

The BID Initiative Story

Improving health services through innovation in data quality and use



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The BID Initiative Story highlights the value of collaborative, country-driven planning; local leadership and ownership; user-centered design; and continuous learning and adaptation when developing and deploying innovations. It also shows why we are optimistic about our progress and future efforts to improve health services and outcomes across sub-Saharan Africa by transforming data collection, quality, and use.

Photo: Bill & Melinda Gates Foundation/Riccardo Gangale

Overview

At the Usa River Health Facility in Tanzania, it used to be hard for Sister Oliver Mlemeta to plan for immunization clinics. To figure out how many children were due for vaccinations, she'd spend hours sifting through paper records and tallying numbers. Afterward, she'd cross-check that information against her facility's vaccine stocks. If Oliver didn't have enough supplies on hand, she'd call neighboring clinics and retrieve what she needed by motorbike. Sometimes, she had to turn mothers and children away because she'd run out of vaccines.

It didn't end there. Oliver and her team often worked nights and weekends to record data on paper forms for the hundreds of children they saw during a single immunization clinic. After they sent the data to the district office, at the end of the month, they seldom saw it again. Had the clinic seen more patients than last month? Why the sudden surge in children who didn't come back for their scheduled vaccines? With no feedback loop and no means to process and analyze this information, they couldn't address gaps in care, accurately calculate their target population, or determine children who had recently missed vaccines.

Putting the right information in the right hands

The BID Initiative was designed to make Oliver's work easier, to help her access and use data to do her job better, and to reach more children with lifesaving vaccines. By transforming data collection, data quality, and the use of that data to make decisions, BID worked to empower health workers and countries to improve immunization and overall health service delivery.

Launched in 2013, BID was led by PATH and the governments of Tanzania and Zambia with support from the Bill & Melinda Gates Foundation. The initiative was grounded in the belief that better data, plus better decisions, will lead to better health outcomes. Although BID initially focused on testing and proving its approach with immunization programs, the interventions were designed to be applicable to other health areas, such as nutrition or maternal and newborn health.



Patients wait at Usa River Health Center in Tanzania.

Photo: PATH/Trevor Snapp

Laying the Groundwork

2013-2015

Laying the groundwork through partnerships and user-centered design

The BID Initiative began with collaborative, country-driven planning involving members from all levels of the health system to ensure that solutions would meet local needs and challenges. By engaging multiple countries in sub-Saharan Africa, we determined their most critical immunization service delivery problems and related data challenges. We then worked with technology developers to explore digital solutions that could be coupled with change management approaches to encourage adoption of the digital solutions and increase use of the data captured. We partnered with two countries, Tanzania and Zambia, to lead the implementation, and we established a peer learning network for countries across sub-Saharan Africa to share information, tools, and lessons learned.

Identifying country partners committed to designing and advocating for data quality and use interventions

The “last mile” references the final challenges a country faces as it works to vaccinate all members of its communities and achieve full immunization coverage. At the root of this challenge are fragmented and weak information systems. BID conducted a landscape assessment to identify ten potential demonstration countries where accurate, timely, and accessible data could be used to ensure the right vaccines are administered to the right people, at the right times. BID and its partners then convened representatives from all ten countries for a **consultation meeting** in Nairobi, Kenya, to get a better sense of the data-related opportunities and barriers to closing the immunization gap.

Despite the challenge before them, countries agreed on the need to prioritize improvements in information systems. Their enthusiasm and commitment were unwavering. Although the purpose of the country consultation meeting was to exchange knowledge around information systems and data management policies needed to strengthen immunization programs, it was also an opportunity to forge partnerships. Tanzania and Zambia emerged with strong ambitions and dedicated commitment to improving immunization data, quality, and use. BID worked with the governments of both demonstration countries to designate a region or province to initiate work on interventions with the goal to test, refine, and then scale up. In Tanzania, the Arusha region represented a unique opportunity and series of immunization challenges due to its porous border with Kenya, pastoral populations, and variations in urban, peri-urban, and rural settings. In Zambia, the government visited health facilities in four districts and, after observing strengths and opportunities as well as the presence of key challenges, identified Southern Province as the strongest region for BID’s initial demonstration.

“Data is not just for policy and planning, but it is also for service delivery. Investing in terms of infrastructure is one thing, but more so our desire is to invest critically in human resources – [the] people that are going to look at numbers and make decisions based on those numbers. [Health workers] are used to collecting data, but there hasn’t been a need for them to critically look at the numbers...Our desire is to transcribe that information into people and realize that every digit that goes on record is a human.”

– DR. MPOKI ULISUBISYA, PERMANENT SECRETARY OF TANZANIA’S MINISTRY OF HEALTH,
COMMUNITY DEVELOPMENT, GENDER, ELDERLY, AND CHILDREN

Because many countries were grappling with the same issues, participants suggested establishing an African-led, peer learning network—to be known as the BID Learning Network, or BLN. The BLN would bring together digital health experts and immunization program leaders from across sub-Saharan Africa to exchange experiences in implementing electronic immunization registries, data management systems, change management approaches, and data use policies and practices. Despite their varying health landscapes, the more than 20 participating countries involved in the BLN share many common challenges and potential areas of learning.

Convening technology developers to identify promising tools for testing

Now that BID had a roadmap forward, we needed to understand how to get there. Digital tools present one solution to closing the immunization gap. In December 2013, the BID Initiative held a Tools Developer Summit in Washington, DC. Groups that develop information and communication technologies joined BID, partners, and donors to provide a deeper understanding of the tools available to improve immunization information systems.

These ranged from electronic immunization registries to SMS systems, GIS technologies, and even biometrics tools.

Using a series of lightning talks and breakout sessions, summit participants focused on how these technologies could be used for communication, patient identification, and supply chain management. BID asked for “there’s an app for that” opportunities—situations where new ideas or an integration of existing ideas would help improve data and processes related to immunization. Throughout the BID Initiative, this group collaborated to explore solutions for information system challenges in sub-Saharan Africa.

-  [BID Initiative theory of change](#)
-  [The journey to scale: Moving together past digital health pilots](#)
-  [BID Initiative product vision](#)

Establishing the BID Learning Network

Sometimes the best solutions have a deceptively simple answer, or the solution already exists. Peer learning networks are an opportunity for professionals working across a range of workplaces, sectors, and countries to swap experiences, share best practices, and adapt defined solutions to their own contexts, so as not to reinvent the wheel. Throughout BID’s journey, the BLN has been a platform for this sharing, fostering continuous learning and communication among countries.

Outlining a standard process for designing an information system

Building on previous work by PATH, the Public Health Informatics Institute, and other groups, we led development of a product vision document outlining a process for designing a scalable immunization information system. Representatives from Tanzania, Zambia, and other BLN countries contributed to the document’s development.

In seven chapters, the [product vision document](#) outlines a series of steps for gathering and organizing needed information. Chapters cover topics such as user personas, business processes, user and system requirements, and use scenarios.



BLN participants visit Kaoleni Health Center in Arusha, Tanzania.

