

Full Length Research Paper

Providers' and government officials' perspective of factors affecting human papilloma virus vaccination, cervical cancer screening and treatment in Kampala, Uganda- a qualitative study

Kavanya Feustel¹, Kia Lechleitner^{1*}, Ronald Anguzu², Simon Kibira³, Danielle Savino¹, Courtney Jankowski², Robert Lukande⁴, Simon Kasasa⁵ and Kirsten Beyer²

¹Medical College of Wisconsin, United States.

²Division of Epidemiology and Social Sciences, Institute for Health and Equity, Medical College of Wisconsin, United States.

³Department of Community Health and Behavioral Sciences, Makerere School of Public Health, Uganda.

⁴Department of Pathology, Makerere University College of Health Sciences, Uganda.

⁵Department of Epidemiology and Biostatistics, Makerere University School of Public Health, Uganda.

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Uganda has one of the highest age-standardized cervical cancer (CxCa) incidence rates in Eastern Africa (56.2/100,000 women), due to limited provision and access to CxCa prevention strategies through Human Papillomavirus (HPV) vaccination, CxCa screening and treatment. This study identified barriers and facilitators to HPV vaccination, cervical cancer screening and treatment from CxCa providers' perspectives in Uganda. This qualitative study was conducted among 11 purposively selected healthcare providers and policy makers who offer CxCa prevention and treatment services in Uganda. Interviews explored barriers and facilitators to CxCa prevention strategies from providers' perspectives. Thematic content analysis was conducted, and emergent codes grouped and described. Multilevel barriers limit CxCa prevention and treatment at the individual, community, provider, environmental and systemic levels. Primary barriers include uncoordinated healthcare delivery, misconceptions fueled by poor understanding and information delivery, sociocultural norms and financial and geographic hurdles. Primary, secondary, and tertiary cervical cancer prevention has been successful in availability of screening materials and provider knowledge. Ugandan women remain highly susceptible to CxCa despite a robust vaccination program and increasing capacity for secondary and tertiary preventive measures. Providers need greater fiscal and professional support. Women require digestible information to create demand for the HPV vaccine and increase screening uptake.

Key words: Cervical cancer; women's health; cancer prevention; cancer screening; human papillomavirus (HPV).

INTRODUCTION

The age-standardized rate of cervical cancer (CxCa) incidence in Uganda is 56.2/100,000 women, almost double that of bordering Eastern African countries of South Sudan (20.5), Kenya (31.3), and Rwanda (28.2)

(Bruni et al, 2021). CxCa is the most frequently diagnosed cancer and leading cause of cancer-related deaths among women in Uganda (Bruni et al, 2021; Baldwin et al, 2003). Almost 4,000 yearly cases of CxCa

are diagnosed in Uganda, resulting in at least 2,200 deaths per year (Bruni et al, 2021). Human Papillomavirus (HPV) is the main cause of CxCa, with at least 57% of both adenocarcinoma and squamous cell carcinoma of the cervix in Uganda reported to be caused by HPV 16 and 18, two of the most virulent strains (Bruni et al, 2021; Baldwin et al, 2003; Banura et al, 2011).

Current best practice for the prevention and control of CxCa includes a combination of HPV vaccination, cervical cancer screening and treatment of identified cases. Uganda began an HPV vaccination program in 2008 to address the high rates of HPV and consequential diseases with the goal to vaccinate 140,000 girls aged 9 to 12 in two of the 134 districts (Ministry of Health, 2010; Gulland, 2012).

This program was up scaled in 2012 to 12 additional districts, then again in 2015 to deliver the vaccine to all 134 districts in the country (Ministry of Health, 2010). A partnership with Merck Pharmaceuticals provided 460,000 free doses of the quadrivalent vaccine to protect against HPV 6, 11, 16 and 18 (Schlecht et al., 2003). Recent data suggested that 85% of Ugandan target-aged girls received the first dose of the two-dose regimen, but only 41% of girls received the second dose (Mwebembezi, 2019).

Screening is low, with the once per lifetime cervical screening rate being only 4.8% rurally and 30% in urban Uganda, mainly Kampala (World Health Organization, 2014). Uganda's standard cervical screening method is founded in a "See and Treat" algorithm established by the Ministry of Health (MOH) in 2010.

Their primary method employs visual inspection with acetic acid to the cervix (VIA) with removal of tissue suspicious for dysplasia and neoplasia with cryotherapy (Ministry of Health, 2010). Gas and equipment for the procedure are limited as only two distributors exist in Uganda, both located in Kampala (World Health Organization, 2014; Nakisige et al., 2017). If a suspicious lesion is identified, further pathology laboratory processes all the samples (Nakisige et al., 2017). physicians trained to perform this procedure tools and Few mobile teams transport the equipment to rural areas, workup is required by colposcopy with and only one Only three government facilities have the biopsy leaving time for loss to follow-up and disease advancement in patients diagnosed with CxCa (Mutuyaba et al., 2006).

Unfortunately, 75% of Ugandan CxCa cases present at an advanced stage (stage III or greater), resulting in poor prognosis and significant treatment needs (Twinomujuni et al., 2015). Surgical excision, chemotherapy and external beam radiation therapy are treatments available for varying stages of CxCa as supported by the American Society of Clinical Oncology, which the Ugandan MOH

references in its treatment protocols (Ministry of Health, 2010). Surgical excision is promoted in treatment of early stage CxCa, but current access to operating theaters and trained personnel is limited to ten days per year (Nakisige et al., 2017). Radiation therapy is used to treat or control more advanced disease. The Uganda Cancer Institute (UCI) houses the nation's now three radiotherapy machines.

The first was installed in 1995 as a second-hand donation; it terminally broke down in March 2016 and was replaced in January 2018 through a partnership between the Ugandan government and the International Atomic Energy Agency (Ampurire, 2020; International Atomic Energy Agency, 2018). It alone was used to treat up to 36,000 patients annually, until a second machine was installed and commissioned in February 2020 through a partnership with India (Ampurire, 2020). A third, more complex, TrueBeam machine was installed in December 2020, which was purchased with MOH funds and installed through a partnership with Varian Medical Systems (Atukunda, 2020). Previously, patients waited many days for their turn to initiate treatment followed by daily waiting for hours for their turn at radiation therapy (Mutuyaba et al., 2006).

