Introducing and Scaling up HPV testing to strengthen Cervical Cancer screening in LMIC's

Leveraging existing HIV/AIDS investments and programming

Gogo Maidei Masomere*[1] is a very jovial and energetic woman who works hard to fend for her four grandchildren. At 45, she is one of the youngest grandmothers in the Mutendebvure village, Makoni West District, Manicaland Province, Zimbabwe. She has never had to worry about her health and occasionally jokes about how she is never sick. This time she has taken a three-hour walk to the Rural Hospital, which is 10km away. One of her grandchildren has a fever, and she suspects malaria. Gogo laments that these visits steal from her productive time as she works diligently on their small plot growing maize, tobacco, and rearing goats. As a widow, she works in neighboring fields for extra money to supplement family earnings. Hospital visits leave her with minimal time for critical activities.

Six months ago, at an EPI (Early Pediatric Immunization) outreach in the village, a health care worker (HCW) spoke about Cervical cancer; a chronic disease that affects women-*cancer of the cervix* (CaCx). The HCW explained how the disease was preventable and that women could lose their lives if CaCx is not detected and treated early. This message created an urgency to get checked and know her status as she has never had a CaCx screen in her lifetime. She, however, did not pursue screening because the nearest facility that can provide this care is at the district office over forty kilometers away from her village. As much as she knew she needed to get screened, *Gogo Masomere's work always took precedence. To get the VIA screen the HCW had discussed, she needed bus fare.* Maybe she would go if she felt a bit sick.

More recently, Gogo Masomere lost her sister to CaCx. At her funeral, a community health care worker (CHCW) sensitized women on a new intervention, HPV testing using the self-sampling method (HPV-SS). *HPV-SS means a woman can now get a CaCx screen in a remote geographic village that has never had CaCx services before, without leaving the village*. Gogo Masomere now excitedly talks about this to all her friends, encouraging them to join her as she plans to be the first to participate in this new self-care initiative.

Gogo Masomere's story shows us that Zimbabwe's low CaCx screening rates, and indeed many other sub-Saharan countries like it, are not due to a lack of knowledge alone *(13% CaCx screening coverage in 2018, with only 6% of women in rural settings having accessed a screen in their lifetime[2])*. There are physical, financial, and emotional barriers to access. These barriers include access to screening sites[3] *(availability of sites locally, distance to testing sites, etc.)*[4], stigma, fear of pain and discomfort, competing health needs, poverty, fragile health care infrastructures, and lack of trained providers to perform CaCx screenings[5].

1 NOT HER REAL NAME

2 https://www.zimstat.co.zw/wp-content/uploads/publications/Social/Health/ZDHS2015.pdf pg148

3 Guillaume D, Chandler R, Igbinoba S. Barriers to CaCx Screening Among Women Living With HIV in Low- and Middle-Income Countries: A Systematic Review. J Assoc Nurses AIDS Care. 2020 Sep-Oct;31(5):497-516. doi: 10.1097/JNC.0000000000000194. PMID: 32675646.

4 Waller J, Bartoszek M, Marlow L, Wardle J. Barriers to CaCx screening attendance in England: a population-based survey. J Med Screen. 2009;16(4):199-204. doi: 10.1258/jms.2009.009073. PMID: 20054095.

5 Catarino, R., Petignat, P., Dongui, G., & Vassilakos, P. (2015). CaCxCaCx screening in developing countries at a crossroad: Emerging technologies and policy choices. World journal of clinical oncology, 6(6), 281–290. https://doi.org/10.5306/wjco.v6.i6.281

Every two minutes, one woman dies from CaCx globally[6]. These deaths are unfortunate considering that CaCx can be prevented. The incidence of CaCx can be reduced by over 50 percent if every woman has access to at least one screen in her lifetime, followed by standard clinical interventions for any adverse outcomes.[7] While Gogo Masomere's story is set in rural Zimbabwe, her plight represents millions of women living in low- and middle-income countries (LMICs).

