# Gavi Full Country Evaluations

## 2016 Annual Dissemination Report

### Uganda Report

# Acknowledgments

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# Evaluation team

This report presents findings from the 2016 Gavi Full Country Evaluations (FCE). It was prepared by the Institute for Health Metrics and Evaluation (IHME) at the University of Washington (UW) in collaboration with members of the FCE Team: icddr,b in Bangladesh; University of Eduardo Mondlane (UEM), Mozambique; Manhiça Health Research Centre (CISM), Mozambique; Health Alliance International (HAI), Mozambique; the Infectious Diseases Research Collaboration (IDRC), Uganda; the University of Zambia (UNZA), Zambia; and PATH in the United States.

This work is intended to inform evidence-based improvements for immunization delivery in FCE countries, and more broadly, in low-income countries, with a focus on funding from Gavi, the Vaccine Alliance. The contents of this publication may not be reproduced in whole or in part without permission from the Gavi FCE team at IHME.

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# Acronyms

| | |
|---|---|
| AEFI | Adverse event following immunization |
| APR | Annual Progress Report |
| BoQ | Bills of Quantities |
| CDP | Child health Days Plus |
| CRS | Catholic Relief Services |
| DAH | Development assistance for health |
| DFID | Department for International Development |
| DPT | Diphtheria, pertussis, tetanus |
| FCE | Full Country Evaluations |
| FPHP | Federation for Private Health Professionals |
| GOU | Government of Uganda |
| GVAP | Global Vaccine Action Plan |
| HFS | Health Facility Survey |
| HSS | Health System Strengthening |
| IFMIS | Integrated Financial Management Systems |
| IFMS | Integrated financial management system |
| IPV | Inactivated polio vaccine |
| ISS | Immunization services support |
| JAR | Joint appraisal report |
| KII | Key informant interview |
| M&E | Monitoring and evaluation |
| MOE | Ministry of Education |
| MOF | Ministry of Finance |
| MOFPED | Ministry of Finance, Planning and Economic Development |
| MOH | Ministry of Health |
| MOU | Memorandum of Understanding |
| NCC | National Coordinating Committee |
| NITAG | National immunization technical advisory groups |
| NMS | National Medical Stores |
| PCV | Pneumococcal conjugate vaccine |
| PHC | Primary Health Care |
| PIE | Post Introduction Evaluation |
| SCM | Senior Country Manager |
| SIA | Supplementary Immunization Activities |
| TA | Technical assistance |
| TOC | Theory of Change |
| UNEPI | Uganda National Expanded Program on Immunization |
| UNITAG | Uganda National Immunization Technical Advisory Group |

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|---|---|
| VIG | Vaccine Introduction Grant |
| VHT | Village Health Team |

# Introduction

The Gavi Full Country Evaluations (FCE) is a prospective study covering the period 2013–2016 with the aim of understanding and quantifying the barriers to and drivers of immunization program improvement, with emphasis on the contribution of Gavi, the Vaccine Alliance in four countries: Bangladesh, Mozambique, Uganda, and Zambia. This fourth annual dissemination report complements previous reports by providing key findings and recommendations for the 2016 evaluation period in the four FCE countries. The FCE encompasses all phases of Gavi support, from decisions to apply, application and approval, preparation, and implementation in each of the relevant streams of support. Table 1 summarizes the scope of the evaluation during the 2016 period. In addition to evaluating the various streams of support active in each of the FCE countries, we have addressed issues that impact Gavi support across streams. The latter includes both established processes that affect all vaccine streams within the four countries, such as the Joint Appraisal (JA) and Partner Engagement Framework (PEF), as well as broad organizational functions, such as the provision of technical assistance and promotion of sustainable EPI programs that affect the extent of Gavi's current and future success.

**Table 1: Overview of streams evaluated in each country***

| Gavi Stream | Vaccine | Bangladesh | Mozambique | Uganda | Zambia |
|---|---|---|---|---|---|
| **New Vaccine Introductions (NVI)** | **Inactivated polio vaccine (IPV)** | Implementation interrupted by global stockout | Post-introduction | Implementa-tion interrupted by global stockout | Potential introduction postponed until 2018 |
| | **Measles second dose (MSD)** | | Post-introduction | | Post-introduction |
| | **Measles-rubella (MR) vaccine** | | | | Preparation for introduction |
| | **Meningitis A vaccine** | | | Preparation for introduction; launch postponed until 2017 | |
| | **Rotavirus vaccine** | | Post-introduction | Launch postponed until 2017 | Post-introduction |

| | | | | | |
|---|---|---|---|---|---|
| | **Pneumococcal conjugate vaccine (PCV)** | Post-introduction | Post-introduction | Post-introduction | Post-introduction |
| | **Human papillomavirus (HPV) vaccine** | Implementation of demonstration project | Post-demonstra-tion project | Post-introduction | Preparation of application for national introduction |
| **Campaigns** | **Measles-rubella (MR) vaccine campaign** | | | | Implementation and evaluation |
| **Health System Strengthening (HSS)** | **Health System Strengthening (HSS)** | Implementation of HSS-2 | Implementa-tion of HSS-2 | Completion of HSS-1 and application for HSS-2 | Preparation for HSS-2 |

**The Gavi FCE did not evaluate pentavalent vaccine delivery, since pentavalent vaccine had been established and routinized in these countries prior to the start of the FCE. That put pentavalent vaccine outside of the scope of the FCE.*

# Methods

Evaluation components relevant to this report include:

- Development of priority themes used to guide data collection at the global and country levels;
- Process tracking based on document review, observation, and fact-checking interviews;
- Root-cause analysis to identify underlying causes of identified challenges and successes;
- In-depth analysis of the process using key informant interviews (KII) and social network analysis (SNA);
- A resource tracking study to generate estimates of national-level resource envelopes on immunization in Uganda (submitted separately from this report);
- Analysis of Health Management Information Systems (HMIS) and EPI administrative data to understand the rollout of new vaccine introductions;
- Analysis of primary and secondary data to generate small-area estimates of vaccine coverage, other maternal and child health indicators, and child mortality at subnational levels (Annexes 5 and 6);
- Causal analysis of small-area estimates of vaccine coverage and child mortality to estimate the relationship between new vaccine introductions and child mortality (Annex 7); and
- Analysis of household survey data to assess inequality in DPT3 coverage by sex and wealth quintiles over time (Annex 8).

Strengths and limitations of the Gavi FCE approach are summarized in Table 2.

**Table 2: Strengths and weaknesses of the Gavi FCE**

| **Strengths** |
| --- |
| • Mixed-method approach allows for triangulation of findings across evaluation components to increase robustness of findings and provide more in-depth understanding. Findings from one data source also inform the design and implementation of other data collection.<br>• Concurrent evaluation of all relevant streams of Gavi support in a country allows for timely understanding of the interactions between streams of support.<br>• Evaluations such as Post-Introduction Evaluations (PIEs), monitoring and evaluation of HPV vaccine demonstration projects, or HSS monitoring and evaluation focus on the implementation phase. The Gavi FCE complements these by examining the full process from decision-making to application, preparation, implementation, and routinization, and allows identification and linkage of issues earlier in the process with downstream consequences.<br>• Data collection designed to build on or complement other surveys and activities to minimize duplication.<br>• Prospective approach allows for collection of information in real time so that key issues may be identified as they arise, allowing for the opportunity to inform implementation process and implement corrective action. |
| **Limitations** |
| • Due to the wide scope of the FCE, there is a limited ability to examine all issues in detail. However, the broad scope compels selective and more in-depth evaluation of critical issues that are priority areas for Gavi and countries.<br>• Limited ability to prospectively collect information on larger-scale political-economic and social processes (e.g., priority-setting at the donor level; social displacement and migration at the country level) that affect immunization activities but fall outside the analytical scope of the process tracking of defined milestones.<br>• Although there is a better ability to access informal channels of communication and decision-making, there are limits to this which result in an incomplete understanding of the process.<br>• Absence of a prospective observation mechanism at the regional or global level and at subnational levels.<br>• In-depth qualitative data collection relies heavily on KIIs that are prone to recall and respondent bias.<br>• In each country a limited number of stakeholders are involved across multiple streams, introducing significant potential for respondent fatigue in key informant interviews.<br>• The timing of surveys means that the evaluation is only able to capture relevant aspects of some, but not all, Gavi support streams.<br>• Secondary data analyses are subject to the availability and quality of the underlying data source (e.g., HMIS, surveys). |

# Summary of findings and recommendations

Table 3 summarizes the recommendations for the country findings.

**Table 3: Findings and recommendations**

| Findings | Recommendations |
|---|---|
| *Multiple vaccine introductions* | |
| **Finding 1:** Uptake varied across the new vaccine introductions, from rollout to actual routinization. Analysis of HMIS data shows that it has taken almost three years for PCV to stabilize. Although there has been tremendous improvement in PCV routinization since January 2014, it is not fully routinized at the same level as routine immunizations. IPV delivery increased quickly after its introduction in April 2016, but began to drop after June. | 1. The Ministry of Health (MOH) should conduct a survey to fully understand the reasons for the discrepancy in delivery between PCV and pentavalent vaccines, as this will help to inform efforts to improve routinization for both recent and future new vaccine introductions.<br>2. MOH should prioritize the regular monitoring of newly introduced vaccines, particularly beyond Post Introduction Evaluation (PIE), in order to ensure routinization of new vaccines. |
| **Finding 2:** Introduction of multiple vaccines into routine immunization has increased the country's co-financing obligations as well as the workload of both the small UNEPI team at the national level and the frontline health workers at the subnational level. In response to the increasing co-financing obligations from the several newly introduced vaccines and those planned, MOH requested NITAG to provide technical guidance on priority vaccines to introduce before a final decision is made. | 1. For sustainability purposes, during the planning phase the MOH should carefully consider its ability to meet the co-financing requirements that come with proposed new vaccine introductions. The Ministry of Finance should be involved at all stages of planning for new vaccine introduction. |
| *Human papillomavirus vaccine* | |
| **Finding 1:** HPV national rollout was slow. Following the launch of HPV national rollout in November 2015, eight districts did not report HPV data until April 2016. Moreover, coverage for HPV vaccine is low, with HPV-1 at 83.4% and HPV-2 at 22.8% (as of December 2016). The slow national rollout included critical shortfalls in HPV planning and rollout (described in the 2015 FCE report) but | 1. MOH should ensure adequate planning for new vaccine introduction vis-a-vis timely supply of vaccines and prior distribution of sufficient updated tools. As well, consideration of the characteristics of the target population is necessary before new vaccine rollout. |

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| also a mismatch between the launch date and the school calendar, and the delayed rollout in several districts due to late receipt of vaccines and monitoring and evaluation (M&E) tools. | 2. As districts are using different approaches to HPV vaccine delivery, the MOH should evaluate the different delivery models being used (including the associated social mobilization and other demand-generation activities) to identify best practices and inform efforts to improve HPV coverage nationwide. |
| *Impact of the Alliance processes on the UNEPI program* | |
| **Finding 1:** In addition to the standard Gavi application and reporting processes, the numerous uncoordinated visits from the Gavi Secretariat to the country are placing a management burden on UNEPI. This reduces the time the UNEPI team has to focus on other immunization activities. | 1. Gavi and partners should communicate their planned missions and related terms of reference to MOH at the beginning of each year. Having a schedule of events and their expectations early will enable the MOH to plan better to cater to its interests, as well as those of Gavi and other partners.<br>2. Gavi should empower the SCM to coordinate the timing of Gavi-related visits to the country to ensure coordination across multiple visits and alignment with the EPI team's planned activities. |
| **Finding 2:** The PCA was a top-down process from Gavi. Findings from the PCA were well received by country stakeholders and were known. However, country stakeholders felt that their feedback during the PCA debrief meeting wasn't incorporated. As such, some of the recommendations were perceived to be contextually inappropriate. Channeling of Men A campaign funds to WHO was perceived to have stemmed from PCA recommendations. PCA recommendations were perceived to inform the GMR, which is a prerequisite to disbursement of Health System Strengthening (HSS) 2 grant funds. | 1. Gavi should improve the country ownership of PCA recommendations. This could be facilitated by:<br>• Selecting PCA consultants that are familiar with both country and Gavi contexts so recommendations are contextually appropriate.<br>• Using the PCA debrief/report (and/or other discussion venues such as the JA) as an opportunity to present PCA findings and to jointly develop recommendations with country stakeholders.<br>• Gavi should ensure that it shares PCA reports with the MOH in a timely manner.<br>2. Gavi should ensure that the timing and design of the PCA is aligned with other Gavi activities in country so the PCA findings can inform HSIS proposals, JA discussions, and PEF-TCA requests. |

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| *Health System Strengthening 1* | |
| **Finding 1:** By the end of the no-cost extension period (up to June 30, 2016), several civil works under HSS-1 had not been implemented. This necessitated that the country apply for an exceptional no-cost extension from Gavi. In addition, Gavi decided to withdraw funds meant for construction of the central vaccine store because construction could not be concluded before the end of the no-cost extension. | 1. All the lessons learnt regarding challenges in implementing HSS-1 as documented in all FCE reports should be well considered as the country plans to embark on implementing HSS-2.<br>• The protracted procurement and civil works processes should be planned for ahead of time.<br>• Effective communication between the national and district stakeholders should be maintained at all phases of HSS implementation, including the closing phase. |
| *Health System Strengthening 2* | |
| **Finding 1:** The application process for the HSS-2 proposal was protracted because the initial proposal development was not inclusive of the necessary EPI stakeholders so the country decided to revise the application and postpone the submission date. The second phase of the application process included many stakeholders, but this resulted in lengthy discussions and disagreement over the key priorities and the methodology for critical bottlenecks analysis. On the other hand, the extensive stakeholder engagement fostered country ownership of the proposal. | 1. Gavi should develop more structured guidance for countries on how to conduct a bottleneck analysis, including which bottlenecks to consider and potential data sources to measure the magnitude of those bottlenecks. This will provide guidance to the MOH to improve efficiency of the process and limit disagreement over the priorities of the proposal, thus fostering country understanding and ownership of the HSS-2 application. |
| *Technical Assistance* | |
| **Finding 1:** Although there was lack of clarity on the definition of technical assistance (TA) and a strong perception that the JA process was complex, the majority of the stakeholders believed the JA process added benefit to the country and considered the process to be highly useful in controlling and/or mitigating risk. | |
| **Finding 2:** There are four models of TA for immunization in the country: external consultants, | 1. Gavi should devise an operational definition of TA to guide country stakeholders in identifying proper |

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|---|---|
| in-country consultants, in-country alliance staff, and embedment in the EPI program. Stakeholders perceive the several models as important depending on the need. | TA needs and increase in-country appreciation of PEF's approach to TA allocation.<br>2. Gavi should consider developing standard guidelines to be followed in identifying and prioritizing TA needs at the country level so as to reduce the complexity of the process and guard against partner interests influencing the JA process. |
| *Constraints Analysis* | |
| | 1. We recommend that demand-generation interventions in Uganda should use reduced drop-out as a key metric of success.<br>2. We recommend that NVI programs focus on Facility Readiness to achieve success. |

# Contents

Uganda first received support from Gavi, the Vaccine Alliance in 2001 for immunization services support and the introduction of hepatitis B vaccine, which was rolled out in 2002. During the past 15 years, Gavi has disbursed a total of $US 304.6 million to Uganda to support vaccination efforts through the Uganda National Expanded Program on Immunization (UNEPI). Uganda introduced *Haemophilus influenzae* (Hib) vaccine in 2001 and pneumococcal conjugate vaccine (PCV) in 2013. The country utilized cash support for injection safety between 2002 and 2004, and was approved for HSS support in 2008, with initial disbursements occurring between 2012 and 2014. In March 2015, a revised work plan and budget for HSS were submitted to Gavi, as well as a no-cost extension to 2016. A national introduction of human papillomavirus (HPV) vaccine was initiated in 2015. In 2016, Uganda applied for HSS-2 support. It also prepared applications, scheduled to be submitted in early 2017, for rotavirus vaccine and meningitis A vaccine introduction support. Table 4 provides an overview of all streams of Gavi support, including the period of support and corresponding funding amount.

