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Clicks and checks: investigating the association between internet usage frequency and women's uptake of clinical breast examination in Ghana

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Abstract

Background In resource-constrained settings, availability and access to mammography is a challenge. As such, the World Health Organization (WHO) recommends clinical breast examination (CBE) for women in such settings. Yet, CBE uptake remains low. We, therefore, aimed to contribute to the discourse on factors that influence women's screening practice by investigating the association between the frequency of internet use and women's uptake of CBE in Ghana.

Methods This study was based on data from 15,013 women who participated in the 2022 Ghana demographic and health survey. We performed descriptive analysis, computed Pearson's chi-square test, and fitted multivariable logistic regression models. The findings from the regression model were presented in adjusted odds ratio (AOR) at a 95% confidence interval.

Results Only 18.39% of women 15–49 years had their breasts examined by a healthcare provider. About 38.22% of the total sample often used the internet. Compared to women who did not use the internet at all, those who often used it had twice the odds of getting screened (COR = 2.86; 95%CI: 2.62–3.13). The odds of CBE uptake remained significantly higher among those who often used the internet (AOR = 1.26; 95%CI: 1.12–1.43) even after adjusting for the covariates.

Conclusion We conclude that CBE uptake is significantly high among women who frequently use the internet. This association persists even when considering other influential factors such as age, education level, marital status, and socioeconomic status. As such, it is imperative for the Ministry of Health in collaboration with the Ghana Health Service to recognize the potential of digital health interventions, including online health education campaigns and telehealth services, in reaching and engaging women to get their breast examined by a healthcare provider.

Keywords Breast Cancer, Screening, Internet use, Public Health, Women's Health

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Background

Global public health institutions and policymakers agree that advanced breast cancer and related mortalities can be substantially reduced when there is early detection and diagnosis [1–3]. Consequently, there have been a lot of advocacies for women to undergo breast screening. This includes the nations leveraging the month of October to raise awareness of the population about breast cancer and the need to undergo screening [4, 5].

It must be noted that even though mammography is the recommended gold standard screening modality, it has proven to be expensive and a barrier to breast cancer screening in resource-constrained settings like sub-Saharan Africa (SSA) [6, 7]. As such, the World Health Organization (WHO) recommends clinical breast examination (CBE) and breast self-examination for women in resource-constrained settings [7]. In this study, CBE refers to a breast examination performed by a healthcare professional to check for abnormalities, while a BSE is conducted by an individual to monitor their breast health. CBE encompasses a visual check of skin and tissue, and a manual check of unusual lumps and breast texture by a healthcare professional [8]. Yet, uptake of CBE remains unacceptably low. For instance, a multi-country study [9] involving participants from Burkina Faso, Ivory Coast, Kenya and Namibia revealed that only 12.9% of women had undergone CBE. In Ghana, one study [10] reported a 4.5% prevalence in the uptake of CBE among older women (50 years and older).

To address the low uptake of CBE among women in SSA, particularly in Ghana, there is a need to understand the factors that predict screening uptake. Previous studies conducted in Ghana [10, 11], South Africa [12], and Lesotho [13] have identified factors such as low educational level, poorer wealth status, far distance to the health facility, being of younger age, ethnicity, and having multi-morbidities as key factors associated with the low uptake of CBE. Additionally, factors such as low perceived susceptibility, high perceived barriers, and fatalistic perceptions have been reported to significantly impact negatively on women's breast screening practices [14].

Beyond these established factors, there is an interest in how online activities of women could be influencing their breast cancer screening practices. On one hand, there is evidence [15] suggesting that there is no significant association between women's use of social networking sites and breast screening uptake. A longitudinal study [16] conducted in the United Kingdom also found no significant association between internet use and breast screening uptake. However, one study [17] has revealed that women who look up for health information on the internet are more likely to undergo breast screening. It must be noted that all of the studies cited were based on mammography as a screening modality. Furthermore, these studies [15–17] were conducted in non-SSA countries, thus, making their applicability to countries like Ghana difficult due to the socio-cultural and health infrastructure differences. It is also important to note that frequent internet use can serve as a proxy for greater access to and engagement with health information [18], which can influence their health-seeking behaviors including CBE uptake. Yet, after an extensive literature review, there are no published evidence to confirm or refute the hypothesis that CBE uptake is higher among women who frequently use the internet. This is an important knowledge gap that must be filled. Our study seeks to narrow this gap by investigating the association between the frequency of internet use and women's uptake of CBE in Ghana.

