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Real-World Cervical Cancer Screening Uptake and Predictors of Visual Inspection With Acetic Acid Positivity Among Women Living With HIV in Care Programs in Western Kenya

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ABSTRACT

PURPOSE To achieve the WHO cervical cancer elimination targets, countries globally must achieve 70% cervical cancer screening (CCS) coverage. We evaluated CCS uptake and predictors of screening positive at two public HIV care programs in western Kenya.

METHODS From October 2007 to February 2019, data from the Family AIDS Care and Education Services (FACES) and Academic Model Providing Access to Healthcare (AMPATH) programs in western Kenya were analyzed. The study population included women age 18-65 years enrolled in HIV care. Screening uptake was calculated annually and overall, determining the proportion of eligible women screened. Multivariate logistic regression assessed predictors of positive screening outcomes.

RESULTS There were 57,298 women living with HIV (WLWHIV) eligible for CCS across both programs during the study period. The mean age was 31.4 years (IQR, 25.9-37.8), and 39% were on antiretroviral therapy (ART) at the first CCS-eligible visit. Of all eligible women, 29.4% (95% CI, 29.1 to 29.8) underwent CCS during the study period, 27.0% (95% CI, 26.5 to 27.4) in the AMPATH program, and 35.6% (95% CI, 34.9 to 36.4) in the FACES program. Annual screening uptake varied greatly in both programs, with coverage as low as 1% of eligible WLWHIV during specific years. Age at first screening, CD4 count within 90 days of screening, current use of ART, and program (AMPATH *v* FACES) were each statistically significant predictors of positive screening.

CONCLUSION CCS uptake at two large HIV care programs in Kenya fell short of the WHO's 70% screening target. Screening rates varied significantly on the basis of the availability of funding specific to CCS, reflecting the limitations of vertical funding programs.

ACCOMPANYING CONTENT

Appendix

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INTRODUCTION

Although invasive cervical cancer (ICC) is preventable, it is the second most common cancer among women worldwide.[1] Global trends of ICC represent a dire health inequity, with 85% of incident cases and 90% of deaths occurring in low- and middle-income countries (LMICs).[1] The burden of cervical cancer is particularly pronounced in sub-Saharan Africa (SSA), which accounts for 71% of the global burden of HIV infection, despite being home to only 12% of the global population.[2,3] Women living with HIV (WLWHIV) have a higher risk of human papillomavirus (HPV) infection[3] and are six to eight times more likely to develop cervical cancer compared with women who are HIV-negative.[4] With near-universal access to antiretroviral therapy (ART) globally,[5] WLWHIV in LMICs have prolonged life expectancy, increasing their vulnerability to death from cervical cancer.[6] In Kenya, cervical cancer is the second most common cancer in women, contributing 5,250 (12.9%) of new cancer cases and 3,286 (11.8%) cancer deaths annually.[7] To preserve the progress made in HIV care globally, prioritization of cervical cancer screening (CCS) coupled with accessible and effective treatment for WLWHIV living in LMICs is urgently needed.[8]

In 2020, the WHO launched the 90/70/90 global strategy to eliminate cervical cancer, which calls for 90% HPV vaccination of girls, 70% of all women receiving CCS at least twice, and 90% of those with a positive result adequately treated by

CONTEXT

Key Objective

To evaluate cervical cancer screening (CCS) coverage among eligible women living with HIV (WLWHIV) at the Family AIDS Care and Education Services and Academic Model Providing Access to Healthcare HIV care programs in western Kenya.

Knowledge Generated

Within two of the largest HIV care programs in western Kenya, 29.4% of eligible WLWHIV underwent CCS between 2007 and 2019. Yearly CCS coverage rates varied greatly and were often <10% of eligible WLWHIV undergoing CCS. This falls short of the WHO target of 70% CCS coverage.

Relevance

WLWHIV, the majority of whom live in sub-Saharan Africa, are at the highest risk of cervical cancer and are a priority population for secondary prevention. HIV care programs must prioritize adequate CCS coverage of WLWHIV to prevent deaths from this preventable cancer.

