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Factors associated with cervical cancer screening among women of reproductive age in Ghana

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Abstract

Background Cervical cancer remains a leading cause of cancer-related deaths among women in Ghana and other Sub-Sahara African (SSA) countries. Despite the importance of early diagnosis for timely treatment and death prevention, cervical cancer screening among women in developing countries remain very low. Nonetheless, there is a paucity of research examining the factors associated with screening uptake among women of reproductive age in Ghana. Thus, this study fills the scholarly void and contributes to the existing literature by examining the determinants of cervical cancer screening in Ghana.

Methods Utilizing data from the 2022 Ghana Demographic and Health Survey (GDHS) ($N = 15{,}014$ women), and by employing logistic regression models for a cross-sectional analysis, this study evaluated the factors associated with cervical cancer screening in Ghana.

Results Women with tertiary educational attainment (OR = 4.140; 95%CI: 2.960 5.789; $p < 0.001$), from the richer (OR = 1.968; $p < 0.001$) and richest households (OR = 2.492; $p < 0.001$), the married/living with partner (OR = 1.773; 95%CI:1.372 2.290; $p < 0.001$), the widowed/divorced/separated (OR = 1.888; 95%CI:1.320 2.701; $p < 0.001$), owners of valid health insurance card (OR = 1.356; 95%CI:1.086 1.693; $p < 0.01$), visitation to health facility in the past 12 months (OR = 1.312; 95%CI: 1.082 1.590; $p < 0.001$), those who watched television at least once in a week (OR = 1.395; 95%CI: 1.055 1.846; $p < 0.001$), as well as those who listened to radio at least once in a week (OR = 1.509; 95%CI: 1.228 1.853; $p < 0.001$), were all significantly more associated with cervical cancer screening in the study context. Also, ethnicity, religion, and the region of residence significantly predicted cervical cancer screening in the study context.

Conclusion Cervical cancer screening in Ghana can be improved by addressing socioeconomic and geographical disparities in the country's healthcare system. To ensure early detection, timely treatment or care and prevention of cervical cancer-related deaths in the country, there must be coordinated efforts by the government of Ghana to improve healthcare access and surveillance systems for cervical cancer cases, particularly, in geographically disadvantage areas.

Keywords Cancer screening, Cervical cancer, Ghana, Women

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Background

Globally, cancer is one of the leading causes of death, accounting for about 10 million deaths in 2020 alone [1]. Cervical cancer is the fourth most commonly diagnosed types of cancer among women [2–6]. Over 660, 000 new cervical cancer cases and about 350, 000 deaths were recorded in 2022 [7], with developing countries being disproportionately affected due to major inequities driven by lack of access to national Human Papillomavirus (HPV) vaccination programmes, cervical cancer screening and treatment services, and socioeconomic factors [7]. In Ghana for instance, about 80,700 cervical cancer deaths were recorded in 2019 alone [8]. Available evidence further shows that approximately 90% of all new cervical cancer cases and deaths occurs in low-and middle-income countries [1]. In fact, in 2022, of the 350, 000 cervical cancer deaths recorded worldwide, 94% occurred in low- and middle-income countries [7]. Africa in particular, accounted for 23% of global cervical cancer mortalities in 2022, yet the mortality rate for the continent is projected to increase to 30% by 2030 if the current trend continues. Moreover, whereas early screening is associated with up to 80% reduction in cervical cancer cases in developed countries [1, 5, 9, 10], in most developing countries including Ghana, access to effective screening remains very low leading to late detection and high mortality rates [3, 11, 12]. Studies suggest that the observed disparities between developed and developing countries regarding cervical cancer incidences and mortalities, are largely connected to factors such as insufficient healthcare infrastructure, understaffed health professionals, and inadequate utilization of preventive cancer services by women in developing countries [11–13].

Based on the World Health Organization's 2030 targets for cervical cancer, (a) about 90% of girls are expected to be fully vaccinated with the Human Papillomavirus (HPV) vaccine by the age of 15; (b) 70% of women should be screened with a high-performance test by 35 years of age and again by 45 years of age; and (c) 90% of women identified with cervical disease should receive treatment. Nonetheless, access to, and the quality of cervical cancer services remain weak across Sub-Saharan Africa (SSA). In Ghana, neither a national screening programme for cervical cancer, nor programme/guidelines exist to strengthen early detection [8]. While other SSA countries including Burkina Faso (70% HPV coverage in 2022), Kenya (42% HPV coverage in 2022), and Ethiopia (90.87% HPV coverage as of 2022) have introduced national HPV vaccination programmes with considerably good coverages, Ghana is currently left out [14]. In fact, in addition to not having a national HPV vaccination programme, there exist only four radiotherapy devices throughout the country. Thus, the number of radiotherapy units per 10 000 cancer patients in Ghana as well as the number of brachytherapy units per 10 000 cancer patients in 2021, were 2 and 1, respectively [15]. Consequently, the screening rate for cervical cancer in Ghana stood at 3% as of 2019 [14].

