

# Multi-site community-engaged quality improvement to inform regional cervical cancer screening implementation and sustainment in rural Sénégal

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**Research**

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## Abstract

**Background** The improvement of quality at the primary health care level in low resource settings is key to addressing health equity challenges around the world. In 2014, a Sénégal-Peace Corps-University of Illinois at Chicago partnership began to study the impact of a community-engaged quality improvement program on health services and regional health system determinants to prevent cervical cancer, the leading cause of cancer deaths among women in Sénégal. The purpose of this paper is to describe how a multi-site participatory quality improvement (QI) approach can identify access barriers and provide contextualized programmatic recommendations to strengthen the cervical cancer screening program in the rural Kédougou region of Sénégal and inform higher-level program implementation and sustainment.

**Methods** : We adapted a facility-level quality improvement process by involving community health committee representatives. Using a mixed methods case study approach, we collected data at nine demonstration sites in the Kédougou region from quality improvement program action plans, client surveys, health leader interviews, and service guidelines discussions at the regional level from January 2015 through June 2019. We calculated the demand and supply-side barriers and organized them into the Levesque Patient-Centered Access to Health Care Framework.

**Results** During the study period, 27 quality improvement meetings took place. There were a total of 50 (14 unique) stated access barriers to cervical cancer prevention across all sites. The health service barriers were concentrated in approachability (5) and availability and accommodation (16), whereas the demand-side barriers were concentrated in the ability to perceive (14) and ability to seek care (3). Individual health facilities responded with increased community outreach among other interventions while regional programmatic recommendations led to strategic partnership initiatives such as social mobilization and peer-to-peer education activities.

**Conclusions** The community-engaged QI process has meaningfully contributed to strategic planning of the implementation and sustainment of a cervical cancer screening program within the context of rural Kédougou, Sénégal. The iterative and patient-focused nature of QI has allowed health personnel to continually strengthen how they deliver their health services to meet the community's needs while data aggregated from QI action plans across multiple sites has helped inform responsive health policies to ensure program sustainment. The parallel and iterative application of participatory capacity building and QI activities across multiple sites provides a useful approach for implementing sustainable cervical cancer programs.

## Background

Improving access to high quality primary health care (PHC) services in low resource settings is key to ensuring universal health coverage and health equity.<sup>1</sup> Health service-level continuous quality improvement (QI) programs are an established iterative process for identifying and addressing existing supply-side barriers to healthcare access. The engagement of clients and communities through participatory methodologies has been shown to improve the understanding of demand-side barriers and improve health care quality.<sup>2,3</sup> However, direct individual and community engagement in traditional QI processes is marginal.<sup>4,5</sup> There are, furthermore, a lack of frameworks and approaches for systematically gathering perspectives from the community through a QI process for the purpose of informing higher-level decision making. In addition, in striving for high quality person-centered health care,<sup>6</sup> there are gaps in the understanding of how regional health systems can best be informed by the perspectives of individuals who are confronted daily by challenges at the health service- and community-levels.<sup>7</sup>

### Global Disparities in Cervical Cancer Prevention and Control

In 2018, globally 569,847 cervical cancer diagnoses and 311,000 deaths were estimated due to this preventable disease.<sup>8</sup> Cervical cancer is the fourth most common cancer diagnosed among women worldwide. It has the highest cancer incidence rate among women in 28 countries and is the most common type of cancer-related mortality among women in 42 countries, with the majority being in Sub-Saharan Africa.<sup>8</sup> While cervical cancer incidence rates are declining in high resource areas, incidence, prevalence, and mortality rates continue to rise in low- and middle-income countries (LMIC).<sup>8</sup> Furthermore, global cervical cancer mortality is expected to increase by 42% to 442,926 deaths in the year 2030.<sup>9</sup> The greatest rise will be in LMICs where, currently, 85% of incident cervical cancers and 87% of cervical cancer deaths occur.<sup>10,11</sup>

Various evidence-based cervical cancer screening techniques have been developed, tested, and proven to be appropriate for diverse contexts including visual inspection methods (employing acetic acid and/or Lugol's solution) which are effective, low-cost approaches appropriate for low-resource settings. However, there are considerable challenges in implementing sustainable cervical cancer screening programs in a low-resource, rural context, especially in LMICs. Demand-side barriers include factors such as health literacy, discomfort with the procedure, trust, embarrassment or anxiety, geographic reach, inability to pay, and communication challenges.<sup>12</sup> On the supply-side, barriers include deficient outreach, preference for a female provider, workforce shortages, lack of functional equipment, and lack of available training.<sup>12</sup> A better understanding of how to implement evidence-based interventions into real world settings, especially at the decentralized level, is needed to achieve reasonable global progress toward the elimination of Human papillomavirus (HPV) related cancers.<sup>12,13</sup>