**Table 4: Streams of Gavi support for Uganda**

| Gavi support | Period of support | Total amount of funding ($US) |
|---|---|---|
| Pneumococcal conjugate vaccine (PCV) | 2013–2020 | $141,197,326 |
| Pentavalent vaccine | 2002–2020 | $188,482,806 |
| HPV vaccine (national introduction) | 2015–2016 | $10,829,040 |
| Inactivated polio vaccine (IPV) | 2015–2017 | $9,430,500 |
| Health system strengthening (HSS) | Approved in 2008, disbursed in 2012 (2013 funds reprogramed for use 2014–2015) | $19,242,000 |
| Immunization services support | 2001–2004 | $9,230,520 |
| Injection safety support | 2002–2004 | $1,207,299 |
| Vaccine introduction grant (VIG) | 2002, 2013, 2015, 2017 | $5,601,144 |

*Source: http://www.gavi.org/country/all-countries-commitments-and-disbursements, accessed November 21, 2016. Values shown represent Gavi commitments, those which Gavi intends to fund over the lifespan of the program, subject to performance and availability of funds.*

## Methods overview

The FCE identified key priority themes to be evaluated in 2016. These themes were then shared with MOH and other stakeholders for their input during the annual dissemination meeting. Stakeholders also suggested the tracking of IPV as a priority focus area. These focus areas were then developed into key evaluation questions classified under key priority themes as shown in Table 5 below.

**Table 5: Priority research themes for 2016**

| Priority theme | Evaluation questions |
|---|---|
| **Multiple Vaccine Introductions** | To what extent has PCV, HPV, and IPV routinization taken place?<br><br>How has introduction of multiple vaccines impacted the health system? |
| **Health system strengthening 1** | How is the country transitioning from HSS-1 to HSS-2? |
| **Health system strengthening 2** | What was the effect of the big partnership on the HSS-2 application process?<br><br>Why was the application process for HSS-2 protracted?<br><br>What was the cost of the HSS-2 application process? |
| **HPV** | What delivery model is Uganda using for HPV?<br><br>Why was national rollout of HPV slow?<br><br>What will be the effect of merging HPV and IPV PIE? |
| **Impact of the alliance processes on the UNEPI program** | What is the overall management burden associated with Gavi processes?<br><br>What is the effect of the PCA on management of Gavi support, including planned NVIs and HSS-2? |
| **Technical Assistance** | What are the different models of TA implemented in-country?<br><br>What are the perceptions of stakeholders on the different TA models?<br><br>How is the TA funding through the PEF 2015 alignment with the JA 2015?<br><br>Did the 2016 JA process adhere to the Gavi guidelines?<br><br>How do the needs for TA identified during the 2016 JA compare with the 2015 TA needs?<br><br>How complex was the 2016 JA process?<br><br>How has PEF maintained the principles of transparency, accountability, and country ownership? |

To answer the above evaluation questions, and in keeping with the prospective nature of the FCE, the team assessed implementation of Gavi-supported activities by related milestones under theories of change (TOC) for each support stream. Table 6 provides an overview of the methods used, sources of data, and topics assessed by these methods.

**Table 6: Evaluation methodology**

| Methods | Source consulted/study area | Topics investigated |
|---|---|---|
| **Process tracking** | --Collected and reviewed documents, including Gavi applications (rotavirus and meningitis A, HSS-2 application), Gavi decision letters, operational plans and budgets, the Comprehensive Multi-Year Plan, meeting minutes, communication letters between Gavi and MOH, and various reports including the WHO pre-review comments on HSS-2 application and joint appraisal report 2016.<br>--Observed EPI technical meetings, National Coordinating Committee (NCC) meetings, Technical Coordination Committee (TCC) meetings, Senior Management meeting, PCA debrief meeting, HSS-2 application development meetings. | --Information was collected based on relevant theory of change (TOC) milestones for HSS, rotavirus vaccine, and meningitis A vaccine. |
| **Key informant interviews (KIIs)** | --Conducted 13 in-depth KIIs and 20 fact-checking interviews at the national level with government and other partner organizations. Conducted 19 in-depth KIIs at the subnational level. | --Information was collected based on relevant TOC milestones for PCV, HSS, HPV, IPV, rotavirus vaccine, and meningitis A. |
| **Analysis of administrative data** | --Reviewed all administrative data from HMIS. | --Estimates of vaccine coverage trends were calculated for PCV, HPV and IPV since their introduction to date. |
| **Small area analysis** | --Compiled and analyzed all available survey and census data sources. | --Estimates of district- and province-level vaccine coverage and child mortality were calculated for 1990–2015. |
| **Inequality analysis** | --Compiled and analyzed all available survey data sources of household wealth and vaccination coverage. | --Estimates of vaccine coverage differences by wealth quintile and gender were calculated. |

## Findings

The FCE compiled and systematically analyzed relevant data to estimate country performance along key indicators at the national and, when possible, the subnational level.

**Table 7: Country characteristics of Uganda**

| Characteristic | |
|---|---|
| *Demographic and economic indicators* | |
| Total population (2016) | 40,433,685 |
| Birth cohort (2016) | 1,701,549 |
| GNI per capita (2015)* | $US 700 |
| *Health spending and development assistance for health (DAH) ** | |
| Government health expenditure as source (GHE-S) | $US 542.9M |
| DAH, channeled through government (DAH-G) | $US 181.0M |
| DAH, channeled through non-government entities (DAH-NG) | $US 554.7M |
| Total DAH | $US 735.7.M |

*GNI per capita source: World Bank World Development Indicators, 2015, reported in US dollars.

**Health expenditure is explained in terms of GHE-S, DAH-G, and DAH-NG. GHE-S + DAH-G gives the total government health expenditure, and GHE-S + Total DAH gives total spending on health in the country. Institute for Health Metrics and Evaluation (IHME). *Financing Global Health 2015: Development Assistance Steady on the Path to New Global Goals*. Seattle, WA: IHME, 2016. Unit is 2013 USD.

**Table 8: Vaccine coverage estimates in Uganda**

| Vaccine coverage | Most recent survey estimate* | WUENIC 2015** | Self-reported coverage (WHO)*** |
|---|---|---|---|
| DPT/Penta3 coverage | 71.5% | 78% | 89% |
| DPT1-DPT3 dropout rate | 21.6% | 12% | 12% |
| BCG coverage | 93.7% | 93% | 95% |
| Polio3 coverage | 62.9% | 82% | 92% |
| Measles coverage | 75.8% | 82% | 94% |
| Percent fully vaccinated**** | 51.6% | NA | NA |

* Most recent survey coverage estimates from 2011 DHS

** WHO/UNICEF Estimates of National Immunization Coverage (WUENIC) 2015[1]

***WHO vaccine-preventable diseases monitoring system, 2016 global summary [2]

**** BCG, measles, and three doses each of DPT and polio vaccine (excluding polio vaccine given at birth).

**Table 9: Child, adult, and vaccine-preventable disease mortality in Uganda**

| Child, adult, and vaccine-preventable disease mortality | GBD 2015* |
|---|---|
| *All-cause mortality (deaths per 1,000 live births)* | *Estimate (95% uncertainty interval [UI])* |
| Infant mortality ($_1q_0$) | 40.0 (33.9–47.4) |
| Under-5 mortality ($_5q_0$) | 113.0 (102.5–126.2) |
| Female adult mortality ($_{49}q_{15}$) | 313.2 (164.2–532.9) |
| Male adult mortality ($_{49}q_{15}$) | 469.9 (264.4–822.3) |
| *Cause-specific mortality: children under 5 (deaths per 100,000)* | |
| Measles | 13.3 (2.4–41.4) |
| Diphtheria | 0.1 (0.01–0.4) |
| Tetanus | 7.09 (4.4–11.2) |
| Pertussis | 14.0 (0.04–69.25) |
| Meningococcal infection | 10.69 (4.6–21.7) |
| Diarrheal disease | 106.7 (66.8–159.6) |
| Lower respiratory infections | 169.0 (121.3–234.2) |
| *Cause-specific mortality: all ages (deaths per 100,000)* | |
| Cervix uteri cancer | 4.4 (1.7–9.1) |
| Acute hepatitis B | 1.2 (0.6–2.0) |
| Cirrhosis of the liver secondary to hepatitis B | 2.3 (1.1–4.1) |
| Liver cancer secondary to hepatitis B | 1.1 (0.5–1.9) |

** Mortality based on Global Burden of Disease (GBD) 2015 estimates*

## Figure 1: Timeline of major immunization events in Uganda, 2007–2016

| | PLANNED | | ACTUAL |
|---|---|---|---|
| | 2007 | HSS application submitted and approved by Gavi | ✓ |
| | | Suspension of cash transfers from Gavi to country | ✓ |
| | 2008 | | |
| | 2009 | | |
| | 2010 | | |
| | 2011 | | |
| | 2012 | | |
| | 2013 | Country applied for Gavi support to introduce HPV nationally | ✓ |
| | | Initial HSS disbursement made from Gavi to country | ✓ |
| 2014 | JAN | | |
| | FEB | HSS reprogrammed proposal submitted to Gavi | ✓ |
| | MAR | HSS reprogrammed proposal approved by Gavi | ✓ |
| | | Gavi approved application | ✓ |
| | APR | | |
| | MAY | Country applied for Gavi support to introduce IPV | ✓ |
| | JUN | | |
| | JUL | Gavi approved application | ✓ |
| | AUG | | |
| | SEP | | |
| | OCT | | |
| | NOV | UNICEF received funds for procurement of Gavi HSS equipment | ✓ |
| | DEC | HPV Vaccine Introduction Grant (VIG) arrived in country | |
| 2015 | JAN | | |
| | FEB | | |
| | MAR | Country submits revised HSS budget and work plan to Gavi | ✓ |
| | | IPV VIG arrived in country | ✓ |
| | APR | Initial introduction date for IPV introduction | O APR 2016 |
| | | Initial launch date for HPV national rollout | O NOV 2015 |
| | MAY | | |
| | JUN | First consignment of refrigerators arrive in country; official expiry date for HSS grant period | |
| | JUL | | |
| | AUG | Intermediate introduction date for IPV | O MAR 2016 |
| | SEP | Country applied for Gavi support to introduce rotavirus and Men A | ✓ |
| | OCT | Intermediate launch date for HPV national rollout | O NOV 2015 |
| | NOV | Gavi approved revised HSS budget and work plan up to June 30, 2016 | |
| | DEC | Approval of application for Men A and Rota | ✓ |
| | | Uganda parliament passes immunization bill | ✓ |
| 2016 | JAN | Target submission date | O APR 2016 |
| | | Country submitted responses to Gavi comments | ✓ |
| | FEB | | |
| | MAR | President signs immunization bill into law | ✓ |
| | | PCA consultations with country stakeholders | ✓ |
| | APR | Switch from tOPV to bOPV | ✓ |
| | MAY | Country receives WHO pre-review comments | ✓ |
| | | Country submits responses to WHO pre-review comments | ✓ |
| | | PCA debriefing | ✓ |
| | JUN | Official end of grant period | ✓ |
| | | Country receives decision letter for Men A | ✓ |
| | | Gavi pre-visit audit | ✓ |
| | JUL | Country receives first round of IRC review comments | ✓ |
| | | Joint Appraisal report writing workshop | ✓ |
| | AUG | Gavi grants country Exceptional No Cost Extension | ✓ |
| | | Country submits responses to IRC comments | ✓ |
| | | Gavi program audit | ✓ |
| | SEP | Country receives 2nd round of IRC review comments | ✓ |
| | | Initial launch date for Rota | O Apr 2017 |
| | OCT | | |
| | NOV | Men A campaign to begin | O Jan 2017 |
| | | HPV PIE | O Jan 2017 |
| | | IPV PIE | O Jan 2017 |
| | DEC | | |

Support streams evaluated in 2016
- Health System Strengthening (HSS)
- Human papillomavirus vaccine (HPV)
- Inactivated polio vaccine (IPV)
- Other

