

# Normative BREAST-Q Scores in Sub-Saharan African Women: Interpreting the Impact of Mastectomy and Reconstruction

Brigit D. Baglien, MD\*

Nishant Ganesh Kumar, MD\*

Sarah H. Kennedy, MD†

Mahteme Bekele, MD‡

Paa Ekow Hoyte-Williams, MBBS§

Emmanuel E.R. Ezeome, MBBS¶

Adeyiza O. Momoh, MD\*

**Background:** Breast cancer is a leading cause of mortality among women in sub-Saharan Africa (SSA). As such, optimizing outcomes for treatment and reconstruction is a global health priority. Currently, normative data for interpreting BREAST-Q results are limited to high-income countries. This study seeks to evaluate baseline breast-related quality of life in SSA women without breast cancer and compare it with previously published normative values.

**Methods:** Women in Ghana, Nigeria, and Ethiopia 18 years of age and older with no history of breast cancer or breast surgery were recruited to complete the BREAST-Q preoperative mastectomy module. Multivariable regression was performed to identify correlations between sociodemographic variables and BREAST-Q scores. Comparisons were made between normative data previously published in high-income countries and within individual SSA populations.

**Results:** Normative BREAST-Q scores were obtained from a total of 453 women (169 Ghanaian, 210 Nigerian, and 74 Ethiopian) with a mean age of  $26 \pm 7$  years and body mass index of  $26 \pm 6 \text{ kg/m}^2$ . Scores were as follows: satisfaction with breasts,  $64 \pm 26$ ; psychosocial well-being,  $63 \pm 23$ ; sexual well-being,  $57 \pm 26$ ; and physical well-being,  $68 \pm 16$ . Compared with scores published in the United States, SSA women scored higher in breast satisfaction and lower in psychosocial and physical well-being. Significant differences in scores were also found among countries in SSA.

**Conclusions:** This study establishes normative values for the BREAST-Q mastectomy module in a group of women in SSA without breast cancer and found significant variability globally and among countries within the same region. (*Plast Reconstr Surg Glob Open* 2025;13:e6495; doi: [10.1097/GOX.00000000000006495](https://doi.org/10.1097/GOX.00000000000006495); Published online 19 February 2025.)

## INTRODUCTION

Breast cancer is a leading cause of mortality among women in sub-Saharan Africa (SSA), and it is an accelerating

public health problem because the incidence of breast cancer in Africa is expected to nearly double by 2040.<sup>1,2</sup> Accordingly, the investigation of measures to improve holistic breast cancer care to women in the region is paramount. In the United States and a number of other high-income countries (HICs), validated patient-reported outcome (PRO) instruments such as the BREAST-Q have been used to assess breast-related quality of life (QOL) and satisfaction with surgical treatment and reconstruction.<sup>3–7</sup> Prior studies established the normative BREAST-Q values for women in the United States to give context to PRO changes throughout breast cancer treatment and reconstruction.<sup>8</sup>

Currently, normative data for interpreting BREAST-Q results are limited to HICs. It is unknown how PRO

*From the \*Section of Plastic and Reconstructive Surgery, Department of Surgery, University of Michigan, Ann Arbor, MI; †Department of Plastic Surgery, North Atlanta Plastic Surgery, Alpharetta, GA; ‡Department of Surgery, St. Paul's Millennium Medical College, Addis Ababa, Ethiopia; §Department of Surgery, Kwame Nkrumah University of Science and Technology Hospital, Kumasi, Ghana; and ¶Department of Surgery, University of Nigeria Teaching Hospital, Enugu, Nigeria.*

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measures translate internationally to low- and middle-income countries (LMICs) or how normative values between HICs and LMICs compare. Normative values published for populations of women in HICs cannot serve as an accurate baseline for populations of women in LMICs, such as in SSA. Sociocultural differences may influence priorities and perceptions as they relate to breast cancer care and reconstruction. This could impact studies related to patient satisfaction and breast-related QOL in these populations, potentially altering the interpretation of postoperative PRO measures.

To better place PROs in the SSA context, we designed a study to evaluate both country and region-specific normative BREAST-Q values for women without breast cancer in Ghana, Nigeria, and Ethiopia. We hypothesized that there would be differences in the baseline BREAST-Q values within groups of SSA women and internationally among women from SSA and HICs, namely the United States, thereby emphasizing the importance of tailored breast cancer treatment and reconstruction protocols in accordance with varied cultural backgrounds.