## Cervical Cancer in Sénégal

The cervical cancer incidence rate in Sénégal (37.8) is about five times greater than that in the U.S., and Sénégal ranks 17<sup>th</sup> in the world in the age-standardized incidence rate of cervical cancer.<sup>13,14</sup> HPV prevalence<sup>15</sup> and the cervical cancer burden<sup>16</sup> in urban areas of Sénégal remain high. However, adequate data to compute the prevalence of cervical cancer and dysplasia in rural regions are not available.<sup>17</sup> In Sénégal, HPV positivity is higher in older-aged women (over age 45) compared to other countries in Africa.<sup>18</sup> Despite the value of cervical cancer screening and treatment in reducing mortality, the estimated participation rate for cervical cancer screening in Sénégal is very low (6.9% of all women ages 18 to 69). It is especially low in rural areas as well as in older age groups (1.9% of women ages 40 to 49 and none for women 50 and above).<sup>15</sup>

In 2010, a partnership was formed among the Kédougou Medical Region in Southeastern Sénégal; the Institute of Health and Development at Cheikh Anta Diop University (UCAD), Dakar, Sénégal; Peace Corps Sénégal; and the University of Illinois at Chicago (UIC). The stated overarching goal of this partnership is to achieve health equity by improving community access to quality primary health care services. By identifying local priorities and health service gaps, Kédougou health leaders and workers established that the aims of the partnership are to: 1) improve access to cervical cancer prevention services as a key component of high quality primary health care by strengthening the health care workforce and delivery systems in the Kédougou region and 2) inform the development and implementation of cervical cancer prevention programs in other rural regions of Sénégal. The Sénégal-Peace Corps-UIC partnership has conducted implementation research on capacity building and quality improvement activities to achieve partnership, community, and research objectives that include informing priorities, improving health outcomes, and building knowledge.<sup>19,20</sup> In 2014, the partnership began to study the impact of a QI program on the supply-side (health service-level) determinants of cervical cancer screening and the implementation of regional health programmatic strategy.

## Community-Engaged Quality Improvement

Health service-level QI programs are increasingly applied in low-resource settings<sup>21</sup> and incorporating community participation into service-level QI activities may improve person-centered care.<sup>3</sup> However, few traditional QI programs in LMICs routinely inform service-level QI activities by including a community voice. Some QI interventions, therefore, may not fully capture demand-side concerns or community recommendations for addressing context-specific barriers.

To overcome this challenge, we adapted the EngenderHealth-developed Client Oriented Provider Efficient (COPE®) quality improvement process as a structured QI approach within our partnership. The EngenderHealth-developed COPE® cervical cancer quality improvement process uses a clients' rights and providers' needs framework and is a well-documented and well-established QI approach used at the primary health care level in many countries globally.<sup>22-25</sup> The COPE® process employs client surveys, health leader interviews, and the quarterly development of action plans for each health facility. The action planning process is managed by a quality improvement committee at each facility. Our partnership adapted the process by including community health committee representatives, a formal part of the Sénégalaise health system, in the QI Committee and at the action planning meetings. This process provided local health staff and community members with the opportunity to evaluate the local health services while also generating participatory input for the partnership.

The purpose of this paper is to describe how a multi-site quality improvement (QI) approach can identify access barriers and provide contextualized programmatic recommendations to strengthen the cervical cancer screening program in the rural Kédougou region of Sénégal and inform higher-level program implementation and sustainment.

## Methods

Through a case study design using mixed methods we analyzed two sources of data: 1) quantitative and qualitative analysis of quality improvement action plans (de-identified from community participatory primary health care facility-level quality improvement meetings) from January 2015 through June 2019 at nine demonstration sites in the Kédougou region of Sénégal and 2) document review (partnership strategic reports and regional plans) spanning partnership initiation in 2010 through June 2019.

## Demonstration Sites for Quality Improvement

In 2014, we selected nine demonstration sites in the Kédougou Medical Region through non-probability sampling including one health center and two rural health posts from each of the three districts comprising the region. We selected sites that were evenly geographically dispersed across the region while having reasonable proximity to a Peace Corps Volunteer to facilitate routine engagement. In the Kédougou District we selected the Dalaba health post, Bandafassi, and Dindéfello. In the Salemata District we selected the Salemata Health Center and the health posts of Dar Salaam and Dakately. In the Saraya District, we selected the Saraya Health Center and the posts of Nafadji and Khossanto. Table 1 reports baseline descriptive data from each site. We adapted the COPE® model and introduced a community-participatory quality improvement process to all demonstration sites by working with the health service leadership (nurse and/or midwife) and the community health committee at each site.