In 2018, about 570,000 women worldwide were diagnosed with CaCx. Despite the presence of life-saving interventions, about 311,000 succumbed to death[8]. Over 85 percent of these deaths were in sub-Saharan Africa, this shows the impact of sharp socioeconomic disparities. To address this, the World Health Organization (WHO) made a call to eliminate CaCx as a public health concern by increasing access to vaccination for human papilloma virus (HPV), CaCx screening, and the treatment of pre-cancerous lesions. Specific targets include achieving 90 percent HPV vaccination coverage, 70 percent CaCx screening coverage, and 90 percent treatment of cervical pre-cancer[9]. WHO recommends HPV testing as the first-choice screening method for CaCx, using either thermal ablation or cryotherapy to treat all screen-positive women.

What is HPV testing?

HPVs are the most common sexually transmitted infections. Most of the time the infection is cleared away naturally. Persistent infection with high-risk types (HrHPV) is implicated in over99 percent of CaCx. There are over 100 related viral types, but only HPV16, 18, 31, 33, 35,39, 45, 51, 52, 56, 58, and 59 are the high-risk genotypes. HPV 66 and 69 pose a lower risk of progression to disease. CaCx develops slowly following the initial infection with HPV. In HIV negative women, progression from HPV infection to disease can take 15 to 20 years. In HIV positive women, this interval is much shorter and screening with HPV testing every five years is sufficient to detect precancers and treat early. Current screening methods require women to screen between one- to three- year intervals, meaning HPV testing allows longer intervals which will decongest health facilities. *Women living with HIV are at a greater risk of progressing to cancer. The likelihood is six times greater compared to HIV negative women. This warrants an earlier screening onset.*[10]

HPV testing involves collecting sample from a woman and conducting a nucleic acid technology (NAT) test. The NAT test looks for genetic material to confirm the presence or absence of cervical infection by HPV. The HPV test has a high negative predictive value (NPV) making it an excellent screening test. This high NPV has allowed WHO to shift the recommended screening interval up to five to ten years for general population and three to five years for women living with HIV (WLHIV). The screening interval is every three years for Visual Inspection with Acetic Acid (VIA) and cytology for the general population and only one year for WLHIV. HPV testing as an initial screen also allows health facilities to prioritize VIA resources for HR-HPV positive clients with a higher risk for progression to disease[11].

The HPV testing sample provides considerable advantages. It is a high vaginal swab that is easy to collect. The sample is collected using a dry swab either by the HCW or self-collected by the patient and sent to the lab for testing. The HPV sample is very stable (up to 60 days) in the cervical specimen transport tubes at room temperature without loss of test performance.[12]

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6 Gaffney DK, Hashibe M, Kepka D, Maurer KA, Werner TL. Too many women are dying from cervix cancer: Problems and solutions. Gynecol Oncol. 2018 Dec;151(3):547-554. doi: 10.1016/j.ygyno.2018.10.004. Epub 2018 Oct 6. PMID: 30301561; PMCID: PMC6281756.

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8 https://www.who.int/health-topics/cervical-cancer#tab=tab_1

9 World Health Organization. (2020). Background: why is a global strategy needed? In Global strategy to accelerate the elimination of CaCx as a public health problem (pp. 7-9). World Health Organization. http://www.jstor.org/stable/resrep27864.4

10 https://www.who.int/news-room/fact-sheets/detail/human-papillomavirus-(hpv)-and-cervical-cancer

11 Kocken, M.; Uijterwaal, M.H.; De Vries, A.L.M.; Berkhof, J.; Ket, J.C.F.; Helmerhorst, T.J.M.; Meijer, C.J.L.M. High-risk human papillomavirus testing versus cytology in predicting post-treatment disease in women treated for high-grade cervical disease: A systematic review and meta-analysis. Gynecol. Oncol. 2012, 125, 500–507