Photo: PATH/Trevor Snapp

In May 2014, representatives from 13 different countries and international partners assembled in Kigali, Rwanda, for the **formal launch of the BLN**. The dynamic convening allowed members to talk and work directly with others in the same space, to strengthen immunization programs through innovations in data availability, quality, and use.

The BLN embodies demand-driven and African-led solutions. So, when BLN members met again later that year at the first Design Collaborative in Lusaka, Zambia, participants took full charge of the agenda. The subsequent Design Collaboratives held across Africa focused on country-identified priorities such as immunization registries, change management, and supply chain logistics.

Between meetings, BLN members provided input on the design and testing of data quality and use interventions for Tanzania and Zambia and shared learnings through webinars, an online discussion forum, and our BLN Resource Library. The network provides an opportunity for other countries interested in improving their health programs through better data and decision-making to adopt aspects of the BID Initiative and adapt them for their own country context. For example, through the small grant program, The Gambia developed an immunization registry, called E-Tracker, and piloted its use in the Western Health Region. If the pilot proves successful, The Gambia is expected to scale the system nationally.

 **Recommendations and lessons learned:**
Peer learning

“The value in peer learning is enormous. You can’t quantify it. When my peer trains me, I understand it better...Because most of us come from the same environment.”

– DOMINIC KWABENA ATWEAM, BLN MEMBER AND POLICY PLANNING MONITORING AND EVALUATION DIVISION, GHANA HEALTH SERVICE



On a field visit during a BLN meeting in Dakar, Senegal, participants visited the National Procurement Pharmacy and learned about Senegal’s use of Logistics Management Information Systems (LMIS). Field visits brought digital solutions to life and helped participating countries understand how these tools might be adapted for their own country contexts.

BLN meeting dates/ locations/topics

- May 2014: **BLN launch** (Rwanda)
- Dec 2014: **Design collaborative** (Zambia)
Electronic registries
- May 2015: **Design collaborative** (Senegal)
Logistics Management Information Systems (LMIS)
- Dec 2015: **Discussion meeting** (Tanzania)
Tanzania and Zambia progress
- May 2016: **Design collaborative** (Ghana)
Electronic registries
- July 2016: **Study visit** (Benin)
VaxTrac implementation
- Nov 2016: **Design collaborative** (Uganda)
Change management
- Aug 2017: **Study visit** (Chile)
*Nationwide implementation of an immunization registry
(Pan American Health Organization)*
- Sept 2017: **Discussion meeting** (Zambia)
BID Initiative progress and future prospects

Photo: MEASURE Evaluation
Strategic Information for South Africa

Dr. Eddie Mukooyo Sefuluya

CHAIRPERSON FOR THE UGANDA AIDS COMMISSION
AND BID LEARNING NETWORK MEMBER

The whole is greater than the sum of its parts. This is how Dr. Eddie Mukooyo Sefuluya, a BLN member and Chairperson for the Uganda AIDS Commission, describes the peer learning network that for the last five years has tackled some of the most complex challenges facing health information systems—and developed its most promising solutions. The BLN comprises more than 20 countries in sub-Saharan Africa. With conversation topics ranging from the design of patient registers to community-based early warning systems for Ebola outbreaks, the BLN allows participants to connect, learn, and collaborate in ways that advance their own discrete efforts, while also accelerating the pace of progress for all.

Dr. Mukooyo's voice bubbles with excitement as he recalls the first time he was invited to speak at a BLN meeting in Ghana. In his 35 years in the field, he had never had an opportunity to share his experience on this scale, among his peers.

The day of the meeting, the room was arranged into small clusters of tables and it crackled with energy. It wasn't like the lecture-style classroom settings he'd experienced before.

"Peer learning networks allow us to brainstorm our different scenarios and people are able to talk about what works, what doesn't work, the pros and cons and together agree how we can move forward. The beauty of it is it [creates] platforms where you can link and network...so that we don't have to reinvent things that are working, but rather improve and contribute to what other people have already done."

In this setting, everyone has something to contribute, and everyone has something to learn. Surrounded by government officials from ministries of health all over sub-Saharan Africa, the room swelled with excitement, and everyone's titles melted away. In their place were the shared experiences of its participants and a common goal to strengthen health information systems with digital solutions.

"At the end of the day, you're part of this movement toward change," says Dr. Mukooyo.

"You are benefiting from each other's experiences and leapfrogging off one another, taking advantage of each other's knowledge and skills."

Over the years, the BLN has provided a number of platforms and outlets for learning exchange. Study visits have allowed members to observe countries that have successfully designed and implemented data management interventions, while forging professional relationships with peers working on similar challenges and solutions. Discussion meetings have enabled healthy debate, propelling the field to a more common understanding of digital policies, products, and practices. Webinars have helped crystallize learnings, and small grant awards have provided seed funding for countries to pilot interventions in their own health systems. Without these opportunities, countries risk duplicating efforts and investing in technologies or strategies that don't yield high impact. It's a uniquely authentic exchange that's fostered true camaraderie across countries and countless learnings.

For instance, after visiting several health facilities implementing the Tanzania Immunization Registry (TImR) in Arusha, Tanzania, Dr. Mukooyo was moved by the health worker testimony he heard that day. He saw health workers nimbly navigating tablets, entering patient data, and calling up vaccine records. He wanted to learn more, and wrote his colleagues in Tanzania.

“One of the objectives of the BLN is to learn from and energize each other, so that [members] can take these examples and deploy them in their own countries,” he recalls.

“They responded immediately. They sent resources, even the source code [for TImR].”

In Uganda, the government has recently introduced its own eHealth strategy. Dr. Mukooyo has personally championed the establishment of the health management information system in the country, moving Uganda from monthly, quarterly, and annual paper reporting to an electronic system supported by the DHIS2 in all districts.

As the BLN evolves and grows, Dr. Mukooyo hopes the network will become a model and megaphone to amplify the collective knowledge of the rest of the continent, maybe even beyond.

“I want it to evolve into something bigger than what it is, so that it’s a driving force for change. It gives me hope. Because when you see other countries succeeding in this area, you know you can do the same.”



Photo: PATH/Trevor Shapp

BLN participants visit a health facility to learn more about Tanzania’s electronic immunization registry.

Implementing solutions

2015–2017

Developing and implementing data quality and use solutions

Together with Tanzania, Zambia, and BLN members, BID developed and implemented a comprehensive set of interventions to improve data collection, quality, and use. We first identified a suite of proven interventions spanning data management policies and practices, information system products, and training. Together with end users from all levels of the health system, we collaboratively developed this package of interventions for use in Tanzania and Zambia, then piloted the interventions in select facilities and regions before further rolling out.

Based on a [literature review](#) and [landscape analysis](#) of previous, relevant projects and in close partnership with Tanzania and Zambia, BID identified a holistic package of interventions that could be replicated and adapted in other countries to improve immunization service delivery. These included:

- An electronic immunization registry with supply chain information.
- Automated, simplified report generation.
- Data use campaigns.
- Micro-training videos.
- Peer support networks.
- Barcodes or QR codes on child health cards and vaccine supplies.
- Targeted supportive supervision for health workers.
- Data visualizations/dashboards to monitor facility and neighboring facility performance.

