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Facility-Based Indicators to Manage and Scale Up Cervical Cancer Prevention and Care Services for Women Living With HIV in Sub-Saharan Africa: a Three-Round Online Delphi Consensus Method

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Background: Of women with cervical cancer (CC) and HIV, 85% live in sub-Saharan Africa, where 21% of all CC cases are attributable to HIV infection. We aimed to generate internationally acceptable facility-based indicators to monitor and guide scale up of CC prevention and care services offered on-site or off-site by HIV clinics.

Methods: We reviewed the literature and extracted relevant indicators, grouping them into domains along the CC control continuum. From February 2021 to March 2022, we conducted a three-round, online Delphi process to reach consensus on indicators. We invited 106 experts to participate. Through an anonymous, iterative process, participants adapted the indicators to their context

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(round 1), then rated them for 5 criteria on a 5-point Likert-type scale (rounds 2 and 3) and then ranked their importance (round 3).

Results: We reviewed 39 policies from 21 African countries and 7 from international organizations; 72 experts from 15 sub-Saharan Africa countries or international organizations participated in our Delphi process. Response rates were 34% in round 1, 40% in round 2, and 44% in round 3. Experts reached consensus for 17 indicators in the following domains: primary prevention (human papillomavirus prevention, n = 2), secondary prevention (screening, triage, treatment of precancerous lesions, n = 11), tertiary prevention (CC diagnosis and care, n = 2), and long-term impact of the program and linkage to HIV service (n = 2).

Conclusion: We recommend that HIV clinics that offer CC control services in sub-Saharan Africa implement the 17 indicators stepwise and adapt them to context to improve monitoring along the CC control cascade.

Key Words: women living with HIV, acquired immunodeficiency syndrome, early detection of cancer, cervical cancer, consensus, sub-Saharan Africa

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INTRODUCTION

Cervical cancer (CC) is the most common cancer among women living with HIV (WLHIV), who are at high risk of persistent human papillomavirus (HPV) infection and 6 times more likely to develop CC than the general population.[1,2] HIV infection contributes to 21% of all CC diagnoses among women in Africa, accounting for 85% of the global tally of women diagnosed with CC attributed to HIV.[1,3] To achieve the goal of the World Health Organization (WHO) of eliminating CC, countries in sub-Saharan Africa (SSA) must scale up access to primary, secondary, and tertiary prevention measures, especially for girls and WLHIV.[4–6] To improve CC control programs, clinicians, researchers, and policymakers need high-quality routine health facility data,[7,8] which can be collected by monitoring each step of the path that people take through the health system. To create a monitoring plan for cancer control, each sequential step through a complex health system must be quantified within the framework of a cascade[9] and indicators must be specified for each step.[10,11] Cascades are widely used conceptual models that support monitoring, assess engagement, and identify gaps in services.[9,12,13] Several studies have taken this approach to evaluating the performance of CC control programs for WLHIV in SSA,[14–20] but they did not use standardized indicators, so it is difficult to compare their findings.[14–20] Indicators that consider HIV status are often omitted from cancer control policies, even in countries with high HIV burden,[21] where they are most necessary.[22] Most cancer control polices in these countries advice leveraging existing infrastructure and integrating CC prevention and care services into existing HIV programs to facilitate access to and scale up of these services and eventually significantly reduce CC incidence and mortality.[23–27] But today, data on access to and uptake of services for women attending HIV clinics in SSA are limited or rare, although electronic data systems are widely available.[21,22,28]

We urgently need standardized indicators for each step in the CC prevention and care cascade to measure and compare access with the quality of the services offered to girls and WLHIV, so we used a Delphi process to bring experts to consent on facility-based indicators for monitoring, managing, and scaling up the CC prevention and care cascade through which girls and women attending HIV clinics in SSA progress.

METHODS

Study Settings

We collaborated with the International epidemiology Databases to Evaluate AIDS consortium (IeDEA, https://www.iedea.org/), a network that collects and analyzes data from routine care of more than 2.2 million people living with HIV globally. In SSA, IeDEA is present in 22 countries across 4 regions (Central, East, Southern, and West Africa) and comprises 240 HIV treatment and care sites in both urban and rural areas, operating mostly at the primary or secondary care level.[29] The study received an ethics waiver from the Cantonal Ethics Committee of Bern (BASEC-Nr: Req-2020-00748).

