



Knowledge, perceptions, uptake, and determinants of HPV vaccination, and preferred delivery strategies among out-of-school girls in Masaka, Uganda

Jonathan Kitonsa, Paddy Kafeero, Violet Ankunda, Richard Muhumuza, Freddie Mukasa Kibengo, Martin Onyango, Hadijah Naluyinda, Daniel Opoka, Maria Teddy Ndagire, Esther Awino, Isiimael Hibombo, Geoffrey Kimbugwe, Dorothy Ainembabazi, Ivan Kasamba, Ubaldo Bahemuka, Gloria Lubega, Vincent Basajja, Sylvia Kusemererwa, Joseph Lutaakome, Yunia Mayanja, Joseph Mugisha & Eugene Ruzagira

To cite this article: Jonathan Kitonsa, Paddy Kafeero, Violet Ankunda, Richard Muhumuza, Freddie Mukasa Kibengo, Martin Onyango, Hadijah Naluyinda, Daniel Opoka, Maria Teddy Ndagire, Esther Awino, Isiimael Hibombo, Geoffrey Kimbugwe, Dorothy Ainembabazi, Ivan Kasamba, Ubaldo Bahemuka, Gloria Lubega, Vincent Basajja, Sylvia Kusemererwa, Joseph Lutaakome, Yunia Mayanja, Joseph Mugisha & Eugene Ruzagira (2026) Knowledge, perceptions, uptake, and determinants of HPV vaccination, and preferred delivery strategies among out-of-school girls in Masaka, Uganda, *Human Vaccines & Immunotherapeutics*, 22:1, 2654928, DOI: [10.1080/21645515.2026.2654928](https://doi.org/10.1080/21645515.2026.2654928)

To link to this article: <https://doi.org/10.1080/21645515.2026.2654928>



© 2026 The Author(s). Published with license by Taylor & Francis Group, LLC.



Published online: 02 Apr 2026.



[Submit your article to this journal](#)



Article views: 813



[View related articles](#)



[View Crossmark data](#)

RESEARCH ARTICLE



Knowledge, perceptions, uptake, and determinants of HPV vaccination, and preferred delivery strategies among out-of-school girls in Masaka, Uganda

Jonathan Kitonsa ^{a,b}, Paddy Kafeero^a, Violet Ankunda^a, Richard Muhumuza^a, Freddie Mukasa Kibengo^a, Martin Onyango^a, Hadijah Naluyinda^a, Daniel Opoka^a, Maria Teddy Ndagire^a, Esther Awino^a, Isiimael Hibombo^a, Geoffrey Kimbugwe^a, Dorothy Ainembabazi^a, Ivan Kasamba^a, Ubaldo Bahemuka^{a,b,c}, Gloria Lubega^a, Vincent Basajja^a, Sylvia Kusemererwa^a, Joseph Lutaakome^a, Yunia Mayanja^a, Joseph Mugisha^a, and Eugene Ruzagira^{a,c}

^aViral Pathogens, Medical Research Council/Uganda Virus Research Institute and London School of Hygiene and Tropical Medicine Uganda Research Unit, P.O. Box 49, Entebbe, Uganda; ^bDepartment of Global Health, Brighton and Sussex Medical School, Brighton, UK; ^cDepartment of Epidemiology, London School of Hygiene and Tropical Medicine Uganda Research Unit, London, UK

ABSTRACT

Cervical cancer is a leading cause of cancer-related mortality among women in sub-Saharan Africa, and accounts for 80% of female cancer cases in Uganda. The Human Papillomavirus (HPV) vaccine prevents cervical cancer but is mainly administered to school-going girls aged 9–15 y, potentially excluding out-of-school girls. This study assessed knowledge, perceptions, uptake, and preferred delivery strategies among out-of-school girls aged 9–20 y in inland and fishing communities in Masaka, Uganda. Between August and October 2024, we surveyed 428 girls (214 per community) using structured questionnaires. Descriptive statistics summarized participant characteristics, and logistic regression identified factors associated with uptake. The median age was 17 y (IQR: 15–19). Nearly one-fifth (19.9%) were married or cohabiting, and 62.4% had ever had sex. Less than half (44.2%) reported prior knowledge of the HPV vaccine, though most recognized its importance (73.4%) and safety (72.2%). Uptake remained low: 29.9% had received at least one dose, and 12.9% had completed two doses. Prior awareness strongly predicted uptake (aOR = 7.82; 95% CI: 4.67–13.44), with higher uptake in fishing communities (aOR = 2.21; 95% CI: 1.30–3.84). Lower uptake was associated with being out of school for 6–10 y (aOR = 0.24; 95% CI: 0.14–0.40) and prior sexual experience (aOR = 0.51; 95% CI: 0.27–0.96). Among unvaccinated girls, 91.2% expressed willingness to receive the vaccine. Preferred strategies included community outreaches (57.7%), health facility approaches (53.3%), and door-to-door delivery (29.2%). Uptake among out-of-school girls was low despite high willingness, underscoring the need for targeted interventions in high-risk settings.

ARTICLE HISTORY

Received 12 December 2025
Revised 19 March 2026
Accepted 30 March 2026

KEYWORDS

Out-of-school girls; fishing community; inland community; HPV vaccine; vaccine uptake; willingness; vaccine delivery

Introduction

Cervical cancer remains a leading cause of morbidity and mortality among women globally. In 2020, an estimated 604,000 women were diagnosed with cervical cancer, and about 342,000 died from the disease.¹ The burden is disproportionately high in sub-Saharan Africa (SSA) and other developing countries, where 85% of all cases occur making it the leading cause of cancer-related deaths among women in these regions.^{2,3} In Uganda, cervical cancer has an incidence rate of 30 per 100,000 women annually and accounts for 80% of all cancers diagnosed in women.⁴ One of the major reasons for this high burden in Uganda and other SSA countries is the high prevalence of HIV. In 2021, 67% of the 38.4 million people living with HIV globally resided in SSA, the majority of whom were women.⁵ Women living with HIV have a six-fold increased risk of cervical cancer and tend to develop the disease at younger ages compared to those without HIV.⁶

The two mechanisms by which cervical cancer can be prevented include early screening with management of pre-cancerous lesions, and vaccination against the Human papillomavirus (HPV), the