 [A health worker's journey: Oliver's life after the BID Initiative](#)

Developing electronic immunization registries

In a scene characteristic of most health facilities across developing countries, bulky paper records overflow from bookshelves and tower above desks, sometimes hiding the health workers seated behind them. Inside each record are rows and rows of patient data. Searching for a child's immunization history in one of these books is like looking for a needle in a haystack. Electronic immunization registries (EIRs) replace this cumbersome system of manual recordkeeping and have been a critical component of BID's intervention package. EIRs help ensure that every child is registered for immunization from birth and receives all recommended vaccines. By providing timely, accurate, and complete data, EIRs also empower health workers, so they can do their jobs more effectively and efficiently.



Before data quality and use interventions were introduced under the BID Initiative, health workers spent hours collecting, recording, and summarizing immunization data.

The BID Initiative supported development of an electronic registry for each country, which required intensive, sustained collaboration by our team, the governments of Tanzania and Zambia, health workers, and our technical partners. The success of the software development process hinged on documenting and applying knowledge of many factors, such as:

- In-depth knowledge of routine immunization services, clinical care, and vaccine schedules in each country.
- An understanding of micro-level, individual-level data that feed into the EIR as well as macro-level data on system outputs.
- Knowledge about the ways in which data may be used to improve immunization service delivery at each level of the health system.
- Understanding and awareness of the landscape of information system strategies and tools in the country and established standards to ensure EIR data can be shared with other systems (such as District Health Information System 2, or DHIS2).

New technology entails a learning curve, particularly among health workers who've used paper registries throughout their careers. The EIRs introduced under BID were no exception. Active engagement of local stakeholders at all steps of the process was critical to ensure that the EIRs were truly functional and enhanced in-country skills related to data quality and use. We established user advisory groups (UAGs) in both Tanzania and Zambia, composed of staff from every level of the health system, to define data needs, refine innovations, and plan rollout strategies.

In one UAG meeting in Zambia, for instance, members were split into small groups and provided with tablets to test early prototypes of the EIR. UAG members buzzed with excitement as they crowded around the screens. They practiced registering children using mock data, entering names, place of residence, date of birth, and weight, and modeled the process for high-volume clinics, where 50 or more children may be seen in a single day. The first attempts were not without trial and error, but UAG members quickly mastered the system, and their feedback informed future iterations of the EIR.



Photo: Ona

Matt Berg

CEO, ONA

Matt Berg, the CEO of Ona, a Nairobi- and Vermont-based technology company, remembers one of the first immunization clinics he witnessed in Livingstone, Zambia. As a long queue of patients waited to be vaccinated, three health workers and one community health volunteer busied themselves with that day's work.

The community health volunteer weighed children, placing infants into a hanging canvas scale. Two nurses sat at a desk, immunization-related papers fanned out before them. As one pored over a paper registry, the other recorded data on a tally sheet and updated the child's immunization card. A third nurse administered vaccines inside the clinic.

Matt couldn't help but wonder what could be done to allow the small cadre of health workers to spend more time with patients, instead of administrative tasks. A more streamlined immunization process would make for shorter wait times and a more meaningful exchange between patients and nurses, and it would free up the workers' time for other critical clinic tasks.

Despite global progress, one in five children worldwide still lacks access to lifesaving vaccines. The missing "fifth child" refers to the hardest-to-reach children in these communities, an estimated 20 percent of children globally, that health systems are chronically missing. Digital systems are increasingly seen as a solution to help locate and immunize these vulnerable children.

Matt had been working in mHealth for much of his adult career when the BID Initiative approached the company in late 2016 with a request about what it would take to develop a digital platform for immunization. The BID Initiative was already partnering with developers on an EIR based on the generic DHIS2 platform, but there were serious questions as to whether it could be secured, adapted, and scaled nationally.

Recognizing the importance of a rapid, iterative software development process, and the need to minimize costs and expedite timelines, BID turned to Ona with the Ministry of Health's requirements. Since 2014, Ona had been developing a platform called OpenSRP. Its modular design can be adapted to different country needs and settings and a variety of health areas, including immunization. Though Ona had worked in other countries, including Pakistan, Indonesia, and Bangladesh, Zambia presented an opportunity to achieve much larger geographic and health worker coverage.

"BID has been catalytic for us," explains Matt. "It gave us the chance to showcase OpenSRP's potential, which is the culmination of years of blood, sweat, and tears."

The Zambia Electronic Immunization Register (ZEIR), as it would come to be known, presented a break from many of the existing generic platforms that apply a one-size-fits-all approach to data collection.

"We evaluated the mHealth space closely and it's our firm belief we will always have to compromise on user experience if we make something generic," he says. "By generic, I mean a form-based app that you can use for immunization, antenatal care, or any other health workflow. We figured that a lot of kids get immunized each year, so why not give health workers an interface optimized for immunizing children."

Matt added, “We have also seen great value in the approach of creating a very standardized app, in that it makes it easier to build a global community of practice around it. The ability to compare notes between teams running the same app in Bangladesh and Zambia has been invaluable.”

To design a system that was truly functional, Ona convened a series of design workshops. Using interactive prototypes, they asked health workers to define the basic system requirements. They also studied the daily routine of health workers under the current paper system. Witnessing scenes like the one described above, where multiple nurses were assigned to various tasks of vaccinating children, helped inform a series of use cases, or scenarios, in which health workers were likely to interact with the system. In doing so, Ona was able to design ZEIR for multiple contexts. These findings led Ona to get rid of data entry forms whenever possible, giving the immunization interface its unique look and feel.

Of course, ZEIR has not been without its challenges. When Ona first began work on ZEIR, it had just two weeks to translate system requirements into visual designs and workflows. Ona had a similarly aggressive timeline to develop and pilot the system before broader rollout.

Matt cautions that while ZEIR has been largely triumphant, the real test lies ahead. ZEIR was designed for national scale-up and its success depends on the government’s ability to secure sustainable training mechanisms, funding sources, and health worker buy-in.

“This is what BID has convinced me of—for us to be successful in the long run, the technology can only take you so far,” says Matt. “Once having demonstrated this is actually possible, it’s about promoting data use and getting buy-in from all key stakeholders until it firmly takes root.”



Photo: PATH/Chimwasu Njapawu

A health worker uses a tablet to record and reference immunization data.

Integrating change management

One of the main criticisms of many efforts to implement new digital tools is that they do not adequately address socio-technical factors—that is, they do a poor job of addressing human aspects of intervention adoption. Applying change management practices ensures that digital health technologies are adopted and integrated within existing processes and cultures of health facilities. For the BID Initiative, change management has complemented implementation of the EIRs. For example, using WhatsApp, health workers connected with their peers from other facilities to troubleshoot filling out monthly reports and ensure sufficient vaccine supply.