12 Lin, C. Q., Zeng, X., Cui, J. F., Liao, G. D., Wu, Z. N., Gao, Q. Q., Zhang, X., Yu, X. Z., Chen, W., Xi, M. R., & Qiao, Y. L. (2017). Stability Study of Cervical Specimens Collected by Swab and Stored Dry Followed by Human Papillomavirus DNA Detection Using the cobas 4800 Test. Journal of clinical microbiology, 55(2), 568–573. https://doi.org/10.1128/JCM.02025-16

HPV Testing is a game-changer

Over the last decade, VIA has been the primary screening tool in sub-Saharan Africa. VIA initiatives have scaled dramatically across the continent, but CaCx screening rates have failed to reach desired coverage. Advantages of VIA include low cost per test, and the ability to screen and treat in one visit[13]. Despite these programmatic advantages, screening rates have remained depressed partly because VIA has not successfully scaled to the primary care level. The VIA program in Zimbabwe was set up coupled with cryotherapy to facilitate a one-day see-and-treat approach.[14] The setup costs to scale this technology combination to rural settings are prohibitive and a barrier to scaling VIA to the primary care level.

Human Resource (HR) constraints and staff attrition provide additional challenges to the scaling of VIA. VIA requires a committed staff contingent that has been trained over an extended period; VIA relies on the clinician's skill[15]. HCW turnover in Zimbabwe happens through Ministry of Health and Child Care (MOHCC) service rotation systems, staff repurposing, and competitive alternative hiring practices. These in turn affect VIA service availability, service quality, gaps in service delivery, and pose a challenge to VIA scale-up[16,17].

VIA is provided at facilities in Zimbabwe up to the district level. This means that many women must travel long distances to access screening services. In rural Zimbabwe, road networks are bad and transport availability is limited. Some women travel over 30 kilometers (sometimes on foot) to access CaCx screening and treatment services[18].

The HPV test is an intervention that can overcome these challenges to access CaCx screening. Setting up HPV testing has low start-up and running costs if it leverages on existing HIV program infrastructure. Sample collection for HPV testing requires low skill levels. A separate study in Zimbabwe demonstrated the feasibility of task-shifting HPV self-collection to CHCWs[19]. If staff move, on-the-job training for HPV testing is easy to implement. HPV testing removes the need to travel long distances and can occur regardless of geography. *HPV testing moves the sample instead of the patient and offers differentiated models of care including self-collection. These are key factors that can enable mass screening[19,20].*

HPV Testing Self-Collection

HPV testing self-collection is a simple technique for CaCx screening that empowers women by allowing them to collect their own samples in private, at their own time, and where they are comfortable[20]. The samples are then given to a HCW for forwarding to the testing laboratory. HPV self-collection (HPV-SS) requires a lower human resource skill level when compared to the HCW-collected model.

A study carried out in Zimbabwe during the phased-in scale-up showed that self-sample collection is comparable to the healthcare worker collected screening method. This study showed similar test performance for HPV detection between the self- and clinician-collected samples with sensitivity (82 percent) and specificity (94 percent). These values are higher than expected cut-offs (78 percent and 90 percent, respectively)[21]. The sample collection procedure was relatively simple, participants easily

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17 Chary, A. N., & Rohloff, P. J. (2014). Major challenges to scale up of visual inspection-based CaCx prevention programs: the experience of Guatemalan NGOs. Global health, science and practice, 2(3), 307–317. https://doi.org/10.9745/GHSP-D-14-00073

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19 Fitzpatrick, M.B., El-Khatib, Z., Katzenstein, D. et al. Community-based self-collected human papillomavirus screening in rural Zimbabwe. BMC Public Health 19, 603 (2019). https://doi.org/10.1186/s12889-019-6810-5

20 https://journalofethics.ama-assn.org/article/why-consider-self-sampling-cervical-cancer-screening-low-and-middle-income-countries/2020-02

21 Jessica Joseph, Phibeon Mangwendeza, Tatenda Maparo, Tasimba Mhizha, Owen Demke, Sandra Murwira, Henry Dickson, Bernard Madzima, Shaukat Khan, Comparative analysis between self-collected and clinician-collected samples for HPV testing in public health facilities in Zimbabwe, Journal of Clinical Virology, Volume 145, 2021

understood the instructions, and preferred HPV-SS to HCW collection.