**Table 1: Quality improvement demonstration sites baseline context data**

### **Health Service Quality Improvement Activities**

To establish the quality improvement activities at the primary health care level in each health facility, we trained local Sénégalaise research assistants (RAs) in the QI process and instruction, project coordination, quantitative and qualitative data collection methodologies, and research ethics. These RAs, who were fluent in the local languages and were living in or near the selected sites, facilitated the introduction and management of QI activities at each site on a quarterly basis. Throughout the course of the study continuous training occurred to ensure local ownership and future sustainability. To conduct the local QI process, each health facility identified a QI committee lead who was responsible for scheduling QI meetings involving all available health staff and members of the QI committee, representatives from the community health committee, representatives from the women's group, as well as Peace Corps volunteers (at some sites). Prior to a quality improvement meeting at each site, local personnel (from the community health committee or women's group) conducted client interviews using two standard questionnaires to gather data on general health services and cervical cancer knowledge and service utilization. Partnership RAs aided the local personnel in coordinating the client-level data collection to achieve 12 interviews per site (6 on general health services and 6 on the cervical cancer screening service) each quarter. The RA role was to recruit and select participants (3 men and 3 women for the general health services survey; 6 women for the cervical cancer survey, all aged 30 to 59 which is the cervical cancer screening target population) as they prepared to leave the health facility. The RAs obtained oral informed consent prior to the initiation of the QI client-survey by local personnel. The RA then ensured that all questions were recorded anonymously. After all data were collected, the QI committee at each site reviewed and summarized identified problems from these data to prepare for each QI meeting. The QI committee led the 90-minute QI meeting, where health personnel and community representatives discussed health care services planning and prioritization, utilizing the prepared client data summary as a guide. The results of the discussion were recorded through hand-written notes. A formal site-specific "quality improvement action plan" describing health service problems, main causes, and recommendations was created. This report was displayed at the health facility to make it visible to clients and distributed to district and regional health officials as well as other community stakeholders (e.g. mayor, village chief). Client identifiers were absent from the compiled reports.

### **Strategic Planning Activities**

Partnership strategic planning activities were held twice yearly between 2010 and 2019 to advance partnership operations, project planning, and regional programmatic development through a participatory process. The semiannual activities include three days of Partnership Meetings in Kédougou involving regional- and district-level health officials as well as clinical personnel (health center and post physicians, nurses, and midwives) and community representatives (community health committee officers and women's group representatives) from each of the nine demonstration sites in the rural Kédougou, Sénégal region. Hired local RAs, Peace Corps Volunteers, and University Personnel (UIC and UCAD) also participated in the regional meetings as well as in discussions at the national level.

### **Document Review**

We conducted a review and aggregated de-identified data from each site's QI action plans. We identified operational and access barriers to cervical cancer prevention service implementation and sustainment as stated in reported QI action plans across all sites. In addition, we reviewed observations, notes, and strategic planning discussions from partnership and strategic planning meetings as documented by partnership personnel through periodic reports. We reviewed partnership reports from 2010 through June 2019 to summarize meaningful partnership activities relevant to the implementation, strengthening, and sustainment of the cervical cancer prevention program in the region.

### **Data Analysis using the Levesque Guiding Framework**

All sources of data were assessed to identify formative barriers to the implementation and sustainment of a quality cervical cancer screening health service. We distinguished between demand and supply-side barriers and organized them into the Levesque Patient-Centered Access to Health Care Framework.<sup>26</sup> This framework specifies barriers on both the demand-side (clients and community) as well as the supply-side (health services).<sup>26</sup> The framework is useful for more fully considering how central program strategy should emphasize upstream effects (peripheral barriers) to positively influence downstream impact (access) and served to guide our interpretation of these data. Demand-side barriers are subcategorized into ability to “Perceive,” “Seek,” “Reach,” “Pay,” and “Engage” while supply-side barriers are subcategorized into “Approachability,” “Acceptability,” “Availability and Accommodation,” “Affordability,” and “Appropriateness.” The Levesque framework further matches demand-side to supply-side barriers together to indicate unified categories of healthcare access determinants. We also catalogued the interventions and programmatic recommendations specific to the identified barriers. We combined the QI-identified barriers with the major programmatic barriers identified through project reports. This exercise allowed us to compile the major regional-level program strategy recommendations relevant to the identified barriers. In addition, throughout the course of this project, we created a separate log to monitor research methodology fidelity as well as record process limitations and challenges encountered.

