

Factors influencing cervical cancer re-screening in sub-Saharan Africa: a cohort study

Sophie Evina Bolo (✉ Sophie.Evina@etu.unige.ch)

University of Geneva

Bruno Kenfack

Annex Regional Hospital of Dschang

Ania Wisniak

University Hospital of Geneva

Beat Stoll

University of Geneva

Alida Moukam

University of Geneva

Pierre Vassilakos

Geneva Foundation for Medical Education and Research

Gilles Tankeu

Global Research Agency

Virginie Yakam

Annex Regional Hospital of Dschang

Patrick Petignat

University Hospital of Geneva

Jessica Sormani

University Hospital of Geneva

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Abstract

Background

- Screening participation at recommended intervals is a crucial component of cervical cancer prevention effectiveness. However, little is known regarding the rate of re-screening in a Sub-Saharan context. Our aim was to estimate the re-screening rate of women in Cameroon after an initial Human Papilloma Virus - based screening and to identify factors that influence adherence.

Methods

- A cohort study was conducted in the Annex Regional Hospital of Dschang, where a primary screening unit had been implemented in 2015. Participants enrolled in the present study were women who had been screened more than 5 years before the date of inclusion and, for whom a re-screening test for cervical cancer was due. Women who initially tested positive for human papilloma virus (n = 132) and, a random sample of women who tested negative for human papilloma virus (n = 220) were enrolled in the present study. Participants were invited to participate in a telephone survey conducted between October 2021 and March 2022. The survey assessed participation to re-screening or not and reasons for participation or non-participation. Sociodemographic factors were collected, and associations were evaluated using chi-squared tests and logistic regression.

Results

- A total of 352 participants aged under 50 years (mean age 37.4 years) were contacted, and 203 (58.0%) complete the survey. The proportion of women who complied with the screening recommendation was 34.0% (95% CI 27.5% – 40.5%). Age, marital status, education level, type of employment, and place of residence were not associated with the rate of re-screening. Main reported barriers to re-screening were lack of information (39.0%), forgetfulness (39.0%), and impression of being in good health (30.0%). Women who remembered the recommended screening interval were 2 to 3 times more likely to undergo re-screening (aOR (adjusted odds ratio) = 2.3 [1.2–4.4], p = 0.013). Human papilloma virus- positive status at the initial screening was also associated with the re-screening((aOR) (95% CI): 3.4 (1.8–6.5).

Conclusion

- Following an initial Human Papilloma Virus-based screening campaign in the West Region of Cameroon, one third of women adhered to re-screening within the recommended timeframe. Existing screening strategies would benefit from developing better information approaches to reinforce the importance of repeated cervical cancer screening.

Background

Cervical cancer is the fourth most common cancer among women worldwide, with over 600,000 new cases in 2020 [1]. Nearly 90.0% of cervical cancer deaths occur in low-income countries, and the mortality rate is 18 times higher in low- and middle-income countries than in high-income countries [2, 3]. It is the leading cause of cancer death-related among women in sub-Saharan Africa, largely due to the lack of screening [2, 3, 4]. In Cameroon, it is the second most common cancer among women, after breast cancer [5, 6]. However, regular screening could reduce the risk of cervical cancer by 70.0% [7]. According to the World Health Organization's (WHO) global strategy for the elimination of cervical cancer, 70.0% of the target population should undergo screening using a high-performance test such as a Human Papillomavirus (HPV) test [4, 8]. This remains a challenge in low-income countries that face many obstacles that may hinder women's access to cervical cancer screening services. Screening and treatment failures are related to difficulties such as lack of awareness among the target population, financial difficulties, and lack of adequate specialized health infrastructures [9, 10]. Long distances to travel to the few health facilities that offer screening, prohibitive transportation costs, negative attitudes towards patients, long waiting times, and lack of male support have been identified as major obstacles to accessing existing screening services [11–16].

For HPV-based screening, the WHO recommends regular screening at five-year intervals [8]. Adherence to regular screening is necessary for a program to be effective and should be monitored through longitudinal observation of screening participation. Only few studies have been conducted in low-resource settings and available data evaluating one-year follow-up after HPV + testing support a low rate of adherence to cervical cancer re-screening (26.0%) for recommended screening [17].

