RESEARCH ARTICLE

Sociodemographics and health-literacy as predictors of cervical cancer screening practices among Haitian women: A secondary data analysis of 2016–17 DHS surveys

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Abstract

Cervical cancer screening rates in Haiti are concerningly low. Access to health-related information and health literacy may be important determinants of engagement in cervical cancer screening. This study explored the relationship between sociodemographics,literacy, and sources of information on cervical cancer screening among Haitian women. A secondary data analysis was conducted using USAID Demographics and Health Survey Haiti household data from 2016–2017. Univariate logistic regressions identified significant predictor covariates measuring sociodemographics and sources of information in cervical cancer screening uptake.Two multivariate logistic regression models with adjusted odds ratios were developed using the significant predictor variables from the univariate analysis. N = 610 women responded to questions pertaining to cervical cancer screening. The first multivariate model evaluating sociodemographics demonstrated an economic background of poorer (aOR = 4.06, 95% CI [1.16,14.27]) and richest (aOR = 19.10 , 95% CI[2.58,141.57]), higher education levels (aOR 7.58 , 95% CI [1.64,34.97]), and having insurance (aOR = 16.40, [95% CI 2.65, 101.42]) were significant predictors of cervical cancer screening. The second model evaluating literacy and sources of information indicated that access to a television (aOR = 4.28, 95% CI [1.21,9.34]), mobile phone ownership (aOR = 4.44, 95% CI [1.00,5.59]), and reading the newspaper (aOR = 3.57, [95% CI 1.10,11.59]) were significant predictors of cervical cancer screening. Diverse health communication initiatives that are adapted for literacy level and that incorporate multimedia components may effective in raising women's cervical cancer knowledge and awareness , and increasing intention and uptake of cervical cancer screening in Haiti.

Introduction

Cervical cancer, which is primarily caused by infection with human papillomavirus (HPV), is the fourth most diagnosed cancer amongst women globally [1]. Haiti reports the highest rates of cervical cancer incidence and mortality in the Caribbean, with cervical cancer being the second most diagnosed female cancer among women between 15–44 years old [2–4]. The mortality associated with cervical cancer in Haiti is alarming- amongst those who are diagnosed, approximately 75% will die from the disease [4]. While data on the prevalence of HPV in Haiti has been inconsistent, certain studies have estimated prevalence rates of high-risk oncogenic HPV strains in Haiti being as high as 19% in semi-urban and urban populations [5]. Due to the lack of cancer registries and insufficient cancer surveillance systems in Haiti, it is likely that these numbers are higher than what is reported.

Although cervical cancer can be averted through primary prevention (i.e. HPV vaccination) and secondary prevention (i.e. cervical cancer screening), women in Haiti are less likely to engage in preventative measures [3, 6]. To date , HPV vaccines are not included into Haiti's national immunization schedule. Therefore, the main prevention method that is utilized is cervical cancer screening. The success of cancer screening programs is primarily dependent on the support of the local health system, coupled with patient engagement and adherence [7, 8]. Currently, the standard of care for cervical cancer screening by the Haitian Ministry of Health (Ministre de la Sante Publique et de la Population [MSPP]) is cytology with Papanicolaou tests (i.e. pap smears) [6]. However, numerous challenges exist in implementation due to insufficiently trained staff to conduct pap smears, lack of labs and pathologists to interpret results, and delayed notification of positive results [9, 10]. These limitations are not only unique to Haiti, but to many low- and -middle-income countries (LMICs), which has resulted in the WHO establishing new guidelines in cervical cancer screening through the use of screen-and-treat strategies [11, 12]. In Haiti, single visit screen-and-treat approaches for cervical cancer with visual inspection with acetic acid (VIA) , followed by treatment of positive screens with cryotherapy have been implemented in certain settings [13, 14]. However these interventions heavily rely on sporadic interventions through non-governmental and civil society organizations [14–16].

Studies have evaluated individual barriers and facilitators associated with the uptake in cervical cancer screening in LMICs including low knowledge, perceived risk, competing health needs, lack of social support, and cultural beliefs [17, 18]. While many studies cite the influence of these individual-level factors as a primary motivator of health behaviors surrounding cancer screening, few studies have adequately explored the role of health literacy and sources of information in cervical cancer screening in LMICs. Furthermore, health behavior change theories such as the Health Belief Model largely overlook the construct of health literacy in engagement in preventive behaviors. Health literacy and sources of information may contribute towards individuals' cervical cancer and cervical cancer screening knowledge levels, perceived susceptibility, perceived benefits and barriers, perceived severity, and perceived self-efficacy in engagement in cervical cancer screening; thus informing perceptions and attitudes towards engagement in cancer screening [17, 19].

In the context of cancer screening, a growing body of literature has observed relationships between high literacy levels and access to information sources as determinants of engagement in cancer screening [20, 21]. High literacy and access to health information have been found to contribute to positive outcomes of knowledge, attitudes, and subsequent engagement in preventive health behaviors [23–25]. In several LMICs, studies have demonstrated that low levels

of cancer literacy can result in low uptake of screening even among populations of higher socioeconomic status [22, 26]. In relation to sources of information, health literacy has been found to be influenced by information sources, with certain populations being more prone to certain information sources compared to others which can impact engagement in screening interventions [27].

The WHO strategy for cervical cancer prevention and control emphasizes the essential role of health education in cervical cancer prevention programs, with lack of information being a deterrant to engagement in screening [21]. Research efforts to understand the influence of literacy and sources of information on cervical cancer screening among Haitian women have been largely insufficient. There is a growing need for the development of initiatives to take into consideration literacy, language barriers, and social inequities that may contribute to cervical cancer risk among Haitian women [21]. The purpose of this study was to assess determinants of engagement in cervical cancer screening among women living in Haiti, with a focus on sociodemographics, literacy, and access to sources of information.