The HPV-SS model creates an opportunity where CHCW's can function as the key driving officers for community screening through HPV-SS. A clear pictogram of sample collection steps is supplied with the sample collection kit. The CHCW will explain the process, and then take the sample to the clinic after self-collection. Utilizing existing transport systems, the samples are sent to the central lab for testing. The testing uses existing machines already set up for HIV VL testing. In the case of a clinic setting, the HCW offers a brief explanation of how to collect the sample and supplies a private sample collection space. This reduces the workload on the HCW and can allow screening programs to continue with minimal disruptions even during the pandemic, travel restrictions, and lockdowns[22]. Additionally, the privacy afforded by self-sampling may encourage more people to get tested when compared with other available methods.

Deployment of differentiated models of care in Zimbabwe

Offering HPV-SS decentralizes screening to the women's doorstep. HPV-SS reduces the patient's potential financial and logistical burden, allowing a sense of privacy and autonomy[23]. The impact of HPV-SS in underserved populations, particularly predominantly indigenous and rural communities with CHCW as the focal officer, is set to change the CaCx screening landscape radically[24].

The CaCx program in Zimbabwe will deploy differentiated service delivery models using both HCW-collected and self-collection. Over 35 CaCx clinical mentors have been trained nationwide as master trainers or trainers with plans to have them train trainers who will train trainees at the primary level. The master trainers were equipped to deliver both HCW-collected and self-collected training and both models of care will be deployed dependent on the setting as well as available resources. In line with this, Zimbabwe is now shifting programming to have CHCWs offer HPV-SS in the community.

The HPV-SS model will be directed, but not limited to, the lowest level facilities that currently do not have any CaCx screening services as well as community-based initiatives. The added benefits of self-collection include convenience, reduced time and effort, ease, comfort *(includes decreased embarrassment, pain, and anxiety)*, speed, safety, and user-friendliness[25] These factors will increase screening uptake. HPV-SS will potentially obliterate the need for a HCW at the initial screen; this will be a crucial factor as the country scales up HPV testing.

Lesson learned: HPV testing will allow programs to reach women in hard-to-reach areas like Gogo Masomere who have never had access to at least one life-saving screen.

In remote/rural, hard-to-reach areas, CHCW's will be equipped to deliver CaCx screening services to women through education, outreach, counseling, and sample collection training, thus facilitating HPV-SS. The use of CHCW's will reduce the workload on overburdened healthcare providers and decongest health facility service areas. An additional approach will involve integrating CaCx screening services into existing outreach services where self-collected CaCx screening will be offered in conjunction with Opportunistic Infections/Anti-Retroviral Therapy (OI/ART), and The Expanded Program on Immunization (EPI) outreach initiatives. Social initiatives such as condom distribution models will also be leveraged for HPV self-collection kit distribution. Another key consideration will be around integrating HPV-SS, ART drug administration, and antenatal care at the facility level.

22 Murewanhema, G. (2021). Reduced CaCx screening in Zimbabwe as an indirect impact of the COVID-19 pandemic: implications for prevention. Pan African Medical Journal, 38(131). https://doi.org/10.11604/pamj.2021.38.131.27852

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24 Maza, M., & Gage, J. (2017). Considerations for HPV primary screening in lower-middle income countries. Preventive Medicine, 98, 39-41. https://doi.org/10.1016/j.ypmed.2016.12.029

25 https://www.who.int/publications/i/item/9789240015166

HPV testing is cost-competitive

If HPV testing is set up as a silo, the initial setup and running costs will be very high. However, leveraging infrastructure investments made by the HIV program makes HPV testing introduction and scale up cost competitive. Based on pooled quantities and leveraging existing testing pricing deals negotiated by the HIV program, an all-inclusive Service Level Agreement (SLA) price per test for HPV testing on the Hologic was signed at US$9.00 for all-in pricing[26]. This is the initial price which can be accessed by several LMICs. The costs per test are still high, but ongoing market shaping negotiations will bring the price down as volumes increase.