In Cameroon, only 5.0% of women aged between 30 to 49 years have undergone screening in the past five years [18]. In line with national guidelines recommending early and regular screening as well as treatment of precancerous and cancerous lesions [19], the Annex Regional Hospital of Dschang, Cameroon, in collaboration with the University Hospitals of Geneva, has established a cervical cancer screening unit with free clinical services since 2015 [20]. The aim of cervical cancer screening is not only getting women to initiate screening but also to encourage them to maintain regular use over time. To date, very little is known about participation rate of re-screening as well as factors that may help or hinder women's participation to screening adherence over time. Yet, understanding determinants of re-screening appears essential for developing interventions to encourage women to be re-screened. The aim of our study was to determine the proportion of HPV-positive and HPV-negative women who attended cervical cancer re-screening within the recommended timeframe and factors influencing adherence and non-adherence to re-screening.

Methods

Study site

Our study was conducted in the West Region of Cameroon, in Dschang, a university town located 4 hours from Douala and 5 hours from Yaoundé. It is a council situated in the Menoua division. Dschang has an estimated population of around 176,940 inhabitants [21]. This is a follow-up study of a pilot study called the "3T approach" based on primary screening for HPV, implemented with the support of the Cameroonian Ministry of Health in 2015.

Study type and design

This retrospective cohort study included women screened as part of the 3T-Approach (test, triage, treat) cervical cancer screening campaign organized at the Annex Regional Hospital of Dschang in collaboration with the University Hospitals of Geneva in 2015. Approximately 1012 women aged between 30 to 49 were included if they understood the study procedures, and voluntarily agreed to participate by signing an informed consent form. Women eligible for this study had to be under 44 years of age at the time of initial screening. Exclusion criteria were pregnancy, previous total hysterectomy, and inability to comply with the study protocol. Each included woman was primarily screened by an HPV test [22]. Women who tested negative for HPV received oral information from a qualified healthcare provider and a document reminding them of their next screening appointment in 5 years. Women who tested positive for HPV underwent a triage with visual inspection with acetic acid (VIA) and were treated free of charge if needed. Women having a positive HPV test underwent a follow-up screening test following the same procedure at 12 months, and, in case of negative results, received oral information from a qualified healthcare provider reminding them of their next screening appointment in 5 years. Adherence to the 1-year follow-up was of 80% [23]. For the present study, we considered for enrolment only women for whom a re-screening test was due and non-adherence was defined as not receiving at least two consecutive cervical cancer screening tests within a five-year schedule.

Data collection

Sociodemographic data (age, education level, marital status, number of children, type of employment, place of residence) of participants were collected from the archives of the 2015 cohort. Re-screening data were collected over a 6-months period between October 2021 and March 2022. Participants were contacted by phone and interviews were conducted in French and/or English by a Cameroonian anthropologist (VY) and a physician (SE) based on a structured questionnaire developed by a team of Cameroonian and Swiss physicians and anthropologists experienced in cervical cancer screening in Cameroon. The questionnaires were pre-tested on 10 women and adapted accordingly. The final validated questionnaire was oriented along the following axes: (i) update of sociodemographic data and medical history of participants, as well as cervical cancer screening status, (ii) reasons for participation in re-screening, if any, (iii) reasons for non-participation in re-screening, (iv) experience of first screening and treatment, (v) support from the community, family or partner to attend screening, (vi) perception of cervical cancer and screening. Likert scale questions were used for sections (iv) and (v) of the survey.

The participants who were not reachable during the first call were called back at least two more times at different times of the day and week. For those who remained unreachable, text messages containing

information about the purpose of the call were sent. This method allowed us to maximize participation rate. The data collected during the calls were recorded using a paper form and then entered into an electronic database for analysis using Secutrial® software. At the end of the study, the accuracy of all data was verified. Any inconsistencies were clarified by recalling the participant.

Sample size

The study population consisted of 1012 women included in the 2015 cohort who were initially screened and/or treated. Among these, 728 women were eligible for our study, of whom 132 (18.1%) were positive for HPV. Assuming the proportion of women undergoing a new screening to be 20.0%, the inclusion of 246 women would have been necessary to obtain a precision of (+/- 5%) with a confidence level of 95%. However, considering a response rate to telephone questionnaires of 70.0%, based on our previous experiences with this study design, a total sample size of approximately 350 women was required. To achieve this sample size, we included all HPV-positive women (n = 132) and 220 randomly selected HPV-negative women, for a total sample size of 352 women. Random selection of HPV-negative participants was done using R statistical software [24].