Even though cervical cancer incidences are projected to skyrocket in Africa by 2030 due to changing demographic factors, cancer continue to receive a relatively low amount of public health priority in the continent for several reasons including limited resources, and lack of awareness regarding current and future burden of the disease on the continent [7, 13, 14]. Given the higher likelihood of increment in annual cancer cases and deaths in the continent, there is a pressing need for coordinated efforts to improve surveillance systems for cancer monitoring. While earlier studies have examined the factors associated with cervical cancer screening among women in SSA countries [16, 17], the topic remains largely unexplored in Ghana [18], prompting an investigation for insights and policy directions. Even though there exist some studies in Ghana on cervical cancer [19–21], none of these have done so using a nationally representative data. For instance, Ampofo et al. [19] evaluated barriers to cervical cancer screening in the Ashanti region of Ghana, highlighting unemployment and lack of formal education as major barriers in that context. Likewise, after examining the barriers to the uptake of cervical cancer screening and treatment among rural women in the North Tongu district of Ghana, Binka et al. [21] uncovered, among other things, personal or psychological convictions, low level of income and cost of screening and treatment as major barriers. Thus, given the limited scope of prior studies, this study in response, examines the determinants of cervical cancer screening among women of reproductive age in Ghana using a nationally representative dataset with large sample size. The use of nationally representative dataset (i.e., 2022 Ghana Demographic and Health Survey) not only enhance the validity and relevance of the research, but also allows for generalization of the findings, and for informing national policies and decision-making.

The overarching research question for this study is "What are the key factors associated with cervical cancer screening among women of reproductive age in Ghana?". Thus, based on this question, we hypothesize that: (i) Women of reproductive age in Ghana with higher levels of education are more likely to undergo cervical cancer screening than those with lower education levels; (ii) Women who have regular access to healthcare services are more likely to participate in cervical cancer screening than those with limited access; (iii) Women of reproductive age in Ghana who possess valid health insurance are more likely to undergo cervical cancer screening compared to those without insurance; (iv) Women from wealthier households are more likely to undergo cervical

cancer screening than women from lower-income households; and (v) Women who are regularly exposed to health information through media (e.g., television, radio) are more likely to participate in cervical cancer screening than those with less media exposure.

Theoretical framework

This study is underpinned by the Health Belief Model (HBM), a conceptual framework that was originally developed in the early 1950s to understand "the widespread failure of people to accept disease preventives or screening tests for the early detection of asymptomatic disease" [22, 23]. The HBM consists of four main factors that intersect or work to influence the adoption of a health behaviour such as cervical cancer screening. Namely: (a) perceived susceptibility to illness; (b) perceived illness severity; (c) perceived benefits of treatment; and (d) perceived barriers to treatment. Perceived susceptibility to illness refers to the individual's subjective susceptibility to infections such as cervical cancer. Perceived illness severity also involves the individual's evaluation of both the medical/clinical consequences of the disease (including pain, disability, death) and the possible social consequences (e.g., effects on social relations like marriage, family life, work conditions, stigma, etc.,) that may result from contracting diseases like cervical cancer. Further, the perceived benefit of treatment relates to beliefs surrounding the effectiveness of health actions such as early cancer diagnosis in reducing the associated threats (e.g., death). The fourth dimension, perceived barriers to treatment, is a cost benefit analysis whereby the individual weighs the action's effectiveness against possible negative consequences [22]. For instance, individuals who understand the benefits of early diagnosis, would most likely uptake available screening exercises to avert future consequences (including late diagnosis, and potential death). Perceived barriers to treatment also entail the individuals' assessment of the obstacles or hindrances they might face when seeking treatment or adhering to health behaviors like cervical cancer screening. These barriers can be psychological, financial, social, or logistical. Specifically, these may include fear of being judged or discriminated against for seeking treatment, concerns about the financial expense of treatment/medication, difficulties in accessing healthcare services (such as proximity to health facilities/transportation issues, or long waiting times), as well as perceived lack of time to attend appointments or follow treatment regimens. A fifth component know as 'cues to action' was introduced by Janz and Becker [22], and several studies have since utilized it. 'Cues to action' is the information required to trigger the process of engaging in healthy actions (e.g., contact with a health worker, health education programs offered through mass media outlets such as radio and televisions, etc.). Thus, guided by the HBM, this study evaluated the factors associated with women behaviours towards cervical cancer screening in Ghana.

Methods

Data collection

Using a cross-sectional design, this study draws data from the 2022 Ghana Demographic and Health Survey (GDHS) for secondary analysis of the factors associated with the uptake of cervical cancer screening. The 2022 GDHS was implemented by the Ghana Statistical Service (GSS), and data collection took place between 17 October 2022 and 14 January 2023. To ensure that the survey procedures were in accordance with the U.S. and international ethical research standards, the International Coaching Federation (ICF) provided GSS with technical assistance and submitted the GDHS survey protocol to the ICF Institutional Review Board (IRB) for ethical clearance. Ethical clearance for the survey was granted by the IRB. The sampling frame for the 2022 GDHS is an updated version of the 2021 Population and Housing Census, prepared by the GSS. The sampling procedure was a stratified two-stage cluster sampling, designed to yield representative results at the national level, for urban and rural areas, and for each of the country's 16 regions for most DHS indicators. In the first stage, 618 target clusters were selected from the sampling frame using a probability proportional to size strategy for urban and rural areas in each region. In the second stage, after the selection of clusters, a household listing and map operation was carried out in all the selected clusters to develop a list of households for each cluster. This list then served as a sampling frame for selection of the household sample. To account for nonproportional allocation of the sample to the different regions and the possible differences in response rates (especially, given that the 2022 GDHS sample was a two-stage stratified cluster sample), sampling weights were calculated based on sampling probabilities separately for each sampling stage and for each cluster. This was necessary to ensure actual representation of the survey results at the national level. Also, the design weights were adjusted for household nonresponse and individual nonresponse in order to obtain the sampling weights for households and for women, respectively. The differences between the household sampling weights and the individual sampling weights were introduced by individual nonresponses. The final sampling weights were normalized so that the total number of unweighted cases was equal to the total number of weighted cases at the national level for both household weights and individual weights.