 **Recommendations and lessons learned: Change management**

 **Recommendations and lessons learned: Electronic immunization registries**

Engaging users to iterate and adapt a registry for Tanzania

In Tanzania, the BID Initiative and the Ministry of Health, Community Development, Gender, Elderly, and Children (MOHCDGEC) teamed up with technical partners to develop the first iteration of their EIR, the Tanzania Immunization Information System (TIIS). The TIIS was an adaptation of an open source platform, GIIS, that was designed and developed to be able to share data with other systems through standards-based data definitions and application programming interfaces (APIs). Because of the complexity of the solution being developed, the timeline for developing TIIS had to be extended from three months to six months—a lesson that was considered in subsequent EIR development.

Pilot use of TIIS, however, showed a need for improvements. The system was slow and frequently crashed, making it difficult for health workers to keep up on busy clinic days. The system also had challenges with synchronization, which led to problems with data integrity and use among facilities using multiple tablets. These challenges and user input led to the decision to seek a tool that would better meet the needs identified for data collection.

In late 2016, TIIS was followed by an improved EIR, the Tanzania Immunization Registry (TImR). TImR provides each health worker with a unique login, offers better synchronization, and enables health workers to order vaccine stock directly through the information system. Its summary reports and colorful data visualizations also help health workers understand and improve upon their performance. TImR effectively manages immunization services by automatically tracking and notifying health workers about the children in their catchment area due for immunization, which vaccines they need, and how much stock and supplies the clinic requires to accommodate these patients. On immunization days, health workers can search for a child record by simply scanning the barcode sticker on each child's health card and update the child immunization record in the registry.

“It was important for all these new interventions to be tested. After testing, we had a better understanding of which interventions would be helpful and would provide solutions to our immunization challenges.”

– DR. CLIFF HARA, CHAIRPERSON OF ZAMBIA'S USER ADVISORY GROUP,
DISTRICT DIRECTOR OF HEALTH

The data are accessible at all levels of the health system from the facility level up to the national level, allowing visibility into programs and vaccine stock levels, through interoperability with the Vaccine Information Management System (VIMS) and then to DHIS2. The registry also stores contact information for parents, so health workers can follow up if a child misses a scheduled vaccine. Thanks to the registry's automated reporting, health workers spend more time delivering care and less time preparing and reporting.

“My clients are very happy, especially when I share with them the reports showing the green color on immunization coverage [which indicates excellent performance], and when they see their children's electronic cards in the system. They feel the [improvements in] service, as we get more time to discuss their child's developments. They know that I will follow up, unlike before, since we have all the information at a click of a scanner.”

– MUSA MAPUNDA, A REPRODUCTIVE AND CHILD HEALTH (RCH) NURSE AT MAKUYUNI DISPENSARY IN KOROGWE DISTRICT, TANGA REGION, TANZANIA

Photo: PATH/Trevor Snapp



Oliver Mlemeta (left), sister in charge, and Beatrice Owawa (right), medical attendant, prepare for an immunization day at Usa River Health Center in Tanzania.

Although TImR required a new user interface and some additional training, we minimized disruption in Arusha Region, where the previous version of the registry (TIIS) had already been rolled out, by waiting to switch systems until after TImR was successfully implemented in other facilities in Tanga. Thanks to careful planning and precise coordination with Tanzania health officials, data migration was successfully completed in the Arusha Region in early 2018.

Recommendations and lessons learned: Software development cycle

Balancing implementation timelines and software development in Zambia

Initially, the BID Initiative and Zambia Ministry of Health partnered with technical experts to develop an EIR for Zambia using a patient-level Android application built on the DHIS 2 platform in late 2015. The aggregate version of this open-source platform was already implemented in Zambia as an online, national-level health management information system.

After initial tests of the system did not meet health worker requirements and revealed a lengthy software development timeline, we turned to the Open Smart Register Platform (OpenSRP) in early 2017 to develop a registry for Zambia. OpenSRP had previously been implemented in Bangladesh, Indonesia, and Pakistan, providing a foundation against which Zambia could launch its EIR.



Photo: PATH/Saumu Juma

Aziza Ahmed Seif

HEALTH WORKER, MIKANJUNI HEALTH CENTER, TANZANIA

In March 2018, Aziza Ahmed Seif and her fellow nurses at the Mikanjuni Health Center in Tanga, Tanzania, made history. They, along with workers at 32 other health facilities in Tanga, retired the thick paper immunization registers they had spent their entire nursing careers using and embraced a digital system that places a universe of data at their fingertips. They traded pen and paper for a tablet framed by colorful data visualizations, swapped crowded tally sheets for a simplified stock management module, and replaced the long evenings of record-keeping that used to characterize immunization clinics with a series of automated reports.

Mikanjuni is one of more than a thousand health facilities in Tanzania that have embraced data quality and use interventions, ranging from TImR to behavior change campaigns focused on a culture of data use and bar codes on child health cards to uniquely identify patients.

Mikanjuni sees between 20 and 24 children each day, or approximately 100 children each week. This can lead to long queues, with patients sometimes waiting several hours before seeing a nurse. Adding to their workload, health workers have historically relied on paper records to determine which vaccines patients have received, and when. But the dizzying array of data—birth dates, the number of vaccine vials on hand, and projected patient volumes—was overwhelming. If a patient missed a vaccine, it was often lost in this sea of numbers.

“Sometimes you’d forget to tally everything, because there were so many registers,” remembers Aziza. “Missing a record used to lead to a reporting disaster at the end of the month. The burden was too great when the nurse at the clinic didn’t know how the registers were filled, or if she misplaced the record.”

Several missed tallies might result in incorrect reporting and lower stock estimates, resulting in stockouts and a child potentially missing a lifesaving vaccine. Today, Aziza has mastered TImR and can adeptly navigate its different dashboard functions.

At the beginning of each work day, she checks to make sure her tablet is fully charged, consults her vaccine stock balance and the number of patients she expects to see that day, and then turns her attention to the mothers and infants who often trek miles for a check-up or vaccine.

“Mothers see the change,” explains Aziza, “and they’re happy with the improvements to service delivery and the more time they have with nurses.”

Aziza no longer feels like she’s at the mercy of this complex and unwieldy data. If, for instance, a patient doesn’t show up for an expected vaccine, she can pull up their caregiver’s mobile number in the registry and call them directly. If Aziza enters a patient’s weight and finds that they are underweight, a pop-up message appears on her tablet screen.

“It immediately tells you if the child is normal, under or overweight, which then [helps me] to start a discussion with the parent.”

Because she can pull up patient records in seconds and update them in real time, Aziza can now slow down. She takes her time with patients—carefully reviewing each child’s growth chart and tracing their progress, as she explains their nutritional status to their mothers, and when they are next due for a vaccine. In short, Aziza now has more time for what she loves most—caring for the patients who pass through her clinic.

The resulting ZEIR supports nurse workflows for child vaccination and growth monitoring. Data visualization tools make it easy for health workers to understand their individual and facility performance. Clean graphics, colors, and symbols designed for community health workers track coverage rates and indicate when a certain service, such as the second or third dose of a vaccine, is overdue. Key features of ZEIR include:

- A unique login for health workers in the same facility, allowing them to easily log in and out of a shared device to access data, even without an internet connection.
- A simple birth registration form that resembles the paper cards mothers bring with them to clinic visits.
- Data on growth monitoring, deworming status, and Vitamin A supplementation, among several other metrics, to mirror nurse workflows and help health workers avoid duplicative data entry.