## The Conduct of Responsible Research

The University of Illinois at Chicago has an ongoing Partnership Affiliation Agreement with the Institute of Health and Development at the University Cheikh Anta Diop and with the Medical Region of Kédougou. This partnership uses a participatory approach ensuring that all activities are well-aligned with the expressed priorities of the local health system. The study was approved through the UIC and Sénégal Ministry of Health and Social Action research ethics committees. The Medical Region of Kédougou, its three health districts, and participating health posts granted researchers permission through signed letters of support to implement and conduct the quality improvement activities. Each investigator and research assistant, including Peace Corps Volunteers, completed the Collaborative Institutional Training Initiative (CITI) research ethics training prior to conducting the research.<sup>27</sup> We have adhered to the Revised Standards for Quality Improvement Reporting Excellence (SQUIRE 2.0) in the creation of this manuscript.<sup>28</sup>

## Results

### Quality Improvement Action Plans

Between January 2015 and June 2019, the demonstration sites conducted a total of 27 QI meetings: Kédougou (3), Bandafassi (5), Dindéfelo (4), Salemata (3), Dakately (2), Dar Salaam (2), Saraya (2), Nafadji (4), and Khossanto (2). Across the nine demonstration sites, there were a total of 123 identified barriers (73 total barriers to general health services and 50 total barriers to cervical cancer health services), comprised of 14 unique barriers to cervical cancer services (Table 3).

Table 2 lists examples of the General Health and Cervical Cancer Services Problems derived from the QI action plan alongside the Resulting Health Facility Impact for each site. The sites have faced unique challenges to providing general health services to the community, including poor maintenance of mosquito nets and low vaccination rates among children. For cervical cancer services delivery specifically, the most commonly identified challenge has been the population's lack of knowledge and awareness of the illness. Based on these findings, the health facilities have implemented new activities and adapted current efforts to address these problems. For instance, Dakately scheduled a day for health staff to wash and properly hang mosquito nets above all of the beds in the facility. Nafadji implemented health talks and used their women's care groups to discuss the importance of vaccinating children. Furthermore, each site found an opportunity to incorporate lessons on cervical cancer and screening into existing community outreach efforts. These efforts include home visits and weekly health talks which occur during baby-weighing events that bring mothers throughout the community together.

**Table 2: Select identified problems for quality general health services and cervical cancer health services with the resulting health facility impact.**

Table 3 highlights barriers specific to cervical cancer health services identified at each site and categorized into the Levesque framework. We identified supply-side (health service) barriers within the following categories: approachability (5) and availability and accommodation (16). The demand-side (clients and community) barriers were concentrated within the following Levesque categories: the ability to perceive (14), ability to seek (3), and ability to engage (2). There were no identified barriers corresponding to the Affordability / Ability to Pay construct. (Table 3)

**Table 3: Programmatic-relevant barriers associated with the cervical cancer services explicitly identified by demonstration sites through QI action planning between 2015 and 2019 (by site).**

Table 4 reports the aggregated and deduplicated barriers specific to the cervical cancer screening service across all sites. The most frequent QI-reported supply-side barriers specific to cervical cancer screening in Kédougou are: 1) Lack of screening training for providers, 2) Cervical cancer screening services not available, and 3) Lack of staff knowledge on cervical cancer. The most frequent QI-reported demand-side barriers specific to cervical cancer screening in Kédougou include: 1) Lack of information or awareness of cervical cancer within the community, 2) Low screening participation rates, and 3) Cervical cancer is a taboo subject. (Table 4)

**Table 4: Aggregated barriers identified in QI action plan data between January 2015 and June 2019 by each demonstration site**

### **Regional Programmatic Recommendations**

Table 5 reports the major regional programmatic recommendations from the partnership over the course of this study. The QI recommendations were taken into account alongside other data throughout the strategic planning process in developing these regional program strategy recommendations. The recommendations are also categorized in the Levesque framework.

**Table 5: Regional cervical cancer prevention programmatic recommendations informed by the QI action plans and partnership strategic planning between 2014 and 2019 categorized into the Levesque framework**

## **Discussion**

The results of the QI program have informed activities that are clinically relevant at the health facility level and applicable to program strategy within the Kédougou regional health system. Through QI action plans, the health facilities have identified problems specific to each site, and in turn, have made recommendations that could inform higher-level programmatic development. QI meetings have led to thoughtful discussion and problem-solving among health personnel and community members across the nine demonstration sites. As a result, these quarterly meetings have also become forums for those present to exchange ideas and develop feasible solutions that can be executed at the clinical level.

### **QI Informed Barriers and Programmatic Recommendations**

The purpose of this paper is to report community-engaged, quality improvement-identified access barriers and contextualized programmatic recommendations over time, specific to the cervical cancer screening program in the rural Kédougou region of Sénégal to describe a multi-site QI approach for informing higher-level program implementation and sustainment.

