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SOCIOECONOMIC AND GEOGRAPHIC INEQUALITIES IN BREAST AND CERVICAL CANCER SCREENING UTILIZATION AMONG WOMEN IN NIGERIA: EVIDENCE FROM THE 2024 NIGERIA DEMOGRAPHIC AND HEALTH SURVEY

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ABSTRACT

Background: Breast and cervical cancers are a significant public health burden in Nigeria. Screening and detecting cancers early can reduce the high morbidity and mortality, but access to preventive services may be unequally distributed. In this study we aimed to assessed the socioeconomic and geographic inequalities in reported breast examination and cervical cancer testing among women in Nigerian.

Methods: The study was a cross-sectional analysis conducted using the women's Individual Recode file from the 2024 Nigeria Demographic and Health Survey (NDHS). The sample comprised 39,050 women aged 15–49 years. Outcomes were self-reported breast examination for cancer by a healthcare provider and ever having been tested for cervical cancer by a healthcare provider. "Don't know" responses were excluded from the relevant outcome denominator. Sampling weights, strata and primary sampling units were incorporated. Weighted prevalence and 95% confidence intervals were estimated using Taylor linearization. Wealth-related inequality was evaluated using concentration indices, and separate weighted logistic regression models were fitted for each outcome.

Results: For breast cancer examination, the weighted prevalence was 5.48% (95% CI 5.13–5.84) and 3.14% (95% CI 2.89–3.38) for cervical testing. Among women aged 30–49 years, prevalence was 7.95% (95% CI 7.38–8.52) and 5.00% (95% CI 4.56–5.44), respectively. Both outcomes were concentrated among wealthier women: the wealth concentration index was 0.436 for breast examination and 0.352 for cervical testing; corresponding Erreygers indices were 0.090 and 0.043. Lagos had the highest state-level prevalence for both outcomes (18.2% and 11.9%, respectively). Higher

education, richest-household status, health insurance, older age and employment were associated with greater adjusted odds of both outcomes. Geographic associations differed between outcomes.

Conclusion: The reported breast examination and cervical cancer testing were rare and showed significant socioeconomic and geographic inequalities. Unbiased access, financial protection, provider-initiated services and state-responsive delivery strategies should be strengthened.

Keywords: Breast Cancer, Cervical Cancer, Screening, Socioeconomic Inequality, Geographic Inequality, Nigeria, NDHS, Concentration Index.

1 INTRODUCTION

Breast and cervical cancers are important public health concerns in Nigeria. Their prevention and control require more than the availability of diagnostic technologies: women must be able to access appropriate information, screening or early-detection services, diagnostic follow-up and timely treatment (Ajayi et al., 2019). These opportunities are shaped by education, household resources, place of residence, health financing and the distribution of health services. The 2024 Nigeria Demographic and Health Survey provides a nationally representative source of information on women's health and healthcare utilization. It interviewed 39,050 women aged 15–49 between December 2023 and May 2024 and was designed to provide estimates nationally, by urban-rural residence and for each of the 36 states and the Federal Capital Territory (NPC, 2025). The women's questionnaire included questions on whether a healthcare provider had ever examined the respondent's breasts for cancer and whether a healthcare provider had ever tested her for cervical cancer. These questions permit a comparative analysis of two cancer-related preventive services within one population.

Evidence from Nigeria finds financial constraints, limited awareness, fear, service availability and health-system barriers as challenges to cervical cancer screening (WHO, 2021; Mafiana et al. 2022). A multicountry analysis of DHS data also found pro-rich inequalities in cervical cancer screening across sub-Saharan Africa, with education, wealth and residence contributing to disparities (Asgedom et al., 2024). A recent integrative review of breast cancer screening in Nigeria highlighted limitations in diagnostic infrastructure and the need to strengthen early diagnosis and service readiness (Akindoju et al., 2026).

Recent publications have begun analyzing cancer-related variables from the same 2024 NDHS. One 2026 study examined economic dependency and both breast and cervical outcomes among women aged 30–49, while another examined cervical testing among women aged 30–49 (Okyere, 2026; Olubodun, 2026). The present study has presented its contribution as a comparative assessment of both outcomes across the full 15–49 age range, state-level variation and wealth-related concentration, with separate adjusted models.

The study aimed to: (1) estimate the weighted prevalence of reported breast examination and cervical cancer testing among women aged 15–49; (2) evaluate socioeconomic differences in the utilization of both services; (3) describe geographic inequalities across geopolitical zones and states; (4) quantify wealth-related inequality using concentration measures; and (5) identify factors independently associated with each outcome.

