BETTER IMMUNIZATION DATA
INITIATIVE

Better Immunization Data (BID) Theory of Change Narrative

BID Initiative Theory of Change Interventions | Primary Outcomes 1 & 2

May 2015

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Recommended citation:

BID Initiative. *BID Initiative Theory of Change Interventions: Primary Outcomes 1 & 2.* Seattle, WA: PATH; 2014.

Cover Photo: PATH/Doune Porter

BID Initiative Theory of Change Narrative: BID Initiative Interventions - Primary Outcomes 1 & 2 (ToC 1)

Outcome 1: *Improved overall immunization data quality at scale in one demonstration country and sub-national in two by 2017.*

Outcome 2: *Increased use of immunization data for decision making across all levels of the health system at scale in one demonstration country and across targeted sub-national levels in two others by 2018.*

The BID Initiative Theory of Change (ToC) document includes a graphic (Appendix 1) and this narrative explaining the challenges identified by the BID Initiative demonstration countries, the hypotheses behind the BID Initiative approach, and the interventions being designed, developed, and deployed by the BID Initiative to address the challenges. The descriptions of the interventions include a brief overview of the intervention (with more detailed information in Appendix 2) including the linkages from the activities to outputs and outcomes, the evidence behind the selection of the intervention, the assumptions (the key conditions that must be in place) in order to achieve success, and risks in achieving success.

Two important items to note are first, that the three intervention areas outlined in this document and on the graphic are designed to work together as a package of interventions to address the various challenges identified by the country governments and not in isolation from each other. Secondly, that the specific interventions or activities that fall within each intervention area will be iterative in nature. The interventions in development by the BID Initiative and the subsequent packages of tools will be adjusted and improved as the BID team learns more about what works and what does not work throughout implementation.

Problem Statement

Immunization service delivery in Sub-Saharan Africa is highly routinized and most countries experience similar challenges in delivering the services. The BID Initiative began by initially working with demonstration countries to identify challenges they face with data quality and data use in their immunization program (which are shared by many other countries as confirmed through wider consultation done through the BID Learning Network (BLN). The challenges include:

1) Inaccurate or uncertain denominators for calculating immunization rates (not having a good understanding of your catchment population).
2) Defaulter tracing (having difficulty identifying children who do not start immunization or who drop out).
3) Vaccine stock outs due to lack of visibility into stock management and logistics.
4) Inadequate data management and use capacity at all levels of the health system.

These are complex and often multifaceted challenges. There is no single solution. While these challenges are common to many countries, there is a degree of variability both within countries (and often even between districts or facilities within a country) as well as between countries.

Primary hypotheses and assumptions

The overall BID Initiative ToC is based on the **principal** hypothesis that better information will lead to better decisions which will lead to better health outcomes. Better information focuses on more accurate, complete, and timely data about vaccine delivery including who should receive immunization services, where they are located, and what specific vaccinations they need. Better information also focuses on improved supply chain data including more accurate, complete, and timely data on vaccine availability at all levels of the health system. Access to better information on vaccine stock and immunization delivery will assist in facilitating better decisions to lead to stronger immunization programs. Some such decisions could lead to the ability to provide the necessary immunization services to the right children at the right time, to order new vaccine stocks when needed, and to ensure that all necessary vaccines are readily available and safe to use. These improved decisions will ultimately increase efficiencies in the health system, build a culture of data use, reduce vaccine wastage, increase the number of children receiving on-time immunizations, and increase the number of children completing their vaccination schedules.

Another major hypothesis of the BID Initiative is that there are packages of interventions that can be assembled and adapted locally to address major challenges. It is not a single solution, but rather a combination of interventions that will be synergistic and lead to success. These interventions include people, processes, and technology products that work together to provide the right tools, capacity, and environment to address the challenges.

Finally, the BID Initiative makes the hypothesis that improved data use will influence data quality, and vice versa. By starting to use the data more frequently for decision-making, health workers at all levels of the health system will begin to see quality issues and recognize the importance for improving the quality of the data they must use. As data quality improves and health workers have increased confidence in the data, they will be more likely to value the data and use it to make decisions, thus creating a virtuous cycle of improvement.

There are three intervention areas that will address the major challenges identified by the countries:

1) Immunization registry (addresses denominator issue and defaulter tracing).
2) Stock management system (addresses stock outs).
3) Creating a data culture (contributes to addressing all challenges, specifically data use).