✓ Implemented as planned/no delay
O Delay

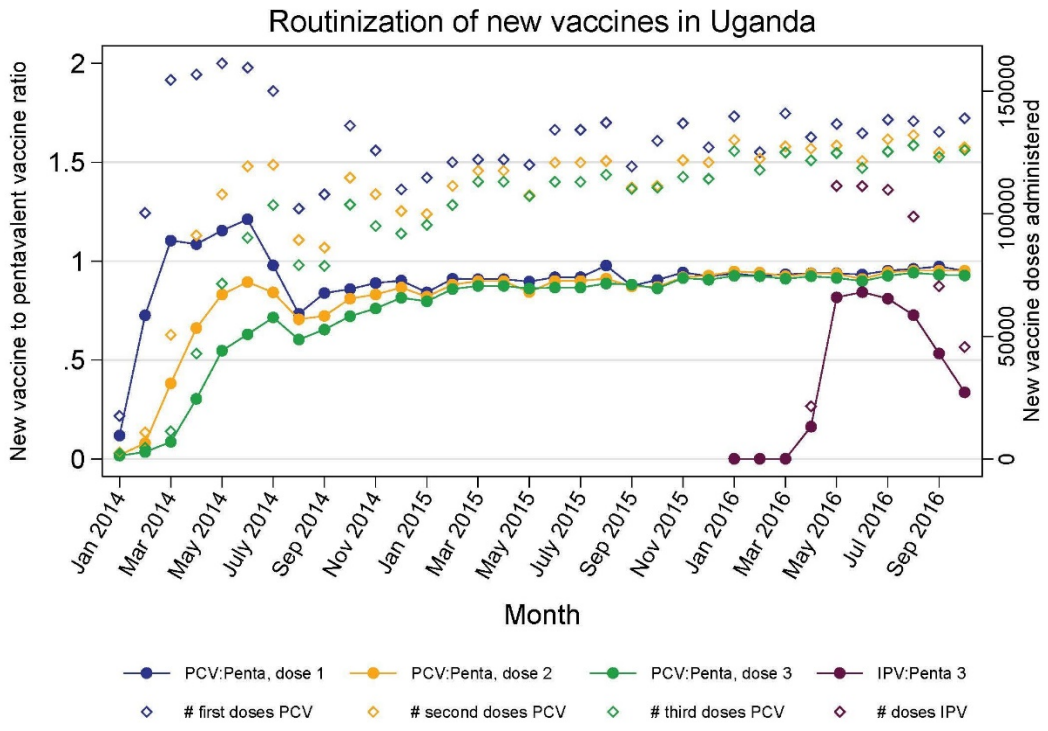
## Experience of multiple vaccine introductions

Uganda has introduced several vaccines into routine immunization in the recent four years: PCV in April 2013; HPV, November 2015; and IPV, April 2016. As reported in the Gavi FCE reports of 2013, 2014, and 2015, most new vaccine introductions in Uganda have been characterized by delays and postponement of launch dates for reasons such as protracted financial disbursements to afford the training of health workers, inadequate stocks of vaccines, and limited human resources at UNEPI to manage competing EPI priorities. The introduction of multiple new vaccines in quick succession has had several effects on the entire immunization system. However, several good practices and lessons learned have been registered and applied in subsequent introductions.

### Finding 1

*Uptake varied across the new vaccine introductions, from rollout to actual routinization. Analysis of HMIS data shows that it has taken almost three years for PCV to stabilize. Although there has been tremendous improvement in PCV routinization since January 2014, it is not fully routinized at the same level as routine immunizations. IPV delivery increased quickly after its introduction in April 2016, but began to drop after June.*

**Figure 2: Routinization of PCV and IPV in Uganda, 2014–2016**



Routinization was measured by comparing the number of reported doses of PCV and IPV to the number of reported doses of pentavalent, a routine immunization being delivered by the health system. As stated in the 2014 and 2015 FCE reports, the initial suboptimal routinization was due to PCV stockouts at all service delivery levels of the health system. While the PCV/pentavalent ratio improved tremendously in 2015 and 2016, unexplained dissonance remained. The improvement coincided with strategic interventions by UNEPI and partners including scale-up of the Reach Every District micro-planning strategy and training of health workers on data quality improvement by Data Improvement Teams throughout the country.

The persistent difference between PCV and pentavalent is not well understood by country stakeholders. However, through interviews with district EPI officials and health workers and observations at several immunization sessions at health facilities, the FCE team found it is highly likely that the difference is due to poor recording and reporting bias whereby pentavalent is overreported because it is the performance indicator.

> *I realized the difference between PCV3 and DPT3 recently when the district team visited our facility for support supervision. I did not have any explanation because we have not had any PCV stockouts and every child that gets DPT also gets PCV. But, we are always overwhelmed by workload so there is a problem with the data. This has changed; we are now okay.* (Subnational-level KII, MOH)

This highlights data-quality issues at the health facility level given that vaccines are being normally administered but not properly recorded.

Whereas the discrepancy between PCV and penta has been well documented and discussed in numerous EPI meetings at the national level, no deliberate effort has been made to establish the root causes. This in part is due to limited bandwidth of the UNEPI team compounded by several competing demands. Hence, less attention is paid to post-introduction monitoring and evaluation, particularly after the PIE. A detailed survey could lead to a full understanding of the root causes of the suboptimal PCV/pentavalent ratio.

There was a sharp rise in IPV routinization in May, shortly after its introduction in April. However, the routinization decreased gradually from July. This is attributed to stockouts of IPV vaccine at all levels of the health system. The stockouts resulted from a global shortage of IPV vaccine.

### *Recommendations*

1. The Ministry of Health (MOH) should conduct a survey to fully understand the reasons for the discrepancy in delivery between PCV and pentavalent vaccines, as this will help to inform efforts to improve routinization for both recent and future new vaccine introductions.

2. MOH should prioritize the regular monitoring of newly introduced vaccines, particularly beyond Post Introduction Evaluation (PIE), in order to ensure routinization of new vaccines.

*Robustness of finding*

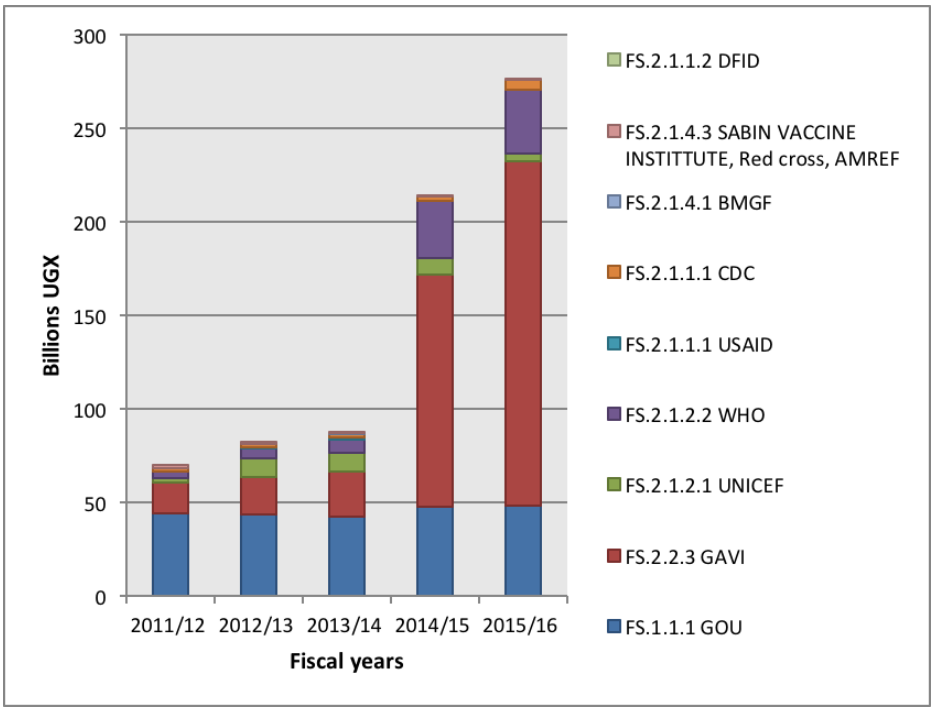
| Finding | Ranking | Robustness criteria |
|---|---|---|
| *Uptake varied across the new vaccine introductions, from rollout to actual routinization. Analysis of HMIS data shows that it has taken almost three years for PCV to stabilize. Although there has been tremendous improvement in PCV routinization since January 2014, it is not fully routinized at the same level as routine immunizations. IPV delivery increased quickly after its introduction in April 2016, but began to drop after June.* | B | This finding is factual and is based on analysis of HMIS data. However, there are limitations in understanding the reasons for persistent suboptimal routinization of PCV. |

## Financing

Immunization financing in Uganda during the past five years, from 2011–2012 to 2015–2016 has been steadily increasing. In absolute terms, the resource envelope increased nearly four-fold from UGX 70.5 billion in 2011–2012 to UGX 276.5 billion in 2015–2016. During the five years, on average, the proportional increase in the resource envelope has been around 49%, with the biggest increment in funding observed in fiscal years 2014–2015 and 2015–2016. Gavi resources increased remarkably in the two financial years where the spike in funding is observed, and this is perhaps due to the lifting of the ban on Gavi funding.

The observed spike in funding in the most recent two fiscal years was largely driven by increased funding from Gavi, and to a lesser extent from WHO. The Government of Uganda (GOU) was the greatest contributor toward immunization activities in the first three years (2011–2012 to 2013–2014), but Gavi took over as the biggest contributor in the past two years of the five-year period. With the exception of UNICEF, we note that all immunization stakeholders – including GOU and development partners – have progressively contributed increasing absolute amounts to immunization activities year over year, as indicated in Figure 3 below.

**Figure 3: Five-year trend analysis of immunization financing, 2011–2016**



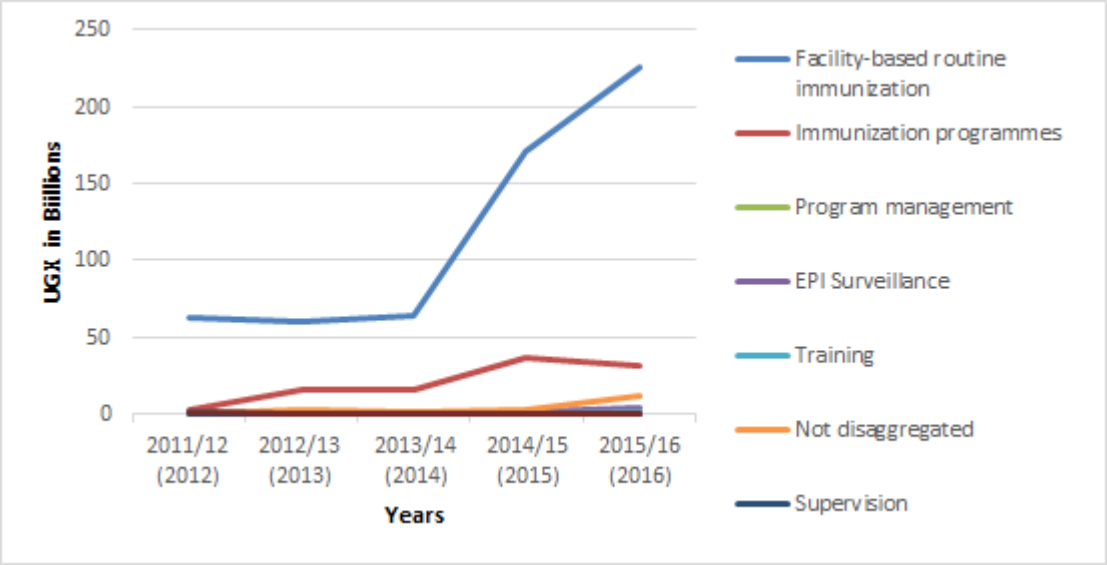

The increase in immunization financing during the past two years can be attributed to the introduction of HPV vaccine in October 2015 and the introduction of IPV in April 2016. There were also additional activities on immunization during these financial years, including the shift from trivalent (tOPV) to bivalent (bOPV) in April 2016 as part of the polio endgame strategy to end the transmission of wild polio virus and the polio campaign.

Although immunization financing is increasing, the number of vaccines in the system is also increasing, and immunization funds must be aligned to the country's priorities to achieve maximum impact. The main challenge with immunization resources from development partners is that they are often off budget. These funds are not included in the annual EPI budget and are therefore not planned for. As a consequence, the funds are not fully aligned to the country's priorities. For this reason, the sustainability of the immunization program is questionable in maintaining high immunization coverage due to the high cost of vaccines and vaccine delivery.

### *Immunization expenditure*

Across a five-year period, the biggest proportion of resources has been devoted to facility-based routine immunization. As seen in Figure 4 below, there is a sudden increase in the proportion of resources devoted to facility-based routine immunization in 2013–2014 from UGX 64.6 billion to UGX 170.6 billion in 2014–2015, and this increases further in 2015–2016 to UGX 225 billion. Facility-based routine immunization accounts for 80% of the total resources, including spending on immunization outreaches.

**Figure 4: Resources (UGX billions) devoted to immunization activities, 2011–2016**




### Finding 2

*Introduction of multiple vaccines into routine immunization has increased the country's co-financing obligations as well as the workload of both the small UNEPI team at the national level and the frontline health workers at the subnational level. In response to the increasing co-financing obligations from the several newly introduced vaccines and those planned, MOH requested NITAG to provide technical guidance on priority vaccines to introduce before a final decision is made.*

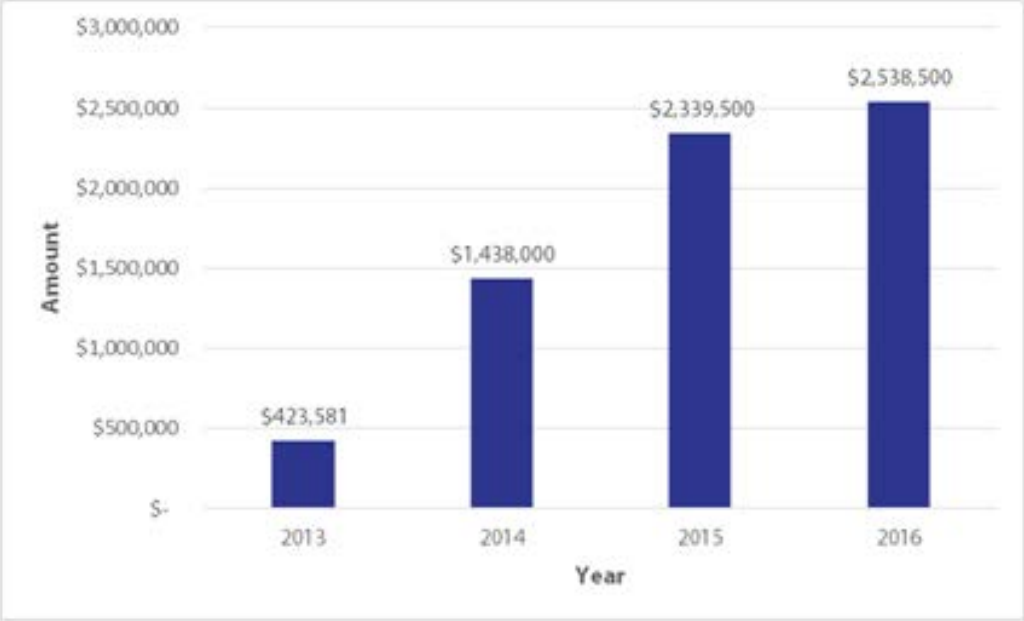
The country has faced challenges with honoring co-financing obligations that have increased as a result of the multiple new vaccine introductions in the recent past (2013–2016, Figure 5). The country did not complete its co-financing obligations for 2014 and 2015 on time and was considered a defaulter. The main reason advanced by MOH has always been the difference between GOU and Gavi financial systems, whereby GOU follows a fiscal year while Gavi follows a calendar year. But this explanation is not fully embraced by Gavi. This was reflected in Gavi's insistence that the country should fulfill its 2016 co-financing obligations (US$2.3 million) by August 2016. Short of that, Gavi would make no new disbursement. In response, the MOH requested frontloading of co-financing obligations from the Ministry of Finance for 2016.