CONTACT Jonathan Kitonsa  Jonathan.Kitonsa@mrcuganda.org 

© 2026 The Author(s). Published with license by Taylor & Francis Group, LLC.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

causative agent in approximately 95% of cervical cancer cases.² An effective vaccine that could prevent many HPV infections with the potential to progress to cancerous lesions is available.⁷ In November 2020, the WHO launched the Global Strategy to accelerate the elimination of cervical cancer by 2030, with a key target of achieving 90% HPV vaccination coverage among eligible girls.⁸ The vaccine is most effective when administered to adolescent girls aged 9–12 y, in two doses,⁷ and has the potential to prevent up to 90% of cervical cancer cases, if administered before sexual debut.⁹ The updated guidelines now recommend extending HPV vaccination to include older girls aged 15–20 y, and older women, where resources permit.¹⁰

In Uganda, HPV vaccination is predominantly delivered through school-based outreach programs, and the majority of recipients are 9–12 y old. Outside these programs, the vaccine may also be accessed from health facilities and through routine immunization outreaches.⁴ In 2021, national coverage was estimated at 75% for the first dose and only 44% for the second dose.¹¹ A number of factors have been documented as contributors to sub-optimal uptake of the vaccine. These include limited exposure to information that would for example have been delivered through the internet given its popularity,¹² misinformation and rumors around side effects,¹³ distance from where the vaccine can be accessed,¹⁴ limited awareness among girls and their parents regarding the need and availability of the HPV vaccine,¹⁵ among others. Low uptake is compounded by the reliance on school-based outreaches as the main delivery model, which results in the exclusion of many out-of-school girls from vaccination efforts. According to the Uganda Bureau of Statistics, the primary school completion rate was only 34% in 2022,¹⁶ with rates even lower in rural settings and particularly among girls compared to boys.¹⁷ Consequently, HPV vaccination coverage remains inequitable, with out-of-school girls exposed to fewer opportunities. These same girls are also more likely to experience early marriage or engage in transactional sex, increasing their risk of HPV exposure and cervical cancer. Over-reliance on the school based approach may also exclude parents who normally have a key role in supporting the decision to have girls vaccinated.¹⁸

We conducted a study among two contrasting populations in Masaka district, an inland community and a fishing community, to assess knowledge, perceptions, and uptake of the HPV vaccine, and to establish preferred delivery strategies among out-of-school girls.

Methods

This was a cross-sectional study employing both quantitative and qualitative components. The qualitative findings are reported separately.

Study setting and population

The study was conducted in Masaka District, in the Central Region of Uganda, about 130 km south-west of the capital city, Kampala. Participants were out-of-school girls recruited from two contrasting settings: an inland community and a fishing community, chosen for their distinct social and economic dynamics. Out-of-school girls from the inland community were expected to reflect the broader Ugandan population, while girls from the fishing community were considered unique due to contextual factors such as earlier sexual debut, higher risk of sexually transmitted infections including HPV, and increased likelihood of school dropout.^{19–21}

Participants from the inland community were recruited from the three administrative divisions of Masaka City, Nyendo-Ssenyange, Katwe-Butego, and Kimaanya-Kyabakuza, selected purposively for their proximity to the research site, which reduced logistical costs, and because they are densely populated. Participants from the fishing community were recruited from Bukakata sub-county, located on the western shores of Lake Victoria. Bukakata was selected because it is the largest and most densely populated fishing community in Masaka District. It is situated approximately 44 kilometers (27 miles) east of Masaka City.

Community engagement

Community engagement was conducted in line with the policies of the MRC/UVRI & LSHTM Uganda Research Unit. Engagement activities included meetings with the district health management teams, the

community advisory board, heads of health facilities, village health team members, and community leaders. Through these meetings, influential community members were identified and actively involved in mobilizing potential participants.

Participant eligibility

We included girls aged 9–20 y, consistent with the updated WHO recommendation to extend vaccination to girls aged 15–20 y.¹⁰ Eligible participants were those who had dropped out of school before completing Primary 7 (i.e., had not sat the Primary Leaving Examination). Non-school attendance was defined as not having been enrolled in school for at least one year prior to data collection. Girls who had been out of school for less than a year were excluded, as they were considered likely to return to school. All participants provided informed consent if aged ≥ 18 y or if emancipated minors, while those younger than 18 y provided assent in addition to parental consent.

Participant recruitment

Community mobilizers selected during engagement meetings helped to identify eligible girls within their communities. Girls who met the eligibility criteria were then asked to assist identify additional eligible peers through a snowball sampling approach. Recruitment continued in this manner until the target sample size was achieved in both the inland and fishing communities.

Data collection and management

Interviews were conducted either at participants' homes or, where feasible, in designated community settings that ensured privacy and confidentiality. Data were collected using a standardized questionnaire programmed in REDCap. The questionnaire was developed based on a review of existing HPV vaccine surveys used in Uganda and similar sub-Saharan African settings and were adapted to reflect local context. The questionnaire was first piloted among 10 girls (five from each community) to assess clarity, relevance, and consistency, after which the final version was uploaded onto computer tablets for data collection. Data quality was monitored continuously by the data study manager and principal investigator, who reviewed submissions for completeness and accuracy.

Sample size

A sample size of 428 out-of-school girls was determined to be adequate for the study. The calculation assumed a conservative uptake of HPV vaccine of 40% (defined as receipt of at least one dose) among out-of-school girls in Uganda, based on the national first-dose uptake of 75%,²² where vaccination is mostly delivered through school-based outreaches.

We further assumed a minimum difference in proportions under the null and alternative hypotheses as 7%, a 5% significance level, and 80% power. The effective sample size was adjusted for 10% missing data. To enable comparison between settings, equal numbers of participants ($n = 214$) were recruited from the inland and fishing communities.

Study variables

The primary study outcome was self-reported uptake of the HPV vaccine, defined as having ever received at least one dose. Secondary outcomes included: willingness to receive the HPV vaccine among those never vaccinated; knowledge of HPV infection and vaccine (e.g., awareness of transmission, risks associated with getting the vaccine); attitudes toward the HPV vaccine (e.g., perceptions of safety and effectiveness); and preferred delivery strategies for HPV vaccination.

Exposures of interest included: socio-demographic characteristics (age, religion, community type (inland vs. fishing), duration out of school, and sexual and reproductive health characteristics (ever had sex, age at sexual debut).

Statistical analysis

All data were analyzed using R version 4.4.1. Descriptive statistics were used to summarize participant characteristics and primary and secondary outcomes. Continuous variables were reported as means and standard deviations (SD) or medians interquartile ranges (IQR), depending on the distribution, while categorical variables were summarized as frequencies and percentages. This included HPV vaccine uptake, knowledge, perceptions, and preferred vaccine delivery strategies.