Literature Review

Three researchers (M.D., K.T., and S.L.A.) reviewed the literature to identify relevant indicators for monitoring CC control programs. We first reviewed the recent WHO toolkit, *Improving Data for Decision Making in Global Cervical Cancer Programmes* (IDCCP), which describes indicators and best monitoring practices,[30] and the International Cancer Control Partnership database.[31] Next, we included the most recent national cancer control policies, strategic plans, and where available, national plans for controlling noncommunicable diseases in SSA countries. We explored national health ministry websites and online web tools and contacted experts in the field to identify the relevant unpublished literature. We included documents published between 2010 and 2020 in English and French. Two researchers (M.D. and S.L.A.) independently extracted relevant indicators and the definitions of numerators and denominators when they were available. These researchers compared the results, deduplicated, and grouped similar indicators. When they disagreed, they consulted a third investigator (K.T.) to arrive at consensus. From our list of extracted indicators, we deliberately preselected those that could be quantified with data collected at HIV clinics during routine care. We did not limit the number of indicators, but we excluded indicators that would require facilities to conduct surveys or patients to fill out satisfaction questionnaires, for example, qualitative indicators that measure CC awareness or quality of care, patient experience, and satisfaction.

The Expert Panel

Based on predefined selection criteria (see File S1, Supplemental Digital Content, http://links.lww.com/QAI/C163), we recruited experts in CC or HIV/AIDS prevention and care in SSA through the IeDEA network. We also invited participants of the 2019 workshop "CC Prevention and Care Cascade in WLHIV in SSA," hosted by the third IeDEA All Africa meeting. Expert Panel (EP) members were asked to

volunteer their participation in the Delphi process and to attend our online meetings. We aimed for equal geographic and sex distribution of EP members.

Delphi Process

We conducted a three-round online Delphi process (see Figure S1, Supplemental Digital Content, http://links.lww.com/QAI/C162), after recommendations from guidelines and reviews.[32–36] The Delphi process is a structured method for gathering and distilling the collective knowledge and opinions of a group of topic experts. We developed and piloted a Delphi questionnaire in English and French, which included (1) informed consent, (2) study description and instructions, and (3) general and demographic questions. The questionnaire also included (4) the indicators we had identified, preselected, and then adapted or revised with the EP members during the process, along with any remaining open questions. Rating and ranking instructions (5) were also provided. We emailed EP members and asked them to use the Qualtrics^{XM} survey platform to participate anonymously in the online Delphi process.

The first Delphi round questionnaire included a preliminary list of the 30 preselected indicators in tabular format,[37] listing title and definition, purpose and rationale, measurement method, data collection methodology and frequency, data disaggregation, guidelines for interpreting and using data, and relevant additional information. The questionnaire included multiple choice questions about additional items for indicators, for example, definition of the population, appropriate levels of disaggregation, age ranges, and time periods. We used the responses to modify indicators in subsequent rounds, based on majority rule. Then, we grouped the indicators into the 6 domains that match the steps of the CC control continuum (Fig. 1). In the second Delphi round, we presented these revised indicators to our experts, along with summaries of the first-round comments. We asked EP members whether they agreed with the updates or believed they needed further discussion. We also told them that, once they reached consensus on indicators (high or very high rating by at least 70% of respondents, see below for details), we would implement the variables needed to calculate those indicators into the IeDEA Data Exchange Standard. Experts were told to rate the revised indicators on a 5-point Likert-type scale (1-very low and 5-very high) for 5 rating criteria: relevance, feasibility, comparability, reliability, and understandability (see File S2, Table S3, Supplemental Digital Content, http://links.lww.com/QAI/C164). We drew our selection of the type of Likert scale, and our definitions and the number of rating criteria from the literature and made final decisions within our team through the voting process. Between the second and third Delphi rounds, we organized 4 satellite sessions and an online stakeholder meeting. At the satellite sessions, we discussed definitions of indicators and data elements, key populations, age ranges, time periods, rating results, comments we had selected from previous rounds, and domains. The EP members shared and discussed their concerns and ideas and proposed solutions. At the final stakeholder meeting, we presented and discussed successful regional models of CC management and data collection and future activities. Professional moderators guided all sessions, and we used interpreters to ensure that language was not a barrier to joining the discussions. In the third Delphi round, we shared a summary of comments from previous rounds and minutes of our meetings (see File S3, Supplemental Digital Content, http://links.lww.com/QAI/C165). We asked the EP to rerate indicators based on our 5 rating criteria. We presented again 30 indicators, although some did not reached consensus in the second round because we discussed and adjusted indicators based on feedback we received during satellite sessions. The EP then ranked the importance of each indicator, stratified by the 6 domains. Throughout the process, participants could comment in open-ended question