2030.[9] The WHO recommends HPV testing for CCS, or visual inspection with acetic acid (VIA) when HPV testing is not available, followed by immediate treatment to reduce lost to follow-up.[10] This screen-and-treat strategy has been shown to reduce the incidence and mortality from cervical cancer in population-based longitudinal studies in India[11-13] and South Africa.[14] This strategy is the basis of national CCS efforts in most LMICs, including within HIV clinics where integration of CCS within ART provision is increasingly common.[15] The Kenya National Cancer Guidelines call for CCS for women age 25-65 years for the general population or starting at the point of HIV diagnosis for WLWHIV.[7] In Kenya, CCS is recommended yearly for WLWHIV and every 5 years for women who are HIV-negative.[7] The success of CCS programs depends on adequate screening coverage. To date, little is known about CCS coverage in HIV clinics in Kenya caring for women at the highest risk of cervical cancer. To fill this gap in the literature, we evaluated the uptake of CCS among WLWHIV at two large public HIV care programs in western Kenya. We also examined demographic and clinical factors associated with CCS and the predictors of VIA positivity among women in these programs.

METHODS

We analyzed HIV clinic and CCS data collected between October 2007 and February 2019 at the Family AIDS Care and Education Services (FACES) and Academic Model Providing Access to Healthcare (AMPATH) programs in western Kenya. The FACES program was a collaboration between the Kenya Medical Research Institute (KEMRI) and the University of California San Francisco, which provided HIV care and supporting services at over 140 ministry of Health facilities in western Kenya between 2004 and 2021.[16] The AMPATH program is a partnership between Moi University School of Medicine, Moi Teaching and Referral Hospital, and several North American institutions led by Indiana University.[17] AMPATH provides HIV care and treatment to over 100,000 patients with HIV at over 19 urban and rural clinics in western Kenya. During the study period, both FACES and AMPATH offered CCS using nurse-led VIA screening, as HPV testing was unavailable. The study population included women age 18-65 years, enrolled in HIV care, and eligible for annual screening on the basis of the Kenya national guidelines.[7] At both sites, data were from screening initiatives that predated the Go Further public-private partnership between President's Emergency Plan for AIDS Relief (PEPFAR) and the George W. Bush Institute and partners supporting CCS among WLWHIV in SSA.[18,19]

Data on screening uptake (numerator data) were available at FACES between October 2007 and September 2014, while at AMPATH, data were available between June 2009 and February 2019. Numbers of eligible women (denominator data) were obtained from the number of women eligible for screening per the national guidelines at both programs (age 18-65 years). Routine HIV care databases created under the East Africa International Epidemiology Databases to Evaluate AIDS (EA-IeDEA) program,[20] with built-in mechanisms for data completion and quality assurance, were used.

From the EA-IeDEA database, we obtained demographic and clinical characteristics of all WLWHIV eligible for CCS enrolled in HIV care at both programs, as well as those who underwent CCS. For those screened, baseline was defined by the date of each subject's first VIA screening. Demographic characteristics, including age and education level, were included from enrollment data or the date closest to the first VIA screening. Baseline clinical characteristics such as hormonal contraception use, ART use, and previous VIA testing were identified using the closest nonmissing data preceding or on the date of the first VIA screening. Baseline WHO stage and CD4 count were identified using the closest nonmissing value within the 90 days preceding or on the date of the first VIA. VIA positivity was defined as a positive screening test including presence of any acetowhite area on screening or biopsy-confirmed cervical intraepithelial neoplasia after VIA.