A pretest of the survey questionnaire, and training of GSS staff was carried out by GSS prior to data collection. Women aged 15–49 years were identified as eligible

participants for this survey. The risk of cervical cancer is high among women of reproductive age (15–49 years), thereby making it crucial to understand the prevention behaviours of this group, to inform strategies for risk reduction and death prevention. Verbal informed consents of all the eligible participants were obtained and recorded on the survey questionnaire before the survey itself [24]. Additional information on methods of data collection and survey questionnaire can be found at: https://dhsprogram.com/pubs/pdf/FR387/FR387.pdf.

Measures

Outcome variable: The outcome variable assesses whether respondents have ever undergone cervical cancer screening by a healthcare provider. Specifically, respondents were questioned: "Have you ever been examined for cervical cancer by a healthcare provider?", with responses categorized as 0 for "No" and 1 for "Yes (0=N0, 1=Yes).

Explanatory variables: The educational attainment of respondents (0=No education, 1=primary education, 2=secondary education, 3=tertiary education), their ages (15–49 years), marital status (0=Never in a union, 1=married/living with partner, 2=Widowed/divorced/separated), household wealth (0=Poorest, 1=poorer, 2=middle-income, 3= richer, 4=richest), religious affiliation (0=Christianity, 1=Islam, 2=Traditional/spiritualist, 3=No religion/Other), ethnicity (0=Akan, 1=Ewe, 2=Ga/Dangme, 3=Guan, 4=Mole-Dagbani, Grusi, 5=Gurma, 6=Mande, 7=Other), ownership of a valid health insurance (0=No, 1=Yes), distance to health facility (0=A big problem, 1=Not a big problem), visited health facility in the past 12 months (0=No, 1=Yes), number of visits to health facility the last 12 months (0=None, 1=Once, 2=More than once), self-rated health (0=Bad, 1=Good), frequency of watching television (0=Not at all, 1=Less than once a week, 2=At least once a week), frequency of listening to radio (0=Not at all, 1=Less than once a week, 2=At least once a week), whether respondent is currently working (0=No, 1=Yes), type of place of residence (0=Urban, 1=Rural), and the region of residence (0=Western, 1=Central, 2=Greater Accra, 3=Volta, 4=Eastern, 5=Ashanti, 6=Western North, 7=Ahafo, 8=Eastern, 9=Bono, 10=Bono East, 11=Northern, 12=Savannah, 13=North East, 14=Upper East, 15=Upper West) were accounted for. The household wealth variable was derived using the Principal Component Analysis (PCA) technique, where scores were assigned to the participating households based on the number and kind of goods or properties they own (ranging from a television to a bicycle or car), as well as the housing characteristics (such as source of drinking water, toilet facilities, and flooring materials) [24]. National wealth quintiles were compiled by assigning the household score to each usual (de jure) household member, ranking each person in the household population by his or her score, and then dividing the distribution into five equal categories, each comprising 20% of the population [24]. Also, after conducting checks for missingness, none of our explanatory variables had missing values for which we employed the Complete Case Analysis (CCA). Informed by prior studies [25], the CCA approach was adopted to preserve the original relationships between variables in the dataset.

Analytical approach

Both descriptive and inferential statistical analyses have been conducted in this study. First, a statistical description of the respondents' socio-demographic characteristics was provided at the univariate level of analysis. Also, logistic regression models were used to examine the relationship between each predictor variable and the outcome variable. Both univariate and multivariable logistic regression analyses were conducted to evaluate the factors associated with cervical cancer screening in the study context. All variables from the univariate results were directly included in the multivariable analysis with due considerations to several factors including, but not limited to statistical significance, the strength of association with the outcome variable, theoretical and practical relevance, as well as the need to control for potential confounders while ensuring absence of multicollinearity. Results of the regression models are reported in Odds ratios (ORs) where significant ORs above one (OR>1) indicate higher likelihood of cervical cancer screening, while ORs below one (OR<1) indicate lower likelihood of screening. Statistically significant results are reported at 95% Confidence Interval (CI). All statistical data analyses were performed in Stata version 18.

Results

Sample characteristics

Results for the sample characteristics are presented in Table 1. Of the 15,014 women age 15–49 years, majority had secondary education (54.02%), were married/living with their partners (58.69%), from the Christian religious background (69.47%), were employed (73.50%), had valid health insurance card (68.44%), had proximity to health facilities (73.83%) but did not visit a health facility in the preceding 12 months (67.62%), and never tested for cervical cancer (95.40%). Extremely concerning, only 4.60%, representing 690 women, has ever been tested for cervical cancer in the study context. See Table 1 for details on the sample characteristics.

