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Cervical cancer screening uptake and its predictors among women aged 30–49 in Ghana: Providing evidence to support the World Health Organization's cervical cancer elimination initiative

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Abstract

Introduction Cervical cancer remains a global health challenge, disproportionately affecting women in low- and middle-income countries, including Ghana. Hence, this study examined the regional variations and predictors of cervical cancer screening uptake among women aged 30–49 in Ghana.

Methods Data for this study was obtained from the 2022 Ghana Demographic and Health Survey, comprising 7,124 women aged 30–49. The regional variations in women's uptake of cervical cancer screening was presented using spatial map. A mixed-effect multilevel binary logistic regression was used to examine the factors associated with cervical cancer screening uptake. The results were presented using adjusted odds ratios (aORs) with 95% confidence intervals (CIs).

Results The uptake of cervical cancer screening was 7.27% [6.33, 8.35] in Ghana. Significant variations in cervical cancer screening existed across regions, with the lowest uptake in Western, Oti, Savannah, and North East regions. Women in rural areas had lower odds of being screened for cervical cancer [aOR = 0.46; 95% CI = 0.28, 0.76] compared to those in urban areas. Women living in the Central, Greater Accra, Volta, Eastern, Ashanti, Ahafo, Bono East, Oti, Northern, North East, Upper East, and Upper West regions all had higher odds of undergoing cervical cancer screening compared to those in the Western region. Women with higher education [aOR = 2.71; 95% CI = 1.23, 5.94] were more likely to be screened for cervical cancer compared to those with no formal education. Women who visited a health facility in the past year had higher odds of being screened for cervical cancer [aOR = 1.48; 95% CI = 1.02, 2.15] relative to those who did not. Reading newspapers or magazines increased the odds of cervical cancer screening uptake [aOR = 1.80; 95% CI = 1.10, 2.92] . Women who belonged to the middle [aOR = 2.19; 95% CI = 1.07,

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4.49], richer [aOR = 2.85; 95% CI = 1.28, 6.38], and richest [aOR = 3.08; 95% CI: 1.25, 7.59] wealth indices were more likely to be screened for cervical cancer compared to those in the poorest wealth index.

Conclusions Our findings highlight critical disparities in cervical cancer screening uptake in Ghana, particularly emphasizing the need for targeted interventions to address the lower screening rates among women in the Western, Oti, Savannah, and North East regions. The significant association between cervical cancer screening uptake and healthcare access, media exposure, and wealth underscores the importance of enhancing healthcare infrastructure and outreach in underserved regions. To improve screening rates, it is recommended that public health initiatives focus on increasing awareness through community education programs, promoting health facility visits, and leveraging media platforms to disseminate information about cervical cancer screening. Additionally, policies should aim to reduce geographical and socioeconomic barriers, ensuring equitable access to screening services across all regions, especially for women in lower wealth quintiles.

Keywords Cervical cancer screening, Ghana, Demographic and Health Survey

Introduction

Cervical cancer continues to pose a global health challenge, particularly impacting women in low- and middle-income countries (LMICs) [1]. Recent studies underscore the pivotal role of human papillomavirus (HPV) infection, particularly persistent infection with high-risk HPV types, as the primary cause of cervical cancer [1–5]. Despite advancements in understanding the aetiology of cervical cancer, there exists a persistent gap in translating this knowledge into effective screening practices, especially among women in Ghana.

Cervical cancer is a significant global health concern and one of the leading causes of cancer-related mortality among women, particularly in LMICs [1, 2, 6–8]. In Ghana, cervical cancer is the second most common cancer among women, with an estimated 3,072 (19.2%) new cases and 1,815 (16.9%) deaths annually [9]. Also, the age-standardized incidence and mortality rate for cervical cancer were 27.0 and 16.9 per 100,000, respectively, in 2022 [9]. Additionally, specific studies have provided insights into the prevalence of HPV infection in different groups within Ghana. For instance, a study conducted in the North Tongu District of Ghana found a high-risk HPV prevalence of 32.3% among the samples analysed [10]. Another study estimated an overall HPV prevalence of 65% in pregnant women aged 18–41 years in Ghana, with 72% of them being infected with high-risk HPV genotypes [11]. These studies indicate a significant prevalence of HPV infection in specific groups within Ghana, highlighting the importance of continued monitoring and preventive measures to address the burden of HPV-related diseases in the country.

Cervical cancer screening, through methods like Pap smears or HPV testing, plays a crucial role in early detection and prevention and faces low utilisation rates in sub-Saharan African countries [12, 13]. For instance, cervical cancer screening uptake among Ghanaian women remains low from 2.4 to 24.6% despite geographic proximity to health centres that provide free cervical cancer screening [14, 15]. The low utilisation rate of screening services contributes to the high burden of cervical cancer in these countries, including Ghana, necessitating targeted interventions to enhance screening uptake and mitigate the disease's impact.

Several recent studies have explored the complex interplay of individual, social, and healthcare system factors influencing cervical cancer screening uptake in LMICs [16, 17]. The predictors of cervical cancer screening in Ghana encompass various socio-demographic characteristics, risk factors, knowledge of screening, and utilisation of screening services [18]. Marital status, satisfaction with healthcare, healthcare involvement, educational level, age, and difficulty with self-care have been identified as predictors of cervical cancer screening uptake among women in Ghana [14, 15, 19, 20]. Understanding these predictors is essential for developing targeted interventions and public health campaigns aimed at increasing cervical cancer screening uptake among at-risk populations.

The 2021 World Health Organization's (WHO) guidelines for cervical cancer prevention and screening represent a significant advancement in the global fight against this disease. The guidelines emphasise a risk-based approach, prioritising HPV testing as the primary screening method. It also emphasizes the need to for women to be screened for cervical cancer every 5–10 years starting at age 30. However, cervical cancer remains a significant public health burden in Ghana, with a disproportionate impact on women [21]. To help contribute to the global advancement in the fight against cervical cancer, there is a need for studies on cervical screening uptake in Ghana. In line with this, existing literature has shown several studies conducted in Ghana on cervical cancer screening uptake. These include studies that have been conducted among women in general [20, 22–25] and among those living with HIV [26, 27]. Most of these studies were conducted in small geographical areas in the country and only two used nationally representative data

from the 2022 Ghana Demographic and Health Survey (Ghana DHS) [22, 25]. These studies reported low cervical screening rates among Ghanaian women and found factors such as age, education, income, rural residence, and lack of awareness as associated with cervical cancer screening uptake.