Co-financing obligations as seen in the cMYP are projected to increase in the next five years from US$3,864,410 in 2017 to US$4,798,378 in 2021. This includes all the planned vaccines including rotavirus, yellow fever, and meningitis A. Yellow fever vaccine was added as part of the cMYP co-financing projections even though Uganda has not yet formally applied for the vaccine.

The co-financing challenges have raised even more debate among in-country immunization partners on the ability of the country to sustain the ever-increasing immunization budget with each new vaccine

added. This was reflected by the NITAG's demand for the MOH to clearly calculate the additional operational costs required for the introduction of rotavirus and meningitis A vaccines and explain how those funds would be raised. Annual co-financing obligations as per 2016 were USD $2,538,500.

**Figure 5: Annual co-financing obligations in Uganda based on Gavi decision letters (in $US), 2013–2016**




Given the proposed vaccine introductions including yellow fever, measles-rubella, and hepatitis B, coupled with the co-financing challenges, MOH put any new applications for new vaccine introduction on hold in 2016. NITAG was consulted for guidance on prioritizing new vaccine introductions; a formal response had not been provided by the end of the year. In this light, as well as in consideration of the proposed new vaccine introductions in the near future (2017–2020), the country is taking steps to ensure financial sustainability of the immunization program.

In consideration of how to sustain immunization financing after the country graduates from Gavi support, an immunization bill was passed by parliament in December 2015 and enacted into law in March 2016. The Immunization Act provides for compulsory immunization against immunizable diseases and establishes an immunization fund. The immunization fund is for purchasing vaccines and related supplies, cold chain, and immunization outreach activities. Discussions are ongoing on how to operationalize the fund. Additionally, with support from WHO under the PEF, the country plans to develop an immunization financial sustainability plan.

### *Human resources*

The numerous activities involved in the multiple vaccine introductions during a short period of time have strained the thin human resource team at the national level, as stated in the 2015 Gavi FCE annual report. As a coping mechanism, UNEPI, with funding from the Clinton Health Access Initiative (CHAI), sought technical assistance to boost the UNEPI human resource capacity at the national level. From previous introductions and EPI activities, there is a heavy reliance on technical assistance to deliver on

these activities, as further discussed in detail in the management burden and technical assistance sections.

At the subnational level, there is an increase in health worker workload due to an increase in the number of vaccinations, as well as the amount of time spent on a client. However, health workers report having adjusted to the increased workload.

> *Generally, with the introduction of a new program, anything introduced is in addition to what already exists. So for us the facility workers, we have an addition of workload onto the already strained workforce. So definitely there's some impact of workload. But because we know the need and importance, we have to keep on stretching and keep hoping that government tries to reconsider restructuring and staffing.* (Subnational-level KII, MOH)

On a positive note, multiple vaccine introductions have provided an opportunity for in-service mentorship and refresher trainings on immunizations in general.

> *It has built our potential. Before we were reluctant, but now we have to be sure about the vaccines.* (Subnational-level KII, MOH)

#### *Recommendation*

1. For sustainability purposes, during the planning phase the MOH should carefully consider its ability to meet the co-financing requirements that come with proposed new vaccine introductions. The Ministry of Finance should be involved at all stages of planning for new vaccine introduction.

#### *Robustness of finding*

| Finding | Ranking | Robustness criteria |
|---|---|---|
| *Introduction of multiple vaccines into routine immunization has increased the country's co-financing obligations as well as the workload of both the small UNEPI team at the national level and the frontline health workers at the subnational level. In response to the increasing co-financing obligations from the several newly introduced vaccines and those planned, MOH requested NITAG to provide technical guidance on priority vaccines to introduce before a final decision is made.* | A | This finding is factual and is supported by FCE resource-tracking data, observations from EPI meetings, subnational-level KIIs, and several fact-checking interviews. |

## Human papillomavirus vaccine

The proposed delivery model – outlined in Uganda's application to Gavi for national HPV vaccine introduction – is a health facility model with outreach visits through the routine EPI system. However, on national rollout, districts were using various delivery models. Some have integrated HPV vaccine into routine immunization (vaccination at health facilities and outreach visits) while others are leveraging the

Child Health Days Plus (CDP) for HPV vaccination. Our finding is that those using the CDP model did so because they found it more convenient. As reported in the 2014 FCE annual report, the CDP delivery mechanism is not sustainable as it is dependent on external funding.

**Table 10: Timeline of major HPV events in Uganda**

| Time | Activity |
|---|---|
| **2006** | PATH signs a Memorandum of Understanding with Government of Uganda to implement HPV vaccination demonstration project |
| **2006–2007** | PATH conducts formative research in five districts to formulate the vaccine demonstration project plan |
| **2008–2009** | Demonstration project of HPV vaccine delivery conducted in Nakasongola and Ibanda districts |
| **2012** | HPV vaccine immunization extended to 12 additional districts |
| **September 2013** | Government of Uganda applies for Gavi support to introduce HPV vaccine nationally |
| **March 2014** | Gavi approves application |
| **November 2015** | Launch of HPV national rollout |

### Finding 1

*HPV national rollout was slow. Following the launch of HPV national rollout in November 2015, eight districts did not report HPV data until April 2016. Moreover, coverage for HPV vaccine is low, with HPV-1 at 83.4% and HPV-2 at 22.8% (as of December 2016). The slow national rollout included critical shortfalls in HPV planning and rollout (described in the 2015 FCE report) but also a mismatch between the launch date and the school calendar, and the delayed rollout in several districts due to late receipt of vaccines and monitoring and evaluation (M&E) tools.*

The launch of HPV vaccine national rollout was on November 23, 2015, a time when several schools had closed for the holidays. Given that the majority of the target age group (10-year-old girls) are in school, this was a missed opportunity to vaccinate them. Learning from PCV introduction, MOH intended to wait to launch the new vaccine until HPV vaccines had been distributed to all district health offices. This led to the postponement of the launch date from October to November 2015. Hence, there a mismatch arose between the launch date and the school calendar.

**Figure 6: HPV vaccine coverage in Uganda, from HMIS data, November 2015 to December 2016**

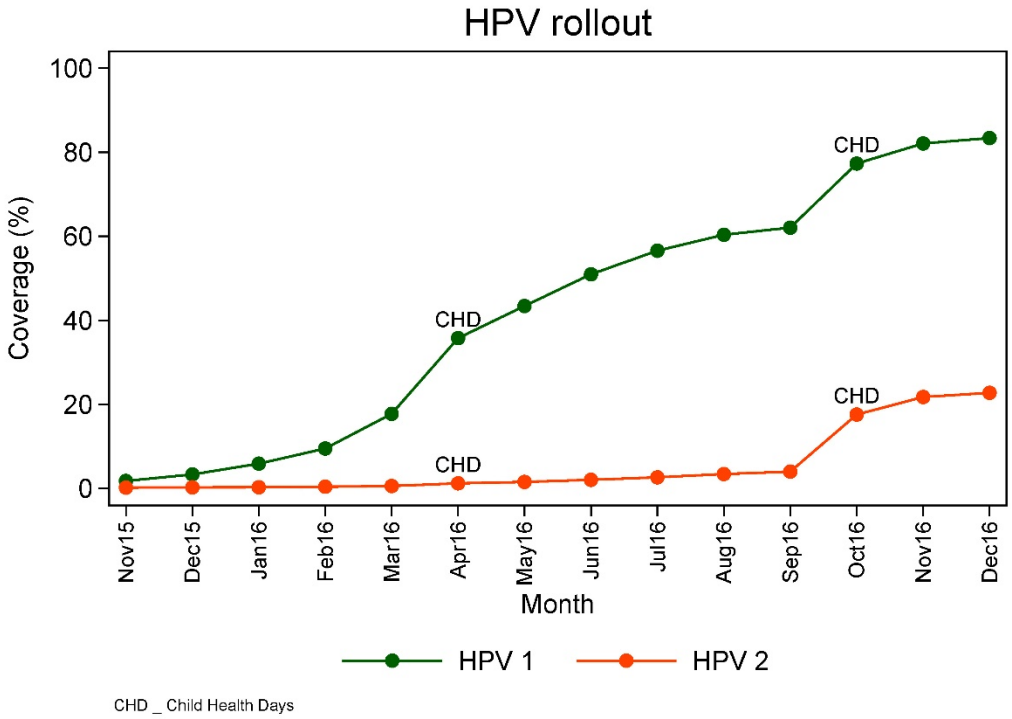
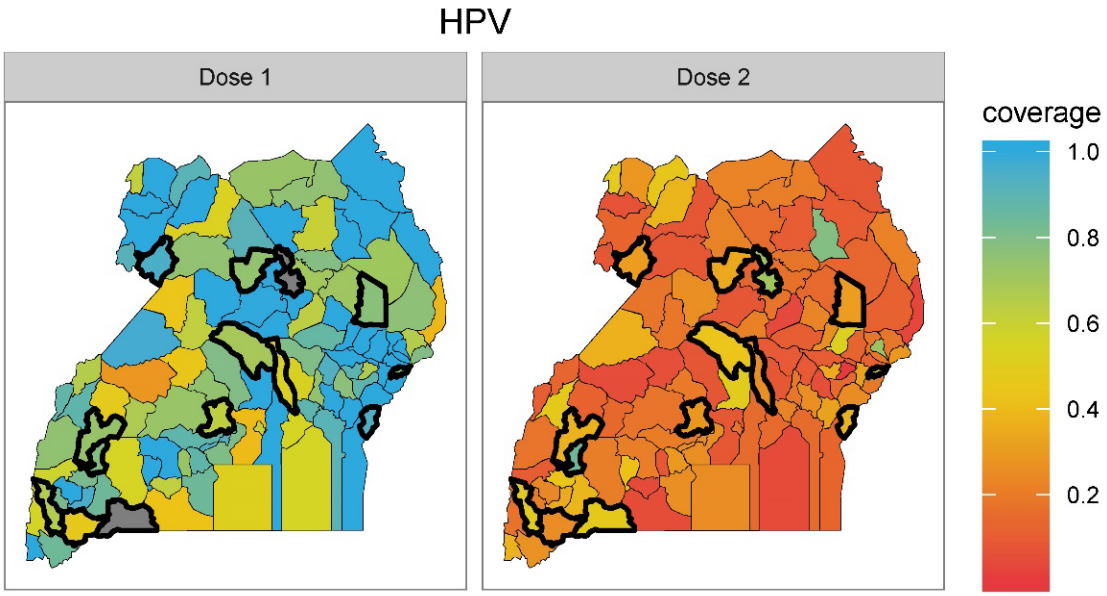



**Figure 7: HPV vaccine coverage by district in Uganda, from HMIS data, November 2015 to December 2016**

*Bold outlined districts are HPV vaccine demonstration districts*



In addition, the HPV rollout was delayed in several districts. According to DHIS2 data, eight districts did not report data on HPV vaccination for the first five months after the launch (November 2015 to March 2016). Our field findings revealed that this was because they started HPV vaccination in April 2016. The delayed HPV rollout was due to two major causes: late receipt of HPV vaccines at several health facilities due to limited stock at the national level, and an unclear HPV delivery model. The lack of clarity around the delivery model was largely due to inadequate training of health workers on the HPV vaccine rollout, which was in part due to the merger of measles campaign and HPV introduction activities. Measles campaign was given more prominence during training, social mobilization was left unfunded, and this led to insufficient social mobilization for HPV introduction, which also contributed to the delayed HPV national rollout (as covered in more detail in the Uganda FCE 2015 Annual Report).