The BID Initiative has identified several *primary assumptions* about how these interventions will reinforce each other to strengthen evidence-based decision making in planning and delivering immunization services. These are:

- All levels of the health system will commit to using the new tools and practices, and will reinforce others to use them.

- The government (at all levels) will support the BID Initiative interventions and take on the responsibility of maintaining and supporting the new tools, systems, and practices.
- Health workers will be empowered to use data to make locally-appropriate decisions.
- Health workers or the district level staff will have the resources available to carry out the desired, evidence-based improvements.
- Having the specific and accurate data regarding all children, from birth, in a single accessible place will improve the ability to plan immunization delivery services.
- The availability of a robust and functioning paper and electronic information system will ensure that users have the confidence that this new workflow will be practical and sustained.
- The paper and electronic information system will be effectively used if they are available, functional, and health workers have been oriented to use them.

Description of the Interventions

As shown in the ToC diagram (Appendix 1), the three BID Initiative intervention areas are cross-cutting and overlapping. Each will be responsive to specific local contexts, but they will combine to address the underlying challenges and contribute to intersecting results. The interventions have also been designed to achieve, during the life cycle of the BID Initiative grant, the Primary Outcomes 1 (improved data quality) & 2 (increased data use) as outlined above. This denotes the "Line of Accountability" beyond which the BID Initiative is not accountable to achieve measurable impact within the timeframe of the grant. To the right of the "Line of Accountability" is a column titled "Impact/Results." These are the results hypothesized by the BID Initiative to occur later in time as the improved data quality and increased data use have time to achieve broader impact and lead to overall impacts on health outcomes (as referenced above). Given the grant timeframe, the BID Initiative only has sufficient time to commit to measuring achievement of the Primary Outcomes 1 & 2. We have included the expected "Impact/Results" in the ToC to convey the anticipated ultimate, long-term results of better information leading to better decisions which will lead to better health outcomes. These results include:

- Increase in children completing vaccination schedule
- Increase in children being vaccinated
- Culture of data use
- Increased efficiency in immunization services

The three intervention areas contributing to the ToC are outlined below.

Intervention 1: Electronic Immunization Registry

Overview

An electronic immunization registry (EIR) will address several data-related challenges, primarily the denominator issue (target population estimates) and defaulter tracing. The EIR will record the birth of every child to provide the specific number of children in a given catchment area,

thereby giving an accurate and up-to-date denominator. It will also address issues around defaulter tracing and planning by providing a specific list of children who need their vaccinations rather than merely a census-based projection of the number of unidentifiable children within the respective catchment area. With this information, facilities can then follow up on specific children, know when and where to hold outreach sessions, and more efficiently plan their services. Also, since the EIR will contain all children in the country when scaled, it can account for children who receive immunizations at various facilities. Ultimately, an EIR user could eventually identify patterns of care-seeking across facilities, which will allow support to be targeted at those facilities that are being underutilized. Having an accurate numerator and denominator in the EIR also allows for accurate coverage calculations which can be used to compare performance across facilities, districts, or regions and target support and scarce resources. For additional information on the specifics of this intervention area and how it will function please refer to the document “Intervention Descriptions Tanzania” in Appendix 2.

This intervention will include the activities of developing an EIR and revised paper forms (for facilities without access to the electronic registry itself) to feed into the EIR at the district level. Children will be registered into this system at birth (by computer in health facilities or by SMS from village leaders), and this system will eventually link to the national birth registration system. These activities will contribute to the following outputs: electronic systems are available and functional (1.1.1), all levels of the health systems are oriented to use the electronic systems (1.1.2), job aids and associated tools are available (1.1.3), there is increased feedback between levels of the health system (1.2.1). These outputs are in turn expected to lead to intermediate outcomes, including: electronic systems (immunization registry and stock management tool) that are effectively used by health workers at all levels of the health system (1.1), health workers at all levels of the health system are motivated to improve data quality (1.2), there is increased capacity of health workers to use immunization data (2.1). All of these results will ultimately lead to the Primary Outcomes of improving data quality (Outcome 1) and increasing data use (Outcome 2).