Considering the efforts by the WHO to eliminate cervical cancer by 2030, there is a need for recent nationally representative data on cervical screening coverage, including disaggregated data by age, region, and socioeconomic status. Although there are already two existing studies on cervical cancer screening uptake in Ghana that used recent nationally representative data [22, 26], a critical review of these studies has shown major gaps which our study seeks to fill. First, both studies were done using data on women aged 15–49. Conducting a study on cervical cancer screening uptake using data from women aged 15–49 contradicts WHO recommendations by focusing on a group that is largely outside the target population for screening. Including younger women (15–29) in the study risks underestimating the true prevalence of cervical cancer in the at-risk population (30–49). Since cervical cancer is rare in women under 30, the inclusion of this age group could dilute the actual screening results, leading to biased conclusions about the overall effectiveness of screening programs. This could lead to over-screening, misallocation of resources, and medical interventions in younger women who are unlikely to benefit. Our study addresses this gap by focusing on women aged 30–49, in line with the WHO recommendation. By focusing solely on women aged 30–49, our study provides a more targeted, scientifically sound, and policy-relevant findings. It addresses the population most at risk for cervical cancer, leading to better resource allocation, more accurate results, and stronger public health impact. Another major gap in those two studies which our study addresses is the use of binary logistic regression to test the associations between variables rather than adopting the multilevel modelling approach as recommended by the DHS [28]. By relying on binary logistic regression, these studies overlook the complex, multilevel nature of the DHS data, which compromises their ability to draw accurate conclusions about cervical cancer screening uptake. By using the multilevel modelling approach in our study, we provide a better understanding of both individual-level and community-level predictors of screening uptake. Ignoring these levels could lead to potential underestimation of prevalence, biased results, and less robust public health recommendations. Hence, our study addressed these two major gaps by examining the regional variations and predictors of cervical cancer screening uptake in Ghana.

Methods

Data source

Data from the 2022 Ghana DHS was used for the study. A sample of 7,124 women aged 30-49 were used for the analyses. DHS is a representative survey conducted in several countries worldwide to ascertain trends of health and social issues affecting women, men, and children [29, 30]. Since the inception of the DHS, over 350 surveys have been conducted in over 90 LMICs [29]. In Ghana, the 2022 DHS is the seventh standard DHS since the first survey was conducted in 1988 [31]. Pretested and validated structured questionnaires were used to collect data from the respondents [31]. A cross-sectional design was adopted for the Ghana DHS, and the respondents were sampled using a multistage sampling method. The detailed sampling methodology has been published in the literature [32]. In writing this paper, we followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist [33].

Variables

The study's outcome variable was the uptake of cervical cancer screening, which was operationally defined as haven tested for cervical cancer. This was derived from the question: "Have you ever tested or been screened for cervical cancer by a health worker or health professional?" The response options were no and yes. Based on the findings of previous studies [34–37], and to derive a binary outcome for our analyses, we coded no as "0" and yes as "1".

Seventeen explanatory variables were used in this study. These variables were selected for inclusion in the study based on their association with cervical cancer screening following an extensive literature search [34–37] and their availability in Ghana DHS. The variables consist of the age of the women, level of education, marital status, current working status, religion, parity, covered by health insurance, visit to a health facility in the last 12 months, past year experience of genital sores/ulcer, past year experience of genital discharges, internet usage, exposure to watching television, exposure to reading newspaper or magazine, exposure to listening to radio, household wealth index, place of residence, and region of residence. Based on the hierarchical and complex nature of the DHS data, we segregated the variables into individual and contextual levels (household and community level variables). Table 1 shows the variables and their categories.

Statistical analyses

All the analyses were carried out using STATA software version 17.0. We used percentages with confidence intervals (CIs) to summarise the uptake of cervical cancer screening. A spatial map was used to present the findings of the regional variations in cervical screening uptake

Table 1 Bivariate analysis of cervical cancer screening uptake among the women

Variables	Weighted sample	Screened for cervical cancer	
	n (%)	% [95% CI]	*p*-value
Women's age (years)			0.594
30–34	2,298 (30.86)	6.91 [5.53, 8.61]	
35–39	2,010 (28.21)	7.06 [5.65, 8.79]	
40–44	1,635 (22.95)	7.08 [5.39, 9.24]	
45–49	1,281 (17.98)	8.48 [6.59, 10.84]	
Level of education			< 0.001
No education	1,811 (25.41)	3.11 [2.24, 4.31]	
Primary	1,123 (15.76)	4.61 [3.13, 6.74]	
Secondary	3,378 (47.42)	6.84 [3.61, 8.31]	
Higher	812 (11.40)	22.04 [18.04, 26.63]	
Marital status			0.192
Never in union	505 (7.09)	7.87 [5.28, 11.58]	
Married	4,344 (60.97)	7.66 [6.53, 8.97]	
Cohabiting	1,064 (14.94)	5.11 [3.58, 7.24]	
Previously married	1,211 (17.00)	7.54 [5.54, 10.18]	
Religion			0.004
Christianity	5,474 (76.83)	8.03 [6.88, 9.35]	
Islamic	1,319 (18.52)	5.51 [4.10, 7.35]	
African Traditionalist	170 (2.39)	0.65 [0.15, 2.78]	
No religion or other	161 (2.25)	3.13 [0.75, 12.15]	
Current working status			0.385
Not working	714 (10.02)	6.29 [4.28, 9.14]	
Working	6,410 (89.98)	7.38 [6.43, 8.47]	
Number of children			< 0.001
None	429 (6.02)	13.53 [9.67, 18.61]	
One	2656 (9.22)	11.76 [8.32, 16.37]	
Two	1,075 (15.09)	9.44 [7.14, 12.40]	
Three	1,302 (18.27)	7.12 [5.52, 9.13]	
Four or more	3,662 (51.40)	5.16 [4.17, 6.36]	
Covered by health insurance			0.003
No	642 (9.01)	3.48 [1.96, 6.11]	
Yes	6,482 (90.99)	7.65 [6.68, 8.75]	
Visited the health facility in last 12 months			< 0.001
No	3,134 (43.99)	4.95 [3.81, 6.42]	
Yes	3,990 (5.01)	9.10 [7.72, 10.69]	
Genital sore/ulcer in last 12 months			0.252
No	6,579 (92.35)	7.41 [6.42, 8.54]	
Yes	545 (7.65)	5.63 [3.53, 8.84]	
Genital discharge in the last 12 months			0.365
No	5,877 (82.49)	7.09 [6.08, 8.26]	
Yes	1,247 (17.51)	8.12 [6.20, 10.58]	
Watch television			< 0.001
No	1,792 (25.15)	3.19 [2.32, 4.37]	
Yes	5,332 (74.85)	8.65 [7.51, 9.94]	
Listen to radio			< 0.001
No	2,203 (30.92)	4.62 [3.41, 6.22]	
Yes	4,921 (69.08)	8.46 [7.40, 9.67]	
Read newspaper or magazine			< 0.001
No	6,553 (91.99)	6.22 [5.30, 7.28]	
Yes	571 (8.01)	19.39 [15.07, 24.58]	
Use Internet			< 0.001
No	4,334 (60.83)	3.87 [3.18, 4.70]	