Univariate logistic regression analyses

Attainment of secondary education (OR=1.347, 95%CI: 1.064 1.703, $p<0.05$), and tertiary education (OR=7.219,

Table 1 Descriptive statistics of study sample

Variable	Frequencies (%)
Ever been examined for cervical cancer	
No	14,324(95.40)
Yes	690(4.60)
Education	
No education	3357(22.36)
Primary	2245(14.95)
Secondary	8111(54.02)
Tertiary	1301(8.67)
Current age (Continuous)	Min (15), Max (49), Mean (32), SD (12.2)
Wealth	
Poorest	3666(24.42)
Poorer	3366(22.42)
Middle	3008(20.03)
Richer	2686(17.89)
Richest	2288(15.24)
Marital status	
Never in a union	4916(32.74)
Married/living with partner	8811(58.69)
Widowed/divorced/separated	1287(8.57)
Religion	
Christianity	10,430(69.47)
Islam	3994(26.60)
Traditional/spiritualist	305(2.03)
No religion/other	285(1.90)
Ethnicity	
Akan	5217(34.75)
Ga/Dangme	593(3.95)
Ewe	1641(10.93)
Guan	697(4.64)
Mole-Dagbani	4024(26.80)
Grusi	747(4.98)
Gurma	1484(9.88)
Mande	479(3.19)
Other	132(0.88)
Currently employed	
No	3978(26.50)
Yes	11,036(73.50)
Has a valid health insurance	
No	4739(31.56)
Yes	10,275(68.44)
Distance to Health facility	
A big problem	3929(26.17)
Not a big problem	11,085(73.83)
Visited health facility in the past 12 month	
No	7112(47.37)
Yes	7902(52.63)
Times visited health facility in the past 6 months	
None	10,152(67.62)
Once	2109(14.05)
More than once	2753(18.34)
Self-rated mental health	
Bad	3201(21.32)
Good	11,813(78.68)
Frequency watching television	
Not at all	4454(29.67)
Less than once a week	2379(15.85)
At least once a week	8181(54.49)
Frequency listening to radio	
Not at all	5716(38.07)
Less than once a week	3563(23.73)
At least once a week	5735(38.20)
Region of residence	
Western	797(5.31)
Central	979(6.52)
Greater Accra	969(6.45)
Volta	837(5.57)
Eastern	854(5.69)
Ashanti	1131(7.53)
Western north	792(5.28)
Ahafo	849(5.65)
Bono	835(5.56)
Bono East	974(6.49)
Oti	921(6.13)
Northern	1169(7.79)
Savannah	999(6.65)
North East	963(6.41)
Upper East	987(6.57)
Upper West	958(6.38)
Type of place of residence	
Urban	7362(49.03)
Rural	7652(50.97)

95%CI: 5.619 9.275, $p<0.001$), being a member of wealthy household (see Table 2), being married/living with partner (OR=2.544, 95%CI: 2.070 3.128, $p<0.001$), the Widowed/divorced/separated (OR=2.569, 95%CI: 1.905 3.466, $p<0.001$), the employed (OR=2.113, 95%CI: 1.708 2.614, $p<0.001$), possession of valid health insurance card (OR=2.042, 95%CI:1.658 2.515, $p<0.001$), proximity to health facility (OR=1.570, 95%CI: 1.292 1.908, $p<0.001$), visitation to health facility in the preceding 12 months (OR=1.904, 95%CI:1.826 2.545, $p<0.001$),watching television at least once in a week (OR=2.980, 95%CI:1.562 2.762, $p<0.001$), and listening to radio at least once in a week (OR=2.107, 95%CI: 1.234 1.910, $p<0.001$) were all factors significantly, and positively associated with cervical cancer screening among women of reproductive age in the study context. However, being a rural resident (OR=0.452, 95%CI: 0.384 0.532, $p<0.001$) was significant and negatively associated with the uptake of cervical cancer screening among women of reproductive age in the study context. Moreover, age, religious affiliation, as well as the region of residence significantly predicted cervical cancer screening (see Table 2).

Multivariable analyses

First, we employed Alternative Model Specification for sensitivity analysis. Specifically, we tested the effect of removing certain covariates/interaction terms (insignificant variables) from the model to ascertain the validity of findings of the model. After doing so, we found that all significant covariates in model 1 (See Table 3) were also significant in model 2 (Table 4). A comparison of the level of fitness between model 1 (R^2=0.137) and model 2 (R^2=0.132) shows that model 1, in addition to accounting for potential confounders, has better fitness. Thus, model 1 serves as the point of reference for our analysis.

Attainment of tertiary education (OR=4.140, 95%CI: 2.960 5.789, $p<0.001$), being a member of wealthy household (see Table 3), the married/living with partner (OR=1.773, 95%CI: 1.372 2.290, $p<0.001$), the Widowed/divorced/separated (OR=1.888, 95%CI:1.320 2.701, $p<0.001$), possession of valid health insurance card (OR=1.356, 95%CI: 1.086 1.693, $p<0.01$), visitation to health facility in the preceding 12 months (OR=1.312, 95%CI: 1.082 1.590, $p<0.001$), watching television at least once in a week (OR=1.395, 95%CI: 1.055 1.846, $p<0.001$), and listening to radio at least once in a week (OR=1.509, 95%CI: 1.228 1.853, $p<0.001$) were all significant factors that are positively associated with cervical cancer screening among women of reproductive age in the study context. Also, members of the Mole-Dagbani (OR=1.478, 95%CI: 1.086 2.011, $p<0.05$) and the Grusi (OR=1.740, 95%CI: 1.140 2.655, $p<0.05$) ethnic groups were significantly more likely to uptake cervical cancer screening relative to members of the Akan ethnic background. Furthermore, being a Muslim (OR=0.737, 95%CI: 0.564 0.946, $p<0.001$) was significantly negatively associated with the uptake of cervical cancer screening relative to being a Christian. Moreover, regional disparities were of observed in the likelihood of cervical cancer screening among women of reproductive age in the study context (see Table 3).

