Expanding digital platforms for pandemic preparedness

Outcomes and recommendations from the Digital Results Improve Vaccine Equity and Demand (DRIVE Demand) project

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Project Overview

Photo: PATH/Brian Mushaukwa

Strengthening immunization systems and improving equitable vaccine access, uptake, and reach through digital and data tools

BACKGROUND

Digital opportunities for pandemic preparedness

The COVID-19 pandemic challenged immunization programs around the world, resulting in decreased uptake of routine vaccinations as well as limited uptake of COVID-19 vaccines in many settings.[1] These vaccination gaps put populations at risk of preventable diseases and increase vulnerability to future epidemics. To help accelerate COVID-19 vaccination and catch young children up on missed routine immunizations, many governments introduced, adapted, or expanded the use of digital health tools in their immunization and health systems.

When used appropriately, digital tools and approaches can provide critical data and communication channels to aid public health authorities in their overall immunization microplanning and response. They can rapidly identify which populations are hesitant or unvaccinated, where they are located, and why they remain unvaccinated—and then target them with evidence-based communications to trigger action. However, given the rapidly unfolding nature of the pandemic and the need to get systems implemented or adapted quickly, many digital tools utilized during the pandemic were implemented without a long-term strategy for their cross-cutting applications and potential for future uses or created in parallel to other systems.

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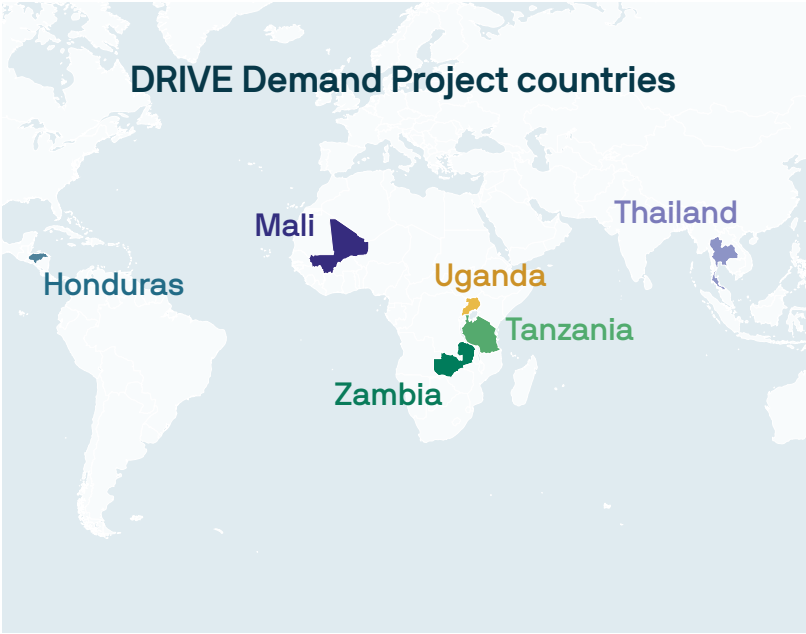
By adapting, expanding, or switching to new digital health tools that better meet the needs of the health ministry, a country can strengthen its immunization system to increase coverage now while also improving preparedness for future public health needs and emergencies.

DRIVE Demand took a user-centric approach to technology development and adaptation. Here, members of the team conduct user testing for the Zambia Electronic Immunization Registry. Photo: PATH/Brian Mushaukwa

THE DRIVE DEMAND PROJECT

With support from The Rockefeller Foundation, Digital Square at PATH launched the Digital Results Improve Vaccine Equity and Demand (DRIVE Demand) project in June 2022 to aid and inform efforts to increase vaccine demand and acceptance rates in six countries through digitally enabled interventions. The six countries chosen were Honduras, Mali, Tanzania, Thailand, Uganda, and Zambia. The project's approach leveraged digital and data tools to drive more effective and proactive vaccine interventions in these countries while simultaneously addressing barriers to vaccination such as access, trust, and information sharing. DRIVE Demand is guided by The Rockefeller Foundation's Global Vaccination Initiative, which is focused on supporting iterative, country-driven, hyper-local efforts to increase demand for vaccination.



Conducting research to better understand barriers and enablers to vaccination

Digitally enabled vaccine promotion communications are only effective if the messaging is relevant to the target population's localized concerns around vaccination. To better understand the essential behavioral dynamics impacting routine and COVID-19 vaccination uptake in low- and middle-income countries, DRIVE Demand partnered with the Busara Center for Behavioral Economics to conduct a literature review as well as behavioral research via focus group discussions with target vaccine-hesitant audiences in Mali, Tanzania, Uganda, and Zambia. Conducted in parallel with other country-specific DRIVE Demand activities, Busara's research was designed to help inform the development and implementation of innovative, human-centered Social and Behavior Change (SBC) messaging optimized for mobile platforms to drive demand for vaccines in the target populations.

The research findings are presented in *Dynamics of Vaccine Hesitancy: A Practitioner Playbook*.[2]

Country-specific activities

Each country's activities were identified in partnership with the national health authority and fully customized according to the country's needs and preferences. Below, find a high-level summary of DRIVE Demand activities in each focus country, and learn more in the country-specific reports.

DRIVE Demand Honduras exemplified the impact of integrating digital health tools and data management methodologies for enhancing immunization coverage, particularly in regions with historically low coverage rates. The project expanded on work begun by the Data for Implementation (Data.FI) Project to understand the digital ecosystem and establish people-first data practices. By building local capacity in data management for 39 health workers and establishing six digital "situation rooms" for advanced immunization analytics, the project not only helped address immediate disparities in vaccine distribution but also laid a foundation for sustained improvements in digital health governance in the Gracias a Dios and Colón regions.

DRIVE Demand Mali showcased the effectiveness of adapting existing digital tools and processes within health systems to support communication aimed at enhancing vaccination uptake. By leveraging multilingual and multi-channel SMS and audio messages and engaging directly with communities through District Health Information Software 2 (DHIS2) and WhatsApp, the project added a key functionality for the Ministry of Health and Social Development (MOHSD) to increase awareness and acceptance of vaccination in Mali. Combined with robust community engagement, Busara's research, and the evaluation of pop-up vaccination clinic models that reached over 3,000 people with easily accessible vaccination services, this approach positioned the MOHSD to continue advancing public health outcomes in Mali.

DRIVE Demand Tanzania exemplified the impact of strategic investments in digital health tools and communications to enhance public health responses, particularly in immunization. Through the development of a national health communications repository, the project strengthened the Ministry of Health's ability to share timely and accurate health messaging—informed by Busara's research—sending over 300,000 SMS messages. Additionally, the project enhanced existing digital health immunization platforms and local capacity to use these for optimal impact.

DRIVE Demand Thailand underscored the effectiveness of hyper-localized SBC messaging via common digital health channels to address vaccine hesitancy and improve health outcomes in remote settings. By investing in community-focused strategies and digital engagement, Thailand can continue enhancing its public health response and foster more equitable vaccine access across all regions.

DRIVE Demand Uganda successfully leveraged geographic information system (GIS) technology and enhanced data management practices to help improve vaccination coverage across the country. The project trained 147 local biostatisticians in GIS, strengthened data utilization, supported policy updates, and engaged in multisectoral collaborations to reach local community champions with accurate and timely immunization data, information, and messaging informed by Busara's SBC research. These activities support and amplify the existing strong MOH leadership in digital health and will inform future epidemic and pandemic preparedness in Uganda.

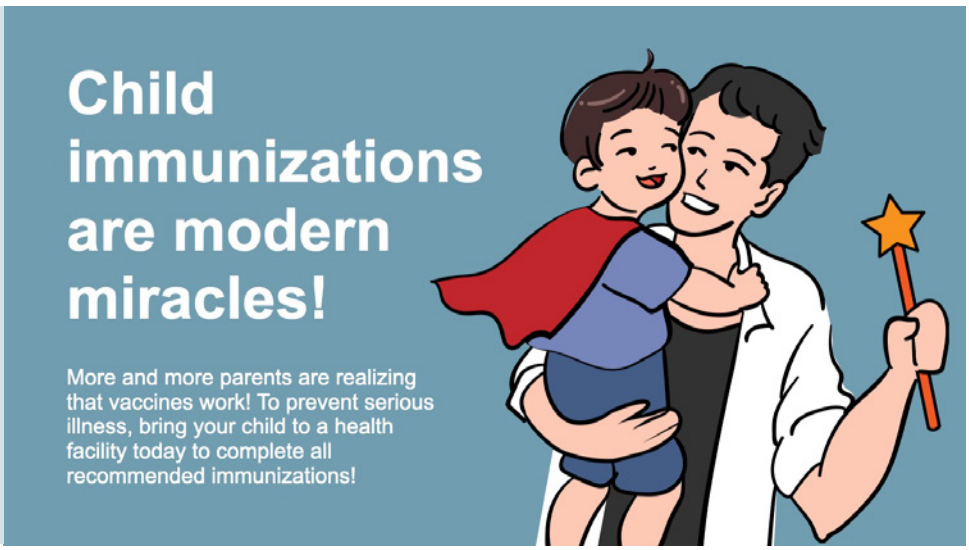
DRIVE Demand Zambia demonstrated the importance of adaptable digital health solutions and strong stakeholder collaborations in enhancing public health systems. The project made enhancements to the Zambia Electronic Immunization Registry (ZEIR) for interoperable data sharing and then identified ways that the adaptations could inform other platform uses, such as DHIS2. These efforts helped move the country toward a national unified electronic immunization platform.

