Implementing a learning agenda on hepatitis B birth dose vaccine delivery in Africa

A case study from Uganda

PATH

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Cover photo: A nurse administers the hepatitis B birth dose to a newborn in Uganda. PATH/Khalid Alli.

Contents

Abbreviations

ANC	antenatal care
BCG	bacillus Calmette-Guérin
CHEW	community health extension worker
CHW	community health worker
CTC	controlled temperature chain
eCHIS	electronic Community Health Information System
EPI	Expanded Programme on Immunization
FGD	focus group discussion
HBV	hepatitis B virus
Hep B	hepatitis B
HIV	human immunodeficiency virus
MAP	microarray patch
MeSH	medical subject headings
MOH	Ministry of Health
NMS	National Medical Stores
OpenSRP	Open Smart Register Platform
OPV0	oral polio vaccine birth dose
PFS	prefilled single-dose syringes
TBA	traditional birth attendant
UNICEF	United Nations Children's Fund
VHT	village health team
WCG	WIRB-Copernicus Group
WHO	World Health Organization

Background

The World Health Organization (WHO) estimates that approximately 254 million people worldwide live with chronic hepatitis B (Hep B) infection, which can lead to serious health issues.[1] The burden is particularly high in low- and middle-income countries, including the WHO African Region, where an estimated 65 million people are infected.[1] Chronic Hep B infection is commonly the result of vertical transmission of the hepatitis B virus (HBV). Babies who are infected before they are one year old have a 90% risk of developing chronic Hep B.[2] The second most common cause of chronic Hep B is transmission during early childhood, with a 30% risk among children who are infected between one and five years of age.[2]

Vaccination is one of the most critical measures to prevent Hep B infection. When administered within 24 hours of birth, the Hep B birth-dose can prevent 75% to 95% of vertical transmissions.[3] Since 2009, this vaccine has been endorsed by WHO, which recommends that all infants receive the first dose as soon as possible after birth, followed by two or three subsequent doses to complete the infant Hep B vaccine series.[4]

However, administering the vaccine within 24 hours of birth is challenging, particularly in contexts where births take place outside of health facilities. In many African countries, more than 40% of births occur at home.[5] While 63% of new Hep B infections are in the WHO African Region, only 18% of newborns there receive the Hep B birth dose, with only 15 of 47 countries in the region offering it as part of their routine immunization programs.[6]

Project overview

With funding from Gavi, the Vaccine Alliance, PATH is implementing a learning agenda on Hep B birth-dose vaccine delivery in Africa, including a focus on synthesizing lessons learned from countries with decades of experience implementing the Hep B birth dose, as well as countries newly introducing the birth dose into routine immunization schedules.[7,8] The learning agenda includes questions around operational feasibility, acceptability, cost, market access, and the impact of innovative strategies to improve the reach of timely Hep B birth dose for babies born both within and outside of facility settings.

By exploring innovative delivery strategies, assessing the role of community health systems, and understanding stakeholder perspectives, the project's primary objective is to identify effective models for increasing Hep B birth-dose coverage. Evidence and insights from this initiative will apply to countries planning for Hep B birth-dose vaccine introduction as well as those seeking to deploy new strategies to increase coverage rates and timely administration within 24 hours of birth.

The project is being implemented in four countries—Uganda, Ethiopia, Nigeria, and The Gambia—selected based on several criteria, including a high HBV burden, moderate or high rates of home births, moderate or high birth-dose rates for oral polio vaccine birth dose (OPV0), demonstrating success with another type of birth dose, and an enabling environment for community health care providers to administer vaccines. PATH also has a strong presence in these countries through longstanding collaborations with their ministries of health. This case study presents insights from Uganda.

Ugandan context

In 2022, Uganda's National Immunization Technical Advisory Group recommended the universal inclusion of the Hep B birth-dose vaccine in the national immunization program to accelerate progress toward global Hep B elimination goals. Recognizing the importance of this milestone, the Ministry of Health (MOH) made a national commitment to prioritize Hep B birth-dose introduction. In October 2022, the MOH leveraged existing adult HBV vaccines to initiate newborn vaccination at half the adult dose while preparing to apply for additional Gavi support for the full introduction of the Hep B birth dose. In 2024, Uganda applied for the new vaccine introduction support to Gavi, subsequent to the approvals from both the Technical Coordination Committee and the Interagency Coordinating Committee in April 2022. In September 2025, Uganda officially launched the nationwide rollout of the Hep B birth dose. The introduction and scale-up are jointly financed by Gavi, which has committed $659,000, and the government of Uganda, which is contributing cofinancing at $0.20 per dose.

As laid out in The National Viral Hepatitis Prevention and Control Strategic Plan 2023 – 2028, Uganda has set ambitious goals for this introduction: (1) to achieve 75% Hep B birth-dose coverage by the end of the first year of introduction; (2) to ensure that over 90% of children born in health facilities receive each birth dose vaccine (Hep B, bacillus Calmette-Guérin [BCG] and OPV0) by 2030; and (3) to reduce HBV prevalence among children under five years of age to below 0.5% by 2030.[9] In line with WHO and Uganda's National Immunization Technical Advisory Group guidance, the national policy also clarifies that the vaccine should be administered at birth or within 24 hours, though vaccine administration within the first six weeks remains acceptable according to national guidelines.

Currently, the Hep B birth dose is being co-delivered with the BCG vaccine and OPV0 within maternity wards and immunization units; the goal has been to integrate newborn vaccination into maternal and child health services to promote facility-based births and early vaccination.[10] However, no clear strategy has been outlined for reaching newborns delivered outside facilities, in community settings.

To support the introduction and scale-up of the Hep B birth dose, program guidelines outline several implementation activities to strengthen health system readiness. On the supply side, health workers are being trained using the Immunization in Practice guidelines, updated with birth-dose-specific protocols.[11] The government is also conducting supportive supervision to ensure proper bundling practices, reduce wastage, and strengthen data monitoring through DHIS2. The National Medical Stores (NMS) will oversee vaccine procurement, cold chain management, and distribution.

However, based on early experiences from the introduction of partial adult-dose vaccines in October 2022,[12] timely administration of the birth dose within 24 hours of birth remains a persistent challenge, especially in settings where many deliveries take place outside formal health facilities. Overall, the coverage of Hep B birth dose nationally was 36% in 2024 per the DHIS2; however, no data are available on timely coverage nor disaggregation by urbanicity or location of birth.[13] The high proportion of home births in Uganda limits opportunities for timely vaccination of newborns: nationally, an estimated 32% of women deliver at home based on routine DHIS2 data (and as high as 60% in some districts[14]), although household surveys indicate by an average of 13%.[15]

Given the low rates of timely vaccination and the limited systems for tracking timeliness, Uganda is working to identify and test innovative approaches that can sustainably reach all newborns with the birth dose. Through a human-centered design approach, involving co-creation workshops, PATH, in partnership with the Ugandan MOH, is engaging caregivers, community health workers (CHWs), community leaders, health care providers, health facility managers, program implementers, and policymakers to better understand their knowledge, attitudes, and practices related to birth-dose delivery. The goal is to codesign in-facility and out-of-facility delivery strategies that are contextually appropriate and acceptable to communities and stakeholders alike. This case study presents insights from Uganda's efforts to design innovative, context-sensitive service delivery models that enable timely Hep B birth-dose vaccination for newborns delivered both within and outside health facilities.

The role of Uganda's CHWs in immunization

The policy environment in Uganda strongly supports a robust and coordinated community health system, with national strategies emphasizing investment in community health cadres, community engagement, and household-level empowerment. Uganda's community health system includes two complementary cadres: village health teams (VHTs), which were established in 2001 and consist of volunteers who operate at the village level (two VHTs per village), and community health extension workers (CHEWs), introduced in 2018 as a formal, salaried cadre with expanded training and qualifications to serve full-time at the parish level (two CHEWs per parish).[16,17]

The professionalized CHEW cadre was developed in response to a national assessment of the VHTs,[18] which revealed persistent challenges, including unclear recruitment processes, inconsistent funding,

weak supervision, inadequate training, poor referral mechanisms, and limited community involvement. These gaps prompted the MOH to rethink and strengthen the community health platform by establishing a professionalized cadre with responsibilities covering an integrated scope of work, including health education on hygiene, nutrition, disease prevention, and vaccination; supporting HIV/AIDS awareness, testing, and linkage to antiretroviral therapy; managing common illnesses such as malaria, diarrhea, and respiratory infections; and delivering maternal and child health services, including family planning and vitamin supplementation. Beyond supervising and coordinating VHTs, CHEWs are expected to conduct home visits and outreach as well as collect and report data through the electronic Community Health Information System (eCHIS). Indicators from eCHIS relating to the community health interventions and birth dose vaccines are linked to and cross-reported in the DHIS2. Since June 2024, CHEW training has expanded to more than 35 of Uganda's 141 districts and 11 cities, marking a major step toward strengthening community-level health service delivery.[19]

CHEWs and VHTs play complementary roles in routine immunization, wherein VHTs create demand and link households to services and CHEWs provide and coordinate the delivery of vaccination services (Table 1). CHWs, including VHTs and CHEWs, are trained to administer injectable contraception, with CHEWs additionally trained to insert implants. Through VHTs, access to community-based family planning has increased significantly; this indicates a potential policy pathway to expand VHTs' practice to include vaccination.[20] However, challenges have been reported during the rollout of CHEWs, leading to tensions related to compensation structures. The VHTs are increasingly pursuing financial incentives to sustain their work motivation, leading to a potential deprioritizing of unincentivized tasks, such as health education on birth dose vaccines and community outreach efforts.[21]

Recent innovations: eCHIS

Uganda's eCHIS is a national digital platform designed by the MOH to modernize and standardize community health service delivery.[22] eCHIS was launched in Uganda in 2021 and expanded steadily from 2022 through 2025. The system is built on open-source platforms (e.g., Community Health Toolkit and/or Open Smart Register Platform [OpenSRP]) to support flexibility, offline use (important in rural areas), and integration.[23] eCHIS functions as a digital job aid that replaces paper-based registers; it guides VHTs through service delivery, data entry, referrals, and follow-up even in offline rural settings.[24] Uganda adopted eCHIS in 2023 in a phased manner, to reduce fragmentation from multiple partner-led tools, improve data accuracy and timeliness, and align with the National Community Health Strategy and Digital Health Strategy. eCHIS integrates key community health modules, including integrated community case management; maternal and child health (antenatal care [ANC], postnatal care, newborn care); immunization tracking, including Hep B birth-dose vaccination for all newborn children up to six weeks after birth according to national guidelines; nutrition and growth monitoring; water, sanitation, and hygiene; family planning; HIV/tuberculosis screening; and community-level stock monitoring.[22,25,26] It also provides supervisors and facility teams with dashboards for tracking CHW performance, service coverage, and referral completion.[22] Challenges remain, including limited nationwide coverage, connectivity issues, and the need for ongoing supervision and training. Despite these, eCHIS is already strengthening primary health care, improving community-level surveillance, and supporting Uganda's progress toward universal health coverage.[24] According to MOH, as of 2024/2025, over 28,000 CHWs in 19 districts were using eCHIS, resulting in improved reporting rates, better follow-up, and enhanced child and maternal health outcomes.[27]

TABLE 1. **Comparison of CHEW and VHT roles.**

CHEW role in routine immunization (salaried)	VHT role in routine immunization (volunteer)
• Conduct health education, address community concerns, and increase general awareness about immunization. • Provide immunization services, including sometimes administering vaccines during outreach sessions. This is because some CHEWs are nurses by training but have not yet been recruited into public service. • Keep vaccination records, monitor coverage, and report data to health facilities.	• Mobilize households for routine immunization and outreach sessions. • Identify and refer unimmunized or partially immunized children to health facilities. • Provide health education, like CHEWs, on the importance and schedule of vaccines. • Help track defaulters and encourage completion of the immunization schedule.

Abbreviations: CHEW, community health extension worker; VHT, village health team.

Project approach

Ethics review

The protocol for the study in Uganda was approved by the Uganda National Council for Science and Technology (#SS4277ES) and Mildmay Uganda Research Ethics Committee (#MUREC-2025-1760). It was granted an exemption by the WIRB-Copernicus Group (WCG) institutional review board (#RES-00899) in the United States. All respondents gave informed written consent prior to participating in the study.

Study sites and context

The study was conducted in the Lira and Butaleja Districts (Figure 1), which were purposively selected to capture diverse geographic and health system contexts relevant to Hep B birth-dose delivery (Table 2, Table 3). While both districts had relatively higher percentages of Hep B prevalence (with 4.3% in Lira and 2.8% in Butaleja),[28] they were distinct in terms of their degree of urbanization, service delivery capacity, institutional delivery rates that could influence barriers and facilitators to birth-dose uptake.