The cost for VIA has been noted to be between US$4.00 and US$6.00. Costs considered in VIA pricing include direct medical costs (salaries, provider wages, supply chain costs, sample transportation, laboratory, and equipment costs), patient time costs, and programmatic costs[27]. Additional studies on cost-effectiveness have demonstrated that HPV testing is cost-effective if it achieves higher population coverage[28]. When the screening interval is considered, HPV testing allows women to test fewer times compared to VIA. The longer interval frees up clinic's and client's time. This reduced frequency sets off the pricing, making HPV testing cost-competitive[29].

HPV testing is ready to scale leveraging on investments made in the HIV Program

Setting up a national CaCX screening program with HPV testing as the primary screening tool is a low-hanging fruit. HPV testing integration can readily be accommodated on existing investments and program infrastructure developed for HIV testing and treatment in most low-resource countries. This integration offers a feasible option to immediately curb CaCx morbidity and mortality. In the implementation of the phased scale-up program in Zimbabwe, there are several lessons we learned.

1. Regulatory Framework

Clear and concise regulatory frameworks are a crucial enabler for HPV testing scale-up. WHO recommendations explicitly state that country CaCx screening programs should transition immediately from VIA to HPV testing as the primary screening method. This guidance alone is not enough to facilitate HPV testing scale-up as countries often require local context data to support policy transition.

A key study helped kick start this transition in Zimbabwe. The study evaluated the feasibility of the inclusion of HPV testing as part of the national CaCx diagnostic algorithm and nested an option for differentiated models of care by comparing Self-collected against clinician-collected HPV samples; the aforementioned validation helped to kick-start HPV testing using the sample self-collection method To date, over 8,000 women have been screened for HPV on existing laboratory equipment and the evidence generated has been used as part of the advocacy pack to influence the government's inclusion of HPV testing in the national guidelines and as well as support testing scale-up in-country.

Country programs need to work with the relevant government departments to draft clear policies and well-defined guidelines that include HPV testing in the country's CaCx screening algorithms. In Zimbabwe, cervical cancer is managed through three different departments: Prevention is managed under the Zimbabwe Expanded Program on Immunization *ZEPI*, screening and treatment of lesions under the Reproductive Health department, and the treatment of cancer under the Non-Communicable Diseases (NCDs) department. In most LMIC's, VIA is the primary screening method in their current CaCx screening guidelines. The health sector in these countries is supported by long-term developmental partners, funders, and donors (PEPFAR, World Bank, Global Fund, GAVI, USAID, Bill & Melinda Gates Foundation, etc.). These organizations support commodities and fund

26 https://aslm.org/resource/diagnostic-pricing-database/
27 https://assets.publishing.service.gov.uk/media/57a08b0140f0b649740008ea/srhhiv-researchbriefing2-cervicalcancerscreening.pdf
28 Umulisa, M., Franceschi, S., Baussano, I., Tenet, V., Uwimbabazi, M., & Rugwizangoga, B. et al. (2018). Evaluation of human-papillomavirus testing and visual inspection for CaCx screening in Rwanda. BMC Women's Health, 18(1). https://doi.org/10.1186/s12905-018-0549-5
29 Mezei AK, Pedersen HN, Sy S, et al Community-based HPV self-collection versus visual inspection with acetic acid in Uganda: a cost-effectiveness analysis of the ASPIRE trial BMJ Open 2018;8:e020484. doi: 10.1136/bmjopen-2017-020484

programs that are backed by clear policies and are currently supporting VIA activities. For these organizations to support HPV testing, policy documents need to clearly endorse it. HPV testing is a new tool, and scale-up can be funded if it is included in the country's CxCa screening policies and algorithms. Coordination and early involvement of these departments and partners is key to successful policy adoption.