Screening uptake was defined as the number of women ever screened (numerator) among all eligible women (denominator), and yearly uptake was defined as the number of women screened per year from among the eligible number of women with encounters during that year. Uptake was evaluated as a proportion (period prevalence) with 95% CIs for each calendar year of the study period. We evaluated predictors of first VIA positivity by first fitting univariate logistic regression models with baseline characteristics, which included age, marital status, highest education achieved, and WHO stage. We then fit a multiple logistic regression model, which included age at first VIA screen, WHO stage, CD4, current ART status, age at start of ART, and program. Subjects with missing data for independent variables were not included in the models of outcomes. Marital status and highest education level had substantial amounts of missing data and hence were not included in the multiple regression model. Similarly, previous VIA screening, number of children, and use of hormonal contraception were only collected for AMPATH and hence were not included in the multiple regression model. A *P* value of <.05 was considered statistically significant. Analyses were performed using SAS/STAT software (version 9.4 of the SAS System for Windows, Copyright 2016, SAS Institute Inc, Cary, NC) and R software (R Core Team, Vienna, Austria).[21] Use of these routinely collected data was approved under the EA-IeDEA retrospective data analysis. EA-IeDEA is approved by the Moi Teaching and Referral Hospital Ethics Review Committee (IREC/2008/79), KEMRI (KEMRI/RES/7/3/1), and the Indiana University Institutional Review Board (1105005574).

RESULTS

There were 57,298 WLWHIV eligible for CCS across both programs during the study period (Table 1). The median age of WLWHIV eligible for screening was 31.4 years (IQR, 25.9-37.8). The majority of women were married or had a partner (51.2%), and 60.6% had primary education as the highest education level achieved (Table 1). Thirty-nine percent overall were on ART at the first CCS-eligible visit, with AMPATH having a larger proportion on ART (49.3%) compared with FACES (14.6%). In both programs, the majority of women had WHO clinical stage I or II HIV disease (69.8%) within 60 days of first CCS eligibility.

Of all eligible women, 29.4% (95% CI, 29.1 to 29.8) underwent CCS during the study period, 27.0% (95% CI, 26.5 to 27.4) in the AMPATH program, and 35.6% (95% CI, 34.9 to 36.4) in the FACES program (Appendix Table A1). The median age at first VIA screening among all women was 37.3 years (IQR, 30.7-44.7; Table 2). This was higher among women in the AMPATH program, 39.5 years (IQR, 33.4-46.6), compared with FACES, where the median age was 32.8 years (IQR, 27.6 to 39.9). Similar to the population of women eligible for CCS at both programs, the majority of women undergoing VIA screening were married or living with a partner (53.2%) at the time of the first VIA screening, and 65.0% had primary school as their highest form of education. Data on previous history of VIA screening were only available from AMPATH, where the majority, 92.2%, had no previous history of CCS. The majority of women undergoing VIA at both programs were on ART (76.1%), which was lower at FACES (64.1%)

TABLE 1. Characteristics of Women Living With HIV at the AMPATH and the FACES Programs Eligible for Cervical Cancer Screening During the Study Period

Characteristic	AMPATH (n = 40,829)	FACES (n = 16,469)	Overall (N = 57,298)
Age at ART start, years			
Median (IQR)	32.6 (27.0-38.9)	28.1 (23.8-33.9)	31.4 (25.9-37.8)
Marital status at enrollment, No. (%)			
Never married	5,307 (21.8)	834 (5.6)	6,141 (15.6)
Married/living with partner	12,061 (49.5)	8,020 (53.9)	20,081 (51.2)
Separated or divorced/widowed	7,001 (28.7)	6,031 (40.5)	13,032 (33.2)
Highest education level, No. (%)			
None	281 (0.9)	209 (2.2)	490 (1.2)
Some/completed primary	18,015 (59.7)	5,990 (63.7)	24,005 (60.6)
Some/completed secondary	9,733 (32.2)	2,666 (28.4)	12,399 (31.3)
Some college/university	2,158 (7.2)	538 (5.7)	2,696 (6.8)
WHO stage within 60 days of first CCS eligibility, No. (%)			
Stage I	15,061 (46.7)	7,612 (50.1)	22,673 (47.8)
Stage II	5,859 (18.2)	4,569 (30.1)	10,428 (22.0)
Stage III	9,023 (28.0)	2,622 (17.3)	11,645 (24.6)
Stage IV	2,288 (7.1)	394 (2.6)	2,682 (5.7)
On ART at first CCS eligible visit, No. (%)	20,140 (49.3)	2,408 (14.6)	22,548 (39.4)

Abbreviations: AMPATH, Academic Model Providing Access to Healthcare; ART, antiretroviral therapy; CCS, cervical cancer screening; FACES, Family AIDS Care and Education Services.