The UCI also offers chemotherapy, which is subject to the same limitations as cryotherapy as well as the high cost to the consumer (Uganda Bureau of Statistics, 2018).

Significantly, a majority of Ugandans meet their health expenses out of pocket, as no national health insurance program exists. Only a few can afford insurance in the private sector.

There are many historically reported obstacles in prevention, screening, patient retention, and treatment delivery in Uganda. This exploratory study aims to identify facilitators and barriers to adequate primary, secondary, and tertiary prevention of CxCa in Uganda from the perspective of professionals actively working in this area.

MATERIALS AND METHODS

Theoretical framework

An Ecological Model for Health Promotion, proposed by McLeroy and colleagues (1988), was adopted as the theoretical framework to guide the design and analysis of this study (McLeroy et al, 1988). McLeroy et al. (1988) described five levels of influence on patterned behavior, primarily guided through one's interests which both shape and are shaped by one's environment. The analytic levels are intrapersonal factors, interpersonal factors, institutional factors, community factors, and public policy. This framework adopted a priori to provide structure to the study and adapted as analyses were conducted.

*Corresponding author. E-mail: klechleitner@mcw.edu

Individual influences encompassed an individual's knowledge, attitudes and behavior. Community influences are defined as the effects one experiences due to their professional, social and family networks. Provider factors were added to the referenced schema due to the direct impact professionals have on multiple levels and for clear delineation of their impact to be used for future actions. Environmental factors are defined as geographical, media and political influence and the innately slow-growing nature of HPV. Systemic factors included state determined public policy as well as healthcare policy and practices as determined by hospital administration, individual providers and availability of resources.

Study design

This focused, qualitative study consists of interviews with key informants (providers, researchers, government officials) to explore current opinions and perceptions regarding CxCa vaccination, screening and treatment in Kampala, Uganda.

Study setting

This study was completed primarily in Kawempe District. Sites visited included Mulago Hospital, Mulago National Referral Hospitals, Child and Family Foundation of Uganda, Reproductive Health Uganda, Makerere University College of Health Sciences (formerly Medical School) and the Uganda MOH. The population of the district of Kampala is estimated to be 1.7 million in 3,263 square miles according to the Uganda Bureau of Statistics census projections for 2019 (Uganda Bureau of Statistics, 2018). Within Kampala, the largest hospital is Mulago Hospital, which includes the UCI. This setting was selected for its dense population of healthcare providers of all levels and proximity to the MOH.

Study population and sampling procedure

Key informants included healthcare providers, researchers and policy makers identified by colleagues at Makerere University, literature searches and snowball sampling. Participants were approached face-to-face and via email.

Inclusion criteria required the respondent to be a researcher, provider or other authority on the state of CxCa and HPV in Uganda and to be conversant in English.

Exclusion criteria included age less than 18 years. Subjects were consented in accordance with both overseeing institutions' human subjects' protection protocols, the Medical College of Wisconsin and Makerere University. A total of eleven individuals consented and participated in the interviews and saturation was reached as themes were repetitive and new interviews did not provide newer information.

Data collection

Prior to information gathering, a semi-structured list of open-ended questions was prepared and internally validated to guide the 30 to 60 min expert interviews. The in-depth interviews were conducted in-person at various clinics as well as virtually and explored respondents' perceptions, views and knowledge of three main subjects: 1) HPV vaccination and infection, 2) CxCa screening and 3) CxCa treatment. These areas were explored according to each interviewee's area of expertise. Additional questions were administered to health care providers to obtain information on the availability of supplies, personnel and training to deliver adequate care.

Key informants were provided with details of the objectives, methods, and the advantages and disadvantages of participation in this study. Once agreeable, in-depth interviews were conducted by two female researchers, from June 2018 to June 2020, and audio recorded if participants consented. The interviews concluded when no further information was obtained from the subject. Field notes were made during and after the interviews. The audio-recordings were transcribed using f4transkript software and accuracy confirmed by repeat listening of the recordings with the associated transcript (Dresing and Pehl, 2004).

Qualitative data analysis approach

Three investigators reviewed eleven transcripts. Emerging codes were generated from meaningful quotes as used in specific interviewee contexts of facilitators and barriers to HPV vaccination, CxCa screening and treatment. Additionally, a small subset of preexisting codes was used as determined during the interview tool development. The following steps were employed using MAXQDA qualitative data analysis software (VERBI Software, 2019).

In vivo

During the first pass of coding, in vivo methods were employed. This process included analyzing a selection of representative transcripts to identify apparent major themes. Here, we used color coding, clips of direct quotes, summary statements and analytical memos to track the themes and supporting data. As the transcripts were coded, data analyses and notes were continually condensed and grouped to create concise and unique codes.

Processed

Concurrently with in vivo coding, processed themes and codes were noted. These were gerund phrases reflecting the coders' observations of thoughts and actions, both observable and conceptual, described within the transcripts.

Initial/Focused

All thoughts, reflections and insights coders identified during the in vivo and processed coding were recorded. These Free Codes were then integrated into the code book as an auxiliary data set and influenced final codes.

The primary author applied the full codebook to all interviews, generating brief descriptions of each code and identifying illustrative quotes. The 'final' codes were reviewed, and a codebook was constructed by consensus through integration of reviewers' independent codes to guide formal prospective coding, to improve credibility and transferability of results. The ecological model proposed by McLeroy et al. (1988) was adapted to better fit the data as themes better aligned with a similar but varying five levels of influence defined later as subcategories: individual, community, provider, environmental and systemic.

RESULTS

Below, successes and barriers reported were summarized at each of these levels for primary, secondary and tertiary prevention. Findings are further summarized in Table 1.

Vaccination

Systemic - successes

The MOH's cooperation with the Ministry of Education (MOE) proved to be a paramount systemic strength identified by most interviewees. Although the Ministry of Education was not initially involved in the HPV vaccine's debut, both Ministries recently collaborated to better educate the public and deliver the vaccine systematically. In Uganda, vaccines are routinely completed at schools by village health teams (VHT).