2 METHODS

2.1 Study Design and Data Source

A secondary analysis of the 2024 NDHS was conducted using the Individual Recode (IR) dataset. The survey was implemented by the National Population Commission under the aegis of the Federal Ministry of Health and Social Welfare, with technical assistance from ICF and The DHS Program (NPC, 2025). The NDHS used a stratified two-stage sample design, selecting enumeration areas as primary sampling units and households within selected enumeration areas. The survey supports national, urban-rural and state-level estimates.

2.2 Study Population and Analytical Sample

The analytical population comprised all interviewed women aged 15–49 years (n=39,050). The breast examination outcome was available for 39,014 respondents after excluding 36 "don't know" responses. The cervical testing outcome was available for 38,994 respondents after excluding 56 "don't know" responses. A supplementary descriptive analysis was conducted among women aged 30–49 years because WHO recommends starting HPV DNA-based cervical screening at age 30 in the general population, with different recommendations for women living with HIV (WHO, 2021). The NDHS item does not identify HIV-specific screening eligibility or the screening method used.

2.3 Outcome Variables

The outcomes variables were binary: (1) ever had breasts examined for cancer by a healthcare provider (yes=1, no=0); and (2) ever tested for cervical cancer by a healthcare provider (yes=1, no=0). "Don't know" responses were set to missing. The outcome variables capture self-reported lifetime provider examination/testing. They do not establish whether the respondent received mammography, a standardized clinical breast examination, HPV testing, visual inspection with acetic acid, cytology or another specified test. They also do not establish cancer diagnosis, test results, screening frequency or whether the service was performed within a recommended interval.

2.4 Explanatory Variables

The explanatory variables for the study were age group (15–24, 25–34 and 35–49 years); place of residence (urban/rural); educational attainment (no education, primary, secondary and higher); household wealth quintile (poorest, poorer, middle, richer and richest); geopolitical zone (North Central, North East, North West, South East, South South and South West); health insurance coverage (yes/no); current working status (yes/no); and union status (currently in union, never in union and formerly in union). State was used for descriptive geographic comparisons.

2.5 Statistical Analysis

All estimates incorporated the women's sampling weight, primary sampling unit and sampling stratum. Weighted prevalence was estimated as the weighted proportion reporting each outcome. Confidence intervals for weighted proportions were calculated using Taylor linearization, aggregating linearized contributions at PSU level within strata. Design degrees of freedom were based on the number of PSUs minus the number of strata.

Separate weighted logistic regression models were fitted for breast examination and cervical testing. Each model included age group, residence, education, wealth quintile, geopolitical zone, insurance, employment and union status. Adjusted odds ratios (aORs), 95% confidence intervals and p-values were estimated using a PSU-clustered, stratum-centred Taylor-linearised sandwich covariance estimator. Reference categories were age 15–24 years, rural residence, higher education, middle wealth quintile, North Central zone, insured, not working and currently in union.

Wealth-related inequality was quantified using the concentration index (C), calculated from the weighted covariance between the binary outcome and fractional socioeconomic rank. Positive values indicate concentration among wealthier respondents. For binary outcomes, the Erreygers normalised concentration index was also calculated as $E = 4\mu(1 - \mu)W$, where μ is the weighted mean. The reported indices are point estimates.

We used statistical significance at $p < 0.05$. The data was analyzed using the R statistical package, with custom Taylor-linearized variance calculations to reflect clustering and stratification.

2.6 Ethical Considerations

The analysis used anonymized secondary data. The primary NDHS obtained ethical approvals from the relevant Nigerian and ICF ethics review bodies and informed consent from participants (NPC, 2025).

3 RESULTS

3.1 Characteristics of the Study Population

The analysis included 39,050 women aged 15–49 years. Based on weighted distributions, 51.7% lived in rural areas and 48.3% in urban areas. Approximately 34.3% had no formal education, 40.8% had secondary education and 13.7% had higher education. The poorest and poorer quintiles together represented 36.0% of the weighted population, while 22.4% were in the richest quintile. Only 3.3% reported health insurance coverage.

