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# Achieving high uptake of human papillomavirus vaccine in Cameroon: Lessons learned in overcoming challenges

Javier Gordon Ogembo<sup>a,\*</sup>, Simon Manga<sup>d</sup>, Kathleen Nulah<sup>d</sup>, Lily H. Foglabenchi<sup>d</sup>, Stacey Perlman<sup>b</sup>, Richard G. Wamai<sup>c</sup>, Thomas Welty<sup>d</sup>, Edith Welty<sup>d</sup>, Pius Tih<sup>d</sup>

<sup>a</sup> University of Massachusetts Medical School, Worcester, MA, United States

<sup>b</sup> Pathfinder International, Watertown, MA, United States

<sup>c</sup> Northeastern University, Boston, MA, United States

<sup>d</sup> Cameroon Baptist Convention Health Services, Bamenda, Cameroon

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## ABSTRACT

**Background:** Cameroon has the highest age-standardized incidence rate of cervical cancer (30/100,000 women) in Central Africa. In 2010–2011, the Cameroon Baptist Convention Health Services (CBCHS) received donated human papillomavirus (HPV) vaccine, Gardasil, from Merck & Co. Inc. through Axios Healthcare Development to immunize 6400 girls aged 9–13 years. The aim was to inform the Cameroon Ministry of Health (MOH) of the acceptability, feasibility, and optimal delivery strategies for HPV vaccine. **Methods and findings:** Following approval by the MOH, CBCHS nurses educated girls, parents, and communities about HPV, cervical cancer, and HPV vaccine through multimedia coverage, brochures, posters, and presentations. Because educators were initially reluctant to allow immunization in schools, due to fear of adverse events, the nurses performed 40.7% of vaccinations in the clinics, 34.5% in community venues, and only 24.7% in schools. When no adverse events were reported, more schools and communities permitted HPV vaccine immunization on their premises. To recover administrative costs, CBCHS charged a fee of US\$8 per 3-dose series only to those who were able to pay. Despite the fee, 84.6% of the 6,851 girls who received the first dose received all three doses.

**Conclusions and lessons learned:** With adequate education of all stakeholders, HPV vaccination is acceptable and feasible in Cameroon. Following this demonstration project, in 2014 the Global Access to Vaccines and Immunization (GAVI) Alliance awarded the Cameroon MOH HPV vaccine at a price of US\$4.50 per dose to immunize sixth grade girls and girls aged 10 years who are not in school in two districts of Cameroon.

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## 1. Introduction

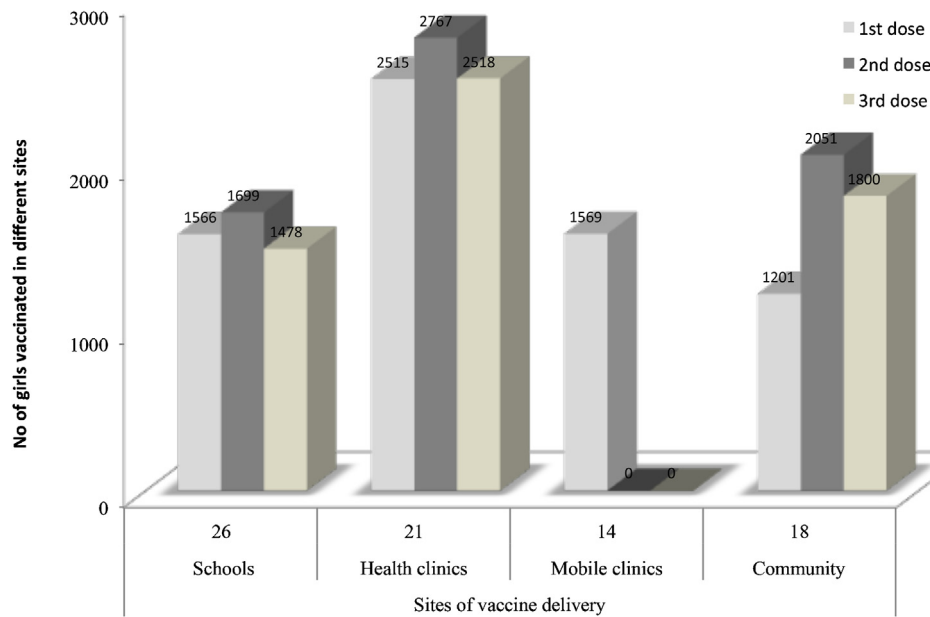
Cervical cancer is the leading cause of cancer mortality among women in Africa [1]. In Cameroon, cervical cancer accounts for 23% of all cancers among women, with an annual incidence of 1993 cases (age-standardized rate 30/100,000 women) and 1129 deaths per year (age-standardized rate 17.5/100,000 women) [1]. While developed countries have significantly reduced cervical cancer through screening, early treatment and use of prophylactic vaccines, similar initiatives are lacking in Africa [2].