"The biggest success is I think was - it was already there. Using the existing system." [Health Official]

Systemic - barriers

Some informants noted that the healthcare and public health systems delivered limited information to a limited population due to a lack of resources that would allow complete dissemination such as media coverage. They also noted that centralization of health workers left rural communities without a trained healthcare provider to address the need for and the risks and benefits of the vaccine. Some informants argued that better education during the vaccine introduction would have abated misconceptions and increased demand and compliance. As one participant noted:

"HPV vaccine can be improved by increasing the area net to the public...We must ensure services in the hard to reach area" [Public Health Nurse].

Informants also argued that vaccination documentation is inadequate. The VHT travel to schools for biannual Child Health Days Programs to administer vaccines and perform well-child checks. These VHT are distributed from a central Health Unit, which has only one physical registry book. Multiple teams from one unit would travel to different places on the same day, leaving one team with the official register and the rest with loose forms or blank papers for recording.

Typically, there would be two queues of girls, one for the vaccination and one for registration. From accounts, this operation could become chaotic quickly with girls receiving the vaccine without being recorded and vice versa. This manner of vaccination produced challenges to correct vaccination of the target population and appropriate reporting for surveillance and analysis. Furthermore, one public health nurse attested that patients are not always reminded of the date they should return for their second dose of the HPV vaccine.

Provider - successes

Informants argued that providers are aware of vaccination

benefits, convey the information appropriately, are present at health units throughout the country and vaccinate P4, or Primary grade 4, the transition year from lower to upper primary schooling, girls at school. Providers and health care officials agreed vaccination decisions were evidence based. One public health nurse noted that one of the biggest factors contributing to HPV vaccination success is training healthcare workers in educating patients:

"Once they understand the importance of HPV vaccination and they know that the cancer of the cervix is the most severe diseases, the parents, those who have received the message, are responding...They need to pass on facts on HPV so that they can understand" [Public Health Nurse].

Provider - barriers

Reported provider limitations were few, with the exception that there are few providers. Most schools do not have a nurse or healthcare professional within their area to educate beneficiaries and their guardians about the HPV vaccine.

"Every time teams go out; they should carry the vaccine. This is not happening." [MD, PhD in gynecology-oncology]

Some health workers are misinformed, causing both their families and those who trust their opinions to be further misinformed. Providers attested to their role in rectifying incorrect beliefs about vaccination and screening.

"Even among the healthcare providers some people are not convinced. I have spoken to nurses who brought their children for vaccination. And then they are like, but we heard you know maybe infertility, maybe not... But Uganda has been vaccinating girls for HPV since 2008. You know with the pilot and then with a scale up. The Universal roll out was in November 2015. But there's obviously a need for further engagement with the public" [Pediatrician]

"When you explain the HPV vaccine, OHHH we've heard of it, so that's what it's about -- they don't know. [...] if we had talked more, maybe people would have been more receptive" [Gynecologist- Oncologist]

Community - successes

Children typically attend school until age 12. The Uganda HPV Vaccination Program instructs vaccination of girls aged 9 to 12 or grades P4 and P5. The communities targeted in the initial rollout were determined to be of higher risk for young marriage

Table 1. Levels of influence on primary, secondary and tertiary CxCa prevention.

CxCa continuum levels of influence	Primary Prevention (HPV Vaccination)	Secondary prevention (CxCa Screening)	Tertiary prevention (CxCa treatment)
Individual	Successes: vaccinated girls are advocates. Barriers: misconceptions	Successes: none identified Barriers: discomfort and pain of the pelvic exam, embarrassment	Successes: free radiotherapy Barriers: belief cancer is a 'death sentence', late disease presentation
Provider	Successes: patient education Barriers: few providers	Successes: instant results of VIA, frequent visits by patients for family planning Barriers: lack of training, lack of knowledge of female reproductive organ symptom investigations	Successes: definitive treatment of early lesions, new gynecology-oncology physician fellowship training program Barriers: few radiation oncologists, limited radiotherapy machines
Systemic	Successes: cooperation of governing bodies, utilization of existing vaccination infrastructure. Barriers: information dissemination, health worker centralization, documentation	Successes: affordable supplies, mobile village health teams Barriers: lack of personnel and lack of training	Successes: increased accessibility of care, increased training capacity for providers. Barriers: inconsistent radiotherapy availability and limited machines, Limited and distant access to pathology departments
Community	Successes: empowerment of local stakeholders. Barriers: awareness and information delivery, no demand created	Successes: increased awareness has led to increased women presenting for screening. Barriers: misconceptions, fear	Successes: none identified. Barriers: conversation on female reproductive health is a taboo
Environmental	Successes: none identified Barriers: none identified	Successes: none identified. Barriers: limited access to health centers	Successes: HPV progresses slowly to malignant lesions. Barriers: none identified

Source: Author

and early sexual debut. Education and empowerment of health workers, school nurses and teachers were assets to public compliance to HPV vaccination.

“It would be great if school nurses or school health teachers ... can be more empowered to provide information on HPV or deliver an HPV vaccination ... and also they are closer so they can teach them better” [Pediatrician].

Community - barriers

Awareness and education delivery are community

hindrances to completion of vaccination. Girls would receive the first vaccine dose at school without their parents’ knowledge or consent. Providers and researchers believed this miscommunication caused some parents to refuse the second dose due to lack of awareness and understanding regarding the vaccination’s preventative use. Furthermore, informants indicated that at rollout, vaccine supply was abundant, but influential bodies did not provide public education to create demand resulting in ambivalence and ignorance toward it by the general public. Two key informants quoted only a 22% second dose completion rate at their last

analysis in 2016.

“They haven't appreciated the, the connection between the vaccine and the cancer. Otherwise, parents would also be demanding it, and bring their girls” [Medical Officer].

Due to the lack of information disseminated at the roll out of the vaccination program, limited access to screening and limited professionals with correct information regarding it, informants noted that many women and families hold incorrect beliefs preventing them from seeking preventive interventions.

"I've heard that women believe that sometimes they remove the uterus to examine then put it back for cervical cancer screening' [Gynecologist-Oncologist]

It is common for young people to stop attending school before completion, where the HPV vaccination is primarily administered. Further, in rural areas, early marriage results in early termination of schooling leading to higher truancy rates and missed HPV vaccinations.

Individual - successes

Those who received the vaccine and their guardians are viewed as advocates for vaccination efforts.

"...good to have key stakeholders and the immunization discussions. So that it can have many people in the research agenda interested" [Health Official].