All photo credits to PATH except CHAI Honduras

CROSS-CUTTING LESSONS LEARNED

As part of the end of the DRIVE Demand project, detailed country reports with strategic recommendations for sustainable integration and country ownership were presented to each country's health ministry. While the needs, activities, and recommendations in each country were diverse, the project identified four lessons that applied across all country contexts:

1. **Strong partnerships lead to localized interventions:** Driving resilient, country-led, pandemic-prepared digital health systems requires adaptability and strong coordination among different community-based stakeholders.
2. **Capacity strengthening pays off:** Supporting capacity strengthening is a high-impact investment that improves the quality, utility, and sustainability of digital health interventions.
3. **Understanding the local context is crucial:** Listening to communities to address hyper-local needs, scale bright spots, and amplify community voices is central to developing effective approaches.
4. **Creating and leveraging digital systems enables mass communication:** Digital tools for health messaging can be used to trigger behavior change to increase vaccine demand and uptake by putting the right messages in the right hands at the right time.



This image and message were created as part of DRIVE Demand Thailand based on a hyper-local study on how to drive demand for vaccines in under-immunized regions. Messages like these were given to the Ministry of Public Health for delivery via existing digital communication channels.

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About DRIVE Demand

With support from The Rockefeller Foundation, Digital Square at PATH launched the Digital Results Improve Vaccine Equity and Demand (DRIVE Demand) project in June 2022 with the goal of increasing vaccine demand and acceptance rates in six countries: Honduras, Mali, Tanzania, Thailand, Uganda, and Zambia. By driving demand for COVID-19 vaccination awareness, acceptance, and activation, the project aims to increase each country's overall vaccine uptake while also strengthening the broader routine immunization program for long-term sustainability.

Honduras

Photo: CHAI Honduras

Strengthening the national immunization system by reinforcing data quality and governance

COUNTRY-DEFINED CHALLENGE

In Honduras, the lack of availability and use of timely data from different systems in the health and vaccination sector has been a barrier to effective decision-making. While the Ministry of Health (MOH) has made significant efforts to make local- and regional-level vaccine information available to facilitate informed decision-making, they had not been able to implement a comprehensive universal vaccine tracking system. Instead, the MOH relied on a mix of paper-based forms, Excel files, and different electronic tools for each health facility and vaccine post. This multifaceted approach has exacerbated access to accurate and up-to-date vaccination data, thereby limiting the MOH's opportunities to improve equity of and access to vaccines and adequate health services for all Hondurans, especially those in remote health catchment areas.

The COVID-19 pandemic posed further challenges for Honduras' vaccine information system. These challenges underscored the importance of strengthening national digital information systems to help ensure an equitable and efficient response and distribution of vaccines and prepare for future public health emergencies. In response, the Secretariat of Health (SESAL) invested in strategic information systems with the support of the Data for Implementation Project (Data.FI), which is funded by the United States Agency for International Development (USAID). In 2022, SESAL convened workshops to co-create a COVID-19-related data use strategy.[1] This strategy was implemented in pilot health regions in 2022 and 2023 with positive results.

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CLINTON HEALTH ACCESS INITIATIVE

Given The Rockefeller Foundation's existing work with the Clinton Health Access Initiative (CHAI) in Honduras, DRIVE Demand partnered with CHAI to amplify support to SESAL. Through DRIVE Demand, SESAL requested CHAI to define and develop a data governance structure in two additional regions with low vaccination coverage, Gracias a Dios (GAD) and Colón.

Figure 1. DRIVE Demand Honduras focused efforts on the Gracias a Dios and Colón regions given their low vaccination rates.

SOLUTION

Assessing the digital health ecosystem in Honduras

In December 2023, as part of DRIVE Demand, CHAI completed an assessment of the existing regional infrastructure, hardware, connectivity, personnel, and data processes related to digital immunization tools in Honduras. The MOH uses the Plataforma de Sistema Vacunación (SIVAC) as the primary national immunization digital health platform. However, five other digital systems collect vaccine data, both digitally and manually, leading to duplication and sub-optimal use of the information.

Earlier in 2023, Data.FI had consolidated SIVAC with two of the platforms—the Plataforma en línea del Sistema Vigilancia de la Salud (SVS) and a COVID-19 Excel sheet on hospital capacity—into a PowerBi-based dashboard. This COVID-19 dashboard allows government officials to review and update data, develop analytics on current immunization rates, and understand where resources are most needed. Even with this update, the tools still had several limitations and were not being utilized to their full potential to inform decision-making.

The assessment highlighted five areas for improvement to effectively leverage digital tools such as SIVAC and SVS:

1. Inability to triangulate information across different systems.
2. Lack of access to data analysis.
3. Lack of a real-time display.
4. Lack of accountability mechanisms.
5. Lack of equipment availability in certain regions.

Following the assessment, further adaptation of the COVID-19 dashboard was transitioned to DRIVE Demand to support continued feature development and refinement through May 2024. The MOH, Data.FI, and CHAI held many consultative discussions in subsequent months to exchange information and system documentation to support these processes. Ownership of the dashboard remained with the MOH throughout the project.

Example of a static "situation room" mural in Gracias a Dios. Photo: CHAI

SOLUTION

Training health workers in data entry and supervision

To make assessment findings actionable, DRIVE Demand Honduras focused on capacity strengthening at the regional level by training health clinic workers who interact with data entry and supervision of data personnel. To do this, CHAI leveraged an MOH-approved methodology developed by Data.FI that uses "situation rooms assisted by technology" (SSAT), an adaptation of health-oriented "situation rooms." The concept of situation rooms is derived from military or emergency response situations where high-level decision-makers meet in one location and are provided with updated data and

analyses, enabling them to make critical decisions jointly based on the best available information.[2] The MOH has promoted the use of situation rooms as a key tool for health data discussion since 2014.[3] However, due to the lack of technological access given some health centers' remote locations or lack of consistent connectivity infrastructure, these "rooms" often remained as static murals where graphs were shared on paper.

Developed with the MOH in 2022, Data.FI's methodology consists of four components: (1) identification of target health clinics or municipalities; (2) methodology and training; (3) implementation of SSATs in a virtual space to allow interaction with data; and (4) supervision visits. The MOH continued to use this approach and supported DRIVE Demand to investigate its use in GAD and Colón.

SSAT training workshops in Gracias a Dios (top) and Colón (bottom). Photo: CHAI

1 Identifying target locations for SSATs

In December 2023, DRIVE Demand Honduras held meetings with regional MOH stakeholders to exchange knowledge of current data flows, review and correct data, and identify target data users at the regional level. Based on the findings, CHAI provided computers and access to official systems and training to help update systems in GAD municipalities and health surveillance units in both regions.

2 Developing methodology and training

Having identified the target areas for training, DRIVE Demand Honduras developed a standardized operating procedure (SOP) for vaccination data management and governance to enhance data analysis and decision-making for regional officials around COVID-19 immunization. Finalized in January 2024 and approved in April 2024, the SOP outlined roles and responsibilities for each position in local health facilities regarding the Data.FI methodology and SSATs.

CHAI conducted SSAT strategy training workshops in December 2023 in Colón, GAD, Puerto Lempira, and Trujillo. In January 2024, SESAL requested that DRIVE Demand resume these workshops in order to add two hospitals in Colón. Throughout these workshops, interviews were carried out with key informants who helped the team understand the intricacies of information flow at the regional and local levels, the roles and responsibilities of each team member, and the most significant gaps in data management in both regions. These details facilitated the organization of information analysis meetings, ensured the completion of missing data for analyses, and arranged team discussions regarding the data. In total, 39 health workers across six health facilities were trained.

3 Implementing SSATs

Following the training workshops, CHAI implemented an SSAT for the six health facilities where trainers were expected to apply the methodology. From January to April 2024, CHAI established a series of SSATs in Brus Laguna, Puerto Lempira, Tocoa, and Trujillo municipalities. The purpose of the SSATs was to establish a structured methodology for the regular and rapid review of data to support decision-making. These participatory sessions helped identify inefficiencies in outbreak response efforts, clarify reasons for poor performance, and procure appropriate services for the population. A total of 27 health facility staff members participated in the SSATs in Colón and GAD regions.