Methods

Ethics statement

Data from the Haitian USAID Demographic and Health Surveys (DHS) wasiswere used for this study [28]. DHS is a nationally representative population-based survey with Women of reproductive age (15–49 years old) being eligible to participate with all data being anonymous.

Procedures and questionnaires for DHS surveys are reviewed and approved by the International Coaching Federation (ICF) International Review Board (IRB), with country-specific DHS surveys being reviewed internally by host countries [28, 29].

Data source

The most recent Haitian DHS data was collected in 2017–2018, however for the purposes of this study DHS data from the year 2016–2017 was used as this dataset contained specific cervical cancer screening indicators. In 2016–17, MSPP in partnership with several organizations such as Partners in Health (i.e. Zanmi Lasante) led efforts to increase access to primary and secondary cervical cancer prevention services [30]. The widespread cervical cancer awareness campaigns in Haiti during this time period may have contributed to the inclusion of cervical cancer measures on the DHS survey. Authorization to use the dataset was obtained through submitting a data use agreement which was approved by ICF.

Measures

Items from the the DHS survey were used for this analysis. The survey included items measuring sociodemographics, reproductive behavior and intentions, family planning, HIV and STI knowledge, marital background,intimate partner violence,maternal care, and other topics of public health significance.

The dependent variable in our study was engagement in cervical cancer screening. This was measured as having ever recieved cervical cancer screening, which was reported as a binary variable. The independent variables included sociodemographics, literacy levels, and access and frequency in using information sources. These variables have been associated with engagement in cervical cancer screening in previous studies within LMICs [5, 10, 12, 31, 32]. In addition, given increased cervical cancer campaigns in Haiti in 2016–17, it is possible that participants may have had exposure to cervical cancer screening information, which may have influenced their engagement in screening services.

More specifically, sociodemographics included age, number of children, marital status, area and department of residence, economic status, education level, insurance status, employment, religion, engagement in the health system (i.e. having ever received prenatal care), transportation and age of first coitus which were measured as categorical variables. Literacy level was measured as a nominal variable (e.g. can read a partial sentence, can read a full sentence, cannot read at all, blind/visually impaired) which was converted to a binary variable (partial or full literacy [i.e.able to read a partial or full sentence], no literacy [i.e. cannot read or blind/ visually impaired]). Language of literacy was not asked on the DHS survey. Sources of health information included items measuring household ownership of communication devices (i.e. radio, television, newspapers, internet), along with the frequency of using communication devices. The DHS dataset did not directly measure whether participants heard of cervical cancer through information sources. However, the dataset measured whether women heard of family planning using information sources with women reporting having heard of family planning through either radio, newspaper or magazine, television, or text message. Thus, radio, TV, and print materials were selected as indicators of sources of information in our study. Such platforms are widely used in Haiti by NGOs and MSPP to disseminate health education, and have been frequently used to spread information on cervical cancer and prevention services along with other disease states [14, 33, 34].

Data analysis

STATA software was used for the analysis [35]. Descriptive statistics were used to describe the sample. Univariate logistic regression was conducted to evaluate the significance of covariates on engagement in cervical cancer screening. Variables that demonstrated significance in the univariate regression were included in the multivariate logistic regression models. Two multivariate models were developed, the first evaluated the influence of sociodemographics on receiving cervical cancer screening. The second model evaluated the influence of literacy and sources of information on receiving cervical cancer screening. In all analyses, statistical significance was set at $p \leq 0.05$.

Results

There were N = 6,530 women in the total sample, however n = 610 women answered questions pertaining to engaging in cervical cancer screening. Thus, the results for this study focus on the sub-set of women who responded to cervical cancer screening questions. Over seventy percent of women (n = 444; 72.79%) had heard of cervical cancer, however fewer women had heard of tests for cervical cancer (n = 295; 66.44%). Only n = 45 (7.38%) women reported ever testing for cervical cancer. Of those who tested for cervical cancer, the majority had tested within the last 1–3 years (n = 21, 46.67%).

Sociodemographics

While the total sample included women between the ages of 15–49 years, only women between 35–49 years answered cervical cancer screening questions. In assessing sociodemographic variables, the majority of women lived in rural areas (n = 449, 73.60%). Although over half of the sample was employed (n = 402; 65.90%) , the socioeconomic status of the sample was low. Regarding education level, the majority had no education (n = 233; 38.20%). Among those who received education, primary school was the highest level completed (n = 220; 36.07%). The vast majority of women were married (n = 498; 81.64%) with children, and had a history of receiving prenatal care (n = 409; 88.34%). Over seventy percent of participants were sexually active within the last two months (n = 457;74.92%) (Table 1).

Table 1. Sociodemographic characteristics of sample.