Table 1 (continued)

Variables	Weighted sample	Screened for cervical cancer	
	n (%)	% [95% CI]	*p*-value
Yes	2,790 (39.17)	12.56 [10.71, 14.67]	
Wealth index			< 0.001
Poorest	1,142 (16.02)	2.07 [1.39, 3.07]	
Poorer	1,275 (17.90)	3.22 [2.29, 4.52]	
Middle	1,374 (19.28)	5.60 [3.86, 8.05]	
Richer	1,597 (22.42)	8.09 [6.09, 10.67]	
Richest	1,736 (24.37)	14.25 [11.92, 16.94]	
Place of residence			< 0.001
Urban	4,068 (57.10)	9.65 [8.14, 11.39]	
Rural	3,056 (42.90)	4.12 [3.30, 5.13]	
Region			0.047
Western	447 (6.4)	3.54 [1.81, 6.81]	
Central	749 (11.3)	6.21 [4.24, 9.00]	
Greater Accra	1209 (15.5)	9.71 [7.23, 12.92]	
Volta	362 (4.7)	9.33 [6.05, 14.13]	
Eastern	617 (8.1)	8.12 [5.85, 11.16]	
Ashanti	1395 (19.5)	8.62 [5.74, 12.74]	
Western North	188 (2.7)	4.99 [2.36, 10.24]	
Ahafo	149 (2.1)	6.12 [3.99, 9.27]	
Bono	255 (3.8)	5.60 [3.33, 9.28]	
Bono East	305 (4.5)	6.18 [3.63, 10.34]	
Oti	188 (2.7)	4.13 [2.37, 7.08]	
Northern	562 (7.7)	7.41 [4.33, 12.38]	
Savannah	134 (2.1)	1.71 [0.83, 3.46]	
North East	125 (1.9)	3.88 [2.00, 7.40]	
Upper East	264 (4.3)	6.25 [3.74, 10.27]	
Upper West	175 (2.7)	5.56 [3.26, 9.35]	
National	7124 (100%)	7.27 [6.33, 8.35]	

**P*-values obtained from chi-square test

among women. We determined the distribution of cervical cancer screening uptake among the women using cross-tabulation. At the same time, a Pearson's chi-square test of independence was utilised to select the significant variables for the next stage of the analysis which involved a multilevel binary logistic regression modelling. The regression model included all the variables with *p*-values less or equal to 0.05. We performed the analysis using four models (Model O-III). Model O was an empty model with no explanatory variables, and it showed the variation in cervical cancer screening uptake attributed to the clustering at the primary sampling unit (PSU). Model I and II included the individual and contextual-level variables, respectively. Model III contained all the explanatory variables. The output was segregated into fixed-effect and random-effect results. The fixed effect results showed the explanatory variables' association with cervical cancer screening. The results were presented using adjusted odds ratio (aOR) with their respective 95% CIs. On the other hand, the random effect results measured the variation in cervical cancer screening uptake by the intra-cluster correlation coefficient (ICC).

Ethical consideration

No ethical clearance was sought for the study. The ICF Institutional Review Board ensured that the survey complied with the U.S. Department of Health and Human Services regulations for protecting human subjects. Permission to access and use the data was sought from Monitoring and Evaluation to Assess and Use Results Demographic and Health Surveys (MEASURE DHS).

Results

Prevalence of cervical cancer screening in Ghana

The national uptake of cervical cancer screening was 7.27% [6.33, 8.35]. Across the 16 regions, there were variations in the uptake of cervical cancer screening. As shown in the red-shaded regions of the spatial map, the regions with the highest uptake were Volta, Eastern, Ashanti, and Greater Accra. Western, Oti, Savannah, and North East regions had the lowest uptake as shown in the blue-shaded regions (Fig. 1).