Multiple initiatives are being explored to reduce the burden of cervical cancer in Africa [3]. Notably, the Global Access to Vaccines and Immunization (GAVI) Alliance has recently announced its plans to prepare eligible low-income countries for nationwide rollouts of HPV vaccine at a reduced price of US\$4.50 per dose [4]. The first GAVI Alliance HPV vaccine demonstration project was launched in Kenya in 2013 and 18 additional African countries including Cameroon were approved to receive similar support in 2013 and 2014 [5].

Additionally, five African countries have implemented their own initiatives to reduce cervical cancer prevalence. Rwanda became the first country in Africa to carry out a national HPV vaccination program through its partnership with Merck & Co. Inc. (the manufacturer of the HPV vaccine, Gardasil), achieving 93% coverage for all the three doses of HPV vaccination of all grade six adolescent girls in 2011 [6]. Similar HPV vaccination projects were recently

\* Corresponding author. Tel.: +1 508 856 3380.

E-mail addresses: [javier.ogembo@umassmed.edu](mailto:javier.ogembo@umassmed.edu), [jogembo@gmail.com](mailto:jogembo@gmail.com) (J.G. Ogembo).



**Fig. 1.** Human papillomavirus vaccine demonstration project in Cameroon 2010–2012. \* The column for mobile clinics is blank for second and third doses because most of the girls that were enrolled during mobile clinics were later traced and vaccinated in the communities.

undertaken] in Uganda [7], Tanzania [8], Lesotho [9] and South Africa [10]. These countries delivered HPV vaccines for free to the targeted populations. All the countries used a school-based delivery model, with the exception of Lesotho, which used a mixed approach (schools and health facilities).

With limited access to screening and treatment particularly in Africa, it is more important to vaccinate girls against HPV to offer protection against cervical cancer. With a subsidy from GAVI, HPV vaccination will now be cost-effective compared to routine cervical cancer and HPV DNA screenings [11]. However, a recent systematic review assessing readiness of HPV vaccine introduction in sub-Saharan Africa found most countries are not prepared, demonstrating a need for HPV vaccine demonstration projects [3].

In recognition of the disproportionately high incidence of cervical cancer, Cameroon Baptist Convention Health Services (CBCHS) successfully applied to Axios International's Gardasil Access Program in 2009, for 19,200 doses of donated vaccine to immunize 6400 girls aged 9–13 years. From March 2010 through November 2012, CBCHS conducted a HPV vaccine demonstration project with donated vaccine in three settings: schools, healthcare facilities, and via community outreach. This paper reports the success of the CBCHS HPV vaccination initiative, identifying lessons learned in overcoming the challenges.

## 2. Materials and methods

### 2.1. Settings and vaccine procurement

CBCHS has provided medical services to Cameroonians for over 60 years (see [www.cbchealthservices.org](http://www.cbchealthservices.org)). It currently runs six hospitals, 26 integrated health centers, and over 50 primary health centers in six of Cameroon's ten regions. CBCHS's Women's Health Program (WHP) provides cervical cancer screening and treatment of precancerous lesions and other services at six CBCHS facilities as well as a mobile clinic that serves remote rural communities. The choice of age range and number of doses were done according to World Health Organization guidelines [12]. Immunization took place in the capital city Yaoundé, North West (NW) and South West (SW) Regions of the country. The vaccination and procurement

timeline is provided in Supplementary Fig. S1. The facilities that coordinated the immunizations are noted in Supplementary Fig. S2.