TABLE 2. Demographic and Clinical Characteristics of Women Living With HIV Undergoing VIA at the AMPATH and the FACES HIV Care Programs in Western Kenya Between 2007 and 2019

Characteristic	AMPATH (n = 11,003)	FACES (n = 5,866)	Overall (n = 16,869)
Age at first CCS screen, years			
Median (Q1-Q3)	39.5 (33.4-46.6)	32.8 (27.6-39.9)	37.3 (30.7-44.7)
Marital status at enrollment, No. (%)			
Never married and not living with partner	548 (15.3)	84 (2.2)	632 (8.5)
Legally married/living with partner	1,739 (48.5)	2,212 (57.5)	3,951 (53.2)
Separated or divorced/widowed	1,295 (36.2)	1,551 (40.3)	2,846 (38.3)
Highest education achieved, No. (%)			
None	150 (1.6)	0 (0.0)	150 (1.3)
Some primary/primary completed	5,537 (60.0)	1,782 (87.8)	7,319 (65.0)
Some secondary	1,205 (13.1)	0 (0.0)	1,205 (10.7)
Secondary completed	1,743 (18.9)	37 (1.8)	1,780 (15.8)
Some college/university	587 (6.4)	211 (10.4)	798 (7.1)
Had a previous VIA test, No. (%)			
No	10,123 (92.2)	NA	10,123 (92.2)
Yes	855 (7.8)	NA	855 (7.8)
No. of children birthed/sired			
Median (Q1-Q3)	3.0 (2.0-5.0)	NA	3.0 (2.0-5.0)
Hormonal contraception, No. (%)			
No	9,991 (91.0)	NA	9,991 (91.0)
Yes	983 (9.0)	NA	983 (9.0)
WHO stage, No. (%)			
I	4,279 (40.1)	1,832 (31.5)	6,111 (37.0)
II	2,160 (20.2)	1,807 (31.0)	3,967 (24.0)
III	3,424 (32.0)	1,777 (30.5)	5,201 (31.5)
IV	821 (7.7)	409 (7.0)	1,230 (7.5)
CD4 within 90 days preceding first VIA, No. (%)			
<100	605 (5.9)	360 (6.4)	965 (6.1)
100-199	1,026 (10.0)	524 (9.3)	1,550 (9.8)
200-499	5,018 (48.9)	2,586 (46.0)	7,604 (47.9)
≥500	3,614 (35.2)	2,152 (38.3)	5,766 (36.3)
On ART at first CCS visit, No. (%)			
No	1,916 (17.5)	2,102 (35.9)	4,018 (23.9)
Yes	9,062 (82.5)	3,746 (64.1)	12,808 (76.1)
Age start ART therapy, years			
Median (Q1-Q3)	36.4 (30.5-43.4)	32.0 (27.2-39.1)	35.0 (29.1-42.0)
Positive VIA test at first screening, No. (%)			
No	9,456 (86.3)	4,490 (79.9)	13,946 (84.1)
Yes	1,502 (13.7)	1,127 (20.1)	2,629 (15.9)

Abbreviations: AMPATH, Academic Model Providing Access to Healthcare; ART, antiretroviral therapy; CCS, cervical cancer screening; FACES, Family AIDS Care and Education Services; NA, not available; VIA, visual inspection with acetic acid.

compared with AMPATH (82.5%). Among those with available CD4 counts, mean counts were between 200-499 cells/mm^3 in 47.9% and 500 or greater in 36.3% (Table 2). During the study period, VIA positivity was 13.7% (95% CI, 13.1 to 14.4) at AMPATH compared with 20.1% (95% CI, 19.0 to 21.1) at FACES.