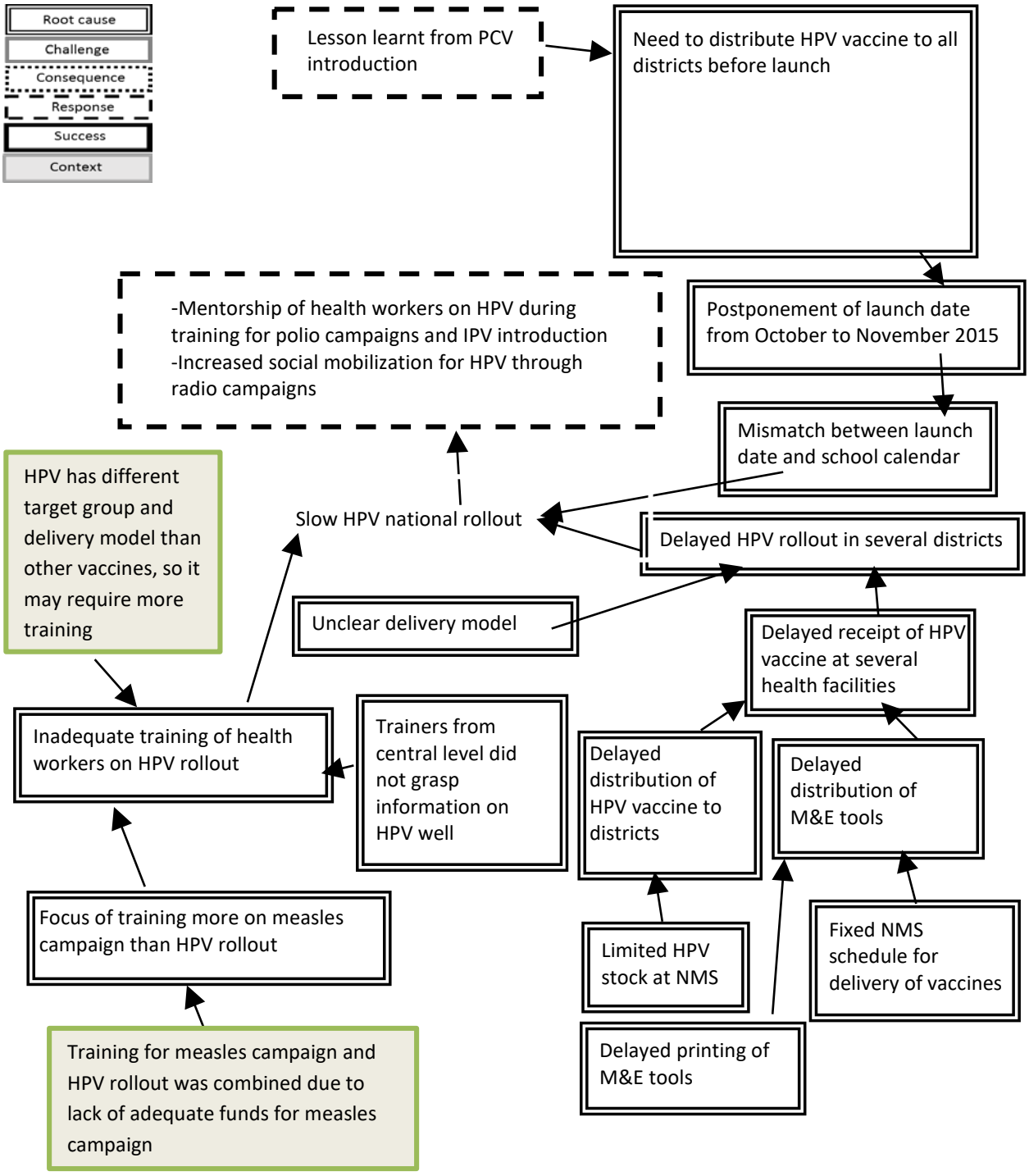
> *Like for HPV, it was a little bit funny. They brought for us a central supervisor who was not well equipped with everything. The information she was giving wasn't well detailed, and when someone would ask a question she would even get stuck.* (Subnational-level KII, MOH)

The delivery model for HPV vaccine was unclear to districts and health workers. Districts were using different models of delivery, i.e., integration into routine immunization and leveraging the aforementioned CDP. The districts using the CDP model started HPV vaccination in April 2016, which was the first time after the November launch that the CDP was scheduled. This slowed the national rollout process.

In some districts health workers expected to receive further training on HPV vaccine after the measles campaign, and therefore delayed commencing HPV vaccination at their health facilities. In other districts, the district cold-chain focal persons delayed the distribution of the HPV vaccine to facilities due to a lack of monitoring and evaluation tools (e.g., tally sheets, HPV registers, and vaccination cards) as these also serve as an accountability mechanism for the vaccines. The lack of monitoring and evaluation tools was due to delayed printing as well as late distribution of printed tools to districts, as the National Medical Store (NMS) has a fixed schedule for vaccine delivery. Due to limited HPV stock at the central vaccine store at the time of the launch, several districts delayed administration while awaiting HPV vaccine.

Following the introduction of HPV vaccine in October 2015 and IPV in April 2016, the country planned to merge the PIEs for IPV and HPV which were scheduled to take place in 2016. However, the PIEs have been postponed to 2017. This means that the PIEs will not take place within the 12 months of the launch date, recommended as per WHO guidelines.

**Figure 8: Root cause analysis for suboptimal HPV national rollout**



*Recommendations*

1. MOH should ensure adequate planning for new vaccine introduction vis-a-vis timely supply of vaccines and prior distribution of sufficient updated tools. As well, consideration of the characteristics of the target population is necessary before new vaccine rollout.

2. As districts are using different approaches to HPV vaccine delivery, the MOH should evaluate the different delivery models being used (including the associated social mobilization and other demand-generation activities) to identify best practices and inform efforts to improve HPV coverage nationwide.

*Robustness of finding*

| Finding | Ranking | Robustness criteria |
|---|---|---|
| *HPV national rollout was slow. Following the launch of HPV national rollout in November 2015, eight districts did not report HPV data until April 2016. Moreover, coverage for HPV vaccine is low, with HPV-1 at 83.4% and HPV-2 at 22.8% (as of December 2016). The slow national rollout included critical shortfalls in HPV planning and rollout (described in the 2015 FCE report) but also a mismatch between the launch date and the school calendar, and the delayed rollout in several districts due to late receipt of vaccines and monitoring and evaluation (M&E) tools.* | A | This finding is factual and is based on HMIS data, and its explanation is largely based on information from KIIs at both national and subnational levels. |

## Impact of the alliance processes on the UNEPI program

### Finding 1

*In addition to the standard Gavi application and reporting processes, the numerous uncoordinated visits from the Gavi Secretariat to the country are placing a management burden on UNEPI. This reduces the time the UNEPI team has to focus on other immunization activities.*

Gavi approaches risk management and fiduciary oversight through a multi-tiered approach. This includes three separate lines of risk management reflecting best practice in separation of responsibilities comprising (1) Routine oversight of program implementation by the country program teams (2) Program Capacity Assessment (PCA), monitoring reviews, program monitoring and evaluation, and legal and finance guidance (3) Program audits and internal audits. This multi-tiered approach entails several visits by the Gavi Secretariat to country EPI teams. In 2016, the country received several visits from Gavi, as shown below.

**Table 11: Gavi activities in Uganda, January to November 2016**

| Activity | Date | Purpose |
|---|---|---|
| **PCA** | February 22 to May 3, 2016 | Assess MOH's financial and program management systems of the grants |
| **PCA debrief** | May 4, 2016 | Present to MOH findings of PCA |
| **Gavi pre-visit – improvement of data systems** | June 2016 | Improvement of data systems |
| **Gavi audit pre-visit** | June 27 to July 1, 2016 | Preparations for program audit |
| **Joint Appraisal** | July 12-15, 2016 | JA report writing |
| **Gavi audit** | August 8-26, 2016 | Program audit |
| **Phillips – survey** | August 8 to September 23, 2016 | Information System Challenges in Primary and Community Care Service Delivery In Uganda: Focus Area: Immunization |
| **UK parliamentarians** | August 21-26, 2016 | Looking at gains from Gavi support as well as areas of need |
| **STEP** | August 29 to September 2, 2016 | Leadership training with reference to the vaccine supply chain |
| **Comic Relief** | September 28, 2016 | Filming |
| **Phillips** | September 28-29, 2016 | Data quality improvement |
| **Senior Country Manager** | November 22-25, 2016 | Visit from the Senior Country Manager to UNEPI and introduction of new SCM for Uganda |

The table above only shows visits for Gavi activities, which are in addition to standard Gavi processes and requirements that occur at the country level, including performance and financial reporting, applications for new funding, and implementation of existing streams of support. Moreover, several other partners and donors also engage UNEPI in immunization-related activities. These activities, coupled with the numerous demands that come with the multiple new vaccine introductions in the recent four years have placed a management burden onto UNEPI. This leaves limited time for the UNEPI team to focus on other routine immunization activities.

### *Recommendations*

1. Gavi and partners should communicate their planned missions and related terms of reference to MOH at the beginning of each year. Having a schedule of events and their expectations early will enable the MOH to plan better to cater to its interests, as well as those of Gavi and other partners.

2. Gavi should empower the SCM to coordinate the timing of Gavi-related visits to the country to ensure coordination across multiple visits and alignment with the EPI team's planned activities.

*Robustness of finding*

| Finding | Ranking | Robustness Criteria |
|---|---|---|
| *In addition to the standard Gavi application and reporting processes, the numerous uncoordinated visits from the Gavi Secretariat to the country are placing a management burden on UNEPI. This reduces the time the UNEPI team has to focus on other immunization activities.* | B | This finding was based on fact-checking interviews, observations from EPI meetings, and global KIIs from Gavi Secretariat. |

### Program Capacity Assessment

As part of the Transparency and Accountability Policy (TAP) that the Gavi Alliance adopted in 2013, Gavi revised the scope of its financial management assessments to include a more in-depth review of the capacity of both program management and vaccine stock management. In reference to this, the process was renamed the Program Capacity Assessment (PCA). The purpose of the PCA is to assess the (current or proposed) financing modality and other structures for use of Gavi support provided in the form of cash grants, vaccines, and vaccine-related devices.

### Finding 2

*The PCA was a top-down process from Gavi. Findings from the PCA were well received by country stakeholders and were known. However, country stakeholders felt that their feedback during the PCA debrief meeting wasn't incorporated. As such, some of the recommendations were perceived to be contextually inappropriate. Channeling of Men A campaign funds to WHO was perceived to have stemmed from PCA recommendations. PCA recommendations were perceived to inform the GMR, which is a prerequisite to disbursement of Health System Strengthening (HSS) 2 grant funds.*

Gavi contracted PricewaterhouseCoopers (PwC) to conduct a PCA in Uganda from February 22 to March 4, 2016. The assessment methodology included a desk review and consultations with in-country stakeholders; a debrief meeting occurred on May 4, 2016. From the debrief meeting, our observations were that stakeholders agreed with the findings (which they felt were largely known) and provided critical feedback on the recommendations. The PCA was a top-down process from Gavi, as country stakeholders were not consulted on the timing or design and felt that they did not have adequate input into the findings and recommendations. Most of the country stakeholders said that their suggestions at the debrief meeting were ignored, and as a result they perceived the PCA recommendations to have been predetermined and viewed by some as contextually inappropriate. This was exacerbated by the fact that the PCA report was never shared despite several requests. This deprives the country of the opportunity to wholly appreciate its challenges and develop sustainable solutions. This lack of transparency also undermines country ownership of the recommendations.

In October, Gavi shared the Grant Management Requirement (GMR) with the MOH, and it is important to note that the country is legally bound to implement requirements outlined in the GMR in order to

receive HSS and other financial support. Many of the requirements in the GMR mirrored the recommendations shared in the PCA debrief meeting, so country stakeholders understood that the PCA recommendations informed the GMR requirements. For example, one of the conditions was that the first disbursement for HSS-2 is dependent upon the Fiduciary Management Agency being in place.

Country stakeholders in Uganda perceive that the PCA recommendations have directly informed the GMR requirements, resulting in unintended consequences for the HSS-2 grant where the GMR requirements must be met before funding is disbursed to the country. For the HSS-2 funds, the country was told to provision 5% of the existing budget for management of the grant by a fiduciary management agency, as was recommended by the PCA team. This cost was not foreseen in the initial HSS-2 grant planning, which means that costs will have to be cut from elsewhere in the grant.

Country stakeholders also perceive that the PCA recommendations had indirect effects on the Men A campaign and rotavirus vaccine introduction. The country postponed rotavirus vaccine introduction from October 2016 to April 2017 largely due to a delayed decision letter from Gavi that stemmed from unfulfilled 2016 co-financing obligations by the country. But country stakeholders also thought that recommendations from the PCA had a role to play based on the fact that the required modifications in program management and financial management as recommended by PCA could not be implemented in time for the October launch date. For example, the PCA recommended the disbandment of the Project Management Unit (PMU) at MOH, but the personnel there had running contracts – therefore rushed termination of contracts would result in other unintended consequences. Moreover, the recommendation that the IFMS should be configured to provide Gavi specific accountability requires a protracted process involving the Ministry of Finance which is the custodian of the IFMS program. All these recommendations did not account for resources (time, money, and personnel) required to operationalize them and as such had downstream effects on implementation of Gavi-funded activities.

Also, the meningitis A campaign, planned for September 2016, was postponed to November 2016 and then postponed again to January 2017. The decision by Gavi to channel funds for the Men A campaign through WHO was perceived to have been based on PCA recommendations about the need to make comprehensive changes in financial management and program management processes at MOH to avert risk.

Although the process of channeling money through third parties involved low risk, it incurs high transaction costs; the VIG funds reached the WHO country office account in October. At the national level, it takes up to two weeks for WHO to release funds for preparatory activities. At the district level, it takes WHO up to one month to release funds to district accounts and up to one month for the districts to access the funds. This protracted process led to the postponement of the meningitis A campaign to January 2017. Additionally, the decision to channel VIG funds through WHO requires that 7% of the funds be paid to WHO as a management fee, which was unanticipated by the country. This decision raises questions about the implications for sustainability and capacity-building of MOH staff and systems.

*Recommendations*

1. Gavi should improve the country ownership of PCA recommendations. This could be facilitated by:
    - Selecting PCA consultants that are familiar with both country and Gavi contexts so recommendations are contextually appropriate.
    - Using the PCA debrief/report (and/or other discussion venues such as the JA) as an opportunity to present PCA findings and to jointly develop recommendations with country stakeholders.
    - Gavi should ensure that it shares PCA reports with the MOH in a timely manner.
2. Gavi should ensure that the timing and design of the PCA is aligned with other Gavi activities in country so the PCA findings can inform HSIS proposals, JA discussions, and PEF-TCA requests.