Evidence supporting this intervention

- Kempe et al. (2004) assessed the impact of an immunization registry in the state of Colorado on up-to-date coverage reporting and found it improved the up-to-date documentation significantly. More importantly, it allowed appropriate follow-up for children who were not consistently seen by the same provider group, thus having records scattered among multiple providers (including public and private). The regional immunization registry data uncovered previously unknown patterns of care-seeing behavior (e.g. a significant shift away from private providers to public health services) as children got older. This may have significant impacts on policy and service delivery strategies.
- McKenna et al. (2002) recorded the direct cost savings of electronic immunization registries across multiple healthcare sites. They only measured the cost of tracing the information electronically versus the cost of tracking it manually. They found a reduction

in operating costs of $26,768 USD in the 23 health centers in Boston using the system when compared to the same activities in 14 control sites. These results were extrapolated to expanded health centers and they found a significantly larger savings as more facilities shared the immunization registry. This evaluation was conducted in 1998, and since then technology costs have reduced substantially, so it may be reasonable to assume that the results would be at least as good if not better now. More recently, Pereira et al. (2011) found that the use of an immunization registry in Canada compared to a hybrid (paper/electronic) system resulted in an increased reduction of the per capita cost in all scenarios when compared to hybrid as it was more widely distributed.

- PATH and the World Health Organization (WHO) collaborated with the Albanian government from 2010 to 2012 to implement an online immunization registry program as part of Project Optimize. An assessment in 2012 demonstrated the effectiveness of the immunization registry. The main benefits of the tool-- called Immunization Information System (IIS)—included better tracking of children's' immunization status, better identification of patients who had missed appointments, better tracking of vaccinations to ensure safety of the vaccine, facilitated communication with parents, and improved administrative processes for nurses, among other benefits (PATH 2012). The system proved to be feasible to introduce with more than 13,000 children entered into the system by nurses in the first ten months (WHO, PATH 2013).
- A study of children under 24 months old in southern Brazil determined that enrollment in an EIR played an important role in contributing to high levels of vaccination coverage. The EIR was introduced across administrative districts from 1999 to 2003, and the study found that among a cohort of 2,637 children born in 2002 EIR coverage was 98%, underreporting of vaccine doses was 11%, and record duplication was 20.6%. They also found high levels of coverage for the complete vaccine schedule across the municipality (95.3% at 12 months and 90.3% at 24 months) and concluded that EIR enrollment was an important contributing factor to high levels of coverage and equity (Luhm et al. 2011).
- Project Optimize, a collaboration between PATH and the WHO, helped health workers in Vietnam introduce a digital immunization registry which allowed for better tracking of children due for vaccinations. Other benefits of the program included automatically generated short message service (SMS) reminders for parents to replace hand-written forms for each child, easy access to data for health workers when they have internet access, and easily accessible health records (Robertson 2013).
- The WHOs Global Immunization News reported high effectiveness of and satisfaction with Panama's EIR. Their evaluation showed high data agreement between paper forms and the registry, and high levels of satisfaction with the software itself for providers and administrators. (de Hewitt et al. 2014).
- Many multilateral health organizations have recognized the importance of using information and communication technologies (ICT) for health and specifically for immunization. In 2005, the WHO established an electronic health (eHealth) strategy and launched the Global Observatory for eHealth (GOe) with a mission to improve health by providing strategic information and guidance on effective practices and standards in eHealth ("WHO | Global Observatory for eHealth"). The United Nations Commission on

Information and Accountability for Women's and Children's Health (CoIA) recognizes that "ICTs provide new possibilities to capture and process data, link information systems, increase the timeliness of information produced, and store data for institutional memory" (*eHealth and Innovation*, 2014). The Pan American Health Organization (PAHO) newsletter highlighted a 2013 workshop in Brazil which focused on the importance of EIRs in being a powerful tool to improve vaccination monitoring to increase coverage rates and equity ("Second Workshop" 2013).