To identify factors associated with uptake of at least one HPV vaccine dose, logistic regression was conducted. First, bivariate analyses were performed for each potential predictor, and variables with a p -value $< .2$ were considered for inclusion in the multivariable model to avoid prematurely excluding potentially important confounders. A purposeful selection strategy was used to build the final model with age included a priori, while statistical significance was defined as $p < .05$. Results are presented as odds ratios (OR) with 95% Confidence Intervals (CI).

Ethical considerations

Ethical approval to conduct the study was obtained from Uganda Virus Research Institute Research Ethics Committee (Ref: GC/127/1019), Uganda National Council for Science and Technology (Ref: HS4559ES) and London School Hygiene Tropical Medicine Research Ethics Committee (Ref: 31174). Permission to conduct the study was also obtained from the Masaka District Health Officer. All participants provided written informed consent for the adults and emancipated minors, while minors (<18 y) provided written assent following parental consent.

Results

Socio-demographic characteristics of the study population

The study population had a median age of 17 y (IQR: 15–19). Only 7% (30) were in the age group 9–12 y. 63.8% (272) had completed upper primary education (Primary 4 to 7). While 65% (278) had been out of school for less than 5 y, girls from the fishing community had longer periods out of school. Nearly one-fifth (85 girls, 19.8%) were married or divorced, predominantly from the fishing community. Additionally, 62.4% (272) reported ever having had sex, with earlier sexual debut (mostly 13–15 y) being more common among girls in the fishing community compared to inland areas (mostly 16–20 y), [Table 1](#).

Knowledge and attitudes about the HPV vaccine

[Table 2](#) summarizes the participants' knowledge and attitudes regarding the HPV vaccine. Less than half of the participants reported having prior knowledge of the HPV vaccine (189, 44.2%), a trend observed consistently across both communities (inland community: 91, 48.1%; fishing community: 98, 51.9%). Among those who had prior knowledge of the vaccine, nearly half (94, 49.7%) did not understand how HPV is transmitted. Despite these gaps, majority of participants, including some that had never heard about the vaccine believed that it was safe and effective (309, 72.2%). Nonetheless, misconceptions were reported: 22 (5.1%) believed the vaccine could cause infertility/and or cervical cancer.

Table 1. Baseline characteristics of out-of-school girls from inland and fishing communities in Masaka district, Uganda.

Characteristic	All participants n (%) ^a	Inland community n (%) ^a	Fishing community n (%) ^a	p-value
All participants	428 (100)	214 (50.0)	214 (50.0)	
Median age (IQR), years	17.0 (15.0, 19.0)	16.0 (15.0, 18.0)	18.0 (16.0, 19.0)	
Age category				<.001
9–12	30 (7.0)	23 (10.7)	7 (3.3)	
13–17	198 (46.3)	114 (53.3)	84 (39.3)	
18–20	200 (46.7)	77 (36.0)	123 (57.5)	
Religion				.250
Christian	354 (82.7)	172 (80.4)	182 (85.0)	
Muslim	74 (17.3)	42 (19.6)	32 (15.0)	
Highest level of Education				.027
No formal Education/P1 – P4	155 (36.2)	66 (30.8)	89 (41.6)	
P5 – P6	273 (63.8)	148 (69.2)	125 (58.4)	
Years out of school				.003
1–5 y	278 (65.0)	154 (72.0)	124 (57.9)	
Above 6 y	150 (35.0)	60 (28.0)	90 (42.1)	
Marital status				<.001
Single/Never married	343 (80.1)	190 (88.8)	153 (71.5)	
Currently/previously married / Cohabiting	85 (19.9)	24 (11.2)	61 (28.5)	
Employment status				.411
Employed	141 (32.9)	75 (35.0)	66 (30.8)	
Unemployed	287 (67.1)	139 (65.0)	148 (69.2)	
Ever had sex				<.001
No	161 (37.6)	117 (54.7)	44 (20.6)	
Yes	267 (62.4)	97 (45.3)	170 (79.4)	
Age category at sexual debut ^b				<.001
Never had sex	161 (37.8)	117 (55.2)	44 (20.6)	
Less than 15 y	149 (35.0)	46 (21.7)	103 (48.1)	
16–20 y	116 (27.2)	49 (23.1)	67 (31.3)	
Ever heard of HPV vaccine and disease				.559
No	239 (55.8)	123 (57.5)	116 (54.2)	
Yes	189 (44.2)	91 (42.5)	98 (45.8)	

^aColumn percentage; ^bData missing for two girls in the inland community.

Uptake and willingness to receive the HPV vaccine

Out of 428 girls, 128 (29.9%) had received at least one dose of the HPV vaccine and 55 (12.9%) had received 2 doses (Table 3). Of the 300 girls who had never received the HPV vaccine, 276 (92.9%) expressed willingness to be vaccinated. Majority of girls who had been vaccinated reported receiving the vaccine while still in school.

Factors associated with HPV vaccine uptake

Results from bivariate and multivariate analyses detailing the relationship between sociodemographic and behavioral variables and vaccine uptake (defined as having received at least one dose) are presented in Table 4. The strongest positive predictor was having had prior awareness of the vaccine (adjusted odds ratio (aOR) = 7.86, 95% CI: 4.68–13.59). Additionally, residence in the fishing community was associated with significantly higher uptake compared to residence in the inland community (aOR = 2.22, 95% CI: 1.30–3.84). Conversely, the duration out of school was a strong negative predictor; girls who had been out of school for 6–10 y were significantly less likely to have received the vaccine compared to those out for 1–5 y (aOR = 0.19, 95% CI: 0.10–0.35). Furthermore, having had sex previously was associated with a reduced likelihood of having received the vaccine (aOR = 0.52, 95% CI: 0.27–0.98).

HPV vaccine delivery model or approach

The most preferred vaccine delivery approach was community outreaches, endorsed by over half of the participants (n = 247, 57.7%), followed by health facilities (n = 228, 53.3%) (Figure 1). Other suggested approaches included door-to-door delivery (n = 125, 29.2%) and school outreaches (n = 90, 21.0%). A smaller proportion of participants (n = 85, 19.9%) recommended a combination of all methods. No participants expressed opposition to vaccination.