Discussion

This study evaluated the determinants of cervical cancer screening among women of reproductive age in Ghana. Guided by the HBM, the association between participants demographic characteristics, socio-economic conditions, health-related factors, as well as geospatial factors were explored to understand their influence on the uptake of cervical cancer screening among women (15–49 years). The results indicates that tertiary educational attainment, marital status, household wealth, religion, ethnicity, employment status, ownership of valid health insurance, visit to health facility in the preceding 12 months, frequency of watching television and listening to radio, as well as the region of residence were all factors that are significantly associated with cervical cancer screening in Ghana. The findings that 95.40% (i.e., 14324 in absolute numbers) of women in the study have never screened for cervical cancer, presents a very worrying concern given the importance and policy emphasis on early diagnosis for timely treatment and death prevention.

A noteworthy finding is the association between sociodemographic factors and screening for cervical cancer. For instance, a positive association between higher levels of educational attainment and cervical cancer screening was observed among women in the study, a finding that is consistent with earlier studies [6, 16]. Lack of knowledge about cervical cancer and understanding of the role of screening is shown to be a key barrier to cervical cancer screening in Low-and-Middle-Income countries [26, 27]. Women without any formal educational attainment may have relatively lower levels of health-literacy, thereby limiting their ability to comprehend health information from health professionals and other sources like media outlets. This therefore underscores the crucial need for cervical cancer awareness creation, particularly among women with lower levels of educational attainment. Also, marriage has shown to be associated with positive health outcomes for both men and women [28–30], and the findings in this study affirms it as the married and previously married were significantly more likely to be screened for cervical cancer. Hanske et al. [31] in their study of the influence of marriage on cancer screening, shows that marriage is associated with increased rate of cervical cancer screening. Likewise, Krishnamoorthy et al. [28] in India uncovered a positive correlation between marriage and higher likely of cervical cancer screening. The mediating role of education and socioeconomic factors on married women's uptake of cancer screening has however been highlighted [31].

Also, compared to women from the Christian religious background, Muslim women were less likely to go for cervical cancer screening, a finding that aligns with prior studies [32, 33]. Christian religious organizations, particularly, the catholic church is known for its integral role in organizing health programs and openly preaching about important health topics such as cervical cancer screening to its congregants [34], an initiative that is seldomly utilized by Islamic leaders in the study context. A recent study on cervical cancer screening participation, intention and self-efficacy among Muslim women in southern Ghana suggest that Islamic modesty is associated with decreased intention to participate in screening [32]. Thus, a possible explanation for lesser likelihood of testing among Muslim women include the fact that cervical cancer screening involves the physical touching of the reproductive organs, meanwhile the privacy of women is a highly revered core value in the Islamic faith [34]. Hence, even where screening services are readily

Table 2 Univariate logistic regressions predicting cervical cancer screening among women in Ghana

Variable	OR (SE)	95% CI
Education (Reference: **No education**)		
Primary	1.100(0.177)	0.802 1.508
Secondary	1.347(0.161) *	1.064 1.703
Tertiary	7.219(0.922) ***	5.619 9.275
Current age (Continuous)	1.047(0.004) ***	1.038 1.055
Wealth (Reference: **Poorest**)		
Poorer	1.526(0.247) **	1.110 2.096
Middle	2.367(0.362) ***	1.754 3.196
Richer	3.379(0.500) ***	2.529 4.516
Richest	6.412(0.902) ***	4.867 8.448
Marital status (Never in a union)		
Married/living with partner	2.544(0.268) ***	2.070 3.128
Widowed/divorced/separated	2.569(0.392) ***	1.905 3.466
Religion (Reference: **Christianity**)		
Islam	0.804(0.073) *	0.671 0.962
Traditional/spiritualist	0.125(0.089) **	0.031 0.505
No religion/other	0.339(0.153) *	0.139 0 0.825
Ethnicity (Reference: **Akan**)		
Ga/Dangme	1.08(0.212)	0.740 1.594
Ewe	0.983(0.130)	0.757 1.275
Guan	0.917(0.178)	0.626 1.343
Mole-Dagbani	1.041(0 0.100)	0.861 1.259
Grusi	1.026(0.185)	0.720 1.462
Gurma	0.503(0 0.089) ***	0.355 0.714
Mande	0.724(0.185)	0.439 1.195
Other	0.775(0.357)	0.314 1.912
Currently employed (Reference: **No**)		
Yes	2.113(0.229) ***	1.708 2.614
Has a valid health insurance (Reference: **No**)		
Yes	2.042(0.217) ***	1.658 2.515
Distance to Health facility (Reference: **a big problem**)		
Not a big problem	1.570(0.156) ***	1.292 1.908
Visited health facility in the past 12 month (Reference: **No**)		
Yes	2.156(0.182) ***	1.826 2.545
Times visited health facility (Reference: **None**)		
Once	1.689(0.179) ***	1.372 2.079
More than once	2.037(0.185) ***	1.704 2.436
Self-rated health (Reference: **Bad**)		
Good	1.088(0.105)	0.899 1.316
Frequency of watching television (Reference: **not at all**)		
Less than once a week	2.077(0.301) ***	1.562 2.762
At least once a week	2.980(0.340) ***	2.383 3.727
Frequency of listening to radio (Reference: **not at all**)		
Less than once a week	1.536(0.170) ***	1.234 1.910
At least once a week	2.107(0.199) ***	1.750 2.537
Region of residence (Reference: **Western**)		
Central	1.500(0.404)	0.884 2.546
Greater Accra	1.997(0.517) **	1.202 3.318
Volta	2.477(0.637) ***	1.496 4.102
Eastern	2.424(0.623) ***	1.464 4.014
Ashanti	2.043(0.516) **	1.245 3.352
western north	1.291(0.373)	0.732 2.276
Ahafo	1.696(0.460)	0.996 2.886