Table 1: Characteristics of the study population

Characteristic	Unweighted n	Weighted %
Age 15–24	14,708	38.3
Age 25–34	11,956	30.8
Age 35–49	12,386	30.9
Rural residence	20,130	51.7
Urban residence	18,920	48.3

No education	12,139	34.3
Primary	4,382	11.2
Secondary	16,777	40.8
Higher	5,752	13.7
Poorest	6,993	17.2
Poorer	6,525	18.8
Middle	7,769	20.0
Richer	8,855	21.6
Richest	8,908	22.4
Health insurance: yes	1,267	3.3
Currently working	23,044	57.8

3.2 Overall Prevalence

The weighted prevalence of ever having had a breast examination for cancer was 5.48% (95% CI 5.13–5.84; n=39,014). The weighted prevalence of ever having been tested for cervical cancer was 3.14% (95% CI 2.89–3.38; n=38,994). Among women aged 30–49 years, breast examination prevalence was 7.95% (95% CI 7.38–8.52) and cervical testing prevalence was 5% (95% CI 4.56–5.44).

Table 2: Overall prevalence

Outcome	Unweighted yes	Unweighted no	Valid n	Weighted prevalence	95% CI
Breast examination	2,253	36,761	39,014	5.48%	5.13–5.84
Cervical cancer testing	1,148	37,846	38,994	3.14%	2.89–3.38

3.3 Socioeconomic and Geographic Differences

Reported utilization increased markedly for both outcomes with educational attainment and household wealth. Breast examination prevalence ranged from 1.14% in the poorest quintile to 13.35% in the richest quintile. Cervical testing ranged from 1.09% in the poorest quintile to 6.89% in the richest quintile. Women with higher education reported substantially greater utilization than women with no education. Unadjusted prevalence was higher in urban than rural areas for both outcomes; however, residence was not independently associated with either outcome after adjustment for the included socioeconomic and geographic variables.

Table 3: Socioeconomic and geographic differences

Characteristic	Category	Breast examination %	Cervical testing %
Age	15–24	2.43	1.11
Age	25–34	6.16	3.31
Age	35–49	8.60	5.48
Residence	Urban	8.24	4.38
Residence	Rural	2.91	1.97
Education	No education	1.46	1.50
Education	Primary	3.85	2.27
Education	Secondary	5.18	2.78
Education	Higher	17.80	8.99
Wealth	Poorest	1.14	1.09
Wealth	Poorer	1.93	1.52

Wealth	Middle	3.00	2.14
Wealth	Richer	6.20	3.20
Wealth	Richest	13.35	6.89
Insurance	Insured	23.86	13.58
Insurance	Not insured	4.86	2.78
Employment	Working	7.38	4.22
Employment	Not working	2.89	1.65
Zone	North Central	4.49	2.11
Zone	North East	2.85	2.12
Zone	North West	2.80	2.23
Zone	South East	7.69	2.96
Zone	South South	9.24	3.87
Zone	South West	11.33	7.07

3.4 State-level Inequalities

State-level estimates showed clear geographic variation. Lagos recorded the highest weighted prevalence of both outcomes: 18.2% for breast examination and 11.9% for cervical testing. For breast examination, other high estimates were in Cross River (16.6%), Imo (13.5%), Oyo (12.7%) and Akwa Ibom (10.8%). The lowest estimates were in Zamfara (0.6%), Katsina (0.7%), Kebbi (0.7%), Borno (1.1%) and Taraba (1.6%). For cervical testing, relatively high estimates were also observed in Akwa Ibom (7.8%), Ogun (7.6%), Abia (6.3%) and Oyo (6.2%); the lowest were in Kebbi (0.2%), Ebonyi (0.4%), Yobe (0.6%), Niger (0.8%) and Sokoto (0.8%).

Table 4: State-level inequalities

Highest state estimates	Breast examination %	Cervical testing %
Lagos	18.2	11.9
Cross River	16.6	4.1
Imo	13.5	6.1
Oyo	12.7	6.2
Akwa Ibom	10.8	7.8

Rank from lowest	Breast examination state (%)	Cervical testing state (%)
1	Zamfara (0.6)	Kebbi (0.2)
2	Katsina (0.7)	Ebonyi (0.4)
3	Kebbi (0.7)	Yobe (0.6)
4	Borno (1.1)	Niger (0.8)
5	Taraba (1.6)	Sokoto (0.8)
Ebonyi	—	0.4
Yobe	—	0.6
Niger	2.0	0.8
Sokoto	2.3	0.8

3.5 Wealth-related Inequality

The wealth concentration index was positive for both outcomes, indicating a pro-rich distribution. The concentration index was 0.436 for breast examination and 0.352 for cervical testing. The corresponding Erreygers normalised concentration indices were 0.090 and 0.043, respectively. The stronger relative concentration index for breast examination suggests a steeper wealth gradient in reported breast examination than in cervical testing, although the outcomes have different prevalence levels.