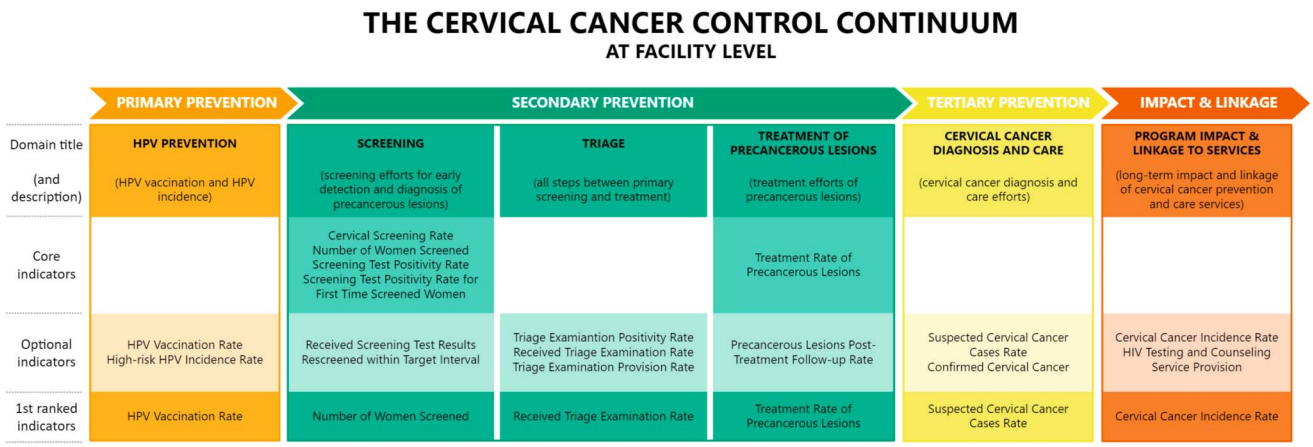

FIGURE 1. The Cervical Cancer Control Continuum at facility level: the overview of domains, core, optional, and first ranked indicators per each domain that reached consensus in round 3. Consensus is reached if the indicator had a high level of agreement (more than 70% of respondents rated an indicator as 4 and 5 points on Likert scale) in 3 or more criteria. Within each domain, the core and optional indicators are ordered based on their rating results, with the highest-rated indicator placed at the top. Core indicators are indicators that reached a high level of agreement in all 5 criteria, and optional indicators are those with a high level of agreement in 3 or 4 criteria. The indicator ranked as the most important in each domain is presented as the first ranked indicator.

fields. Two researchers (M.D. and A.Z.) could access the database containing the responses; feedback could not be linked back to individuals. In each Delphi round, we sent weekly reminders to participants who had not yet submitted their answers.

Data Analysis

We used descriptive statistics to report characteristics of EP members and participation, response, and completion rates; these equations are detailed in Table S1, Supplemental Digital Content, http://links.lww.com/QAI/C162. Rating and ranking results are presented by level of agreement and consensus, ranking score (RS), and total rank; descriptions of rating and ranking calculations are provided in File S4, Supplemental Digital Content, http://links.lww.com/QAI/C166. We defined consensus as the median score above our predefined threshold and a high level of agreement (see File S2, Supplemental Digital Content, http://links.lww.com/QAI/C164, Definition of consensus),[38,39] defined as an indicator rated 4 (high) or 5 (very high) points on the Likert scale for at least 3 of 5 criteria (relevance, feasibility, comparability, reliability, and understandability) by 70% of respondents. We provided an illustrated overview and comprehensive tables for indicators that reached consensus in round 3, basing our presentation on international recommendations. Tables include title, definition, calculation, purpose and rationale, data source, frequency, disaggregation, and guidelines. We used thematic analysis to interpret qualitative data from open-ended questions (see File S5, Supplemental Digital Content, http://links.lww.com/QAI/C167).[40,41]

RESULTS

Literature Review

We identified and reviewed 46 documents (39 in English and 7 in French): 39 policies from 21 African countries and 7 from international organizations and 2 web tools for cancer-related data analysis (https://canscreen5.iarc.fr/ and https://nordscreen.org/) (see Table S2, Supplemental Digital Content, http://links.lww.com/QAI/C162). In total, we extracted and reviewed 509 indicators; of these, 52 were extracted from the WHO IDCCP Toolkit.[30] Two researchers deduplicated and then grouped the extracted indicators based on similarity. We then proposed 30 indicators to the EP.