Table 2 (continued)

Variable	OR (SE)	95% CI
Bono	1.541(0.426)	0.896 2.650
Bono East	1.391(0.380)	0.813 2.377
Oti	1.309(0.366)	0.756 2.264
Northern	2.518(0.619) ***	1.555 4.078
Savannah	0.682(0.216)	0.367 1.270
North East	1.566(0.420)	0.925 2.652
Upper East	1.840(0 0.480) *	1.102 3.070
Upper West	1.736(0.459) *	1.033 2.916
Type of place of residence (Urban)		
Rural	0.452(0.037) ***	0.384 0.532

*$P<0.05$; **$P<0.01$; ***$P<0.001$; Odd Ratio (OR), Standard Error (SE), Confidence Interval (CI)

available, practicing Muslim women may be reluctant to go for screening especially when screening services are being provided by the opposite sex. Given that screening vary by religious affiliations and beliefs, health interventions that aims at increasing awareness and screening uptake in multireligious contexts like Ghana must consider incorporating these varying religious beliefs in the design and implementation process for cervical cancer screening.

Consistent with that of prior studies [35–37], ethnic disparities were further observed in the study context regarding cervical cancer screening. These observed ethnic disparities in cervical cancer screening and other preventive measures are intertwined with sociodemographic factors, unequal access to healthcare, income and education level [37], and often time translate into poorer health outcomes, especially among ethnic minorities [38] both in the developed and developing countries. This underscores the need to identify and target ethnically disadvantaged groups for cervical cancer screening in Ghana and other SSA countries. Furthermore, women who reported having valid health insurance coverage, were more likely to undertake cervical cancer screening relative to their uninsured counterparts. This finding is consistent with earlier studies [17, 38] which reported that health insurance coverage tends to mediate the financial barriers faced by women from poor financial backgrounds and guarantee some degree of equity to accessing cancer screening services. In Ghana, even though there is no national vaccination program for HPV [14], health insurance owners are more likely to frequent health facilities, establish contact with healthcare providers and get informed or encouraged to uptake available cervical cancer screening services. Nonetheless, other studies shows that even where people have health insurance, they still may not undergo screening test if additional payment is required [39, 40]. Unsurprisingly, household wealth was significantly associated with cervical cancer screening as women from wealthy households (i.e., richer, and richest households) were more associated with cervical cancer screening compared to those from the poorest households. Prior studies have shown that women from low socioeconomic backgrounds are less likely to uptake cancer screening services for several reasons including the associated cost [39, 41], thereby highlighting the vulnerabilities of women from low-income households and as well as the unemployed, to the risk of late diagnosis and treatment in the study context.

Women who visited health a facility in the preceding 12 months, significantly reported higher odds of cervical cancer screening relative to those who did not. In resource poor settings of SSA where most families are without regular family doctors, visits to health facilities have shown to be a very crucial source of health information for women [34]. Likewise, exposure to mass media outlets including television and radio, significantly predicted cervical cancer screening as women who watched television at least once a week, and those who listened to radio at least once a week were more associated with screening compared to those who neither watched television nor listened to radio. Similar studies across SSA have uncovered direct links between mass media exposure and adherence to preventive health behaviours [42–44]. In their evaluation of Knowledge and attitude towards cervical cancer among women of reproductive age, Mengesha et al. [45] discovered that mass media was the major source of information on cervical cancer. Given this positive correlation between mass media exposure and likelihood of cervical cancer screening, the government of Ghana, through the Ministry of Health, must utilize media outlets such as television and radio to intensify awareness creation on the importance of early diagnosis.

Finally, geographical variations were observed. For instance, residents of the Central, Volta, Eastern, Ashanti, Ahafo, Bono East, Oti, Northern, North East, Upper East, and Upper West regions were significantly more associated with cervical cancer screening relative to those in the Western region. Ashanti region for instance houses the only cancer registry center (i.e., Kumasi Cancer Registry) in Ghana [46] thereby making cancer services more

Table 3 Multivariable logistic regressions predicting cervical cancer screening among women in Ghana