4 Conducting supervision visits

The final component was supervision visits, which occurred one month after the SSATs were implemented. MOH and CHAI traveled to each health facility to determine the uptake of methodology and where reinforcement was required. The supervision visits highlighted the need to further define the roles of each team member, have a clearer sustainability plan, and document preliminary results and improvements more thoroughly.

ENSURING PROJECT SUSTAINABILITY

To help ensure that the project's efforts were institutionalized and carried on beyond the lifespan of the project, DRIVE Demand Honduras maintained a close partnership with USAID's Data.FI project and leveraged support from The Rockefeller Foundation for ongoing work supporting the Honduras MOH. These partnerships resulted in a highly complementary scope of work to continue existing efforts to advance Honduras' digital health environment. CHAI also leveraged its participation in various related Technical Working Groups to socialize DRIVE Demand's activities and include feedback to the country's Digital Health Roadmap (2024-2028).

As part of the project sustainability efforts, DRIVE Demand Honduras created a repository for all project documentation, including SOPs and sustainability plans. The repository was made available through a publicly available website[4] in April 2024. The website will be maintained by MOH following the end of the project in June 2024.

Finally, the team developed a project sustainability plan. The plan detailed assessment findings, gaps, and information needed to continue to hold training workshops and maintain the situation rooms. By providing strategic recommendations and all project resources to the MOH, DRIVE Demand aimed to equip the MOH with the tools and knowledge needed to sustain the project's efforts under fully country-led ownership.

STRATEGIC RECOMMENDATIONS FOR THE MINISTRY OF HEALTH

1. **Strengthen political commitment:** Ensure continued support from leaders and policies that prioritize the integration of information technologies in public health.
2. **Integrate with existing programs:** Incorporate SSATs into other health programs to maximize resources and broaden impact.
3. **Optimize procurement and regulatory mechanisms:** Establish transparent and efficient processes for technology acquisition and define clear regulatory standards for SSAT operations.
4. **Continuous training and capacity building:** Improve the training and skills of health care personnel in data analysis and health technology management.
5. **Foster strategic partnerships:** Collaborate with key partners such as local governments, the private sector, and public health agencies for technical, financial, and operational support.

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Mali

Photo: PATH/Ibrahima Togola

Implementing evidence-based digital messaging tools to generate vaccine demand

COUNTRY-DEFINED CHALLENGE

It is estimated that only 45 percent of children in Mali receive all essential vaccinations.[1] Further, 14 percent are so-called zero-dose children who have received no vaccination at all, depriving them of protection from common yet preventable diseases.[1] Against a global backdrop of increasing disease outbreaks, such gaps represent a serious risk for the health and well-being of Mali's population—both now and in the face of future epidemics.

Like many other countries, Mali faces immunization-related challenges related to supply chain gaps, a need for continuous training given frequent staff turnover, and misinformation, which triggers fear and lack of demand for vaccination. These fears are exacerbated by community mistrust and the rapid spread of misinformation, particularly via digital platforms and social media.

The Mali Ministry of Health and Social Development (MOHSD) is committed to tackling these challenges to support the national goal of increasing coverage of routine vaccinations for preventable childhood disease—particularly for zero-dose children—and strengthening the country's overall immunization system to better prepare for future pandemics. Digital solutions such as integrated digital messaging for social and behavior change (SBC) communication offer a promising solution for reaching users to help improve vaccine acceptance and uptake. Until now, however, the MOHSD did not have a way to connect their vaccination data platform to improved communications to reach more people with appropriate messaging about vaccination.

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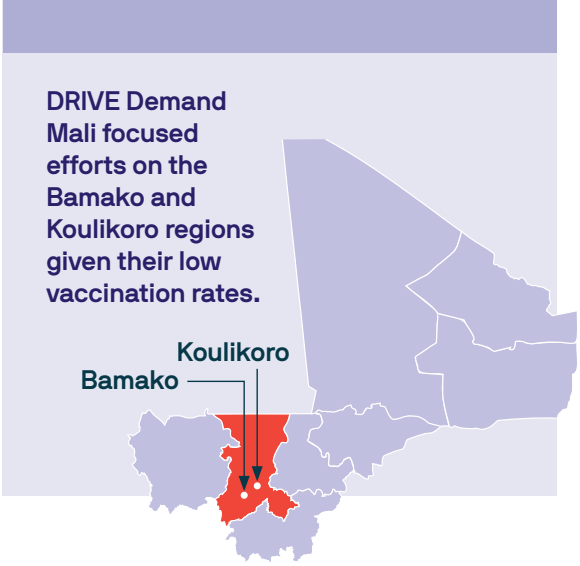
SOLUTION

Adding SMS functionality to Mali's digital immunization platform



Mali currently uses one District Health Information Software 2 (DHIS2) Tracker instance for routine childhood immunization data and a separate DHIS2 Tracker instance for COVID-19 vaccination data for people aged 12 and older. In discussions with DRIVE Demand Mali, the MOHSD identified the need to improve the functionality of both DHIS2 platforms by adding a gateway for Short-Message Service (SMS) and pushed audio messaging—to reach the 69 percent[2] of the Malian population who are unable to read—in local languages. A gateway enables a software system to send and receive texts and audio messages to and from mobile phones. Through such messaging, the MOHSD could communicate routine appointment reminders and scheduling, notifications of vaccine availability, and SBC messages to improve vaccine awareness and uptake among target populations.

Digital Square worked with MOHSD and many partners to design the SMS gateway. This process involved user advisory groups (*Comités Locaux d'Appuis à la Vaccination*, or CLAVs), integration with DHIS2, technical workshops, and pilots with health districts. In consultation with MOHSD, the project focused its efforts on the Bamako and Koulikoro regions given the ability to reach a large portion of the population with messaging. DRIVE Demand Mali then further selected focus communities within these regions with the lowest vaccination coverage rates.

The CLAVs helped review and share all audio and SMS messages in six local languages (Bambara, Fulfuldé, Soninké, Songhay, Tamasheq, and French) for optimal reach. Both the SMS gateway and the separate interface for sharing audio messages via WhatsApp were integrated into DHIS2 to foster improved sharing of messages by MOHSD to individuals and caregivers of young children.

Informed by all these inputs, the SMS gateway became fully functional in December 2023. The final version enables the MOHSD to pull individuals' vaccination records, identify children and caregivers in the system with upcoming vaccinations or past-due vaccinations, and send SMS and audio reminders with SBC-informed messaging. As of early 2024, 34,808 SMS messages (6,195 COVID-19 messages and 28,613 routine immunization messages) had been shared and 175,192 messages had been scheduled. The audio messages are projected to reach an additional 210,000 recipients. This evergreen functionality can be leveraged by MOHSD and other partners and donors for years to come to share messages related to immunization or other health events or emergencies.

A health worker stands in front of an education sign intended to improve vaccination uptake. Photo: PATH/Ibrahima Togola

SOLUTION

Improving vaccine uptake through evidence-based messaging

To ensure the most accurate and effective messaging to use with the DHIS2 SMS and pushed audio approaches, DRIVE Demand Mali worked with the MOHSD to use an SBC research framework to define what messages to send, how often, and to whom.

In the first year of the project, the team laid the foundation for conducting SBC qualitative research in Bamako and Koulikoro districts. Digital Square led active engagement with several partners to determine appropriate and impactful research to drive demand for immunization and enhance the project's SMS gateway adaptation. Ultimately, MOHSD and DRIVE Demand Mali agreed on three activities:

1 Hold focus group discussions with target populations to better understand and lessen vaccine hesitancy and barriers.

To understand hesitancy and inform SBC messaging, DRIVE Demand enlisted the Busara Center for Behavior Economics to conduct behavioral research in four locations across the DRIVE Demand project: Bamako, Mali; Dar es Salaam, Tanzania; Kampala, Uganda; and Lusaka, Zambia. The study was designed to use focus group discussions to gather information on three populations: adults who had not received the COVID-19 vaccine in the past year; pregnant people who had not received the COVID-19 vaccine in the past year; and health care providers who delivered vaccinations. In Mali, at the request of MOHSD, Busara also included focus group discussions for caregivers of children under two years of age. Focus group discussions occurred in Bamako in April 2024. Findings across the four countries are presented in *Dynamics of Vaccine Hesitancy: A Practitioner Playbook*.[3]

DRIVE Demand aimed to understand and improve vaccine confidence among caregivers of children. Photo: PATH/Ibrahima Togola

2 Curb misinformation and drive vaccine acceptance in communities via targeted communications.

To identify SBC messages to reduce hesitancy and increase vaccine acceptance in Mali, DRIVE Demand Mali, the MOHSD, and national partners reviewed and validated existing messages during a workshop, translated them, and then recorded the audio messages in five local languages. Leveraging the CLAVs, the team identified WhatsApp as the most-used platform, especially for health care workers and CLAV-moderated mothers' groups.