#### Supply-side Barriers

The data from the QI action plans indicate an immense need to address the capacity and knowledge gaps that exist among health personnel as well as respond to the shortage of cervical cancer screening equipment. The demonstration sites recommended training the head nurses and midwives on cervical cancer screening. Maintaining capacity has proven challenging in this isolated region. To illustrate capacity challenges, in 2011, after identifying visual inspection of the cervix with acetic acid (VIA) as an appropriate, safe, and cost-effective screening method, the partnership implemented a training of trainers for the midwives throughout the Kédougou region. Of the original 63 health care workers trained by the end of 2013, only 19 remained in the region at the end of 2015, resulting in an attrition rate of 70% over two years. By the end of 2017, an additional 24 midwives were transferred out of the region.<sup>12</sup> Kédougou's underdeveloped and limited infrastructure has led to many health care personnel routinely leaving the region after two to five years to move closer to urban centers. Furthermore, this growing challenge of high attrition rates is worsened by the length of time taken to replace relocated staff. As new midwives are posted in Kédougou, they are also required to receive in-service training on VIA and cryotherapy since these skills are not incorporated in their pre-service formal training. To respond to this significant challenge, the partnership has proposed collaborating with the midwifery training center in the neighboring region of Tambacounda financed by the Sénégal Ministry of Health and Social Action. This training center provides instruction for midwives posted throughout Sénégal's southeastern regions. This programmatic proposal intends to decentralize the cervical cancer prevention training curriculum that is currently available only at the national level. The training will include VIA screening and cryotherapy procedural skills enabling the provision of comprehensive cervical cancer services to all new midwives and nurses placed in the region. This programmatic proposal will ensure reliable access to high quality training for midwives and address the issue of having to continuously train new midwives as they are assigned to the Kédougou region.

#### Demand-side Barriers

The most frequently reported barrier for the demand-side was the lack of cervical cancer prevention knowledge in the community. Action plans reported that the target population was not adequately aware of the characteristics of cervical cancer or the importance of screening for prevention.

Furthermore, although women ages 40+ are at highest risk of cervical cancer, they are the least likely to seek cervical cancer screening services.<sup>19</sup> An important aim for this participatory QI approach is to improve health equity through a heightened community voice.

Given that the teams largely interviewed clients and selected village leaders and those who seem engaged with the health center (community health committee, women's groups), it is very hard to get information about barriers from those in the community who do not use services. From those community members who do not use services (who may be the most socially and economically marginalized), the costs of transport or time lost may be important barriers.

Misinformation is pervasive and concerns surrounding the stigmatization of HPV and cervical cancer may worsen the non-acceptance of screening, resulting in continued low screening uptake. Through the QI process, the demonstration sites recommended increasing organized sensitization activities to engage the target population as well as community leaders (e.g. village chiefs, religious leaders). In 2018, the partnership responded with the introduction of a peer-to-peer educational intervention through the Care Group model, a low-cost and evidence-based approach to educating the community. The Care Group model has been implemented in over 20 countries utilizing a train-the-trainer approach to disseminate information.<sup>29,30</sup> Although this model has been used extensively for maternal / child care and for other topics, prior to this project, curricula focused on cervical cancer did not exist.<sup>31</sup> To respond to the programmatic recommendation, the partnership developed an educational curriculum orienting community members to the 1) causes, risk factors, and signs and symptoms of cervical cancer, 2) screening and treatment of cancer and precancerous lesions, and 3) psychosocial considerations of prevention and follow-up after diagnosis. These resources have been translated into French and local languages. Care Groups of 10 to 15 women (ages 30 to 59) were created at each demonstration site and led by a local female health worker, the 'Care Group Leader'. Members meet once or twice per month to learn and practice teaching the lesson plan, which they then facilitate with their assigned neighborhood group. Through this peer-to-peer network, a single Care Group has potential to reach up to 225 women each month, strengthening the effect of each educational topic and making it a high-impact, low-cost solution to addressing information gaps through a social network. Moving forward, the cervical cancer educational module that has developed as an outcome of the QI action plan recommendations may serve as a template for maximizing early impact of new cervical cancer screening services implemented in other areas of rural Sénégal.<sup>12</sup> This effort to address demand-side barriers to cervical cancer screening implementation and sustainability has potential to improve local advocacy and communication capacity within the health system and community.