Individual - barriers

The primary barrier perceived by key informants was lack of knowledge and pervasive misconceptions surrounding the vaccine. Providers and policy makers acknowledged insufficient public education at the vaccine rollout. Since it was only administered to females, due partially to cost-effectiveness, informants reported that the public inferred from this that the vaccine could cause infertility, was intended as a contraceptive, or was a way for the MOH to give leeway to girls for sexual promiscuity. One researcher hypothesized that sharing stories of older women who have become pregnant post-vaccination could combat the infertility misconceptions.

Referring to the public's opinion:

"Now what's this vaccine? It's to promote promiscuity among young girls because now they are immunized and so they can have sexual intercourse with every other person" [Gynecologist-Oncologist].

"We need to show that vaccinated girls do have babies. Parents cannot tell until their girls are mature and have babies if the vaccine causes infertility or not" [MD, PhD].

Screening

Systemic - successes

Informants noted that screening via acetic acid is affordable for clinics and health workers and that many non-profit organizations throughout Uganda pay for mobile health teams to come to their establishments and screen women. In Kampala, there are multiple

organizations whose work is dependent upon external financial support, training health workers in CxCa screening and health education, and then those workers function as mobile health teams to rural communities.

"We can do the cervical cancer screens for free. Because they can call us. They provide transport, they provide I mean because the fuel in the form of transport. They give allowance for the service providers who come and screen" [Midwife].

Systemic - barriers

Informants noted that not all women had easy access to health centers and that health centers often had limited care providers who can complete the screening procedure correctly.

"Lack of medical centers that can offer screening. ...at the national referral, at the cancer institute, [they] offer screening and then some private places, Marie Stopes, and then some private not-for-profit clinics [...] But in other government regional hospitals, it is not as active and reason being understaffing" [Gynecologist-Oncologist].

Some discussed the problem of competing demands for the skilled personnel who are available to do CxCa screenings:

"Other places have only one midwife... and so she's delivering, then the post-natal mothers also come into the unit - she attends to those during the day and she delivers in the delivery room. So, you find that manpower is little" [Gynecologist-Oncologist].

Finally, some described long waiting times at the clinic, which consumes a significant amount of patient time.

"Sometimes people may come just to screen and go to work, but then they spend almost half a day" [Gynecologist-Oncologist].

Provider - successes

Provider successes include the instant results and wide availability of VIA screening, which limits patient burden and loss to follow-up and increases patient compliance. Informants felt that health workers are successful at incorporating screening during family planning and post-natal care visits.

"They come for family planning, then for post-natal checkup and for immunization of their baby. So, like we do many things at a go and they just give up that

day. So when you do the screening, it's also like part of their package" [Gynecologist-Oncologist]

"We can do the cervical cancer screens for free. Because they can call us. They (Village Health Teams) provide transport, they provide I mean because the fuel in the form of transport. They give allowance for the service providers who come and screen" [Midwife]

Provider - barriers

Participants noted that the materials for screening, particularly acetic acid, are readily available, but the number of trained health workers is not adequate.

"But the skill, the knowledge of health workers to use the acetic acid may be a barrier, but acetic acid is cheap" [Academic Researcher]

Informants indicated that there is lack of provider knowledge when presented with a woman who exhibits signs of a reproductive organ disease process and that this can sometimes result in delayed or inadequate care.

"I know that most people do not (perform pelvic exams) because some people come late because they presented with a discharge and nobody bothered to look. So, I think there is a limitation there depending on the level of the health worker that the person gets to" [Gynecologist-Oncologist].

Community – successes

A gynecologist-oncologist observed that an increasing population is presenting to health centers for CxCa screening due to increased awareness and knowledge about the disease. Participants agreed that communities are receptive to health teams traveling to them and providing screening.

"People are motivated to come because people know that this is a curable disease when gotten early and if pre-malignant lesions can be also treated. People now are having more courage to continue" [Gynecologist-Oncologist].

Community - barriers

A primary community barrier to CxCa screening described by interviewees is the presence of pervasive misconceptions in the community.

"We lose out on most of the women who are well and at home and they are not, they haven't just delivered, so they are not coming in for immunization and they

don't want a family planning method. Those are the majority [...] because all those feel like I am not having intercourse, I am not delivering, I am post-menopausal - I don't need screenings" [Gynecologist-Oncologist].

Informants also indicated that fears or rumors held by patients have negatively impacted women's behavior regarding cervical cancer screening.

"There are rumors that when we go for cervical cancer screening, they remove the uterus, put it on the table then take it, then afterwards put it back. [...] they also say now if I am found to be positive or what that is a death sentence. Only it is not" [Midwife].

Individual – successes

In the HIV clinic at Mulago, there has been excellent patient uptake of screening.

"So the guidelines for the HIV care service are that any woman above the age of 21 should get a PAP smear on a yearly basis. But this is a unique group and the uptake is quite good" [Pediatrician].

Individual - barriers

Providers and researchers perceive that women feel the screening procedure is uncomfortable and painful, leading to avoidance.

Furthermore, reproductive health is not freely discussed in most communities leading females to be embarrassed of examination, especially if performed by a member of the opposite sex.

"This [cervical cancer] is a cancer which deals with a genital system and in this setting really generally; a genital area is a no-go area.

So, people would not really know, may not be comfortable with you doing certain things, especially when the health workers are males" [Gynecologist-Oncologist].

Environmental – successes

In the capitol, providers endorse adequate private space for screenings.

"There is enough private space in health centers, there are examination rooms" [MD, PhD].

Environmental - barriers

Access to a health care center capable of performing

screenings can be limited in rural Uganda, as can adequate private space.

“We should also ensure that we have privacy, especially in the adult clinic” [Public Health Nurse].
 “Cancer screening is in a small corner like this. You’ve been to the clinic down there in Kawempe. We’ve requested for two rooms - so that we can do colposcopy in two rooms or even like private. But we only have one room and sometimes it’s limited -so you put a curtain while one is doing a colposcopy and one is doing results and followup” [Gynecologist-Oncologist].

Treatment

Systemic - successes

Treatment of pre-malignant lesions throughout Uganda has increased, effectively reducing the number of women who eventually suffer from CxCa.