*Robustness of finding*

| Finding | Ranking | Robustness criteria |
|---|---|---|
| *The PCA was a top-down process from Gavi. Findings from the PCA were well received by country stakeholders and were known. However, country stakeholders felt that their feedback during the PCA debrief meeting wasn't incorporated. As such, some of the recommendations were perceived to be contextually inappropriate. Channeling of Men A campaign funds to WHO was perceived to have stemmed from PCA recommendations. PCA recommendations were perceived to inform the GMR, which is a prerequisite to disbursement of Health System Strengthening (HSS) 2 grant funds.* | B | This finding is factual and is based on observations from EPI meetings and fact-checking interviews. |

## Health system strengthening 1

**Figure 9: Timeline of major HSS-1 events, 2007–2015**

| Timeline | Activity |
|---|---|
| **November 2007** | Government of Uganda is approved for HSS cash support |
| **2007** | Gavi suspends cash transfers to the government |
| **2012** | Gavi lifts suspension following the signing of a Memorandum of Understanding between the government and Gavi |
| **February 2014** | Uganda submits HSS reprogramed proposal to Gavi |
| **March 2014** | Gavi approves HSS reprogramed proposal up to June 2015 |

| | |
|---|---|
| **March 2015** | Uganda submits request for a 12-month no-cost extension to Gavi to complete implementation of HSS activities |
| **November 2015** | Gavi approves no-cost extension request up to June 30, 2016 |

### Finding 1

*By the end of the no-cost extension period (up to June 30, 2016), several civil works under HSS-1 had not been implemented. This necessitated that the country apply for an exceptional no-cost extension from Gavi. In addition, Gavi decided to withdraw funds meant for construction of the central vaccine store because construction could not be concluded before the end of the no-cost extension.*

The delays in implementation of the HSS-1 grant, as stated in the FCE 2014 and 2015 reports, persisted through the last year of the grant. These delays necessitated approval of a six-month no-cost extension through June 2016. In May 2016, MOH sought from Gavi a No Objection to continue with the procurement process for the construction of staff houses and district vaccine stores such that committed funds can be used beyond June 30 (the expiry date of the no-cost extension). In August, Gavi granted an Exceptional No-Cost Extension to June 2017. Relatedly, as reported in the 2015 FCE report, both Gavi and the Global Fund had separately allocated money for the construction of a central vaccine store. There was a protracted process to harmonize the funders' approach to accomplish this task, in addition to other bureaucratic processes, including verification of ownership of land and streamlining the role of NMS and other stakeholders. On realizing that it was unlikely for the country to implement this activity by June 30, 2016, Gavi withdrew US$2.7 million meant for the central vaccine store. The Global Fund remains committed to fund the superstructure of the central warehouse that is to house the central vaccine store.

Beyond the no-cost extension, Gavi recommended that only key staff of the project management unit be retained to monitor implementation of activities for a maximum of six months. The process of recruiting additional UNEPI staff under HSS-1 was halted midway since their payment was not guaranteed during the transition from HSS-1 to HSS-2. These staff could have lessened the work burden on the limited UNEPI staff and helped transition between the two HSS awards.

The end of HSS-1 support for several subnational activities (such as outreach campaigns) was not communicated to districts. Districts and facilities continued implementing outreach with the hope that money would be coming soon. This may be a challenge in case the HSS-2 grant delays.

#### *Recommendation*

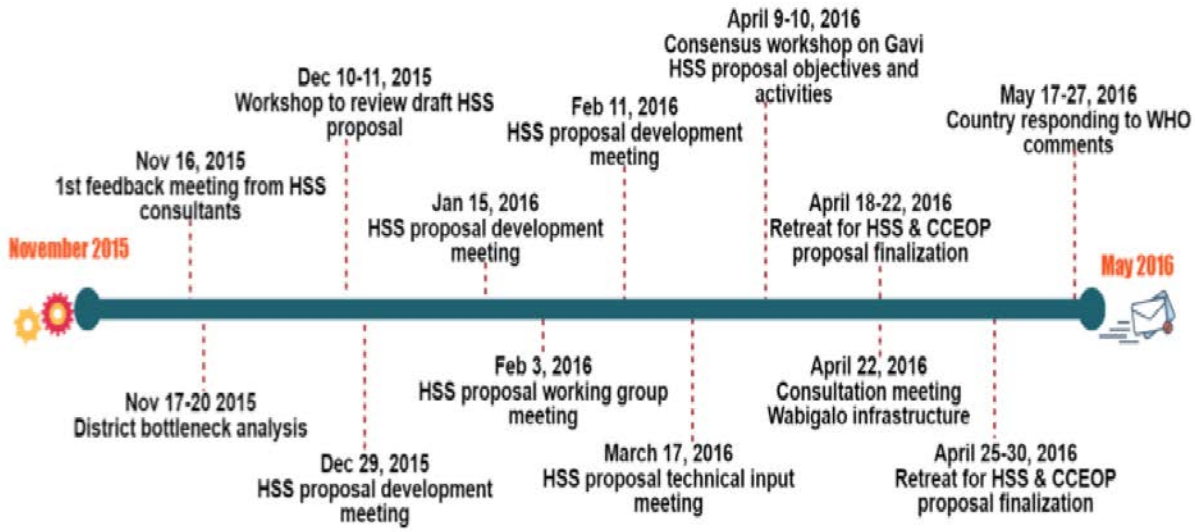
1. All the lessons learnt regarding challenges in implementing HSS-1 as documented in all FCE reports should be well considered as the country plans to embark on implementing HSS-2.
    - The protracted procurement and civil works processes should be planned for ahead of time.
    - Effective communication between the national and district stakeholders should be maintained at all phases of HSS implementation, including the closing phase.

*Robustness of finding*

| Finding | Ranking | Robustness criteria |
|---|---|---|
| *By the end of the no-cost extension period (up to June 30, 2016), several civil works under HSS-1 had not been implemented. This necessitated that the country apply for an exceptional no-cost extension from Gavi. In addition, Gavi decided to withdraw funds meant for construction of the central vaccine store because construction could not be concluded before the end of the no-cost extension.* | B | The finding is based on several KIIs at the national and subnational levels. It is also based on observation of several meetings. |

## Health system strengthening 2

**Figure 10: HSS-2 grant timeline, November 2015 to May 2016**




Uganda started applying for the HSS-2 grant in November 2015. A local consultancy firm was procured with funding from CHAI to develop the HSS-2 proposal, with a target submission window of January 2016. However, NCC meeting (December 29, 2015) was not satisfied with the consultants' output at the time and decided to submit the application in the May window. The contract of local consultants was never renewed after it expired in December 2015. In March 2016, an international consultant was hired by WHO to provide guidance on the application development, and a local consultant was hired by CHAI to prepare the costing of the HSS-2 application. Uganda submitted the HSS-2 proposal to Gavi in April 2016. The country also applied for the Cold Chain Equipment Optimization Platform (CCEOP) grant concurrently with the HSS-2 application.

### Finding 1

*The application process for the HSS-2 proposal was protracted because the initial proposal development was not inclusive of the necessary EPI stakeholders so the country decided to revise the application and postpone the submission date. The second phase of the application process included many stakeholders, but this resulted in lengthy discussions and disagreement over the key priorities and the methodology for critical bottlenecks analysis. On the other hand, the extensive stakeholder engagement fostered country ownership of the proposal.*

Following a presentation by the first set of consultants about the progress of the HSS-2 proposal development, EPI stakeholders disagreed about the proposed objectives, bottleneck analysis, and activities. Stakeholders viewed the quality of the proposal as low, and resolved to postpone the target submission window from January to May 2016. The low quality of the presented proposal was contributed to by a lack of support to the consultants from EPI stakeholders, which was largely attributed to competing priorities (especially related to HPV vaccine rollout and measles campaign). In addition, there was limited time (November to December 2015) during which the consultants were meant to engage multiple stakeholders both at national and district levels.

Furthermore, the second phase of the HSS-2 proposal development process was characterized by lengthy discussions to reach consensus on multiple issues. The lengthy discussions were due to several factors:

1. Many stakeholders were involved in the process and had different interests. The application process involved more than 60 participants representing a variety of organizations, including UNEPI, Ministry of Finance, Ministry of Education, MOH, Gavi project management unit, NMS and Joint Medical Store, Gavi core partners (WHO and UNICEF), expanded partners (civil society organizations, CHAI, PATH, Save the Children, Malaria and Childhood Illness NGO Network, African Field Epidemiology Network, Maternal and Child Survival program, Uganda Healthcare Federation) and the consultants at the different stages of the application process. Additionally, WHO conducted extensive stakeholder engagement, which further prolonged the process.

2. Many of the non-routine partners involved in the application process were unfamiliar with the HSS concept and process. The previous HSS application development occurred in 2007, before several of the present-day EPI stakeholders were in their current positions.

3. Several stakeholders expressed difficulties using the Gavi HSS tools and guidelines. From their experience, the costing tool was not user-friendly and the CCEOP guidelines lacked some pertinent information.

   *The costing tool isn't user-friendly. You have to work outside the tool then fill it in at the final stage. You can't edit within the tool*. (KII, MOH)

   *CCEOP needed a lot of time to understand because there were many things that were not in the guidelines, but we were hearing them from the other people. There was quite a lot that was not mentioned in the guidelines.* (KII, partner organization)

Despite the prolonged process, the NITAG was only consulted late in the HSS-2 application process and therefore were not able to adequately review the application before it was submitted.

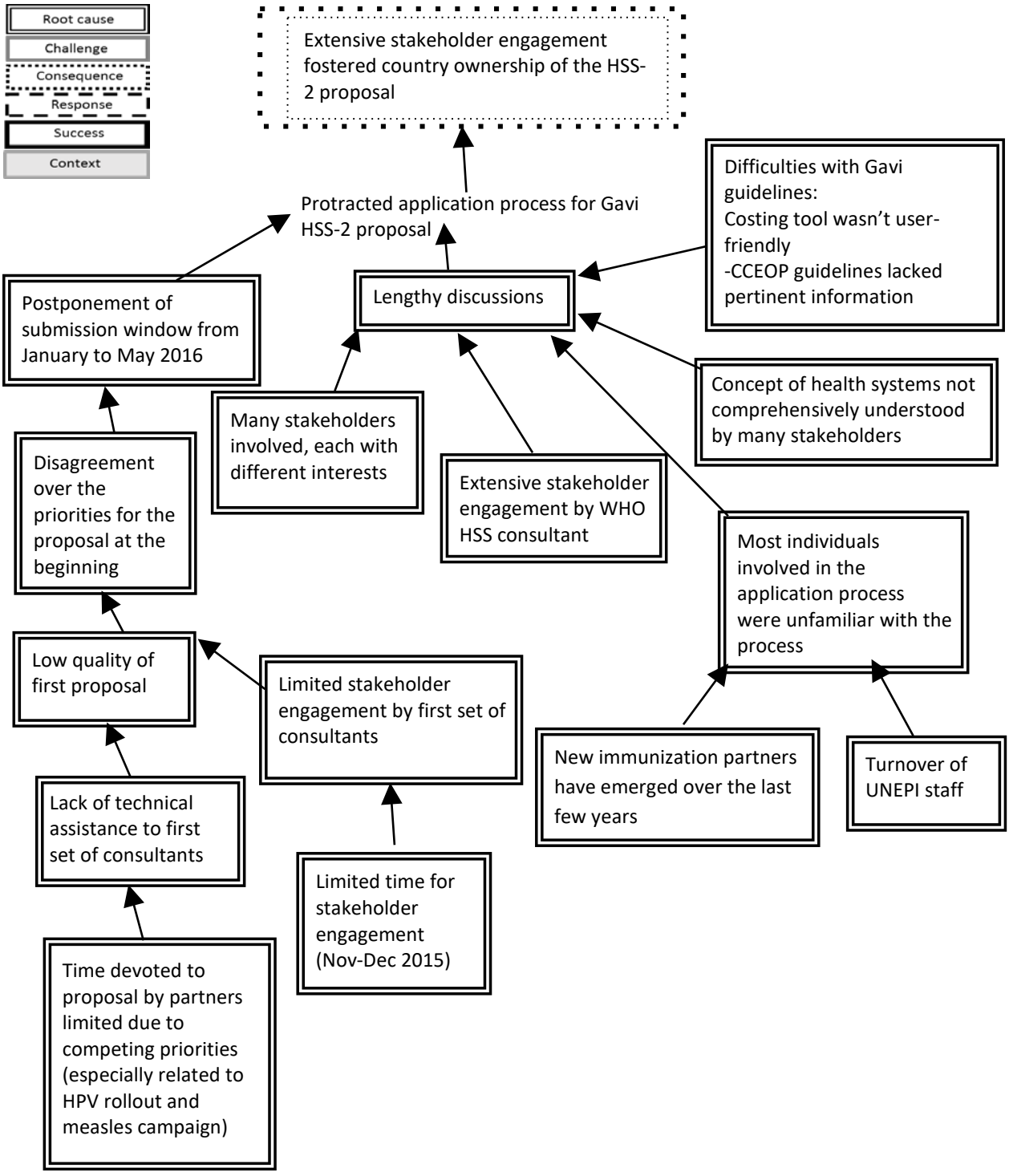
It is also important to note that in the same period (January to May), UNEPI was supposed to prepare for and conduct two polio campaigns in preparation for the switch from tOPV to bOPV as required by the Polio Endgame. They were also preparing for the introduction of IPV which happened April on top of other routine activities. Given the small bandwidth at UNEPI, this process placed a high management burden on the team. This posed a challenge to the UNEPI team in terms of coordination of activities. Nevertheless, UNEPI excelled in ensuring that there was management representation throughout the entire application process.

The HSS-2 application process cost approximately USD$80,868 dollars for a grant award of more than USD$30 million. The cost driver for the process was the consultants hired to provide technical assistance accounting for more than 50% of the total cost; the remainder of the funds went to facilitate writing workshops, retreats, and meetings, and to conduct field visits. The largest source of funds was CHAI, which contributed 50% of the funds. The remaining funds came from WHO, PATH, UNICEF and UNEPI.

On a positive note, the extensive stakeholder engagement fostered country ownership of the proposal and may lead to increased ownership of the grant implementation:

> *What worked well was the engagement of different stakeholders. At least there was significant effort put to bring stakeholders together to the extent that it even derailed the process, but they agreed on the priorities of the proposal.* (KII, partner organization)

**Figure 11: Root cause analysis for protracted HSS-2 application process**



*Recommendation*

1. Gavi should develop more structured guidance for countries on how to conduct a bottleneck analysis, including which bottlenecks to consider and potential data sources to measure the magnitude of those bottlenecks. This will provide guidance to the MOH to improve efficiency of the process and limit disagreement over the priorities of the proposal, thus fostering country understanding and ownership of the HSS-2 application.

*Robustness of finding*

| Finding | Ranking | Robustness criteria |
|---|---|---|
| *The application process for the HSS-2 proposal was protracted because the initial proposal development was not inclusive of the necessary EPI stakeholders so the country decided to revise the application and postpone the submission date. The second phase of the application process included many stakeholders, but this resulted in lengthy discussions and disagreement over the key priorities and the methodology for critical bottlenecks analysis. On the other hand, the extensive stakeholder engagement fostered country ownership of the proposal.* | A | This was based on observation during numerous EPI meetings. It was supported by several KIIs at the national level. |

## Technical Assistance

Under the Gavi model, partners play a fundamental role in providing normative and implementation support to countries for introducing new vaccines and improving immunization outcomes. Gavi partners receive funding from Gavi to fulfill this role as a supplement to their own institutional resources. Uganda's EPI program has received TA from Gavi and its partners to achieve its objectives.