Assumptions

The BID Initiative believes the EIR intervention area will be effective if the following assumptions hold true:

- The orientation through the BID Initiative is sufficient to give health workers the necessary skills to use the EIR in the way it is intended.
- The EIR is user-friendly, health workers have positive perceptions of the EIR's usefulness, there is high acceptability of the EIR, and the system functionality is aligned with the health workers' needs.
- Job aids and written or video instructions allow sufficient "on the job training" for staff who do not get any formal orientation from BID staff.
- There is an expectation that the use of the system is "part of the job", not an optional add-on component.
- The EIR will ultimately be implemented at scale.
- Until the EIR is implemented at scale, special workflows will be available to account for children moving between facilities that have implemented and those that have not.
- Children who were entered into the EIR but do not return for their vaccinations will be seen as defaulters.
- Nurses will register births in a health facility. Community members (community health worker or village chairman) will register home births in a timely manner.
- New staff at a facility will be provided with adequate orientation by existing staff to learn and successfully utilize the EIR.
- The EIR will have adequate functionality to detect and correct duplicate records.
- Movement between facilities is not the norm in rural areas nor do they happen in predictable ways. In other words, most mothers take their children to the same facility most of the time with minimal migration between facilities.
- Urban facilities are often seeing many children who are not from their proper catchment area. Movement between clinics is more common (as they are so close together, people can "shop" for the one with the shortest line or is properly stocked).
- Most electronic facilities will be in urban areas.
- Once the EIR is in place, manual data entry and aggregation will be substantially reduced which will lead to improved completeness, timeliness, and accuracy of data.
- This intervention area will sync to the data use interventions and provide health workers skills to make decisions regarding immunization delivery.

Risks

In addition to the above assumptions that must happen in order to ensure success, there are several risks that would inhibit the ability of this intervention area to be successful:

- There are technical issues with equipment that make it non-functional (e.g. battery not charging, printer out of toner, corrupt files, broken/lost equipment) that are not resolved quickly.
- The government insists on paper copies of records (such as the immunization registers and other existing forms like tally sheets and stock reports).
- Health workers perceive the new system to be time-consuming and burdensome.
- Births are not registered in a timely manner.
- Facility managers are not supportive.
- Equipment is lost or used for other purposes not related to immunization services.
- The government does not assume responsibility for maintenance or replacement costs to ensure tools are in place for ongoing use of the EIR.
- The data are produced, but not used.

Intervention 2: Supply Chain Interventions

Overview

While a logistics management and information system (LMIS) can perform many stock management functions, the primary interest for the BID Initiative is to provide visibility into stock levels throughout the health system in order to prevent stock outs, reduce wastage, and allow for proper planning of distribution. This is a system that can help manage and monitor the supply chain much more efficiently and effectively through a combination of paper and electronic forms. The LMIS will also track stock (antigens and related supplies) from the national stores down to the districts and even facilities to some degree. This can be used by district, provincial, and national managers to identify issues and address them early to reduce stock outs and wastage. For additional information on the specifics of this intervention area and how it will function please refer to the document “Intervention Descriptions Tanzania” in Appendix II.

This intervention will include the activities of utilizing the stock management system (in the immunization registry initially and then connecting to the updated national eLMIS), and improving the stock reporting system to connect to these systems. These activities will contribute to the outputs of having electronic systems available and functional (1.1.1), that all levels of the health systems are oriented to use the systems (1.1.2), that job aids and associated tools are available (1.1.3), and that there is increased feedback between levels of the health system (1.2.1). These outputs are in turn expected to lead to the intermediate outcomes of having electronic systems (immunization registry and stock management tool) that are effectively used by health workers at all levels of the health system (1.1), that health workers at all levels of the health system are motivated to improve data quality (1.2), and that there is increased capacity of health workers to use immunization data (2.1), all of which will ultimately

lead to the Primary Outcomes of improving data quality (Outcome 1) and increasing data use (Outcome 2).

