Zambia

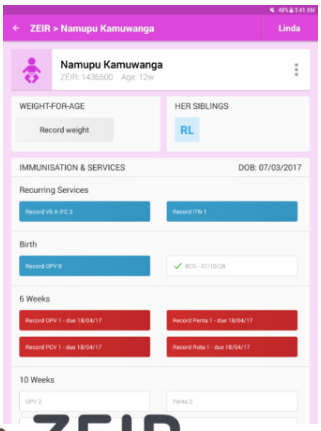
Photo PATH/Brian Mushaukwa

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.

ZEIR

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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:

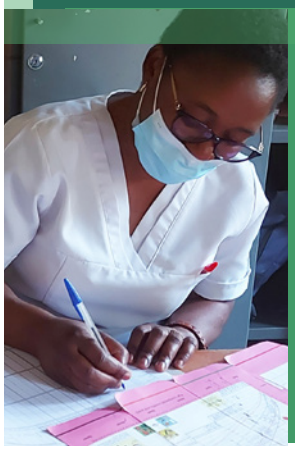
- capturing adult vaccination (e.g., COVID-19) data in addition to routine childhood vaccinations;
- modifying the existing childhood vaccination module to include additional indicators;
- expanding the platform's use into Lusaka Province to reach a majority of Zambians; and
- ensuring compliance with 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.

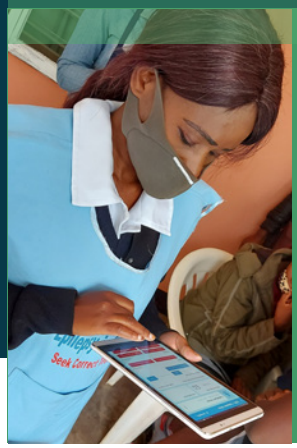
Building a foundation for DHIS2 Tracker enhancements

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.

References

1. UNICEF. *UNICEF highlights a decline in vaccination coverage that leaves children unprotected against childhood diseases*. 24 April 2023. Available at: https://www.unicef.org/zambia/press-releases/unicef-highlights-decline-vaccination-coverage-leaves-children-unprotected-against.
2. Carnahan E, Nguyen L, Dao S, et al. Design, Development, and Deployment of an Electronic Immunization Registry: Experiences From Vietnam, Tanzania, and Zambia. *Global Health*: Science and Practice. 2023; 11(1): e2100804.
3. Digital Square at PATH. *Total Cost of Ownership Tool*. Available at: https://digitalsquare.org/tco-tool.
4. Busara Center for Behavioral Economics and PATH. *Dynamics of Vaccine Hesitancy: A Practitioner Playbook*. 2024.

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.