Lira, located in northern Uganda, is more urbanized and has a mixed network of public, private, and not-for-profit health facilities, with only half of women delivering in a facility (47.3%) in 2024 (Table 3).[14] In contrast, Butaleja, in eastern Uganda, is predominantly rural, with scattered settlements, predominantly public sector facilities and over two-thirds of women delivering in a facility (68.4%) in 2024.[14] Access barriers and limited outreach capacity affect timely Hep B birth-dose delivery in Butaleja.[15]

FIGURE 1. **Map of study sites in Lira and Butaleja Districts.**

Study design

The study used a multiphase qualitative design combining: (1) a literature review; (2) primary data collection through key informant interviews and focus group discussions (FGDs) at national and subnational levels; and (3) co-creation workshops at the district level.

Literature review

First, we conducted a literature review to: (1) document existing birth-dose delivery models in in-facility and out-of-facility settings in Uganda, including their effectiveness, barriers, and facilitators; and (2) understand the roles of community-based providers, such as CHWs, midwives, and traditional birth attendants (TBAs) in birth-dose delivery to date. These findings informed the design of interview guides for the primary data collection.

TABLE 2. **Characteristics of Lira and Butaleja Districts.**

Aspect	Lira District	Butaleja District
Livelihood and economic activities	Predominantly agro-pastoral: cattle rearing and crop farming (maize, beans, sunflower). More urbanized with trading centers.	Rural economy: mainly subsistence farming; rice growing is a major economic activity. Less urbanized.
Religion, social/cultural beliefs, and gender norms	Mixed Christian denominations; cultural norms allow moderate autonomy for women in health decisions; newborns are confined inside the house for 3–4 days, depending on the sex, for fear of demonic encounters.	Predominantly Muslim and Christian; stronger patriarchal norms influence women's health choices; newborns are confined inside the house for an average of 40 days, irrespective of the sex, for fear of demonic encounters.
eCHIS implementation[29]	Launched eCHIS in 2023 (pilot district).	Launched eCHIS in early 2025.

Abbreviation: eCHIS, electronic Community Health Information System.

TABLE 3. **Health system structure and institutional delivery rates, by study district.**[30]

Health system indicators	Lira District	Butaleja District
Number of general hospitals (government owned)	1	1
Number of health centers (government owned)*	26 (10 HC II; 13 HC III; 3 HC IV)	24 (9 HC II; 11 HC III; 4 HC IV)
Number of VHTs	1,382	502
Number of CHEWs	166	150
Percentage of institutional deliveries (2024)	47.3	68.4
Average number of institutional deliveries per month (2024)	480	909
Percentage of newborns with postnatal contact with a health provider within 24 hours of birth (2024)	47.0	63.4

Abbreviations: CHEW, community health extension worker; HC, health center; VHT, village health team.

*HC II is an outpatient facility serving 5,000 people, led by a nurse; HC III is an in-patient facility serving 10,000 people (including labor and delivery care, and diagnostics), led by a clinical officer; HC IV provides surgical services, emergency obstetric care, and blood transfusion and is led by a medical doctor.

Sources: Global Financing Facility Data Portal: Uganda DHIS2. Accessed December 12, 2025: https://data.gffportal.org/country/uganda ; Uganda Ministry of Health:National Health Facility Registry. Accessed December 19, 2025: https://nhfr.health.go.ug/facilities

The literature review included 25 resources spanning peer-reviewed articles, policy documents, technical reports, and conference/webinar presentations. The initial search was conducted in PubMed using a combination of medical subject headings (MeSH) and text words related to immunization programs, neonatal vaccines, and specific vaccines—Hep B vaccine, BCG vaccine, and OPV0—limited to publications from 2000 onward. This search identified 23 documents, which were supplemented with additional gray literature and secondary resources to capture a broader range of evidence. These supplementary materials provided further insights into the health system context, including determinants of facility-based delivery, ANC use, and service delivery strategies.

Qualitative data collection

Building on this foundation, the study proceeded with three phases of qualitative data collection (Table 4):

- Phase 1 (n = 18) involved national-level interviews with policymakers, Expanded Programme on Immunization (EPI) managers, technical experts, civil society representatives, and supply chain specialists. These interviews examined past and current experiences and strategies to increase Hep B birth-dose uptake and explored the value, feasibility, and operational considerations of introducing a controlled temperature chain (CTC) approach, including potential regulatory and technical barriers to CTC qualification, comparative programmatic implications of one-dose versus ten-dose presentations, the feasibility of using both presentations concurrently across different contexts within the country, and wastage issues.
- Phase 2 (n = 6 district-level officials, n = 15 facility health care providers) consisted of interviews with district health officials; maternal, newborn, and child health and EPI staff; and members of professional associations. We assessed how national strategies were implemented locally, identified contextual challenges, and explored opportunities for new strategies or for adapting existing ones.
- Phase 3 (n = 16 interviews and 8 FGDs) consisted of individual interviews with mothers (n=12) and TBAs (n=4) as well as FGDs (n=8) at the community level, each grouped by respondent type (fathers, grandmothers, CHEWs/VHTs, and community leaders). These discussions focused on lived experiences and mapping of individual- and community-level barriers and facilitators to facility birth, newborn vaccination, and Hep B prevention and control.

Analysis

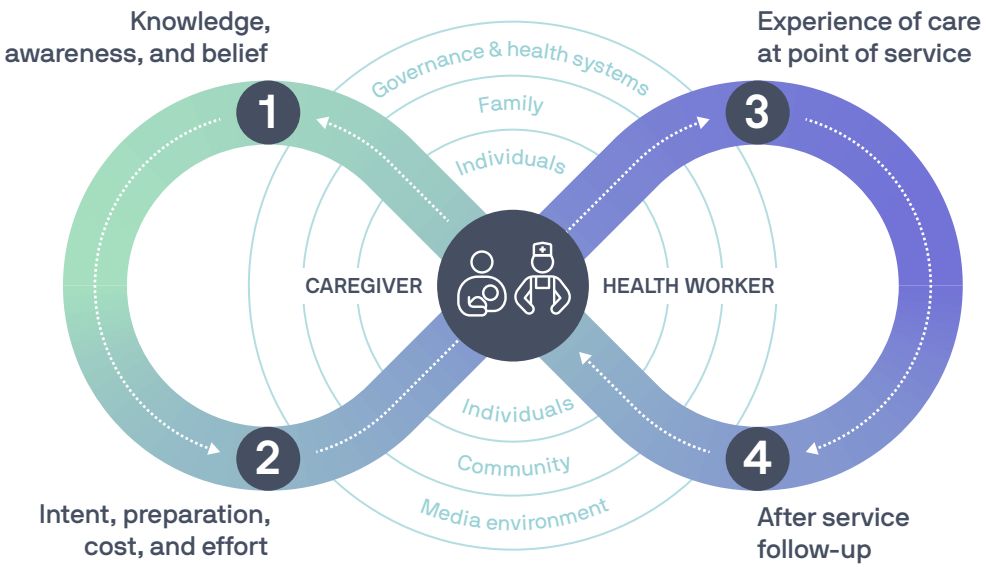
The study applied UNICEF's Journey to Health and Immunization framework,[31] which maps six stages in the caregiver and provider journey (knowledge, awareness, and belief; intent; preparation, cost, and effort; point of service;

TABLE 4. **Summary of respondents for qualitative data collection at the national and subnational levels.**

Respondent category	Lira District	Butaleja District	Total
National-level interviews			
Policymakers, EPI managers, technical experts, and civil society representative interviews			18
District-level interviews			
District-level staff interviews	3	3	6
Facility-level staff interviews	9	6	15
Community-level interviews and FGDs			
Caregiver interviews (mothers)	6	6	12
Health care provider interviews (TBAs)	2	2	4
Community FGDs (fathers, grandmothers, VHTs/CHEWs, community leaders)	4	4	8
Total			**63**

Abbreviations: CHEW, community health extension worker; FGD, focus group discussion; TBA, traditional birth attendant; VHT, village health team.

FIGURE 2. **An adapted Journey to Health and Immunization Framework.**



Adapted from UNICEF Health Section Implementation Research and Delivery Science Unit and the Office of Innovation Global Innovation Centre. *Demand for Health Services Field Guide: A Human-Centred Approach.* UNICEF; 2018, 56. https://www.unicef.org/innovation/sites/unicef.org.innovation/files/2019-05/demand_for_healthservices_fieldguide.pdf

experience of care; and after service) to examine barriers, facilitators, and implementation processes. This framework informed the interview design and guided thematic analysis. All the literature review data were collated in Smartsheet, and the interview data were collected in KoboToolbox. Both were synthesized into memos to identify enablers, barriers, and potential adaptations for strengthening Hep B birth-dose delivery in Uganda.

Our findings are presented in a modified framework (see Figure 2), which has been condensed to four stages where intent is combined with preparation, cost, and effort, and point of service is combined with experience of care, as these identified barriers and enablers were often interrelated and difficult to distinguish cleanly. Additionally, our stakeholders described the interactions with the health system as a single encounter, combining the point of service and experience of care. By combining these stages, our analysis maintains fidelity to the Journey to Health and Immunization framework while ensuring that findings reflect how respondents themselves experienced the journey to immunization.

Co-creation workshops

Following analysis of the qualitative data, co-creation workshops were conducted at the district level to understand Hep B birth-dose vaccination activities based on findings from the qualitative data collection phases. Each workshop aimed to generate, test, and refine prototype concepts (herein described as strategies) that could strengthen caregiver engagement and improve Hep B birth-dose vaccine uptake. Conducted over four days, the workshops brought together a diverse group of participants, as detailed below and in Appendix A:

- **Day 1:** Caregivers (both mothers and fathers), community leaders, VHTs, and CHEWs.
- **Day 2:** District health managers, EPI focal persons, and facility-based health care providers.
- **Days 3 to 4:** Mixed participant groups for collaborative prototyping sessions focusing on iterative design, feedback, and refinement of strategies.

A total of 70 participants (33% male and 67% female) were involved across all workshops, including 38 in Lira and 32 in Butaleja.

Before moving into solution generation, co-creation workshop participants were presented with the key barriers to administering birth-dose vaccines, particularly the Hep B birth-dose vaccine, as identified through FGDs and key informant interviews. Participants reviewed and validated these themes to ensure that they accurately reflected community realities. This validation step established a shared understanding of challenges and confirmed the relevance of the findings before transitioning to ideation.

To guide the ideation process, facilitators introduced "how might we" questions that framed the challenges as opportunities/strategies for innovation (Appendix B). Participants then took part in a structured brainstorming session to generate potential solutions. Subsequently, participants used a prioritization matrix to identify the most feasible and impactful ideas for further development. For each prioritized idea, they created strategies that included the following elements: concept description, proposed activities, potential challenges, and estimated costs.

The strategies were subsequently presented to members of Uganda's Viral Hepatitis Technical Working Committee for initial feedback and validation, with a focus on policy alignment and feasibility within existing health system constraints. They were then shared with the two districts where the co-creation workshops were held to further explore how the strategies could be adapted to local contexts, identify anticipated implementation gaps, and discuss how these could be addressed.

Findings

Barriers and facilitators to Hep B vaccine uptake within and outside of facility settings

Crosscutting barriers and enablers

Caregivers and health workers across Lira and Butaleja described a shared set of structural, cultural, and behavioral factors that shape early vaccination (Table 5). At the community level, limited availability of vaccination services, particularly the inconsistency of daily immunization, combined with long travel distances, poor road conditions, high transport costs, and concerns about travel at night create substantial obstacles to timely birth-dose vaccination. These challenges are compounded by common cultural norms that encourage keeping newborns indoors for several days after birth and by persistent fear of adverse events following immunization. Community narratives often amplify negative experiences, reinforcing hesitancy and heightening concerns about pain and side effects for newborns.

Although mothers overwhelmingly prefer to deliver in facilities, many still give birth at home if labor begins unexpectedly, which significantly reduces the likelihood of timely vaccination. Women generally make primary decisions about child health, but broader family dynamics, including the influence of grandmothers, strongly shape whether mothers seek facility-based services.

Grandmothers provide the bulk of postpartum support, including decision-making around cultural norms and care-seeking after home deliveries.

VHTs help counter barriers at the community level by promoting facility deliveries and reinforcing the importance of timely birth-dose vaccination; however, gaps in community awareness persist across both districts. For many families, vaccinating a newborn is both cost- and time-intensive, requiring transport arrangements, long waits, and risk of being turned away due to stockouts or limited immunization days.

At the facility level, health workers in both districts highlighted similar systemic constraints. The absence of birth-dose vaccines within maternity labor wards disrupts workflows and reduces opportunities for vaccinating newborns before discharge. Limited training during the 2022 Hep B birth-dose introduction contributes to inconsistent knowledge across staff cadres, while stockouts and supply chain gaps further erode confidence among both providers and caregivers. Health workers echoed community narratives about cultural barriers, noting that families may delay postnatal visits due to norms around isolating newborns. Some facilities previously used small incentives to increase return for vaccination, which proved effective but were discontinued once funding ended.