“There is really now active treatment of pre-malignant lesions that cause cervical cancer using either LEEP or cryotherapy or cone biopsies. So, I think because now that is now more active especially for people who come in ... here to Mulago, Kawempe, to UCI. So those people probably talk to people who had knowledge to treat them, probably would not progress into cervical cancer. So, I think that is really a big success” [Gynecologist-Oncologist]

Multilevel efforts have effectively increased accessibility of provider care and CxCa curative treatment. The healthcare system and its international partners are working to build capacity of providers who can address gynecological cancers. Providers report that they and their colleagues have great interest in completing the advanced training.

“I think the biggest success has been creating subspecialties in the department of obstetrics and gynecology” [Gynecologist-Oncologist].

Systemic - barriers

The participants described a complex process of diagnosis and treatment. Before treatment of a patient’s CxCa can occur, she must be diagnosed and appropriately staged through histological analysis. Primary barriers to diagnosis in the Ugandan health system are transport and evaluation of tissue samples. There are few pathology departments. All potentially malignant tissues are sent to Mulago Hospital and the

UCI. A specimen transport hub system operates under the Central Public Health Laboratory (CPHL) of the MoH that is charged with the collection of samples from periphery units and onward forwarding to the laboratories at Makerere and UCI. Unfortunately, many providers are unaware of this porter system, which results in the providers instructing their patients to self-transport their biopsy samples to the Makerere pathology laboratory. Many patients come to Kampala from rural areas and must therefore navigate an area where they may not know the language, be able to read the street signage or be able to afford bus fare, the pathologists’ fee or the financial implications of being away from their families for an extended period of time. To lower this barrier to care, some of the pathologists’ time is allocated to processing and analyzing tissue samples for those who cannot afford their services and supplies; however, the resources available for this cost-free work is pales in comparison to the size of the population who are unable to afford the full cost. Further, processing of these samples requires approximately one month. By this time, many patients have returned home, and some may never return. Some try to gather as much money as they can in hopes to return for treatment. While CxCa progresses slowly, many women are diagnosed late in their disease when one month may be the difference between a respectable or treatable disease and one that has progressed beyond modern medicine’s curative abilities.

“We don’t have a system to handle such specimens at least to ensure they are taken. When you take off a tissue, you collect and then maybe someone in the lab would be able to transport them to pathology lab and thereafter they would bring back the results. Sometimes when the pts get results and they never bring them back so you get loss to follow up” [Gynecologist-Oncologist].

“We have to solicit for funds so that we are able to buy gas. And if for the cryotherapy the carbon dioxide gas and even buying more machines, the cryotherapy machines and the cryotherapy guns [...] someone may not be able to pay. Before when it was funded, we weren’t charging anything. But now as want to raise money so that we are able to buy gas there is some fee which is being charged. That is a challenge” [Midwife]

The financial and time costs are perceived to be the greatest burdens to patients, especially those who traveled to Kampala for treatment from rural areas.

“Because even when you have someone to take culture you can organize in advance and this ward should be able to get the samples as she is going home, she drops them at medical school. That can be organized locally, but now the money will be paid

at that site. So, maybe people have money they can take it, they can take it. They don't have - that is a challenge" [Gynecologist-Oncologist].

Finally, the availability of radiotherapy has been inconsistent. The MOH installed a radiotherapy machine in Kampala, the only one in the country until 2018 available to treat all malignancies requiring treatment with external beam radiation. While this treatment is free to the public, the patient load exceeds the capacity of this machine, supported by six medical physicists, and its five physician and nine radiotherapy technologist operators.

"I think it's the access to the services. Because like for example, the operating theaters, the radiation are so long waiting, the chemotherapy drugs run out, the skilled people to do the surgeries, you'd see a lot of issues surrounding that" [Academic Researcher].

"So, this radiation that has just come now, now overburdened, it has like all the other cancers are lined up there with only two providers. I fell they, the most success is surgery the next is radiation, I'm not sure if they are getting enough attention in the radiation, on the radiation side, but we are sending them there to be treated, and the numbers are overwhelming. Maybe if we get a second machine that might be useful" [Gynecologist-Oncologist]

Provider - successes

Providers find success in their ability to definitively treat cancers that are detected early.

"The other rewarding thing is treating early cancer. Okay, and then you cure it!" [Gynecologist-Oncologist]

Uganda recently created a gynecology-oncology fellowship as few physicians specialized in this area. These providers can perform surgical and medical interventions.

"... Gynecologists, 3 have been on mentorship with gyne-oncologists coming from UCSF, Duke, and they come periodically. So like after this we can manage the surgery bit and now we'll have a fellowship with two gyne-oncologists being trained in gyne-oncology" [Gynecologist-Oncologist].

Provider - barriers

"Most of our patients present late so there are very few patients we can do surgery on" [Gynecologist-Oncologist].

"The operating theaters, the radiation is so long waiting, the chemotherapy drugs run out, the skilled people to do the surgeries, you'd see a lot of issues surrounding that" [Gynecologist-Oncologist].

"You wonder where these women who come in stage 4, stage 3 where they can be. And truly, when you interview them, they have been somewhere in a health center, so it means there's a lot of lack of knowledge, including the medical workers lack knowledge about how to manage cancer of the cervix "[Gynecologist-Oncologist].

Individual - barriers

Providers had varying perceptions of the barriers to adequate treatment of CxCa in Uganda. All agreed with this statement made by a Gynecologist-Oncologist:

"It's not really giving them adequate treatment. It's like for us the time we notice a person has a disease is when it's late. So, the barriers they still stand to be screening and seeking of medical care when symptoms come."

Interviewees relayed a concern over the public's lack of knowledge surrounding the medical community's ability to successfully treat cervical cancer. Even if patients do come for treatment to the UCI, there are further barriers to treatment adherence because of the complexity of some treatment plans. Moreover, while radiation treatment is free, chemotherapy and surgery are not. Patients must purchase all supplies, including personal protective equipment for all involved, and medications for sedation. The overall costs can be overwhelming for patients who may not undergo a life-saving procedure due to their inability to afford it.

"You bring them to cancer institute to enroll for radiation, but even then, you know these logistics of moving up and down and coming back another day, come this day, go and do this, do a chest X-ray, do an U/S, scan, do this, so the waiting times sometimes becomes overwhelming for some patients and we lose them" [Gynecologist-Oncologist].

Community – successes

Specialists are optimistic that community providers are becoming more aware of investigative and treatment protocols for gynecological symptoms and signs.

