencing discrimination was while getting service, at work, or in a public setting.

Our findings are also consistent with a qualitative study of African American BC survivors in North Carolina that identified racism as a driver of QOL concerns,³⁵ and with cross-sectional studies of cancer survivors in the Behavioral Risk Factor and Surveillance System³⁶ and the All of Us cohort¹¹ that found experiences of racism and discrimination to be associated with poor mental and physical health and lower QOL.

An important finding from our study is that discrimination was associated with lower QOL for women with low levels of spirituality compared to women who reported high levels of spirituality, suggesting that spirituality may help ameliorate the negative impacts of discrimination on mental and physical health outcomes. This finding is consistent with data from the general population² and qualitative studies of Black BC survivors, which identified faith and spirituality as essential sources of resilience and coping and addressing their QOL concerns.^{31,35,37,38} High resilience has been associated with improved outcomes for various psychological, behavioral, and physiological measures in other populations.³⁹ Our findings support that future individual-level interventions aimed at enhancing survivorship outcomes and addressing some of the negative impacts of discrimination on QOL in Black BC survivors should incorporate

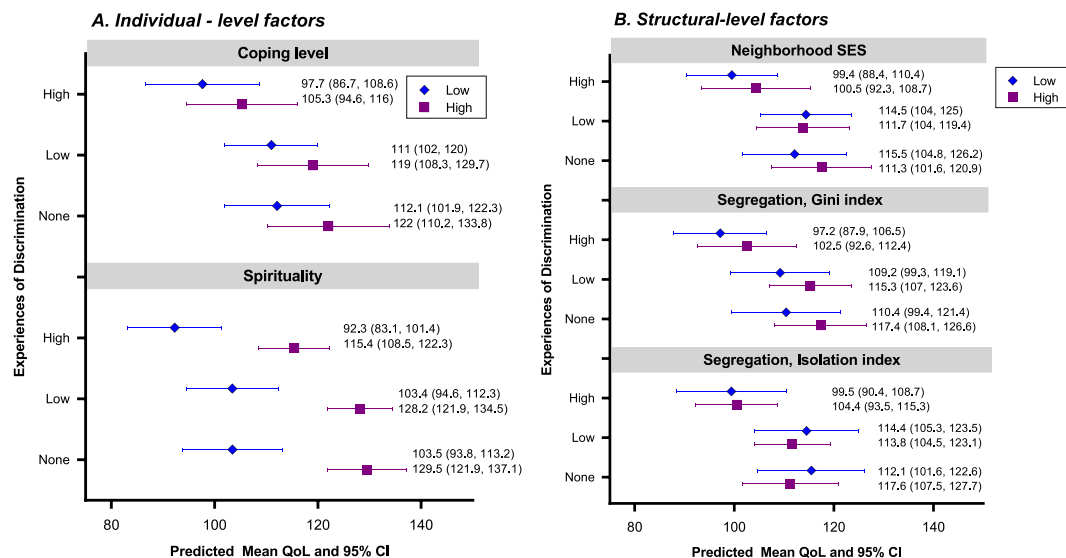


FIGURE 1 Association between baseline racial/ethnic discrimination and health-related quality of life by individual- and structural-level factors in the Womens Circle of Health Follow-up Study. All models adjusted for adjusted for age, tumor stage at diagnosis, educational attainment, household income, smoking status, insurance, body mass index, and neighborhood socioeconomic status.

spirituality and faith components. In addition, societal and systemic level interventions and policies are sorely needed to address the sources of individual discrimination and the impact of structural racism and ultimately reduce and eliminate racial and ethnic discrimination.⁴⁰ Further, a study in the All of Us cohort demonstrates that eliminating experiences of discrimination, specifically in the medical setting, has the potential to mitigate racial and ethnic disparities in QOL for cancer survivors.¹¹ Interventions that specifically address sources of discrimination in the medical setting and screening for experiences of discrimination may improve outcomes in cancer survivors.