Characteristic	N (%)
Age	
35–39	359 (58.85)
40–44	192 (31.48)
45–49	59 (9.67)
Residence	
Urban	161 (26.39)
Rural	449 (73.61)
Economic Status	
Poor-poorest	364 (59.68)
Middle	104 (17.05)
Rich-Richest	142 (23.28)
Education Level	
No education	233 (38.20)
Primary	220 (36.07)
Secondary	137 (22.50)
Higher	20 (3.38)
Employment Status	
Unemployed	208 (34.10)
Employed	402 (65.90)
Religion	
No religion	43 (7.05)
Catholic	246 (40.33)
Protestant	312 (51.15)
Voudousant	9 (1.48)
Marital Status	
Married	498 (81.64)
Living with partner	53 (8.69)
Never in union, widowed, divorced, or separated	59 (9.67)
Number of Children	
1–3	152 (24.92)
4–7	319 (52.30)
8–10	112 (18.36)
>10	27(4.43)
Having received hospital prenatal care (N = 463)	
No	54 (11.66)
Yes	409 (88.34)
Age at first sex	
8–12	19 (3.11)
13–17	315 (51.64)
18–22	214 (35.08)
23–27	43 (7.05)
>30	19 (3.11)
Transportation	
No Transportation	523 (85.73)
Access to Transportation	77 (12.62)
Department	
Aire Metropolitaine/Ouest	132 (21.64)

(Continued)

Table 1. (Continued)

Characteristic	N (%)
Sud-est	35 (5.74)
Nord	48 (7.87)
Nord-est	51 (8.36)
Artibonite	92 (15.08)
Centre	54 (8.85)
Sud	62 (10.16)
Grand-Anse	48 (7.87)
Nord-ouest	61 (10.00)
Nippes	27 (4.43)

https://doi.org/10.1371/journal.pgph.0002221.t001

The univariate regression model showed that total children, economic status, education level, health insurance, religion, and access to transportation were all associated with a statistically significant higher odds of reciving cervical cancer screening. Using the significant sociodemographic variables from the univariate model, a multivariate model was developed (Table 2). In the multivariate model, women from an economic background of poorer (aOR = 4.06, 95% CI [1.16,14.27], p = 0.03) and richest (aOR = 19.10 , 95% CI[2.58,141.57], p = 0.00), women with the highest education level (aOR 7.58 , 95% CI [1.64,34.97], p = 0.00) and those with insurance (aOR = 16.40, [95% CI 2.65, 101.42], p = 0.00) had a statistically significant higher odds of undergoing cervical cancer screening.

Literacy and sources of information

The sample had nearly equal numbers of women who were illiterate (n = 303; 49.67%) and literate (n = 307; 50.33%). Among those who were literate, 10.75% (n = 33) had been screened. Among those who were not literate , less than 5% (3.96%, n = 12) had received screening. In comparing access to information sources, a higher number of participants owned mobile phones (n = 219, 31.90%). Regarding frequency of usage of sources of information, radios were more frequently used with the majority of participants reporting listening to radio between at least once a week (n = 132 ; 21.64) to almost every day (n = 174;28.52%) (Table 3).

All the co-variates for sources of information demonstrated significance in the univariate analysis. In the multivariate model, women who had access to a television (aOR = 4.28, 95% CI [1.21,9.34], p = 0.02) and those who owned a mobile phone (aOR = 4.44, 95% CI [1.00,5.59], p = 0.05) were over four times more likely to undergo cervical cancer screening, with this finding being statistically significant. In the multivariate model , women who read the newspaper at least once per week were over three times more likely to engage in cervical cancer screening (aOR = 3.57, [95% CI 1.10,11.59] p = 0.03). Women who had some form of internet use within the last 12 months were four times more likely to undergo cervical cancer screening (aOR = 3.99 [95% CI 1.45,10.97] p = 0.01) (Table 4).

Discussion

This study set out to assess the role of sociodemographics, health literacy, and sources of information on cervical cancer screening in Haiti. In Haiti, cervical cancer is a disease of major public health significance. Estimates from GLOBOCAN, a database developed by the International Agency for Research on Cancer (IARC), rank the Latin America and the Caribbean regions generally with some of the highest cervical cancer incidence internationally, and Haiti specifically with disproportionate incidence [4, 36, 37]. Despite these alarming data, reports

Table 2. Regression analysis of sociodemographic variables on cervical cancer screening.

Covariates	OR [95% CI]	P Value	AOR [95%CI]	P Value
Economic Status				
Poorest	*REF		*REF	
Poorer	4.44 [1.36,14.47]	0.01	4.06 [1.16,14.27]	0.03
Middle	3.43 [0.95,12.42]	0.06	2.82 [0.62,12.90]	0.18
Richer	5.89 [1.73,20.13]	0.01	3.81 [0.58,24.89]	0.16
Richest	23.22 [7.43,72.52]	0.00	19.10 [2.58,141.57]	0.00
Education Level				
No education	*REF		*REF	
Primary	1.33 [0.52,3.46]	0.55	0.90 [0.32,2.52]	0.84
Secondary	3.98 [1.67,9.50]	0.00	1.39 [0.45,4.26]	0.56
Higher	28.13 [9.13,86.63]	0.00	7.58 [1.64,34.97]	0.01
Insurance Status				
Not Insured	*REF		*REF	
Insured	34.51 [8.58,138.80]	0.00	16.40 [2.65,101.42]	0.00
Transportation				
No transportation	*REF		*REF	
Access to Transportation	2.22 [1.04,4.70]	0.04	0.44 [0.13,1.48]	0.12
Residence				
Urban	*REF		*REF	
Rural	0.23 [0.12,0.43]	0.00	1.44 [0.39,5.29]	0.58
Department				
Aire Metropolitaine/Ouest	*REF		*REF	
Sud-est	0.11 [0.01,0.85]	0.04	0.17 [0.01,2.07]	0.16
Nord	0.16 [0.03,0.73]	0.02	0.14 [0.0,1.18]	0.07
Nord-est	0.40 [0.13,1.18]	0.10	1.57 [0.37,6.62]	0.54
Artibonite	0.17 [0.05,0.53]	0.00	0.42 [0.09,1.82]	0.24
Centre	0.37 [0.13,1.10]	0.08	1.38 [0.31,6.09]	0.67
Sud	0.62 [0.25,1.54]	0.30	1.85 [0.45,7.69]	0.40
Grand ' anse	0.16 [0.03,0.73]	0.02	0.59 [0.09,3.91]	0.59
Nord-ouest	0.06 [0.01,0.48]	0.01	0.21 [0.02,2.00]	0.12
Nippes	0.14 [0.02,1.12]	0.07	0.46 [0.04,5.00]	0.52

have shown that Haitian women's participation in cervical cancer screening is drastically low due to structural and individual barriers [9, 10] Our study aimed to address the individual barriers that may contribute to low screening uptake with a focus on health literacy and sources of information as this has been shown to contribute to cervical cancer screening uptake. Major contributing factors to low uptake in our sample, included disadvantageous sociodemographic status and restricted access to sources of information which may limit awareness and knowledge towards cervical cancer and preventative services.