Table 5: Wealth-related inequality

Outcome	Concentration index (C)	Erreygers index	Interpretation
Breast examination	0.436	0.090	Pro-rich concentration
Cervical cancer testing	0.352	0.043	Pro-rich concentration

3.6 Factors Associated with the Outcomes

In the adjusted breast examination model, women aged 25–34 years (aOR 1.56, 95% CI 1.28–1.89) and 35–49 years (aOR 1.90, 95% CI 1.55–2.34) had higher odds than women aged 15–24. Compared with women with higher education, odds were lower among women with no education (aOR 0.20, 95% CI 0.16–0.26), primary education (aOR 0.33, 95% CI 0.26–0.42) and secondary education (aOR 0.43, 95% CI 0.38–0.49). The richest women had higher odds than women in the middle wealth quintile (aOR 2.19, 95% CI 1.77–2.71), while the poorest had lower odds (aOR 0.64, 95% CI 0.43–0.94). Lack of insurance was associated with lower odds (aOR 0.48, 95% CI 0.40–0.57). Working women had higher odds (aOR 1.28, 95% CI 1.11–1.47). The South East, South South and South West had higher adjusted odds than North Central.

For cervical testing, age 25–34 years (aOR 1.90, 95% CI 1.46–2.47) and 35–49 years (aOR 2.81, 95% CI 2.15–3.67) were associated with higher odds relative to age 15–24. No education (aOR 0.34, 95% CI 0.25–0.45), primary education (aOR 0.37, 95% CI 0.27–0.51) and secondary education (aOR 0.51, 95% CI 0.43–0.60) were associated with lower odds than higher education. The richest quintile had higher odds than the middle quintile (aOR 1.74, 95% CI 1.33–2.27), while the poorest had lower odds (aOR 0.59, 95% CI 0.39–0.90). Lack of insurance was associated with lower odds (aOR 0.49, 95% CI 0.40–0.60), and working women had higher odds (aOR 1.29, 95% CI 1.05–1.59). Compared with North Central, adjusted odds were higher in North East, North West, South South and South West. Urban residence was not statistically significant in either model.

Table 6: Factors associated with the outcomes

Predictor contrast	Breast examination aOR (95% CI)	Cervical testing aOR (95% CI)
Age 25–34 vs 15–24	1.56 (1.28–1.89)	1.90 (1.46–2.47)
Age 35–49 vs 15–24	1.90 (1.55–2.34)	2.81 (2.15–3.67)
Urban vs rural	1.05 (0.89–1.23)	0.91 (0.74–1.14)
No education vs higher	0.20 (0.16–0.26)	0.34 (0.25–0.45)
Primary vs higher	0.33 (0.26–0.42)	0.37 (0.27–0.51)
Secondary vs higher	0.43 (0.38–0.49)	0.51 (0.43–0.60)
Poorest vs middle	0.64 (0.43–0.94)	0.59 (0.39–0.90)
Poorer vs middle	0.92 (0.70–1.20)	0.83 (0.58–1.18)
Richer vs middle	1.55 (1.27–1.90)	1.23 (0.93–1.63)
Richest vs middle	2.19 (1.77–2.71)	1.74 (1.33–2.27)
North East vs North Central	1.11 (0.80–1.54)	1.64 (1.14–2.36)
North West vs North Central	1.01 (0.82–1.26)	1.64 (1.26–2.15)
South East vs North Central	1.34 (1.08–1.67)	1.10 (0.85–1.43)
South South vs North Central	1.42 (1.15–1.77)	1.35 (1.03–1.76)
South West vs North Central	1.44 (1.16–1.78)	2.14 (1.67–2.74)

No insurance vs insured	0.48 (0.40–0.57)	0.49 (0.40–0.60)
Working vs not working	1.28 (1.11–1.47)	1.29 (1.05–1.59)
Never in union vs currently in union	0.57 (0.47–0.69)	0.57 (0.44–0.74)
Formerly in union vs currently in union	1.15 (0.93–1.41)	1.26 (0.99–1.61)

4 DISCUSSION

In this study we discovered that the reported breast cancer examination and cervical cancer testing were uncommon among women aged 15–49 years in Nigeria. Weighted prevalence was 5.48% for breast examination and 3.14% for cervical testing. These estimates follow through with the summary from 2024 NDHS, which reported approximately 6% of the women had ever been tested for breast cancer and 3% for cervical cancer (NPC, 2025).