## METHODS

### Study Population

Women from Ghana, Nigeria, and Ethiopia were recruited at member sites for the International Center for the Study of Breast Cancer Subtypes. Participants were identified under the supervision of investigators at Komfo Anokye Teaching Hospital in Kumasi, Ghana (P.H.W.), the University of Nigeria Teaching Hospital in Enugu, Nigeria (E.R.E.), and St. Paul's Hospital Millennium Medical Center in Addis Ababa, Ethiopia (M.B.). Participants were recruited between March 2021 and November 2022. Surveys were administered electronically by e-mail to potential participants or conducted as an interview by a female study coordinator. Inclusion criteria were women at least 18 years of age with no history of breast cancer or breast surgery. Women were excluded from the study if they did not complete 50% of at least 1 BREAST-Q section. Before recruitment, site-specific institutional review board approval was obtained. Questionnaires included sociodemographic information, clinical data, and the preoperative mastectomy BREAST-Q module.

We performed a sample size power analysis for each of the 4 BREAST-Q domains individually. We based our calculations on previously published US data of the mean and SD for the BREAST-Q mastectomy module<sup>8</sup> to demonstrate a 3- to 4-point difference in BREAST-Q score, calculated to be the recommended minimal important difference for clinical outcomes research.<sup>9</sup>

### Primary Outcome

The primary outcome of this study was normative breast-related PRO scores for women without breast cancer from Ghana, Nigeria, and Ethiopia utilizing preoperative BREAST-Q scores. The BREAST-Q is a validated breast surgery-specific PRO instrument used to measure satisfaction and health-related QOL in women undergoing

## Takeaways

**Question:** Do normative BREAST-Q values vary internationally?

**Findings:** Significant variability was found between BREAST-Q scores of women without breast cancer in Ghana, Ethiopia, and Nigeria, and between high- and low-income countries globally.

**Meaning:** Population-based normative values provide a foundational context to interpret patient-reported outcomes scores and tailor interventions.

mastectomy.<sup>3,10</sup> The preoperative mastectomy module includes 4 independently functioning scales including satisfaction with breasts, psychosocial well-being, physical well-being, and sexual well-being, assessed with 4-, 10-, 16-, and 6-item scales, respectively. Items were answered with response categories on a 4- to 5-point Likert-type scale.

### Statistical Analysis

The purpose of this analysis was to characterize country-specific normative BREAST-Q values for women in SSA from Ghana, Nigeria, and Ethiopia, and region-specific values by comparing SSA normative scores to previously published scores from HICs such as the United States. Baseline sociodemographic and clinical characteristics were described for the total cohort of women and for each study site.

The BREAST-Q scores were calculated from the preoperative mastectomy module. Items for each BREAST-Q scale were summed and transformed utilizing conversion tables into a score ranging from 0 to 100. Higher scores reflect a greater level of satisfaction. Per BREAST-Q scoring guidelines, for missing data of less than 50% of the scale's items, the mean for the individual's completed items was imputed for the missing items before summing the total raw score. Data for women with greater than 50% missing items within each scale were excluded.<sup>3</sup>

Continuous and multichotomous categorical variables were dichotomized for multivariate regression analysis as follows: age was dichotomized as older than 40 versus less than or equal to 40; body mass index as greater than or equal to 30 kg/m<sup>2</sup> versus less than 30 kg/m<sup>2</sup>; education as tertiary versus less than tertiary; employment as unemployed versus some employment; income as no income versus some income; marital status as married versus other; and first language as English versus other. A backward-selection linear multivariate regression was utilized to identify which variables were associated with BREAST-Q scores. Variables with a probability of less than 0.2 were removed, and the model was rerun with only significant variables included. Multivariable linear regression modeling was created for the total cohort and for each study site. To determine the significance of region-specific findings, each of the 4 BREAST-Q scores was compared with normative BREAST-Q scores previously reported for women in the United States in the first investigation of normative BREAST-Q scores by Mundy et al<sup>8</sup> with 2-sample *t* tests. A comparison of SSA data to other samples from HICs,

including a single-center US sample and an Australian sample of normative BREAST-Q scores, was performed using 95% confidence intervals.<sup>6,11</sup> To compare country-specific findings, a 1-way ANOVA was performed to compare the effect of the 3 different countries on BREAST-Q scores. The Bonferroni correction was utilized for multiple comparisons. All analyses were performed using statistical software (Stata 17.0, College Station, TX), and at the 5% significance level.