## Limitations

Our site selection was non-random and while it is arguable that these sites do represent the context of all sites in the region, there may be differences with the selected sites regarding their capabilities or other characteristics such as benefiting from other programs. The QI committees and QI activities do not currently function uniformly across all sites due to various challenges. At the health post/center level, the challenges included 1) high staff turnover resulting in new staff not trained in QI, 2) the absence of Peace Corps volunteers in some sites to assist with QI meeting facilitation, and 3) scheduling issues. At the regional level, health officials who are often overburdened with work had reported being unable to properly manage regional level data collection. These limitations are parallel to the challenges to which the partnership is responding through the overall project. While the QI process is participatory, it is likely that it does not represent all of the perspectives of non-users of services, therefore the access barriers of the most marginalized may not be fully identified.

Given that the implementation of service-level QI programs in the Kédougou region is recent, it is important to note that many of the same barriers to providing access to high quality cervical cancer prevention also created considerable challenges in the implementation of a quality improvement process in this setting. During the course of this study we have encountered several barriers that have limited the effectiveness of the QI program. The shortage of healthcare workforce in this rural region is a major barrier. Given time constraints of the existing workforce, the routine actualization of the QI process may at times take a back seat to pressing clinical work or administrative issues. Therefore, future research could be focused on better understanding the implementation factors related to the acceptability (e.g. relative advantage, credibility), adoption (e.g. intention to try), feasibility (e.g. practicality, utility), cost, and sustainability (e.g. institutionalization, maintenance, and routinization) of a quality improvement program at the health service level in this setting. Furthermore, better understanding is needed to improve the community engagement component of a health service quality improvement program. There appears to be a steep learning curve among stakeholders both on the supply- and the demand-sides of the equation concerning the value and process of a QI program. The effectiveness of this program and the long-term sustainment would benefit from a better understanding of these barriers.

## Conclusions

The QI process has meaningfully contributed to the partnership activities related to strategic planning and programmatic development of the implementation and sustainment of a cervical cancer screening program within the context of rural Kédougou, Sénégal. In response to the context-specific barriers identified in the aggregated QI action plans gathered across multiple demonstration sites and through other partnership activities, the partnership has proposed the major programmatic recommendations listed in Table 4. Given the overall value to our partnership's objectives, we recommend that other partnerships consider implementing a QI process within existing health systems at the primary health care facility level across multiple sites as a means to monitor dynamic implementation barriers and ensure program sustainability across multiple sites. The project demonstrated that a systematic QI process can address concerns regarding quality of care, which has been identified by the World Health Organization as a key driver in strengthening health systems in developing nations.<sup>32</sup> Rather than being implemented as an exclusively central

program or focused only on health providers, we have shown how QI can be integrated within local health facilities to ensure accountability and responsiveness of the community health systems to the local context.<sup>33</sup> Through continuous QI, an additional recommendation is that health leaders engage with community members through activities such as client surveys and the action planning process to better understand their perspective of the local health care services, thus giving the community a stronger voice in the process. This dialogue ensures that the community's concerns are represented during meetings among staff when barriers to quality care are identified and action plans are created to address them, thus increasing the likelihood of program sustainability.<sup>34</sup> The iterative and patient-focused nature of QI allows health providers to continually strengthen how they deliver their health services to meet the community's needs.<sup>33</sup> Furthermore, the data aggregated from QI action plans of decentralized sites can help inform higher level activities and shape impactful health policies as future challenges are identified.<sup>12</sup> As quality of care is improved, the implementation of the program better responds to the local context, and the health system is strengthened from the bottom up, contributing to better health outcomes.

The parallel and iterative application of participatory capacity building and QI activities across multiple sites can serve as a useful approach for implementing sustainable cervical cancer programs in LMICs, because the processes shape the programs to fit local contexts. The aggregated data gathered from QI action plans provide information to inform activities and program development at the higher-levels of the health system and advance the knowledge of how to deliver primary healthcare services at the local level in LMICs.<sup>35</sup> As the partnership and local ministry of health respond to the barriers identified in the QI action plans, cervical cancer programs and primary healthcare services should be strengthened and adapted to multiple locations and various contexts. We believe that the participatory and systematic QI approach provides a framework for how QI can guide strategic planning at the local level and potentially inform regional and national level policy for improved program implementation.

## Abbreviations

CC	cervical cancer
CITI	Collaborative Institutional Training Initiative
COPE	Client Oriented Provider Efficient
HPV	human papillomavirus
LMIC	low- and middle-income country
PHC	primary health care
QI	quality improvement
RA	research assistant
SQUIRE	Standards for Quality Improvement Reporting Excellence
UCAD	University Cheikh Anta Diop
UIC	University of Illinois at Chicago
VIA	visual inspection of the cervix with acetic acid

## Declarations

- Ethics approval and consent to participate
  - The study was approved through the UIC and Sénégal Ministry of Health and Social Action research ethics committees. The Medical Region of Kédougou, its three health districts, and participating health posts granted researchers permission through signed letters of support to implement and conduct the quality improvement activities.
- Consent for publication
  - Not applicable
- Availability of data and material
  - The datasets during and/or analyzed during the current study available from the corresponding author on reasonable request.
- Competing interests
  - The authors declare that they have no competing interests.
- Funding