Table 2. Knowledge and attitudes toward the HPV vaccine among out-of-school girls in inland and fishing communities of Masaka district, Uganda.

Variable Category	Total	Inland community	Fishing community
Ever heard about the HPV vaccine: Yes	189 (44.2)	91 (48.1)	98 (51.9)
How is HPV transmitted? ^a			
Sexually	84 (44.4)	44 (48.4)	40 (40.8)
Other	22 (49.7)	9 (9.9)	13 (13.3)
I do not know	94 (49.7)	42 (46.2)	52 (53.1)
Diseases the HPV vaccine protects women from ^{a,b}			
Cancer of the uterus	29 (15.3)	21 (23.1)	8 (8.2)
Cancer of the cervix	141 (74.6)	63 (69.2)	78 (79.6)
Ano-rectal cancer	1 (0.5)	1 (1.1)	0 (0.0)
Ovarian cancer	2 (1.1)	1 (1.1)	1 (1.1)
I do not know	34 (18.0)	17 (18.7)	17 (17.3)
Is HPV vaccine essential for my health? ^c			
Strongly agree	190 (44.4)	91 (42.5)	99 (46.3)
Agree	124 (29.0)	63 (29.4)	61 (28.5)
Not sure	97 (22.7)	51 (23.8)	46 (21.5)
Disagree	17 (4.0)	9 (4.2)	8 (3.7)
Strongly disagree	0 (0.0)	0 (0.0)	0 (0.0)
Is HPV vaccine safe and effective? ^c			
Strongly agree	175 (40.9)	77 (36.0)	98 (45.8)
Agree	134 (31.3)	75 (35.0)	59 (27.6)
Not sure	99 (23.1)	51 (23.8)	48 (22.4)
Disagree	20 (4.7)	11 (5.1)	9 (4.2)
Strongly disagree	0 (0.0)	0 (0.0)	0 (0.0)
Any risks associated with getting the HPV vaccine ^{c,b}			
No associated risks	150 (35.0)	71 (33.2)	79 (36.9)
Minor side effects	70 (16.4)	35 (16.4)	35 (16.4)
Major side effects (infertility and/or cancer of the cervix)	22 (5.1)	10 (4.7)	12 (5.6)
Other	4 (0.9)	3 (1.4)	1 (0.5)
I do not know	187 (43.7)	98 (45.8)	89 (41.6)

^aOnly asked participants who had knowledge of HPV vaccine(189); ^bMultiple options allowed (percentages total may exceed 100%); ^c question answered by all participants.

Table 3. Uptake and willingness to receive the HPV vaccine among out-of-school girls in inland and fishing communities in Masaka district, Uganda.

Variable	Overall	Inland community	Fishing community
Total participants	428 (100)	214 (50.0)	214 (50.0)
Ever received an HPV vaccine dose			
No	297 (69.4)	154 (72.0)	143 (66.8)
Yes	128 (29.9)	57 (26.6)	71 (33.2)
Not sure	3 (0.7)	3 (1.4)	0 (0.0)
Vaccine doses received			
Not vaccinated	300 (70.1)	157 (73.4)	143 (66.8)
One dose	73 (17.1)	32 (15.0)	41 (19.2)
Two doses	55 (12.9)	25 (11.7)	30 (14.0)
Where did you receive vaccination from ^a			
School	97 (73.5)	48 (80.0)	49 (68.1)
Hospital	14 (10.6)	6 (10.0)	8 (11.1)
Community outreach	21 (15.9)	6 (10.0)	15 (9.7)
Willingness to receive HPV vaccine if offered one ^c			
No	7 (2.4)	4 (2.6)	3 (2.1)
Not sure	14 (4.7)	2 (1.3)	12 (8.4)
Yes	276 (92.9)	14 (96.1)	128 (89.5)

^aOnly girls who were vaccinated (128); ^bMultiple options allowed (percentages total may exceed 100%); ^conly girls who were not vaccinated (297).

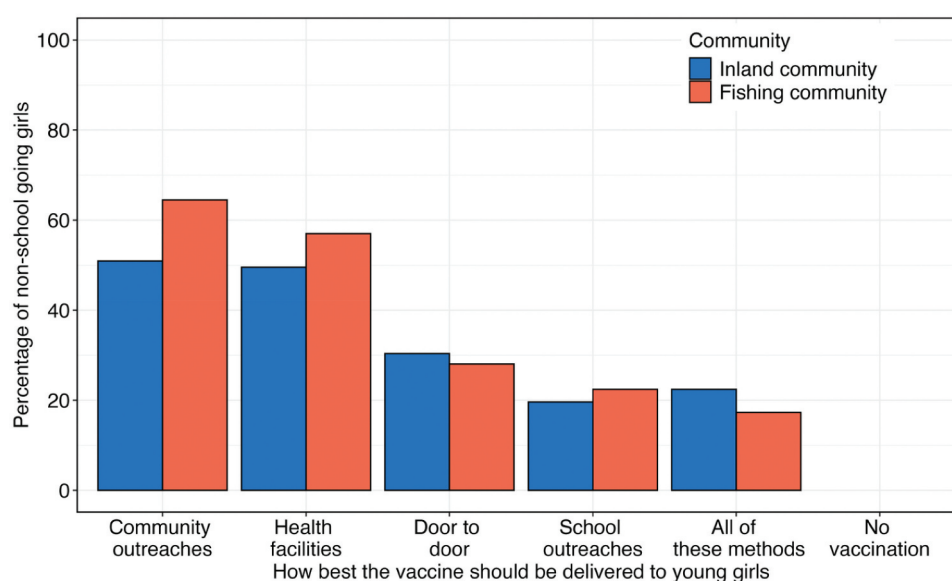
Discussion

This study investigated the knowledge, perceptions, and uptake of the HPV vaccine among out-of-school girls in inland and fishing communities in Masaka, Uganda. We found that most girls had never heard of the HPV vaccine, a trend consistent across both communities. Slightly higher but still suboptimal levels of awareness were reported in a study conducted in Kampala.¹⁵ The knowledge gap identified in our study may be attributed to limited sensitization efforts on HPV vaccination, as noted by other researchers in Uganda.^{15,23} Among the

Table 4. Factors associated with HPV vaccine uptake among out-of-school girls in inland and fishing communities of Masaka district, Uganda.