## RESULTS

A total of 453 women completed BREAST-Q surveys and were included in the analysis, including 169 women from Ghana, 210 women from Nigeria, and 74 women from Ethiopia. The overall response rate was 74.5%. Table 1 summarizes the sociodemographic characteristics of the collective cohort. Of the total cohort, participants were young with an average age of  $26 \pm 7$  years and an average body mass index of  $26 \pm 6 \text{ kg/m}^2$ . The majority of women had a tertiary level of education (75.9%), were single (78.7%), unemployed (58.6%), and without income (55.3%). When analyzed by country, there was a similar distribution of age, height, and weight with differences in

employment and income. The majority of Ethiopian women included in the study were employed (93.2%) compared with 19.5% of Nigerian women and 42.9% of Ghanaian women surveyed. Similarly, 72.9% of Nigerian women and 53% of Ghanaian women reported no source of income compared with 9.5% of Ethiopian women included in the study.

We surveyed a sufficient sample size, calculated between 247 and 395 participants depending on the BREAST-Q domain, to achieve 80% power to detect significant differences between the SSA cohort and US cohort based on an alpha value equal to 0.05. Table 2 lists the calculated scores for each of 4 BREAST-Q scales for the total cohort and previously calculated US normative values. There were significant differences across nearly all subscales when comparing the overall SSA cohort to US values, with increased satisfaction with breasts (64 versus 58,  $P < 0.001$ ), decreased psychosocial well-being (63 versus 71,  $P < 0.001$ ), and decreased physical well-being (68 versus 93,  $P < 0.001$ ) within the SSA cohort. A similar pattern was found in the comparison between normative BREAST-Q mastectomy module scores from 3 HIC samples (nationwide United States, single-center United States, and Australia) with 95% confidence intervals, as shown in Figure 1.

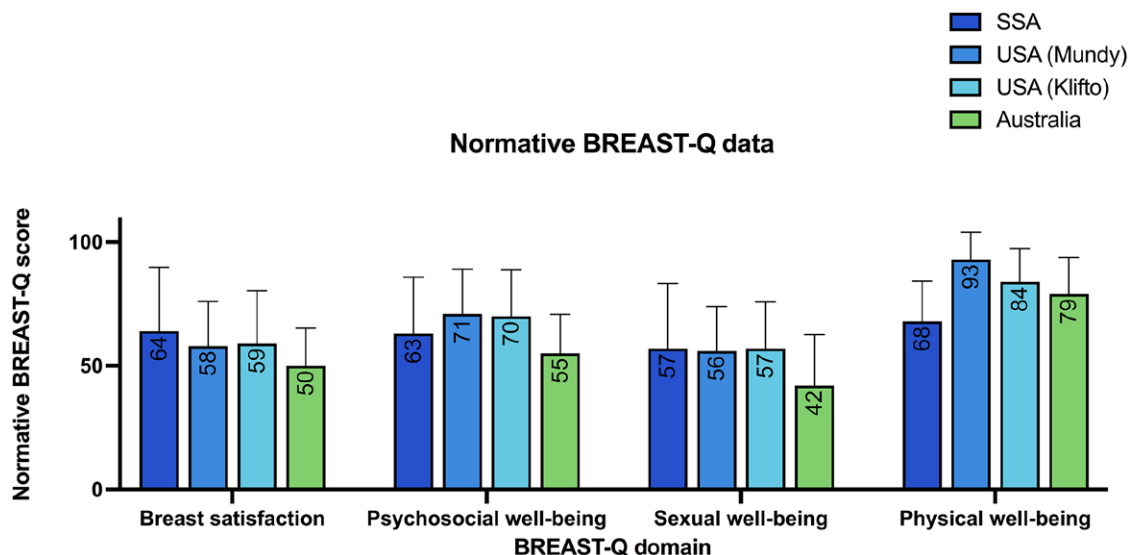
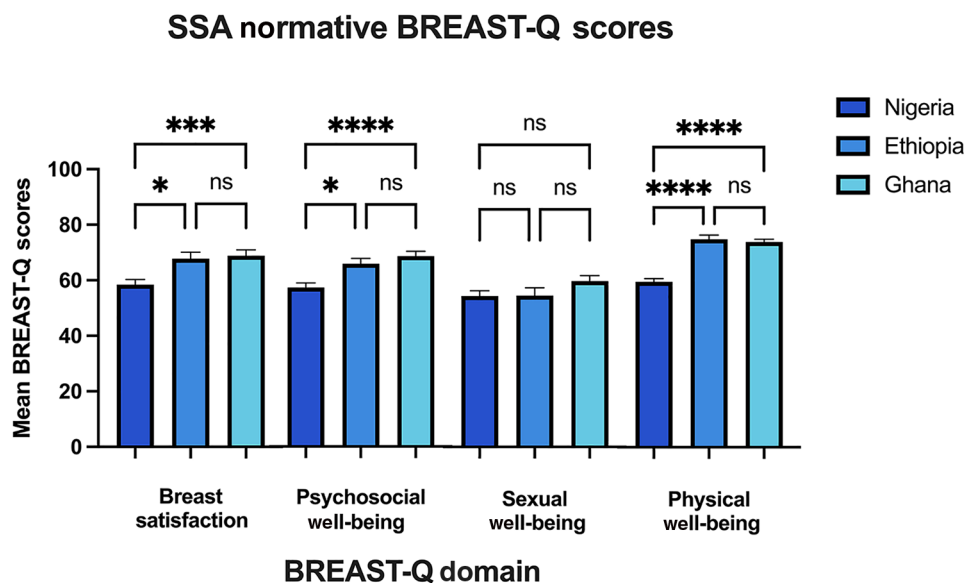
**Table 1. Patient Sociodemographic Characteristics**