### 2.2. HPV vaccine implementation strategy

In order to achieve an 85% three-dose completion rate, CBCHS nurses first carried out awareness campaigns, making presentations in English, French, Pidgin and sometimes the local tribal language in schools, churches, clinic waiting rooms, and community gatherings. The presentations were geared to educate adolescents, parents, health care workers, and community leaders about HPV vaccine and cervical cancer as reported elsewhere [13–15]. WHP nurses also designed posters that were hung in multiple clinics and other venues and brochures were handed out to adolescents in schools and to other stakeholders. These campaigns resulted in high awareness among parents and adolescent girls in the different communities where vaccine intervention was implemented [13,14]. Since many teachers and school principals were initially reluctant to allow vaccination in schools because they were concerned about adverse events, it was necessary to explore other vaccine delivery strategies.

The three vaccine approaches used in delivering vaccines to adolescent girls were clinics, schools, and community mother–daughter approach (screening mothers for cervical cancer while immunizing their daughters). All the clinics (Table S1), schools, and communities were chosen based on convenience and consent from relevant authorities.

Following approval from MOH and CBCHS institutional review committees to vaccinate, the vaccine was first administered in clinics to assure parents there was medical back up available should any side effects occur, as this was a major concern during the sensitization [14]. When no significant adverse events were reported among the first 1600 girls immunized in clinics, CBCHS nurses began to administer the first doses of vaccine in schools near the clinics, if the principal approved. The girls were either handed information sheets and consent forms to take home to their parents or given letters of invitation for parent–teacher association meetings during which parents were briefed on the health benefits of the vaccine. All eligible girls whose parents

**Table 1**  
Lessons learned and recommendations for implementation from the HPV demonstration project in Cameroon.

Lessons learned	Recommendations for implementation
(1) The use of mixed approaches of vaccine delivery can achieve high coverage	Use mixed approaches when necessary in order to bridge the accessibility gap in remote areas and to gain acceptance to vaccinate in schools
(2) Charging those who can afford a fee (US\$8 in this demonstration) to partially recover administrative costs is feasible	Charge the fee for all three doses prior to giving the first dose. This will increase uptake of the second and third doses, since the cost is already paid for in full
(3) A mother–daughter approach succeeded in extending vaccine coverage to hard-to-reach girls, extending cervical cancer screening to mothers, and encouraging mother–daughter communication on health issues. Women who are screened for cervical cancer are motivated to get their daughters vaccinated	Consider using a mother–daughter approach, especially in rural areas where both mothers and daughters have difficulty in accessing health services
(4) Determining the best approach to understand, confront, and resolve religious and socio-cultural conflicts related to HPV vaccine is quite challenging. Some parents and health care workers expressed concerns about safety and efficacy and that immunization against a sexually transmitted infection might lead to promiscuity. In Cameroon, village leaders (Fons) and pastors required thorough explanation of vaccine benefits, safety, and risks before they would allow immunization in their villages and churches. Their support and peer tracking of girls needing second and third doses resulted in high vaccine uptake	Educate community leaders according to socio-cultural etiquette before approaching their communities. Perform community sensitization well before scheduling immunization dates and then determine the best dates and venues for vaccine delivery. Involve the local media in promoting HPV vaccine and providing scientific information about efficacy and adverse events. Utilize peer tracking to find girls who need second and third doses and who live in rural communities
5. Use of clinics to begin HPV vaccinations convinced most school authorities that the vaccine was safe. A side benefit was the use of clinic refrigerators, which helped in optimizing cold storage	Consider beginning vaccination programs in health facilities to reassure teachers and communities that the vaccine is safe, if educators are reluctant to accept immunization in schools
(6) High uptake of vaccine depends on education of parents, caregivers, teachers, traditional leaders, religious leaders, and communities with the most accurate scientific information available on the risks and benefits of HPV vaccination presented in language that the lay public can understand. The high level of CBCHS's credibility, based on its long history of providing quality medical care, encouraged stakeholders to accept vaccination for adolescent girls	Give all stakeholders accurate information on vaccine efficacy, safety, and potential adverse effects*. Anaphylaxis and fainting have been reported following administration of HPV vaccination. However, anaphylaxis only occurs in 2.6 per 100,000 HPV vaccine doses (1 in 38,462 exposures)** compared to 1 in 5000 exposures to antibiotics such as penicillin**. Vaccine recipients should be observed for 15 min. Dispel rumors about vaccine associated adverse reactions that are not proven to be causally related to the vaccine. Allow stakeholders to ask questions and give honest, evidence-based answers
(7) Careful advance planning of vaccine delivery based on school period, weather, and import clearance and customs charges is critical to overcome poor road networks in rural areas and government bureaucracy	Consider importing vaccine through the offices of MOH, WHO or UNICEF in countries where non-governmental organizations are conducting HPV immunization programs, to minimize import duties and administrative costs
(8) With adequate training and effective protocols, nurses can successfully implement all aspects of HPV vaccine projects, including developing IEC materials, providing community sensitization and delivering vaccine in multiple venues	Train and utilize nurses to conduct HPV vaccine projects. Provide them with clear protocols for all aspects of project implementation, including management of potential adverse events
(9) Use of an electronic database was necessary to enable recalling girls for follow up for second and third doses and for monitoring and evaluation of this project. Web-based data entry would have made use of the database more efficient, but poor Internet connectivity in Cameroon was prohibitive	Use web-based electronic health information systems for data entry on a real-time basis, if Internet connectivity is adequate
(10) The media has much misinformation on HPV vaccine associated adverse events from anti-vaccine groups, which reporters often use to publish reports that rouse public distrust. For this small, non-governmental project, Axios advised no media response to an inflammatory newspaper article	Advise public health officials to develop a strategy to manage inaccurate media coverage in newspapers, radio or TV