After pilot use in six facilities in early 2017, ZEIR was rolled out across all health facilities that deliver immunization services in Southern Province. ZEIR is also interoperable with DHIS2 to share the critical data across the health system, and work is underway to integrate with UNICEF’s mobile app for community health workers to send reminders and register new births into ZEIR to gain even greater insights into the target population to be served.

“We have children who don’t come for immunizations, and so they are vulnerable to sicknesses, and different types of diseases. Now it’s very easy to capture that child who has missed a vaccine, because the tablet will show us.”

– REGINA CHIKELWA, NURSE AT MAHATMA GANDHI CLINIC,
LIVINGSTONE DISTRICT, ZAMBIA

Introducing and refining a comprehensive rollout strategy in Tanzania

Progress and growth is often a nonlinear process. Sometimes it is defined by significant gains and great leaps forward, and other times it is slow and steady. In keeping with this trajectory, BID’s mission to improve data quality and data use in Tanzania and Zambia has—at times—been a rollercoaster of both successes and challenges. Implementation has been one such example of BID’s ability to adapt in the face of new and evolving circumstances. In Tanzania, we first introduced our full suite of interventions, including the EIR, in two districts in Arusha Region. We piloted use in a handful of facilities and then incorporated feedback before extending interventions to other districts.

Implementation specialists visited each facility four times to ensure that tools were fully functional and that health workers not only knew how to use the EIR but understood how to interpret its outputs. Making data more pervasive and accessible isn’t enough. BID is working to foster a culture of data use in which health workers are incentivized and enabled to access, analyze, and interpret data. As a result, they feel a connection to the numbers they collect. The numbers aren’t just statistics—they are the names and faces of their community.

We learned a lot during implementation in our first region and were able to apply those learnings not only to Zambia, but to the subsequent regions in Tanzania (Tanga and Kilimanjaro). We adjusted our rollout strategy for providing on-the-job training to health workers by introducing data use mentors, who are district health staff, and transitioned to BID staff offering only need-based visits. This led to faster implementation, increased ownership at the local level, and significant cost savings with each successive introduction.

Implementation in the rural areas of Tanga Region presented logistical challenges but also validated that the interventions could be scaled to multiple geographic and health contexts. In Tanga, for instance, TImR was rolled out across all health



Photo: PATH/Mali Kambandu

Dr. Francis Dien Mwansa

NATIONAL EXPANDED PROGRAMME ON
IMMUNIZATION MANAGER, ZAMBIA

In July 2017, the Zambia Ministry of Health (MOH) and the BID Initiative hosted a showcase event to demonstrate the data quality and use interventions that had been collaboratively developed in an iterative process since 2014. During this event, a health worker from Monze in Southern Province shared his experience with data use tools, such as the Zambia Electronic Immunization Registry.

Dr. Francis Dien Mwansa, Zambia's National EPI Manager, also took to the front of the room to demonstrate ZEIR's functions to the audience. After the demonstration, a participant from a partner organization raised her hand and asked, "I keep hearing you say 'my, my.' Is this an MOH system or is it BID's? Please explain, we're getting confused."

Dr. Mwansa smiled and said, "This is my system," touching his chest for emphasis. "And I am from MOH."

This confidence and ownership exemplifies how far the BID Initiative and MOH have come in developing tools that will address data accessibility, quality, and use challenges in the health service, particularly in immunization.

The Ministry of Health has a strong connection to the data quality and use interventions because of the dynamic way in which the ministry partnered with the BID Initiative. Instead of dictating interventions and strategies for implementation, BID worked hand-in-hand with the MOH and User Advisory Groups to identify and then execute an adaptable package of solutions.

Dr. Mwansa explains: "The partnership with BID has been unique in that every step of the way, we were involved—we were part of the decision-making and BID ensured we were on board. This transparency is not something we see with all partners and programs, but it was important because we [the MOH and BID] were able to tell the same story, and it makes taking the next steps together easier."

The development process of the EIR took longer than expected and was met with several challenges along the way, but both MOH and BID rose to overcome these obstacles.

In particular, Dr. Mwansa underscores the importance of achieving data integrity. Inaccurate data can present health risks for patients and a liability for health facilities, leading to, among other issues, data loss and inaccurate or incomplete care.

“We haven’t lost sight of what we want to achieve—we needed a tool that can show us credible data. For us the most important thing is the integrity of the data, and interventions based on where the data is being generated,” says Dr. Mwansa. “This has been our driver and we have not lost that vision. We are not fancied by beautiful products and dashboards, we are focused on clean data at the point of collection, and that’s what we have with [ZEIR] right now.”

Of course, the downside of a long development process that also required changing system platforms is that it has left less time for users across the health system to experience the tool. Rollout of data quality and use interventions in Southern Province began in November 2016. ZEIR was later added to this package of solutions in May 2017.

To ensure that Southern Province has more time to use the interventions and data to improve immunization service delivery, the MOH and the BID Initiative are actively engaged with donors such as Gavi, the Vaccine Alliance, to achieve ongoing support for long-term success and sustainability. But before Zambia can consider scaling ZEIR, it will need to demonstrate the long-term benefits of using an EIR over paper registries. To do so, ZEIR will need to be implemented beyond Southern Province.

“With our clear vision, we can begin mobilizing what we need to move beyond Southern Province,” says Dr. Mwansa.

Working closely with a partner organization is not new to the MOH or to Dr. Mwansa, but there is a key difference that he notes when reflecting on the tools produced by this particular partnership. It is also one of the initiative’s greatest successes, in his eyes.

“The change management component has been the biggest positive. Everyone [in the health facilities and MOH] agrees that our involvement in the User Advisory Group, which was a large part of how change management worked, helped us succeed. This is because it allowed the health workers to provide input that would be taken on board and used. It empowered the health workers with knowledge and decision-making abilities. They saw they had the power or influence to change things, which was important. The tool is user-based, and having the buy-in from the users built trust in the tools we were developing, and it’s something unique to BID so far.”



Photo: PATH/Chimwasu Njapawu

A health worker addresses patients in Zambia.