The first set of models evaluated the association of sociodemographics on receiving cervical cancer screening. While univariate analysis resulted in significance for engagement in cervical cancer screening across total children, economic status, education level, health insurance, religion, and transportation, the multivariate model indicated that women from extremes of economic status (i.e., poorer and richest) were most likely to have engaged in screening. This initial finding may suggest not only the protective nature of high education often associated with better access to healthcare resources, but also a potential growing impact of health interventions focused on underresourced populations [5, 38, 39]. Consistent with previous studies,

Table 3. Literacy and sources of information characteristics.

Characteristic	N(%)
Literacy	
Cannot read	303 (49.67)
Partial or full literacy	307(50.33)
Household sources of information	
Household has a radio	
No	401 (65.74)
Yes	199 (32.62)
Household has a tv	
No	494 (80.98)
Yes	106 (17.38)
Mobile phone	
No	391 (64.10)
Yes	219 (35.90)
Frequency of using sources of information	
Reading Newspaper	
Not at all	481 (78.85)
Less than once a week	81 (13.28)
At least once a week	25 (4.10)
Almost every day	23 (3.77)
Listening to radio	
Not at all	96 (15.74)
Less than onceonce a week	208 (34.10)
At least once a week	132 (21.64)
Almost every day	174(28.52)
Watching TV	
Not at all	368 (60.33)
Less than onceonce a week	164 (26.89)
At least once a week	40 (6.56)
Almost every day	38 (6.23)
Internet Use	
Never	547 (89.67)
Yes, within the last 12 months	219 (54)
Yes, before the last 12 months	9 (1.48)

https://doi.org/10.1371/journal.pgph.0002221.t003

women with the highest education level as well as those with insurance also had a significantly higher odds of undergoing cervical cancer screening [10, 40, 41]. However, the wide confidence interval for insurance suggests the sample does not provide precise representation of population given that majority of Haitians do not have insurance, and there is currently no national insurance program available [42]. Concerningly, only individuals between the ages of 35–49 answered questions pertaining to cervical cancer screening. DeGennaro et al. (2019) reported that in a cohort of Haitian women undergoing chemotherapy for cervical cancer, a large percentage of women were younger than 50 years old [14]. It is likely that women in Haiti have a higher chance of developing cervical cancer at younger ages due to numerous risk factors, thus reinforcing the need for regular screening starting from 25 years old as recommended by the WHO [43].

The second set of models evaluated the influence of sources of information and literacy on receiving cervical cancer screening. Notably, the sample was fairly split between literate and

Table 4. Regression analysis of literacy and sources of information variables (Model 2).

Covariates	OR [95%CI]	P Value	AOR [95% CI]	P Value
Literacy Level				
Cannot read	*REF		*REF	
Partial or full literacy	2.92 [1.47,5.77]	0.00	0.77 [0.29,2.03]	0.60
Household sources of information				
Household has a radio				
No	*REF		*REF	
Yes	2.03 [1.09,3.79]	0.03	0.47 [0.18,1.23]	0.12
Household has a tv				
No	*REF		*REF	
Yes	4.28 [2.25,8.14]	0.00	3.37 [1.21,9.34]	0.02
Mobile phone ownership				
No	*REF		*REF	
Yes	4.44 [2.31,8.55]	0.00	2.37 [1.00,5.59]	0.05
Frequency of using sources of information				
Reading Newspaper				
Not at all	*REF		*REF	
Less than once a week	2.28 [1.06,5.32]	0.04	0.84 [0.30,2.40]	0.75
At least once a week	7.40 [2.82,19.43]	0.00	3.57 [1.10,11.59]	0.03
Almost every day	5.29 [1.81,15.46]	0.00	2.01 [0.55,7.31]	0.29
Listening to Radio				
Not at all	*REF		*REF	
Less than once a week	1.16 [0.35,3.80]	0.80	1.00 [0.27,3.62]	1.00
At least once a week	1.29 [0.37,4.53]	0.69	1.54 [0.40,5.87]	0.53
Almost every day	3.68 [1.23,10.94]	0.02	2.49 [0.66,9.41]	0.18
Watching TV				
Not at all	*REF		*REF	
Less than once a week	1.08 [0.51,2.27]	0.84	0.57 [0.22,1.46]	0.24
At least once a week	1.22 [0.35,4.24]	0.78	0.19 [0.04,0.93]	0.04
Almost every day	4 [1.65,9.71]	0.00	0.48 [0.13,1.76]	0.27
Internet Use				
Never	*REF		*REF	
Yes, within the last 12 months	7.71 [3.77,15.74]	0.00	3.99 [1.45,10.97]	0.01
Yes, before the last 12 months	16.04 [4.06,63.24]	0.00	13.70 [2.52,74.51]	0.00

https://doi.org/10.1371/journal.pgph.0002221.t004

non-literate women. Nonetheless, approximately a third of the sample owned a mobile phone and nearly a quarter of the sample listened to the radio daily. Although all univariate analyses demonstrated significance, multivariate results specifically indicated women who owned a mobile phone or had some form of internet use in the last year were both four-fold more likely to undergo cervical cancer screening. This may be influenced by sociodemographics such as education and economic status, but also may suggest potential avenues of mobile Health (mHealth) for education and intervention given the ability to overcome literacy issues using audiovisual communication [44–47]. Furthermore, findings imply access to technology may be a protective factor for health care access since there was no significant difference in likelihood of undergoing cervical cancer screening by reports of those who did and did not watch television. However, those with access to a television were more likely to have undergone screening.