Factor	Total	Nigeria	Ethiopia	Ghana	<i>P</i>
N	453	210	74	169	
Age (y), mean $\pm$ SD	25.7 $\pm$ 6.9	24.2 $\pm$ 7.1	29.8 $\pm$ 5.1	26.0 $\pm$ 6.8	<0.001
Height (cm), mean $\pm$ SD	159.1 $\pm$ 10.3	156.2 $\pm$ 11.6	161.4 $\pm$ 6.8	160.6 $\pm$ 10.1	<0.001
Weight (kg), mean $\pm$ SD	64.9 $\pm$ 15.0	64.5 $\pm$ 14.3	60.6 $\pm$ 10.1	67.6 $\pm$ 17.4	0.005
BMI (kg/m <sup>2</sup> ), mean $\pm$ SD	26.0 $\pm$ 6.1	27.1 $\pm$ 6.7	23.4 $\pm$ 3.8	26.5 $\pm$ 6.3	<0.001
Race					
Black	410 (91.9%)	179 (85.6%)	67 (95.7%)	164 (98.2%)	<0.001
White	6 (1.3%)	2 (1.0%)	1 (1.4%)	3 (1.8%)	
Multiracial	30 (6.7%)	28 (13.4%)	2 (2.9%)	0 (0.0%)	
Annual income (USD)					
None	246 (55.3%)	153 (72.9%)	7 (9.5%)	86 (53.4%)	<0.001
1 $\leq$ 200	31 (7.0%)	16 (7.6%)	6 (8.1%)	9 (5.6%)	
200–500	65 (14.6%)	27 (12.9%)	14 (18.9%)	24 (14.9%)	
501–1000	33 (7.4%)	7 (3.3%)	14 (18.9%)	12 (7.5%)	
$\geq$ 1000	70 (15.7%)	7 (3.3%)	33 (44.6%)	30 (18.6%)	
Education					
Primary	10 (2.2%)	9 (4.3%)	1 (1.4%)	0 (0.0%)	<0.001
Secondary	99 (21.9%)	80 (38.1%)	8 (10.8%)	11 (6.5%)	
Tertiary	343 (75.9%)	121 (57.6%)	65 (87.8%)	157 (93.5%)	
English first language					
No	246 (54.9%)	95 (45.2%)	73 (98.6%)	78 (47.6%)	<0.001
Yes	202 (45.1%)	115 (54.8%)	1 (1.4%)	86 (52.4%)	
Employed					
No	265 (58.6%)	169 (80.5%)	5 (6.8%)	91 (54.2%)	<0.001
Yes	182 (40.3%)	41 (19.5%)	69 (93.2%)	72 (42.9%)	
Maybe	5 (1.1%)	0 (0.0%)	0 (0.0%)	5 (3.0%)	
Marital status					
Single	355 (78.7%)	168 (80.0%)	46 (63.0%)	141 (83.9%)	<0.001
Married	53 (11.8%)	8 (3.8%)	23 (31.5%)	22 (13.1%)	
Divorced	19 (4.2%)	12 (5.7%)	4 (5.5%)	3 (1.8%)	
Widowed	3 (0.7%)	3 (1.4%)	0 (0.0%)	0 (0.0%)	
Separated	21 (4.7%)	19 (9.0%)	0 (0.0%)	2 (1.2%)	