Statistical analyses

The complete electronic dataset was analysed using SPSS 16 software [25]. Categorical variables were expressed as proportions, and 95% confidence intervals were estimated. Numeric variables were expressed as means with standard deviations or medians with interquartile ranges, as appropriate. Proportions between subgroups were compared using the Chi2 test or Fisher's exact test, depending on the sample size, and means were compared using the t-test or Mann-Whitney test, depending on the sample distribution. Associations between sociodemographic and clinical characteristics and cervical cancer re-screening were evaluated by simple and multivariable logistic regression. All p-values less than 0.05 were considered statistically significant.

Ethical considerations

This study is a continuation of the 3T-Approach 2015–2016 study approved by the Geneva Canton Ethics Council, Switzerland (CCER, N°2017 - 0110, and ceR-amendment n°3) and the National Ethics Committee for Human Health Research in Cameroon (N°2018/07/1083/CE/CNERSH/SP). Informed consent was obtained orally by telephone from each participant before the survey began, and all data collection forms were anonymized.

Results

Survey profile

A total of 203 female participants under 50 years old, including 88 (43.3%) positive for HPV and 115 (56.6%) negative, completed the questionnaire (participation rate of 58.0%). The average time between initial screening and inclusion in the study was 6.5 years, with a standard deviation (SD) of 0.1. One

hundred and forty-nine participants were unable to complete our questionnaire: 27 participants refused to participate in the study, and 122 could not be reached (Fig. 1).

Note

(n), number of patients, HPV: human papillomavirus.

FU: follow up

Sociodemographic characteristics of study participants

The mean age of participants was 37.4 years. Eighty-six percent were married or in a relationship, and 54.5% of participants had more than four children. Regarding education level, 57.6% had completed secondary school, 21.7% university, 15.3% primary school, 2.9% apprenticeship, and 1.0% had not completed any formal education. Seventy-five percent of the participants lived in a semi-urban area. The most common type of employment or profession was salaried (50.4%); 30.7% were self-employed, 15.8% were housewives, and 2.9% were farmers (Table 1).

Clinical characteristics

Ninety-eight percent of the participants were non-smokers, and 84.7% had no known chronic diseases. Less than one percent were HIV-positive, 50.7% were HIV-negative, and 48.3% had not been tested for HIV for more than a year. Almost a third reported having a relative with cancer.

Table 1
Socio-demographic and clinical characteristics of participants

	n	(%)
Socio-demographic characteristics		
Age (average) 37.4 (+/-3.9)		
Marital status		
Single/ Widow/ Widower	16	(7,8)
Divorced/separated	11	(5,4)
Married/coupled	175	(86,2)
I did not mean	1	(0,4)
Level of education		
Primary	31	(15,2)
Learning/Secondary School	122	(60,1)
University	45	(22,1)
Not in school / Other	4	(1,9)
No response	1	(0,4)
Area of residence		
Rural	19	(9,3)
Semi-urban	153	(75,)
Urban	31	(15,2)
Job/occupation* (if applicable)		
Employee	102	(50,2)
Farmer/ Self-employed	60	(29,5)
Housewife/ Other	41	(20,2)
Number of children		
≤ 4	92	(45,5)
> 4	110	(54,4)
Smoker* (*)		
<i>*: Data updated during telephone calls in 2022</i>		

	n	(%)
Socio-demographic characteristics		
Age (average) 37.4 (+/-3.9)		
Marital status		
Yes	4	(1,9)
No	199	(98)
Clinical features* (1)		
Chronic illness		
Present	31	(15,2)
Not present	172	(84,7)
HPV status		
HPV-	115	(56,6)
HPV positive	88	(43,3)
HIV infection		
Yes	2	(0,9)
No	103	(50,7)
No screening for > 1 year	98	(48,2)
Parent with cancer		
Yes	60	(29,5)
No	139	(68,7)
Prefer not to answer	3	(1,4)
Missing	1	(0,4)
<i>*: Data updated during telephone calls in 2022</i>		

Previous screening and/or treatment experience

Ninety-eight percent of the participants reported being satisfied with the health care providers at their initial screening; among these, 97.5% reported being well-received, 81.3% were satisfied with the information received, and 70.7% reported feeling treated with respect.

Screening practice

Of the 203 women who completed the questionnaire, 34.0% had attended re-screening. Of those, 40.6% did it at the recommended time (after at least 5 years), while 59.4% attended re-screening before the recommended date. Forty-nine percent of re-screened women reported repeating screening because it was free; 26.1% because they were advised to do so by their relatives, and 18.8% because they had symptoms (pelvic pain, bleeding, etc.), 10.0% because it was the recommended date, 4.0% because they had been recalled, and 14.5% for other reasons (out of concern, during a routine visit, during a health campaign, by coincidence).