Community-level insights: similarities and differences between Lira and Butaleja

While the two districts share a common set of community barriers, several nuances distinguish local contexts. In Butaleja, the fear that vaccines may cause infertility is uniquely prominent, as are religious narratives linking the Hep B vaccine with Satan. Families reported that *bodaboda* (motorbike) drivers are reluctant to transport women in labor at night due to low pay and safety concerns, further reducing access to facility delivery. Communities perceived that women in Butaleja have relatively greater autonomy in deciding when and whether to vaccinate children, compared to women in Lira.

In Lira, mothers more frequently referenced ANC visits as trusted sources of information on vaccination benefits, with some facilities using visual aids such as disease photos to strengthen understanding. However, mothers also described highly constrained economic conditions requiring them to return to work immediately after childbirth, limiting their availability to seek timely vaccination. Lira communities additionally reported more frequent vaccine stockouts at facilities, contributing to frustration after long and costly journeys.

Despite these differences, both districts exhibit similar patterns of postpartum isolation, strong roles of grandmothers, hesitancy driven by concerns for newborn pain, and fear among mothers who deliver at home of being judged or scolded when bringing newborns to facilities late for vaccination.

Facility-level insights: similarities and differences between Lira and Butaleja

At the facility level, the two districts face comparable structural constraints, but the ways these challenges manifest in daily practice differ. In Butaleja, hospital settings are generally better positioned to administer the birth dose within the labor suite, yet health center IIIs lack this capacity, creating uneven access to timely vaccination within the district. Midwives in Butaleja described being heavily overburdened due to staffing shortages, which limits their ability to follow up with mothers before discharge or to conduct newborn immunization outreach. These workload pressures are compounded by a lack of functional vaccine carriers, restricting outreach activities and diminishing the district's ability to maintain cold chain conditions outside the facility.

In Lira, operational bottlenecks are driven less by staffing and outreach constraints, and more by challenges in maintaining reliable cold chain. Facilities described recurrent issues with refrigeration capacity and temperature stability, which contribute to inconsistent vaccine availability and occasional stockouts. These disruptions not only affect the ability to vaccinate newborns immediately after birth but also reinforce caregiver perceptions that facility visits might not result in successful vaccination.

Together, these district-level differences illustrate how broader system challenges play out uniquely across facility types and geographies. Both contexts ultimately underscore the need for tailored strategies to address the specific operational realities of each district.

TABLE 5. **Barriers and facilitators to hepatitis B birth-dose immunization uptake.**

Theme	Barriers and facilitators (literature)	Barriers and facilitators (interviews)	Illustrative examples from interviews
Knowledge, awareness, and belief			
Caregiver knowledge and perceptions of birth-dose vaccines.	(–) Limited awareness of Hep B birth dose, particularly its benefits, and HBV transmission risks.[28] (–) Providers' use of complex medical terminology makes it hard to understand disease prevention and vaccine benefits.[28] (+) After gaining knowledge about Hep B birth dose, pregnant women show positive intent to vaccinate babies at birth.[28] (+/–) Some families prefer to receive the vaccine immediately after childbirth, while others would like to recover from childbirth before vaccinating their baby.[28]	(–) Mothers will not accept the new vaccine because there are too many injections in the EPI schedule. (–) Low literacy levels pose challenges in messaging accurate information to caregivers. (–) Some families have misconceptions about vaccines, including that they may become sick, disabled, or infertile. (+/–) Some view the benefits of vaccination and facility delivery as common knowledge, and others do not.	"Very many antigens in the EPI program, and this has become a problem. Mothers also complain of too many injections." —National stakeholder (NS-U-02) "Low literacy levels for community support groups make messaging a bit hard—more so designing messages to communicate Hep B information to local structures. A diversity of languages makes messaging very hard." —National stakeholder (NS-U-10) "Some of the women are ignorant of the importance of vaccines. They claim that 'so-and-so and my neighbor never vaccinated their own, [so] why should I take mine?'" —Father, Butaleja (FGD-DAD-U-02) "There are some people who think that when a child is vaccinated, they may get sick." —Community leader, Butaleja (FGD-CL-U-02) "They say vaccines will affect our children in [the] future for our children not to give birth." —Community leader, Lira (FGD-CL-U-01) "Sometimes they may not know about the importance of immunization [and] thus don't come to the hospital." —Community leader, Lira (FGD-CL-U-01)
Health provider knowledge and confidence.	(–) Health workers' lack of clarity on when vaccinating is considered "timely," especially when preterm infants can receive the birth dose.[32] (–) Hep B birth-dose delivery may not be perceived as a core responsibility because birth-dose programming falls outside the conventional scope of the EPI, raising the question: Is it the responsibility of the delivery provider or the EPI staff to vaccinate?[33]	(–) TBAs fear consequences upon referring home-birthed children for immunization due to their participation in delivering the children at home. (+/–) Inconsistency in training leads some providers to feel confident and others unaware of the Hep B birth-dose vaccine.	"Presence of TBAs who support [children's] delivery but fear to report and refer children for immunization since they have been prohibited from operating in Uganda." —National stakeholder (NS-U-06) Paraphrased quote: I have not received any training on vaccines. I don't know about the Hep B birth dose, but I know other birth doses. —Health care provider, Lira

Theme	Barriers and facilitators (literature)	Barriers and facilitators (interviews)	Illustrative examples from interviews
Cultural and religious beliefs that shape care-seeking behavior.	(–) Religious beliefs and cultural norms lead to misconceptions about the birth dose.[34,35]	(–) Cultural practice of isolating newborns for up to 1 week limits opportunities to receive the vaccine on time. (–) Hep B disease and, by extension, the vaccine are associated with Satan, limiting uptake among some religious individuals.	"Exposing a newborn baby in some cultures [is a main challenge to implementing the Hep B birth dose]. They don't bring [the newborns] out until 7 days." —National stakeholder (NS-U-12) "There are diseases which are airborne. That is why, by tradition, we keep the children in the house for some time to avoid epilepsy." —Father, Lira (FGD-DAD-U-01) "There are religions which say that when you immunize against Hep B, you have already registered with Satan." —Father, Lira (FGD-DAD-U-01) "Hepatitis is regarded to be a Satanic disease, and taking the vaccine is like worshipping Satan." —CHW, Lira (FGD-CHW-U-01) "Some religious beliefs hold that some religions do not immunize their children and fear that if they bring their children for immunization, their religious leaders will see them and accuse them." —CHW, Butaleja (FGD-CHW-U-02) "Way back, they would fear meeting bad omen while taking the child out before 3 to 4 days." —Community leader, Lira (FGD-CL-U-01) "It is a community practice in this area, and they say that when a child is brought outside, they can be attacked by demons and they will die." —Community leader, Butaleja (FGD-CL-U-02)
Gender and family dynamics.		(–) Men have larger influence on vaccine decision-making and care-seeking behaviors as money earners and transportation providers and may not prioritize vaccination or facility delivery. (+/–) Community members influence families' uptake and perceptions of vaccines.	"Men, we just act as *bodaboda* men to offer transport." —Father, Lira (FGD-DAD-U-01) "The sister to my wife refused to let [her] give birth at home. She is the one who brought the vehicle, and my wife was taken to the hospital to give birth." —Father, Butaleja (FGD-DAD-U-02) "Some husbands refuse their wives permission to take the children for immunization." —Community leader, Butaleja (FGD-CL-U-02) "Men are always busy taking care of their wives, and they may not be able to take their child to the facility for vaccination." —Community leader, Butaleja (FGD-CL-U-02)

Theme	Barriers and facilitators (literature)	Barriers and facilitators (interviews)	Illustrative examples from interviews
Vaccine safety concerns.	(–) Some hesitancy to vaccinate as community perceives newborns as "too small," especially preterm and LBW infants.[32] (–) Some fear birth-dose vaccines are given "too early" and could introduce Hep B infection rather than prevent it.[28] (–) Injectable vaccines, like the Hep B birth dose, are seen as less safe than oral formulations due to the pain and possible reactions at injection sites.[28]	(–) Mothers are worried about the pain and side effects of vaccination for a newborn.	"I used not to like vaccination because a neighbor's child died after vaccination." —Mother, Lira (MOM-U-04) "Some women fear vaccinating their children since it's painful and they feel bad when they see their babies crying." —Mother, Butaleja (MOM-U-07)
Information sources.	(+) Health workers have strong trust among the community and have influence over intent to vaccinate.[28] (+) Community prefers to receive information about vaccines during ANC visits from health care providers.[28] (–) Lack of HBV testing and screening of pregnant women at ANC appointments limits awareness of HBV status and opportunities to counsel about the birth-dose vaccine.[28]	(+) CHEWs and VHTs help mobilize mothers to the health facility for timely vaccination and facility delivery. (+) Current vaccination education and awareness raising is impacting mothers' decisions to vaccinate. (–) Misinformation is spread and reduces uptake of the vaccine. (+) Strategies to spread accurate vaccine information exist. (+) Strong commitment from community leaders to be a consistent and collaborative information source with other leaders.	"[The strategy to] use of CHEWs to mobilize mothers [is working well to facilitate timely birth-dose uptake]." —National stakeholder (NS-U-03) "What changed my mind [to vaccinate my child] was the visual pictures of children who were suffering from diseases that come as a result of not being vaccinated. Seeing that changed my mind, and I decided to get my baby vaccinated." —Mother, Lira (MOM-U-04) "As a VHT, I encourage mothers not to give birth in the communities because they will miss the Hep B injection within 24 hours but also to encourage mothers to get all vaccines as required." —CHEW, Butaleja (FGD-CHW-U-02) "Anti-vaxxers in the space keep slowing down uptake." —National stakeholder (NS-U-13) "Working together as 3 departments—like the cultural leader, religious leader, and government leader—if we speak the same thing, then the people in the community will take up. It's our responsibility." —Community leader, Lira (FGD-CL-U-01) "We use various methods to reach the intended audience." —National stakeholder (NS-U-13) "We have VHTs who always mobilize mothers in communities about health workers coming to conduct an immunization outreach, so they take their children for immunization." —Community leader, Butaleja (FGD-CL-U-02)

Theme	Barriers and facilitators (literature)	Barriers and facilitators (interviews)	Illustrative examples from interviews
Acceptance of facility deliveries.		(+) Most women want to give birth in a facility due to availability of medical attention in emergencies and positive experiences with health services and health workers.	"The best practice from my experience is giving birth from the hospital because there is easy access to birth-dose vaccines as compared to home births." —Mother, Lira (MOM-U-04) "[Giving birth at the hospital] made it easier for me to access the vaccines because the midwives were very active." —Mother, Lira (MOM-U-03) "With Hep B, the uptake is okay if the baby is there at the facility." —District Health Manager, Butaleja (DHM-U-05)
Intent, preparation, cost, and effort			
Tracking and notification of home births.		(–) TBAs fear consequences upon referring home-birthed children to immunization due to their participation in delivering home births since TBAs are not permitted to assist in home births and doing so is considered illegal. (+) VHTs are responsible for tracking and identifying home births and referring to facilities for vaccination. (–) The system for notifying health facilities of home births is informal and relies on connections between families, VHTs, and facilities; responsibility can therefore be unclear.	"Presence of TBAs who support children delivery but fear to report and refer children for immunization since they have been prohibited from operating in Uganda." – National Stakeholder (NS-U-06) "Working with the community health workers, like VHTs, to track and refer mothers who have given birth at home to the facility to get the birth dose [is a strategy that is going well]." —National stakeholder (NS-U-06) "VHTs are instrumental in linking mothers to health facilities to receive vaccines." —National stakeholder (NS-U-06) "Mothers should first go to the VHT to inform them of the child's birth." —Community leader, Butaleja (FGD-CL-U-02) "Clan leaders are sometimes the first ones to know when a child is born. And when they come to celebrate, they can be informed about immunization." —Community leader, Butaleja (FGD-CL-U-02) "Sometimes VHTs check on pregnant mothers to see if they have given birth and link them to the facility for vaccination." —Community leader, Butaleja (FGD-CL-U-02) "Some husbands rush to the leader, who tells the VHT [of a home birth]." —Community leader, Lira (FGD-CL-U-01) "For those who deliver themselves at home are hard to identify." —Community leader, Lira (FGD-CL-U-01)