In our study, we did not find the association of EOD and QOL to be modified by structural factors such as nSES or measures of residential segregation. This contrasts with findings from the Pathways study that reported slightly lower QOL scores for Black women who experienced discrimination and lived in highly segregated neighborhoods compared to women who lived in low to moderately segregated neighborhoods, as well as findings for all women who lived in high nSES neighborhoods compared to low nSES neighborhoods.¹⁰ These differences are likely due to differences in measures of residential segregation used in the study and underlying differences in the study populations of cancer survivors in NJ and California.

Racial and ethnic discrimination can impact health outcomes, including QOL, through several hypothesized pathways, such as reduced access or denial of access to resources, including housing, wealth, income, and access to medical care.² In addition, racial discrimination increases psychological dysregulation (allostatic load), increases psychosocial stress and the resulting physiological responses (including activation of the hypothalamic-pituitary-adrenal axis, inflammation, epigenetic changes, accelerated aging), and can

impact health behaviors (reduced physical activity and sleep, smoking).^{2,3,5,41–44} There are limited studies examining the impact of racial and ethnic discrimination and BC outcomes with a focus on mechanistic pathways. Mandelblatt et al. examined self-reported experiences of major discrimination and aging (measured as deficit accumulation index) in a large population-based study of Black cancer survivors in Detroit. They reported perceived discrimination to be associated with greater deficit accumulation.⁴⁵ Other studies have examined the impact of structural racism (i.e., neighborhood contextual factors including discriminatory housing policies [redlining], racialized segregation, and neighborhood disadvantage) on BC outcomes and reported higher allostatic load,^{46,47} differential tumor methylation in genes related to tumor progression and metastasis,⁴⁸ as well as epigenetic age acceleration.⁴⁹ Future studies are warranted to elucidate the biological pathways through which racial/ethnic discrimination impacts survivorship outcomes in cancer survivors.

Our study had several notable strengths, including leveraging a population-based prospective cohort of Black BC survivors, detailed information on demographic factors, individual SES variables, clinical factors, lifestyle factors, and structural level factors, and the use of validated measures of discrimination and QOL. However, our study is not without limitations. Our study is limited by sample size; however, it is similar to the sample size of Black BC survivors in the Pathways study.¹⁰ Finally, our study was conducted in a rich cohort of Black BC survivors in NJ, so our results may not be generalizable beyond NJ, as racial and ethnic discrimination experiences may vary across the United States.

In conclusion, this study provides further evidence that experiencing racial and ethnic discrimination is associated with poorer QOL in a cohort of Black BC survivors. Moreover, spirituality appears to play an important role in mitigating the harmful impacts of

discrimination on QOL, as individuals with high levels of spirituality, even in the presence of high discrimination, report higher QOL. Notably, those with high spirituality have higher QOL than individuals with no spirituality and no experiences of discrimination, underscoring the significant positive impact of spirituality on quality of life.

AUTHOR CONTRIBUTIONS

Nur Zeinomar: Funding acquisition; writing—original draft; conceptualization; methodology; visualization; writing—review and editing; formal analysis; supervision; data curation. **Marley Perlstein:** Formal analysis; writing—review and editing. **Bo Qin:** Writing—review and editing; funding acquisition; data curation. **Hari S. Iyer:** Writing—review and editing. **Jesse J. Plascak:** Writing—review and editing; data curation; funding acquisition. **Coral O. Omene:** Writing—review and editing. **Christine B. Ambrosone:** Writing—review and editing; funding acquisition. **Kitaw Demissie:** Writing—review and editing; funding acquisition. **Chi-Chen Hong:** Writing—review and editing; funding acquisition. **Elisa V. Bandera:** Writing—review and editing; funding acquisition; conceptualization; methodology; data curation.

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CONFLICT OF INTEREST STATEMENT

Dr. Bandera served as a member of Pfizer's Advisory Board to enhance minority participation in clinical trials (7/2021-8/2023). No other disclosures were reported.

DATA AVAILABILITY STATEMENT

The deidentified data underlying this article can be shared upon approval of a data request form by the Women's Circle of Health Follow-up Study Scientific Committee and with appropriate human subjects approval and data transfer agreements. The data are not

publicly available due to their containing protected health information that could compromise the privacy of research participants. For more information contact: wchstudy@cinj.rutgers.edu.

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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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