Lesson learned: Country programs need to work with the relevant government departments to draft clear policies and well-defined guidelines that include HPV testing in the country's CaCx screening algorithms.

In Zimbabwe, CxCa is under the NCDs department. Armed with WHO recommendations and the HPV testing study results, a policy review process was started with this department to include HPV testing for both HIV positive and negative women. A more comprehensive policy document on CaCx screening and treatment guidelines catering for all women is still under review.

To expediate HPV testing adoption in the national guidelines, the program leveraged the HIV program's review process to capitalize on evidence generated in the HPV testing study together with updated WHO recommendations to adopt HPV testing for WLHIV. The new ART guidelines now recommend HPV testing with triage for all WLHIV. Leveraging on existing HIV program systems made the adoption faster and seamless.

2. Training and capacity building in-country

To sustainably equip staff for HPV testing scale-up in Zimbabwe, comprehensive training material was developed. The material covered aspects of the updated CxCa screening and treatment policies, HPV testing technology, rationale of new guidance, considerations for facility patient flow reorientation to allow HPV testing integration, demand generation, and data management principles. The material was developed to cater to health facility staff, community cadres, and laboratory staff as they all play a part in the HPV testing matrix. A national trainer of trainers' team was set up and equipped to deliver a comprehensive training package. The core team includes public health officers, general medical officers, gynecologists, and clinicians and this makes national scale-up feasible. Developing a clear training curriculum and training trainers is a sustainable capacity building method that can ensure successful national scale-up of HPV testing.

Lesson learned: Developing clear training curriculums and training trainers is a sustainable capacity building method that can ensure successful national scale up of HPV testing.

3. OI ART as the entry point of phased in approach

Most LMIC's have functional OI/ART clinics in many of the health facilities. WLHIV are at a higher risk of developing CaCx. Mainstreaming CaCx HPV screening into existing HIV OI/ART programming with this population would be the first step in a phased-in scale-up. This entails the integration of demand generation, patient records and monitoring tools, sample/result transportation systems, patient tracking, and referral systems into the HIV program. Large-scale community screening is feasible utilizing the CHCWs and the different community-based models of care already established for the HIV program. At the clinic, health education related to CaCx is incorporated into general HIV education sessions. These sessions should include key topics such as viral load monitoring intervals and HPV screening intervals.

In Zimbabwe, setting up HPV testing at the OI/ART clinic involved mapping site patient flows and adapting them for HPV testing demand. Demand generation was carried out through the integration of CaCx education into the general HIV talks in the waiting areas. Information, Education and Communication (IEC) material (banners, pamphlets, and posters) was developed and placed in various strategic areas to increase demand.

Enrollment and sample collection took place in the OI/ART consultation rooms and linkages to the VIA clinic were created for HPV-positive clients to

receive triage services and treatment of pre-cancerous lesions.

Lesson learned: The OI/ART clinic and its supporting systems can be used as an entry point in a phased-in scale up approach for HPV testing.

Site level CaCX HPV integration training material was developed, and all staff were equipped with knowledge and job aids to sensitize and recruit clients for HPV testing. All facility staff, including registered nurses, nurse aides, and CHCWs took part in the facility health education sessions for patients. Clinical staff were trained to collect HPV samples (HPV clinician collected model) as well as instruct clients on sample self-collection (HPV-SS), counseling, sample packaging, storage, transportation, linkage to care, and data management. All systems that were developed to facilitate HPV testing were modeled after existing systems used by the HIV program.