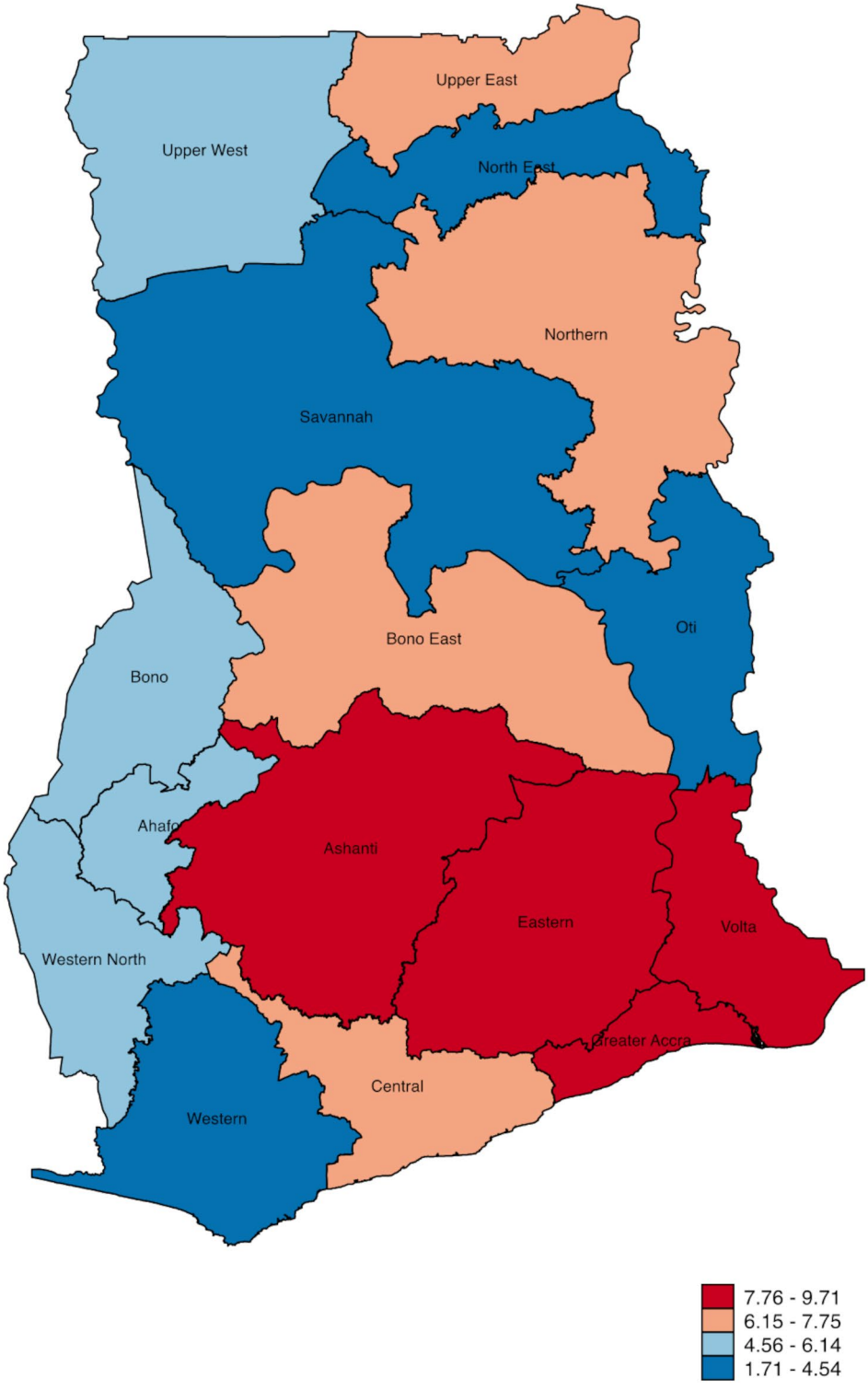

Fig. 1 Regional distribution of cervical cancer screening uptake among women aged 30–49 in Ghana

Distribution of cervical cancer screening uptake among the women

Table 1 presents a bivariate results of cervical cancer screening among women, highlighting various demographic and socioeconomic factors. Cervical cancer screening rates increased with age, from 6.91% in the 30–34 age group to 8.48% in the 45–49 age group. Women with higher educational levels had higher

screening rates, with only 3.11% for those with no education compared to 22.04% for those with higher education. Screening rates were similar across marital statuse, ranging from 5.11% among cohabiting women to 7.87% among those never in union. Christian women had the highest screening rate (8.03%), while those identifying as African Traditionalists have the lowest (0.65%). Working women had a slightly higher screening rate (7.38%) compared to non-working women (6.29%). Women with no children had the highest screening rate (13.53%), while those with four or more children have the lowest (5.16%). Women with health insurance had a significantly higher screening rate (7.65%) compared to those without (3.48%). Women who visited a health facility in the last 12 months had a higher screening rate (9.10%) compared to those who did not (4.95%). Women who watched television, listen to the radio, read newspapers, or use the internet had higher screening rates compared to those who did not. Screening rates increased with wealth, from 2.07% in the poorest group to 14.25% in the richest group. Urban women had a higher screening rate (9.65%) compared to rural women (4.12%). Screening rates varied by region, with the Greater Accra region showing the highest rate (9.71%) and the Savannah region the lowest (1.71%). The chi-square test results showed that level of education, religion, number of living children, health insurance coverage, visit to the health facility in last 12 months, exposure to television, radio, newspaper/magazine, and internet, wealth index, place of residence, and region were significantly associated with the uptake of cervical cancer screening.

Factors associated with cervical cancer screening uptake among women in Ghana

Fixed effect results

As shown in Model III of Table 2 (the model that had all the explanatory variables), women with higher education had higher odds of being screened [aOR = 2.71; 95% CI = 1.23, 5.94] for cervical cancer, compared to those with no formal education. Women who visited a health facility in the past year had higher odds of being screened [aOR = 1.48; 95% CI = 1.02, 2.15], than those who did not. Reading newspapers or magazines significantly increased the odds of cervical cancer screening [aOR = 1.80; 95% CI = 1.10, 2.92]. Women who belonged to the middle [aOR = 2.19; 95% CI = 1.07, 4.49] richer [aOR = 2.85; 95% CI = 1.28, 6.38], and richest [aOR = 3.08; 95% CI: 1.25, 7.59] wealth indices were more likely to be screened for cervical cancer compared to those in the poorest wealth index. Women living in the Central, Greater Accra, Volta, Eastern, Ashanti, Ahafo, Bono East, Oti, Northern, North East, Upper East, and Upper West regions all had higher odds of cervical cancer screening uptake compared to the Western region. Women in rural areas had significantly lower odds of being screened [aOR = 0.46; 95% CI = 0.28, 0.76] compared to those in urban areas.