Methods

Data source and design

The analysis utilized data from the 2022 Ghana Demographic and Health Survey (GDHS), specifically drawing from the individual recode file (IR). The GDHS is part of a larger initiative spanning 85 low-and-middle-income countries (LMICs) [19]. The primary objective of the 2022 GDHS was to furnish current estimations of fundamental demographic and health indicators. To achieve this goal, a meticulously designed two-staged sampling strategy was implemented, resulting in a stratified representative sample, comprising 18,450 households distributed across 618 clusters [19]. This method ensured thorough representation at the national level, encompassing both urban and rural areas, and within each of Ghana's 16 regions [20].

During the initial stage, 618 target clusters were identified using a probability proportional to size method, considering urban and rural differentiations within each region [20]. Subsequently, an equal probability systematic random sampling approach was employed to choose the requisite number of clusters in both urban and rural settings. Moving to the second stage, subsequent to cluster selection, an exhaustive household listing and map updating process was conducted within all selected clusters, establishing a comprehensive roster of households for each cluster. From each cluster, 30 households were randomly chosen for interviews [20]. For further information on the design of the GDHS, refer to: https://www.dhsprogram.com/pubs/pdf/FR387/FR387.pdf.

Study variables

Outcome variable

Our outcome variable was CBE which was measured by using the question, "Have you had your breasts examined for cancer by a healthcare provider?" The responses were 'Yes', and 'No'.

Main explanatory variable

The main explanatory variable was the frequency of internet use. This was constituted from the question, "What is the frequency of using internet in the last month?" The question had four responses: not at all, less than once a week, at least once a week, and almost every day. We recoded the responses to have the following: never (i.e., not at all), rarely (i.e., less than once a week), and often (at least once a week and almost every day).

Table 1 Sample distribution and proportion of women CBE uptake across all variables

Variables	Sample *n* (%)	Yes, CBE uptake *n* (%)	*p*-value
Frequency of internet use			**< 0.001**
Never	8735 (58.19)	1103 (12.62)	
Rarely	539 (3.59)	80 (14.92)	
Often	5739 (38.22)	1578 (27.49)	
Place of residence			**0.002**
Urban	8557 (57.00)	1968 (23.00)	
Rural	6456 (43.00)	793 (12.27)	
Age group			**0.015**
15–19 years	2681 (17.86)	186 (6.95)	
20–24 years	2695 (17.95)	403 (14.95)	
25–29 years	2339 (15.58)	470 (20.11)	
30–34 years	2252 (15.00)	531 (23.56)	
35–39 years	2059 (13.71)	504 (24.47)	
40–44 years	1675 (11.15)	354 (21.14)	
45–49 years	1312 (8.74)	313 (23.87)	
Highest level of education			**0.001**
No formal education	2411 (16.06)	220 (9.11)	
Primary	2070 (13.79)	235 (11.35)	
Secondary	8999 (59.94)	1581 (17.57)	
Higher	1533 (10.21)	725 (47.30)	
Marital status			**0.001**
Never married	5267 (35.08)	733 (13.93)	
Currently in union	8204 (54.65)	1717 (20.93)	
Previously in union	1542 (10.27)	311 (20.15)	
Exposure to media			**0.001**
No	4102 (27.32)	459 (11.19)	
Yes	10,911 (72.68)	2302 (21.10)	
Wealth index			**0.001**
Poorest	2447 (16.30)	188 (7.68)	
Poorer	2712 (18.06)	304 (11.22)	
Middle	3121 (20.79)	480 (15.38)	
Richer	3378 (22.50)	654 (19.37)	
Richest	3355 (22.35)	1134 (33.81)	
Distance to a healthcare facility			**0.001**
Big problem	3353 (22.34)	426 (12.70)	
Not a big problem	11,660 (77.66)	2335 (20.03)	
Total	**15,013 (100)**	**2761 (18.39)**	

p-values were computed from the chi-square test of homogeneity; CBE: clinical breast examination