"There is really now active treatment of pre-malignant lesions that cause cervical cancer using either LEEP or cryotherapy or cone biopsies. So, I

think because now that is now more active especially for people who come in like to here to Mulago, Kawempe, to UCI. So those people probably to talk to people who had knowledge to treat them, probably would not progress into cervical cancer. So, I think that is really ... big" [Gynecologist-Oncologist].

Community – barriers

Informants agreed that the female reproductive system and its ailments are not freely discussed within the Ugandan culture. As perceived by a Gynecologist-Oncologist, when a woman is experiencing something abnormal, she will not seek medical attention immediately. She will ask her friends and try herbal remedies first. If the problems persist, then she will seek professional help.

"Pelvic exam involved with VIA. Most women do not want to go through with that if they don't feel sick anywhere then I don't have to go screen or treatment" [Gynecologist-Oncologist]

"Not many people visit health units unless they are sick"[Pediatrician and senior lecturer]

"But those who do not know what can be done. They are the majority. They are poor and marginalized" [Midwife].

Environmental - successes

Due to the nature of the virus, HPV-induced dysplasia and neoplasia develop slowly compared to most other cancers and can be treated with a small procedure when identified early in the disease course.

"Well, it's amazing that CxCa is a cancer which at least has a pre-malignant lesion. Compared to others, like maybe ovary you can't - by the time you know it is really too late" [Gynecologist-Oncologist].

Communication strategies

Uganda's MOH and providers work to deliver accurate and easily understandable information to the population via flyers, radio and television advertisements.

Systemic

The MOH worked to communicate through existing channels and trusted sources in communities for HPV vaccination efforts; they are further working to encourage

CxCa screening. Many key informants advocated involving key stakeholders that have direct influence over the young women.

"Through minister of education [...] they are communicating to their channels and they are involving the schools and involving the senior female teachers who handle these girls. Then also we have done a lot of discussion with the healthcare workers. So, the demand has been created and at the same time the service now is more available" [Health Official]

Provider

The health administration prioritizes encouraging and empowering education of providers to recommend cervical cancer screening and HPV immunization to their patients on routine care visits.

"Using the village health teams house to house. As they go for immunization to educate the mothers and that's it. But is that happening? That's the issue. Because communication should be routine. It should not be seen to happen then stop" [Health Official]

"We should engage the leaders in promoting HPV vaccination...we should also teach our health workers on messages" [Public Health Nurse]

Community

The primary source of information, key informants agree, is word of mouth from trusted relatives and community members. Administration is confident in young girls' ability to share information with their families after school-administered vaccination.

"On radio, on television, but mostly from relatives and friends" [Pediatrician].

Environmental

Cost is a limiting factor to employing multiple media modalities. The MOH has disseminated information through various media sources but not everyone has access to a radio or television. Political leaders deliver public health information cyclically with their campaigns. Fragmented information depends upon privately funded programs and non-for-profit organizations. Stakeholders call for consistent, correct and clear information delivery to the public.

"On the other hand, the media is also sending

information about the vaccine not being safe. So, those are the issues that are raising eyebrows [...] but we have to find ways of countering that” [Health Official].

Strategy implementation

Systemic – successes

Developing a vaccination program upon an existing one was a major success.

“The biggest success is I think was - it was already there. Using the existing system, you know you have reached, like already in one week. Because we just had to give the vaccine out to the facilities which were already providing the other routine vaccines” [Health Official].

When HPV vaccination was up scaled to reach all of Uganda, the designers of the program were considerate of the entire population aiming to primarily vaccinate girls who attended school but also to vaccinate girls who could not attend school via the existing clinics and health teams. The MOH is working diligently to coordinate efforts across the country to deliver a complete CxCa primary and secondary prevention regimen.

“We are trying to engage partners and just not focus on vaccination. But to the whole package of prevention. Which has the screening, for early detection and treatment and of course palliation? So, I think it is now up to us to engage the other players Reproductive Health, The UCI, and see how we can enrich the package of prevention of cancer across the country” [Health Official].

Systemic -barriers

At rollout, there was poor communication between the MOH, public and health care delivery teams. Informants identified a need to further support the efficacy of the HPV vaccine via timely reporting of uptake and cervical cancer rate changes by the health administration.

“It’s really very difficult because the priorities of government are different competing priorities. We really are in a resource constrained environment. Where priorities are different, there is a lot of corruption and so on” [Academic Researcher].

“We involved the minister of education. But when it came to implementation, there was a laxity in discussing or involving ministry of education in the activity and then we also had some difficulty with transmitting the message and to the health workers

so there was a lot of misunderstanding” [Health Official].

“The program seems to be very wide. It’s not easy to control everyone, so sometimes you just use grit. Then also the issue of reporting is like how to use your data collection on time. That’s the kind of challenge and what’s the intent of that message? To be able to make, convince people to take decisions” [Health Official].

The vaccination program originally targeted girls in one school grade, but not by age as some do not know how old they are.

“Another challenge also we had was when the target, you know at first, we were targeting P4. And P4 can have anyone perhaps from 9 to 16 years. So also, that could have caused issues in our reporting in terms of measuring our progress” [Health Official].

Initial vaccination effort funding is depleted, leaving health officials to find creative avenues of continuing to create demand for vaccination and refute myths.

“Males are not vaccinated – there is no funding. Explaining why they need it is difficult if it only causes cervical cancer” [Academic Researcher].

CxCa screening requires few but necessary resources which are not always readily available to providers.

“The biggest challenge I could say maybe lack of resources to use. Because we improvise a lot” [Gynecologist-Oncologist].

There are limited hospital beds and resources to offer people who have travelled far to complete staging and receive treatment at the UCI.

“If they are not so sick, they have to travel home because you see we have very few beds. So, we can’t admit all those people for just biopsy” [Gynecologist-Oncologist].

Provider - successes

There are many competent providers who complete CxCa screening regularly.

“Comfort with doing something comes with practice, even like refresher courses, even here like in the national referral the midwives who are more competent, are the ones who do it mostly, and the ones who are usually in the family planning clinic or the screening clinic – others are not comfortable”

[Gynecologist-Oncologist]

Provider - barriers

Providers must be sensitive and creative in their counseling. There exists a word for the cervix in central Ugandan local languages that translates to, "mouth of the uterus." Although this word may not be part of all citizens' vocabulary or be ubiquitous across languages and regions.