Random effect results

The random effect results in Table 2 indicates that there were considerable variations in cervical cancer screening uptake across the clusters ($\sigma 2 = 6.83$, 95% CI = 5.45 to 8.56). Approximately 67% of the prevalence of cervical cancer screening was attributed to the variations between the clusters (ICC = 0.674). The between-cluster difference dropped to 61.8% in Model I, decreased to 60.0% in Model II, and marginally decreased to 59.3% in Model III. These ICC results suggest that the variations in the likelihood of undergoing cervical cancer screening can be attributed to the variances across the clusters.

Discussion

This study used the 2022 Ghana DHS to examine the regional variation and predictors of cervical cancer screening among women in Ghana. The prevalence of cervical cancer screening uptake among women aged 30–49 in Ghana is 7.27% [6.33, 8.35]. Various factors associated with cervical cancer screening were identified including, level of education, visit to health facilities, exposure to reading newspapers or magazines, wealth index, place of residence and region of residence.

The observed low uptake of cervical cancer screening (7.27%) in Ghana is higher than those reported in two studies conducted in Ghana that also used nationally representative data to examine the issue. One of the studies reported a prevalence of cervical cancer screening uptake of 4.60% [22], and the other reported a prevalence of 5.0% [25] despite both studies using the same data and sample size. Our observed prevalence could potentially reflect the unbiased estimate of cervical cancer screening uptake in the country since we focused on the most at-risk women aged 30–49 as recommended by the WHO. However, a previous study has reported a higher proportion (8%) among college students in Ghana [38]. Furthermore, three systematic reviews [13, 39, 40] reported higher cervical cancer screening rates, specifically 10%, 11-19.9%, 12%, and 14% in Tanzania, Ethiopia, sub-Saharan Africa, and Kenya, respectively. The disparity in the prevalence may be ascribed to a dearth of information and understanding of cervical cancer and its prevention and restricted access and limited availability of screening services, particularly in rural regions [15]. The high expenses associated with screening and treatment render it financially inaccessible for many women [15]. Women's access to reproductive health care is also hindered by cultural and religious beliefs [41].

The study found that women with a higher level of education exhibited a greater likelihood of undergoing cervical cancer screening compared to those with no formal

Table 2 Predictors associated with cervical cancer screening uptake among women in Ghana

Variable	Model O Empty model	Model I aOR [95% CI]	Model II aOR [95% CI]	Model III aOR [95% CI]
Fixed effect results				
Religion				
Christianity		1.00		1.00
Islamic		0.54[0.26,1.10]		0.52 [0.25,1.08]
African Traditionalist		0.26 [0.04,1.54]		0.26 [0.04,1.60]
No religion or other		0.74 [0.13,4.05]		0.77 [0.14,4.23]
Level of education				
No education		1.00		1.00
Primary		1.18 [0.60,2.35]		1.13 [0.56,2.26]
Secondary		1.22 [0.65,2.29]		1.09 [0.57,2.10]
Higher		3.17** [1.52,6.63]		2.71*[1.23,5.94]
Number of children				
None		1.00		1.00
One		0.98[0.47,2.04]		0.96 [0.46,1.99]
Two		0.83[0.44,1.56]		0.83 [0.45,1.55]
Three		0.70[0.38,1.27]		0.70 [0.39,1.25]
Four or more		0.91 [0.45,1.85]		0.94 [0.47,1.87]
Covered by health insurance				
No		1.00		1.00
Yes		1.30 [0.65,2.61]		1.27 [0.64,2.50]
Visited health facility in last 12 months				
No		1.00		1.00
Yes		1.51* [1.04,2.18]		1.48*[1.02,2.15]
Watch television				
No		1.00		1.00
Yes		1.03 [0.65,1.63]		0.84 [0.50,1.39]
Listen to radio				
No		1.00		1.00
Yes		1.32[0.88,1.99]		1.30 [0.86,1.97]
Read newspaper or magazine				
No		1.00		1.00
Yes		1.81* [1.11,2.94]		1.80* [1.10,2.92]
Use Internet				
No		1.00		1.00
Yes		1.66**[1.15,2.40]		1.48 [0.97,2.24]
Wealth index				
Poorest			1.00	1.00
Poorer			1.48 [0.82,2.68]	1.38 [0.75,2.52]
Middle			2.66**[1.42,4.98]	2.19*[1.07,4.49]
Richer			4.38***[2.36,8.13]	2.85*[1.28,6.38]
Richest			8.15***[4.27,15.58]	3.08*[1.25,7.59]
Place of residence				
Urban			1.00	1.00
Rural			0.48** [0.29,0.78]	0.46**[0.28,0.76]
Region				
Western			1.00	1.00
Central			4.47* [1.37,14.59]	4.28*[1.30,14.12]
Greater Accra			4.48**[1.48,13.57]	4.48**[1.46,13.80]
Volta			6.80**[1.99,23.25]	6.35**[1.84,21.91]
Eastern			9.01***[2.88,28.24]	8.99***[2.85,28.37]
Ashanti			4.68**[1.54,14.20]	4.83**[1.59,14.65]
Western North			2.28 [0.53,9.86]	2.14 [0.49,9.35]
Ahafo			7.05**[1.93,25.83]	6.60**[1.80,24.23]

Table 2 (continued)

Variable	Model O Empty model	Model I aOR [95% CI]	Model II aOR [95% CI]	Model III aOR [95% CI]
Bono			3.36 [0.93,12.14]	3.19 [0.88,11.60]
Bono East			5.64**[1.53,20.74]	5.43* [1.46,20.22]
Oti			4.43* [1.13,17.43]	4.79* [1.19,19.23]
Northern			6.01** [1.81,19.90]	8.87**[2.38,33.07]
Savannah			1.53 [0.36,6.59]	2.03 [0.46,9.06]
North East			5.75* [1.44,23.01]	7.79**[1.83,33.11]
Upper East			6.78** [1.90,24.24]	5.59** [1.53,20.33]
Upper West			7.53** [1.97,28.79]	7.77** [1.97,30.69]
Random effect model				
PSU variance (95% CI)	6.83 [5.45, 8.56]	5.33 [4.06, 7.00]	4.98 [3.86, 6.43]	4.78 [3.64, 6.28]
ICC	0.674	0.618	0.602	0.593
N	7124	7124	7124	7124
Number of clusters	618	618	618	618

aOR = adjusted odds ratios; CI = Confidence Interval; $^{*}p<0.05$, $^{**}p<0.01$, $^{***}p<0.001$; 1.00 = Reference category; PSU = Primary Sampling Unit; ICC = Intra-Class Correlation

education. These results are consistent with previous research conducted in Ghana, which showed that those with a higher level of education were more inclined to undergo screening [19, 23]. As stated by Ebu [23], women who have received education are more equipped to comprehend health risks and are more likely to participate in screening tests. Education tends to alter beliefs and negative actions towards interventions implemented to improve understanding of health and illness [42]. Therefore, it is unsurprising that they have a higher likelihood of utilising cervical cancer screening services [43].