Among those who attended re-screening, 79.7% had an HPV test, and 72.0% percent were re-screened at the Dschang district hospital.

Obstacles to re-screening

Sixty-six participants did not undergo re-screening since their participation in the 2015 campaign. Reported obstacles to rescreening included practical considerations, emotions related to screening, perception of one's own health, and other reasons. In terms of practical considerations, 23.0% of participants stated that they did not repeat screening due to lack of time; 8.0% due to lack of money for transportation; 14.0% due to lack of available screening facilities; and 12.0% due to the long distance between their home and the hospital.

Regarding emotional reasons, 24.0% stated they did not repeat screening because they feared being diagnosed with cervical cancer, 5.0% because they feared the screening procedure would be painful, and 2.0% because they were embarrassed to have their private parts examined. Additionally, 30.0% did not undergo re-screening because they felt healthy, and 1.0% stated that their religious beliefs prevented them from being re-screened.

Participants were also asked to report any other reason that had prevented them from undergoing re-screening. In response to this question, 39.0% of participants said that lack of information was the problem, and the same proportion stated that they had forgotten that they needed to be screened again. Twenty-five per cent of participants mentioned other reasons such as neglect (14.0%), insecurity (2.0%), COVID-19 (1.0%), and others (8.0%).

For HPV-positive participants specifically, the main obstacles to re-screening test were forgetfulness (49.0%), lack of information (42.0%), anxiety about repeating the test (49.0%), the impression of being healthy (43.0%), and lack of time (37.0%) (Fig. 2).

*Percentage of participants who answered 'agree' and 'strongly agree' to questions related to barriers to CC re-screening

Support from partner, family, or community

Seventy-nine percent of participants reported receiving support from their spouse or partner; 69.0% from their family and 57.0% from the community (Fig. 3).

Beliefs and perceptions of cervical cancer

More than 95.0% of participants believed that cervical cancer was a serious disease; 52.0% believed they were at high risk of cervical cancer, and about the same proportion (51.0%) believed that screening could prevent cervical cancer.

Approximately 15.0% of women trusted traditional medicine more than conventional medicine; and 82.0% reported that cervical cancer should not be diagnosed and treated by traditional medicine (Fig. 3).

Regarding knowledge of the recommended frequency of screening, 27.0% of participants stated that a woman should undergo cervical cancer screening every 5 years, which was the recommended frequency in our screening program. While 13.0% thought it should be done every 3 years and 28.0% every year, 31.0% said they did not know, and 1.0% believed it to be every 10 years.

Eighty-one percent of participants stated they would feel encouraged to undergo screening if it was recommended by the government; 78.0% if it was recommended by community outreach workers, and 87.0% if recommended by religious figures.

Regarding the cost of screening, 77.0% of participants stated they could undergo screening if the cost was between 5,000 and 10,000 FCFA (7.67 and 15.33 Euro), 38.0% if the cost was between 10,000 and 30,000 (15.33 and 46 Euro) and 32.0% between 30,000 and 50,000 FCFA (46 and 76,67 Euro).

Associations between re-screening and participant characteristics

Associations between re-screening and family and medical history, as well as barriers to screening were examined. Only HPV status at initial screening and knowledge of recommended screening frequency were significantly associated with adherence to re-screening ($p = 0.001$ and $p = 0.03$, respectively). After adjusting for potential confounders, having a positive HPV status was associated with a 3 to 4 times higher risk of being screened again, compared to non-infected women (aOR = 3.4 [1.8–6.5], $p < 0.001$). Furthermore, women who remembered the recommended screening frequency were 2 to 3 times more likely to undergo new testing than those who did not remember (aOR = 2.3 [1.2–4.4], $p = 0.013$).

None of the evaluated sociodemographic characteristics were significantly associated with adherence to re-screening (Table 2).

Table 2
Factors associated with re-screening.