Annual screening uptake varied greatly in both programs (Fig 1; Appendix Table A2). At AMPATH, CCS coverage was lowest in 2009 when only 1.3% of eligible women had VIA screening, peaked in 2012 at 17.7%, and dropped back to 1.4% at the end of the evaluation period in 2019. At FACES, VIA coverage in 2007 was at 20% of eligible women, peaked in 2008 when 41.9% of eligible women underwent screening, and dropped to 7.1% in 2014, coinciding with an externally funded investigation (2007-2008)[22-24] and permission from CDC to cover CCS using PEPFAR funds.

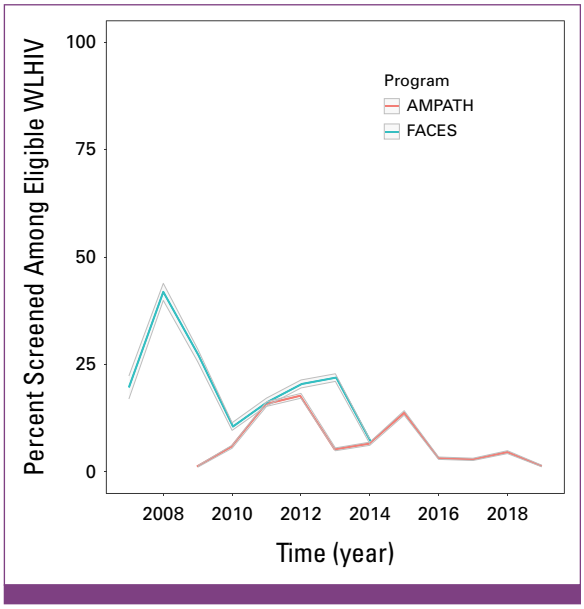

FIG 1. Uptake of VIA screening among eligible women living with HIV by year at the AMPATH and the FACES programs in western Kenya between 2007 and 2019 (percent screened and 95% CIs). AMPATH, Academic Model Providing Access to Healthcare; FACES, Family AIDS Care and Education Services; VIA, visual inspection with acetic acid; WLHIV, women living with HIV.

From the multivariate logistic regression to evaluate predictors of VIA positivity, age at first VIA screening, CD4 count within 90 days of VIA screening, current use of ART, and the program (AMPATH *v* FACES) were each statistically significant predictors of positivity (Table 3). A 10-year increase in age at first screen was associated with 30% decreased likelihood of a positive VIA result (odds ratio [OR], 0.70 [95% CI, 0.67 to 0.74]; $P < .001$). Although the overall test of an association between VIA positivity and WHO stage was not statistically significant, we found that women with WHO stage III were significantly more likely to be VIA-positive (OR, 1.13 [95% CI, 1.01 to 1.26]; $P = .037$) compared with women with WHO stage I. Compared with women with CD4 count >500 cell/mm^3, lower CD4 counts were associated with increased odds of VIA positivity, highest for CD4 <100 cell/mm^3 (OR, 1.77 [95% CI, 1.48 to 2.11]; $P < .0001$). Women on ART were 23% less likely to be VIA-positive (OR, 0.77 [95% CI, 0.69 to 0.89]; $P < .0001$), and women receiving care at FACES were more likely to be VIA-positive compared with those at AMPATH (OR, 1.22 [95% CI, 1.11 to 1.34]; $P < .0001$).