The messages were shared—followed by interactive discussions—within 10 WhatsApp groups to help improve vaccination rates in areas where children are under-vaccinated or have not received any doses. In total, **701 members** of these groups were reached by the awareness messages communicated by the CLAVs. To enable use past the life of the project, Digital Square developed a user guide for the continuation of SBC messages by the CLAVs.

3 Conduct implementation research on the feasibility of a community-based vaccination 'pop-up' model to support vaccine uptake in priority at-risk groups

DRIVE Demand Mali worked with MOHSD to design and implement ten-day vaccination "pop-ups" at local markets in Bamako and Koulikoro in April 2023. Locations included Bamako's central market area and traditional gold mining areas of Koulikoro, chosen because of each area's lack of accessible health services and high number of under-vaccinated children. MOHSD helped coordinate the logistics for the pop-ups, including shipment of vaccines and supplies, recruitment of health workers, awareness-raising, and other needs. In total, **1,210 people** received immunizations in the Bamako pop-up and **1,803 people** received immunizations in the Koulikoro pop-up. DRIVE Demand evaluated and analyzed the pop-ups with MOHSD to understand the impact, costs, and benefits of the activity to inform future implementations.

Pop-up clinics in Bamako and Koulikoro were held in April 2024, during which the MOHSD was able to vaccinate over 3,000 people. In the top photo, a child receives a vaccine. In the bottom photo, a health worker fills out a paper-based vaccination card. Photos: PATH/Ibrahima Togola

ENSURING PROJECT SUSTAINABILITY

As a two-year project, DRIVE Demand Mali sought to ensure that all activities could be sustainably carried on after the life of the project to enable lasting impact. To do this, the team partnered closely with MOHSD throughout the project to ensure alignment, a shared vision, and adequate capacity to manage efforts going forward. Importantly, MOHSD validated the project's final SMS gateway and took over ownership and management of the tool. In April 2024, the tool was fully transitioned from PATH servers to MOHSD-owned and maintained servers, and Digital Square handed over the DHIS2 SMS tracking dashboard and all relevant documents. DRIVE Demand also pre-paid for bulk SMS packages through Vonage, the mobile network partner, for MOHSD to continue to send messages through the end of 2024. Going forward, the tool will be managed by the MOHSD SMS technical team.

As active participatory members of the project with both the design and implementation of the SMS gateway as well as the SBC message delivery, the CLAVs will play an important role in carrying on project knowledge. Final discussions with MOHSD acknowledged the value of CLAVs. Plans are in place to maintain and expand them to support moderation of WhatsApp channels and message distribution.

As part of the project transition in May 2024, Digital Square presented a sustainability roadmap for the continuation of CLAVs, the use of SMS and audio reminders, and the installation of pop-up clinics in nontraditional settings. The roadmap detailed needs for human resources, costs, maintenance, and other considerations, including guidelines for engaging with local and regional telecommunications companies to procure SMS bundles to support future use of the gateway. With this messaging platform, the MOHSD is now equipped to send targeted, evidence-based messages to inform and influence behaviors for better health—both now and in future emergencies.

RECOMMENDATIONS FOR THE MINISTRY OF HEALTH AND SOCIAL DEVELOPMENT

1. **Prioritize multi-channel and multi-lingual communication approaches** (e.g., through SMS, WhatsApp, pushed audio, and CLAV communication) to effectively reach a wider audience as well as Mali's diverse linguistic and cultural communities.
2. **Invest in strengthening the capacity of local stakeholders**, including MOHSD staff, health workers and community volunteers, to manage and sustain the project's digital tools and community engagement initiatives.
3. **Strengthen data updating and quality** to ensure continuous access to high-quality data in order to operationalize the SMS vaccination reminders and outbound call gateway services.
4. **Foster partnerships with local telecommunications providers** and other private sector entities to secure long-term support and resources for ongoing communications efforts.

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Tanzania

Photo: PATH/Olgah Odek

Enabling broader health promotion messaging through a digital health communication repository

COUNTRY-DEFINED CHALLENGE

In September 2022, the Tanzania Ministry of Health, Community Development, Gender, Elderly, and Children (MOH) reported that only 33 percent of the population had been fully vaccinated against COVID-19,[1] falling well below the target of 70 percent suggested by the World Health Organization. In addition, the pandemic's service and supply chain disruptions, resource diversions, and misinformation about COVID-19 vaccines caused significant declines in routine immunization coverage in the country. Routine vaccination for Tanzania's children shows a drop in coverage rates from 86 percent in 2019 to 81 percent in 2021 with the third dose of diphtheria, tetanus toxoid, and pertussis vaccine (DTP3), which is often used as a general indicator of routine vaccination coverage.[2] Although Tanzania nearly regained pre-pandemic coverage levels in 2022 (84 percent), the immunity gap caused by the pandemic led to increased measles transmission, with sporadic measles outbreaks in some districts in 2022 and 2023.

Digital tools have the potential to significantly improve vaccination coverage, and Tanzania uses several different digital platforms to manage its national immunization program. For tracking data, Tanzania uses the Vaccine Information Management System (VIMS). VIMS merges immunization data from routine immunization, COVID-19, and vaccine supply chain digital platforms, making it a useful central planning tool. However, VIMS faced technical challenges that made it difficult for the MOH to make informed, real-time decisions around immunization planning and strategy. The MOH therefore sought DRIVE Demand's help with assessing what upgrades were needed for VIMS as well as building local capacity for upgrades.

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To improve uptake of both COVID-19 and routine childhood vaccinations, the MOH sought to deliver digital social and behavior change (SBC) messages among target communities. To do this effectively, the MOH requested DRIVE Demand's help to create a single digital repository for all health communications and media types, allowing for accurate identification of MOH-approved messaging and mass distribution through health implementing partners across the country. The MOH also requested more guidance on the most effective SBC messages for influencing behavior change in under-immunized communities.

SOLUTION

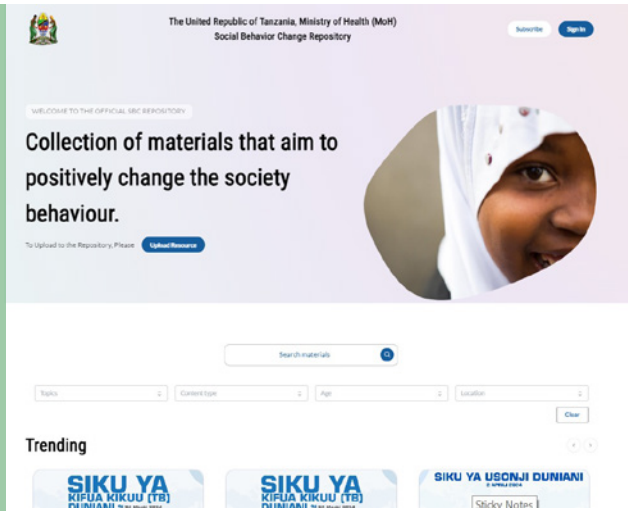
Conducting analysis for optimized use of the Vaccine Information Management System

At the start of the project, DRIVE Demand Tanzania conducted a VIMS assessment that identified challenges related to reporting, training, technical infrastructure, interoperability, as well as affordability of data bundles. Based on this assessment, the DRIVE Demand Tanzania team hired MonitAfrica to conduct a root-cause analysis to inform the needed VIMS enhancements and software upgrades.

A District Immunization and Vaccine Officer from Kibaha District explains VIMS reporting to members of the PATH DRIVE Demand team. Photo: PATH/Olgah Odek

MonitAfrica completed its root-cause analysis of VIMS in October 2023. Later that month, the team presented these findings and shared all documentation with the MOH. The MOH plans to complete the technical upgrades through a separate investment guided by DRIVE Demand's assessment, analysis, and guidance after having gathered input from digital health stakeholders in the country.

Additionally, one of the MOH's priorities for VIMS was the transition of the VIMS server from the Amazon AWS cloud server to a locally owned and maintained MOH server. The DRIVE Demand Tanzania team facilitated this transition in December 2023 to support ongoing country-led ownership and sustainability.



Screenshot of Tanzania's DHPCR, which was developed through the DRIVE Demand project and launched in February 2024.

SOLUTION

Developing the Digital Health Promotion Communication Repository

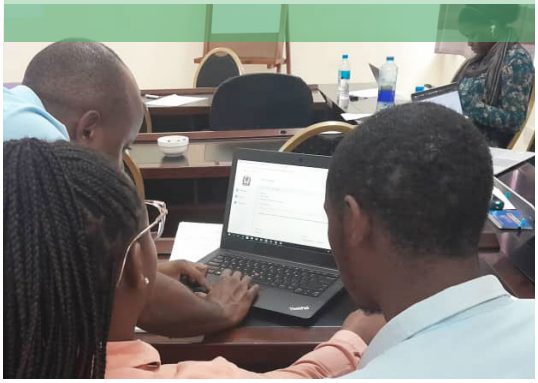
Following discussions with MOH and partners, the DRIVE Demand Tanzania team met with a user advisory group (UAG) to figure out the technical requirements needed to develop a single platform for storing, managing, and delivering all health messaging content, including text, audio, and photos.