\* <http://www.iom.edu/Reports/2011/Adverse-Effects-of-Vaccines-Evidence-and-Causality.aspx> p. 516 Global Advisory Committee on Vaccine Safety, 12–13 June 2013  
 WHO Bulletin No. 29, 2013, 88, 301–312. <http://www.who.int/wer>.  
 \*\* <http://www.cmaj.ca/content/179/6/525.full.pdf+html?sid=449f0f71-9138-4670-b550-bc5f6a55f2df>.  
 \*\*\* <http://archinte.jamanetwork.com/solr/searchresults.aspx?q=Anaphylaxis%20in%20the%20United%20States&fd=JournalID=71&f=JournalDisplayName=JAMA%20Internal%20Medicine&SearchSourceType=3.>

signed the consent forms were vaccinated with the first dose of HPV vaccine, and given appointments for the second dose two months later and the third dose six months after the first dose (see Fig. S1). To reduce risks from allergic reactions or fainting related injuries, staff observed all girls for 15 min after vaccination, asked them about prior adverse events before administering the second and third doses, and were prepared to manage anaphylaxis. Many girls did not honor their appointments, which delayed the delivery of second and third doses. Peer-tracking was used to locate girls who lived in villages. After immunizing one girl, she would help the clinician locate other girls who needed second or third doses, and they were then immunized. The program also used a mobile clinic, which is run in a large US Army-donated ambulance, to conduct the mother–daughter approach, which seeks to mobilize mothers who are informed and have been screened for cervical cancer to encourage their daughters' to get HPV vaccination. At the same time, when a mother brings her daughter for HPV vaccination the mother is informed about the need for cervical cancer screening.

### 3. Results

A total of 6851, 6517 and 5796 girls were immunized with the first, second and third doses of HPV vaccine, respectively, achieving 84.6% full dosage coverage of the adolescents who received the first dose (Fig. 1). The use of peer tracking enabled the clinicians to successfully immunize many girls who did not keep their appointments for second and third doses. Notably, of 2770 girls who received their first dose in the communities, 2229 received their first dose as part of the mother–daughter initiative and 541 received their first dose in churches and other community venues. No adverse events were reported except one girl reported swelling at the injection site, which was resolved without treatment. Although the primary targets for immunization were girls aged 9–13 years (based on World Health Organization guidelines), one third ( $n=2295$ ) of the immunized girls were older than 13. One reason for this was the risk of cold-chain break when the team carried the vaccine to hard-to-reach villages. If they had leftover