Evidence supporting this intervention

- Zambia and Tanzania's electronic logistics management information system (eLMIS) provides nation-wide information about health supply chain management. With access to eLMIS, procurement supervisors are able to view stock levels to make informed decisions about procurement. eLMIS helps improve both countries' health systems by increasing visibility of data for decision-makers, integrating logistics systems and data management systems, increasing accuracy of data, and eliminating duplication of data ("Improving health supply chains in Zambia").
- There is significant evidence that supply chain interventions are successful in saving time and money. Toyota, for example, owes its success in part to meticulous supply chain management. The careful coordination, planning, and control of all steps along the supply chain has also been applied to dozens of non-automotive supply chains and are instrumental in the success of Toyota and many other companies (Iyer et al., 2009).
- As early as the 1970s, the WHO began working to improve global health through the expanded program on immunization (EPI). A key factor contributing to the success of the EPI was supply chain management. The WHO considers the following six supply chain-related items to be critical to immunization delivery: having the right products, having the right quantities, ensuring their availability in the right place, making sure they are delivered at the right time, ensuring quality, and making sure they are at the right cost ("WHO | Immunization Supply Chain and Logistics").
- Project Optimize, a collaboration between the WHO and PATH, was tasked with creating supply chains that are robust and flexible enough to ensure the delivery of health commodities. Project Optimize aimed to address issues causing supply chain systems in many countries to fall behind, risking expensive delays, unnecessary waste, and vaccine supply shortages (PATH, NEPI, 2012).
- As part of Project Optimize, PATH and the WHO collaborated with the Albanian government from 2010 to 2012 to implement an online immunization registry which included a vaccine stock management component. Once the system was in place, health centers had access to stock balance data, vaccine consumption rates, and in some cases wastage rates – all examples of data elements that were previously unavailable at the health center level. Moreover, the system changed how stock was managed at the district level. In 2009 (prior to the new system), pentavalent was consistently overstocked (with an average of almost 5 months of stock on hand at the district level) and MMR vaccine was understocked (with an average of 1.3 months of stock on hand and a total of 67 days of stock outs at the district level). In 2012, with the new system in place, there was an average of 1.7 months of stock on hand for pentavalent and 2.5 months for MMR with no reported stock outs of either vaccine (WHO, PATH 2013).

Assumptions

- Orientation through the BID Initiative is sufficient to give health workers the necessary skills to use the supply chain information system in the way it is intended.

- The supply chain information system and reports are user-friendly, health workers have positive perceptions of the usefulness of the system, there is high acceptability of the system, and the system functionality is aligned with the health workers' needs.
- Job aids and written or video instructions allow sufficient "on the job training" for staff who do not get any formal orientation from BID staff.
- There is an expectation that the use of the system is "part of the job", not an optional add-on component.
- This intervention area will sync to the data use interventions to provide health workers skills to make decisions regarding stock management.
- The supply chain information system (LMIS) will ultimately be implemented at scale from the national level down to the district level.
- Stock visibility from the national level down to the district level, combined with immunization delivery reports from health facilities, will be sufficient to manage stock down to the facility level.

Risks

- Health workers perceive the new system to be time-consuming and burdensome.
- Supply chain data are not updated in a timely manner.
- Facility managers are not supportive.
- Equipment is lost or used for other purposes not related to immunization services.
- The government does not assume responsibility for maintenance or replacement costs to ensure tools are in place for ongoing use of the supply chain information system.
- The paper-based tools are not readily available at point of use.

Intervention 3: Data Use Interventions

Overview

Having accurate, timely, and complete data is only part of the solution. The real impact does not come until that data and tools are used to make better decisions and improve service delivery. This intervention area addresses the challenges around developing and fostering a data use culture within the health system.

Health facilities typically collect data and assemble reports for the district. The district assembles the reports for the provincial level, where they are then sent on to the national level and on to global entities such as WHO. Often these reports aggregate data that is deemed valuable for the next level, but the reported data is not designed to be used and applied at the lower level of the health system (facilities). Thus, the data that can best improve service delivery may not be readily available to those delivering the service. However, providing the appropriate data is not enough to develop and establish a shift in the culture surrounding data. Health workers need to recognize the power of data, understand how they can make better decisions based on evidence, and have the motivation and empowerment to act on those decisions.

The interventions here are closely related to, and integrated with, the intervention areas listed above. These interventions aim to take the improved data that are available through the EIR and stock management system and use them to inform decisions and planning. The first step is identifying what data are appropriate for a given level and then providing those data at each level of the health system in a format that is easy to understand and apply. This will be achieved by creating level-specific dashboards to make the data meaningful. As mentioned, once health workers have access to the actionable data, they also need to be motivated and empowered to use it. Targeted supervision activities, peer networks, micro-training videos, and data use campaigns can encourage data use at all levels and allow sharing of promising practices related to data use. These are just some examples of interventions that will be tried and implemented in this intervention category by the BID Initiative. What these interventions have in common is that they acknowledge the "people" side of what the BID Initiative is attempting to achieve and recognize it is a process that requires intentional strategies to assist health workers to progress from a data-producer to a data-user. For this reason, the BID Initiative often refers to this intervention area as "change management" because it targets the changes in people and practices that are required to support the new systems. For additional information on the specifics of this intervention area and how it will function please refer to the document "Intervention Descriptions Tanzania" in Appendix II.