The FCE defines TA as "the transfer or input of additional expertise, skills, or information necessary for the successful completion of Gavi-related activities" (West, 2012). Under the Gavi strategy for 2016–2020, the PEF is the new model to enlist support of partners, both existing and new, to provide vital normative guidance and TA to countries in alignment with the Gavi focus on continuing new vaccine rollout, and accelerating equitable and sustainable coverage of immunization.

As part of the new strategies to strengthen Gavi's grant management processes to simplify grant applications and review processes and enhance country and partner engagement, the JA process and the High Level Review Panel were introduced. The JA specifically was introduced as a major step in Gavi's grant renewal process. The JA process is an annual, in-country, multi-stakeholder review of the implementation progress and performance of Gavi's vaccine and cash grant support to the country, and of its contribution to improved immunization outcomes. The main objectives of the JA are to identify

persistent challenges impeding progress, highlight areas where greater national investment and efforts as well as TA are required, and to inform Gavi's decision on the renewal of its grants.

The outcomes of the JA inform the High Level Review Panel for renewal of Gavi's New and Underused Vaccines or HSS support, and provide a basis for the identification of TA needs to be provided by Gavi alliance partners.

The JA team is composed of relevant staff from the MOH and Ministry of Finance; members of the Inter-agency Coordinating Committee (ICC) and Health Systems Coordinating Committee (HSCC), including civil society organizations (if appropriate); staff from Gavi Alliance partner organizations; and relevant Gavi Secretariat staff.

Uganda held its annual JA report writing workshop in June 2016. The timing of the JA was aligned with the country planning cycle, although it was conducted at the end of the fiscal year, which is contrary to the recommended timeline of three months following the end of the country's fiscal year.

### Finding 1

*Although there was lack of clarity on the definition of technical assistance (TA) and a strong perception that the JA process was complex, the majority of the stakeholders believed the JA process added benefit to the country and considered the process to be highly useful in controlling and/or mitigating risk.*

Unlike the 2015 JA workshop, this year's JA writing workshop attracted a strong delegation from Gavi Alliance partners, including officials from WHO (headquarters, Africa Regional, East and Southern Africa and country offices), UNICEF (New York and country office), CDC-Uganda, and the Gavi Secretariat. Other participating organizations included MOH, CHAI, NMS, civil society organizations, PATH, and Uganda Maternal and Child Survival Program. The process was led by UNEPI with significant involvement of the Gavi Senior Country Manager. Important to note was the continued absence of the World Bank, one of the core Alliance partners assigned to implement some TA activities in the 2016 PEF-TCA allocations.

During the meeting, it was evident that there was lack of homogenous understanding of what TA meant. A heated debate ensued when the EPI manager asked participants from Alliance partners to clarify what TA meant under the PEF. Whereas most UNEPI officials appeared to understand TA as support offered to the country in areas that require specialized skill and capacity building for sustainability, officials from Gavi and alliance partners maintained that under PEF, TA was any support offered by partners aiming to improve immunization outcomes, including operational research and personnel:

> *In our view, technical assistance is the specialized technical support that is offered by partners to the program to effectively implement an activity but has a component of capacity building so that the program can be able to do it themselves next time so that it is more sustainable in the long run.* (MOH, JA process)

The change in approach in the 2016 JA guidelines whereby stakeholders were only required to identify TA needs and not TA providers was not clear to most participants, as this was a change to the guidelines. Thus, some of the working groups assigned possible TA providers to the identified needs. The Gavi SCM representative repeatedly explained that this was not necessary. In a way, this reflected much of the

partner interests in influencing the TA needs and TA providers. The strong interest partners had in influencing the TA allocations was more evident by the high-powered delegations from Alliance partners present for the JA discussion.

Further still, the FCE team conducted a survey with the aim of identifying aspects of the JA process that were effective and those that could be strengthened. The survey was completed by 14 individual stakeholders including UNEPI and other partners outside of the Gavi Alliance in attendance at the JA. Figure 12 below compares the perceived complexity with the perceived added value of the JA. The x-axis of the graph represents the number of respondents (n=14) and the y-axis is the composite score of each individual's responses regarding perceived complexity and perceived added value on a scale of 1 to 3, 1 being "low" and 3 being a "high" score.

**Figure 12: Stakeholders' perception of complexity and benefit of intervention**

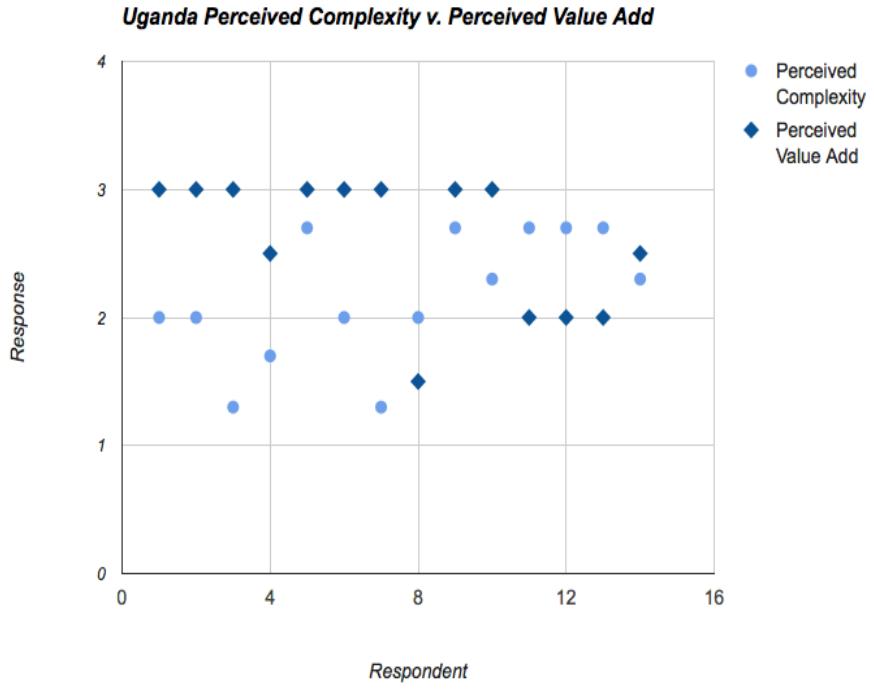



Figure 12 shows that majority of the stakeholders perceived the JA process to be moderately complex, including that it required excessive time and effort to complete, taking away from time to attend to routine EPI activities. Despite this, the majority of the stakeholders considered the JA to have added value to the country. Thus, they considered the process to have been highly useful in controlling and mitigating risk to Gavi's grants.

*Robustness of finding*

| Finding | Ranking | Robustness criteria |
|---|---|---|
| *Although there was lack of clarity on the definition of technical assistance (TA) and a strong perception that the JA process was complex, the majority of the stakeholders believed the JA process added benefit to the country and considered the process to be highly useful in controlling and/or mitigating risk.* | A | This was based on observation during the JA writing workshop and the stakeholder survey conducted during the workshop. |

### Finding 2

*There are four models of TA for immunization in the country: external consultants, in-country consultants, in-country alliance staff, and embedment in the EPI program. Stakeholders perceive the several models as important depending on the need.*

At the start of 2016, the UNEPI team constituted of 13 technical officers, of whom seven were government-supported (one Program Manager, two Senior Medical Officers, one Assistant Engineer, two Cold Chain Officers and one Senior Nursing Officer). Additionally, three cold chain technicians and one monitoring and evaluation specialist were supported under Gavi HSS-1 grant, while two Medical officers were seconded to UNEPI by CHAI. Given the ending of the HSS-1 grant, it is not clear what contingency plans are in place to retain staff supported under this project.

The UNEPI structure has remained thin despite the continued expansion of the immunization platform. As reflected in the 2014 and 2015 Gavi FCE reports, the limited bandwidth at UNEPI has contributed to delays in national rollout and suboptimal routinization of new vaccines. For this reason, there is a heavy reliance on all types of TA by the EPI program in order to achieve its desired immunization outcomes.

**Table 12: Immunization technical assistance models**

| Model | Examples | Source of funds | Funding horizon | Sustainability (financial and programmatic) | Builds capacity of the EPI program? | Other Strengths and Weaknesses |
|---|---|---|---|---|---|---|
| **External Consultants** | WHO Consultants for HSS-2 application | WHO-AFRO | Short-term | -Low. Difficult to transition knowledge for implementation because of short-term engagement | -Low, Focus is on the deliverable. | -Unclear understanding of Uganda's immunization context. |

| | | | | | | |
|---|---|---|---|---|---|---|
| **In-country consultants** | Local consultants hired for initial HSS-2 application development | CHAI | Short-term | -Low | -Low. Focus is on the deliverable. | +Knowledge is retained in-country. |
| **In-country alliance staff** | WHO, UNICEF | WHO, UNICEF | Long-term | Financial sustainability depends on donor and partner resources and priorities | -Low. However, this is dependent on the consultant's motivation. | +Long-standing relationships<br>+Strong understanding of context<br>-Lose objectivity over time<br>-Not accountable to MOH |
| | PEF targeted technical assistance:<br>-WHO<br>-UNICEF<br>-CDC<br>-World Bank<br>-PATH<br>-CRS | Gavi Alliance | Short-term | Financial sustainability depends on donor support | -Low. Dependent on purpose of TA provided, but is usually focused on a deliverable | +Fill resource gaps |
| **TA embedded in EPI program** | Embedded staff working with EPI program (2 personnel) | CHAI | Short-term | Financial sustainability depends on funding source | Learning, capacity building during long-term engagement | +Fill HR gaps |

At the country level, stakeholders have varying perceptions of the TA models identified above. The different models are perceived as important depending on the context, i.e., the type of assistance needed and the sense of urgency:

> *It depends on the kind of work you want to do. There's work that just needs someone embedded within UNEPI to help out in its activities. Then there's work that needs TA, for example the costing part of the HSS application.* (KII partner organization)

Specifically, embedding TA in the EPI program is perceived as effective because it is an immediate solution to the limited staff numbers of the UNEPI team,

> *In Uganda the issue isn't one of skills, it is one of numbers.* (Global KII, Gavi Secretariat)

The embedment of TA into the EPI program is also seen to ease access of the seconding organization to UNEPI and other stakeholders given its representation by the seconded person.

> *I think the secondment of partners to sit and work with EPI is the best because it also gives them access to the people that the partners would like to access.* (KII partner organization)

However, stakeholders feel that the seconded TA should be technically sound to ensure effective and efficient support to the EPI program.

> *This model of embedding TA is good as long as we get the right people. If someone is coming to offer TA, they should be technically sound. If possible we (MOH) should be included in the process of recruiting of these people so that we are sure of their capacity.* (KII MOH)

With any of these TA models, the sustainability of the model should be taken into account. As a global key informant familiar with the Ugandan context has said:

> *Sustainability is difficult – you need to advocate for the government to see the need and take over when partners phase out. (Global KII, Gavi Secretariat)*

### *Recommendations*

1. Gavi should devise an operational definition of TA to guide country stakeholders in identifying proper TA needs and increase in-country appreciation of PEF's approach to TA allocation.
2. Gavi should consider developing standard guidelines to be followed in identifying and prioritizing TA needs at the country level so as to reduce the complexity of the process and guard against partner interests influencing the JA process.

*Robustness of finding*

| Finding | Ranking | Robustness criteria |
|---|---|---|
| *There are four models of TA for immunization in the country: external consultants, in-country consultants, in-country alliance staff, and embedment in the EPI program. Stakeholders perceive the several models as important depending on the need.* | A | This was based on observation during the JA writing workshop and the stakeholder survey conducted during the workshop. |

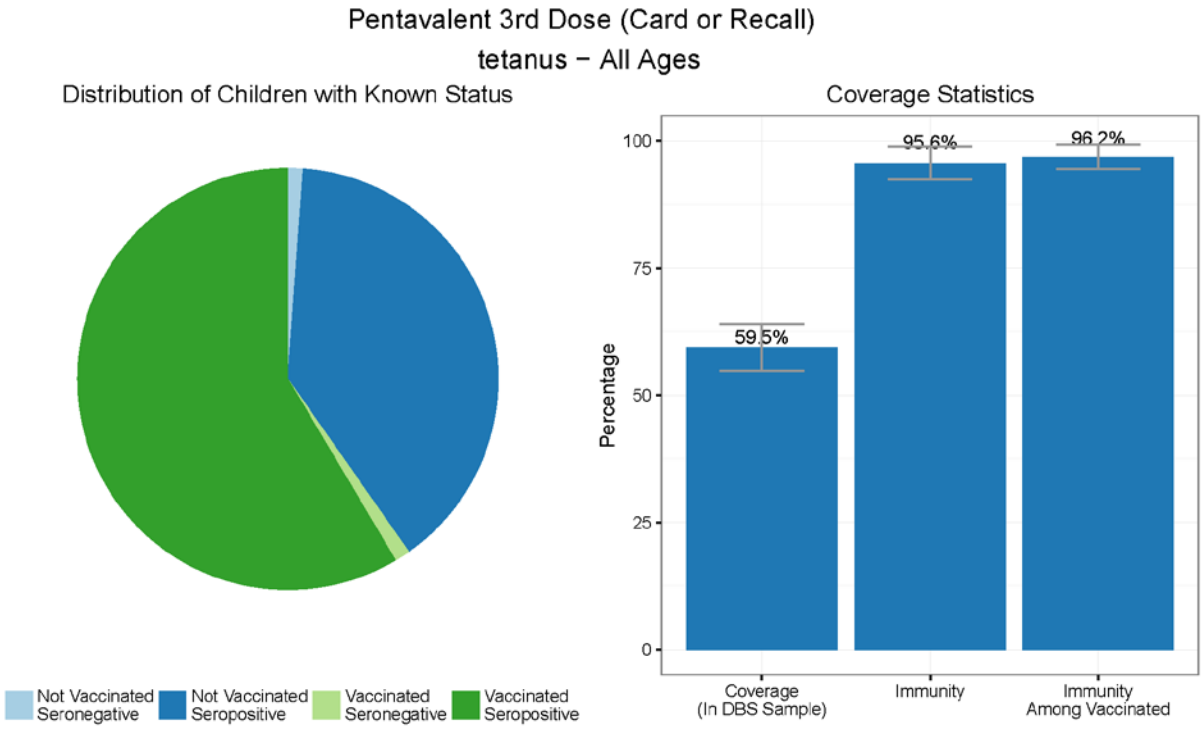
## Household survey Dried Blood Spot (DBS) results

During the Gavi FCE household survey, 1,138 children were randomly selected for blood tests to determine whether they are immune to hepatitis B and tetanus. Trained health workers absorbed five drops of blood from consenting participants onto specially designed filter paper by pricking their finger. Blood spots were dried and sent to a laboratory for antibody testing. The antibodies allow us to determine which children are immune to hepatitis B and tetanus. Laboratory methods and data processing methods are described in Annex 4. We also compared children's immune status to their vaccination status, which allows us to assess which of the vaccinated children have actually gained immunity, and which have not.