Characteristic	Total participants	HPV vaccination uptake rate ^b , n (row %)	OR (95% CI)	p-value	aOR (95% CI)	p-value
Total participants	425 (100) ^a	128 (30.1)				
Community						
Inland community	211 (49.6)	57 (27.0)	1.0		1.00	
Fishing community	214 (50.4)	71 (33.2)	1.34 (0.85, 2.04)	.167	2.22 (1.30, 3.84)	.004
Age category						
9–12	29 (6.8)	9 (31.0)	1.0		1.00	
13–17	197 (46.4)	64 (32.5)	1.07 (0.47, 2.59)	.876	0.92 (0.35, 2.56)	.871
18–20	199 (46.8)	55 (27.6)	0.85 (0.37, 2.06)	.704	1.00 (0.32, 3.18)	.994
Religion						
Christian	352 (82.8)	111 (31.5)	1.00		1.00	
Muslim	73 (17.2)	17 (23.3)	0.66 (0.36, 1.16)	.164	0.83 (0.40, 1.64)	.593
Highest level of Education						
No formal Ed/P1–P4	154 (36.2)	46 (29.9)	1.00	.933		
P5 – P6	271 (63.8)	82 (30.3)	1.02 (0.66, 1.58)			
Years out of school						
1–5 y	276 (64.9)	108 (39.1)	1.00		1.00	
Above 6 y	149 (35.1)	20 (13.4)	0.24 (0.14, 0.40)	<.001	0.19 (0.10, 0.35)	<.001
Marital status						
Single/never married	341 (80.2)	105 (30.8)	1.00	.542		
Currently/previously married/cohabiting	84 (19.8)	23 (27.4)	0.85 (0.49, 1.43)			
Employment status						
Employed	141 (33.2)	36 (25.5)	1.00		1.00	
Unemployed	284 (66.8)	92 (32.4)	1.40 (0.89, 2.22)	.147	1.00 (0.57, 1.75)	.999
Ever had sex						
No	159 (37.4)	60 (37.7)	1.00		1.00	
Yes	266 (62.6)	68 (25.6)	0.57 (0.37, 0.87)	.008	0.52 (0.27, 0.98)	.045
Ever heard about HPV disease and vaccine						
No	236 (55.5)	33 (14.0)	1.00		1.00	
Yes	189 (44.5)	95 (50.3)	6.22 (3.94, 10.01)	<.001	7.86 (4.68, 13.59)	<.001

^aExcluded 3 participants that were not sure if they had been vaccinated; ^bConsidering participants who had received at least one dose.

**Figure 1.** Summary of preferences of the vaccine delivery strategies by community.

girls aware of the HPV vaccine in our study, healthcare workers were the primary source of information, followed by teachers. While most girls recognized that the vaccine protects against cervical cancer, about half did not know how HPV is transmitted. This low level of awareness has been reported in other countries in the region and may be improved upon by provision of information, for example through the internet using social media which is quite popular especially among young persons in this setting.¹² Since most information was

primarily obtained from healthcare workers and teachers, it is plausible that exposure occurred while the girls were still in school, where vaccination programs are mostly delivered in the country. Consequently, girls who drop out or never attend school miss crucial opportunities for both essential health education and vaccination. These findings highlight the urgent need for health education and vaccination programs specifically targeting out-of-school girls. The aspect of creating awareness amongst parents is extremely important given that the program in Uganda and other countries in the region is mostly targeting young girls in the age group of 9–12 y who do not have self-autonomy.²⁴ Parents are often the primary decision-makers regarding whether their daughters are vaccinated, making their attitudes and perceptions critically important.^{18,25,26} We shall share findings regarding our engagement with parents in a separate qualitative results paper.

Most girls agreed that the HPV vaccine is essential for their health and considered it safe and effective. While the majority were unsure about potential risks or believed the vaccine to be risk free, a small but important minority expressed concerns that it could cause infertility or even cervical cancer. This is a very important group because these opinions can easily influence the decision of others to take up the vaccine. Similar concerns have previously been reported in other settings in the country,^{15,27,28} emphasizing the need to have these addressed through health education. On the other hand, it is interesting and encouraging that most girls considered the vaccine to be essential, including those who had never been vaccinated.

Uptake of the HPV vaccine in our study was low, with only 30% having received at least one dose and 13% completing two doses. In comparison, Uganda's national HPV vaccination coverage in 2021 was estimated at 75% for the first dose and 44% for the second dose in 2021.¹¹ Similar studies to our own in other populations have also reported low HPV vaccination rates, suggesting the existence of sub-populations not adequately reached by national vaccination services. For instance, a study in Lira, a town in northern Uganda, reported a very low uptake (at least one dose) of 19.6% among school-going girls aged 9–14 y.²⁹ Similarly, another study in fishing communities in Wakiso and Mukono districts found uptake as low as 10.6% among girls and young women aged 9–25 y.³⁰ These findings underscore the critical need for targeted strategies to increase HPV vaccine uptake in specific settings, including rural areas³¹ and communities with high school dropout rates.³²

Uptake of the HPV vaccine was associated with residence in the fishing community. It is not very clear why this was the case. There is no evidence to show that current school-based vaccination outreaches are implemented differently in one setting over another. One potential explanation is the spillover effect from HIV-related health campaigns. Because these communities are high-risk areas, non-governmental organizations have established a strong presence, likely increasing overall health literacy and the acceptance of preventative services like vaccination. It is noteworthy that girls in the fishing community are not any less likely to take up the vaccine compared to their inland-dwelling counterparts given the higher risk of sexual exposure in this setting. A prolonged absence from school was associated with a reduced likelihood of vaccination. This underscores that schools are crucial for facilitating immunizations in the nationally recommended age group.³³ This emphasizes the need to promote continuity in school as another way of promoting good health practices including uptake of the HPV vaccine. It is unfortunate that girls that had ever had sex were less likely to have received the HPV vaccine. This is concerning, because HPV exposure occurs from sexual intercourse. This situation represents a missed opportunity since the HPV vaccine is most effective when given prior to sexual debut.³⁴ Unsurprisingly, girls that had heard about the HPV vaccine were more likely to be vaccinated. This information was most likely received at the time just before vaccination.