This intervention will include the activities related to producing job aids and tools for all levels of the health system around data use, creation of dashboards to make the data meaningful, targeted supervision activities, peer networks, and data use campaigns. These activities will contribute to the outputs of all levels of the health systems being oriented to use the systems (1.1.2), that job aids and associated tools are available (1.1.3), increased feedback between levels of the health system (1.2.1), and participation in expanded peer networks (1.2.2). These outputs are in turn expected to lead to the intermediate outcomes of having electronic systems (immunization registry and stock management tool) that are effectively used by health workers at all levels of the health system (1.1), health workers at all levels of the health system are motivated to improve data quality (1.2), health workers understand data quality dimensions (1.3), the increased capacity of health workers to use immunization data (2.1), health workers are motivated to use data to make decisions (2.2), and health workers are empowered and expected to make data-based decisions (2.3). These intermediate outcomes will ultimately lead to the Primary Outcomes of improving data quality (Outcome 1) and increasing data use (Outcome 2).

Evidence supporting this intervention

- Franco et al. (2002) stated health sector performance is critically dependent on worker motivation, with service quality, efficiency, and equity, all directly mediated by workers' willingness to apply themselves to their tasks. Thus, when aiming to increase the demand for and use of data, understanding and applying approaches to increase individual motivation to use information as part of routine activities are essential to program success. To which, Franco et al. (2004) later stated that there was a definitive

need to address health worker motivation through multi-faceted and integrated approaches.

- Literature on business intelligence (BI) tools illustrates an approach to managing the flow of multiple information streams through a dedicated dashboard or other device. BI refers to the technology platform and tools used to gather, provide access to, and analyze data about an organization's operations and activities. Viable BI tools should include scorecards, dashboards, custom reporting, and services to transform data into indicators of interest to inform individual and organizational decisions (Baim, 2012).
- Successful use of BI tools requires obtaining buy-in from facility and higher level staff, defining data standards, eliminating some current reporting approaches, establishing BI governance, and improving data quality (Glaser & Stone, 2008).
- Rowe et al. (2005) conducted a review to identify which interventions were most effective or cost-effective for maintaining high-quality performance of health workers in low resource settings and in what situations a particular intervention be used. While there were limitations in the findings across the 11 existing literature reviews (including five systematic reviews) included in the analysis, they revealed some consistent themes. First, supervision and routine performance audits with an integrated feedback loop were generally quite effective for improving motivation. Second, non-traditional training methods such as computer-based training might be less expensive and as effective as traditional methods.
- Conversely, one area that proves to have an evidence gap is peer networking (at least as it pertains to the context with which the BID Initiative is applying it). The evidence compiled in our literature review focuses on the use of communities of practice to share evidence on implementation science, quality improvement techniques and knowledge management (Huckson & Davies, 2007). However, the utilization of social networks to provide real-time support regarding challenges confronted on a daily basis such as stock shortages or health worker capacity issues, is not as well documented. Despite this, based on the extensive discussions with health workers in the Arusha region of Tanzania, the BID Initiative views this intervention with great potential and one that leverages existing skills in addition to a growing trend and presence of smartphones or explicitly enabled phones (for instance they feature WhatsApp functionality on a traditional phone) within the marketplace.

Assumptions

- Change management activities are sufficient to motivate behavior change.
- Health workers at all levels can understand how data can be used to inform decisions.
- Health workers at all levels *believe* that a decision made using data is more valuable than one made without data to back it up.
- Health workers are *motivated* to improve service delivery.
- Health workers have access to the appropriate data they need to make decisions.
- The BID Initiative interventions are not changing the data elements to be captured, but just the form and manner in which they are captured and made available for use.

- Motivation is multi-faceted and some drivers of motivation will be outside of the control of the BID Initiative.

Risks

- Not enough health workers believe in evidence-based decision making for it to influence the overall culture.
- Health workers will be inhibited from using data to make decisions.
- Health workers will not be empowered to use data to make decisions.
- Health workers are not comfortable sharing 'promising practices' with other facilities/districts/regions.
- Health workers do not have the capacity to interpret data as presented in dashboards.
- The health system has insufficient resources to fund targeted supervision and/or peer networks.
- The facility level, paper-based dashboards are not routinely distributed by the district or are not timely in their dissemination.