Characteristics of Expert Panel Members

We emailed 106 experts (85 in Round 1, 84 in Round 2, and 101 in Round 3) and invited them to participate. In the second round, 1 participant opted out. In the third round, we invited additional experts who had expressed interest in joining the stakeholder meeting. In total, 72 individuals participated in at least 1 round (46 in Round 1, 40 in Round 2, and 55 in Round 3). Fifteen African countries were represented in the EP (Fig. 2), and it was gender-balanced (52% women). Most members were researchers (56%) and clinicians (31%). 68% were affiliated with the IeDEA consortium, and about half (48%) worked in Southern Africa (see Table S3, Supplemental Digital Content, http://links.lww.com/QAI/C162). Most participants self-reported that they had either less than 5 years (31%) of experience or 10–20 years (34%) of experience in CC prevention and care and 10–20 years (39%) in HIV/AIDS care and treatment. A third of participants reported additional experience in other areas of research or health care (see Table S4, Supplemental Digital Content, http://links.lww.com/QAI/C162).

Delphi Rounds

The response rate (number of participants who completed the survey/number of emailed participants) was 34% in round 1, 40% in round 2%, and 44% in round 3 (see Table S3, Supplemental Digital Content, http://links.lww.com/QAI/C162 for completion rates and participation rates). The definitions of key population were guided by WHO recommendations on CC screening and treatment for WLHIV,[42] informed by participants' answers in the first and second round, and discussed and agreed on during satellite sessions: "Women living with HIV/AIDS who are enrolled in care and had at least 1 HIV clinic visit during the period of interest" and who aged "25–49 years" and "Girls living with HIV enrolled in care with at least 1 HIV clinic visit during the period of interest" and who aged "9–14 years". Where applicable, we incorporated these definitions for all indicators in the final rating and ranking session.

In the second and third round, EP members rated the 30 proposed indicators, and consensus (at least 70% agreement in 3 or more criteria) was reached on 13 indicators in round 2 (see Figure S2, Supplemental Digital Content, http://links.lww.com/QAI/C162) and 17 indicators in round 3 (Fig. 3). The 17 indicators that reached consensus in round 3 covered all domains of the CC prevention and care continuum: primary prevention (HPV prevention, n = 2), secondary prevention (screening, n = 8; triage, n = 6; treatment of precancerous lesions, n = 4), tertiary prevention (CC diagnosis and care, n = 5), and long-term impact of the program and linkage to HIV services (n = 5). These are comprehensively described in File S6, Supplemental Digital Content, http://links.lww.com/QAI/C168. In the *primary prevention (HPV prevention)* domain, both of the proposed indicators reached consensus. In the *secondary prevention* domain, 6 of 8 screening indicators reached consensus; half of *triage* indicators (3/6) and *treatment of precancerous lesions* indicators (2/4) reached consensus. In the *tertiary prevention (CC diagnosis and care)* domain and the *long-term program impact and linkage to HIV services* domain, 2 of 5 proposed indicators reached consensus.

Five indicators obtained a high level of agreement (>70% of participants) in all 5 criteria, and we labeled these as core indicators. We labeled the other 12 indicators as optional. Of the 5 core indicators, 4 belonged to the *secondary prevention (screening)* domain: Cervical Screening Rate, Number of Women Screened for Cervical Precancer, Screening Test Positivity Rate, and Screening Test Positivity Rate for First Time Screened Women. One belonged to the *secondary prevention (treatment of precancerous lesions)*