DISCUSSION

Our evaluation of CCS uptake using VIA at two major PEPFAR-funded HIV programs in western Kenya between 2007 and 2019 revealed that uptake was significantly below the current WHO goal of ≥70% of all eligible women undergoing CCS. Instead, only about a third of women were screened during the evaluation period, with highly variable annual coverage rates in both programs. This 30% coverage of eligible women within two large HIV programs reflects the challenges in achieving widespread CCS covering in SSA and other LMICs. In a 2022 review of CCS programs and age-specific coverage rates globally, CCS coverage was only 9% in LMICs, compared with 84% of women age 30-49 years living in high-income countries.[25] In results of a 2015 nationally representative survey among the general population in Kenya, only 16.4% of women had ever undergone CCS.[26] The low screening coverages rates are particularly consequential for WLWHIV, many of whom are engaged in HIV care for decades but may be diagnosed with and die of cervical cancer because of lack of screening and precancer treatment.[27]

During the study period, these two public HIV programs depended largely on availability of external funding specific for CCS activities. At FACES, the highest coverage years coincided with a career development award focused on integrating CCS into HIV care (NIH/NCRR/OD UCSF-CTSI grant KL2 RR024130, PI Clay Johnston), while at AMPATH, the highest coverage years coincided with a Center for AIDS Prevention Studies grant to support scaling up CCS within PEPFAR sites (Providence/Boston Center for AIDS Research Grant P30AI042853). Outside of these years, CCS activities were not funded and instead were opportunistic, resulting in very low coverage rates. In a recent systematic review of 21 studies evaluating uptake and barriers to CCS among 20,672 WLWHIV in SSA, overall screening uptake was estimated at 30% (95% CI, 19 to 41).[30] In this review reporting individual-level CCS uptake, barriers to screening included lack of knowledge on cervical cancer, low perceived risk, fear of results, lack of access to screening, high associated costs, and the perception of an additional burden of being diagnosed with cervical cancer diagnosis while living with HIV. To our knowledge, our study is the first to longitudinally evaluate program-level CCS uptake among WLWHIV in HIV care, including reporting yearly screening coverage rates. The strong correlation demonstrated between the availability of CCS-specific funding and high uptake rates in our program-level analysis demonstrates the crucial impact of funding—hence provision of CCS at no cost—on CCS uptake in HIV clinics. Of note, the majority of women in our analysis had never undergone CCS, emphasizing the need for CCS services based in HIV-care facilities.

The use of VIA as the primary method for CCS in this study is consistent with results from a survey of 51 sites within SSA during the same period,[31] which highlight the reality that most programs in LMICs have not transitioned to HPV-based screening as recommended by the WHO.[8] Despite a 30% VIA screening coverage in both programs, the lack of access to high-performing HPV tests leaves some VIA-negative women at risk because of VIA's low sensitivity for detecting cervical precancer.[32-34] We found that overall VIA positivity was 15.9% across both programs (20.1% at FACES and 13.7% at AMPATH), similar to the literature in WLWHIV in SSA demonstrating VIA positivity rates among WLWHIV

TABLE 3. Predictors of VIA Positivity Among Women Living With HIV Undergoing Cervical Cancer Screening at the AMPATH and FACES HIV Care Programs in Western Kenya