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- Authors' contributions
  - All authors contributed to the conception and design of the study (JAD, ELD, HT, EMD, ZRC, ND, TK, KEP, AAK, MD, YN) or to the acquisition, analysis and interpretation of data (SL, EH, ELVL, AF, CEP, LRH, DP), and drafted the manuscript (ELD, JAD, CEP) or revised it critically for content (HT, EMD, SL, ZRC, ND, TK, EH, ELVL, KEP, AAK, MD, YN, AF, LRH, DP). All authors read and approved the final manuscript.
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## Tables

**Table 1: Quality improvement demonstration sites baseline context data**

Health Facility	Number of villages accessing this health facility	Covered population	Number of women's health clinic visits per year at this health facility	Number and type of providers trained in VIA
Kedougou - Dalaba (Post)	8	5995	2558	Midwife (1)*
Bandafassi (Post)	21	7189	819	Nurse (1)
Dindefello (Post)	25	9370	1460	Midwife (2)
Salemata (District Center)	18	7278	231	Midwife (3)
Dakately (Post)	9	3037	120	Nurse (1) Midwife (1)
Dar Salaam (Post)	10	3084	57	Midwife (1)
Saraya (District Center)	6	5890	1610	Midwife (3)
Nafadji (Post)	7	3759	278	Nurse (1)
Khossanto (Post)	6	3471	1892	Midwife (1)

\*Trained in 2016

VIA: Visual inspection of the cervix with acetic acid

Table 2: Select identified problems for quality general health services and cervical cancer health services with the resulting health facility impact.

General Health Services		
Demonstration Site	Action Plan Problem	Resulting Health Facility Impact
Dakately	Dirty mosquito nets Mosquito nets not hung above beds	Health personnel schedule days focused on maintaining bed nets (i.e. washing bed nets and properly hanging bed nets)
Kedougou (Dalaba)	Hand washing stations not used in health post	Health personnel focus their sensitization activities, health talks, home visits and care group lessons on the importance of handwashing
Nafadji	Lack of communication between actors and the community	Community health workers attend and participate in staff meetings, such as COPE
Salemata	Many children are not vaccinated	Health personnel tailor their sensitization activities and health talks to focus on vaccination and identified community knowledge gaps
Cervical Cancer Health Services		
Demonstration Site	Action Plan Problem	Resulting Health Facility Impact
Bandafassi	Ignorance of cervical cancer as an illness	Each site has implemented activities to increase awareness and knowledge about cervical cancer as well as encourage discussion on the subject through: - Social campaigns - Health talks during baby weighing events at the health facilities - Home visits
Dakately	Lack of awareness of cervical cancer screening	
Dar Salaam	Community is unengaged Ignorance about the illness	
Dindefello	Cervical cancer is a taboo subject	
Kedougou (Dalaba)	Lack of community knowledge	
Khossanto	Lack of awareness	
Nafadji	Women don't seek cervical cancer screening services	
Salemata	Lack of knowledge about the importance of cervical cancer screening	
Saraya	Lack of awareness about cervical cancer prevention	

Table 3: Programmatic-relevant barriers associated with the cervical cancer services explicitly identified by demonstration sites through QI action planning between 2015 and 2019 (by site).

Kedougou (Dalaba)	· No midwife (temporary)			X			· Lack of community knowledge on CC	X				
	· Lack of staff knowledge on CC	X										
	· The head nurse is not trained in screening			X								
Bandafassi	· No midwife (temporary)			X			· Lack of community knowledge on CC and importance of screening	X				
	· Lack of staff knowledge on CC	X					· Lack of awareness of CC as an illness	X				
	· The head nurse and staff are not trained in screening			X								
	· Insufficient HPV vaccine supply			X								
Dindefello	· CC screening is not available at health post			X			· CC is a taboo topic	X				
	· The head nurse is not trained in screening			X			· Lack of community knowledge on CC	X				
Salemata	· CC screening is not available at health center			X			· Lack of community knowledge on importance of screening	X				
	· The health providers are not trained on CC			X								
Dakately	· Lack of staff knowledge on CC	X					· Lack of community knowledge on CC screening	X				