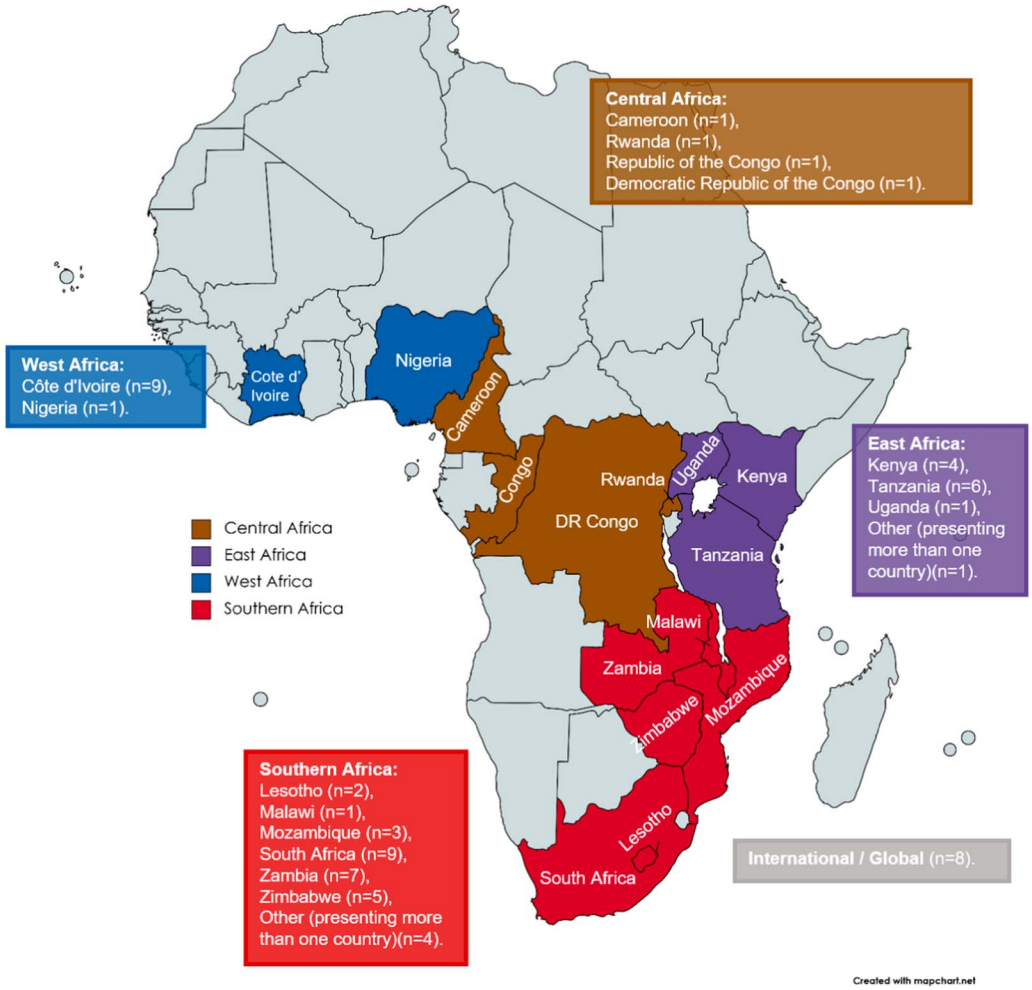

FIGURE 2. Representative countries in the EP in all 3 Delphi rounds (total participants, n = 65).

domain: Treatment Rate of Precancerous Lesions (Fig. 3). The same indicators, except Screening Test Positivity Rate for First Time Screened Women, reached consensus for all 5 criteria in round 2. Cervical Cancer Incidence Rate reached consensus for all 5 criteria in round 2, but not round 3. More than 70% of EP members rated the relevance of 16 indicators in round 2 and 17 indicators in round 3 as 4 (high) or 5 (very high). In round 3, all indicators that reached consensus had been rated 4 or 5 for comparability and understandability. In round 2, only 13 indicators were rated 4 or 5 for comparability, and 14 indicators were rated 4 or 5 for understandability (Fig. 3). Ratings on feasibility and reliability were lower; only 6 indicators in rounds 2 and 3 were rated 4 or 5 for feasibility and reliability. Between rounds 2 and 3, the greatest change in the level of agreement was for Triage Examination Positivity Rate: Feasibility increased by 27% (from 35% to 62%) and understandability by 29% (from 62% to 91%). Of the 13 indicators that failed to reach consensus in round 3, 10 were rated 4 or 5 for relevance by more than 70% of participants; none was rated 4 or 5 for feasibility, comparability, or reliability (see Figure S2, Supplemental Digital Content, http://links.lww.com/QAI/C162).

Our analysis of the qualitative data we collected in all 3 rounds revealed that the topic of most concern was improving the definitions of indicators (eg, age ranges). Several participants believed that it could be difficult to collect the data that informed the indicators during routine care and to disaggregate that information, especially in resource-limited settings and settings where cervical screening services are offered off-site. We integrated these concerns in round 2, when we drafted the agenda for the satellite meetings. For example, at the satellite sessions, we discussed the recent update to WHO screening and treatment guidelines for CC, in which WHO newly recommended that WLHIV should take an HPV DNA primary test and then a triage test if they were found to be HPV positive.[42] Members presented their ideas and suggestions for overcoming challenges to implementing these guidelines, for example, the feasibility of collecting the data (see File S3, Supplemental Digital Content, http://links.lww.com/QAI/C165).