Based on the DBS results, 49.1% of children (95% uncertainty interval: 38.7–59.9%) were immune to hepatitis B, and a much higher percentage, 95.6% (95% uncertainty interval: 94.1–96.8%), were immune to tetanus. According to control samples, sensitivity and specificity were to be higher for tetanus than hepatitis B.

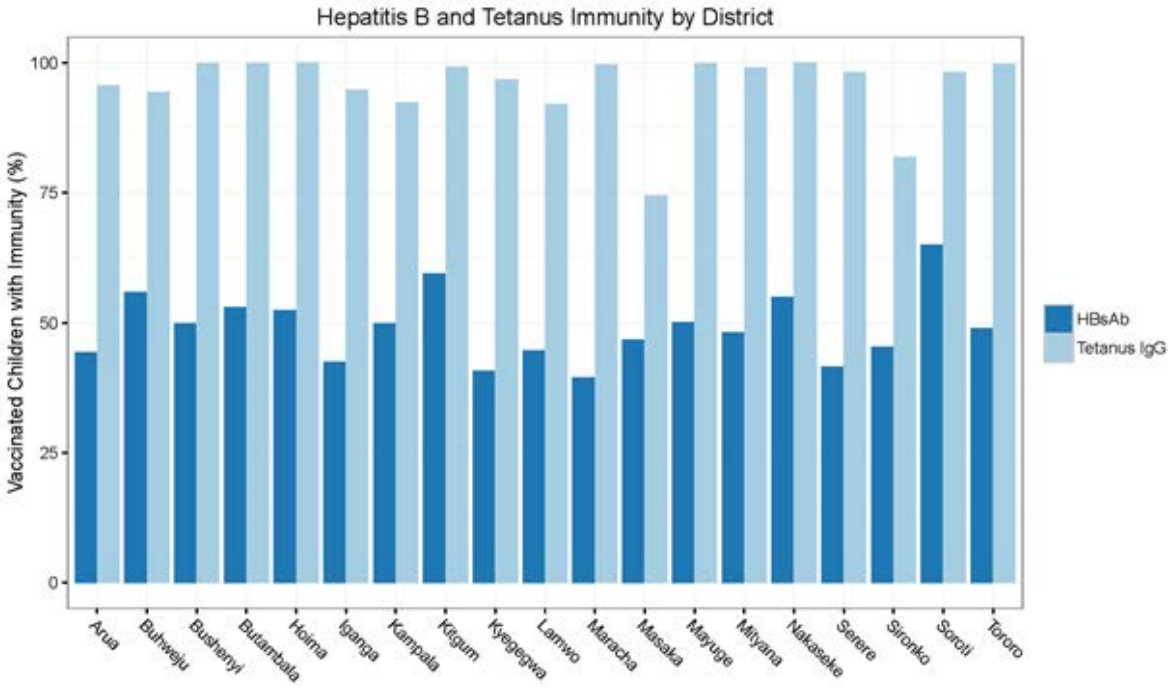
Comparing the DBS results to children's pentavalent vaccine status ("vaccinated" being defined as receiving three doses, according to either maternal recall or vaccine card), only 50.5% of vaccinated children (95% UI: 39.7, 61.1%) were immune to hepatitis B, and 96.2% (95% UI: 94.7, 97.4%) were immune to tetanus. Figure 13 displays this comparison. We caution against interpreting these as estimates of vaccine effectiveness, as the study was designed to measure seroprevalence.

**Figure 13: Comparison between pentavalent vaccination and tetanus immunity among children selected for DBS**




The Gavi FCE surveys can also explain the reasons behind vaccine success. As shown in Figure 14, immunity among vaccinated children varies considerably by district. In Hoima, 100% of vaccinated children were successfully immunized for tetanus, meaning that all vaccinated children gained immunity. Other districts, however, such as Masaka, had a low percentage of vaccinated children successfully immunized for tetanus (<75%). Also notable, children who were vaccinated during outreach, or whose mother/caretaker reported outreach as the typical location for vaccination, were much less likely to gain immunity; only 25% of children vaccinated during outreach were immune as compared with 50% immunity among children vaccinated during static sessions (odds ratio of immunity given outreach: 0.33, (95% UI: 0.15, 0.67). Other variables, such as refrigerator temperature monitors, adherence to dosage schedule, and age at first dose were generally not correlated with vaccine success (or failure). We caution that these are preliminary results and do not account for confounding or uncertainty.

**Figure 14: Percentage of vaccinated children who are immune, by district**




## Constraints analysis results

Using the household survey, we evaluated community and household characteristics that correspond with vaccinated children. Linking children to health facilities, we used the HFS, DHO, and patient surveys to assess the influence of supply-side constraints on vaccine coverage, and how they interrelate with demand-side factors. We used systematic review, thematic analysis, interpretive synthesis, and Bayesian structural equation modeling (BSEM) to assess the relative contribution of demand-side, supply-side, and access-related determinants. Constraints analysis is described in more detail in Annex 3.

Figure 15 displays the high-level results from the constraints analysis. For three doses of pentavalent (Figure 15(b)), the model estimated that the largest driver of vaccination was mother or caretaker's "Intent to Vaccinate", i.e., demand, which explained 36% of pentavalent 3 coverage. PCV-1 utilization (Figure 15(d)) was much more strongly influenced by Health Facility Readiness (33%). For both vaccines, demand was a larger factor for the third dose (Figure 15(b) and (d)) than the first (Figure 15(a) and (c)).

**Figure 15: Relative constraints to individual-level vaccine utilization in Uganda**

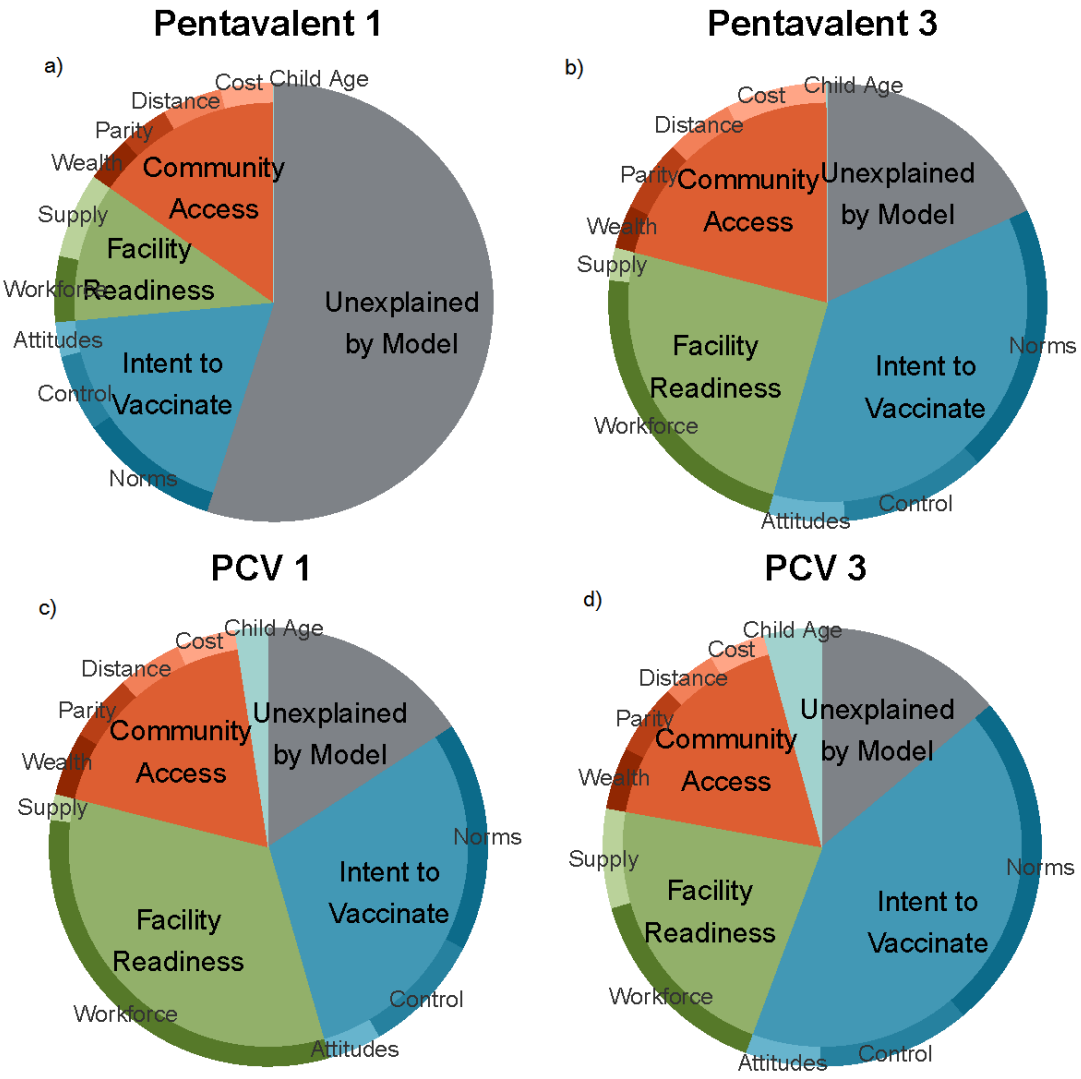
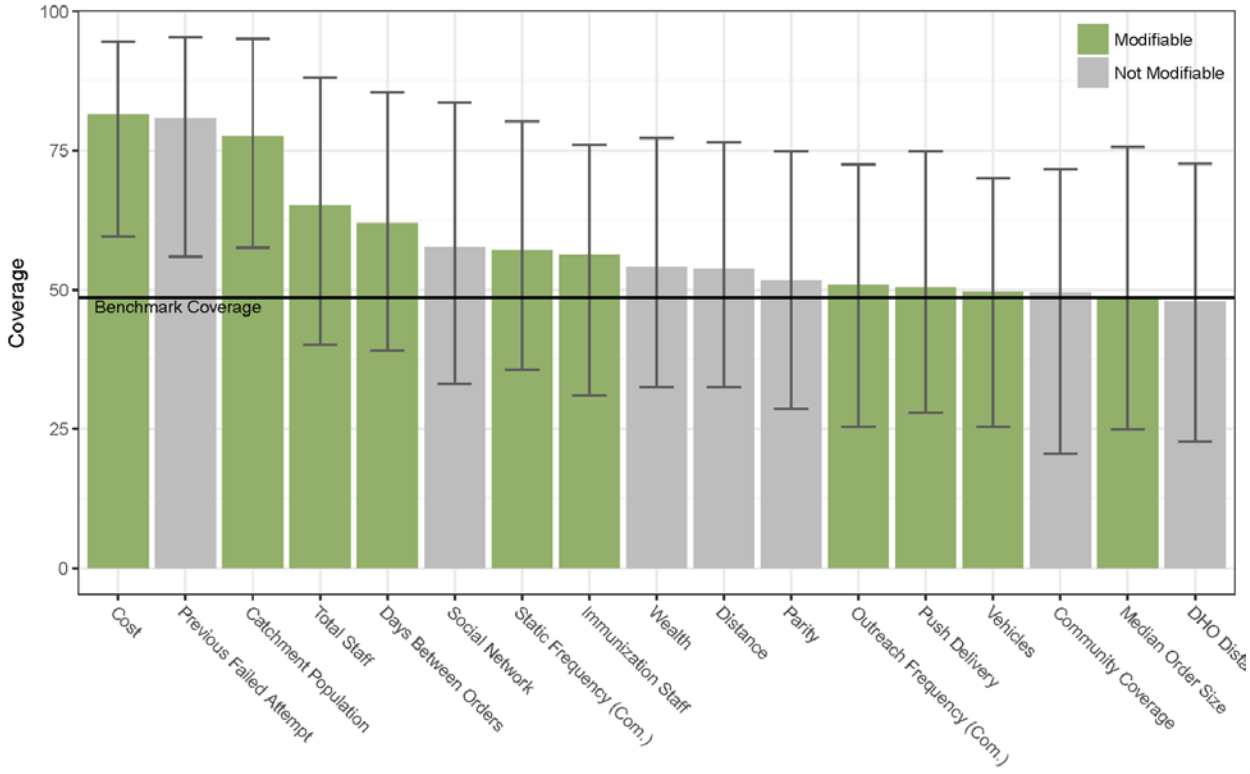


Figure 16 shows detailed results from the constraints analysis for PCV-3 coverage. Certain bottlenecks were correlated with coverage more strongly than others in the data, taking mediating factors into account. Frequency of cost of vaccination (incurred by the mother or caretaker), catchment population at the health facility, and total staff were all strong constraints. In Figure 16, the model estimates that PCV-3 coverage would increase to the height of each bar if the associated barrier was removed.

**Figure 16: Expected PCV-3 coverage if an individual barrier was removed**




*Recommendations*

The data and model indicate that there are different drivers of initiation (first dose) and drop-out (third dose), and different drivers for new and routine vaccines. For example, Intent to Vaccinate (attitudes and perceptions) is a larger driver of three-dose coverage than one-dose coverage, and Facility Readiness is a larger driver of PCV than pentavalent.

1. We recommend that demand-generation interventions in Uganda should use reduced dropout as a key metric of success.
2. We recommend that NVI programs focus on Facility Readiness to achieve success.

# References

1. West, G.R., Clapp, S.P., Averill, E.M.D. and Cates Jr, W., 2012. Defining and assessing evidence for the effectiveness of technical assistance in furthering global health. Global public health, 7(9), pp.915-930.