	Test repeated		Test not repeated		cOR (95% CI)	p	aOR (95% CI)	p
	n	(%)	n	(%)				
Total	69	(34.0)	134	(66.0)				
Age (Mean (SD))	<i>37.4 (3.7)</i>		<i>37.2 (4.0)</i>			0.625*		
[30–35] years	16	(23.2)	41	(30.6)	1			
[35–40] years	31	(44.9)	50	(37.3)	1.6 (0.8–3.3)	0.214		
[40–50] years	22	(31.9)	43	(32.1)	1.3 (0.6–2.94)	0.492		
Civil status								
Married/coupled	58	(84,1)	117	(87,3)	0.8 (0.3–1.7)	0,525		
Single	11	(15,9)	17	(12,7)	1			
Level of education								
Primary + others	13	(19,1)	28	(20,9)	1			
Secondary school	42	(61,8)	75	(56,0)	1.3 (0.6–2.6)	0.628		
University	13	(19,1)	31	(23,1)	0.9 (0.364–2.34)	0.829		
Area of residence								
Rural	7	(10,1)	12	(9,0)	1			
Semi-urban	52	(75,4)	101	(75,4)	0.9 (0.3–2.4)	0.805		
Urban	10	(14,5)	21	(15,7)	0.8 (0.2–2.7)	0.740		
Employment/profession								
Housewife	16	(23,2)	29	(21,6)	1			
Self-employed	18	(26,1)	36	(26,9)	0.9 (0.4–2.1)	0.86		
Employee	35	(50,7)	69	(51,5)	0.9 (0.4–1.9)	0.75		

	Test repeated		Test not repeated		cOR (95% CI)	p	aOR (95% CI)	p
	n	(%)	n	(%)				
Total	69	(34.0)	134	(66.0)				
Chronic illness								
No	59	(85,5)	113	(84,3)	1			
Yes	10	(14,5)	21	(15,7)	0.9 (0.4–2.1)	0.825		
HPV status								
HPV -	28	(40,6)	87	(64,9)	1		1	
HPV +	41	(59,4)	47	(35,1)	2.7 (1.5–4.9)	0.001	3,4 (1,8–6,5)	< 0,001
Parent with cancer								
No	45	(65,2)	94	(70,7)	1			
Yes	24	(34,8)	39	(29,3)	1.3 (0.7–2.4)	0.428		
Frequency of screening								
Knows	33	(47,8)	48	(35,8)	1.6 (0.9–3.0)	0,108	2,3 (1,2–4,4)	0,013
I don't know.	36	(52,2)	86	(64,2)	1		1	
Partner support								
Present	52	(75,4)	108	(80,6)	0.7 (0.4–1.5)	0,391		
Absent	17	(24,6)	26	(19,4)	1			

Discussion

Among our cohort of women having undergone initial cervical cancer screening more than 5 years ago, only one third (34.0%) of participants had attended re-screening at the time of inclusion in the follow-up study. Although participants had been informed to repeat a screening test five years later, our results support that we have not achieved optimal levels of adherence to cervical cancer re-screening. This finding is surprising in the context of a free of charge screening program and in a previously adherent population [23]. To the best of our knowledge, no other studies have investigated re-screening rates

following a negative cervical cancer screening test in low- and middle-income countries. However, in a low-income population in Argentina, adherence of HPV-positive/cytology-negative women to follow-up testing at 12–18 months was 26.0% [17]. Low re-screening rates could limit the long-term impact of cervical cancer screening programs conducted in low-resource contexts (the target set by the WHO being 70.0% population coverage [4, 8]).

Having a previous positive HPV test was associated with adherence to re-screening (aOR:3.4 (1.8–6.5)). This may reflect that women having a positive screening test may have a higher level of familiarity and commitment to the cervical cancer screening process, as they previously had more procedures and appointments than those with a negative HPV test. Several beliefs and perceptions of cervical cancer were identified as potential reasons for adherence or lack thereof. More than half of the participants believed they were at high risk for cervical cancer, and the same proportion believed in the preventive nature of screening. It might be suggested that knowledge of the effectiveness of screening and awareness of the risk of cervical cancer itself would increase women's willingness to be rescreened. Regarding the obstacles to re-screening, overall, our study showed that the main reasons were lack of information, forgetfulness, and a feeling of good health. Our study further showed that women who knew the frequency of screening were 2 to 3 times more likely to undergo re-screening within the recommended timeframe. Lack of information related to CC has also been highlighted in other studies conducted in similar contexts [11, 26–29].

It would therefore be imperative for the Ministry of Health and screening programs to place special emphasis on communication and dissemination of clear and appropriate information on best screening practices, to develop better tailored information campaigns in specific settings to reach the target population, both in public places (markets, streets, schools, universities, women's associations, etc.). And, in hospitals, in departments such as gynaecology/obstetrics and paediatric vaccination, where cervical cancer screening could be an additional service offered to women when they come for other care. In addition, prescribing screening by health personnel is a factor that encourages women to undergo screening, as shown by studies conducted in similar contexts [27, 30]. It would therefore be relevant to involve health personnel in promotion of cervical cancer screening among women attending health care facilities for other reasons. Communication and information strategies through contextually appropriate reminders as SMS recall systems, such as the "call and recall" system that proved successful in the United Kingdom in 1988, leading to a significant drop in CC cases [31], could also be implemented to increase screening rates according to recommendations. Among HPV-positive participants, anxiety related to the idea of having cancer outweighed all other reasons, several other studies have found that HPV + women with abnormal or normal cytology had higher short-term anxiety than those with normal results [32, 33]. It would be very important to train caregivers to reassure HPV + patients.