Table 1 and Figure 1 present the 17 indicators that reached consensus in round 3, ranked by importance and stratified by domain. The highest ranked indicators in each domain were HPV Vaccination Rate in *primary prevention*,

		Rating criteria										No. of Criteria‡	
		Relevance		Feasibility		Comparability		Reliability		Understandability			
Domain†	CORE INDICATORS	R2	R3	R2	R3	R2	R3	R2	R3	R2	R3	R2	R3
2	Cervical Screening Rate	97%	100%	74%	96%	85%	89%	74%	82%	94%	96%	5	5
2	Number of Women Screened for Cervical Pre-cancer	94%	91%	79%	96%	76%	82%	79%	82%	94%	96%	5	5
2	Screening Test Positivity Rate	97%	98%	82%	84%	94%	76%	85%	80%	94%	89%	5	5
4	Treatment Rate of Precancerous Lesions	97%	98%	76%	80%	88%	87%	82%	82%	94%	91%	5	5
2	Screening Test Positivity Rate for First Time Screened	88%	93%	68%	71%	85%	80%	68%	71%	91%	96%	3	5
Domain†	OPTIONAL INDICATORS	R2	R3	R2	R3	R2	R3	R2	R3	R2	R3	R2	R3
5	Suspected Cervical Cancer Cases Rate	88%	93%	71%	80%	71%	73%	62%	64%	88%	98%	4	4
3	Triage Examination Positivity Rate	79%	89%	35%	62%	59%	73%	53%	76%	62%	91%	1	4
6	Cervical Cancer Incidence Rate	94%	91%	82%	56%	97%	87%	79%	58%	97%	91%	5	3
1	High Risk HPV Incidence Rate	88%	84%	59%	53%	76%	71%	74%	69%	91%	84%	4	3
5	Confirmed Cervical Cancers	85%	96%	56%	56%	76%	84%	53%	69%	82%	96%	3	3
1	HPV Vaccination Rate	97%	89%	65%	62%	76%	82%	62%	60%	94%	96%	3	3
4	Precancerous Lesions Post-Treatment Follow-Up Rate	97%	91%	53%	58%	74%	80%	56%	69%	97%	91%	3	3
2	Received Screening Test Results	82%	89%	59%	51%	82%	73%	65%	47%	82%	84%	3	3
2	Rescreened within Recommended Screening Interval	82%	93%	56%	44%	76%	71%	62%	58%	82%	91%	3	3
6	HIV Testing and Counseling Service Provision Rate	74%	84%	56%	60%	68%	71%	62%	67%	74%	84%	2	3
3	Received Triage Examination Rate	74%	86%	53%	55%	68%	70%	56%	66%	62%	84%	1	3
3	Triage Examination Provision Rate	65%	76%	35%	51%	56%	71%	44%	60%	62%	80%	0	3
	Total number of indicators that reached 70% agreement	16	17	6	6	13	17	6	6	14	17		

† Domains: 1) Primary prevention – HPV prevention, 2) Secondary prevention – Screening, 3) Secondary prevention – Triage, 4) Secondary prevention – Treatment of precancerous lesions, 5) Tertiary Prevention – Cervical cancer diagnosis and care, 6) Long-term program impact and linkage to HIV services; ‡ No. of criteria – the number of criteria with high level of agreement (> 70% participants rated as 4 (High) or 5 (Very high) points on the Likert scale). Indicators are ordered by highest to lowest number in R3, followed by the highest to lowest number in R2; Abbreviations: R2 – Round 2; R3 – Round 3

FIGURE 3. List of indicators that reached consensus in round 3. Consensus was reached if more than 70% of participants rated the indicator as 4 (high) or 5 (very high) points on the Likert scale in 3 or more criteria.

Number of Women Screened for Cervical Precancer in *secondary prevention (screening)*, Received Triage Examination Rate in *secondary prevention (triage)*, Treatment Rate of Precancerous Lesions in *secondary prevention (treatment of precancerous lesions)*, Suspected Cervical Cancer Cases Rate in *tertiary prevention (CC diagnosis and care)*, and Cervical Cancer Incidence Rate in *long-term program impact and linkage to HIV service*.

DISCUSSION

We worked with international experts to come to consensus on facility-based indicators for managing and scaling up CC prevention and care services offered to girls and WLHIV, who receive care at HIV clinics across SSA. The group reached consensus (at least 70% agreement in 3 or more criteria) on 17 indicators in the domains of primary prevention (HPV prevention, n = 2), secondary prevention (screening, triage, treatment of precancerous lesions, n = 11), tertiary prevention (CC diagnosis and care, n = 2), and long-term impact of the program and its linkage to HIV services (n = 2). Five indicators from the *secondary prevention (screening and treatment of precancerous lesions)* domain garnered at least 70% agreement for all criteria (relevance, feasibility, comparability, reliability, and understandability) the experts used to rate them.