BMI, body mass index.

**Table 2. Two-Sample t Test Comparing Normative BREAST-Q Scores Between SSA and the United States (Mundy et al<sup>8</sup>)**

BREAST-Q Scale	Location	N	Mean $\pm$ SD	P
Satisfaction with breasts	Total SSA	449	63.4 $\pm$ 25.8	<0.001
	The United States	1200	58 $\pm$ 18	
Psychosocial well-being	Total SSA	450	63.4 $\pm$ 22.8	<0.001
	The United States	1199	71 $\pm$ 18	
Sexual well-being	Total SSA	435	56.7 $\pm$ 26.3	0.6114
	The United States	1018	56 $\pm$ 18	
Physical well-being	Total SSA	440	67.6 $\pm$ 16.2	<0.001
	The United States	1199	93 $\pm$ 11	

**Fig. 1.** International normative BREAST-Q scores compared with SSA cohort with 95% confidence intervals.**Fig. 2.** Mean BREAST-Q scores by SSA country with 95% confidence intervals (\* $P < 0.05$ , \*\*\* $P < 0.001$ , \*\*\*\* $P < 0.0001$ ).

There were also significant differences found within the same 3 subscales when the individual countries were compared with each other. (See table, Supplemental

Digital Content 1, which displays normative BREAST-Q scores by region and country, <http://links.lww.com/PRSGO/D816>.) Figure 2 presents the mean scores for



**Table 3. Sociodemographic Variables Associated With BREAST-Q Scores of the Entire Cohort of SSA Women**

Variable	Higher Score	Margin	P
Satisfaction with breasts			
≤40 versus >40 y old	Younger	54.7 versus 64.7	0.016
Some employment versus unemployed	Employed	59.6 versus 68.6	<0.001
Psychosocial well-being			
No income versus some income	No income	66.6 versus 59.3	0.110
Some employment versus unemployed	Employed	71.4 versus 57.8	<0.001
Sexual well-being			
Married versus unmarried	Married	64.7 versus 55.6	0.018
Physical well-being			
Tertiary versus less than tertiary	Tertiary	69.1 versus 62.2	<0.001
≤40 versus >40 y old	Younger	68.0 versus 53.6	<0.001
Some employment versus unemployed	Employed	70.1 versus 65.1	0.004

satisfaction with breasts, psychosocial well-being, and physical well-being that were significantly different between Nigeria and Ethiopia ( $P = 0.023$ ,  $P = 0.012$ ,  $P < 0.001$ ) and Nigeria and Ghana ( $P < 0.001$ ,  $P < 0.001$ ,  $P < 0.001$ ).

Multivariable regression analysis identified sociodemographic dichotomous variables associated with higher BREAST-Q scores of the entire cohort of women (Table 3). Women who are younger than 40 years have significantly higher breast satisfaction scores than those who are older than or equal to 40 years old (64.70 versus 54.71,  $P = 0.016$ ). Women who are employed have significantly higher satisfaction with breasts, psychosocial well-being, and physical well-being scores than those who are not employed (68.56 versus 59.60,  $P < 0.001$ ; 71.4 versus 57.8,  $P < 0.001$ ; 70.1 versus 65.1,  $P = 0.004$ ). Furthermore, women who are married have significantly higher sexual well-being scores than those who are not (64.7 versus 55.6,  $P = 0.018$ ), and women who have at least tertiary education and who are younger than or equal to 40 years have significantly higher physical well-being compared with those with less than a tertiary level of education and who are older than 40 years (69.1 versus 62.2,  $P < 0.001$ ; 68.0 versus 53.6,  $P < 0.001$ ).