Theme	Barriers and facilitators (literature)	Barriers and facilitators (interviews)	Illustrative examples from interviews
Accessibility of and transportation to health facilities.	(–) Lack of transportation or long distances contribute to missed appointments at the facility for vaccination.[34]	(–) Distance, poor road conditions, weather, and cost of transportation limit families from accessing facilities. (–) Fear of using transportation at night limits timely vaccination as mothers who go into labor or give birth at night cannot access health facilities.	"I gave birth at home. And it came about because I went into labor at 10 p.m. at night, and at that time there [were] no transport means. Then at 1 a.m. in the morning I gave birth." —Mother, Lira (MOM-U-03) "My facility is far. You can take 1 hour on motorcycle bodaboda." —Father, Lira (FGD-DAD-U-01) "Most bodaboda men refuse to wake up and take mothers in labor to the hospital at night. And they claim that community members do not want to pay them the amount they ask for after risking their lives at night." —Father, Butaleja (FGD-DAD-U-02) "Long distances from the community to the facility make it hard for mothers to access the vaccine. When it rains, the roads are impassable, hindering mothers from reaching the facilities." —Community leader, Butaleja (FGD-CL-U-02)
Health facility infrastructure and limited human resources.	(–) Cold chain capacity is lacking in maternity wards and contributes to missed opportunities for vaccination.[36] (–) Staff in maternity wards may need to leave the ward to collect vaccines from the main immunization unit, discouraging same-day administration.[32,36] (–) Over half of children who miss a vaccine have visited a health facility for other services but were not assessed for vaccination.[37]	(–) Limited integration of maternity and EPI services poses challenges for responsibility and access to vaccines. (+) A proposed strategy that EPI teams discharge newborns from facility after vaccination presents an opportunity to reduce missed vaccinations. (+) Newborn care packages are already being implemented and can be leveraged for uptake of the Hep B birth dose.	"[One challenge is] limited integration of maternity services—for example, ANC and EPI, where the 2 categories have failed to work together." —National stakeholder (NS-U-06) "Vaccines not stored in labor wards for midwives to easily access the vaccines." —National stakeholder (NS-U-10) "Structuring the facility operations to have the immunizing officer discharging the mothers/babies [is a proposed strategy that could work well]." —National stakeholder (NS-U-04) "As soon as they are born, they also receive tetracycline eye ointment to prevent eye infections. And because of that intervention, the midwife is also trained to give the newborn birth dose vaccines. They will first care for the newborn, including vaccination. So, it is riding on a system that is already there." —National stakeholder (NS-U-12) "Majority of facilities have an inadequate number of health workers" —National stakeholder (NS-U-06) "Adequate staffing remains a promise from the DHO [that is] not yet achieved." —Health care provider, Butaleja (HP-U-13) "People wait for health workers and get tired and then go back home." —Community leader, Lira (FGD-CL-U-01) "Vaccinators are few; thus, if the birth dose is to work, we need to increase the vaccinators." —Community leader, Lira (FGD-CL-U-01)

Theme	Barriers and facilitators (literature)	Barriers and facilitators (interviews)	Illustrative examples from interviews
Experience of care at point of service			
Vaccine availability.	(–) Stockouts are associated with untimely birth-dose vaccination.[32,34] (–) Some facilities only provide vaccination on weekdays, affecting timely access to birth doses.[32] (–) When vaccines are unavailable at the facility upon caregiver arrival, they are told to return, resulting in multiple trips and delays to vaccination.[34]	(–) High workload and understaffing lead to constraints in the health system that only allow vaccination on specific days of the week. (–) Stockouts limit availability of vaccines and delay timely vaccination. (–) Vaccination services are unavailable on the weekends. (+/–) Some women have challenges with vaccine availability on the day they present at the facility, while others have no issue. (–) Long wait times for vaccines limit opportunities for vaccination. (+) Vaccine is available and accepted in facilities.	"One of the gaps that we found in hepatitis B birth dose would be stockouts, just like BCG." —National stakeholder (NS-U-12) "Missed opportunities in facilities due to health workers' workload due to the high patient to health care worker ratio. Facilities offer immunization on specific days and mothers only bring their children for vaccination on days they are giving vaccines." —National stakeholder (NS-U-10) "What I can say only is because we are adding actions and the same human resource, the basket is now bigger than the vaccines that we give, and it causes a lot of strain to the health worker to ensure that they give all those vaccines 1 time at 1 go." —National stakeholder (NS-U-12) "What would help me and other people get the children vaccinated within 24 hours of birth is that the days of vaccination in the facility should be added, not only Wednesday." —Mother, Lira (MOM-U-01) "It was hard for [my] baby to be vaccinated because the nurse who were in charge [on Friday evening] had gone away from maternity." —Mother, Butaleja (MOM-U-07) "That day, we were not immunized. We had to wait for a vaccinator from [DISTRICT]. They only gave polio drops in the mouth. It's now 2 weeks, and the only vaccine she was given was polio." —Mother, Lira (MOM-U-06) "I did not face any challenges in accessing vaccines for my baby because the vaccines were readily available and there were many nurses vaccinating...These days, the vaccines are there." —Mother, Lira (MOM-U-01) "Another issue is that the facility here only vaccinates once a week, yet deliveries happen at any time." —Community leader, Butaleja (FGD-CL-U-02)

Theme	Barriers and facilitators (literature)	Barriers and facilitators (interviews)	Illustrative examples from interviews
Home vaccination feasibility and acceptance.	(–) Introducing Hep B birth dose strains existing systems, especially where services are outreach based.[36] (–) Logistical challenges, including transportation funds, untimely delivery of vaccine supplies, and too few staff limit the ability to conduct outreach.[34] (–) Outreach health workers are understaffed and can get overwhelmed during outreach with long lines of caregivers, resulting in long wait times and inadequate immunization promotion/education.[34]	(–) It is too cost- and time-intensive to send health workers to each home to vaccinate children born at home. (–) Home vaccination is not feasible with the multidose vial due to concerns with vaccine wastage and cold chain maintenance. (+) Communities' high acceptance of home vaccination could reduce barriers to uptake. (–) Current outreach approaches are conducted on a monthly basis, which would not capture newborns at home in time. (–) Cold chain constraints limit the feasibility of providing birth-dose vaccines through home visits or community outreach.	"More out-of-facility vaccination increases the vaccine wastage." —National stakeholder (NS-U-12) "Health workers cannot move to every home, and giving the health workers facilitation to deliver these vaccines is an expensive venture." —National stakeholder (NS-U-11) "If health workers and VHTs moved from home to home vaccinating children, this would ensure improved uptake of the vaccines. A mother would not have any reason to refuse a vaccine if they come to their home." —Father, Butaleja (FGD-DAD-U-02) "We only sensitize those within our reach, and sometimes paying out of your own pocket is very hard. Since we know some mothers might even refuse to take our information, so you are not encouraged to use your own money." —CHEW, Lira (FGD-CHW-U-01) "There are outreaches where children born in homes get the vaccines. However, outreach is conducted only once a month." —Community leader, Butaleja (FGD-CL-U-02) "Health workers are ready [to deliver the birth-dose vaccine to children born out of facilities], but we need a vaccine that can stay outside the fridge for some time so it can be in the community for a long time." —Community leader, Lira (FGD-CL-U-01)
Competing priorities of caregivers.		(–) Families do not see the need to travel to the facility if the mother and baby are fine after birth; families prioritize rest and recovery. (+/–) VHTs/CHEWs act as strong support systems for families who are unable to take children to vaccination themselves.	"Men don't see the need since the woman and baby [are] okay; thus no need of vaccination." —Community leader, Lira (FGD-CL-U-01) "When a woman gives birth from home, she's very weak to take the child to the hospital. If there's a way this vaccine would be made in tablet form, people would take it home." —Community leader, Lira (FGD-CL-U-01)

Theme	Barriers and facilitators (literature)	Barriers and facilitators (interviews)	Illustrative examples from interviews
Respectful care.	(–) Health workers perceived as rude or uncaring, and as not providing relevant information about when to get birth-dose vaccines.[28]	(+) Positive experiences with health workers during labor at the facility encourage future facility use and vaccination. (–) Some community members fear health workers due to previous negative experiences. (–) Mothers delay or resist taking home-born children to the facility for vaccination out of fear of negative interactions and shame.	"The attitude of nurses and midwives at the main hospital—they quickly help you, and that made me have a good experience." —Mother, Lira (MOM-U-02) "Caretakers experience harsh treatment from health workers, including instances where they are being canned." —CHW, Butaleja (FGD-CHW-U-02) "Mothers fear taking their children to the facility because they have given birth in the community, and it is sometimes because of the fear of being abused by health workers." —Community leader, Butaleja (FGD-CL-U-02) "Some people fear coming to the facility because they do not have clothes to put on. Sometimes they have clothes, but these are very dirty." —Community leader, Butaleja (FGD-CL-U-02)
After service follow-up			
Communication of vaccination.	(–) Inconsistent communication from providers results in caregivers' uncertainty about child's vaccination status and how to follow up.[28,32]	(–) Mothers are unaware of what vaccines are provided at the appointments due to lack of communication from health care providers. (+/–) Families have multiple caregivers to support taking children to the facility for vaccination, but caregivers can receive inconsistent vaccine information, so follow-up information may not be clearly communicated to the rest of the family.	"My child was vaccinated, but I don't know whether my child was vaccinated with hepatitis B birth dose." —Mother, Lira (MOM-U-03) "For the first vaccination, it was my mother-in-law who brought the child for vaccination since I was too weak. So I don't know whether the child was vaccinated with hepatitis B vaccine. I gave birth on Monday, and my mother-in-law brought the child for vaccination on Wednesday." —Mother, Lira (MOM-U-01) "In my home, there is clear agreement on the vaccination between my wife and I. Sometimes I take the child for vaccination, and other times my wife does. And when I return from the facility, I inform my wife of the date of which the baby will be taken back for the next dose. At the same time, if my wife takes the baby, she will come back and brief me about what transpired at the facility and also provide any other information I may need to know about our child's health and vaccination." —Father, Butaleja (FGD-DAD-U-02)

Theme	Barriers and facilitators (literature)	Barriers and facilitators (interviews)	Illustrative examples from interviews
Tracking immunization and record systems.	(–) Preterm infants are not provided vaccination cards after discharge from special care baby unit, resulting in delays and unclear expectations of beginning and resuming vaccination.[32] (–) VHTs are not actively involved in the follow-up of children defaulting on vaccinations, so it is dependent on health facility staff who are already overburdened.[38] (+) Strategies to involve CHEWs in identifying, tracking, and linking defaulters to immunization services have been piloted.[39]	(–) Mothers who deliver at home do not receive a vaccination card, as they are not connected to the health system; and this card is used to understand vaccination.	"When a child is brought to the facility for immunization, they always ask mothers for an immunization card, but those who are produced from the community won't have a card." —Community leader, Butaleja (FGD-CL-U-02)

Abbreviations: ANC, antenatal care; BCG, bacillus Calmette-Guérin; CHEW, community health extension worker; CHW, community health worker; DHO, district health office; EPI, Expanded Program on Immunization; FGD, focus group discussion; HBV, hepatitis B virus; Hep B, hepatitis B; LBW, low birthweight; MOH, ministry of health; OPD, outpatient department; TBA, traditional birth attendant; VHT, village health team.

Operational feasibility considerations: Supply chain, CTC, and product presentation

This section draws on structured interviews with stakeholders at the national (n = 15), district (n = 5), and health facility (n = 15) levels, including EPI managers, supply chain officers, district health team members, and frontline midwives and nurses. Respondents were asked to reflect on three core operational domains shaping Hep B birth-dose delivery: supply chain operations, the potential role of a CTC, and product presentation. Across these domains, stakeholders highlighted both enabling opportunities and binding system constraints.

Supply chain

Vaccine delivery to hard-to-reach and rural communities in Uganda is characterized by a hybrid distribution model anchored in facility-based static services and reinforced by structured outreach. Most national stakeholders described a system in which health facilities conduct daily static sessions as well as at least one scheduled outreach per parish each month. Distribution follows a tiered pathway from national depots to district stores and onward to health facilities, with last-mile delivery supported by motorcycles, boats for island communities, and mobile service camps in mountainous regions. While this architecture enables geographic reach, it remains highly dependent on transport availability and campaign-linked financing.

Adapting this system to support Hep B birth-dose delivery within 24 hours of birth was widely viewed as operationally disruptive to existing routines. National respondents emphasized that monthly outreach schedules are incompatible with the strict timeliness requirements of the birth dose. Instead, they called for more frequent outreach (often weekly), exploring whether CHWs could be authorized to vaccinate, and intensified community mobilization to rapidly identify home births. Several stakeholders further highlighted the need for dedicated motorcycles and real-time birth notification to enable same-day or next-day vaccination for newborns delivered outside of facilities.