		Univariate Logistic			Multiple Logistic Regression		
Variable Label	Nonmissing Records	OR (95% CI)	Type 3 Test	*P*	OR (95% CI)	Type 3 Test	*P*
Age at first VIA screen							
Per 10 years	16,575	0.687 (0.656 to 0.719)		<.0001	0.704 (0.668 to 0.740)		<.0001
Civil status at enrollment							
Never married and not living with partner	7,209	1.061 (0.852 to 1.320)	0.5024	.5980			
Legally married/living with partner		Reference					
Separated		1.090 (0.916 to 1.298)		.3298			
Divorced/widowed		0.942 (0.808 to 1.098)		.4441			
Highest education achieved							
None	11,141	0.503 (0.289 to 0.875)	<0.0001	.0150			
Some primary/primary completed							
Some secondary		0.805 (0.677 to 0.957)		.0142			
Secondary completed		0.747 (0.642 to 0.868)		.0001			
Some college/university		0.661 (0.527 to 0.827)		.0003			
No. of children birthed/sired[a]							
Per one child	10,179	0.937 (0.912 to 0.962)		<.0001			
WHO stage							
I	16,216	Reference					
II		0.994 (0.890 to 1.110)	0.9973	.9088	0.991 (0.881 to 1.115)	0.1111	.8832
III		1.005 (0.908 to 1.113)		.9219	1.126 (1.007 to 1.260)		.0371
IV		0.993 (0.838 to 1.177)		.9344	1.081 (0.902 to 1.295)		.4003
CD4 within 90 days preceding first VIA							
<100	15,600	1.834 (1.544 to 2.177)	<0.0001	<.0001	1.770 (1.482 to 2.114)	<0.0001	<.0001
100-199		1.623 (1.402 to 1.880)		<.0001	1.735 (1.493 to 2.016)		<.0001
200-499		1.273 (1.155 to 1.404)		<.0001	1.330 (1.204 to 1.469)		<.0001
≥500		Reference			Reference		
Current ART status							
On ARTs	16,533	0.705 (0.643 to 0.774)	<0.0001	<.0001	0.771 (0.692 to 0.859)	<0.0001	<.0001
Not on ART		Reference			Reference		
Program							
FACES	16,575	1.581 (1.452 to 1.721)	<0.0001	<.0001	1.217 (1.106 to 1.339)	<0.0001	<.0001
AMPATH		Reference			Reference		

Abbreviations: AMPATH, Academic Model Providing Access to Healthcare; ART, antiretroviral therapy; FACES, Family AIDS Care and Education Services; OR, odds ratio; VIA, visual inspection with acetic acid.

[a]Only collected at AMPATH.

ranging from 9% (95% CI, 8 to 10) in Cameroon,[35] 17% in Namibia,[36] and 17%-47% in Zambia.[37] The variability in VIA positivity rates, given its subjective nature, has previously been documented.[38] Our finding that younger women were more likely to be VIA-positive has been demonstrated in a study in Zambia[37] and in a study in Namibia,[36] and is consistent with the epidemiology of HPV being more common in younger women. The association of lower VIA positivity among those on ART was previously demonstrated among WLWHIV in Malawi,[39] and also in a meta-analysis of 31 studies where WLWHIV on ART were less likely to have high-risk HPV or biopsy-confirmed cervical precancer.[40] Similarly, the relationship between low CD4 count with VIA positivity has been demonstrated in studies among WLWHIV in South Africa,[41] Tanzania,[42] and Nigeria.[43]

Our study period predates the WHO's adoption in 2020 of the global strategy to eliminate cervical cancer,[9] which many LMICs have since adopted. This 90/70/90 strategy calls for 70% CCS coverage of all eligible women globally at least twice in their lifetime by 2030, regardless of their HIV status. Modeling studies demonstrate that achieving the 90/70/90 targets will avert 74 million new cases of cervical cancer and 62 million deaths in LMICs.[44] Our findings, along with other studies looking at CCS coverage in Kenya,[45] reveal a great need to scale up CCS coverage in HIV programs caring for women at the highest risk of cervical cancer to attain the WHO elimination targets and save millions of lives. As a result of inadequate secondary prevention for WLWHIV, few of whom were vaccinated against HPV, cervical cancer is a leading cause of cancer death among WLWHIV in LMICs.[4] Strategies to improve CCS uptake and coverage in HIV clinics in LMICs include increased availability of HPV testing, which allows for self-collection of specimens, which can greatly affect screening coverage, compared with pelvic examination–based screening, which is limited by health worker availability. Use of community health workers to target women in communities with linkage to treatment in clinics can also increase reach and coverage.

Our findings demonstrate a strong link between screening coverage and availability of funds to support implementation of a key mode of cervical cancer prevention within two large HIV care programs, reflecting limitations of vertical funding programs, which, in this case, only funded HIV care and not CCS, yet many WLWHIV were susceptible. It is reassuring that initiatives such as the Go Further public-private partnership launched in 2018 between PEPFAR and the George W. Bush Foundation exist,[18,19] which is specifically supporting CCS and precancer treatment services in PEPFAR clinics in select African countries, providing a vital lifeline. Such programs need to be urgently expanded to reach all at-risk women. Similarly, national governments need to take up this mandate to fund CCS within Ministry of Health clinics offering HIV care independent of donor funding.