Variable	OR (SE)	95% CI
Education (Reference: **No education**)		
Primary	1.216 (0.209)	0.868 1.704
Secondary	1.419(0.208)	1.064 1.891
Tertiary	4.140(0 0.708) ***	2.960 5.789
Current age (Continuous)	1.035(0.006) ***	1.023 1.048
Wealth (Poorest)		
Poorer	1.258(0 0.225)	0.886 1.788
Middle	1.629(0 0.318) *	1.110 2.390
Richer	1.968(0 0.404) ***	1.316 2.944
Richest	2.492(0 0.547) ***	1.620 3.833
Marital status (Reference: **Never in a union**)		
Married/living with partner	1.773(0.231) ***	1.372 2.290
Widowed/divorced/separated	1.888(0.344) ***	1.320 2.701
Religion (Reference: **Christianity**)		
Islam	0.737(0.096) *	0.570 0.952
Traditional/spiritualist	0.250(0.180)	0.060 1.031
No religion/other	0.639(0.296	0.257 1.587
Ethnicity (Reference: **Akan**)		
Ga/Dangme	1.132(0.253)	0.729 1.756
Ewe	0.779(0.150)	0.534 1.136
Guan	1.304(0.301)	0.829 2.051
Mole-Dagbani	1.478(0.232) *	1.086 2.011
Grusi	1.740(0.375) *	1.140 2.655
Gurma	0.9397(0.200)	0.618 1.428
Mande	1.367(0.397)	0.774 2.415
Other	1.103(0 0.533)	0.428 2.846
Currently employed (Reference: **No**)		
Yes	1.268(0 0.153)8	1.000 1.607
Has a valid health insurance (Reference: **No**)		
Yes	1.356(0 0.153) **	1.086 1.693
Distance to Health facility (Reference: **a big problem**)		
Not a big problem	0.9741(0 0.106)	0.785 1.207
Visited health facility in the past 12 month (Reference: **No**)		
Yes	1.312(0 0.128) **	1.082 1.590
Times visited health facility (Reference: **None**)		
Once	1.101(0 0.129)	0.874 1.386
More than once	1.321(0 0.138) **	1.075 1.624
Self-rated health (Reference: **Bad**)		
Good	1.095(0 0.114)	0.892 1.345
Frequency watching television (Reference: **not at all**)		
Less than once a week	1.351(0 0.220)	0.981 1.861
At least once a week	1.395(0 0.199) *	1.055 1.846
Frequency listening to radio (Reference: **not at all**)		
Less than once a week	1.249(0 0.150)	0.986 1.583
At least once a week	1.509(0 0.158) ***	1.228 1.853
Region of residence (Reference: **Western**)		
Central	1.795(0 0.505) *	1.034 3.118
Greater Accra	1.536(0 0.433)	0.884 2.669
Volta	3.310(1.025) ***	1.803 6.076
Eastern	2.251(0 0.618) **	1.314 3.856
Ashanti	1.967(0 0.520) *	1.171 3.305
Western north	1.684(0 0.511)	0.929 3.053
Ahafo	2.512(0 0.724) ***	1.428 4.420

Table 3 (continued)

Variable	OR (SE)	95% CI
Bono	1.609(0 0.469)	0.908 2.851
Bono East	2.080(0 0.607) *	1.174 3.686
Oti	2.391(0 0.746) **	1.297 4.408
Northern	4.303(1.242) ***	2.444 7.576
Savannah	1.472(0.518)	0.738 2.934
North East	3.659(0 1.142) ***	1.985 6.746
Upper East	1.806(0 0.544) *	1.000 3.263
Upper West	1.998(0 0.611) *	1.097 3.639
Type of place of residence (Urban)		
Rural	0.884(0.093)	0.7191 1.087

*$P<0.05$; **$P<0.01$; ***$P<0.001$; Odd Ratio (OR), Standard Error (SE), Confidence Interval (CI)

Number of observations = 15,014; Pseudo $R^2 = 0.137$

readily available to residents of the region relative to residents of other regions. Similar studies with observed regional disparities on access to cancer services have attributed such disparities not only to unavailability of cervical cancer services, but also, the net effect of other social determinants of health including income, health education or awareness among other factors [47–49]. Moreover, the prevalence of different cultural and ethno-religious belief systems across the regions in Ghana may account for this observed disparity concerning cervical cancer screening in our study.

This therefore highlights the crucial need for reducing regional disparities in regional health infrastructure and staff for equitable healthcare and access, as well as taking into account the ethno-cultural beliefs of the diverse population of the country in the design of preventive healthcare programs.

Study limitations

Some noteworthy limitations have been identified in this study. First, given the cross-sectional nature of the study data, interpretation of findings may be limited to statistical association. Second, the findings may be subject to social desirability bias and recall bias as some participants may either provide only socially desirable responses or unable to fully recall if they had ever been screened for cervical cancer. Also, this study may not be exhaustive of all the contextual factors that influence cervical cancer screening including knowledge about the type of cancers. Given these limitations, it will be useful for future studies to conduct a qualitative study that captures the contextual nuances and depth of cervical cancer screening among women of reproductive age in Ghana. Despite these noteworthy limitations, this study, however, adds relevant insights to the existing literature, and for health policy makers in Ghana and similar contexts.

Conclusions and recommendations

Screening for cervical cancer in Ghana remains very low and significantly influenced by several factors including the demographic characteristics, health-related factors, economic conditions as well as geographical location. Specifically, while higher education, employment, belonging to wealthy households, valid health insurance coverage, proximity and visitation to health facility, contact with health professionals, as well as mass media exposure facilitates cervical cancer screening in Ghana, ethno-religious and regional disparities persist. Thus, the strong association between higher education, media exposure, and cervical cancer screening suggests that educational interventions and mass media campaigns can be effective in increasing screening rates. Hence, healthcare providers should focus on enhancing educational efforts and using mass media to reach less-educated women and those in lower socioeconomic groups, for improving screening uptake. Also, given the variations in screening behavior across ethnic and religious groups, there is a need for culturally tailored healthcare strategies. Clinicians/community healthcare providers should develop and implement culturally sensitive educational programs and interventions that address the specific beliefs and practices of different ethnic and religious groups to reduce disparities in screening. Thirdly, efforts must be made to expand health insurance coverage, improve healthcare infrastructure, and facilitate regular health facility visits, particularly in regions with lower screening rates, to ensure equitable access to cervical cancer screening services across different demographics and regions. More importantly, to ensure early detection, timely treatment/care, and cervical cancer related deaths prevention, there must be coordinated efforts by the government of Ghana and Ministry of Health to implement national HPV vaccination program, improve healthcare access and surveillance systems for cervical cancer cases. Drawing on findings of this study, future research should focus on evaluating the factors accountable for cultural,