Cold chain management at sites lacking refrigerators is handled through strict outreach-only protocols. Vaccines are transported daily using passive cold chain equipment—primarily vaccine carriers and cold boxes—and are never stored overnight at these locations. Health workers routinely collect vaccines from nearby refrigerator-equipped facilities and must return unused doses within six hours. This system, while functional, leaves little margin for error and is highly sensitive to transport delays, ice-pack availability, and weather-related disruptions.

Just over half of national stakeholders reported that supply chain innovations have been introduced to extend coverage in hard-to-reach settings. These innovations have focused primarily on hardware solutions, including freeze-free vaccine carriers, solar-powered community

refrigerators, and ice-pack optimization. However, no respondents referenced digital logistics tools, real-time stock visibility systems, or predictive demand planning platforms, suggesting that innovation efforts remain largely equipment driven rather than data enabled.

Collaboration with international organizations is a defining feature of Uganda's immunization supply chain. Nearly all respondents reported active engagement with partners such as UNICEF, WHO, Gavi, PATH, and the Clinton Health Access Initiative. These partners collectively support vaccine procurement, cold chain equipment, supply planning, policy guidance, forecasting, and campaign logistics.

When asked about additional support needed to strengthen Hep B birth-dose procurement and supply chain performance, stakeholders most frequently cited the need for predictable and sufficient financing and uninterrupted vaccine availability. Gaps in cold chain infrastructure, workforce refresher training in vaccine management, and last-mile transport capacity were also raised as important but secondary concerns. Overall, national respondents framed the primary constraints to Hep B birth-dose scale-up not as technological limitations but as systemic vulnerabilities related to financing stability, stock continuity, transport logistics, and workforce readiness.

CTC

Across the national, district, and health facility levels, there is broad conceptual openness to CTC for the Hep B birth dose, but this openness is tempered by uncertainty about whether CTC would meaningfully address the main bottlenecks to Hep B birth-dose uptake. In stakeholder interviews, most respondents at the national level (n = 15) were familiar with CTC (73%) and two-thirds (67%) believed a CTC-approved Hep B birth dose would benefit the system, primarily by expanding reach to home births and easing constraints in low-infrastructure settings. Yet 33% remained unconvinced, noting that "CTC is not one of the problems we are facing" and expressing concerns about exposure to extreme temperatures or added operational complexity. District leaders (n = 5) were somewhat more positive: 80% thought CTC would be useful for reaching out-of-facility births in their area. Facility providers (n=15) were the most enthusiastic, with 93% saying that being able to use the vaccine outside the cold chain would help them reach home births.

When asked about ideally how long the Hep B birth dose would need to remain stable outside 2°C to 8°C for CTC to be useful, district- and health-facility-level respondents generally aligned with a one-week CTC allowance, while national stakeholders were more divided between shorter "safer" windows and longer "maximize reach" windows. National respondents clustered in the 4 to 7 day window, with 33% preferring 4 to 5 days and 40% favoring 6 to 7 days, while a minority pushed for 8 to 14 or more than 14 days. District officials (n = 3) leaned toward a week as well (67% choosing 6 to 7 days), with one advocating for a full 14-day window. At the facility level (n = 15), frontline staff most frequently selected midrange CTC windows that align with routine outreach and postnatal follow-up schedules: 40% said 4 to 5 days and 47% said 6 to 7 days, with only 7% of respondents each suggesting 8 to 14 or more than 14 days.

National and district stakeholders' perspectives differ on where and by whom a CTC Hep B birth dose should be used. National respondents (n = 14) were reasonably supportive of extending use beyond facilities but almost always to recognized cadres: most favored midwives at home births (71%), CHWs (64%), and EPI officers either in the community or facility, while only 21% were comfortable with TBAs administering the vaccine. Several explicitly emphasized that TBAs in Uganda should focus on referring clients to health facilities for births, rather than delivering babies and administering vaccines because they are not permitted to do either under the current policy. District officials echoed this, repeatedly proposing stronger TBA-to-facility linkages and door-to-door follow-up rather than TBAs task-shifting to vaccination. Facility-level interviews did not explicitly probe on preferred cadres for vaccine delivery. However, the combination of high enthusiasm for CTC and consistent preference for the 4- to 7-day stability windows suggests that frontline providers view CTC primarily as a tool to extend the reach and timeliness of birth-dose delivery within existing outreach and postnatal care workflows, rather than as a fundamentally new delivery model.

The benefits and risks attached to CTC are nuanced. At the national level, when given a structured list (n = 15), respondents heavily prioritized CTC's ability to extend reach: almost all selected enabling vaccination in rural/remote areas and low-infrastructure settings and increasing timely vaccination of home births as top benefits, with reduced dependence on refrigeration also scoring highly. District leaders and facility staff, though not asked via a checklist, spontaneously highlighted similar ideas—reduced transport burden, the ability for VHTs to hold vaccine closer to communities, and improved coverage of out-of-facility births. At the same time, national stakeholders flagged a consistent risk: the majority cited the need for substantial training and clear guidelines (roughly three-quarters), fear of confusion between CTC and non-CTC products (about two-thirds), and worries about increased wastage and the need for extra monitoring devices. Their proposed mitigation strategies revolve around intensive training, strong community sensitization, policy clarification, and robust supervision, underlining that CTC is seen as a complex systems change, not a simple label tweak.

On the policy and financing side, national stakeholders

had varied perspectives. A majority (67%) thought the country would ultimately adopt a CTC approach for the Hep B birth dose, but 33% explicitly referenced the human papillomavirus vaccine CTC precedent as a cautionary tale, noting that a CTC-approved vaccine was not taken up nationally. When asked whether Uganda would be willing to procure a CTC-approved Hep B product at all (n = 14), support decreased to 57%, with the remainder again pointing to policy hesitancy and cost. This caution was even more evident in the willingness-to-pay questions (n = 13): most respondents (approximately 54%) said they were not willing to pay more than current prices for either a multidose or single-dose CTC product, while 31% would accept modest premiums of US$0.10 to US$0.30 per dose and roughly 15% would consider higher price increases if clear advantages (e.g., major wastage reduction) were demonstrated.

Facility staff and district leaders focused on operational realities—reaching home births, coping with transport and staffing constraints, and working within weekly outreach cycles. For them, a CTC Hep B birth dose with a 4- to 7-day window looks like a practical tool to close coverage gaps, particularly if it can be safely held by recognized cadres close to the community. National stakeholders shared many of these coverage aspirations but overlaid them with system-wide worries about training burden, product confusion, and long-term financing and policy commitments, especially given past mixed experiences with CTC on other vaccines. Any CTC-oriented strategy for the Hep B birth dose in this context will therefore need to balance these perspectives: pairing a strong operational case built from district and facility realities with a clear, costed plan for training, supervision, policy updates, and price negotiation that can reassure national decision-makers that CTC is addressing a real bottleneck, not creating a new one.

Product presentation

Overall, national, district, and facility stakeholders strongly support aligning the Hep B birth-dose product presentation with the delivery context rather than pursuing a single universal format. However, distinct differences in their perspectives reflect how proximity to service delivery shapes how stakeholders weigh wastage, cold chain constraints, provider workload, caregiver acceptability, and system complexity.

At the national level (n = 9), stakeholders were nearly evenly split, with five of nine stakeholders preferring the one-dose format and four of nine preferring the ten-dose format for in-facility delivery. Stakeholders favoring one-dose vials consistently emphasized reduced wastage, contamination control, and increased willingness among health workers to vaccinate every newborn without fear of discarding unused doses. Those preferring ten-dose vials highlighted their lower unit cost, smaller storage footprint, and compatibility with high-volume hospitals, where multiple births occur daily and cold chain infrastructure is relatively reliable.

At the district level (n = 5), preferences shifted more clearly, with approximately 60% favoring one-dose vials for in-facility delivery; this was driven by operational realities observed across lower-volume facilities. District implementers cited fewer daily births, inconsistent cold chain reliability, higher perceived contamination risk with multidose use, and documentation burden as reasons why one-dose formats are seen as safer and more practical. Ten-dose vials were viewed as appropriate in narrow contexts, such as high-volume urban facilities with dependable refrigeration and predictable patient flow.

At the facility level (n = 15), frontline providers further reinforced clinical and caregiver-centered considerations, showing strong preference for formats that reduce preparation time, procedural complexity, infant distress, and missed vaccination opportunities. Microarray patches (MAPs) and prefilled syringes ranked highly in first- and second-choice positions for in-facility delivery, indicating that ease of use and acceptance at the point of care increasingly outweigh vial-efficiency considerations that dominate higher-level perspectives.

For out-of-facility delivery, all three stakeholder levels favored the one-dose format. At the national level, 78% preferred one-dose vials, driven by the inability to return opened multidose vials to refrigerators following outreach. District stakeholders echoed this preference, with approximately 79% favoring one-dose vials due to ultralow and unpredictable client volumes, long travel distances, cold chain instability during transport, and high wastage risk if ten-dose vials are opened for one or two births. Facility providers reinforced this logic through their rankings, again prioritizing MAPs, prefilled syringes, and one-dose vials for outreach over ten-dose formats.

Across levels, stakeholders struggled to define exclusive settings where multidose vials would always be preferable and, likewise, could not clearly define settings where single-dose vials would always dominate once storage constraints, cost, and cold chain limitations were considered. While a minority of district and national respondents pointed to high-volume urban hospitals as contexts where ten-dose vials may remain efficient, most emphasized that without reliable demand forecasting, staff capacity, and stock management discipline, multidose formats generate avoidable wastage in routine practice. This ambiguity reflects the structural tension between minimizing wastage and managing system-level storage and procurement efficiency.

Preferences for prefilled single-dose syringes (PFS) and MAPs reveal how innovation is perceived differently across the health system. National stakeholders framed PFS primarily as tools for rural and outreach efficiency,

although they expressed concerns about storage burden and price. District respondents expanded this framing by explicitly linking PFS to mitigation of syringe stockouts, reduction in preparation time, and contamination control in hard-to-reach settings. Facility providers strongly favored both PFS and MAPs due to speed, safety, and caregiver acceptance, frequently ranking these formats above both one-dose and ten-dose vials for both facility and outreach use.

MAPs generated consistent enthusiasm but also caution. National respondents highlighted needle-free delivery, potential wastage reduction, and simplicity of use as benefits. District stakeholders were more explicit about social risks—misinformation, community suspicion, and the need for sustained sensitization—alongside conditional openness to task-shifting to CHWs with appropriate training and supervision. Facility providers strongly favored MAPs for their pain-free application and reduction of newborn distress but stressed the necessity of proper hygiene and clear protocols to avoid misuse.

At the national level, respondents were divided on the feasibility of managing both one-dose and ten-dose presentations concurrently for in-facility delivery, while for out-of-facility delivery nearly two-thirds viewed concurrent management as not feasible. At the district level, concerns were more pronounced, with approximately three-quarters of respondents indicating that managing both formats during outreach would be difficult to implement in practice. Facility providers were somewhat more mixed, with just over half (53%) viewing concurrent dual-format use in as workable under certain conditions. These findings suggest that while both presentations may have a place within the national product mix, stakeholders see limited feasibility for managing them concurrently within the same delivery setting—particularly in outreach contexts where supervision, workflow, and cold-chain constraints make dual-format systems difficult to sustain.

Taken together, these findings demonstrate strong cross-level alignment on the need for differentiated product presentation by delivery context, while also showing distinct differences across national, district, and facility perspectives in how innovation, feasibility, and risk are evaluated. National actors emphasize cost, storage, and system manageability; district actors prioritize transport, wastage control, and supervision capacity; and facility providers prioritize speed, simplicity, infant comfort, and caregiver acceptance. These insights suggest support for a segmented, context-specific product strategy for the Hep B birth dose rather than a one-size-fits-all approach.

Co-creation workshops: Developing strategies to overcome barriers and increase the uptake of the Hep B birth-dose vaccine

Co-creation workshops in Lira and Butaleja began with a presentation of the key themes and insights that had been identified through the FGDs and key informant interviews. These insights were then validated through open discussions that gave participants an opportunity to provide feedback and additional information on the uncovered barriers.

Participants, including community members (caregivers), CHEWs and VHTs, facility-based health care providers, and district-level representatives, then took part in a structured brainstorming session to generate potential solutions. Facilitators guided the ideation process by reframing the challenges and barriers as "how might we" questions—that is, as opportunities for innovation. This resulted in nearly 70 solutions across the two districts (Appendix C), which were grouped into key thematic areas:

- Vaccine availability, supply, and cold chain.
- Human resources, training, and health systems strengthening.
- Community engagement and social mobilization.
- Community linkages and relationships between CHEWs/VHTs and facilities.
- Accessibility, transportation, and logistics.
- Service delivery and quality improvement.
- Motivation, including the role of incentives.