Having gathered the requirements, the team then oversaw the technical development of the Digital Health Promotion Communication Repository (DHPCR). Technical development was completed in November 2023, testing was completed in January 2024, and the final product was officially launched in February

2024 with capacity building and use workshops held in March and April to socialize the platform with MOH and health implementing partners.[3] Additionally, DHPCR was integrated with TalkWalker, a social listening digital tool that enables the MOH to monitor language and gather insights on how the DHPCR is used.

The DHPCR is a searchable, curated collection of health communication. In addition, the MOH can utilize its materials to send messages directly to health workers and caregivers to improve health service outreach. The DHPCR has been championed and owned by the MOH from the start. As of March 2024, the MOH took over hosting from DRIVE Demand. As of March 2024, it had been used to deliver 321,500 SBC messages via short message service (SMS) texts to community health workers and caregivers of children under five years of age who were under-vaccinated, based on contact and immunization coverage data from the Tanzania Electronic Immunization Registry (TimR).

As of March 2024, DHPCR had been used to deliver **321,500** SBC messages



Tanzania Ministry of Health staff attend the DHPCR training-of-trainers in Morogoro region in March 2024. Photo: PATH/Isaac Sahera

To ensure sustainability, DRIVE Demand Tanzania developed a national training of trainers on the maintenance of DHPCR. The training of trainers was then implemented by the MOH in Morogoro region in March 2024 for 15 MOH staff. These national trainers will then train district-level users, cascading the reach down to lower-level users. At the project close, all DHPCR design, development, training, and use documents were shared with the MOH. At the request of the MOH, a short four-minute video was also created to help socialize the use of the DHPCR and market its availability.

SOLUTION

Sending SBC messages with the DHPCR

While the DHPCR was being developed, DRIVE Demand and the MOH sought to review and enhance the social and behavior change (SBC) messages that would be managed through the repository. The DRIVE Demand team met with the MOH and Breakthrough ACTION in September 2023 to review existing messages related to COVID-19 and routine immunization. In total, the team identified and validated 51 messages for accuracy. In September 2023, the final messages were integrated into the completed DHPCR and used for SMS delivery to caregivers and community health workers sent through a local telecommunications company.

Busara leads the focus group pilot session in Kibaha District, Tanzania. Photo: PATH/Olgah Odek

SOLUTION

Informing future SBC efforts through focus group research

In parallel, to better understand local vaccine hesitancy and levers for improved uptake to inform SBC messaging for Tanzania and regionally, DRIVE Demand enlisted the Busara Center for Behavior Economics to conduct behavioral research in four locations across the DRIVE Demand project: Bamako, Mali; Dar Es Salaam, Tanzania; Kampala, Uganda; and Lusaka, Zambia. The study was designed to use focus group discussions to gather information on three populations: adults who had not received the COVID-19 vaccine in the past year; pregnant people who had not received the COVID-19 vaccine in the past year; and health care providers who provide vaccination. In Tanzania, focus group discussions occurred in March 2024 following an initial pilot in Kibaha District in early 2024. All findings across the four countries are presented in *Dynamics of Vaccine Hesitancy: A Practitioner Playbook*.[4]

ENSURING PROJECT SUSTAINABILITY

As a two-year project, DRIVE Demand Tanzania sought to ensure that all activities could be sustainably carried on after the life of the project to enable lasting impact. To do this, the team partnered closely with the MOH throughout the project to ensure alignment, a shared vision, and adequate capacity to manage efforts going forward. Since the beginning of the project, the Tanzania MOH displayed strong leadership and a high level of engagement with its many implementing partners in the digital health space. The MOH's continued support resulted in digital tools that fit into the established digital health roadmap, which can be leveraged for use across health areas including for future childhood and adult vaccination, future emergency response, and time-sensitive health outreach.

Key to the continued support and strong relationship was the establishment of a user advisory group early in the project to create a continuous feedback loop between project technical experts, MOH, and community representatives. Additionally, the training sessions—including the national training-of-trainers—will help ensure the sustainability of the newly developed DHPCR.

Pilot focus group discussion in Kibaha District in January 2024.
Photo: PATH/Irene Kemilembe

STRATEGIC RECOMMENDATIONS FOR THE MINISTRY OF HEALTH

1. **Establish partnerships** across communities and with other health implementing organizations.
2. **Expand and prioritize capacity strengthening** in health promotion via coordination at district and regional levels.
3. **Leverage user contributions and crowdsourcing** in SBC material development.
4. **Leverage sustainable open-source technology** for interoperability, adaptability, and scalability. Use data standards and architecture to ensure efficient health systems.
5. **Encourage continuous monitoring and evaluation** through the development of a robust monitoring and evaluation system.
6. **Engage communities** from the start for impactful, hyper-local, culturally-elevant content.
7. **Enable research organizations and academia to add to the repository.**

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About DRIVE Demand

With support from The Rockefeller Foundation, Digital Square at PATH launched the Digital Results Improve Vaccine Equity and Demand (DRIVE Demand) project in June 2022 with the goal of increasing vaccine demand and acceptance rates in six countries: Honduras, Mali, Tanzania, Thailand, Uganda, and Zambia. By driving demand for COVID-19 vaccination awareness, acceptance, and activation, the project aims to increase each country's overall vaccine uptake while also strengthening the broader routine immunization program for long-term sustainability.

Thailand

Photo: PATH/Natchaya Ritthisirikul

Reaching a remote community with localized vaccine promotion messaging

COUNTRY-DEFINED CHALLENGE

During the COVID-19 pandemic, Thailand emerged as an immunization success story. By early 2022, the Ministry of Public Health (MOPH) already achieved a 70 percent COVID-19 vaccination rate, thanks to the country's existing enabling environment including the use of digital tools for health communication and service delivery. However, the coverage of routine childhood immunizations reveals long-standing inequities that were further exacerbated during the COVID-19 pandemic.

Long before the pandemic, immunization coverage had been a particular area of concern in the southern provinces. These areas have many geographically remote communities, religious minorities, and a history of conflict, all of which have created barriers to immunization. In 2018, the southern provinces had experienced a significant measles outbreak, with 4,450 cases reported.[1] In 2022, while 83 percent of 1- to 3-year-old children across the country had received both doses of the Measles-Mumps-Rubella vaccine (MMR2), coverage was much lower in the southern provinces.[2] In Narathiwat province, MMR2 coverage stood at just 54.9 percent.[3]

The MOPH therefore requested DRIVE Demand's help with increasing vaccine acceptance—and specifically MMR2 uptake—in the south. The team would do this through the development, testing, and delivery of hyper-local social and behavioral change (SBC) communication shared through commonly used digital platforms. By developing and delivering these messages, the team aimed to share accurate health information and increase vaccine acceptance among caretakers of children.

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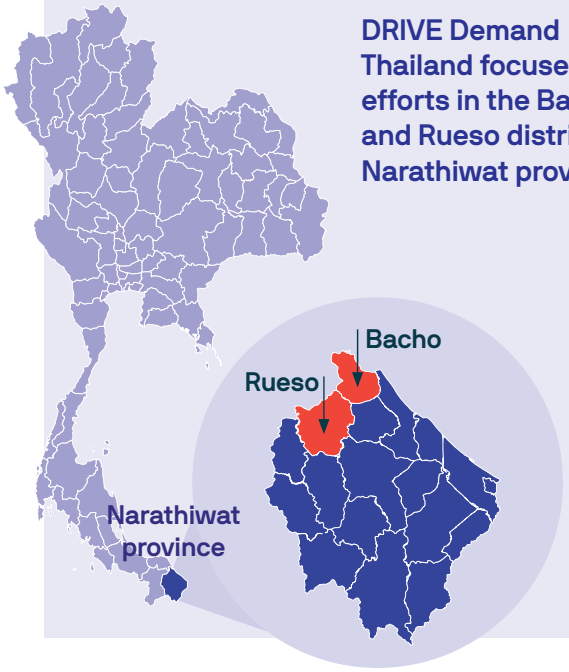
DDCF, Thailand
(Department of Disease Control Foundation)

SOLUTION

Increasing MMR2 vaccine uptake in Narathiwat through hyper-local, tested messages



DRIVE Demand Thailand focused efforts in the Bacho and Rueso districts of Narathiwat province.

Based on input from MOPH, the team worked in Narathiwat province and specifically in Bacho and Rueso districts. These areas were chosen because they had the lowest uptake rates of MMR2 coverage in Narathiwat (41 percent and 35 percent coverage, respectively[4]) as well as a network of available government health officers and trusted local Village Health Volunteers (VHVs).

The success of using SBC communications during the 2004 Avian Flu outbreak in Thailand provided the foundation for building on and refining MMR2 messages in Narathiwat province. This work had shown that barriers to vaccine uptake in the southern provinces of Thailand include **fear of vaccine side effects, religious barriers to vaccination,** and **limited transport and care networks.** The team suspected that the messages would need to focus on those barriers. By testing messages with local caregivers, the team could help ensure relevancy and effectiveness.