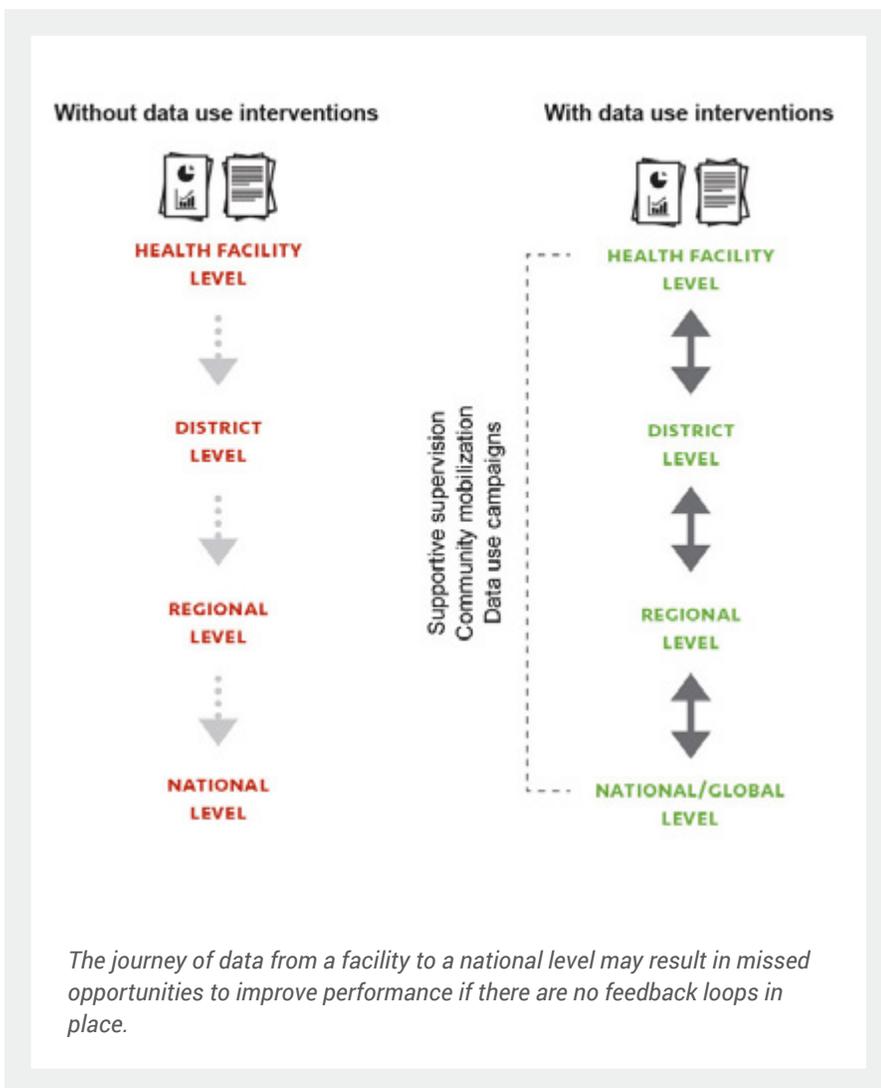
“After implementing BID, I am looking forward to everyone using better immunization data to make decisions.... When I close my eyes, I see people visiting my district from different parts of the world to learn how we improved immunization data. I also see government officials using our data to stress the importance of childhood vaccination.”

– ANNA NANYANJE, IMMUNIZATION MENTOR, MERU DISTRICT, ARUSHA REGION, TANZANIA

facilities in just under two months. In Kilimanjaro Region, we proudly took a supportive role as the MOHC DGEC led the implementation launch meeting with the region’s most senior officials in attendance—including the highest regional leader, the Regional Commissioner.

Progressive implementation across the three regions not only demonstrated the scalability of the interventions but also illustrated the government of Tanzania’s commitment to the work.

Recommendations and lessons learned: Rollout strategy



“Expansion of the BID Initiative in the Tanga Region gives us confidence that our hard work of providing input in the design and testing of interventions in Arusha has paid off. We were involved in the BID Initiative from its inception, and health care workers at all levels gave their valuable inputs tirelessly. We are hoping that the lessons learned from Arusha will be a stepping stone toward successful rollout in the Tanga Region and beyond.”

– DR. WONANJI V. TIMOTHY, REGIONAL MEDICAL OFFICER, ARUSHA REGION, TANZANIA

Rolling out interventions in Zambia's Southern Province

Taking a cue from Tanzania, Zambia developed a rollout strategy that centered on change management interventions, such as data use campaigns and peer support networks in the form of WhatsApp groups. In doing so, BID established a culture of data use before introducing the EIR. For example, we required a greater level of change management experience for the BID staff in Zambia as we grew to appreciate their critical role as change agents. We also focused on building health workers' confidence in using ZEIR and other intervention tools. While tablets and barcode scanners enable health workers, the data itself are also a tool. The health workers were encouraged to see the value and utility of more accessible data. Timely, actionable data allow health workers to promptly reference patient records, ultimately resulting in better health outcomes.

“Immunization is not sufficient if we don't know who should receive vaccines, where these children are, and what vaccines they should be getting. This information matters as much as the vaccines. Data is a critical tool in the health service and all measures to improve its integrity at the health facility level should be put in place.”

– MRS. ESTHER LUNGU,
FIRST LADY OF ZAMBIA

Recommendations and lessons learned: Data use

In July 2017, the BID Initiative sponsored a showcase event in Lusaka to celebrate successes in Zambia, including the formal release of the ZEIR. The event featured remarks by First Lady Esther Lungu; Dr. Chitalu Chilufya, MP, the Minister of Health; and other special guests. The high-profile speakers signified the government's strong commitment to the work.

Challenges and obstacles on BID's journey

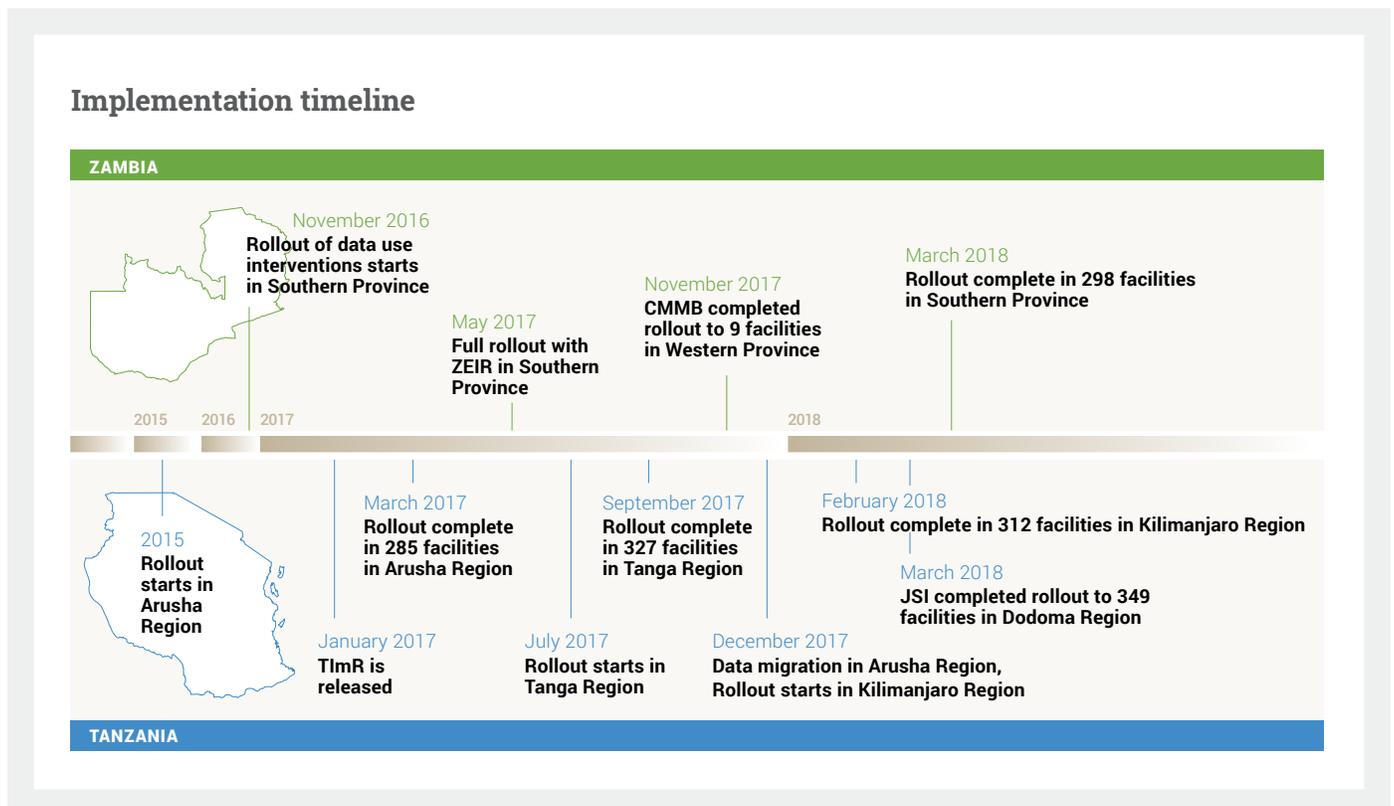
Although we have many successes to celebrate, BID's journey also included many challenges and obstacles. Our goal has always been to share these challenges so that others can learn from our experiences. We have covered some these challenges earlier on in the story ranging from technical setbacks with the EIR development to implementation and governance challenges. Some additional obstacles included:

Sharing lessons learned in Chile

Even as BID clocked achievements in Tanzania and Zambia, it took every opportunity to learn from other countries implementing similar information platforms. In August 2017, BLN members traveled to Santiago, Chile, to share information with representatives of the Pan American Health Organization (PAHO). Chile developed an EIR in response to the AH1N1 flu pandemic that hit South America in 2010. Registro Nacional de Immunizaciones, or RNI as it is also known, has registered more than 10 million people since its launch. Given that TImR and ZEIR have not yet scaled nationally, the study visit provided BLN members with an opportunity to swap experiences and lessons. Chile also benefited from the exchange. Intrigued with the data visualization dashboards available in the Tanzania and Zambia EIRs, the PAHO representatives began to consider similar visualizations for their own registries.

- **A modified paper registry in Tanzania that did not take off.** At rural facilities with lower volumes of patients and intermittent connectivity in Arusha region, BID designed a modified paper registry that could be scanned into the electronic system. However, this approach proved challenging because of the inability to capture all data variables, limited access, and complications around scanning, distributing, and collecting paper forms from facilities. For these reasons, some facilities stopped using the paper registry and even purchased more tablets to cover all of their facilities, eventually going fully digital. When rollout began in our next region, Tanga, they decided to go fully digital from the start, exclusively using tablets to manage immunization data, allowing for real-time access to information, no matter where health workers are located – a rural facility, or the country's capital.
- **Underestimating the length of time for the implementation phase to allow for a truly iterative process.** Initially, as part of a more rigid implementation process, we found it difficult to sufficiently include users, and more time was required to ensure the final interventions met all user requirements as much as possible.
- **On-the-job training was a not a common practice for health workers who were accustomed to learning in a workshop setting.** BID solutions were implemented via on-the-job training rather than large workshops that pull health workers out of their facilities. This approach minimizes disruption to service provision and provides immediate, hands on use of the interventions as opposed to a classroom setting. This strategy was not always well-received since, in some facilities, it meant health workers did not get the incentives of per diem payments or to leave their workplace to attend a workshop. We addressed this with close collaboration at the district and regional levels to send consistent messaging on the value of the on-the-job strategy.

And yet, some challenges still need to be solved for, such as, how do we do outreach in sites with just a few tablets? As each country continues to embrace data quality and use interventions, we will share how implementors are solving for this challenge and more. More details about our challenges and what we learned are captured in the release of our Lessons Learned Briefs and most recently, in our [BID Encyclopedia](#).



Driving scale-up and ensuring sustainability

2017–2018

As the BID Initiative draws to a close, there is still far more work ahead than behind. We're expanding our efforts in Tanzania and Zambia through government and global partnerships and engaging the BLN regional work by sharing tools and approaches that will be useful for improving data quality and use around the world.

In Tanzania, rollout was completed by mid-2018 in the Arusha, Tanga, Kilimanjaro and Dodoma regions, and data on more than 400,000 children were entered into the immunization registry since BID began. Each subsequent rollout presented different health landscapes, demographic compositions, and challenges, and implementation across the three regions represented significant progress toward the goal of nationwide scale-up and country ownership.

In Zambia's Southern Province, the BID Initiative successfully introduced and quickly scaled up ZEIR, thanks to the enthusiasm of health workers across the province. Data on more than 96,000 children have been entered in ZEIR.

From the earliest days, BID has been committed to seeing data quality and use interventions applied to other health areas and countries. BID will continue to support the scale-up of interventions in Tanzania and Zambia and plans to help other countries as they deploy similar data use interventions to improve health outcomes.

 **Defining and building a data use culture**

"I'm very optimistic that we can achieve a greater benefit when the [electronic immunization] system is used countrywide, rather than just pockets of the country. The burden of data collection, accessing, analyzing, and reporting has gone down drastically in the regions using the systems and we believe we can still achieve more if we put more efforts into it. That is why the ministry has committed to scale the interventions using its own resources and resources from our development partners. No child should be deprived from the gift of vaccine and no health care worker should be deprived of her/his personal or family time just because of the need to do data entry or compile monthly reports."

– DR. DAFROSSA LYIMO,
PROGRAM MANAGER FOR IMMUNIZATION AND
VACCINE DEVELOPMENT, TANZANIA

Dr. Tove Ryman

SENIOR PROGRAM OFFICER,
BILL & MELINDA GATES FOUNDATION



Photo: Bill & Melinda Gates Foundation

With the tap of her finger, Neema Temu can easily toggle between two estimates of immunization coverage within her catchment area. A health worker at Monduli Hospital in Arusha, Tanzania, she cheerfully demonstrates her new electronic immunization registry to Dr. Tove Ryman—Senior Program Officer at the Bill & Melinda Gates Foundation and technical lead of the BID Initiative.

Where Neema could once only estimate the number of children in her area using outdated census data, thanks to BID, she can now also evaluate immunization coverage based on the number of children registered at birth in her catchment area. The result: a much more accurate picture of her progress as a vaccinator. And, as she stated during Dr. Ryman's February 2017 visit, the two coverage estimates paint divergent pictures of her progress. One gives her the false impression that she's doing a great job, missing very few kids. The more accurate BID data provide a more sober assessment, with still too many kids going unimmunized.