Subsequently, participants used a prioritization matrix to identify the most feasible and impactful ideas for further development. During the prioritization stage, facilitators first explained the purpose of the matrix and outlined the key factors to consider, including the strategy's acceptability, ease of implementation, alignment with existing health system structures, and ability to address barriers affecting both in-facility and out-of-facility births. Guided by the facilitator, participants then reviewed each proposed solution and discussed where it should be placed within the matrix based on these criteria. Only the solutions identified as highly impactful and relatively easy to implement advanced to the next stage for detailing.

Strategies were presented at the national level to the Viral Hepatitis Technical Working Committee for feedback and to ensure policy alignment. Additional district-level feedback was sought in Lira and Butaleja to ensure the

strategies reflected local realities and to create ownership (see the next section for adaptations that emerged through the validation meetings).

Implementation strategies

Five priority implementation strategies were identified across both districts through the co-creation workshops. For each strategy, the analysis presents the context, a description of the strategy, its key features, and how each district plans to adapt the strategy to its local context.

Strategy 1: Strengthen community-wide awareness about birth-dose vaccines and ANC counseling to ensure everyone is aware of, and every newborn receives, the birth dose on time.

Context: Not all pregnant women attend ANC, and even those who do may miss essential information about birth-dose vaccines, labor signs, and the importance of facility delivery due to lack of awareness, the facility location, health worker attitudes, low perceptions of risk during pregnancy, among other reasons. This requires a strong community-based health education approach led by VHTs and CHEWs to ensure that not only pregnant women and caregivers, but also the community at large, receive timely and accurate information about birth-dose vaccinations as a part of newborn services provided post-delivery.

Strategy description: This strategy has two parts:

- Part 1: This strategy strengthens a whole-of-community approach to birth-dose vaccine education by ensuring that VHTs and CHEWs deliver consistent, clear, and timely messages on birth-dose vaccines, recognition of labor signs, and the importance of seeking facility-based delivery, particularly for pregnant women who do not attend ANC and may be

TABLE 6. **Features of Strategy 1 to strengthen community-wide awareness about birth-dose vaccines.**

Features	Key actions
1. The whole community is sensitized (not only pregnant women)	Content of sensitization: • Discuss the benefits and availability of birth-dose vaccines as a part of the broader PMTCT package (screening, prophylaxis, and vaccination/prevention), labor signs, and the importance of facility delivery. • Encourage families to plan for transport and delivery costs before labor begins. • Reinforce that newborns should ideally receive the Hep B birth dose within 24 hours, but can still receive it up to 6 weeks according to national guidelines. Approach: • Deliver clear, consistent messages across all platforms. • Encourage male partners to attend ANC counseling visits. • Conduct sensitization in accessible community settings (markets, village squares, churches, outreach points). • Use trusted community influencers (e.g., male champions, religious leaders, women leaders, cultural leaders) to support messaging. • Use local languages in community radio programs, social media platforms, and spoken announcements.
2. Community groups are leveraged as influencers	• Leverage gender-specific groups to reach men and women through platforms they trust. • Identify and support male champions to sensitize men (e.g., to attend ANC counseling and vaccinations, plan for transportation/delivery costs, be aware of labor signs etc.). • Engage women group leaders as well as religious and cultural leaders (e.g., clan heads).
3. Health workers provide respectful care during ANC visits, where they counsel mothers on the newborn package of services, including the Hep B birth dose	• Standardize ANC counseling to include birth-dose vaccines, PMTCT linkages, labor recognition, and transport planning. • Train health workers to provide respectful, welcoming counseling so that mothers remain engaged and return for services. • Reinforce to health workers during trainings/supervision that no newborn should be turned away after 24 hours; the vaccine is still valid up to 6 weeks according to national guidelines.

Abbreviations: ANC, antenatal care; Hep B, hepatitis B; PMTCT, prevention of mother-to-child transmission.

missed by the health system. Community education goes beyond mothers to include fathers, male partners, families, and other decision-makers who influence whether newborns are brought to a facility for timely vaccination. It also emphasizes preparing in advance for transport and costs related to delivery.

- Part 2: At the same time, this strategy supports respectful and consistent facility-based counseling during ANC visits, which will ensure that pregnant women who do attend ANC receive the same clear guidance on labor recognition, transport planning, and timely vaccination.

Together, these linked actions will improve readiness for delivery and reduce delays in birth-dose vaccinations after home births. Features of this strategy are outlined in Table 6.

District-level adaptations: No formal adaptations to the strategy were proposed. During the district-level validation workshops, however, respondents emphasized that before this strategy is implemented, it would be important to actively train both VHTs and CHEWs on birth-dose vaccination given the long time since many were last trained. They also stressed that capacity-building should extend beyond vaccinators to include other relevant health cadres, such as VHTs who support surge activities, including vaccination activities. The participants suggested to widen VHTs and CHEWs' scope of work to include community vaccination.

TABLE 7. **Features of Strategy 2 to strengthen coordination and communication between the community and the facility.**

Features	Key actions
1. Community → VHT/CHEWs: identification and trust building	• VHTs should be from the village that they work in to foster familiarity and trust, which will lead to influence. • VHTs/CHEWs lead by example by having their own children immunized, with the community aware of it, to build confidence in birth-dose vaccines. • VHTs/CHEWs use respectful, clear communication to help mothers understand the value and safety of timely vaccination.
2. VHT/CHEWs → facility: notification and referral	• VHTs/CHEWs liaise with TBAs to get information on new mothers who they have helped deliver at home to better track, identify, and register all new births in the community. The eCHIS could be leveraged to record this information, including out-of-facility births and which babies have received the birth dose vaccines. • VHTs/CHEWs alert health facilities immediately when a mother delivers at home so vaccination can be planned. • VHTs/CHEWs follow up with women during pregnancy and support handover to the facility to ensure timely referral for delivery or newborn vaccination at health facilities.
3. Facility → VHT/CHEWs: information flow and accountability	• Health workers should record VHTs/CHEWs' contact information on ANC/maternity cards and immunization cards to link communities with the VHTs/CHEWs. • When a pregnant mother has the VHT's information, she can connect with the VHT when she is in labor. This supports real-time follow-up and referral to vaccinate newborns within 24 hours.
4. Coordinated messaging and follow-up between CHEWs/VHTs/TBAs and facilities	• Facility health workers and VHTs/CHEWs deliver the same message and work together to ensure newborns born at home are vaccinated and receive relevant newborn care. • VHTs/CHEWs conduct community cross-checking to confirm that newborns delivered by TBAs or at home are referred to the facility for the birth-dose vaccine. This creates a feedback loop to the facility.
5. Strengthened coordination across the health system	• Increase coordination between VHTs, CHEWs, and facility teams through regular planning and review meetings. • Use these meetings as well as eCHIS to track mothers, to share community referrals and follow-up needs, and to verify birth doses received in facilities.

Abbreviations: ANC, antenatal care; CHEW, community health extension worker; eCHIS, electronic Community Health Information System; TBA, traditional birth attendant; VHT, village health team.

Strategy 2: Close the coordination and communication loop between the community and the facility through VHT/CHEW engagement to ensure timely birth-dose administration.

Context: In many communities, the relationship between VHTs/CHEWs and caregivers is weak or poorly defined: some VHTs do not fully know the community; many community members do not know who the VHTs are; and although TBAs often serve as a first contact for pregnant women, they are not consistently linked to facilities. This makes it difficult to trace, identify, and refer newborns for timely birth-dose vaccination. Additionally, when mothers deliver at home with the help of TBAs, they often fear going to the health facility because they worry about health workers harassing or blaming them for not delivering at a facility. As a result, some newborns are not brought for vaccination within 24 hours, further delaying birth-dose uptake.

Strengthening respectful linkage between communities and facilities through VHT/CHEW engagement can ensure that:

- Newborns delivered at home with support from TBAs are identified early and escorted or referred to facilities for vaccination.
- Mothers are welcomed, supported, and not turned away or blamed at health facilities and feel encouraged to receive timely vaccination (within 24 hours).
- VHTs/CHEWs can cross-check in the community that newborns, particularly those delivered by TBAs, receive their birth doses.

Strategy description: This strategy aims to strengthen the flow of information, trust, and shared responsibility across VHTs/CHEWs, TBAs, and health facilities to ensure every newborn, whether delivered at home or in a facility, receives a timely birth dose.

By rooting VHTs/CHEWs within their own communities, working closely with TBAs, and formalizing two-way communication between facilities and VHTs/CHEWs, this strategy creates a continuous cycle of identification, referral, notification, and follow-up to ensure no newborn is missed. Features of Strategy 2 are outlined in Table 7.

Adaptations: In Lira, respondents emphasized the importance of including Local Council 1 members' contact information in addition to those of the VHTs/CHEWs, whereas in Butaleja respondents highlighted mentor mothers' role in strengthening community awareness and building trust with the community. In Butaleja, respondents also emphasized that facilities should be assigned the responsibility for generating village-level lists of pregnant women and sharing them with VHTs to support pregnancy tracking and improve coordination and sharing of data between the community- and facility-level health cadres.

Strategy 3: Recognize and support VHT/CHEW performance by providing tools, conducting supervision, and creating accountability to help them track births, engage communities, and refer newborns for timely vaccination.

Context: VHTs and CHEWs play a central role in identifying pregnant women, tracking newborns (especially those born at home), and referring them to health facilities for timely birth-dose vaccination. However, their efforts are often undermined because of:

- Irregular or insufficient incentives, sometimes given to non-active VHTs due to favoritism (relationship with political leader), poor accountability, and governance challenges.
- Lack of clear guidelines on how incentives should be distributed among them.
- Delayed or missed payments (salaries for CHEWs and the current quarterly incentive of 10,000 Ugandan shillings per month for VHTs), which can lead to demotivation and poor performance.
- Limited logistical support (i.e., insufficient funds for transportation), which hinders VHTs from conducting community mobilization, tracking newborns, and reaching caregivers during difficult weather or due to long distances.

Without proper motivation and support, active VHTs may disengage, which would reduce timely referrals and increase delays in birth-dose vaccination.

Strategy description: This strategy aims to sustain and strengthen the active involvement of VHTs and CHEWs in identifying pregnant women, tracking newborns (especially those born at home), and referring them to health facilities for timely Hep B birth dose and other birth-dose vaccines.

By providing supportive items and communication tools as well as creating processes to verify their contributions, VHTs and CHEWs will be better equipped to track due mothers, encourage facility delivery or rapid referral after home births, and reduce missed opportunities for timely vaccination. In addition, use of the primary health care fund to provide VHTs with 10,000 Ugandan shillings per month will help them carry out their activities. Features of Strategy 3 are detailed in Table 8.

District-level adaptations: Across both districts, respondents identified the need for districts and the national government to develop clearer operational guidance to support strategy implementation. This included

TABLE 8. **Features of Strategy 3 to recognize and support VHT/CHEW performance.**

Features	Key actions
1. VHTs/CHEWs are equipped with practical tools	• Provide all VHTs/CHEWs transportation and communication tools (e.g., rain gear, gumboots, torches, bicycles, phone airtime).
2. Transparent verification of performance	• Use signed referral records or facility books to confirm when a VHT/CHEW refers a pregnant mother or newborn. • Supervisors cross-check entries with facility registers to validate referrals.
3. Accountability through facility meetings	• VHTs/CHEWs present progress during facility review meetings, reporting number of pregnant women reached, home births followed, and newborns referred for vaccination. • Compare targets versus actual performance to identify active VHTs/CHEWs.
4. Recognition of active VHTs/CHEWs	• Facility health workers and VHTs/CHEWs deliver the same message and work together to ensure newborns born at home are vaccinated and receive relevant newborn care. • VHTs/CHEWs conduct community cross-checking to confirm that newborns delivered by TBAs or at home are referred to the facility for the birth-dose vaccine. This creates a feedback loop to the facility.
5. Each VHT is provided 10,000 Ugandan shillings per month	• Highlight high-performing VHTs/CHEWs during meetings or supervision sessions. • Ensure recognition is based on verified VHTs/CHEWs (not favoritism). • Provide every VHT with 10,000 Ugandan shillings per month (rather than the quarterly allowance noted in the primary health care fund). This monetary allocation would ensure that VHTs are able to cover food and water associated with their activities.

Abbreviations: CHEW, community health extension worker; VHT, village health team.

defining practical accountability mechanisms for VHTs, establishing clear guidelines for assessing VHT and CHEW performance to ensure incentives are linked to outputs, and formalizing guidance on VHT remuneration as a motivation tool. Respondents also highlighted an important financing need: although a quarterly payment of 10,000 Ugandan shillings is currently intended to motivate VHTs; this is not always allocated in district primary health care budgets; this presents a clear entry point for strengthening funding to facilitate VHT support. This is a gap that an implementing partner can fulfill in the short term.