The finding that was the most consistent was the socioeconomic gradient, which stated that women with higher education and those in the richest wealth quintile were more likely to report both cases. Positive concentration indices confirmed that utilization was disproportionately concentrated among wealthier women. This aligns with multicountry DHS evidence showing pro-rich inequalities in cervical screening across sub-Saharan Africa (Asgedom et al., 2024), and with Nigerian evidence identifying financial constraints and health-service barriers as important difficulties (WHO, 2021; Mafiana et al., 2022].

The health insurance coverage was rare (3.3%), but women with no insurance had approximately half the adjusted odds of reporting either case of cancer compared with insured women. This association is not necessarily causal. Insurance may represent broader socioeconomic advantage, contact with formal healthcare or access to facilities where screening is available. Nevertheless, the finding of this study supports attention to financial protection and the inclusion of preventive services within accessible provision of health coverage.

Geographic differences were significant. In Lagos, we observed the highest prevalence for both outcomes, meanwhile several states had very low estimates. State variation may reflect differences in service availability, health workforce distribution, public awareness, financing, referral pathways and facility capacity.

Urban-rural residence was not independently associated with either outcome after adjustment for education, wealth, insurance, employment and geopolitical zone. This does not mean geography is insignificant; rather, part of the unadjusted urban-rural difference may be accounted for by the unequal distribution of socioeconomic resources and enabling factors. Persistent regional associations suggest broader contextual differences remain.

The age gradient is expected for lifetime examination/testing because older women have had more time and opportunities to encounter healthcare services. Interpretation of cervical testing among women aged 15–29 requires care. WHO recommends starting HPV DNA-based cervical screening at age 30 in the general population, with a different recommendation for women living with HIV (WHO, 2021). Lower reported prevalence among younger women should therefore not be framed as failure to meet screening recommendations. The age-restricted 30–49 estimate of 5.00% is a more policy-relevant supplementary indicator.

Strengths

A major strength is the use of a large, nationally representative survey covering all 36 states and the FCT. The analysis compared two cancer-related outcomes in the same population and evaluated wealth inequality using concentration indices in addition to multivariable modelling. Survey weights, strata and PSUs were incorporated in the estimates and regression variance calculations.

Limitations

First, the cross-sectional design does not establish temporality or causality. Second, both outcomes are self-reported and may be affected by recall or reporting error. Third, the questions do not specify screening modality, timing, frequency, clinical indication, test result or follow-up. Fourth, provider examination/testing cannot be interpreted as confirmed diagnosis, cancer prevalence or adherence to a screening guideline. Fifth, the wealth index is a relative asset-based measure rather than direct income. Sixth, some state estimates may be imprecise because of small numbers of reported examinations or tests. Finally, the NDHS does not contain detailed facility-level supply, cost, distance-to-screening-centre or quality-of-care information needed to explain geographic differences.

5 CONCLUSION

Reported breast examination and cervical cancer testing were rare among women in Nigeria, and both outcomes were disproportionately concentrated among women with greater socioeconomic resources. Clear state-level variation was observed, with Lagos reporting the highest prevalence for both outcomes and several states recording very low levels. Education, household wealth, insurance coverage, age and employment were important correlates. The findings of this study point to the need for an unbiased, state-responsive cancer prevention services, improved financial protection and a stronger primary healthcare referral pathway.

Recommendations

The study supports a combined strategy, which is to expand community-level awareness, integrate cancer prevention information into routine primary healthcare and reproductive health contacts, train providers to offer appropriate, guideline-concordant services, strengthen referral and diagnostic pathways, and prioritise states and populations with the lowest reported utilization. Cervical screening should follow national guidance and WHO recommendations, including appropriate age eligibility, quality-assured testing and linkage to treatment (WHO, 2021). For breast cancer, programmes should strengthen breast awareness, prompt evaluation of symptoms and timely access to diagnostic services rather than assuming that a single self-reported examination represents an effective screening pathway.

Future research should link population survey findings with facility readiness, service availability and longitudinal screening records to determine whether women receive suitable tests and appropriate follow-up.

STATEMENTS ON COMPLIANCE WITH ETHICAL STANDARDS

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Disclosure of conflict of interest

The authors declare no conflicts of interest regarding this manuscript.

Statement of ethical approval

The primary NDHS obtained ethical approvals from the relevant Nigerian and ICF ethics review bodies.

Statement of informed consent

Informed consent was obtained from all the participants that were included in the study.

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