The present finding revealed that women who visited a health facility in the last 12 months were more likely to do cervical cancer screening than those who did not visit. Visiting a health facility for any reason puts women in direct contact with medical personnel who can educate them about cervical cancer, screening methods, and its importance. This exposure can raise awareness and prompt interest in getting screened [15]. Many health facilities display educational materials or conduct brief talks about cervical cancer and screening during waiting times or consultations. This exposure reinforces awareness and encourages action [44].

The study found that women who are exposed to reading newspapers or magazines and use the Internet are more likely to do cervical cancer screening than those not exposed to them. Newspapers, magazines, and the Internet can provide valuable information about cervical cancer, its risks, and the importance of early detection through screening. Newspapers, magazines, and online platforms can provide details about available screening services, locations of nearby healthcare facilities, and contact information for relevant organizations [44]. This readily available information can facilitate service utilisation by removing logistical barriers for women exposed to them.

The likelihood of undergoing cervical cancer screening is higher among individuals with increasing wealth compared to those in the poorest income group. Previous studies on cervical cancer screening support the findings of this study regarding the impact of socioeconomic status on cervical cancer screening practices [20, 44, 45]. Rich women may have more awareness about cervical cancer, its risks, and the benefits of early detection through screening [46]. Rich women may have decision-making power within their families or communities, making it easier for them to prioritise their own health needs.

The finding that women in rural areas have significantly lower odds of cervical cancer screening aligns with existing literature, which consistently shows that geographical disparities hinder access to healthcare services, particularly in low-resource settings [47, 48]. This disparity may be attributed to factors such as limited healthcare infrastructure, lack of transportation, and lower health literacy in rural populations [49]. Such findings underscore the urgent need for targeted interventions that address these barriers, such as increasing the number of screening facilities, training community health workers, and utilizing telehealth services to bridge the gap in cervical cancer prevention efforts. Future research should explore the specific challenges faced by rural women regarding healthcare access and screening behaviours.

The study revealed that women residing in Volta, Eastern, Ahafo, Oti, Northern, Northeast, North East, Upper East, and Upper West regions exhibited a greater likelihood of undergoing cervical cancer screening compared to those residing in the Western region. The indicated regions may have received more public health campaigns and advocacy initiatives focused on raising awareness about cervical cancer and screening than the Western region [50]. Possible strategies could encompass radio broadcasts, community engagement initiatives,

or collaborations with local media outlets [50]. Local grassroots organisations or indigenous leaders in these areas may actively promote cervical cancer prevention and encourage women to engage in screening initiatives. This bottom-up involvement can substantially influence awareness and uptake of services.

Policy and practice implications

The findings of this study underscore the urgent need for targeted policy and practice interventions to enhance cervical cancer screening uptake in Ghana. The significant geographical disparities, particularly the lower screening rates among women in rural areas, highlight the necessity for policies that improve healthcare access and infrastructure in underserved regions. Additionally, the correlation between education and screening likelihood suggests that educational initiatives should be integrated into health promotion strategies to empower women with knowledge about cervical cancer and the importance of regular screenings. Policymakers should also consider leveraging media platforms to disseminate information and increase awareness, particularly in areas with low literacy rates. Furthermore, strategies aimed at reducing socioeconomic barriers are essential, ensuring that women from poorer wealth quintiles have equitable access to screening services is crucial to effectively address the disparities in cervical cancer screening across different regions and demographics in Ghana.

Strengths and limitations

The 2022 Ghana DHS provides data from a large, nationally representative sample of women in Ghana, ensuring that our findings can be generalised to the entire population. The DHS surveys follow rigorous data collection and analysis protocols, making the data reliable and trustworthy. Using the 2022 DHS ensures our analysis reflects Ghana's most recent available data on cervical cancer screening. This study, however, has some limitations. The DHS data used in this study included women aged 15–49, which is broader than the recommended cervical cancer screening age range of 30–49 years [21]. This difference limits the ability to assess screening uptake according to current guidelines. The DHS is a cross-sectional survey, meaning it captures data at a single point in time. This limits our ability to establish causal relationships between variables and assess changes over time. Some data, like screening history, is based on self-reporting, which might be subject to recall bias and inaccuracies. The DHS did not capture the specific type of cervical cancer screening received (e.g., Pap smear, HPV testing), limiting our analysis of different screening approaches. Also, while the DHS provides detailed data, it does not capture all relevant contextual factors influencing screening practices, such as healthcare provider attitudes, availability of screening services, and cultural norms.

Conclusion

The study reveals a concerning national cervical cancer screening uptake of only 7.27% in Ghana, with significant disparities based on geographical location, education level, healthcare access, and socioeconomic status. Women in rural areas are notably less likely to be screened, highlighting critical gaps in access to preventive healthcare services. The findings suggest that targeted interventions are essential to improve screening rates, particularly in rural regions and among women with lower educational attainment. The Ministry of Health, non-governmental organizations, and other relevant stakeholders in Ghana must enhance healthcare infrastructure in underserved areas, increasing awareness and education about cervical cancer through community outreach and media campaigns, and promoting regular health facility visits. Additionally, policies should focus on reducing socioeconomic barriers to ensure equitable access to cervical cancer screening across all regions and wealth quintiles in Ghana.

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Author contributions

LAA, RGA, and BOA conceived the study. RGA, LAA, and BOA wrote the methods section and performed the data analysis. LAA, KA, AO, RGA, and BOA were responsible for the initial draft of the manuscript. All the authors reviewed and approved the final version of the manuscript.