Post-script: Synergy with Scale Theory of Change (ToC2)

This "BID Interventions Theory of Change" (ToC1, outlining Primary Outcomes 1 & 2) should be read in close accompaniment with the "Scaling BID Interventions Theory of Change" (ToC2) document that outlines the theory behind Primary Outcomes 3 & 4 of the BID Initiative work. The two ToCs have a circular relationship where strategic approaches outlined in ToC2 were utilized to set up work in the demonstration countries where ToC1 is being implemented, while the work being done in the demonstration countries under ToC1 is critical for success in ToC2 as it will produce the proof of concept and other key evidence to allow for scale and dissemination of the BID Initiative interventions.

One key example of how the two ToCs are interrelated is that the BID Initiative will evaluate the total cost of ownership in the demonstration countries (ToC1) and this information will provide essential evidence to the demonstration countries to inform decision-making for the scale-up of BID (ToC2). This will also provide evidence to other countries that may want to introduce BID Initiative interventions, donors that want to provide funding to support implementation, and technical agencies who may support the implementation of these interventions (ToC2).

Additionally our conversations with countries and donors (ToC2) have informed what we will capture in terms of costs/economic evaluation in the BID Initiative demonstration countries (ToC1) in that same circular fashion.

Finally, the expectation is that the results in ToC1 (more children being vaccinated, culture of data use, etc.) are the ultimate achievements we expect the BID Initiative to have in the demonstration countries, and that by scaling and expanding these interventions beyond the

demonstration countries (ToC2), we would expect to see these achievements multiplied across the region.