We took a comprehensive methodological approach that comprised a rigorous EP selection process and iterative online Delphi rounds in which discussions were guided and participants presented structured feedback. Questionnaires contained detailed instructions in 2 languages. We assembled an EP of participants from a variety of professional backgrounds and levels of experience; to increase the likelihood, our results would be generalizable and applicable across contexts. We were limited by several factors, including low response rates (34%–45%) in all rounds. In our study, a long questionnaire may have reduced our response rate, especially in round 1; the first round questionnaire was the longest and most complex, containing items to help participants adapt the indicators. Finally, owing to the COVID-19 pandemic, we replaced our planned face-to-face events with online discussions, which may have reduced the EP members' motivation to participate.

Some reviews found that three-round Delphi processes reported response rates between 45% and 93%,[43] but less than a third (31%) of included studies had reported response rates for all rounds.[39] Differences in reported response rates can be also explained by different denominators used to calculate them (eg, number of emailed participants, participants who agreed to participate, or participants who completed the survey in the previous round). To improve the response rates in our study, we used online management survey software to design and administrate user-friendly survey to maintain

TABLE 1. Ranking of Indicators That Reached Consensus per Domains in Round 3 by Importance

Rank* (Score)	Indicator's Title and Definition
Domain: Primary Prevention—HPV Prevention	
1 (85)	HPV Vaccination Rate
	HPV vaccinated "girls living with HIV enrolled in care with at least 1 HIV clinic visit during the period of interest" aged 9–14 yrs
2 (50)	High-Risk HPV Incidence Rate
	Newly diagnosed high-risk HPV cases among "girls and women living with HIV/AIDS enrolled in care with at least 1 HIV clinic visit during the period of interest" in a specific age range in a 12-month period
Domain: Secondary Prevention—Screening	
1 (312)	Number of Women Screened for Cervical Precancer†
	Number of screened "women living with HIV/AIDS aged 25–49 years enrolled in care with at least 1 HIV clinic visit during the period of interest"
2 (304)	Cervical Screening Rate‡
	Screened "women living with HIV/AIDS aged 25–49 years enrolled in care with at least 1 HIV clinic visit during the period of interest"
3 (237)	Screening Test Positivity Rate for the Primary Screening Test
	Screened "women living with HIV/AIDS aged 25–49 years enrolled in care with at least 1 HIV clinic visit during the period of interest" who received a positive primary screening test result in a 6-month period
4 (156)	Received Screening Test Results
	"Women living with HIV/AIDS aged 25–49 years enrolled in care with at least 1 HIV clinic visit during the period of interest" who received their screening test results in a 6-month period
5 (113)	Screening Test Positivity Rate for the Primary Screening Test for First Time Screened Women
	The first time screened "women living with HIV/AIDS aged 25–49 years enrolled in care with at least 1 HIV clinic visit during the period of interest" who received a positive primary screening test result in a 12-month period
6 (75)	Rescreened after a previous Negative Result, within Recommended Screening Interval
	"Women living with HIV/AIDS aged 25–49 years enrolled in care with at least 1 HIV clinic visit during the period of interest" who were rescreened (after a previous negative result) within the recommended screening interval
Domain: Secondary Prevention—Triage	
1 (215)	Received Triage Examination Rate
	Screen-positive "women living with HIV/AIDS aged 25–49 years enrolled in care with at least 1 HIV clinic visit during the period of interest" who received a triage examination in a 12-month period
2 (185)	Triage Examination Positivity Rate
	Screen-positive "women living with HIV/AIDS aged 25–49 years enrolled in care with at least 1 HIV clinic visit during the period of interest" with a positive triage examination result in a 12-month period
3 (116)	Triage Examination Provision Rate
	Screen-positive "women living with HIV/AIDS aged 25–49 years enrolled in care with at least 1 HIV clinic visit during the period of interest" who attended the triage visit and received a triage examination in a 12-month period
Domain: Secondary Prevention—Treatment of precancerous lesions	
1 (176)	Treatment Rate of Precancerous Lesions
	Screen-positive "women living with HIV/AIDS aged 25–49 years enrolled in care with at least 1 HIV clinic visit during the period of interest" who have received treatment in a 6-month period
2 (111)	Precancerous Lesions Post-Treatment Follow-Up Rate
	"Women living with HIV/AIDS aged 25–49 years enrolled in care with at least 1 HIV clinic visit during the period of interest" treated for precancerous lesions who return for a post-treatment follow-up screening test in a 12-month period
Domain: Tertiary Prevention—CC diagnosis and care	
1 (197)	Suspected Cervical Cancer Cases Rate
	Screened "women living with HIV/AIDS aged 25–49 years enrolled in care with at least 1 HIV clinic visit during the period of interest" with suspected cervical cancer in a 12-month period
2 (86)	Confirmed Cervical Cancers Rate
	Screen-positive "women living with HIV/AIDS aged 25–49 years enrolled in care with at least 1 HIV clinic visit during the period of interest" diagnosed with invasive cervical cancer in a 12-month period
Domain: Long-term program Impact and Linkage of HIV Services	
1 (200)	Age-Specific Cervical Cancer Incidence Rate
	New invasive cervical cancer cases diagnosed in "women living with HIV/AIDS enrolled in care with at least 1 HIV clinic visit during the period of interest" in a specific age group or range in a 12-month period
2 (112)	HIV Testing and Counseling Service Provision Rate
	Women with previously unknown HIV status who received testing and counseling service for HIV at their cervical screening visit, and now know their HIV status in a 12-month period