4. Laboratory testing utilizing investments and systems already established for the ART Program

Many components that led to the successful roll out of laboratory HPV testing in Zimbabwe were investments and systems set up and developed to ensure the success of the OI/ART program in Zimbabwe. These include:

- Testing platform: No initial capital investment for platforms. No service and maintenance costs since these are catered for in the HIV viral load (VL) testing program.
- Laboratory HR: Minimal training needed as the staff is already familiar with the platform. No extra HR needed since HPV uses the same workflow as HIV VL.
- Data management systems: Minimal costs related to the addition of an HPV module to the existing HIV Laboratory Information Management System (LIMS). Minimal training as the lab staff is familiar with the LIMS.

Sample transport and results return system: Minimal setup and running costs.

- Waste Management systems: The same kind of waste is generated for the HIV program.

After assessing the diagnostic network, the Hologic panther platform was chosen as the best fit for HPV testing. Panther is a platform that can run over 500 tests per eight-hour shift. Because of this throughput, the platform easily accommodated HPV testing and still met VL testing demand. This removed the need to invest in a separate platform specifically for HPV testing. Multiplexing on the Hologic platform offered added utility from the machine, while reducing service and maintenance costs per test result given.

HPV testing leveraged on available staff. The program did not recruit or train any new staff for testing. Instead, they focused on the experienced laboratory staff who were already using the Hologic platform consistently. These cadres were trained in the processing and testing of HPV samples and were able to run both HPV testing and VL samples concurrently. Using the same staff shortened training period and simplified sample processing workflows. Testing can be introduced at the laboratory level without significantly adding the workload to the existing staff complement.

Lesson learned: Leveraging on existing HIV programs is a low-cost, high-impact investment aimed at serving the high-risk WLHIV population.

Data management for VL testing uses LIMS, the system captures patient data, test results, and it flags patients with critical outcomes such as high VL. This LIMS system is also used for follow-up and linkage to care initiatives. For effective data management, an HPV module was added to this LIMS platform, as opposed to developing a new stand-alone system. Onboarding HPV testing onto this platform was a one-step process with immediate benefit; *HPV testing introduction did not incur significant additional LIMS setup costs*.

Sample transportation and waste management processes for HPV testing were integrated with

existing VL systems. It was relatively easy to synchronize the transportation component because the same staff who did VL testing were now doing HPV sample collection. HPV testing samples and VL samples were collected from the same client on the same day, reducing clinic visits and staff workload. After testing at the laboratory, the waste was handled the same way.

The HPV test can be carried out on several different centralized testing and point-of-care (POC platforms (Hologic, Roche, Abbott, Qiagen, Gene Xpert, Open PCR, etc.). These platforms already have an established presence in many low-resource countries because of existing HIV programs and it is important to negotiate favorable SLA deals capable of sustaining a program's robust testing demands. CHAI Zimbabwe negotiated a price per result SLA. It involves the supplier taking responsibility for the availability of all commodities (proprietary reagents and accessories) that go into the test. The test price includes service and maintenance of the machines as the responsibility of the supplier. In addition, it has verifiable performance indicators whose fulfillment is reviewed quarterly to ensure compliance. This works to the advantage of country programs by cutting out cumbersome logistic processes and reducing the likelihood of stockouts and testing downtimes.

In every laboratory where these platforms are housed, there are systems in place to ensure the success of the HIV program goals, these systems are sufficient for HPV testing.

5. Monitoring and Evaluation (M & E)

Monitoring and evaluation processes are key to the successful scale up of HPV testing as they equip programs to measure success and offer opportunities for continuous improvement. Country teams intending to scale up HPV testing need to decide on information management systems and important indicators to track. Utilizing M & E officers within the HIV project, Zimbabwe tracked cohort positivity, results return turnaround times, linkage to care, and CaCx incidence. To achieve this, existing registers from the OI/ART program were adapted to include HPV testing indicators. The HIV program manager and focal persons were trained to monitor the HPV testing program to avoid additional M & E costs. Overall, the phase-in pilot screened over 3,900 women with results showing ~40 percent positivity. From the HPV positive cohort, about 73 percent were linked to care and received VIA. From the 1,179 women who received VIA, 942 (80 percent) had a negative result, 57 (five percent) had small lesions, 173 (15 percent) had large lesions, and seven (one percent%) were suspected of cancer.