## DISCUSSION

Our study of women from Ghana, Nigeria, and Ethiopia with no history of breast cancer or prior breast surgery has 2 principal findings. First, normative BREAST-Q scores across 3 different scales—satisfaction with breasts, psychosocial well-being, and physical well-being—are different between the combined cohort of SSA women and those reported by women in the United States. Second, there are significant differences in women's reported PROs between Nigeria and Ghana and Nigeria and Ethiopia across the same 3 BREAST-Q scales. Taken together, these findings suggest that breast-related PROs are not directly translatable across countries or regions. Previous studies have calculated normative values within national and institutional samples across the United States, and abroad in samples of Australian, Dutch, and Swedish women.<sup>4-6,8,11</sup> However, this study uniquely examines normative data from LMICs and evaluates a sample of women within SSA.

Significant differences were found between SSA normative BREAST-Q values and previously reported US

normative values, where SSA women reported increased baseline satisfaction with breasts, decreased psychosocial well-being, and decreased physical well-being compared with US studies. A similar pattern of scores was found when comparing SSA normative values with additional normative BREAST-Q studies conducted in other HICs (Fig. 1).<sup>6,8,11</sup> Although it is possible that variable study methodologies may inform these differences, there are likely factors intrinsic to SSA that change the interpretation of health-related outcome questionnaires.

Our results show that normative PRO values are not simply divergent due to differences among regions, as we have shown variability in normative values between countries within the same region and socioeconomic designation. We found significant differences in scores between Nigeria and Ghana and Nigeria and Ethiopia, but not between Ethiopia and Ghana. Within SSA, there is a huge diversity of ethnic groups with different religious and sociocultural values. Geographic, political, and historical factors shape the culture of a population, and considering the 3 sites surveyed in this study, Addis Ababa, Ethiopia, and Kumasi, Ghana, shares similarities as some of the largest cities within each nation. In contrast, Enugu, Nigeria, is a much smaller city with a population 4–5 times smaller than those of Kumasi and Addis Ababa. This regional and sociographic variability may translate to similarities in practices, values, and feelings about oneself and one's health, demonstrated in our findings of significant differences in scores between Nigeria and Ghana and Nigeria and Ethiopia, but not between Ethiopia and Ghana. Kennedy et al<sup>12</sup> described regional variability in breast-related QOL changes after mastectomy in a prospective study that followed up women with breast cancer from Ghana and Ethiopia. The authors found that women in Ethiopia had overall higher BREAST-Q scores at baseline, 3 months, and 6 months postoperatively in the domains of satisfaction with breasts, psychosocial well-being, and sexual well-being compared with women in Ghana.<sup>12</sup> Differences in PROs could be attributed to cohort demographics or to differences in the community, religion, and infrastructure of each country.

Normative breast-related PROs are likely an intersection of perceptions of attractiveness, self-image, and health-seeking behavior, which have been shown to differ from culture to culture, reflecting particular social and cultural

values.<sup>13</sup> Previous studies have identified differences in health-seeking behavior by country. Yeshtila et al<sup>14</sup> investigated breast self-examination practice and its determinants among Ethiopian women and found that sociocultural differences could help explain the discrepancy among health-seeking behavior in certain populations. Gyedu et al<sup>15</sup> found differences in breast health activities between Muslim and Christian women in Ghana, highlighting how religious belief systems within subpopulations may play an important role in health engagement behaviors. Many studies have described sociocultural differences between SSA and US women in the context of delayed presentation with breast cancer. In SSA, delay in presentation has been attributed to symptom misinterpretation, fear, preference for alternative care, and lack of access to care. However, these barriers are not geographically homogenous. Studies have stratified these themes according to regions of SSA where the theme is most strongly related to delayed diagnosis.<sup>13,16–18</sup> Our findings contribute to the current literature to help identify differences in baseline values of breast-related QOL among women of different geographic, sociocultural, and economic backgrounds. It is important to look at each distinct population of women through an individualistic lens and tailor care accordingly.