More than half of our study population (57.0%) reported having community support when it came to undergoing cervical cancer screening. This is an encouraging finding which is worthy of further exploration for promotional activities in similar settings, as community support has been shown to act as a facilitating factor for screening [30].

No association between sociodemographic factors and CC rescreening were observed in our study population. Other studies in Africa have shown that unemployed women were less likely to be screened than employed women [34, 35]. This could be apprehended by the free screening during our study, removing financial barriers for our participants.

Cultural barriers did not seem to prevail in our population, given the high level of confidence in conventional medicine (82.0% reported that cervical cancer should not be diagnosed and managed by traditional medicine) associated with a low percentage of participants (1.0%) who perceived their religious beliefs as an obstacle to screening this high percentage is probably biased by the fact that this is a population that has already been screened once. A large majority (86.0%) stated that they would undergo screening if recommended by the government. Furthermore, most women (76.0%) stated that they could afford screening for a fee ranging from 5,000 to 10,000 CFA francs (approximately 8–16 Euros). These findings should be considered in the implementation of a national strategy for cervical cancer prevention in Cameroon, with an emphasis on universal health coverage given the risk of inequitable access to screening, as our study shows that nearly a quarter of women would not have access to screening if it were to be paid for.

Limitations and strengths

To the best of our knowledge, we report for the first time the re-screening rate in an HPV-based cervical cancer in Sub-Saharan Africa. However, our study should be interpreted with some caveats. First, it is a selected cohort of women who mainly lived in a semi-urban area and went to the local district hospital, where screening and treatment for pre-cancerous cervical lesions were free, and transport was reimbursed. These specifics may have obscured financial barriers to re-screening that may be prevalent in other contexts. Second, adherence to re-screening may have been overestimated due to a participation bias, considering the relatively low participation rate. In fact, the high number of unreachable women resulting in a smaller sample size.

Conclusion

Only one-third of participants were re-screened within the recommended interval, and main reported barriers to re-screening were lack of information, forgetfulness, and impression of being in good health. Yet early and timely detection of precancerous lesions is crucial to prevent long-term morbidity and mortality due to cervical cancer. Existing screening strategies would benefit from developing new approaches to inform women about the importance of regular cervical cancer screening to realize the full benefit of screening. Further studies should be conducted to assess strategies aiming to improve adherence to re-screening.

Abbreviations

CC: cervical cancer

ARHD: Annex Regional Hospital of Dschang

HPV: Human Papilloma Virus

HPV+: Human Papilloma Virus Positive

HPV-: Human Papilloma Virus Negative

VIA: Visual Inspection with Acetic Acid

WHO: World Health Organisation

Declarations

Statements

Ethical approval and consent to participate.

All methods were performed in accordance with the guidelines and regulations of the Declaration of Helsinki. This study is a continuation of the 3T 2015-2016 study approved by the Geneva Canton Ethics Council, Switzerland (CCER, N°2017-0110, and ceR-amendment n°3) and the National Ethics Committee for Human Health Research in Cameroon (N°2018/07/1083/CE/CNERSH/SP).

Informed consent was obtained orally by telephone from each participant before the survey began, and all data collection forms were anonymized.

Consent to publish – Not applicable.

Availability of data and materials

The datasets used and/or analysed during this study are available from the corresponding author upon reasonable request.

Conflict of Interest

The authors declare that they have no competing interests.

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Author Contributions

SE: Writing- Original draft preparation; AW, PV and, PP: Conceptualization, Methodology; GT and SE: data management and analysis; VY and SE: Investigation; BS and BK: Supervision; SE and, AW: Reviewing and Editing; JS and AM: Project administration.