Lesson learned: The availability of a test does not translate to a client receiving treatment. Systems need to be put in place to ensure linkage to care.

Two major challenges encountered included results return to clients as well as client return for triage and treatment. To overcome this, the team utilized a calling and SMS messaging system to inform clients of results availability and follow up on their clinic visits for treatment. In a case where both failed, CHWs physically visited the clients given address. The LIMS system was adapted at a later stage and developed to do the following:

- Automate results return to client by sending a coded message as soon as the test result was out.
- Send the same message to the facility focal person responsible for HPV testing.
- Flag all positive clients and populate a follow up list.
- Send a reminder after a two-week interval following up on actions taken to link positive clients to care.

The program learned that the availability of a test does not translate to a client receiving treatment. Systems need to be put in place to ensure linkage to care.

6. Supply Chain improvement utilizing the established National Quantification tools and systems for HIV related /general commodities

HIV programs have established systematic forecasting and quantification processes, including HR skills. Zimbabwe has a national quantification

process used to forecast HIV and HIV-related medicines and general supplies. Utilizing data from the initial phase-in clinics, and HR within the quantification teams, the national demand for CaCx screening and treatment for WLHIV was quantified. The same quantification process was used to present the national HPV testing needs, define the gaps, and as a launching pad for partner engagement and advocacy. To date, partners in the HIV space have quantified the testing need for the next three years and worked on a costed commodities implementation plan. While the program started at four phase-in clinics, the data generated was key in the national quantification process. The phase-in clinics functioned as evidence generation sites to inform national scale up. The MoHCC set a goal to provide an HPV test for every woman in the ART cohort eligible for HPV testing. The quantification process broke down this target spreading these commodities over the next three years. This process helped develop a costed plan which will be a key tool for advocacy and resources mobilization. The costed plan sets a clear mandate to avail an HPV test to all WLHIV within the next three years.

Lesson learned: Covering the HPV testing need in WLHIV should be the first phase in a country's scale up program.

With the costed implementation plan, development partners were able to incorporate HPV testing planning into their programs, with PEPFAR already procuring 20,000 tests in the first year.

Scaling up access to HPV testing in Zimbabwe

HPV testing offers the best mass screening potential for low-resource settings and can seamlessly be integrated into existing programs. Scaling up HPV testing affords an easily accessible opportunity to strengthen the CaCx screening program and expand reach to the most remote settings. In Zimbabwe, this will be achieved with the promise of dramatic increase in CaCx screening coverage through HPV-SS.

The MoHCC is showing a continued commitment to accelerate progress towards the WHO targets of achieving 70 percent screening coverage by 2030 by harnessing the potential demonstrated by the HPV testing intervention. From the four pilot facilities, the plan is to expand HPV testing to include 16 sites in Mashonaland East Province offering onsite clinician-collected and self-collected testing. In this province, the program will also train 40 CHCW's that will provide self-collected HPV testing in Seke district, allowing women to collect samples and receive results in the comfort of their own homes through HPV-S. Additionally, HPV testing will be rolled out to 20 facilities in Makoni District, Manicaland Province. The goal is to have HPV testing rolled out to at least five provinces by the end of 2022, prioritizing HPV-SS as a tool to provide access to CaCx screening in the hard-to-reach areas. Within the same timeline, additional sites will be activated in Bulawayo, Masvingo and Matabeleland South provinces with PEPFAR partner support.

HPV testing expansion will offer an opportunity for all Zimbabwean women including those from the most disadvantaged communities to receive a life-saving screen. This will go a long way in reducing morbidity and preventing unnecessary CaCx related deaths.

This project was made possible with funding and support from Unitaid. Unitaid is a global health agency engaged in finding innovative solutions to prevent, diagnose, and treat diseases more quickly, cheaply, and effectively, in low- and middle-income countries. www.unitaid.org