On a positive note, while many girls in our study had never received the HPV vaccine, majority of this unvaccinated group expressed willingness to get vaccinated if the opportunity arose. This indicates that lack of access, rather than unwillingness, is the primary barrier to vaccination in this setting. The finding highlights the urgent need for alternative delivery strategies targeting out-of-school girls. Our inquiry into preferred delivery methods revealed that community outreaches, health facilities, and door-to-door approaches were favored, indicating that girls prefer to receive vaccines from their communities. Implementing accessible, community-based vaccination programs is therefore crucial for improving uptake. Our findings reveal a significant equity gap within the framework that mostly targets school-going girls. While school-based programs are potentially efficient for reach, they inherently exclude girls who have dropped out or never enrolled, a demographic that often faces higher risks of early sexual debut, leading to HPV exposure.^{35,36} Our study adds value by identifying that this “missing” population is not necessarily vaccine-hesitant, but rather service-excluded. Unlike the national focus on schools, our data suggests that for out-of-school girls, the program should shift toward community-integrated models. In

Kenya, HPV vaccination was rolled out in 2019, and the vaccine is delivered through health facilities with information and mobilization campaigns conducted in schools and communities.^{37,38} In Tanzania, vaccination was rolled out in 2018 and the vaccine is administered at health facilities and through community outreaches, including to schools.³⁹ By leveraging the high willingness found in our study among unvaccinated girls and the community's preference for door-to-door or local outreach, health planners can design interventions that supplement the school-based model, ensuring no girl is left behind due to her educational status. In addition, successful implementation would also require robust mobilization and health education efforts to address knowledge gaps and counter misinformation.

One limitation of this study is the absence of a comprehensive sampling frame for out-of-school girls in the target communities, which restricts the representativeness and, consequently, the generalizability of our findings. To mitigate this, we made a concerted effort to include all accessible girls until the sample size was reached. Additionally, due to poor local record-keeping practices, we relied on self-reported vaccination status and did not require participants to present vaccination cards while recall bias may also have affected some of the responses. To enhance accuracy, interviewers were trained to confirm that the vaccine being reported was indeed the HPV vaccine, and when confirmation was not possible, responses were recorded as “not sure.” We used a snowballing approach in participant selection which could have led to selection bias. Additionally, we did not include assessment of broader socioeconomic factors such as household income, parental education, and access to transportation which may influence healthcare access and health-seeking behaviors. Lastly, we may not have assessed all variables that may affect vaccine uptake in this setting leading to residual confounding. A key strength of the study is the large sample size, which allowed for robust and precise estimates, along with the inclusion of two populations with distinct community dynamics, providing valuable comparative insights.

Conclusion

This study found that HPV vaccine awareness and uptake were critically low among out-of-school girls in both fishing and inland communities, despite an early sexual debut. Encouragingly, most unvaccinated girls expressed willingness to receive the vaccine. These findings highlight a clear opportunity for intervention, such as community outreaches targeting eligible unvaccinated girls. To address the coverage gap effectively, public health strategies should focus on improving access through preferred delivery methods, including community-based outreaches and health facility services. Concurrently, targeted health education is essential to increase awareness and correct misinformation about the HPV vaccine. Such education should reach not only young girls but also parents, teachers, and other influential persons involved in vaccination decisions.

Acknowledgments

We acknowledge our study participants as well as the field mobilizers who made this study possible. Successful study implementation was also enabled by the community leaders, community advisory board, district health authorities including the district health officer.

Author contributions

CRediT: **Paddy Kafeero**: Data curation, Formal analysis, Writing – review & editing; **Violet Ankunda**: Data curation, Formal analysis, Writing – original draft, Writing – review & editing; **Richard Muhumuza**: Conceptualization, Methodology, Project administration, Writing – review & editing; **Freddie Mukasa Kibengo**: Methodology, Writing – review & editing; **Martin Onyango**: Investigation, Methodology, Writing – review & editing; **Hadijah Naluyinda**: Data curation, Investigation, Writing – review & editing; **Daniel Opoka**: Methodology, Writing – review & editing; **Maria Teddy Ndagire**: Data curation, Investigation, Writing – review & editing; **Esther Awino**: Data curation, Investigation, Writing – review & editing; **Isiimael Hibombo**: Data curation, Investigation, Writing – review & editing; **Geoffrey Kimbugwe**: Methodology, Writing – review & editing; **Dorothy Ainembabazi**: Investigation, Writing – review & editing; **Ivan Kasamba**: Data curation, Methodology, Writing – review & editing; **Ubaldo Bahemuka**: Methodology, Writing – review & editing; **Gloria Lubega**: Methodology, Writing – review & editing; **Vincent Basajja**: Project administration, Supervision, Writing – review & editing; **Sylvia Kusemererwa**: Methodology, Writing – review & editing; **Joseph Lutaakome**: Methodology, Writing – review & editing; **Yunia Mayanja**: Methodology, Writing – review & editing; **Joseph Mugisha**: Methodology, Writing – review & editing; **Eugene Ruzagira**: Methodology, Supervision, Writing – review & editing.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

The work was supported by the MRC/UVRI & LSHTM Uganda Research Unit.

Notes on contributor

Jonathan Kitonsa is a medical doctor and Research Scientist at the MRC/UVRI & LSHTM Uganda Research Unit. He holds a Bachelor of Medicine and Bachelor of Surgery (MBChB) from Makerere University, a Master of Public Health (MPH), and is currently a PhD Fellow at the Brighton and Sussex Medical School.

With over a decade of experience in clinical research, Dr. Kitonsa has participated and led numerous high-impact studies, including Phase I-III clinical trials for HIV and COVID-19 vaccines. His research portfolio focuses on infectious disease epidemiology, the evaluation of novel vaccine candidates, and implementation science strategies to improve healthcare access for underserved populations in sub-Saharan Africa.

Recently, his work has expanded to address vaccine equity among adolescent populations, specifically investigating the barriers to HPV vaccination uptake among out-of-school girls in Uganda. Through this work, Dr. Kitonsa aims to generate evidence-based strategies to inform national immunization policies and support the global goal of cervical cancer elimination. He has authored multiple peer-reviewed publications and actively collaborates with international partners to advance global health security.