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Figures

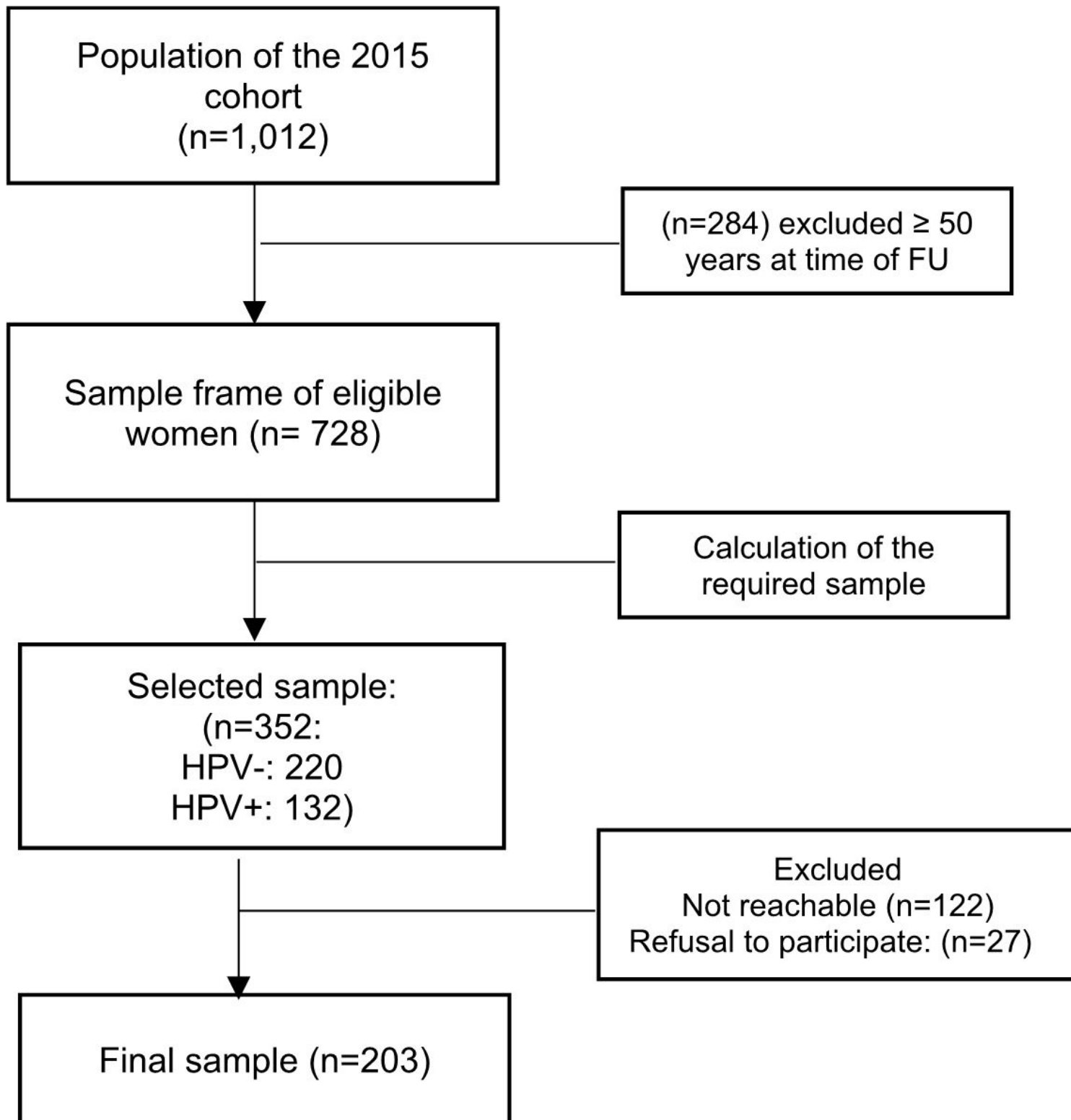


Figure 1

Participants flow chart.