Covariates

Based on a thorough review of pertinent literature [10–13], we identified the following covariates to be included in our analysis: age (25–49 years), residential location (rural and urban), level of education (e.g., no formal education, primary, secondary, higher), marital status (never married, currently in a union, previously in a union), exposure to media (yes or no), wealth index (e.g., poorest, poorer, middle, richer, richest), and perception of distance as a barrier (e.g., significant problem, not a significant problem).

Statistical analyses

The GDHS dataset included observations from 15,014 women aged 15–49 years. Those who responded 'Don't know' to the question on CBE were excluded from the analysis ($n=1$), resulting in a final sample size of 15,013 women. Descriptive statistics such as frequencies and percentages were computed to summarize the distribution of variables within the sample. Additionally, cross-tabulation was performed to examine the distribution of CBE uptake across different variables. To assess whether there were significant differences in observed distributions, Pearson's Chi-Square test was utilized. For the binary logistic regression analysis, we initially conducted bivariate analysis to examine the association between the frequency of internet use and CBE uptake. Subsequently, the effects of covariates were adjusted for in the second model.

Adjusted odds ratios (AOR) with a 95% confidence interval were used to present the results from the multivariable logistic regression analysis. To account for the complex sampling design of the GDHS, the survey design was accommodated by utilizing the complex survey command "svyset" in STATA, which incorporates information regarding strata and primary sampling units (PSUs). This approach ensures that the estimates derived from the analysis accurately reflect the population characteristics and account for the survey's sampling methodology. All statistical analysis for this study was done using STATA version 18 (StataCorp, College Station, TX, USA).

Results

Prevalence of CBE uptake and its distribution across the explanatory variables

Table 1 shows the prevalence of CBE uptake and its distribution across the explanatory variables. Only 18.39% of women 15–49 years had their breasts examined by a healthcare provider. About 38.22% of the participants often used the internet. The prevalence of CBE uptake was high among those who often used the internet (27.49%) and resided in urban areas (23.00%). Additionally, the highest uptake was seen in women aged 30–34 years (23.56%), women with higher educational

attainment (47.30%), those currently in a union (20.93%), and those exposed to the media (21.10%). Further, women in the richest wealth index (33.81%) and those who perceived the distance to the healthcare facility as not a big problem (20.03%) also reported higher CBE uptake.

Association between frequency of internet use and CBE uptake

Compared to women who did not use the internet at all, those who often used it had twice the odds of getting screened (COR=2.86; 95%CI: 2.62–3.13). The odds of CBE uptake remained significantly higher among those who often used the internet (AOR=1.26; 95%CI: 1.12–1.43) even after adjusting for the covariates. CBE uptake increased with age, with the highest odds observed in individuals aged 45–49 years (AOR=3.63; 95%CI: 2.83–4.66). Higher odds of CBE uptake were observed among women with higher educational attainment (AOR=5.01; 95%CI: 4.07–6.17) and those who were currently in union (AOR=1.28; 95%CI: 1.12–1.47). Women who reported being exposed to media had 1.51 times higher odds than those who reported no exposure (AOR=1.51; 95%CI: 1.34–1.71). The odds of undergoing CBE were high among women in the richest wealth index (AOR=1.88; 95%CI: 1.52–2.32) and those who did not consider distance to healthcare facility as not a big problem (AOR=1.19; 95%CI: 1.06–1.35) (see Table 2).

Model fit statistics

The model fit statistics evaluate how well the logistic regression model fits the data. For both the unadjusted and adjusted models, the p-value for the chi-squared test is less than 0.001. This indicates that both models are statistically significant. Without accounting for covariates, frequency of internet use explains approximately 3.91% of the variance in women's uptake of CBE. However, when we accounted for the covariates, the adjusted model explained 11.66% of the variance in CBE uptake. We employed Akaike's Information Criterion (AIC) to compare the two models. Lower AIC values indicate a better fit. The adjusted model exhibited the lowest AIC score (11920.82), suggesting that it better fits the data than the unadjusted model (Table 3).