ORCID

Jonathan Kitonsa  <http://orcid.org/0000-0003-2467-4037>

Data availability statement

The de-identified individual participant data that underlie the results reported in this article are stored in a non-publicly available repository (London School of Hygiene & Tropical Medicine [LSHTM] Data Compass), together with a data dictionary accessible at <https://datacompass.lshtm.ac.uk>. Requests to access the data can also be submitted through e-mail: researchdatamanagement@lshtm.ac.uk

References

1. World Health Organisation. WHO guideline for screening and treatment of cervical pre-cancer lesions for cervical cancer prevention. Geneva (Switzerland): World Health Organisation; 2021.
2. World Health Organisation. Human papillomavirus (HPV) and cervical cancer. WHO fact sheet. Geneva: World Health Organisation; 2020.
3. World Health Organisation. Human papillomavirus vaccines: WHO position paper, May 2017; Wkly Epidemiol Rec 2017;92:241–268.
4. UNICEF. Human papilloma virus (HPV) vaccine fact sheet. Kampala: United Nations Children's Fund.
5. Moyo E, Moyo P, Murewanhema G, Mhango M, Chitungo I, Dzinamarira T. Key populations and sub-Saharan Africa's HIV response. *Front Public Health*. 2023;11:1079990.
6. Stelzle D, Tanaka LF, Lee KK, Ibrahim Khalil A, Baussano I, Shah ASV, McAllister DA, Gottlieb SL, Klug SJ, Winkler AS, et al. Estimates of the global burden of cervical cancer associated with HIV. *Lancet Glob Health*. 2021;9(2):e161–e169. doi: [10.1016/S2214-109X\(20\)30459-9](https://doi.org/10.1016/S2214-109X(20)30459-9).
7. Centers for Disease Control and Prevention. HPV vaccination. Atlanta (GA): U.S. Department of Health and Human Services; 2024.
8. World Health Organization. WHO guideline for screening and treatment of cervical pre-cancer lesions for cervical cancer prevention. Geneva: World Health Organisation; 2021.
9. Lei J, Ploner A, Elfström KM, Wang J, Roth A, Fang F, Sundström K, Dillner J, Sparén P. HPV vaccination and the risk of invasive cervical cancer. *N Engl J Med*. 2020;383(14):1340–1348. doi: [10.1056/NEJMoa1917338](https://doi.org/10.1056/NEJMoa1917338).
10. World Health Organization. WHO updates recommendations on HPV vaccination schedule. WHO news release. Geneva: World Health Organization; 2022.
11. Bruni LAG, Serrano B, Mena M, Collado JJ, Gómez D, Muñoz J, Bosch FX, de Sanjosé S. Human papillomavirus and related diseases in Uganda. Summary report 2023. Barcelona, Spain: ICO/IARC HPV Information Centre (Institut Català d'Oncologia, L'Hospitalet del Llobregat); 2023. <https://hvpcentre.net/>.

12. Wassie M, Zegeye AF, Mekonen EG, Tekeba B, Ali MS, Gonete AT, Kassie AT, Workneh BS, Alemu TG, Tamir TT. Human papillomavirus vaccination coverage among young women in the three sub-Saharan African countries using demographic and health surveys data. *Hum Vaccin Immunother.* 2024;20(1):2370111. doi: [10.1080/21645515.2024.2370111](https://doi.org/10.1080/21645515.2024.2370111).
13. Berhanu W, Gobbo E, Herzig van Wees S, Hanson C, Addissie A. Rumors and fears about the HPV vaccine: perceptions of adolescent girls in government school in Addis Ababa. *Hum Vaccin Immunother.* 2025;21(1):2578894. doi: [10.1080/21645515.2025.2578894](https://doi.org/10.1080/21645515.2025.2578894).
14. Ohaeri B, Adefolaju AO, Onyeneho CA. Knowledge, attitudes and perceptions of Nigerian parents towards human papilloma virus (HPV) vaccines. *Eur J Midwifery.* 2020;4:2. doi: [10.18332/ejm/114886](https://doi.org/10.18332/ejm/114886).
15. Bitariho GK, Tuhebwe D, Tigaiza A, Nalugya A, Ssekamatte T, Kiwanuka SN. Knowledge, perceptions and uptake of human papilloma virus vaccine among adolescent girls in Kampala, Uganda; a mixed-methods school-based study. *BMC Pediatr.* 2023;23(1):368. doi: [10.1186/s12887-023-04174-z](https://doi.org/10.1186/s12887-023-04174-z).
16. BusinessFocus. Parliament to probe increasing primary school dropout rates. 2023.
17. Uganda Bureau of Statistics. National population and housing census 2014: main report. Kampala, Uganda: Uganda Bureau of Statistics (UBOS); 2016. <https://www.ubos.org/>.
18. Ko LK, Taylor VM, Mohamed FB, Do HH, Gebeyaw FA, Ibrahim A, Ali AA, Winer RL. “We brought our culture here with us”: a qualitative study of perceptions of HPV vaccine and vaccine uptake among East African immigrant mothers. *Papillomavirus Res.* 2019;7:21–25. doi: [10.1016/j.pvr.2018.12.003](https://doi.org/10.1016/j.pvr.2018.12.003).
19. Ngabirano TD, Saftner MA, McMorris BJ. Exploring health behaviors in Ugandan adolescents living in rural fishing communities. *J Sch Nurs.* 2022;38(2):148–160. doi: [10.1177/1059840520947142](https://doi.org/10.1177/1059840520947142).
20. Nanyonjo G, Asiki G, Ssetaala A, Nakaweesa T, Wambuzi M, Nanvubya A, Mpendo J, Okech B, Kitandwe PK, Nielsen L, et al. Prevalence and correlates of HIV infection among adolescents and young people living in fishing populations along Lake Victoria Fishing Communities in Uganda. *Pan Afr Med J.* 2020;37:208. doi: [10.11604/pamj.2020.37.208.26124](https://doi.org/10.11604/pamj.2020.37.208.26124).
21. Mafigiri R, Matovu JK, Makumbi FE, Ndyababo A, Nabukalu D, Sakor M, Kigozi G, Nalugoda F, Wanyenze RK. HIV prevalence and uptake of HIV/AIDS services among youths (15–24 years) in fishing and neighboring communities of Kasensero, Rakai District, South Western Uganda. *BMC Public Health.* 2017;17(1):251. doi: [10.1186/s12889-017-4166-2](https://doi.org/10.1186/s12889-017-4166-2).
22. Malande OO, Munube D, Afaayo RN, Annet K, Bodo B, Bakainaga A, Ayebare E, Njunwamukama S, Mworozzi EA, Musyoki AM, et al. Barriers to effective uptake and provision of immunization in a rural district in Uganda. *PLOS ONE.* 2019;14(2):e0212270. doi: [10.1371/journal.pone.0212270](https://doi.org/10.1371/journal.pone.0212270).
23. Nabirye J, Okwi LA, Nuwematsiko R, Kiwanuka G, Muneza F, Kamya C, Babirye JN. Health system factors influencing uptake of human papilloma virus (HPV) vaccine among adolescent girls 9–15 years in Mbale district, Uganda. *BMC Public Health.* 2020;20(1):171. doi: [10.1186/s12889-020-8302-z](https://doi.org/10.1186/s12889-020-8302-z).
24. Lin Z, Chen S, Su L, Liao Y, Chen H, Hu Z, Chen Z, Fang Y, Liang X, Chen J, et al. Influences of HPV disease perceptions, vaccine accessibility, and information exposure on social media on HPV vaccination uptake among 11,678 mothers with daughters aged 9–17 years in China: a cross-sectional study. *BMC Med.* 2024;22(1):328. doi: [10.1186/s12916-024-03538-1](https://doi.org/10.1186/s12916-024-03538-1).
25. Wijayanti KE, Schütze H, MacPhail C. Parents’ attitudes, beliefs and uptake of the school-based human papillomavirus (HPV) vaccination program in Jakarta, Indonesia – a quantitative study. *Prev Med Rep.* 2021;24:101651. doi: [10.1016/j.pmedr.2021.101651](https://doi.org/10.1016/j.pmedr.2021.101651).
26. Kotromanovic Simic I, Kotromanovic D, Lovrinovic Pavlovic N, Kovačević J, Olujic M, Nujic D, Matic Licanin M, Matić I, Sakic Radetic J, Tomas I, et al. Parents’ attitudes and beliefs towards human papillomavirus vaccination. *Vaccines (Basel).* 2025;13(11):1085. doi: [10.3390/vaccines13111085](https://doi.org/10.3390/vaccines13111085).
27. Twikirize B, Kalibwani R, Amanyire J. Assessment of knowledge, attitude and perception of human papilloma virus vaccination among parents of young girls (aged 8–12) in Mbarara city. A cross-sectional study. *Student’s J Health Res Africa.* 2023;4:14.
28. Turiho AK, Okello ES, Muhwezi WW, Katahoire AR. Perceptions of human papillomavirus vaccination of adolescent schoolgirls in Western Uganda and their implications for acceptability of HPV vaccination: a qualitative study. *BMC Res Notes.* 2017;10(1):431. doi: [10.1186/s13104-017-2749-8](https://doi.org/10.1186/s13104-017-2749-8).
29. Nakayita RM, Benyumiza D, Nekesa C, Misuk I, Kyeswa J, Nalubuuka A, Murungi T, Udho S, Kumakech E. Factors associated with uptake of human papilloma virus vaccine among school girls aged 9–14 years in Lira city northern Uganda: a cross-sectional study. *BMC Women’s Health.* 2023;23(1):362. doi: [10.1186/s12905-023-02511-z](https://doi.org/10.1186/s12905-023-02511-z).
30. Laban M, Nanyonjo G, Wambuzi M, Ssetaala A, Basalirwa G, Muramuzi D, Lugemwa JK, Okech B, Mirzazadeh A. Uptake of human papilloma virus vaccine among young women living in fishing communities in Wakiso and Mukono districts, Uganda. *PLOS Glob Public Health.* 2024;4(4):e0003106. doi: [10.1371/journal.pgph.0003106](https://doi.org/10.1371/journal.pgph.0003106).
31. Einarson TA, Musana E, Balonde J, Lorentzen KB, Kallestrup R, Juncker M, Damoi JO, Nakami S, Kallestrup P. Human papillomavirus awareness, vaccination rate, and sociodemographic covariates of vaccination status in a low-income country: a cross-sectional study in the rural Busoga region of Uganda. *Vaccine.* 2025;53:127089. doi: [10.1016/j.vaccine.2025.127089](https://doi.org/10.1016/j.vaccine.2025.127089).