"We need someone who can simplify important terms. [...] A question we get in the field studies of the vaccine is "What and where is the cervix?" [Academic Researcher]

Limited continuing medical education of providers and availability of resources leave health workers to direct their own learning when cyclical funds are low. Providers are also given limited space and tools to perform adequate screening, interventions and follow-up. With limited resources and colleagues and an ever-growing patient population, provider burnout is prevalent.

"Cancer screening is in a small corner like this. You've been to the clinic down there in Kawempe. We've requested for two rooms - so that we can do colposcopy in two rooms or even like private. But we only have one room and sometimes it's limited -so you put a curtain while one is doing a colposcopy and one is doing results and follow-up" [Gynecologist-Oncologist].

Community - barriers

The public understands of the link between a virus and a cancer can limit vaccination efforts. Additionally, community members are not given direct information on who to address or where to present for CxCa screening. Religious beliefs and governmental wariness can prevent parents from allowing their children to be vaccinated.

"Some religions poison parents about the vaccine – and all vaccines. Religious Pentecostals do not get any vaccines. There is a suspicion why this vaccine is given when it is made in the West – are they trying to poison or control us?" [Academic Researcher]

Community - successes

Mobile health teams visit communities and visit people along their path with the HPV vaccine and CxCa screening. They also counsel trusted members of each community to be ambassadors for health education and

promotion.

"We can use the village health team members who are members of the communities themselves to mobilize the women. But that means commitment of funds to that. [...] because they are members of the communities themselves, and costs won't be much" [Academic Researcher]

Researchers and providers are optimistic that accurate information is becoming well-received by the general public.

"I think the information really has been pressed on and it's good. It is bringing positive impact to the community. Within the health workers and even outside the medical field" [Gynecologist-Oncologist].

Individual - barriers

Women do not have established well care provider visits, forcing them to have self-initiative to receive CxCa screening.

"People have to be health aware, like, be cautious you have to go for a PAP smear. There are people who have never had a PAP smear" [Pediatrician].

Some cultures endorse marriage of younger girls to older men leading to greater risk of infection. Husbands may prevent their wives from receiving CxCa screening.

"Their husband can say, 'ah don't go there.' But when we go, the services are free. So, it's for the rumors are the ones that have caused that" [Midwife]

Environmental - successes

Media outreach and political campaigns have augmented vaccination and screening interest and compliance within communities.

"Some of them have a lot of negative information from their community. And then so they get information from maybe mass media, there's a lot of discussion about this disease on television and radios. And the rumors campaign, there's a lot of mass campaign about cancer of the cervix" [Gynecologist-Oncologist]

Environmental - barriers

Means of transport are perceived as a primary barrier to screening and treatment.

“Transport is a barrier to accessing us. It’s a huge one” [Pediatrician].

Media productions do not always disseminate accurate information, which can make the public wary of the government’s intentions.

“Some of them have a lot of negative information from their community. And then so they get information from maybe mass media, there’s a lot of discussion about this disease on television and radios. And the rumors campaign” [Gynecologist-Oncologist].

DISCUSSION

This study shows Uganda’s great advances to control CxCa and HPV transmission. The MOH works to provide resources for all stages of prevention and expand the country’s capacity to treat this rampant disease. This study provides novel insight into successful engagement of target populations for HPV vaccination and CxCa screening and treatment. Multilevel barriers limit CxCa prevention and treatment strategies at the individual, community, provider, environmental and systemic levels. The most prominent barriers within these confines include uncoordinated healthcare delivery efforts, misconceptions, sociocultural norms, financial burden, and geographic impediment.

Individual hindrances largely stemmed from lack of information and locally formed misconceptions. Vaccination compliance was limited due to concerns of infertility and misunderstanding of the role of the vaccine to include contraception and promote sexual promiscuity. In conjunction with the paucity of routine well care provider visits, screening uptake was limited due to interdiction on discussion of women’s reproductive health among peers, particularly by husbands, and fear of pain and physical removal of the uterus during the procedure. The perceived and actual pain and discomfort associated with current CxCa screening practices may have implications for providing a more acceptable and easily disseminated form of screening like HPV vaginal self-sampling. Barriers to treatment are compounded by limited screening causing presentation of malignancy at later stages when curative treatment is no longer viable. Successful treatment is further limited by the public’s lack of awareness of curative treatment for CxCa. Financial burden and geographical challenges negatively influence treatment delivery considering the price of chemotherapeutic and surgical intervention to the patient. Incomplete education surrounding the pathophysiology of HPV infection causing CxCa led to loss to follow-up of girls for the second dose of the vaccine. With minimal education, community members established and disseminated incorrect perceptions of the primary and

secondary preventive measures, outlined earlier, influencing individual barriers to health care. Distrust by parents was fostered through the paucity of education prior to their daughters receiving the HPV vaccine. Girls at the higher end of the target population can miss vaccination due to regular discontinuation of school, sometimes due to early marriage, which is another community barrier. Pentecostals, which comprise 11% of the Kampala district, do not receive vaccination (Uganda Bureau of Statistics, 2018). Lack of funding and knowledge of how to access care impedes screening efforts.

Communities possess assets facilitating CxCa prevention and treatment efforts. Most girls will attend school through age 12 or P6/P7 allowing most of the now clearly defined target population to be accessed through school health programs. Teachers and school officials are empowered secondary to their acceptance of outside health teams’ work and counseling to educate beneficiaries of HPV vaccination. Women are increasingly seeking CxCa screening as correct information regarding the procedure and expectations of a cancer diagnosis shift from a “death sentence” to a disease that can be cured when identified early.

Provider level influences originate from an insufficient workforce to care for the population. Schools do not house health care professionals, limiting their students’ ability to clarify vaccination rationale. Provider training and comfort with performing pelvic exams is inadequate for the number of women who should be screened according to the Strategic Plan outlined by the MOH (Banura et al, 2011). This lack of trained professionals is especially disturbing to providers because they care for a significant number of women whose presenting symptoms were not investigated properly allowing their disease to progress from a curable to potentially incurable stage. A process which currently only six physicians are trained to treat with surgical or chemotherapeutic intervention, one of whom practices at an institution that does not currently offer chemotherapy treatments. Furthermore, only five trained radiation oncologists reside in the country at UCI whose patient load includes those with any malignancy treated with external beam radiation. Not all health workers are correctly informed about the HPV vaccine. Those who are find themselves continually refuting misconceptions. A barrier to educating communities is the lack of a word for cervix in local languages, of which there are an estimated 40 (Atukunda, 2020).