Designing the study and SBC materials

Working with a regional SBC specialist, DRIVE Demand Thailand created a plan to test pre-developed messages for MMR2 vaccination that were then tested locally. As part of this plan, the team created a creative brief to guide the development of the messages, mock-ups, and tools (e.g., a questionnaire for village health volunteers, mock-up communication graphics, and analysis templates), mock-up testing, and results dissemination. As the work progressed, the team gathered and incorporated continuous feedback on the plan from the DRIVE Demand advisory group, which consisted of members from relevant units of the MOPH and the Department of Disease Control (DDC-MOPH) at the central level and in Narathiwat province, the Department of Disease Control Foundation (DDCF), and academic members.

The final questionnaire included seven questions on the mock-up design, messaging, viewer comprehension, and perceptions of Narathiwat caregivers. In parallel, the team developed 12 mock-ups for testing informed by DDC-MOPH's previous MMR2 SBC campaign materials. Of these 12, seven mock-ups were ultimately selected for testing.

Three of the 12 SBC graphic mock-ups used during testing (translated into English). The test evaluated design (photos vs. illustrations), messaging, viewer comprehension, and caregiver perceptions.

I take care of 15 to 20 households throughout their lifetime. Hence, it is easy for me to ask for their cooperation when it comes to health promotion and disease prevention.

I think the digital messaging is impactful. Apart from sending text, images can make people visualize the effect if their children are vaccinated or unvaccinated. When I interviewed caretakers, I showed them the mock-ups. They smiled when they looked at the photograph of a happy family."

Mrs. Rokiyoh Salaeh, Village Health Volunteer in Rueso district, Narathiwat province

Photo: Thailand DDC-MOPH/Dr. Muanfun Kongsomsawaeng

Testing the messages

DRIVE Demand Thailand identified VHVs—Thailand's version of community health workers—as the ideal conduits to conduct this study given their integration into communities and established relationships with caregivers. Vaccination is a sensitive topic for many caregivers, and the trust element is crucial to acquiring low-bias answers.

After identifying and training local VHVs in late 2023, the team supported VHVs to complete 50 outreach visits to caregivers in Bacho and Rueso districts with children between 18 and 36 months of age as part of an iterative message testing feedback loop. Responses were reviewed and analyzed using a combination of quantitative and qualitative methods.

The findings highlight a **preference for mobile/digital formats** of SBC communications designs that: a) highlight the **emotional benefit** of vaccinating young children; b) explain **the side effects are minor and manageable**; and c) **utilize photographs** of children and families as opposed to graphic illustrations. Caregivers also liked mock-ups that positioned vaccination as a social norm, with a fear-of-missing-out message approach, and positioning of vaccines as modern miracles.

Finalizing the messages for delivery

The findings from the study were presented at an advisory group meeting in February 2024. Following feedback from this meeting and DDC-MOPH guidance, four graphics were updated and finalized for distribution through LINE, Facebook, and other commonly used digital channels. In March 2024, the messages were approved by the and the DDC-MOPH.

Project findings dissemination meeting on April 3, 2024, with key stakeholders, including Digital Square at PATH, The Rockefeller Foundation, USAID, World Health Organization, FHI 360, DDCF, DDC-MOPH, National Vaccine Institute, Sungai Kolok Hospital, and academic institutions. Photo: Thailand DDC-MOH/Siroruch Thongtip

ENSURING PROJECT SUSTAINABILITY

As a one-year project, DRIVE Demand Thailand sought to ensure that all activities could have a sustained impact past the life of the project. To do this, the team partnered closely with the MOPH throughout the project to ensure alignment, a shared vision, and adequate capacity to manage efforts going forward.

Remote populations are often the hardest to penetrate with messaging because of their localized challenges. Through DRIVE Demand, Thailand's MOPH strengthened its institutional capacity to conduct small-scale studies to develop hyper-local targeted messages to last-mile populations. These messages provide two opportunities: promoting uptake of positive behavior and building trust. With more contextualized messaging, caregivers' wariness and misinformation around vaccines may lessen, resulting in increased positive behaviors (i.e., vaccine uptake). Indirectly, these messages may also contribute to increased trust and government understanding of citizens' concerns.

Epidemics and pandemics are not going away, emphasizing the need for sustained government approaches and established playbooks for how to quickly address health crises. Lessons from Thailand's navigation of both the Avian Flu outbreak and the COVID-19 pandemic demonstrated the value of digital communications to combat misinformation and expand the reach of vaccinations. By strengthening the MOPH's capacity to develop, test, and deliver hyper-local targeted SBCC messages for vaccination, the DRIVE Demand project has aimed to help decrease health disparities in the present as well as set Thailand up for success for future pandemic preparedness and response.

STRATEGIC RECOMMENDATIONS FOR THE MINISTRY OF PUBLIC HEALTH

1. **Continue investing in VHVs.** VHVs provide an important link between communities and health systems, but they are often given additional responsibilities outside of the VHV curriculum given by MOPH. This project reinforced the importance of tailored training for VHVs.

2. **Always consider linguistic diversity.** VHVs conducted some interviews with caregivers in Malay due to it being the local language. Interpreters may be necessary, but local experts should advise on how this might impact results.

3. **Build trust with community members.** Establishing strong relationships and open communication channels, such as LINE groups with VHVs, proved instrumental in effectively conducting interviews with caregivers and collecting community feedback.

4. **Use channels that are already being used.** LINE was identified as the most popular messenger app in Thailand and in Bacho and Rueso. As a result, SBC messages should be deployed to caregivers of children eligible for MMR2 and other health needs through LINE.

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Uganda

Photo PATH/Heidi Good

Increasing vaccination coverage through improved data usage and geographical information system (GIS) capacity

COUNTRY-DEFINED CHALLENGE

In 2022, only 41 percent of the Ugandan population 12 years of age and older had received at least a first dose of COVID-19 vaccination[1] while just 49 percent of children under five years of age received the second dose of the measles-containing vaccine.[2] Closing the gap for routine immunization coverage and driving engagement for COVID-19 and other vaccinations were high priorities for the Uganda Ministry of Health (MOH) and its Expanded Program on Immunization (EPI).

Digital tools for tracking vaccination data are an effective way to improve the efficiency and reach of immunization programs. Geographic information systems (GIS) software, for example, allows for mapping and precision geolocation of vaccination efforts to reach the highest-priority populations at the right time. However, at the start of the project in January 2023, the Uganda MOH EPI had limited internal expertise in GIS. The MOH wanted to expand this skill set and capacity within district- and national-level biostatisticians, rather than relying on the services of technical consultants. Additionally, an assessment of the use of existing digital health tools—including those used to collect and manage COVID-19 and routine vaccination data—showed knowledge gaps related to their appropriate utilization and acceptability among health workers. Finally, the MOH sought assistance in understanding hyper-local vaccine hesitancy so that they could improve health messaging and leverage local champions to increase vaccine acceptance, particularly among young people. The EPI identified teachers as underutilized, trusted community leaders who could be better informed to help promote information about and build trust in future community vaccination campaigns.

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Busara

SOLUTION

Building local GIS capacity

At the request of the Ministry of Health (MOH), the DRIVE Demand Uganda team conducted a three-day national training of trainers (TOT) in GIS in October 2023. The TOT equipped a pool of 13 trainers in using the free, open-source Quantum Geographic Information System (QGIS) software. In turn, these trainers facilitated the training of 147 national- and district-level biostatisticians in November 2023.

These trainings followed a hands-on, applied learning curriculum developed by DRIVE Demand in partnership with a local QGIS expert with input and approval from the MOH. The curriculum enabled the trainees to effectively utilize GIS to improve immunization performance, support surveillance, respond more quickly to outbreaks, and monitor campaigns and other interventions at subnational levels.

TOP: Mr. Paul Mbaka (left) of the Ministry of Health confers a certificate of completion to a biostatistician who completed the training (right).

BOTTOM: 147 biostatisticians completed the DRIVE Demand GIS training in November 2023.

Photos: PATH/Mariam Nalukenge

SOLUTION

Improving knowledge, use, and coordination of digital immunization tools

First, DRIVE Demand Uganda conducted a landscaping analysis of digital tools used during the COVID-19 response as well as any digital tools used for routine immunization. Only three tools were found to be used for routine immunization: **Smart Paper Technology (SPT)**, **EPIVAC**, and **DHIS2**. However, the study found major knowledge gaps among health professionals at the health facility level around the use and acceptability of these tools. Based on these findings, the DRIVE Demand team developed a report detailing recommendations, including a need for data use training and continued supportive supervision visits—a standardized process of guiding, monitoring, and coaching health workers to promote compliance with standards of practice—to health facilities.