Studies have consistently demonstrated links between health literacy and engagement in cervical cancer screening , with low health literacy being associated with low cervical cancer knowledge and subsequent poor uptake in cervical cancer screening [7, 48, 49]. Interestingly, in our study, women who read the newspaper at least once per week were over three times more likely to engage in cervical cancer screening [40]. Yet in our analysis, literacy was not a significant predictor of cervical cancer screening. It is critical to emphasize that in Haiti, socio-cultural contexts are highly relevant when evaluating the relationship between literacy and uptake of health promotion behaviors. Haiti is one of the few countries where although one language is spoken by all citizens (e.g. Haitian Creole), the educational system uses French as the primary language of communication [50]. Educational and print materials in Haiti are often developed in French as opposed to Haitian Creole , despite less than 10% of the population speaking and reading French fluently [51, 52]. The DHS survey items measuring literacy did not specify whether participants were literate in French or Creole. It is likely that the majority of the individuals who were literate in our sample, were primarily literate in Haitian Creole. It is also likely that those who read the newspaper frequently were fluent in French given that French literacy is required to read the majority of Haitian newspapers. This may explain the reasoning as to why literacy was not significant in our analysis, yet reading the newspaper weekly was significant. French fluency may result in higher exposure to health information leading to increased engagement in health behaviors such as cervical cancer screening. Accurately exploring the relationship between literacy and health behaviors in Haiti requires researchers to account for these contextual subtleties which were not measured in this dataset. While numerous studies provide links between the influence of broad indicators of social determinants of health on linkage to cervical cancer screening and treatment, our study is one of the first to provide preliminary insight on how linguistic preferences rooted in colonialism and classism may influence engagement in cervical cancer screening in Haiti. Moise et al. (2021) [3] states that Haitian women's health should be contextualized through a syndemic approach using both a biomedical and anthropological lens; as the French language disadvantages individuals of low socioeconomic status who are primarily Creole speaking. These specific nuances are imperative to understand when working with Haitian communities, and provides significance to the importance of ensuring that research with Haitians are led by individuals who are aware of these critical contexts.

Limitations

This study is not without limitations. Less than 10% of the sample from the DHS dataset answered questions pertaining to cervical cancer screening. In conducting the DHS survey, MSPP specifically targeted women 35–64 years old to answer questions pertaining to cervical cancer screening [6]. This is a limitation as insights from younger women who are sexually active were not obtained. Given that this is secondary data analysis, it is not possible to distinguish whether bias in data collection was present. In addition, most participants in the study were from rural and critically underserved parts of Haiti. As such, the data obtained could be skewed as most of it is obtained from participants in areas of the country with limited access to health infrastructure. It is possible there are other indicators that influenced engagement in cervical cancer screening that were not included in this analysis.

Conclusion and future research

This paper adds to the literature by providing associations between sociodemographics, literacy, and sources of information on cervical cancer screening among women in Haiti. Future research should focus on recruiting from a larger sample, and including more participants

from metropolitan areas, to evaluate whether the uptake of cervical cancer screening remains low regardless of social or demographic status. Future research should also evaluate how health communication efforts in Haiti can be tailored to enhance women's knowledge of HPV and cervical cancer, which can lead to higher rates of cervical cancer screening; particularly in light of contextual nuances pertaining to literacy [53, 54]. Best-approaches in knowledge dissemination (e.g. marketing campaigns, expansion of audiovisual media) with the goal of influencing motivation and intention to screen should be assessed [55, 56]. For instance, the use of social media and mobile phone platforms that provide interactive audiovisual content in both Haitian Creole and French, may improve motivation in engaging in cervical cancer prevention for communities at-large. Lastly, more implementation research is needed in expanding cervical cancer prevention efforts in Haiti, and evaluating how key stakeholders can influence the scale-up of cervical cancer prevention efforts in a setting with numerous health challenges [57]. Of note, the incidence of high-risk strains of HPV are likely to increase among Haitan womeni due to the current sociopolitical crisis which has resulted in unforseen rates of sexual violence [58]. Therefore, ensuring women have access to cervical cancer screening including timely notification of positive results, along with additional sexual and reproductive health services should be a public health priority.

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References

1. Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. CA Cancer J Clin. 2021; 71: 209–249. https://doi.org/10.3322/caac.21660 PMID: 33538338

2. Pilleron S, Cabasag CJ, Ferlay J, Bray F, Luciani S, Almonte M, et al. Cervical cancer burden in Latin America and the Caribbean: Where are we? Int J Cancer. 2020; 147: 1638–1648. https://doi.org/10.1002/ijc.32956 PMID: 32150288

3. Moise RK, Jonas E, Campa EM, Clisbee M, Lopes G, Kobetz E. *Bayo Lapawol* (Let Their Voices Be Heard): Haitian Women's Barriers to and Facilitators of Cervical Cancer Prevention and Control. Heal Educ Behav. 2021; 109019812199038. https://doi.org/10.1177/1090198121990381 PMID: 33622068

4. IARC. Human Papillomavirus and Related Diseases Report HAITI. IARC HPV Inf Cent. 2022. Available: www.hpvcentre.net

5. McCarthy SH, Walmer KA, Boggan JC, Gichane MW, Calo WA, Beauvais HA, et al. Awareness of Cervical Cancer Causes and Predeterminants of Likelihood to Screen among Women in Haiti. J Low Genit Tract Dis. 2017; 21: 37–41. https://doi.org/10.1097/LGT.0000000000000281 PMID: 27906806

6. Ministère de la Santé Publique et de la Population. RÉPUBLIQUE D'HAÏTI Ministère de la Santé Publique et de la Population (MSPP). 2016. Available: www.DHSprogram.com.