Table 4 Multivariable logistic regressions predicting cervical cancer screening among women in Ghana

Variable	OR (SE)	95% CI
Education (Reference: **No education**)		
Primary	1.199(0.209)	0.852 1.689
Secondary	1.414(0.209) *	1.058 1.891
Tertiary	4.178(0.713) ***	2.990 5.838
Current age (Continuous)	1.037(0.006) ***	1.025 1.049
Wealth (Poorest)		
Poorer	1.248(0.222)	0.880 1.770
Middle	1.617(0.313) *	1.106 2.365
Richer	1.960(0.398) ***	1.316 2.921
Richest	2.491(0.541) ***	1.627 3.813
Marital status (Reference: **Never in a union**)		
Married/living with partner	1.827(0.238) ***	1.415 2.358
Widowed/divorced/separated	1.935(0.353) ***	1.353 2.768
Religion (Reference: **Christianity**)		
Islam	0.725(0.095) *	0.560 0.938
Traditional/spiritualist	0.249(0.180)	0.060 1.027
No religion/other	0.630(0.292)	0.253 1.566
Ethnicity (Reference: **Akan**)		
Ga/Dangme	1.136(0.254)	0.732 1.762
Ewe	0.777(0.149)	0.533 1.134
Guan	1.296(0.299)	0.824 2.038
Mole-Dagbani	1.487(0.233) *	1.093 2.022
Grusi	1.740(0.375) *	1.140 2.657
Gurma	0.952(0.203)	0.626 1.446
Mande	1.356(0.393)	0.767 2.396
Other	1.079(0.522)	0.417 2.789
Has a valid health insurance (Reference: **No**)		
Yes	1.346(0.152) **	1.078 1.679
Visited health facility in the past 12 month (Reference: **No**)		
Yes	1.318(0.129) *	1.088 1.597
Times visited health facility (Reference: **None**)		
Once	1.092(0.128)	0.868 1.374
More than once	1.304(0.136) *	1.062 1.600
Frequency watching television (Reference: **not at all**)		
Less than once a week	1.362(0.222)	0.989 1.876
At least once a week	1.408(0.200) *	1.065 1.861
Frequency listening to radio (Reference: **not at all**)		
Less than once a week	1.268(0.152) *	1.001 1.606
At least once a week	1.539(0.160) ***	1.254 1.888
Region of residence (Reference: **Western**)		
Central	1.787(0.502) *	1.029 3.102
Greater Accra	1.509(0.425)	0.868 2.620
Volta	3.280(1.016) ***	1.787 6.020
Eastern	2.231(0.612) **	1.303 3.820
Ashanti	1.953(0.516) *	1.163 3.280
Western North	1.680(0.509)	0.927 3.043
Ahafo	2.466(0.709) **	1.403 4.336
Bono	1.610(0.469)	0.909 2.851
Bono East	2.064(0.602) *	1.165 3.656
Oti	2.413(0.752) **	1.309 4.447
Northern	4.237(01.221) ***	2.408 7.456
Savannah	1.451(0.510)	0.728 2.891
North East	3.616(1.127) ***	1.962 6.663

Table 4 (continued)

Variable	OR (SE)	95% CI
Upper East	1.810(0.545) *	1.002 3.269
Upper West	1.958(0.599) *	1.075 3.566
Type of place of residence (Urban)		
Rural	0.8920081 0.093)	0.725 1.096

*$P<0.05$; **$P<0.01$; ***$P<0.001$; Odd Ratio (OR), Standard Error (SE), Confidence Interval (CI)

Number of observations = 14,178; Pseudo $R^2 = 0.132$

ethnic, and religious disparities in cervical cancer screening behaviors in Ghana and SSA at large, a crucial step towards identifying tailored interventions to address these disparities. Secondly, there is a need to explore the potential outcomes of implementing a national HPV vaccination program in Ghana, focusing on its impact on cervical cancer incidence and screening rates, particularly in underserved regions. Thirdly, future research can benefit from evaluating the utility of mass media outlets such as television and radio in awareness creation about cervical cancer screening in Ghana.

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Author contributions
Sulemana Ansumah Saaka (S.A.S) Mohammed-Gazali Hambali (M.H) S.A.S Conceptualized the manuscript, conducted the statistical analysis, and wrote first draft. M.H Assisted with reporting of the study results and provided significant input to the first draft. SS.A.S Revised and approved the final draft.

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Data availability
All data underlying this study are publicly available at the Demographic and Health Survey (DHS) repository: https://www.dhsprogram.com/data/.

Declarations

Ethics approval and consent to participate
Ghana Statistical Service obtained ethical clearance from the International Coaching Federation (ICF) Institutional Review Board (IRB) prior to data collection.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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