32. Uganda Radio Network. Zombo grapples with low primary school completion rate among girls. Uganda Radio Network. Kampala: Uganda Radio Network; 2023.
33. Isabirye A, Mbonye M, Asiimwe JB, Kwagala B. Factors associated with HPV vaccination uptake in Uganda: a multi-level analysis. *BMC Women's Health*. 2020;20(1):145. doi: [10.1186/s12905-020-01014-5](https://doi.org/10.1186/s12905-020-01014-5).
34. Adjei Boakye E, McKinney SL, Whittington KD, Boyer VE, Franca MC, Lee M, McKinnies RC, Collins SK, Gerend MA. Association between sexual activity and human papillomavirus (HPV) vaccine initiation and completion among college students. *Vaccines (Basel)*. 2022;10(12):2079. doi: [10.3390/vaccines10122079](https://doi.org/10.3390/vaccines10122079).
35. Kiiru S, Thiongo M, Gichangi P. Correlates of early sex debut among adolescents and young women: a national cross-sectional study [version 1; peer review: 1 approved]. *Gates Open Res*. 2024;8:33. doi: [10.12688/gateopenres.15272.1](https://doi.org/10.12688/gateopenres.15272.1).
36. Omona K, Ssuka JK. Early sexual debut and associated factors among adolescents in Kasawo sub-county, Mukono district, Uganda. *Cogent Public Health*. 2023;10(1):2183561. doi: [10.1080/27707571.2023.2183561](https://doi.org/10.1080/27707571.2023.2183561).
37. Umutesi G, Oluoch L, Weiner BJ, Bukusi E, Onono M, Njoroge B, Mecca L, Ngure K, Mugo NR, Barnabas RV. HPV vaccination in Kenya: a study protocol to assess stakeholders' perspectives on implementation drivers of HPV vaccination and the acceptability of the reduced dose strategy among providers. *Front Health Serv*. 2023;3:1233923. doi: [10.3389/frhs.2023.1233923](https://doi.org/10.3389/frhs.2023.1233923).
38. Karanja-Chege CM. HPV vaccination in Kenya: the challenges faced and strategies to increase uptake. *Front Public Health*. 2022;10:802947. doi: [10.3389/fpubh.2022.802947](https://doi.org/10.3389/fpubh.2022.802947).
39. Li AJ, Manzi F, Kyesi F, Makame Y, Mwenge W, Fleming M, Mkopi A, Mmbaga S, Lyimo D, Loharikar A. Tanzania's human papillomavirus (HPV) vaccination program: community awareness, feasibility, and acceptability of a national HPV vaccination program, 2019. *Vaccine*. 2022;40:A38–A48. doi: [10.1016/j.vaccine.2021.06.047](https://doi.org/10.1016/j.vaccine.2021.06.047).