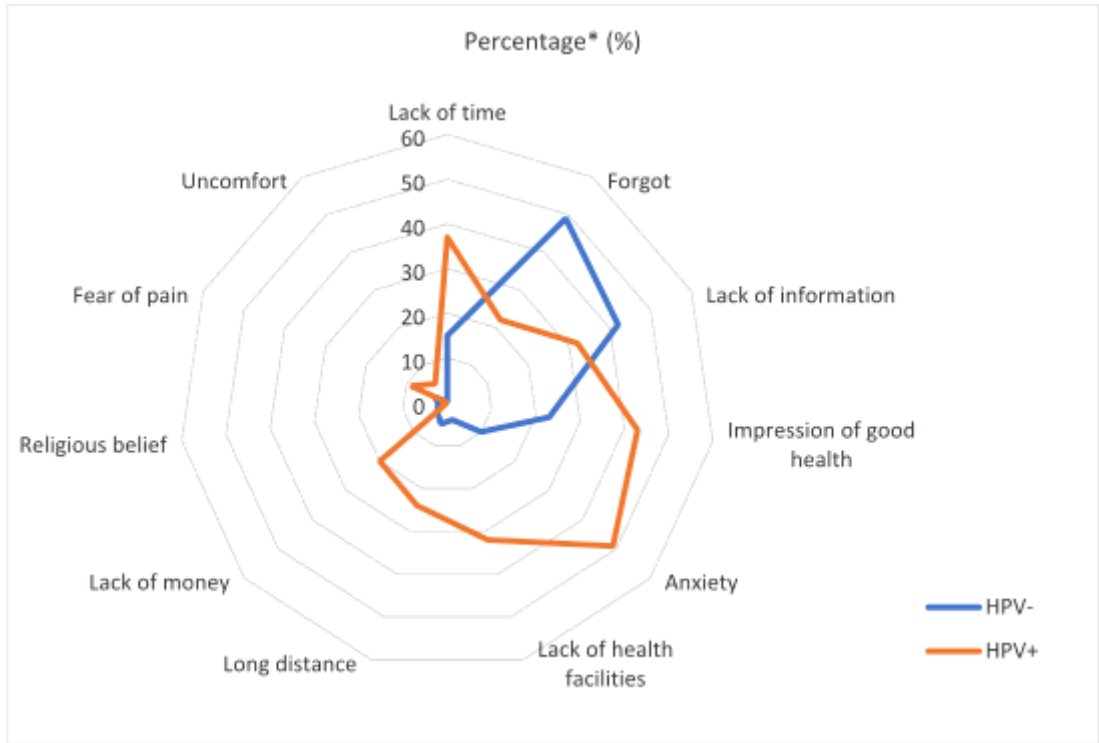


Figure 2

Barriers to the cervical cancer re-screening visit (HPV + and – stratified)

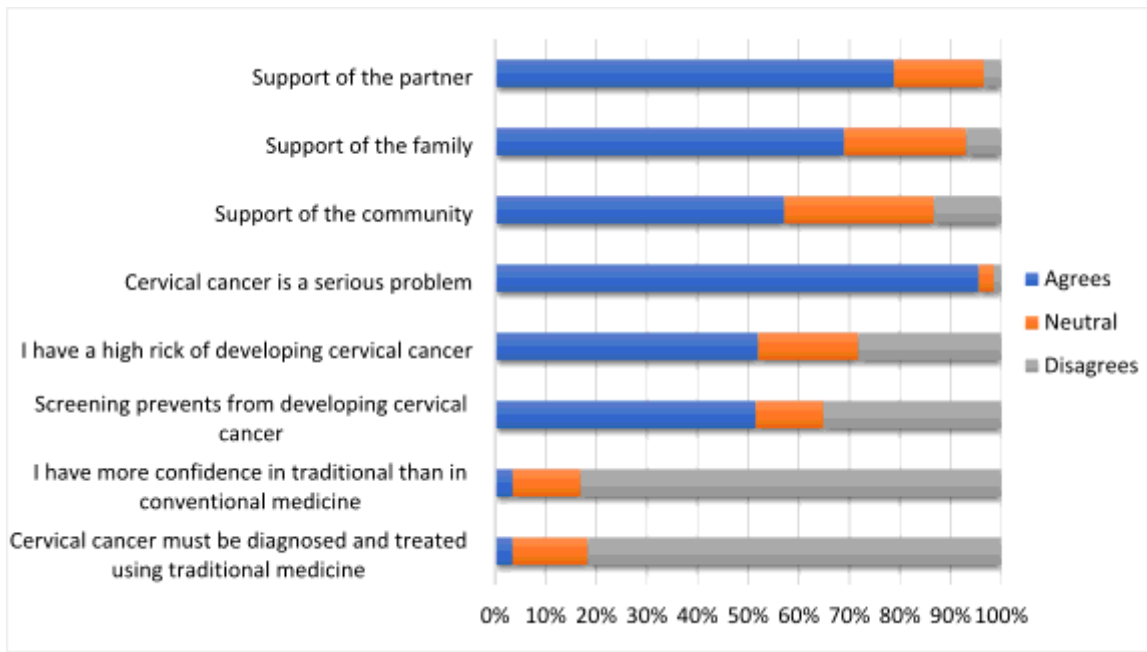


Figure 3

Beliefs and perceptions of cervical cancer screening