Strengths of our study includes leveraging routine HIV care databases created under the EA-IeDEA program to inform CCS uptake at two of the largest HIV programs in Kenya. Limitations of our analysis include missing data during several years in both programs. Additionally, we were unable to specifically link about a third of the screened women at FACES and nearly half of the screened women at AMPATH with the electronic medical records of eligible women and thus were unable to adequately evaluate predictors of undergoing VIA screening. Despite these limitations, a key strength of our study is the use of the EA-IeDEA database, which collects routine HIV care data to inform program-level CCS uptake in Kenya. Without these data, a denominator would have been difficult to enumerate and hence estimate CCS uptake. This has enabled us to provide what until now is scarce information for a critical implementation outcome in the cervical cancer care cascade within HIV care programs in East Africa.

In conclusion, we demonstrate low and variable CCS coverage at two large HIV care programs in western Kenya, likely representing actual coverage rates in similar programs caring for high-risk women in SSA and other LMICs. With coverage significantly below the WHO elimination targets, sustained funding is imperative to ensure service availability, adequate uptake, and coverage, if we are to reach the WHO elimination targets and hence save millions of lives from a preventable cancer.

AFFILIATIONS

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APPENDIX

TABLE A1. Cervical Cancer Screening Coverage Using Visual Inspection With Acetic Acid at the AMPATH and FACES HIV Programs in Western Kenya

East Africa IeDEA Program	Ever Screened, No.	Eligible, No.	% Screened	95% CI
AMPATH	11,006	40,829	26.96	26.53 to 27.39
FACES	5,866	16,469	35.62	34.89 to 36.35
Total	16,872	57,298	29.44	29.07 to 29.82

Abbreviations: AMPATH, Academic Model Providing Access to Healthcare; FACES, Family AIDS Care and Education Services; IeDEA, International Epidemiology Databases to Evaluate AIDS.

TABLE A2. Trends in VIA Screening Coverage Among Eligible WLWHIV by Year at the AMPATH and the FACES HIV Care Programs in Western Kenya From 2007 to 2019

East Africa IeDEA Program	Year	Screened, No	Eligible, No.	% Screened	95% CI
AMPATH	2009	213	16,580	1.28	1.11 to 1.46
	2010	999	16,974	5.89	5.53 to 6.24
	2011	2,809	17,776	15.80	15.27 to 16.34
	2012	3,145	17,736	17.73	17.17 to 18.29
	2013	922	17,474	5.28	4.94 to 5.61
	2014	1,118	17,000	6.58	6.2 to 6.95
	2015	2,271	16,517	13.75	13.22 to 14.27
	2016	494	15,398	3.21	2.93 to 3.49
	2017	439	14,948	2.94	2.67 to 3.21
	2018	678	14,670	4.62	4.28 to 4.96
	2019	192	13,918	1.38	1.19 to 1.57
FACES	2007	166	844	19.67	16.99 to 22.35
	2008	989	2,360	41.91	39.92 to 43.9
	2009	941	3,468	27.13	25.65 to 28.61
	2010	480	4,537	10.58	9.68 to 11.47
	2011	999	6,138	16.28	15.35 to 17.2
	2012	1,475	7,202	20.48	19.55 to 21.41
	2013	1,825	8,306	21.97	21.08 to 22.86
	2014	628	8,819	7.12	6.58 to 7.66

Abbreviations: AMPATH, Academic Model Providing Access to Healthcare; FACES, Family AIDS Care and Education Services; IeDEA, International Epidemiology Databases to Evaluate AIDS; VIA, visual inspection with acetic acid; WLWHIV, women living with HIV.