For Dr. Ryman, this interaction marked a pivotal moment—one where her work to bring better immunization data to low-resource settings started to materialize in a tangible way. And it proved that, not only were the data quality and use interventions spearheaded by BID and country governments feasible, health workers had begun to embrace them as well.

"Despite having only used the electronic immunization registry for a few weeks, Neema was comfortable with it and the data it generated," Dr. Ryman recalls. "It's evidence of what's possible."

Events in the past year have only furthered that notion. The success of BID's early interventions demonstrated that they may be ready for large-scale implementation

in Tanzania, and likely Zambia in the not-too-distant future. The partnerships that have developed with JSI, UNICEF, and Gavi are further driving the enthusiasm and ownership of the initiative. And Dr. Ryman has had even more conversations with frontline health workers learning to apply the data quality and use interventions. While some workers were initially skeptical, and others struggled with the technology, most were excited by its potential to ease their workload and improve immunization service delivery.

Dr. Ryman stated, "For me, it always comes back to the experiences of the health care workers. They're on the front lines, vaccinating children day in and day out. So, I always ask myself and others: How can we ensure that they're empowered to do their best job, and positioned to succeed?"

This past July, Dr. Ryman had the opportunity to accompany Bill Gates to Ngamiani Health Centre in Tanga, where health care workers were using the BID interventions. There, she encountered another inspirational vaccinator named Millen Simon, who demonstrated her use of TimR with such competence and enthusiasm that she was asked to do the same for local media in the capital of Dar es Salaam.



Photo: Bill & Melinda Gates Foundation/John Healey

Dr. Tove Ryman, a Senior Program Officer at the Bill & Melinda Gates Foundation, views vaccination records during a visit to the Mahatma Gandhi Clinic in Livingstone, Zambia.

Despite the relatively quick uptake of BID interventions by health care workers, Dr. Ryman admits that it has not always been an easy journey.

“The development of the electronic immunization registries in both Tanzania and Zambia presented more challenges than we initially anticipated. We thought the technology would be the easy part. However, we came to appreciate that transitioning to an electronic system was a complex process. Thankfully, our team and network of partners persevered through the challenges and made sure we course-corrected where necessary to meet the needs of both frontline health workers and government stakeholders.”

Dr. Ryman continued, “With implementation well underway, I’m optimistic that Tanzania is on the path to scale and that Zambia could soon follow. Many health workers using TImR are currently facing an increased workload while also using the duplicative paper system. The transition to a paperless system in Tanzania is a huge milestone and an exciting opportunity to realize the potential benefits of a fully digital system.”

Without question, BID’s successes to date are worthy of celebration. But bigger successes are yet to come. The initiative is opening new possibilities for how Expanded Programme on Immunization (EPI) managers can think about data quality and use, and how better use of data can inform immunization program management. And the initiative is using the BLN—an Africa-led, member-owned and peer-to-peer network—to provide opportunities for other countries with ambitions to improve their immunization data. The BLN has already helped countries like The Gambia to determine a best-fit electronic immunization system.

In the meantime, Dr. Ryman has already begun to train her sights on how the initiative can further expand to other countries, integrate into other programs and serve as a catalyst to boost equity measurement work. With a smile, she said “We’re just starting to see the potential.”

Transitioning to a fully digital system in Tanzania

In October 2017, the government of Tanzania announced their commitment to the BID Initiative with plans to transition to a paperless immunization information system. Through a phased approach, health facilities will eliminate the use of paper tools, such as child register books and monthly report forms, and shift to a fully digital system. Previously, health workers used traditional paper records in parallel with the new electronic registry, increasing their workload and making it difficult for them to really feel the impact of the interventions.

Tanzania has also committed Gavi funds for health system strengthening to scale up data quality and use interventions to the equivalent of ten additional regions in 2018 and then national scale in 2019. Gavi funding for targeted country assistance will enable PATH to provide technical support for these regions and continue to build national capacity for long-term sustainability.

Expanding interventions with country partners

Data quality and use interventions must be scalable and able to be implemented long after the BID Initiative draws to a close. We are pleased to see these partnerships already taking shape with, for instance, John Snow, Inc. (JSI). BID is partnering with JSI to roll out TImR in Dodoma Region in 2018.

In 2017, the BID team forged a partnership with the Catholic Mission Medical Board (CMMB) to expand interventions in Zambia. We subsequently trained CMMB staff so they could deploy the BID data quality and use interventions, including ZEIR, to Zambia's Western Province. By the end of 2017, nine facilities in Western Province were using the registry. The BID team provided remote support and system monitoring for introduction.

“[Our partnership with I-TECH] is the core of the BID Initiative's theory. Effective electronic immunization registries have to be adapted to a country's context and specific needs. Each time you do that, it becomes less and less of a financial investment for future countries.”

– LAURIE WERNER,
GLOBAL DIRECTOR, BID INITIATIVE

With anticipated support from global funders, PATH will provide additional technical support to Southern Province and build capacity at the national level for long-term sustainability and for further work to optimize immunization systems. Additional interventions include the connection to a UNICEF mobile app for collecting home birth information and sending vaccination reminders, the potential for links to a tool for managing vaccine stock, and supply chain delivery redesign.

Adapting BID tools for use in Kenya

The BID Initiative represents a radical shift away from the current paradigm for many digital health interventions—data streams that don't communicate with the existing health system, software codes hidden behind proprietary black boxes, and technologies that repeat the missteps that came before them. To avoid duplicating efforts, BID is committed to sharing its learnings with other countries interested in implementing data quality and use interventions.

In this spirit, BID and the International Training and Education Center for Health (I-TECH) began collaborating in December 2016. I-TECH localized ZEIR for use in Siaya County, Kenya, and then introduced the tool. The partnership demonstrated that, despite differing health landscapes and immunization programs, data quality and use solutions could be easily and cost-effectively adapted for use in other countries and contexts in sub-Saharan Africa.

 **Recommendations and lessons learned: Sustainability**

 **Total cost of ownership**

Building on the work of the BID Initiative

We continue to build on the BID Initiative work through projects such as Immunization Data: Evidence for Action (IDEA). PATH, in partnership with the Pan American Health Organization (PAHO), is working with several global partners, including representatives from the Government of Tanzania and Zambia, CDC, WHO, AFRO, UNICEF, Gavi, and others, to collect, synthesize, frame, and share evidence-informed learnings and best practices to improve immunization outcomes through improved data quality and use.

The IDEA project is already underway and the learnings and best practices will be available in 2018.

Publication: Planning and costing guide for digital interventions

In 2018, the BID team, in partnership with the WHO, is disseminating a new toolkit for ministerial program managers, decision-makers, and implementers. This toolkit will function as a practical, comprehensive, step-by-step guide on how to select, plan for, cost, and implement digital health interventions aligned with specified health needs, appropriate to the country context and state of maturity, and linked to the broader architecture of existing digital health systems.

Available in both print and digital versions, the toolkit links to WHO's classification of digital health interventions and associated guidelines, integrated with BID best practices and case studies. It allows users to support a facilitated planning process resulting in a costed proposal that can be submitted to a funder or Ministry of Finance.

Coming soon, please check the blog for updates.





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