vaccines after all available 9–13 year old girls had been vaccinated, they vaccinated girls up to 26 years old in those villages in order to use up vaccines that might otherwise spoil due to exposure to high temperatures when the ice in the coolers melted. The team rationalized that WHO recommends “catch-up” vaccination for girls up to 26 years, if vaccine is available. In addition, some health care workers also requested that their daughters over age 13 be vaccinated, and the team felt obligated to comply. Of the 6851 girls who received the first dose of vaccine, 66.4% were 9–13 years, 24.1% were 14–15 years, 6.3% were 16–17 years, 3.2% were 18+ years, and 0.8% ages were not recorded. The three dose completion rates of girls aged 9–13 and 14+ years were 86.1% and 81.6%, respectively. Three girls over 13 years who received the vaccine got pregnant, which helped to diminish rumors that the vaccine might cause sterility. Less than 1% of those girls who were contacted for the second dose refused to be immunized. Most of the girls who did not receive the second and third dose could not be traced. Only 63 of the 19,200 doses received were lost, damaged or expired. Twenty-seven doses were double-counted due to data entry errors, which we were unable to identify and correct in the database. The vaccination initiative was carried out with the help of two physicians, 29 nurses, and four data managers. Challenges experienced and lessons learned are summarized in Table 1

## 4. Discussion

### 4.1. Challenges

This HPV vaccination project revealed a number of challenges and lessons learned. CBCHS initially planned to administer the vaccine to 2400 girls in Yaoundé, primarily through an adolescent clinic at a large referral facility. However, despite sensitization of the staff and media coverage, the uptake was low. WHP also planned to promote the vaccine in other venues within Yaoundé, but an inaccurate article in a weekly newspaper (Le Soir News Paper) claiming that HPV vaccine had serious side effects and even caused some deaths prompted the MOH to restrict immunization activities in Yaoundé. CBCHS and the MOH consulted Axios about whether to publish a rebuttal to the article. Axios strongly recommended against this on the premise that this might cause an even greater backlash from misinformed journalists that could have negative ramifications about HPV vaccine delivery. In the end, only 293 girls received the vaccine in Yaoundé, and the rest of the vaccine doses were then redistributed in the North West and South West Regions, primarily in rural areas.

### 4.2. Lessons learned

Of the multiple lessons learned, there were four highly notable ones. First, the use of mixed vaccination approaches is feasible and, if educators are reluctant to allow vaccination in schools, it might be necessary to first begin immunizing in healthcare facilities to win the support of concerned parents. Second, despite the low level of household incomes in Africa, many will find ways to pay for vaccination when they are well informed about the merits and safety of a vaccine, and if the vaccine is affordable. In some villages, wealthy individuals paid the fees to have all the eligible girls immunized. This project charged fees to partially recover the high administrative costs, including customs and clearing charges of US\$29,000 for importing donated Gardasil. Further research is required to find the most appropriate price for low-resource settings, since the \$4.50 per dose currently being offered by GAVI is still a significant cost for most African governments with per capita spending of \$25–83 per year on health [16]. Although vaccine provided through GAVI does not usually incur customs or clearing charges

and is provided at no charge, non-governmental organizations will have difficulty integrating HPV vaccine into their clinical care due to the necessity of recouping the vaccine customs and clearing costs as well as other administrative costs, which would require charging unaffordable fees even if they could acquire donated or low-cost vaccine. Third, the use of a mobile clinic, mother–daughter and peer-tracking approaches, which were unique to Cameroon, increased vaccine uptake among girls in remote areas and encouraged mother–daughter communication on health issues. These approaches should be explored in other settings where girls are not in school and live in remote areas. Fourth, by gaining the confidence and endorsement of municipal and religious leaders, especially the *Fons* (local tribal leaders), who strongly promoted the vaccine in their domains was instrumental in facilitating successful vaccination of women in their tribe/community.

## 5. Conclusion

This HPV demonstration project in Cameroon has shown that, with adequate education of all stakeholders, HPV vaccination is feasible. Given the experience in Rwanda, Tanzania, Uganda, South Africa, Lesotho and ours in Cameroon, a school-based approach is likely the most efficient way of delivering HPV vaccine to adolescent girls in Africa. However, in Cameroon, HPV vaccine was first administered in clinics to debunk fears about vaccine side effects from parents and teachers. The project also demonstrated that HPV vaccine can be successfully delivered to the general public at a fee to those who can afford it. Despite the noted challenges, the success of this project was largely due to the training, commitment and leadership of CBCHS staff.

## Conflict of interest statement

Authors declare no conflict of interest.

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## Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.vaccine.2014.06.064>.

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