							· Most women do not accept CC screening		X				
							· Low participation rates of CC screening observed during one full day of screening						X
<b>Dar Salaam</b>	· Lack of CC screening equipment			X			· Lack of community knowledge on CC	X					
	· The health providers are not trained in screening			X			· Community is not engaged						X
	· Lack of staff knowledge on CC	X											
	· No available medication for CC			X									
<b>Saraya</b>							· Lack of awareness of CC	X					
							· Lack of community knowledge on CC	X					
	· Lack of information on CC	X					· Lack of community knowledge on importance of screening as means of prevention	X					
<b>Nafaji</b>	· Lack of equipment for CC screening			X			· Women do not seek screening services		X				
	· Lack of materials (i.e. images, photos) for CC education activities			X			· Lack of awareness of CC	X					
	· No cervical cancer screening room			X			· Lack of community knowledge on importance of screening	X					
<b>Khossanto</b>	· CC screening services are			X		· Lack of awareness of CC	X						

not available												
							No access to CC screening	X				
<b>Total</b>	5	0	16	0	0		<b>Total</b>	14	3	0	0	2

CC: Cervical Cancer

HPV: Human papillomavirus

Table 4: Aggregated barriers Identified in QI action plan data between January 2015 and June 2019 by each demonstration site

Barriers	Kedougou District			Saraya District			Salemata District			TOTAL
	Dalaba	Bandafassi	Dindefelo	Saraya	Nafadji	Khossanto	Salemata	Dakately	Dar Salaam	
<b>SUPPLY - SIDE</b>										
1 Lack of screening training for providers	3	0	1	0	0	0	1	0	2	7
2 Cervical cancer screening services not available	0	0	1	0	0	2	3	0	0	6
3 Lack of staff knowledge on cervical cancer	1	1	0	0	0	0	0	1	0	3
4 No midwife (temporary)	1	1	0	0	0	0	0	0	0	2
5 Lack of training equipment	0	0	0	0	0	0	0	0	2	2
6 Lack of cervical cancer materials (i.e. images, photos)	0	0	0	0	2	0	0	0	0	2
7 No cervical cancer screening room	0	0	0	0	1	0	0	0	0	1
8 No medicine available for cervical cancer	0	0	0	0	0	0	0	0	1	1
9 Low HPV vaccine supply	0	1	0	0	0	0	0	0	0	1
<b>DEMAND - SIDE</b>										
1 Lack of information or awareness of cervical cancer within community	1	2	3	4	3	1	1	1	2	18
2 Low screening participation rates	0	0	0	0	2	0	0	2	0	4
3 No access to cervical cancer screening	0	0	0	0	0	1	0	0	0	1
4 The community is unengaged	0	0	0	0	0	0	0	0	1	1
5 Cervical cancer is a taboo subject	0	0	1	0	0	0	0	0	0	1
<b>Total # of barriers identified by each site:</b>	<b>6</b>	<b>5</b>	<b>6</b>	<b>4</b>	<b>8</b>	<b>4</b>	<b>5</b>	<b>4</b>	<b>8</b>	<b>50</b>

Table 5: Regional cervical cancer prevention programmatic recommendations informed by the QI action plans and partnership strategic planning between 2014 and 2019 categorized into the Levesque framework

Regional Programmatic Recommendations		
<b>Supply-side</b>	Approachability	· Develop cervical cancer educational materials for use within the clinical setting and through outreach activities
	Acceptability	· Ensure that all cervical cancer educational materials are available in all local languages & incorporate illustrations that are culturally appropriate · Ensure an adequate number of female providers are trained in cervical cancer screening.
	Availability & Accommodation	· Maintain training capacity in the region to ensure the presence of an adequate workforce. · Provide periodic continuing education to facilitate quality assurance of providers. · Offer the cervical cancer screening service through routine clinical engagement as well as through mass screening campaigns & sensitization activities in more rural areas.
	Affordability	· Ensure no-cost cervical cancer screening and cryotherapy services regionwide within the public healthcare system.
	Appropriateness	· Institute a quality improvement process regionwide to ensure uniform quality measures (safety, effectiveness, comfort, continuity, timeliness, etc.) of the cervical cancer screening service.
<b>Demand-side</b>	Ability to Perceive	· Increase awareness through a peer-to-peer education (e.g. women's care groups) to educate the target & male populations by increasing health literacy and addressing the personal beliefs of clients and decision-makers
	Ability to Seek	· Target older women through peer-to-peer education activities who are at higher risk of cervical cancer. · Ensure the ability of all communities (geographic, cultural, etc.) to be able to readily seek cervical cancer screening services.
	Ability to Pay	· Educate women and communities that screening services and cryotherapy treatment for dysplasia will remain no-cost
	Ability to Reach	· Provide social support services to women who are diagnosed with a positive screen.
	Ability to Engage	· Through outreach activities, educate & empower women to take a leading role on making decisions for themselves concerning accessing the health service. · Provide education on the importance of follow-up after a positive screen and for rescreening in line with national guidelines.

## Supplementary Files

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