Acting on these recommendations, in January 2024, DRIVE Demand facilitated a two-day data quality and use improvement training for health care workers in Wakiso District. The training focused on improving DHIS2 data reporting, data capture, and data use, with COVID-19 data used as an example. Additionally, DRIVE Demand conducted digital health supportive supervision visits in February 2024 to 49 health facilities in Wakiso District. These visits provided monitoring and recommendations to help ensure that health workers are utilizing best practices, receiving sufficient training, and utilizing all data reporting tools effectively.

SOLUTION

Promoting vaccine acceptance in Uganda through teachers, policies, and research

Supporting teachers' ability to be vaccine champions

At the onset of the project, DRIVE Demand worked with UNEPI to identify teachers as potential vaccine champions due to their respected position in communities and their regular engagement with community families. In September 2023, DRIVE Demand Uganda held a workshop with 25 public primary school teachers in Wakiso District from schools of different sizes and locations to understand their knowledge and information-sharing practices with school children and community families. Using focus group discussions and qualitative analysis, the workshop resulted in three key learnings:

1. Media, village health teams, and notice boards were common sources of health information for teachers, especially during disease outbreaks. However, misinformation was commonly shared via digital channels among friends and family, elevating mistrust in vaccine safety.

2. Teachers had a critical need for comprehensive, accurate vaccination information from the MOH and trusted sources to effectively bridge information gaps.

3. Teachers were not invited to actively participate in health information sessions with their students, as this is the role of health promoters who visit the schools and have discussions with students separate from the teachers. Improved communication with educators is paramount to dispelling myths and promoting accurate health information.

The workshop findings were shared with the MOH and Ministry of Education and Sports (MOES) as a valuable resource to enhance their efforts in health promotion, teacher training, and immunization programs. These findings also have the potential to enhance the effectiveness and reach of mass future vaccination campaigns for routine immunization or emergency settings. Improving preparedness for such campaigns has particular importance in the face of future climate-exacerbated disease outbreaks or pandemics.

Supporting school health policies to help teachers and schools promote vaccination

To further support teachers and schools with the inclusion of appropriate messaging to encourage uptake of COVID-19 and routine vaccinations, DRIVE Demand Uganda and the MOH co-hosted a five-day workshop with 34 government and partner stakeholders to review and finalize the school health service standards and develop supporting guidelines. The workshop resulted in the establishment of a multi-sectoral content development team. This team set a meeting cadence to ensure continued progress on an updated school health policy, updated guidelines, an implementation roadmap, and a monitoring and evaluation framework.

My passion lies in caring for children. Although many parents initially hesitate to embrace vaccination, we, as teachers, have strived to clarify that it is safe for their children and themselves. I feel at ease sharing vaccination information, particularly in today's world where vaccination is vital to protect against numerous diseases. Our collective effort contributes to a healthier community."

Kitaka Roald is a teacher at Naggulu Umea Primary School in Wakiso District, Uganda. He took part in the focus group discussions for DRIVE Demand in September 2023.

Photo: PATH/ Heidi Good

Understanding hyper-local barriers and enablers to vaccine acceptance

To better understand vaccine hesitancy and inform social and behavior change (SBC) messaging, DRIVE Demand enlisted the Busara Center for Behavior Economics to conduct behavioral research in Bamako Mali; Dar es Salaam, Tanzania; Kampala, Uganda; and Lusaka, Zambia. The study used focus group discussions to gather information on three populations: adults who had not received COVID-19 vaccine in the past year, pregnant women who had not received COVID-19 vaccine in the past year, and health care providers who provide vaccination.

In Uganda, focus group discussions were conducted in February 2024 in Nabweru sub-county in Wakiso District. Busara interviewed a total of 35 individuals from the approved target populations (unvaccinated adults (14), pregnant women (10), and health care workers (11)). In these discussions, the most-cited beliefs leading to vaccine hesitancy were around side effects and the risk of falling sick. To create vaccine buy-in, respondents noted that they appreciated witnessing the vaccination of others, particularly leaders.

Findings across the four countries are presented in *Dynamics of Vaccine Hesitancy: A Practitioner Playbook*.[3]

ENSURING PROJECT SUSTAINABILITY

DRIVE Demand Uganda sought to ensure that all activities could be sustainably carried on after the life of the project to enable lasting impact. To do this, DRIVE Demand partnered closely with the MOH and UNEPI throughout the project to ensure alignment, a shared vision, and adequate capacity to manage efforts going forward. DRIVE Demand helped increase local technical capacity through GIS and data quality and use trainings, and the team helped ensure the forward progression and sustainability of school health service efforts by providing technical assistance and developing a roadmap for implementation.

At a project sustainability workshop held in February 2024, stakeholders discussed the skills acquired and expanded through DRIVE Demand activities and how these can be leveraged by the MOH for future pandemic preparedness, for climate-health data activation, and in other health areas. The workshop highlighted the need for continued capacity strengthening in GIS, expansion of GIS use beyond immunization, and the potential automation of GIS outputs to inform decision-making. From these conversations, the MOH renewed its commitment to strengthening data mapping for precision health and fostering GIS capacity throughout all levels of the health system.

To ensure continued GIS advancement, DRIVE Demand Uganda worked with the MOH to develop a sustainability roadmap outlining key considerations, costs, and recommendations for the next five years. This roadmap can be used to guide and inform climate health data warehousing, epidemic preparedness, and responsive health services.

DRIVE Demand's capacity building activities enable health clinics like this one in Wakiso District to more optimally use and manage data for decision-making. Photo: PATH/Heidi Good

STRATEGIC RECOMMENDATIONS FOR THE MINISTRY OF HEALTH

1. **Strengthen the use of digital health tools for immunization,** including DHIS2, to improve coverage, improve contact tracing, increase targeted outreach and communication for accurate information sharing, and reduce loss to follow-up.
2. **Leverage GIS digital health mapping** to reach hard-to-reach areas and improve data accuracy for patient follow-up.
3. **Continue building capacity** in reporting and use of digital health tools for health workers, owners of private clinics, and drug shops through routine mentorships and targeted training sessions.
4. **Foster coordination with key community champions,** such as teachers, to empower families with accurate, timely health information via trusted local leaders.
5. **Provide continuous supportive supervision** in data use and improvement to the mentored private facilities in Wakiso District.

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Zambia

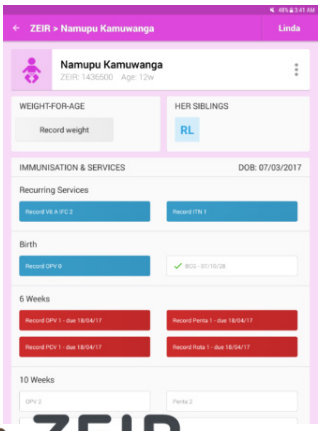
Photo PATH/Brian Mushaukwa

Fostering strong partnerships for inclusive and sustainable digital health planning

COUNTRY-DEFINED CHALLENGE

During the COVID-19 pandemic and its aftermath, Zambia saw a decrease in the percentage of children under five years of age who were fully immunized—dropping from 89.1% in 2019 to 78.6% in 2022.[1] This drop is attributable to a decline in both vaccine access and demand due to school closures, scale-back of immunization services, and general transmission concerns in the community.

To get routine and COVID-19 vaccinations back on track with national goals, Zambia's Ministry of Health (MOH) identified the need to strengthen and adapt its immunization system. Specifically, the MOH sought to enhance and expand the Zambia Electronic Immunization Registry (ZEIR) to capture both routine childhood immunization data and adult vaccinations—including COVID-19—under one system. Additionally, the MOH requested help to implement social and behavior change (SBC) research that could help them better understand local vaccine hesitancy to leverage hyper-local levers to improve vaccine uptake.



DRIVE Demand Zambia worked with the MOH to enhance and expand the Zambia Electronic Immunization Registry (ZEIR). This mockup of a ZEIR vaccine card view mimics the look of a child's paper vaccine card.

SUPPORTED BY

SOLUTION

Strengthening Zambia's digital immunization registry

As of 2022, ZEIR was being used in 29 districts in the Southern and Western Provinces to capture immunization data for children under five years of age in 596 health facilities.[2] Adult COVID-19 vaccinations were being tracked separately through the DHIS2 Tracker. At the launch of DRIVE Demand, DHIS2 records had data backlogs of hundreds of thousands of entries.

To address the need to capture immunization data quickly and appropriately to inform health decision-making during the pandemic and beyond, the MOH took a two-fold approach. They were working with other donors and implementers to update DHIS2 while simultaneously working with the DRIVE Demand Zambia team to update ZEIR. The updates to ZEIR were to include:

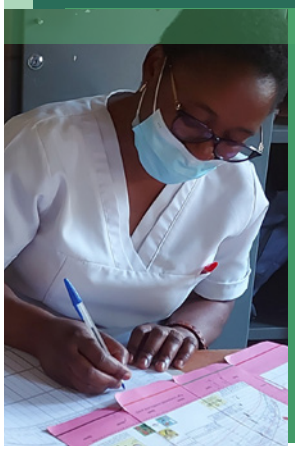
- capturing adult vaccination (e.g., COVID-19) data in addition to routine childhood vaccinations;
- modifying the existing childhood vaccination module to include additional indicators;
- expanding the platform's use into Lusaka Province to reach a majority of Zambians; and
- ensuring compliance with HL7 Fast Healthcare Interoperability Resources® (FHIR), a growing international standard for data exchange and enhancements to what data is being captured for children's health records.