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Data availability

The dataset used can be accessed via the MEASURE DHS repository https://dhsprogram.com/data/dataset/Ghana_Standard-DHS_2022.cfm?flag=1.

Declarations

Ethics approval and consent to participate

No ethical clearance was sought for this study since we analysed a secondary dataset that was publicly available for its usage. Before the GDHS, ICF International sought ethical approval.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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References

1. World Health Organization. Human papillomavirus (HPV) and cancer. 2023 [cited 2024 Jan 23]. Available from: https://www.who.int/news-room/fact-sheets/detail/human-papilloma-virus-and-cancer.
2. World Health Organization. Cervical cancer. 2023 [cited 2024 Jan 23]. Available from: https://www.who.int/news-room/fact-sheets/detail/cervical-cancer.
3. Okunade KS. Human papillomavirus and cervical cancer. J Obstet Gynaecol. 2020;40(5):602–8.
4. Golfetto L, Alves EV, Martins TR, Sincero TC, Castro JB, Dannebrock C, Oliveira JG, Levi JE, Onofre AS, Bazzo ML. PCR-RFLP assay as an option for primary HPV test. Braz J Med Biol Res. 2018;51:e7098.
5. Della Fera AN, Warburton A, Coursey TL, Khurana S, McBride AA. Persistent human papillomavirus infection. Viruses. 2021;13(2):321.
6. Arbyn M, Weiderpass E, Bruni L, de Sanjosé S, Saraiya M, Ferlay J, Bray F. Estimates of incidence and mortality of cervical cancer in 2018: a worldwide analysis. Lancet Global Health. 2020;8(2):e191–203.
7. Hull R, Mbele M, Makhafola T, Hicks C, Wang SM, Reis RM, Mehrotra R, MkhizeKwitshana Z, Kibiki G, Bates DO, Dlamini Z. Cervical cancer in low and middleincome countries. Oncol Lett. 2020;20(3):2058–74.
8. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, Bray F. Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. Cancer J Clin. 2021;71(3):209–49.
9. Ferlay J, Ervik M, Lam F, Laversanne M, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F. Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer. 2024. Available from: https://gco.iarc.who.int/today, accessed [14 February 2024].
10. Krings A, Dunyo P, Pesic A, Tetteh S, Hansen B, Gedzah I, Wormenor CM, Amuah JE, Behnke AL, Höfler D, Pawlita M. Characterization of human papillomavirus prevalence and risk factors to guide cervical cancer screening in the North Tongu District, Ghana. PLoS ONE. 2019;14(6):e0218762.
11. Donkoh ET, Asmah RH, Agyemang-Yeboah F, Dabo EO, Wiredu EK. Prevalence and distribution of vaccine-preventable genital human papillomavirus (hpv) genotypes in Ghanaian women presenting for screening. Cancer Control. 2022;29:10732748221094721.
12. Lemp JM, De Neve JW, Bussmann H, Chen S, Manne-Goehler J, Theilmann M, Marcus ME, Ebert C, Probst C, Tsabedze-Sibanyoni L, Sturua L. Lifetime prevalence of cervical cancer screening in 55 low-and middle-income countries. JAMA. 2020;324(15):1532–42.
13. Yimer NB, Mohammed MA, Solomon K, Tadese M, Grutzmacher S, Meikena HK, Alemnew B, Sharew NT, Habtewold TD. Cervical cancer screening uptake in Sub-saharan Africa: a systematic review and meta-analysis. Public Health. 2021;195:105–11.
14. Tawiah A, Konney TO, Dassah ET, Visser LE, Amo-Antwi K, Appiah-Kubi A, Bell SG, Johnston C, Lawrence ER. Determinants of cervical cancer screening uptake among women with access to free screening: a community-based study in peri-urban Ghana. Int J Gynecol Obstet. 2022;159(2):513–21.
15. Calys-Tagoe BN, Aheto JM, Mensah G, Biritwum RB, Yawson AE. Cervical cancer screening practices among women in Ghana: evidence from wave 2 of the WHO study on global AGEing and adult health. BMC Womens Health. 2020;20(1):1–9.
16. Petersen Z, Jaca A, Ginindza TG, Maseko G, Takatshana S, Ndlovu P, Zondi N, Zungu N, Varghese C, Hunting G, Parham G. Barriers to uptake of cervical cancer screening services in low-and-middle-income countries: a systematic review. BMC Women's Health. 2022;22(1):1–20.
17. Mullapally SK, Digumarti L, Digumarti R. Cervical cancer in low-and middle-income countries: a multidimensional approach to closing the gaps. JCO Oncol Pract. 2022;18(6):423–5.
18. Binka C, Nyarko SH, Awusabo-Asare K, Doku DT. Barriers to the uptake of cervical cancer screening and treatment among rural women in Ghana. Biomed Res Int. 2019;2019:1–8.
19. Ampofo AG, Adumatta AD, Owusu E, Awuviry-Newton K. A cross-sectional study of barriers to cervical cancer screening uptake in Ghana: an application of the health belief model. PLoS ONE. 2020;15(4):e0231459.
20. Ayanore MA, Adjuik M, Ameko A, Kugbey N, Asampong R, Mensah D, Alhassan RK, Afaya A, Aviisah M, Manu E, Zotor F. Self-reported breast and cervical cancer screening practices among women in Ghana: predictive factors and reproductive health policy implications from the WHO study on global AGEing and adult health. BMC Womens Health. 2020;20:1–0.
21. World Health Organization Guidelines Approved by the Guidelines Review Committee. WHO guideline for screening and treatment of cervical precancer lesions for cervical cancer prevention. Geneva: World Health Organization© World Health Organization. 2021;2021.
22. Saaka SA, Hambali MG. Factors associated with cervical cancer screening among women of reproductive age in Ghana. BMC Women's Health. 2024;24(1):519.
23. Ebu NI, Mupepi SC, Siakwa MP, Sampselle CM. Knowledge, practice, and barriers toward cervical cancer screening in Elmina, Southern Ghana. Int J Women's Health. 2014;31–9.
24. Mensah KB, Boamah Mensah AB, Yamoah P, Manfo J, Amo R, Wiafe E, Padayachee N, Bangalee V. Socio-demographic factors and other predictors of pap test uptake among women: a retrospective study in Ghana. Cancer Manage Res 2023 Dec 31:489–99.
25. Anaba EA, Alor SK, Badzi CD, Mbuwir CB, Muki B, Afaya A. Drivers of breast cancer and cervical cancer screening among women of reproductive age: insights from the Ghana Demographic and Health Survey. BMC Cancer. 2024;24(1):920.
26. Owusu AB, Asare M, Owusu R. Using GIS to Understand Cervical Cancer Screening behaviors among women living with HIV (WLWH) in Ghana. Asian Pac J Environ Cancer. 2022;5(1):17–23.
27. Ebu NI. Socio-demographic characteristics influencing cervical cancer screening intention of HIV-positive women in the central region of Ghana. Gynecologic Oncol Res Pract. 2018;5:1–7.
28. Elkasabi M, Ren R, Pullum TW. Multilevel modeling using DHS surveys: a framework to approximate level-weights. ICF; 2020.
29. Croft TN, Marshall AMJ, Allen CK. Guide to DHS statistics, DHS-7 [Internet]. Maryland, USA: ICF,: Rockville; 2018. https://dhsprogram.com/pubs/pdf/DHSG1/Guide_to_DHS_Statistics_DHS-7.pdf
30. Corsi DJ, Neuman M, Finlay JE, Subramanian S. Demographic and health surveys: a profile. Int J Epidemiol. 2012;41(6):1602–13.
31. Ghana Statistical Service (GSS) and ICF. Ghana Demographic and Health Survey 2022. Ghana, and Rockville, Maryland, USA: GSS and ICF: Accra; 2024.
32. ICF International. Demographic and Health Survey Sampling and Household Listing Manual. Maryland, U.S.A.: ICF International.: MEASURE DHS, Calverton; 2012.
33. Von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP, Initiative S. The strengthening the reporting of Observational studies in Epidemiology (STROBE) Statement: guidelines for reporting observational studies. Int J Surg. 2014;12(12):1495–9.
34. Okyere J, Aboagye RG, Seidu AA, Asare BY, Mwamba B, Ahinkorah BO. Towards a cervical cancer-free future: women's healthcare decision making and cervical cancer screening uptake in sub-saharan Africa. BMJ Open. 2022;12(7):e058026.
35. Ba DM, Ssentongo P, Musa J, Agbese E, Diakite B, Traore CB, Wang S, Maiga M. Prevalence and determinants of cervical cancer screening in five sub-saharan African countries: a population-based study. Cancer Epidemiol. 2021;72:101930.
36. Dickson KS, Boateng EN, Acquah E, Ayebeng C, Addo IY. Screening for cervical cancer among women in five countries in sub-saharan Africa: analysis of the role played by distance to health facility and socio-demographic factors. BMC Health Serv Res. 2023;23(1):1–0.
37. Okyere J, Duodu PA, Aduse-Poku L, Agbadi P, Nutor JJ. Cervical cancer screening prevalence and its correlates in Cameroon: secondary data analysis of the 2018 demographic and health surveys. BMC Public Health. 2021;21(1):1–8.
38. Binka C, Nyarko SH, Doku DT. Cervical cancer knowledge, perceptions and screening behaviour among female university students in Ghana. J Cancer Educ. 2016;31:322–7.
39. Lim JN, Ojo AA. Barriers to utilisation of cervical cancer screening in Sub Sahara Africa: a systematic review. Eur J Cancer Care. 2017;26(1):e12444.
40. Devarapalli P, Labani S, Nagarjuna N, Panchal P, Asthana S. Barriers affecting uptake of cervical cancer screening in low and middle-income countries: a systematic review. Indian J Cancer. 2018;55(4):318–26.