The results of our secondary analysis demonstrated associations between sociodemographic variables and higher BREAST-Q scores across the total cohort of SSA women. Employment was significantly associated with higher BREAST-Q scores across multiple scales and age younger than or equal to 40 years was associated with higher breast satisfaction and physical well-being. In a previous study of Nigerian women with breast cancer, age was found to impact health-seeking behavior, where women younger than 50 years old presented with early stages of disease more often than the older generation, translating to a better level of awareness that was found to increase with educational background.<sup>19</sup> In contrast, Mundy et al<sup>8</sup> demonstrated younger age to be associated with lower physical well-being scores in the US population of women.<sup>5</sup> Similarly, in the investigation of the impact of age on outcomes in breast reconstruction, older women (>60 y old) in the United States who underwent autologous procedures had higher physical and psychosocial well-being scores compared with younger women.<sup>20</sup> Therefore, further investigation into the differential effect on age as it relates to breast-related QOL in varying populations may be warranted.

Obtaining normative values for the BREAST-Q for individualized populations is an important step to improve the utility of the instrument for improving breast cancer treatment in SSA. Using the BREAST-Q survey, the impact of breast reconstruction on improved QOL in women in the United States is well established.<sup>21,22</sup> The BREAST-Q is recognized as the gold standard among breast-related PRO instruments, and as such, extensive work has been conducted on validating the BREAST-Q internationally.<sup>7,10,23–27</sup> The adaptation of PRO measures to different populations poses many challenges, including language barriers, cultural considerations, and resource expenditure. The BREAST-Q has been translated into 30 different languages, but only 1 version is in an African language.

Similarly, in a literature search conducted on 270 studies utilizing the BREAST-Q, studies were identified from 27 different countries, none from within SSA.<sup>7</sup> The lack of PRO tools in Africa is not only confined to the BREAST-Q. A review conducted to search for health-related PRO measures that had been translated, validated, or developed for use in 32 non-English SSA languages found 0 representation for 27 SSA countries, containing more than 63 million people.<sup>28</sup> The lack of research tailored to understanding normative values within SSA populations limits generalizability of research findings, excludes the voice and experience of relevant populations, and will continue to perpetuate global health inequities.<sup>28</sup>

This study should be interpreted in the context of important limitations. First, recruitment and questionnaire administration was performed by ancillary team members in 3 separate countries. Therefore, the participation in each country was dependent on individual study coordinators and was subject to sample size variation. Though the overall response rate was favorable at 74.5%, the varying approaches to recruitment and survey administration create the potential for responder bias. Next, to address language and literacy barriers, surveys were often completed with assistance from a study member in the participant's primary language. The surveys, therefore, were not subject to cross-cultural adaptation or back-translation for survey validation. This may introduce the possibility of limited participant comprehension and discomfort with discussion of sensitive topics. However, female research coordinators of the same ethnicity were utilized to attempt to limit respondent discomfort and ensure accurate survey interpretation. Finally, women in the collective cohort from Ghana, Nigeria, and Ethiopia skewed younger than the Army of Women cohort utilized by Mundy et al. An age differential may in fact be representative of the current worldwide state of breast cancer, as the age of diagnosis in SSA has become increasingly younger. The age discrepancies combined with a smaller sample size compared with the US study may impact the generalizability of our findings. Future studies would benefit from significantly larger patient cohorts to provide a more robust sociodemographic representation of each country's breast cancer population. Nevertheless, the current study has merit in that normative BREAST-Q scores have not previously been studied in LMICs and that population samples were collected from 3 separate countries in SSA.

## CONCLUSIONS

In the present study of women from Ghana, Nigeria, and Ethiopia, we found that normative BREAST-Q scores vary globally between previously studied HICs and LMICs as well as regionally between individual SSA countries. The results of this study have important implications for breast cancer care. As PROs have become a critical tool to assess the impact of surgical interventions, further work is needed to translate PROs for health conditions to reach populations in SSA, and importantly, correct interpretation of these instruments is necessary. Our findings provide a foundational context to understand the QOL implications of breast cancer and surgical interventions. These findings

will help guide future research to enhance counseling, education, and methods for the delivery of holistic breast cancer care to millions of women in the SSA region.

**Adeyiza O. Momoh, MD**

Section of Plastic and Reconstructive Surgery  
Department of Surgery  
University of Michigan Health Systems  
1500 E. Medical Center Drive  
Ann Arbor, MI 48109-0340  
E-mail: amomoh@med.umich.edu

## DISCLOSURE

The authors have no financial interest to declare in relation to the content of this article.

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