7. Baccolini V, Isonne C, Salerno C, Giffi M, Migliara G, Mazzalai E, et al. The association between adherence to cancer screening programs and health literacy: A systematic review and meta-analysis. Prev Med (Baltim). 2022; 155: 106927. https://doi.org/10.1016/j.ypmed.2021.106927 PMID: 34954244

8. D'Andrea E, Ahnen DJ, Sussman DA, Najafzadeh M. Quantifying the impact of adherence to screening strategies on colorectal cancer incidence and mortality. Cancer Med. 2020; 9: 824–836. https://doi.org/10.1002/cam4.2735 PMID: 31777197

9. Bien-Aimé DDR. Understanding the barriers and facilitators to cervical cancer screening among women in Gonaives, Haiti: an explanatory sequential mixed-methods study. 2020 Sep. Available: https://dash.harvard.edu/handle/1/37365189

10. Guillaume D, Amedee LM, Rolland C, Duroseau B, Alexander K. Exploring engagement in cervical cancer prevention services among Haitian women in Haiti and in the United States: A scoping review. J Psychosoc Oncol. 2022; 1–20. https://doi.org/10.1080/07347332.2022.2154730 PMID: 36514967

11. WHO. WHO guideline for screening and treatment of cervical pre-cancer lesions for cervical cancer prevention. 2021. Available: https://www.who.int/publications/i/item/9789240030824

12. Guillaume D, Chandler R, Igbinoba S. Barriers to Cervical Cancer Screening Among Women Living With HIV in Low- and Middle-Income Countries: A Systematic Review. J Assoc Nurses AIDS Care. 2020; 31: 497–516. https://doi.org/10.1097/JNC.0000000000000194 PMID: 32675646

13. PAHO. SITUATIONAL ANALYSIS OF CERVICAL CANCER PREVENTION AND CONTROL IN THE CARIBBEAN Results from a 2013 assessment of country policies and services for HPV vaccination, cervical cancer screening, diagnosis and treatment. 2013. Available: https://www.paho.org/hq/dmdocuments/2013/Caribbean-cxca-situation-analysis-2013.pdf

14. DeGennaro VJ, Shafer M, Kelly M, Cornely JR, Bernard JJ. Cervical cancer treatment in Haiti: A vertically-integrated model for low-resource settings. Gynecol Oncol reports. 2019; 28: 71–75. https://doi.org/10.1016/j.gore.2019.03.009 PMID: 30963084

15. PAHO. Comprehensive Cervical Cancer Control in Latin America and the Caribbean (2018) | Virtual Campus for Public Health (VCPH/PAHO). 2018 [cited 21 Dec 2020]. Available: https://www.campusvirtualsp.org/en/course/comprehensive-cervical-cancer-control-latin-america-and-caribbean-2018

16. PAHO. SITUATIONAL ANALYSIS OF CERVICAL CANCER PREVENTION AND CONTROL IN THE CARIBBEAN. 2013.

17. Pierz AJ, Randall TC, Castle PE, Adedimeji A, Ingabire C, Kubwimana G, et al. A scoping review: Facilitators and barriers of cervical cancer screening and early diagnosis of breast cancer in Sub-Saharan African health settings. Gynecol Oncol Reports. 2020;33. https://doi.org/10.1016/j.gore.2020.100605 PMID: 32637528

18. Petersen Z, Jaca A, Ginindza TG, Maseko G, Takatshana S, Ndlovu P, et al. Barriers to uptake of cervical cancer screening services in low-and-middle-income countries: a systematic review. BMC Womens Health. 2022; 22: 1–20. https://doi.org/10.1186/S12905-022-02043-Y/TABLES/3

19. Lindau ST, Tomori C, Lyons T, Langseth L, Bennett CL, Garcia P. The association of health literacy with cervical cancer prevention knowledge and health behaviors in a multiethnic cohort of women. Am J Obstet Gynecol. 2002; 186: 938–943. https://doi.org/10.1067/mob.2002.122091 PMID: 12015518

20. Cudjoe J, Gallo JJ, Sharps P, Budhathoki C, Roter D, Han H-R. The Role of Sources and Types of Health Information in Shaping Health Literacy in Cervical Cancer Screening Among African Immigrant Women: A Mixed-Methods Study. Heal Lit Res Pract. 2021; 5. https://doi.org/10.3928/24748307-20210322-01 PMID: 34251922

21. Ducray JF, Kell CM, Basdav J, Haffejee F. Cervical cancer knowledge and screening uptake by marginalized population of women in inner-city Durban, South Africa: Insights into the need for increased health literacy: https://doi.org/101177/17455065211047141. 2021; 17. https://doi.org/10.1177/17455065211047141 PMID: 34553644

22. Ruddies F, Gizaw M, Teka B, Thies S, Wienke A, Kaufmann AM, et al. Cervical cancer screening in rural Ethiopia: A cross-sectional knowledge, attitude and practice study. BMC Cancer. 2020; 20: 1–10. https://doi.org/10.1186/S12885-020-07060-4/TABLES/5