Fortunately, materials such as gloves, speculums and acetic acid are perceived to be readily available. VIA method provides instant results, decreasing loss to follow-up and permitting acceptable incorporation of the exam into existing health visits. Providers find joy in their ability to identify and treat early lesions, but the ever-increasing patient population with dwindling supplies contributes to significant provider burnout. Not all

providers report adequate space to perform and review CxCa screening with patients. One stated the need for improvisation using curtains to divide rooms to be able to counsel and examine patients. This attestation implies a need for prioritizing of women's preventive care from health care administrations. The VHT travel to villages, creating the opportunity to address loss to follow-up; increase demand for CxCa screening and deliver vaccinations to those who may have never attended school in the primary delivery site for HPV vaccination.

Congruent with our informant report, a 2020 study found only a 22% second dose completion rate (Isabirye et al., 2020). Funding and support for the teams is inconsistent, depending upon non-profit organization support and political election cycles. Providers and researchers call for a maintained, consistent message and funding plan to be able to support and care for their communities.

Geographical challenges comprise most environmental barriers to CxCa screening together with the potential for health visits to consume up to half a day including waiting time is a significant burden upon women. An immense benefit of the nature of HPV developing into CxCa is its relatively slow rate; one study reports development to high-grade squamous intraepithelial lesion, the precursor lesion of CxCa, is on an average of 7 years from HPV infection (Schlecht et al., 2003). Positive environmental influences include the health administration and political campaigns using media to increase awareness and understanding. Contrarily, pervasive information disseminated from non-health administration sources can be inaccurate and has led some to be wary of the government's intention with disseminating the HPV vaccine.

Systemic level factors may carry the greatest influence on CxCa prevention and treatment efforts. A longstanding country-wide vaccination program provided a reliable framework upon which to incorporate the HPV vaccine and required limited commitment of untapped resources and workforce to implement the new program. Alongside the vaccination roll-out, there was little information given to the girls' families before and after they received the vaccine, except the girl-reported information to the families. School teachers and employees were not subsidized to promote this change in vaccination regimen. Stakeholders were given little information, making them unable to create demand and understanding in their communities. Administrative health officials believe if proper information were delivered at the onset of vaccination efforts, there would be greater compliance and fewer misconceptions surrounding their intentions and effects of the vaccine, for which they are actively obtaining feedback to better deliver information in a digestible manner to the public.

Providers and researchers report great disappointment in the disorganized fashion of documenting vaccine administration leading to unreliable population analysis and the disservice to the target population. Further

disorganization was reported from the administrative level due to lack of coordination efforts from the MOH with the Ministry of Education until recently.

Systemic influences also constrict CxCa screening efforts. Health centers have not been built to be accessible to all the population and not all health centers house professionals able to perform a proper pelvic exam. If supplies and personnel are available, CxCa screening is offered free of charge to all women. Both resources are discontinuously supported by non-profit organizations in addition to limited governmental funding, which has been reported to be depleted.

Treatment barriers primarily lie in limited diagnostic capacity with few providers and colposcopes to obtain biopsies and even fewer pathologists to analyze tissue samples. Furthermore, there is an established system to ensure delivery of tissue samples to the nation's only pathology laboratory but providers who procure samples are not aware of it, routinely instructing their patients to transport their samples to UCI and Makerere for analysis. Women are tasked with navigating a capital city and large university campus to deliver their tissue and pay up front for the analysis. If a patient cannot afford the laboratory fee, the sample will be analyzed free of cost. However, their analysis is commonly completed up to a month after receipt. This lack of structure leads to multiple reported problems, most importantly, the loss to follow-up of patients with already moderate to advanced disease.

National protocol endorses treatment at time of diagnosis with VIA if available. Providers report wait times of a year or longer to obtain carbon dioxide gas for cryotherapy, their primary modality of treatment. Health administrators believe cryotherapy supplies are readily available, but providers attest otherwise.

Systemic barriers exist when disease has progressed to require higher level of treatment. One radiotherapy machine discontinuously functioned from 1995 until 2020. The UCI now has three radiotherapy machines, two of which are Cobalt-60 machines and one which is a True Beam linear accelerator machine most recently commissioned. The UCI also provides internal radiation via brachytherapy; however, they have only two radiation oncologists. The MOH provides radiation treatments free of charge, but the capacity of the machines and providers is grossly overshadowed by the number of patients requiring treatment.

The UCI and international partners are building the gynecology-oncology physician force through new fellowships, effectively expanding their patient load capacity. These providers can further train their colleagues in proper pelvic examination techniques. Gynecologist-oncologists are increasing but the number of hospital beds remains the same, forcing caregivers to request patients travel home between treatments if they are not among the most ill.

This study outlines many barriers and successes from all levels of the socio-ecological model in delivering

quality CxCa prevention and treatment to Ugandan females. Misconceptions serve as an individual barrier to vaccination, screening, and treatment. The systemic and community level barriers of inadequate education surrounding the vaccination program and screening benefits proved detrimental to vaccination regimen completion and screening uptake. Limited provider support in the form of colleagues, space, and supplies precludes the delivery of health prevention measures to all women. Inaccessibility and unavailability of facilities prove a substantial environmental barrier.

Evidence is provided to support the need for proper education, which can feasibly be completed through frequent and consistent television and radio announcements to refute myths and encourage adherence. Further support of providers and increasing health facility accessibility is paramount to deliver quality screening and treatment to all Ugandan women.

Limitations of this study include a limited sample size of key informants, localization of key informants to the capitol and nearby rural districts and lack of input from the benefactors of the CxCa prevention regimen, namely the women and girls eligible for vaccination. This study was conducted in parallel with a study that interviewed women from both rural and urban communities whose data are forthcoming. Future directions of applying information gathered from key informants include compiling analyzed data with that from women's views to better understand the disconnect between deliverers and benefactors of CxCa preventive services. Ultimately to learn from Uganda's current system and help to better design a more effective delivery system for CxCa prevention.

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CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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