41. Enyan NI, Davies AE, Opoku-Danso R, Annor F, Obiri-Yeboah D. Correlates of cervical cancer screening participation, intention and self-efficacy among muslim women in southern Ghana. BMC Women's Health. 2022;22(1):1–1.
42. Cunningham MS, Skrastins E, Fitzpatrick R, Jindal P, Oneko O, Yeates K, Booth CM, Carpenter J, Aronson KJ. Cervical cancer screening and HPV vaccine acceptability among rural and urban women in Kilimanjaro Region, Tanzania. BMJ Open. 2015;5(3).
43. Gerald EI, Ogwuche CH. Educational level, sex and church affiliation on health-seeking behaviour among parishioners in Makurdi metropolis of Benue state. J Educational Policy Entrepreneurial Res. 2014;1(2):311–6.
44. Nyaaba JA, Akurugu E. Knowledge, barriers and uptake towards Cervical Cancer screening among female health workers in Ghana: a perspective of the Health Belief Model. Int J Afr Nurs Sci. 2023;19:100587.
45. Akinyemiju TF. Socioeconomic and health access determinants of breast and cervical cancer screening in low-income countries: analysis of the World Health Survey. PLoS ONE. 2012;7(11):e48834.
46. Sankaranarayanan R. Screening for cancer in low-and middle-income countries. Annals Global Health. 2014;80(5):412–7.
47. Khumalo PG, Carey M, Mackenzie L, Sanson-Fisher R. Non-adherence to cervical cancer screening recommendations among women in Eswatini: a cross-sectional study. BMC Public Health. 2023;23(1):290.
48. Zhetpisbayeva I, Kassymbekova F, Sarmuldayeva S, Semenova Y, Glushkova N. Cervical Cancer Prevention in Rural Areas. Annals Global Health. 2023;89(1).
49. Douthit N, Kiv S, Dwolatzky T, Biswas S. Exposing some important barriers to health care access in the rural USA. Public Health. 2015;129(6):611–20.
50. Effah K, Amuah JE, Dunyo P, Akwada G, Kalmoni Y, Wormenor CM, Tetteh S, Akakpo PK. Raising funds through social media to subsidise cervical cancer screening with HPV testing in rural Ghana—the battor experience. J Health Care Poor Underserved. 2021;32(3):1136–44.

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