Strategy 4: Strengthen integrated and collaborative delivery of the Hep B birth dose across maternity and EPI staff through cross-training, ongoing mentorship, shared accountability, and delegation of authority

Context: Operational constraints prevent timely (within 24 hours) vaccination with the Hep B birth dose in facilities, including:

- Limited access to vaccines in labor wards, which means mothers are referred after delivery to the young child clinic, an outpatient clinic within the health facility. This is difficult for new mothers because the young child clinic often has long queues and limited working hours.
- Low confidence or inadequate skills in administering vaccine among some midwives and nurses.
- Poor collaboration between maternity and immunization units, which leads to vaccination being treated as the responsibility of EPI staff.
- Absence of EPI staff during evenings and weekends, which stalls vaccine administration because only one person has authority to access the vaccine fridge.
- The vaccine refrigerator is far from the labor and delivery ward, which makes it difficult for staff to access vaccines quickly after birth.

Strategy description: This strategy reinforces that birth-dose vaccination is a shared responsibility across maternity and EPI staff to ensure that newborns are vaccinated within 24 hours regardless of who is on duty. Newborns are first managed by maternity staff, yet vaccination often becomes the responsibility solely of EPI staff. Additionally, in some health facilities, the EPI corner where vaccines are stored is far from the maternity/labor ward.

By strengthening teamwork across departments, expanding access to vaccines and refrigeration, and training maternity staff to confidently vaccinate and record data, facility staff can function as one integrated team. Improved data tracking also helps identify missed newborns and supports timely follow-up. These collective actions could reduce missed opportunities and enable reliable, round-the-clock access to birth-dose vaccines in the facility setting. Features of Strategy 4 are described in Table 9.

District-level adaptations: In Lira, respondents suggested specifying that the strategy focuses only on health center

TABLE 9. **Features of Strategy 4 to strengthen integrated and collaborative delivery of the Hep B birth dose across maternity and EPI staff.**

Features	Key actions
1. Shared responsibility and team-based administration of the birth-dose vaccine	• Midwives, nurses, and EPI staff share the responsibility of vaccinating newborns within 24 hours after birth. This aligns with the latest guidance around Hep B birth dose delivery outlined in the 2025 Immunization in Practice guidelines. • Facility operates as 1 team and ensures that vaccination continues (whether by EPI staff or maternity staff) during busy periods and long queues. • Birth-dose vaccination is integrated into routine newborn care (with vitamin K prophylaxis, cord care, etc.) for maternity staff.
2. Round-the-clock access to vaccines	• Vaccines are stored near maternity/labor wards or in accessible cold boxes. • Maternity staff can vaccinate during off-hours, weekends, holidays, and busy periods to prevent delays in vaccination when EPI staff are unavailable.
3. Capacity-building of maternity staff	• Maternity staff receive training and mentorship to confidently vaccinate and use respectful, clear communication with mothers and all clients. • All nurses, midwives, and medical students receive preservice training to understand vaccination as part of newborn care. • Intern student nurses or medical students should have the knowledge to remind both EPI and maternity staff when newborns are not yet vaccinated with birth doses or to directly administer them if staff are missing. • Train health workers to provide respectful, welcoming care. • Reinforce to maternity and EPI staff that no newborn should be turned away after 24 hours; the vaccine is still valid up to 6 weeks according to national guidelines.
4. No discharge without vaccination	• Mothers and newborns are not discharged before receiving all birth doses and a vaccination card. • A discharge checklist should include mandatory vaccination with the Hep B birth dose, BCG vaccine, etc.
5. Workflow and monitoring for the 24-hour window	• Facility establishes a clear workflow to ensure newborns receive the birth dose within 24 hours, regardless of staff on duty. • Time of vaccination is recorded (e.g., in DHIS2, which may require a new indicator) to monitor timeliness and ensure accountability.
6. Strong recording and reporting system	• Multiple registers may be used across maternity and EPI units with end-of-day/weekly aggregation of data (the lack of a register should not be a reason not to vaccinate). • Tracking of data should follow the newborn from delivery → vaccination → discharge to minimize missed cases. • Regular coordination meetings (with the facility in-charge and maternity and EPI staff) should be held to review data, solve workflow gaps, and track missed opportunities for vaccinations.

Abbreviations: BCG, bacillus Calmette-Guérin; EPI, Expanded Programme on Immunization; Hep B, hepatitis B.

IV and regional referral hospitals, where the vaccine refrigerator is usually located further from the labor and delivery wards (rather than extending this strategy to lower-level facilities, where vaccine refrigerators are generally closer to the labor suite). They also noted that effective implementation would require capturing data on Hep B birth-dose vaccination once it is integrated into routine newborn care, with midwives explicitly tasked with administering the birth dose. To facilitate accurate documentation and reporting, respondents proposed revising the maternity register to capture Hep B birth-dose administration in the maternity ward and incorporating birth-dose reporting into the daily summary report.

Strategy 5: Ensure reliable vaccine availability through stock tracking, monitoring, and buffer stock management.

Context: Timely administration of the Hep B birth dose depends on vaccine availability at delivery points.

However, several system challenges hinder this:

- Districts receive fewer doses than they request, which leads to lower allocations for facilities.
- NMS deliveries arrive late to districts.
- District deliveries reach last-mile facilities even later, which delays vaccine availability where it is most needed.
- Limited visibility into vaccine stock levels at national, district, and facility levels prevents timely redistribution.

Because facilities have weak visibility into upstream stock levels, they often discover shortages only when a newborn needs to be vaccinated. This leaves no time to adjust orders, borrow doses, or plan community mobilization. These challenges are compounded by:

- Gaps in routine stock tracking and timely reporting.
- Poor buffer stock management.

TABLE 10. **Features of Strategy 5 to ensure reliable vaccine availability.**

Features	Key actions
1. Improved visibility and communication across levels (facility → district → NMS)	• The NMS communicates early (e.g., phone call) with districts on expected deliveries, shortages, and available stock so that the focal point is available to receive and approve the delivery. • Facilities receive timely updates from the district on vaccine availability at the district level. • Districts provide facilities with information on stock availability, so facilities can verify orders against deliveries and can plan vaccination activities accordingly.
2. Accurate ordering based on real consumption and local data	• Build staff capacity to correctly fill source documents (temperature logs, vaccine ledgers, registers) to track consumption and avoid over-/under-ordering. • Use updated target-population data from VHT/CHEW community mapping to improve forecasting. • Orders should reflect recent consumption (stock use data), not assumptions, to reduce wastage and shortages.
3. Clear ordering schedules, lead times, and buffer stock management	• Staff understand vaccine ordering frequency is monthly. • Buffer stock must last at least 2 weeks at facility and district levels. Staff know the lead time for replenishment (i.e., it will take 1 month to replenish the stock).
4. Mechanisms exist for stock exchange and redistribution between facilities	• District teams (i.e., the district cold chain technician) support tracking and movement of excess or expiring doses from facilities with excess stocks to facilities that are running low. • Districts oversee, document, and account for the redistribution of stocks.
5. Strengthened accountability systems to track and verify vaccine availability	• Use monthly review meetings between facility in-charges, district cold chain technicians, and immunization focal persons to review stock status, wastage, and ordering (i.e., what is ordered versus what is delivered).

Abbreviations: CHEW, community health extension worker; NMS, National Medical Stores; VHT, village health team.

- Lack of adequate forecasting based on real consumption data and accurate estimates of pregnancies and births.

As a result, facilities may over-order, under-order, or run out of stock, even when doses may still be available at the district level or in nearby facilities that could redistribute supply. This leads to avoidable missed opportunities for timely birth-dose vaccination, particularly for newborns delivered at home or those who present on weekends or after hours.

Strategy description: This strategy aims to ensure consistent availability of Hep B birth-dose vaccines at delivery points by improving how facilities track, forecast, and communicate vaccine needs and how they collaborate with districts and the NMS. Rather than focusing only on ordering, the approach strengthens facility capacity to monitor stock levels, manage buffer stock, understand delivery timelines, and verify order fulfillment (i.e., what is ordered versus what is received).

Through clearer visibility of what is available at district level and what is being delivered to facilities, health workers can better anticipate shortages and adjust early—whether by reordering, redistributing stock between facilities, or planning community mobilization only when vaccines are available. Strengthening these systems reduces unexpected stockouts at delivery points, minimizes wastage, and prevents missed opportunities for timely birth-dose vaccination. Features of Strategy 5 are described in Table 10.

District-level adaptations: Across both Lira and Butaleja, respondents emphasized a critical implementation gap: the absence of a functional digital stock monitoring system linking national, district, and facility levels. In both districts, stock visibility currently relies on rudimentary reporting mechanisms, constraining timely vaccine redistribution. To address this gap, respondents recommended introducing a digital system to display real-time stock availability across national, district, and facility levels; strengthening facility-level stock reporting through tools such as open data kit tools; and building district capacity, including targeted training for cold chain personnel, to enable timely redistribution of vaccines from overstocked to understocked facilities.

Conclusion

For countries introducing the Hep B birth dose as well as those seeking to improve coverage rates, this case study offers practical guidance and perspectives from diverse health actors and community representatives on implementation strategies adapted to local contexts to address key barriers and challenges to timely Hep B birth-dose administration.

While facility-based births provide the best opportunity for on-time vaccination, this case study highlights missed opportunities within facilities owing to operational constraints, such as fragmented maternity and EPI workflows, inconsistent vaccine availability in labor wards, staff shortages, and a lack of clarity regarding responsibility for administering the Hep B birth dose. The study also revealed strongly rooted cultural norms at the community level, such as keeping babies indoors for some days after birth, fear of vaccine-related injury, and religious misconceptions, which delay or prohibit care-seeking during the critical first 24 hours after birth. These difficulties are exacerbated by transportation constraints, insufficient staff coverage during nighttime labor, and ineffective mechanisms for notifying facilities of home deliveries. Despite these limitations, the findings reveal significant enabling characteristics, such as high trust in health care providers, preferences for facility delivery, and the critical role of VHTs and CHEWs in community mobilization, birth notification, and follow-up.

Importantly, the human-centered design process revealed that communities, providers, and health system managers seek realistic, context-appropriate solutions. The five prioritized strategies—co-created and validated at district and national levels—respond directly to the identified barriers. They reflect a shared recognition that improving Hep B birth-dose coverage requires simultaneous action across demand generation, service delivery integration, workforce support, and supply reliability, rather than reliance on a single intervention.

Policy and program implications

The results of this study have important implications for national policy and program development as Uganda transitions from the introduction of the Hep B birth dosage to a more sustained scale-up using Gavi new vaccine introduction grant support.

The key policy and program implications identified include:

- National guidelines for timely birth-dose delivery should be strengthened—including clearer messaging on eligibility and timeliness, with an emphasis on dose administration within 24 hours of birth—and duties should be assigned to maternity, neonatal, and EPI units to prevent missed opportunities within facilities.
- The Hep B birth dose should be integrated into routine maternal-newborn care processes and workflows to ensure vaccine availability in labor, maternity, and postnatal wards and special care baby units.

- Community-facility birth notification procedures should be formalized by using VHTs, CHEWs, TBAs, and community leaders to quickly identify home births and connect neonates to timely vaccinations. Adding birth-dose tracking (including timeliness metrics) to eCHIS and making accountability loops between communities and hospitals stronger would directly help with finding and following up on home births.
- Investments should be made in ongoing training and mentorship for health care providers to enhance their understanding of Hep B transmission, impact of timely immunization, vaccine cold chain management, and communication with caregivers.
- Caregiver education on Hep B and community involvement should be enhanced by using ANC, community meetings, religious leaders, grandparents, and male partners to confront cultural norms, misconceptions, and reluctance.
- Supply chain and product policy should mirror delivery realities. Evidence from stakeholders revealed that a one-size-fits-all vaccine presentation is unlikely to succeed. Continued use of multidose vials for high-volume facilities coupled with single-dose presentations (one dose vials or prefilled syringes) for low-volume and outreach settings can be explored, considering acceptability, cost, and wastage. CTC is not a comprehensive solution, but a time-limited CTC window (four to seven days) with clear standards, training, and monitoring could dramatically expand reach to out-of-facility deliveries.
- While over half of national-level respondents (58%) indicated that a policy change to allow CHEWs to vaccinate newborns at home or in the community is unlikely or highly unlikely, nearly two-thirds of respondents said that health care providers would be supportive (or highly supportive) of CHEWs taking on this role. Implementation research can be explored to assess the acceptability, feasibility, cost, and impact of a policy shift to allow CHEWs to provide the Hep B birth dose in out-of-facility settings.

Way forward and next steps

As Uganda moves toward its goals for eliminating hepatitis by 2030, this case study summarizes evidence and implementation strategies for the country to make sure that all babies, whether they are born in a facility or in the community, have timely access to the Hep B birth dose. Priority next steps are outlined below.