*Rank position and RS per each domain. To determine the RS, we first calculated frequency (how many respondents placed an indicator as first, second, third etc., within each domain). We multiplied frequency by the weight of the ranked position: First place was the highest and last place was the lowest: RS = 1W1 + x2W2 + x3W3 + x4W4… where x is the frequency (response count) for the indicator choice and W is the weight of the ranked position. Then we ordered RS from the highest to lowest and assigned the ranks: 1 for the first highest RS within domain, 2 for the second highest RS etc.; File S4, Supplemental Digital Content, http://links.lww.com/QAI/C166, Quantitative analysis (rating and ranking) provides step-by-step instructions how ranking was performed.

†This is an absolute number.

‡This is a proportion.

participants' motivation and to send weekly reminders to nonrespondents.[35]

The WHO IDCCP Toolkit[30] and previously published studies that evaluated CC control services for WLHIV in SSA focused primarily on the secondary prevention portion of the cascade (screening, treatment of precancerous lesions, and follow-up). Our study identified core and optional indicators across the CC control continuum, from primary prevention to long-term impact and linkage of services. In general, core indicators result in better data and better use of data to improve programs.[13,30] Optional indicators add insight into program performance and outcome and capture aspects of patient care in more detail.[30] We discussed some of our optional indicators at the satellite meetings, especially those related to updated CC screening and treatment recommendations of WHO. These discussions highlighted the importance of triage test in screening WLHIV, which may be why 2 indicators from the domain *triage* reached consensus in round 3 instead of round 2. But both these indicators were still rated low on feasibility and reliability, perhaps because most cervical screening programs in SSA still rely on visual inspection with acetic acid–based "screen and treat" strategies and have not yet implemented HPV testing, followed by a triage test.[22] Although EP members agreed that all optional indicators were highly relevant, comparable, and understandable (high level of agreement in these criteria) at satellite meetings, they expressed their concern that it was not feasible to collect the necessary data; this concern was reflected in their ratings. EP members also recognized that it would be useful to disaggregate indicators to identify existing differences in service access and quality within subpopulations[13] but were concerned that it would make data collection, management, and aggregation more complex.

In resource-limited settings, we recommend prioritizing the core indicators that garnered the highest level of agreement for feasibility and reliability. Facilities with mature programs, robust data systems, available resources, or needs to monitor specific priorities may consider to include optional indicators. Nevertheless, to perform a comprehensive cascade analysis, it is needed to consider all domains of CC control and include both core and optional indicators. In future, researchers and program managers should weigh the benefits of collecting data to inform these indicators against their capacity to collect high-quality data and manage it. Our next step will be to define a minimum data set and variables needed to inform the core and optional indicators to facilitate data collection at HIV facilities offering CC control services. We will implement the variables within the IeDEA Data Exchange Standard, so we can analyze, interpret, and disseminate CC data and support efforts[44] to track the progress of the WHO CC Elimination Strategy,[4] with a focus on girls and WLHIV. International research collaborations, for example, IeDEA, could increase local capacity to collect and analyze patient-level facility-based data through partnered research activities and help facilities and programs overcome infrastructure or capacity limitations.[26] These activities require dedicated resources because each step of the CC prevention and care cascade requires comprehensive assessment. Because many countries in SSA are investing in cost-effective efforts to improve access to and to manage CC screening and treatment services for WLHIV, we have reason to believe that assessing some indicators might soon become more feasible.[45] We should support these efforts by improving monitoring along with data collection and management.

CONCLUSIONS

We recommend implementing the 17 indicators (see File S6, Supplemental Digital Content, http://links.lww.com/QAI/C168) we identified into routine data collection at HIV clinics and facilities in SSA that offer CC prevention and care services, and this has the potential to significantly increase the quality of data collection and reporting. Programs and facilities can use these core and optional indicators to improve monitoring and evaluation in a variety of contexts, so they can improve CC control services for WLHIV.

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