23. Park A, Eckert TL, Zaso MJ, Scott-Sheldon LAJ, Vanable PA, Carey KB, et al. Associations between Health Literacy and Health Behaviors among Urban High Schoolers. J Sch Health. 2017; 87: 885. https://doi.org/10.1111/JOSH.12567 PMID: 29096408

24. Ciampa PJ, Vaz LME, Blevins M, Sidat M, Rothman RL, Vermund SH, et al. The Association among Literacy, Numeracy, HIV Knowledge and Health-Seeking Behavior: A Population-Based Survey of Women in Rural Mozambique. PLoS One. 2012; 7: e39391. https://doi.org/10.1371/journal.pone.0039391 PMID: 22745747

25. Redmond N, Baer HJ, Clark CR, Lipsitz S, Hicks LRS. Sources of health information related to preventive health behaviors in a national study. Am J Prev Med. 2010; 38. https://doi.org/10.1016/J.AMEPRE.2010.03.001 PMID: 20494238

26. Isabirye A, Mbonye MK, Kwagala B. Predictors of cervical cancer screening uptake in two districts of Central Uganda. PLoS One. 2020; 15. https://doi.org/10.1371/journal.pone.0243281 PMID: 33270792

27. Inoue M, Shimoura K, Nagai-Tanima M, Aoyama T. The Relationship Between Information Sources, Health Literacy, and COVID-19 Knowledge in the COVID-19 Infodemic: Cross-sectional Online Study in Japan. J Med Internet Res. 2022; 24. https://doi.org/10.2196/38332 PMID: 35839380

28. USAID. The DHS Program—Quality information to plan, monitor and improve population, health, and nutrition programs. 2022 [cited 10 Dec 2022]. Available: https://dhsprogram.com/

29. Musuka G, Mukandavire Z, Murewanhema G, Cuadros D, Mutenherwa F, Chingombe I, et al. HIV status, knowledge and prevention of cervical cancer amongst adolescent girls and women: a secondary data analysis. PAMJ 2022; 41:262. 2022;41. https://doi.org/10.11604/pamj.2022.41.262.32615 PMID: 35734312

30. Partners in Health. Cervical Cancer Program Expands in Haiti | Partners In Health. 2016 [cited 12 Dec 2022]. Available: https://www.pih.org/article/cervical-cancer-program-expands-in-haiti

31. Ashtarian H, Mirzabeigi E, Mahmoodi E, Khezeli M. Knowledge about cervical cancer and pap smear and the factors influencing the pap test screening among women. Int J Community Based Nurs Midwifery. 2017; 5: 188–195. Available: /pmc/articles/PMC5385241/ PMID: 28409172

32. Menard J, Kobetz E, Maldonado JC, Barton B, Blanco J, Diem J. Barriers to Cervical Cancer Screening Among Haitian Immigrant Women in Little Haiti, Miami. J Cancer Educ 2010 254. 2010; 25: 602–608. https://doi.org/10.1007/s13187-010-0089-7 PMID: 20232188

33. MFP. Combating Cervical Cancer in Rural Haiti | Medicine For Peace. 2017 [cited 12 Dec 2022]. Available: https://www.medicineforpeace.org/2017/09/13/combating-cervical-cancer-in-rural-haiti/

34. MFP. Milestone Reached: MFP Screens 2,000 Haitian Women for Cervical Cancer | Medicine For Peace. 2012 [cited 12 Dec 2022]. Available: https://www.medicineforpeace.org/2012/07/01/milestone-reached-mfp-screens-2000-women-for-cervical-cancer/

35. STATA. Statistical software for data science | Stata. 2022 [cited 9 Nov 2022]. Available: https://www.stata.com/

36. Arrossi S, Sankaranarayanan R, Parkin DM. Incidence and mortality of cervical cancer in Latin America. Salud Publica Mex. 2003; 45 Suppl 3: S306–14. https://doi.org/10.1590/s0036-36342003000900004 PMID: 14746023

37. Antoni S, Soerjomataram I, Møller B, Bray F, Ferlay J. An assessment of GLOBOCAN methods for deriving national estimates of cancer incidence. Bull World Health Organ. 2016; 94: 174. https://doi.org/10.2471/BLT.15.164384 PMID: 26966328

38. Zhang M, Sit JWH, Chan DNS, Akingbade O, Chan CWH. Educational Interventions to Promote Cervical Cancer Screening among Rural Populations: A Systematic Review. Int J Environ Res Public Health. 2022; 19. https://doi.org/10.3390/ijerph19116874 PMID: 35682457

39. Zahedi L, Sizemore E, Malcolm S, Grossniklaus E, Nwosu O. Knowledge, Attitudes and Practices Regarding Cervical Cancer and Screening among Haitian Health Care Workers. Int J Environ Res Public Health. 2014; 11: 11541. https://doi.org/10.3390/ijerph111111541 PMID: 25390794

40. Damiani G, Basso D, Acampora A, Bianchi CBNA, Silvestrini G, Frisicale EM, et al. The impact of level of education on adherence to breast and cervical cancer screening: Evidence from a systematic review and meta-analysis. Prev Med (Baltim). 2015; 81: 281–289. https://doi.org/10.1016/j.ypmed.2015.09.011 PMID: 26408405

41. Baeker Bispo JA, Seay J, Moise RK, Balise RR, Kobetz EK. Perceptions of Practitioner Support for Patient Autonomy are Associated with Delayed Health Care Seeking among Haitian Immigrant Women in South Florida. J Health Care Poor Underserved. 2022; 33: 633–648. https://doi.org/10.1353/hpu.2022.0053 PMID: 35574866