Implementation research: Based on these findings, prioritize the piloting, refinement, and institutionalization of the five co-created strategies within Uganda's current immunization and community health structures. This could start by conducting implementation research in the two study districts to assess the operational viability, acceptability, cost, and impact of the prioritized strategies, particularly those targeting newborns delivered at home. Key learning questions should include how well VHTs and CHEWs can support real-time birth notification, whether integrated maternity-EPI workflows reduce missed opportunities to birth-dose vaccination, and how product presentation affects wastage and provider behavior.

Policy, guidelines, and communications: Insights gained from this case study can guide updates to national guidelines, training curricula, and financing decisions, ensuring the integration of Hep B birth-dose delivery within Uganda's comprehensive maternal, newborn, and child health and primary health care reforms. Lessons learned can also inform development of (1) clear terms of reference for the Viral Hepatitis Technical Working Committee to integrate the Hep B birth dose within a comprehensive vertical elimination strategy, connecting vaccination, maternal screening, and treatment pathways; and (2) a national communication strategy for the Hep B birth dose that addresses cultural norms related to newborn confinement, fears regarding vaccination pain, and misconceptions and concerns about vaccine safety.

Data systems: Enhance data systems to monitor Hep B birth-dose coverage and timeliness, facilitating evidence-based decision-making for scaling operations. The MOH and its partners should leverage existing digital health investments by integrating Hep B birth-dose indicators into eCHIS and DHIS2, facilitating routine monitoring of coverage and timeliness to address an existing national data gap.

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Appendix A. Co-creation workshop participant summary by district, participant type, and gender

District	Participant type	Male	Female	Total
Lira	District health teams	1	1	**2**
	Facility-based health care providers	2	5	**7**
	CHEWs	1	3	**4**
	Caregivers	3	13	**16**
	VHTs	1	3	**4**
	Community leaders	2		**2**
	TBA		3	**3**
Butaleja	District health teams		1	**1**
	Facility-based health care providers	2	3	**5**
	CHEWs	3	3	**6**
	Caregivers	5	10	**15**
	VHTs	2	2	**4**
Total		**22**	**47**	**69**

Abbreviations: CHEW, community health extension worker; TBA, traditional birth attendant; VHT, village health team.

Appendix B. "How might we" questions that framed the challenges as opportunities during co-creation

How might we question	Participant type for HMW questions Challenges framing HMW opportunities/strategies discussion
Knowledge, awareness, and belief	
HMW ensure all mothers are aware of labor signs and respond to them appropriately so that they avoid spontaneous births at home?	**Community:** All mothers need knowledge on the signs of labor/delivery so that they get to the facility on time and avoid spontaneous births at home that limit their chances of seeking birth-dose vaccines.
HMW increase mothers' awareness on vaccines, the schedule, and side effects in a simple way to eliminate fear and motivate uptake?	**Community:** Mothers need reassurance and education on adverse events following immunization so that they do not fear taking their children for immunization services.
HMW strengthen coordination between health workers and leaders to ensure accurate messaging on newborn vaccination reaches everyone in the community?	**Community:** Leaders try to raise awareness about timely birth-dose vaccination, but information does not reach everybody.
HMW facilitate CHEWs and VHTs to ensure every mother receives information about birth-dose vaccines regardless of how far they live from the facility?	**CHWs, TBAs, and health care providers:** CHEWs and VHTs want to provide accurate information about the benefits of birth-dose vaccination to families but must pay their own way to reach families who live far from facilities. They face a tension between their desire to spread awareness and their experience with paying out of pocket to provide information to mothers who refuse to listen.
Intent, preparation, cost, and effort	
HMW encourage male partner involvement in ANC and immunization processes to improve support for their female partners/caregivers?	**Community:** Mothers need their male partners to be involved in ANC and immunization so that they support timely vaccination of their newborns.
HMW improve the existing identification and tracking system for home births?	**CHWs, TBAs:** VHTs face challenges in tracking and identifying babies born at home, resulting in missed or delayed immunization. The lack of systematic follow-up and reporting mechanisms contributes to delayed 24-hour Hep B birth-dose vaccine uptake.
Experience of care at point of service	
HMW ensure vaccination services are provided everyday so that mothers do not miss the birth dose within the 24-hour period?	**Community, CHWs, TBAs, and health care providers:** Mothers need vaccination services to be available every day at facilities so they do not miss the birth dose within the 24-hour period.
HMW support health workers to manage the high workload so that birth-dose vaccination within 24 hours is achievable?	**CHWs, TBAs, and health care providers:** Shortage of health staff, particularly midwives who have overwhelming workload in health facilities, results in lack of sufficient time to follow up on newborn immunization, contributing to untimely Hep B birth-dose vaccination within 24 hours.

How might we question	Participant type for HMW questions Challenges framing HMW opportunities/strategies discussion
HMW encourage providers to receive caregivers in a friendly manner so as to encourage them to seek the birth dose, even if they delivered at home or their card was not well kept?	**Health care providers:** CHEWs and VHTs' role in the community is to refer families to the health facility for vaccination, but they hear from mothers that they are treated poorly by health workers.
HMW enhance coordination and collaboration among all MCH staff so that newborns receive birth doses even when EPI staff are not available?	**Health care providers:** Collaboration among staff is needed so that vaccination services for the birth dose is provided within 24 hours before a child is discharged. EPI staff, as the ideal vaccinators, are not available 24 hours 7 days a week.
HMW ensure vaccines are distributed to the last mile to minimize stockouts and hence reduce missed opportunities?	**Health care providers:** Vaccines need to always be available for the mothers at the facility to limit missed opportunities or stockouts. Vaccine distribution needs to be strengthened so that all facilities are well stocked and mothers are not turned back due to stockouts.

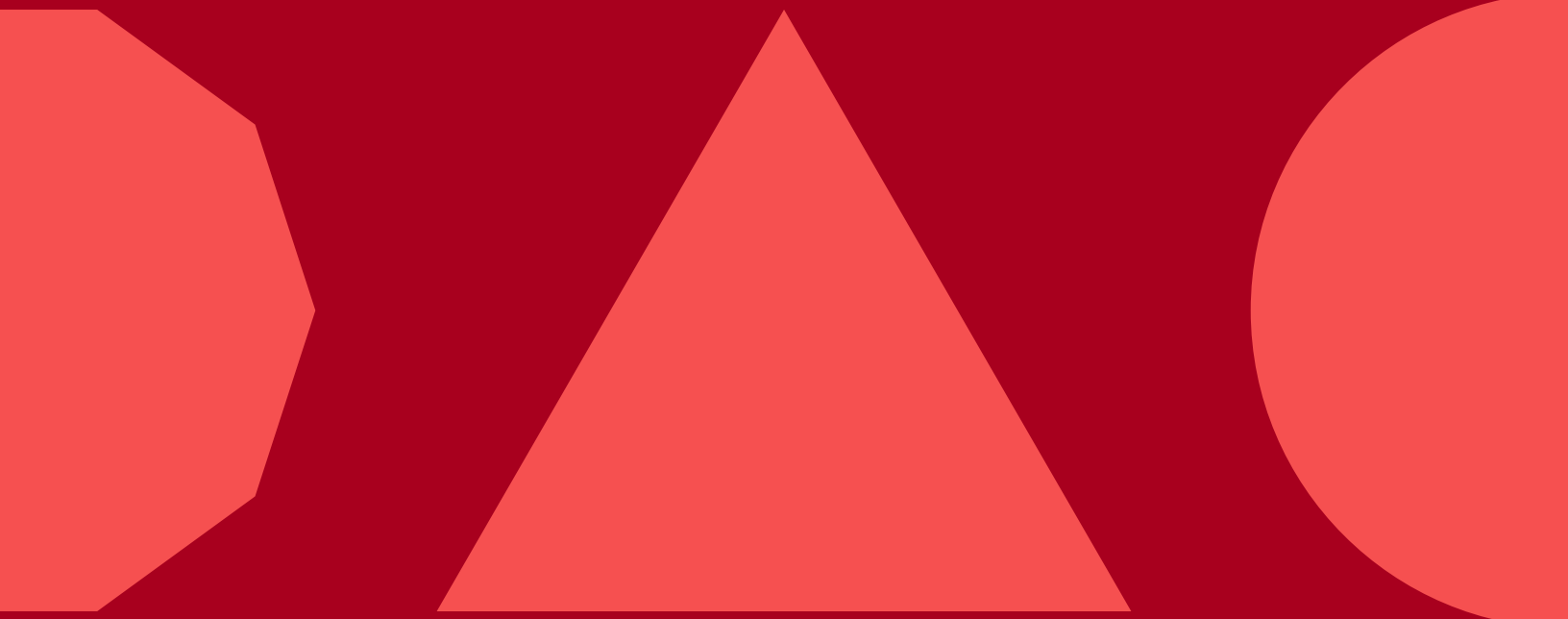
Abbreviations: ANC, antenatal care; CHEW, community health extension worker; CHW, community health worker; EPI, Expanded Programme on Immunization; Hep B, hepatitis B; HMW, how might we; MCH, maternal and child health; TBA, traditional birth attendant; VHT, village health team.

Appendix C. List of solutions generated in Lira and Butaleja, outlined by common themes

Theme	Participant proposed solutions in:	
	Lira	Butaleja
1. Vaccine availability, supply, and cold chain	• Daily vaccine availability at facilities. • Routine immunization every day (including weekends and holidays). • Timely ordering from NMS to prevent stockouts. • Fridges near communities and maternity wards. • Recruitment of cold chain technicians and assistants. • Hep B vaccines stable outside fridge for long outreach.	• Availing vaccines consistently at health facilities. • Changing vaccine presentation to single dose.
2. Human resources, training, and health systems strengthening	• Training of VHTs, CHEWs, TBAs, and health workers on immunization. • Expansion of VHT roles to vaccinate. • Recruitment of more health workers. • Training of staff in customer care and work ethics. • Ongoing mentorship and capacity-building.	• Increased number of health workers. • Integration of vaccines in maternity and postnatal wards. • Conduct of continuing medical education. • Staff rotation and conflict resolution. • Training on AEFIs. • Trained health worker force.
3. Community engagement and social mobilization	• Engagement of LC1 and religious leaders. • Radio talk shows and posters. • Peer support from mothers and grandmothers. • VHT-led counseling on ANC, immunization, and side effects. • Addressing of myths and misconceptions. • Promotion of male and family support.	• Daily health education for mothers. • Sensitization on birth dose and facility delivery. • Proper vaccine messaging. • Mass media communication. • Community dialogues and sensitization. • Sensitization of cultural leaders and male involvement.
4. Community linkages and relationships between CHEWs/VHTs and facilities	• Effective referrals by VHTs for timely Hep B birth dose. • Collaboration and teamwork between health facility and EPI staff.	• VHTs leading by example (vaccinating own children first). • Home visits and pregnancy registration by VHTs/CHEWs. • Relationship building between VHTs, CHEWs, and health workers. • Sharing of vaccination schedules. • VHTs recruited from their own villages. • Improved CHW behavior with communities.

Theme	Participant proposed solutions in:	
	Lira	Butaleja
5. Accessibility, transportation, and logistics	• Transport for VHTs and health workers (bicycles, motorbikes, vehicles). • Home visits and home delivery of vaccines. • Improvement of roads. • Airtime, data, and megaphones. • Tracking of pregnant mothers and EDDs.	• Transport for mothers (especially at night). • Transport for VHTs and CHEWs (bicycles, allowances). • VHTs escorting mothers to facilities. • Additional outreaches. • Daily static immunization clinics. • Improvement of health facility infrastructure.
6. Service delivery and quality improvement	• Daily immunization and outreach services. • Vaccination of all babies before discharge. • Improvement of time management for vaccinators and mothers. • Good customer care and welcoming attitudes. • Accurate record keeping and reporting.	• Integration of vaccination into maternity and postnatal services. • Strengthened provider performance through training.
7. Motivation, including the role of incentives	• Monetary incentives for vaccinators • Lunch allowances and branded T-shirts for CHWs. • Weekend and holiday work incentives.	• Financial incentives for mothers (transport). • Incentives for mothers who vaccinate. • Allowances for VHTs and CHEWs. • Incentives for health workers. • Provision of PPE for TBAs, VHTs, and CHEWs (gumboots, gloves). • Umbrellas, registers, and reporting tools. • IEC materials on AEFIs. • Penalties for defaulters and enforcement of vaccination rules. • AEFI reporting by caregivers, VHTs, and CHEWs.

Abbreviations: AEFI, adverse event following immunization; ANC, antenatal care; CHEW, community health extension worker; CHW, community health worker; EDD,; EPI, Expanded Programme on Immunization; Hep B, hepatitis B; IEC, information, education and communication; LC1, Local Council 1; NMS, National Medical Stores; PPE, personal protective equipment; TBA, traditional birth attendant; VHT, village health team.



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