Discussion

This study aimed to investigate the association between the frequency of internet use and women's uptake of CBE in Ghana. Consistent with previous literature [10], we found a low uptake of CBE in Ghana. The low uptake of CBE reflects the situational at the SSA regional level where less than a tenth of women of reproductive age (9.73%) get screened by a healthcare provider [13]. Thus, underscoring a need for policymakers and stakeholders to reassess the current screening system in the country.

Table 2 Results from the binary logistic regression model

Variables	Model I Crude Odds Ratio (OR)	Model II Adjusted Odds Ratio (AOR)
Frequency of internet use		
Never	Ref.	Ref.
Rarely	**1.37 [1.06,1.75]***	1.04 [0.80,1.35]
Often	**2.86 [2.62,3.13]*****	**1.26 [1.12,1.43]*****
Place of residence		
Urban		Ref.
Rural		**0.88 [0.78,0.98]***
Age		
15–19 years		Ref.
20–24 years		**1.89 [1.55,2.30]*****
25–29 years		**2.38 [1.92,2.94]*****
30–34 years		**2.85 [2.28,3.57]*****
35–39 years		**3.13 [2.49,3.93]*****
40–44 years		**2.97 [2.34,3.78]*****
45–49 years		**3.63 [2.83,4.66]*****
Highest level of education		
No formal education		Ref.
Primary		**1.23 [1.02,1.49]***
Secondary		**1.98 [1.69,2.32]*****
Higher		**5.01 [4.07,6.17]*****
Marital status		
Never married		Ref.
Currently in union		**1.28 [1.12,1.47]*****
Previously in union		1.20 [0.98,1.47]
Exposure to media		
No		Ref.
Yes		**1.51 [1.34,1.71]*****
Wealth		
Poorest		Ref.
Poorer		1.13 [0.95,1.34]
Middle		**1.23 [1.02,1.48]***
Richer		**1.32 [1.08,1.61]****
Richest		**1.88 [1.52,2.32]*****
Distance to healthcare facility		
Big problem		Ref.
Not a big problem		**1.19 [1.06,1.35]****

***$p<0.001$, **$p<0.01$, *$p<0.05$; Ref: reference category; AOR: Adjusted Odds Ratio; COR: Crude Odds Ratio

Table 3 Model fit statistics

Model Fit Statistics	Unadjusted Model	Adjusted Model
Prob > chi2	< 0.001	< 0.001
Pseudo R2	0.0391	0.1166
Constant	**0.13 [0.12–0.14]*****	**0.02 [0.01–0.02]*****
AIC	12928.09	11920.82
Number of observations	15,013	15,013

AIC: Akaike Information Criterion

Our findings indicate that women who frequently use the internet are 1.26 times more likely to undergo CBE. The observed association is inconsistent with prior evidence [15, 16] that have found internet use to be associated with cervical and colorectal cancer screenings, but not breast cancer. However, our result is corroborated by Abraham et al. [17] whose study reported a strong positive association between internet use and breast cancer screening. One plausible explanation for the observed association could be that frequent internet users are more likely to get access to a wealth of online health information and resources related to breast cancer screening, which may enhance their knowledge and awareness about the importance of regular screening. Moreover, active engagement with online health content may empower women to take proactive steps towards their health, including scheduling routine CBE appointments. Another perspective is that the internet provides an opportunity for the formation of online relationships and communities that can act as a cue to action for women to get screened.

Other factors that were significant in predicting higher CBE uptake were increasing age, higher educational attainment, exposure to the media and higher wealth status. All of these factors are consistent with studies conducted in Ghana [10, 11], South Africa [12], and Lesotho [13]. Older women of reproductive age may have a higher perceived risk and thus, be intrinsically motivated to undergo screening. Higher educational attainment is known to empower women to become more assertive and autonomous in their healthcare decision-making, including in deciding to undergo CBE [21].