42. Chen S, Geldsetzer P, Chen Q, Moshabela M, Jiao L, Ogbuoji O, et al. Health Insurance Coverage In Low- And Middle-Income Countries Remains Far From The Goal Of Universal Coverage. https://doi.org/101377/hlthaff202100951. 2022; 41: 1142–1152. https://doi.org/10.1377/HLTHAFF.2021.00951 PMID: 35914199

43. WHO. New recommendations for screening and treatment to prevent cervical cancer. 6 Jun 2021 [cited 7 Feb 2023]. Available: https://www.who.int/news/item/06-07-2021-new-recommendations-for-screening-and-treatment-to-prevent-cervical-cancer

44. Chandler R, Guillaume D, Parker A, Wells J, Hernandez ND. Developing Culturally Tailored mHealth Tools to Address Sexual and Reproductive Health Outcomes Among Black and Latina Women: A

Systematic Review. https://doi-org.proxy1.library.jhu.edu/101177/15248399211002831. 2021; 23: 619–630. https://doi.org/10.1177/15248399211002831 PMID: 33771045

45. DeGennaro V, Gibbs M, Wilson C, Louis N, Kanyandekwe D, Petterson C. Women's Cancer Screening in Haiti: Increasing Access by Bringing Services to the Workplace. J Glob Oncol. 2018; 4: 209s–209s. https://doi.org/10.1200/jgo.18.84300

46. Teng JE, Thomson DR, Lascher JS, Raymond M, Ivers LC. Using Mobile Health (mHealth) and Geospatial Mapping Technology in a Mass Campaign for Reactive Oral Cholera Vaccination in Rural Haiti. PLoS Negl Trop Dis. 2014; 8: e3050. https://doi.org/10.1371/journal.pntd.0003050 PMID: 25078790

47. Kazemi S, Zarei F, Heidarnia A, Alhani F. Improve the cervical cancer prevention behaviors through mobile-based educational intervention based on I-CHANGE model: study protocol for a randomized controlled trial. Trials. 2022; 23: 1–9. https://doi.org/10.1186/S13063-022-06744-5/FIGURES/1

48. Lee SYD, Tsai TI, Tsai YW, Kuo KN. Health literacy and women's health-related behaviors in Taiwan. Health Educ Behav. 2012; 39: 210–218. https://doi.org/10.1177/1090198111413126 PMID: 21742948

49. Flores BE, Acton G, Arevalo-Flechas L, Gill S, Mackert M. Health Literacy and Cervical Cancer Screening Among Mexican-American Women. Heal Lit Res Pract. 2019; 3. https://doi.org/10.3928/24748307-20181127-01 PMID: 31294299

50. DeGraff M. Haiti's "linguistic apartheid" violates children's rights and hampers development | openDemocracy. 2017 [cited 31 Dec 2022]. Available: https://www.opendemocracy.net/en/openglobalrights-openpage/haiti-s-linguistic-apartheid-violates-children-s-rights-and-hampers-/

51. Dunn O. Language Perception and Usage in Haiti: The Impact on Language Perception and Usage in Haiti: The Impact on Education and Literacy Education and Literacy Part of the French and Francophone Language and Literature Commons, and the Language and Literacy Education Commons. St. Catherine University. 2020. Available: https://sophia.stkate.edu/shas_honors

52. Baca J. Role of Language in Identity and in Healthcare Interactions of Haitian Immigrants—KIPDF. COM. Olin College. 2012. Available: https://kipdf.com/role-of-language-in-identity-and-in-healthcare-interactions-of-haitian-immigrant_5aaee47d1723dd415af8659d.html

53. Villavicencio A, Kelsey G, Nogueira NF, Zukerberg J, Salazar AS, Hernandez L, et al. Knowledge, attitudes, and practices towards HPV vaccination among reproductive age women in a HIV hotspot in the US. PLoS One. 2023; 18. https://doi.org/10.1371/JOURNAL.PONE.0275141 PMID: 36656804

54. Joseph NP, Clark JA, Bauchner H, Walsh JP, Mercilus G, Figaro J, et al. Knowledge, Attitudes, and Beliefs Regarding HPV Vaccination: Ethnic and Cultural Differences Between African-American and Haitian Immigrant Women. Women's Heal Issues. 2012; 22: e571–e579. https://doi.org/10.1016/j.whi.2012.09.003 PMID: 23122214

55. Joseph N, Gardiner P, Damus K, Resnick K, Houston A, Shrestha H, et al. Integrating Human Papilloma Virus (HPV) Vaccination Promotion and Cervical Cancer Screening in a Diverse Inner City Primary Care Settings. J Pediatr Adolesc Gynecol. 2017; 30: 323. https://doi.org/10.1016/j.jpag.2017.03.119

56. Joseph NP, Bernstein J, Pelton S, Belizaire M, Goff G, Horanieh N, et al. Brief Client-Centered Motivational and Behavioral Intervention to Promote HPV Vaccination in a Hard-to-Reach Population: A Pilot Randomized Controlled Trial. Clin Pediatr (Phila). 2016; 55: 851–859. https://doi.org/10.1177/0009922815616244 PMID: 26968631

57. Guillaume D, Waheed D e. N, Schlieff M, Muralidharan K, Vorsters A, Limaye R. Key decision-making factors for human papillomavirus (HPV) vaccine program introduction in low-and-middle-income-countries: Global and national stakeholder perspectives. https://doi.org/101080/2164551520222150454. 2022 [cited 1 Jan 2023]. doi:10.1080/21645515.2022.2150454

58. United Nations. Sexual violence in Port-au-Prince: a weapon used by gangs to instill fear—Haiti. 2022 [cited 31 Mar 2023]. Available: https://reliefweb.int/report/haiti/sexual-violence-port-au-prince-weapon-used-gangs-instill-fear