The DRIVE Demand team worked in close collaboration with the MOH, past ZEIR partners Ona Systems and BlueCode, and a User Advisory Group (UAG) to design and implement these updates.

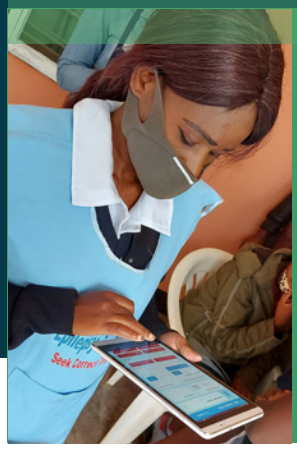
Building a foundation for DHIS2 Tracker enhancements

From late 2022 into 2023, enhancements were made to both platforms. Then, in November 2023, the MOH decided to pivot the planned support for ZEIR in favor of DHIS2 Tracker, which had captured the backlogged records and was being used more consistently for immunization data entry. Rather than adding adult immunizations to ZEIR, they would instead optimize DHIS2 Tracker to also support routine childhood and adult immunization services moving forward. This decision was made following extensive technical discussions and consultations between the MOH, donors, and partners based on lessons learned from the early use of ZEIR as well as the more recent use of DHIS2 Tracker for COVID-19 vaccination.

> *We write our reports in books and then copy the information into reports at the facility. This takes so much time. Having access to digital tools to register this information directly can reduce our effort and result in us spending less time at the facility."*
>
> A community-based volunteer (CBV) in Kazungula district, Southern Province, Zambia, who wished to remain anonymous.



Jane, a nurse in Maramba Clinic in Livingstone, Southern Province, works late entering immunization data from a paper tally sheet into a facility register before proceeding to enter the same data into an Excel sheet, illustrating the duplicative efforts often needed with paper-based systems.



A nurse shows MOH officials how to enter data directly into the ZEIR app during routine immunizations. Digital systems like ZEIR and DHIS2 save workers time and effort by providing a single point for data entry.

Photos: PATH/Brian Mushaukwa

In line with this decision, the DRIVE Demand Zambia team quickly pivoted to realign the project's remaining activities and resources to support the hosting and scale-up of the DHIS2 Tracker for childhood immunizations. In March 2024, the team facilitated a meeting to discuss project sustainability and provide training on total cost of ownership (TCO). The team worked with the MOH to leverage the Digital Square TCO Tool[3] to calculate an accurate estimate of the total long-term costs of using DHIS2 Tracker—including human resources, infrastructure, training, hosting, and scaled implementation.

> *My husband stopped all our children from getting the COVID vaccine because he did not understand, but then the nurses explained it to us and we all got the vaccine."*

Jane Zimba, a community health worker and focus group participant from Kafue district, Lusaka, Zambia, in February 2024. Focus group discussions revealed the power of information from trusted sources to change people's behavior around vaccinations.

PATH/Brian Mushaukwa

The team also highlighted ways to support filling the known gaps of DHIS2 Tracker, such as challenges with offline functionality. Being able to use the registry while offline was identified by health workers during DRIVE Demand's user-centered design discussions as a key challenge for health workers who may work in areas without connectivity.

Finally, the DRIVE Demand Zambia team created a technical report detailing how the project's initial work on ZEIR adaptations could be applied to DHIS2 Tracker enhancement, deployment, and implementation.

Strengthening FHIR capacity within the MOH

As part of the efforts to update ZEIR, DRIVE Demand Zambia assisted the MOH with becoming FHIR-compliant. The FHIR standard enables digital systems to be more easily adapted and integrated with other interoperable systems (e.g., in the event of needing to add a module for a new disease) to share data in real time.

Even after the MOH decided to switch to DHIS2 Tracker, FHIR compliance remained a priority. The DRIVE Demand Zambia team held FHIR training sessions for key technical staff from the MOH Information and Communication Technology (ICT) Directorate in March and April 2024. The training sessions served to build capacity on FHIR interoperability standards, FHIR-native application development, and the development of adapters to link FHIR-native applications with non-FHIR-native platforms, such as DHIS2 Tracker, as part of a process toward one national electronic immunization registry.

SOLUTION

Understanding hyper-local barriers and enablers to vaccine acceptance

To understand hesitancy and inform vaccine messaging for social and behavior change (SBC), DRIVE Demand enlisted the Busara Center for Behavioral Economics to conduct behavioral research in four locations across the DRIVE Demand project: Bamako, Mali; Dar Es Salaam, Tanzania; Kampala, Uganda; and Lusaka, Zambia. The study was designed to use focus group discussions to gather information from three populations: adults who had not received the COVID-19 vaccine in the past year; pregnant people who had not received the COVID-19 vaccine in the past year; and health care providers who administer vaccines.

In Zambia, focus group discussions occurred in March 2024 in Kafue district within Lusaka Province. Focus groups included 37 participants (12 unvaccinated adults, 13 unvaccinated pregnant women, and 12 community health care workers). The participants were recruited from health facilities and communities based on COVID-19 vaccine coverage.

Findings across the four countries are presented in *Dynamics of Vaccine Hesitancy: A Practitioner Playbook*.[4]

ENSURING PROJECT SUSTAINABILITY

As a two-year project, DRIVE Demand Zambia sought to ensure that all activities could be sustainably carried on past the life of the project. To do this, the team partnered closely with the MOH and local partners throughout the project to ensure alignment, a shared vision, and adequate local capacity to manage efforts going forward. When the MOH requested the pivot in activities from ZEIR to DHIS2, the close working relationship enabled DRIVE Demand's adaptability and flexibility to apply lessons from the previous work on ZEIR toward the new DHIS2 Tracker system.

The engagement with the UAG proved critical to gathering timely and inclusive user feedback from multiple levels. By using this user-centered design approach, the project was better able to gain local buy-in for all approaches, promoting country-led sustainability.

Finally, DRIVE Demand Zambia sought to strengthen institutional capacity in multiple ways, helping ensure that the systems could be locally led, developed, and maintained by the MOH for sustainability. First, the team worked with local technical vendor Blue Code for the system adaptation, user-experience insights gathering, and final project sustainability reporting. Second, the team provided FHIR training sessions for MOH team members, helping to fill a critical gap in local digital health capacity. Finally, the team's total cost of ownership (TCO) and sustainability analysis provided critical information to enable informed decision-making for sustainability.

While these tools, recommendations, and user-centered processes were focused on supporting increased immunization under DRIVE Demand, they can also continue to be used by the MOH and counterparts across health areas for future adult vaccinations such as HPV, climate-health data needs, or pandemic preparedness.

STRATEGIC RECOMMENDATIONS FOR THE MINISTRY OF HEALTH

1. **Continue building local development capacity:** Continued collaborative engagement with MOH, particularly the ICT team, for technical capacity building is key to ensuring sustainability, ownership, and scale-up of solutions with leadership from MOH personnel who have capacity to move forward to solution optimization, refinement, and enhancement.

2. **Plan for required ICT infrastructure:** Planning for infrastructure and the associated costs with MOH helps enable a smooth transition of tools to MOH. This includes data storage, hosting, and ensuring MOH access to source code and infrastructure--even when local technology developers are supporting platform adaptations.

3. **Leverage community-based, multi-tier user advisory groups (UAGs):** As a feedback mechanism, UAGs support ownership across levels of system users and help refine platform adjustments based on unique project needs. Engagement of front-line users is key but must be intentional. Appropriately profiling and supporting the needs of subnational and national decision-makers is likewise key to ensure end-to-end buy-in and ownership of the system and solution.

4. **Continue using the TCO Tool and Sustainability Calculator:** The TCO tool developed by PATH and Vital Wave is practical for consideration of all costs needed for sustainability and longevity. Going forward, this tool can be refined to ensure that it is useful not only in end-of-project sustainability settings but also at the start of any digital health project to ensure a sustainability mindset.

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About DRIVE Demand

With support from The Rockefeller Foundation, Digital Square at PATH launched the Digital Results Improve Vaccine Equity and Demand (DRIVE Demand) project in June 2022 with the goal of increasing vaccine demand and acceptance rates in six countries: Honduras, Mali, Tanzania, Thailand, Uganda, and Zambia. By driving demand for COVID-19 vaccination awareness, acceptance, and activation, the project aims to increase each country's overall vaccine uptake while also strengthening the broader routine immunization program for long-term sustainability.

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