Consistent with extant literature [22, 23], we found that not considering the distance to the healthcare facility as a big problem increased the likelihood of women being screened. A possible explanation for this is that travel time may interact with the economic status of the individual [24]. This means that women from poorer households would have more tendency to view the distance to the healthcare facility as a problem since they will probably struggle to get money for transportation. It is, therefore, not surprising that rural dwelling women were significantly less likely to have participated in CBE services. This is because most healthcare facilities that offer CBE services are located in urban centers; thus, making travel distance, time and money a hindrance to rural dwelling women to would have desired to be screened. This result is a call on the Ghana Health Service to ensure that the integration of breast cancer screening into the community health planning services (CHPS) facilities in rural Ghana.

Implications for policy and practice

Our findings have several implications for policy and practice. The results imply that policymakers could leverage the internet and develop targeted online health education campaigns aimed at encouraging women to prioritize breast cancer screening. Additionally, the findings suggest an opportunity for healthcare practitioners to utilize digital platforms for remote patient education and engagement, providing accessible information about the importance of regular CBE and facilitating appointment scheduling for screening services.

This study also highlights a need for public health policies to prioritize strategies to improve screening uptake among underserved populations, such as older women, those with lower educational levels, and individuals with limited access to healthcare resources. This could involve targeted outreach initiatives, community-based screening programs, and culturally sensitive interventions tailored to the specific needs and preferences of diverse population groups. The relatively low Pseudo R-squared suggests that while the variables included in our models are significant, there are likely other unmeasured factors influencing CBE such as the health beliefs of women (i.e., perceived susceptibility, barriers, benefits, severity, and cues to action), attitudes of healthcare professionals and gender of healthcare professionals. As such, future studies would have to consider and explore these unmeasured factors.

Strengths and limitations

The large sample size of this study is a strength as we are able to extrapolate the findings to the larger population of women aged 15–49 years. Also, we followed appropriate statistical analytical approaches in selecting the best fit model. With the clear outline of the methods and analysis, our study can be replicated in similar jurisdictions. However, our findings cannot be applicable to older women (i.e., 50 years and above) due to their unique characteristics. Our model did not account for other important confounding variables such as family history of cancer, perceived susceptibility, among others. As such, the findings should be interpreted with caution. Given that CBE was self-reported by participants rather than obtained from a hospital registry or medical records, it is essential to acknowledge the potential presence of recall and social desirability biases in the study findings. Participants may inadvertently overestimate or underestimate their screening uptake.

Conclusion

We conclude that CBE uptake is significantly high among women who frequently use the internet. This association persists even when considering other influential factors such as age, education level, marital status, and

socioeconomic status. As such, it is imperative for the Ministry of Health in collaboration with the Ghana Health Service to recognize the potential of digital health interventions, including online health education campaigns and telehealth services, in reaching and engaging women to get their breast examined by a healthcare provider.

Abbreviations

AIC	Akaike Information Criterion
AOR	Adjusted Odds Ratio
CBE	Clinical Breast Examination
LMICs	Low-and-middle-income Countries
Ref	Reference Category
SSA	Sub-Saharan Africa
WHO	World Health Organization

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Author contributions
JO conceived and designed the study. JO and CA contributed to the design of the analysis. JO performed the formal analysis and provided methodological insights. JO, CA, and KSD drafted the initial manuscript. KSD supervised the research. All authors read, revised and approved the final manuscript for submission. JO had the responsibility of submitting the manuscript.

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Data availability
The datasets generated and/or analysed during the current study are available in the Measure DHS repository: http://www.dhsprogram.com/data/available-datasets.cfm.

Declarations

Ethics approval and consent to participate
We did not need to seek ethical clearance because the DHS dataset we used is publicly available. We obtained the datasets from the DHS Program after completing the necessary registration and getting approval for their use. We followed all the ethical guidelines that pertain to using secondary datasets in research publications. You can find detailed information about how we used the DHS data and the ethical standards we followed at this link: http://goo.gl/ny8T6X.

Consent for publication
None declared.

Competing interests
The authors declare no competing interests.

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