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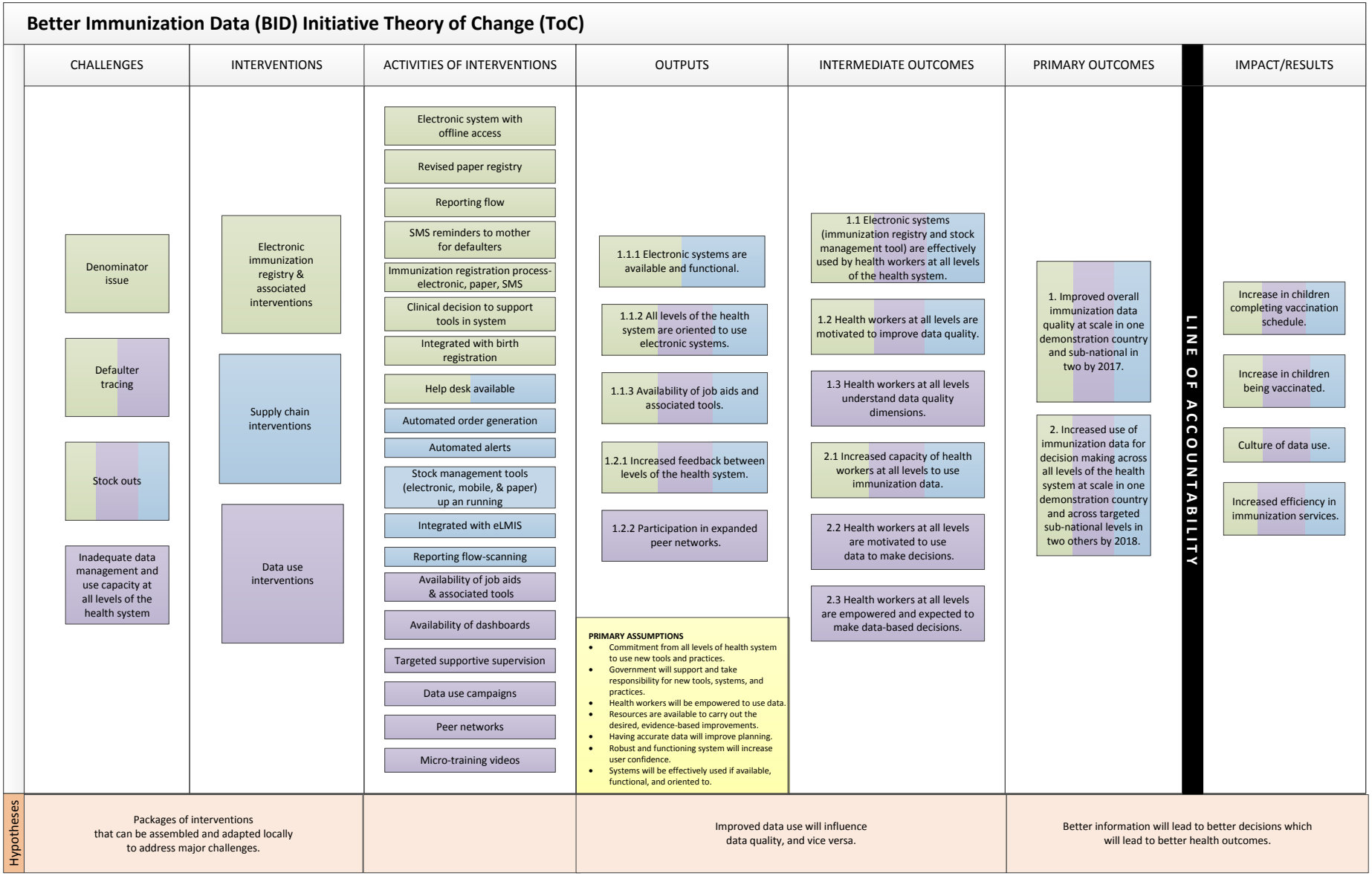
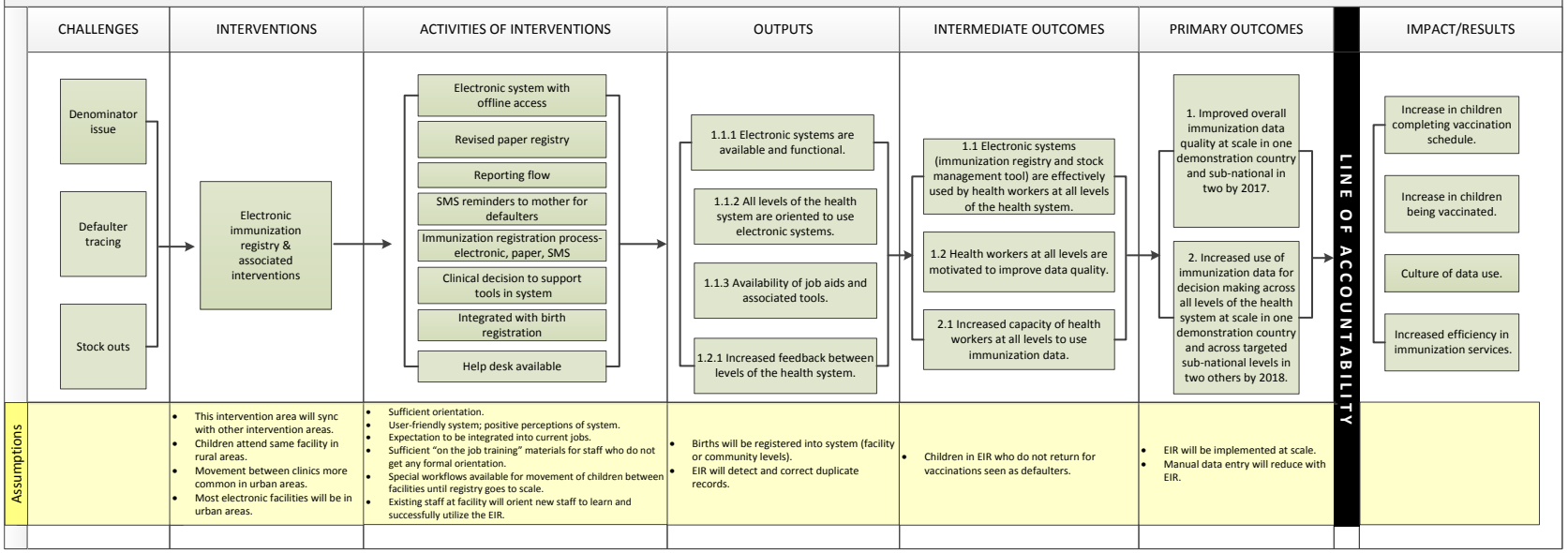
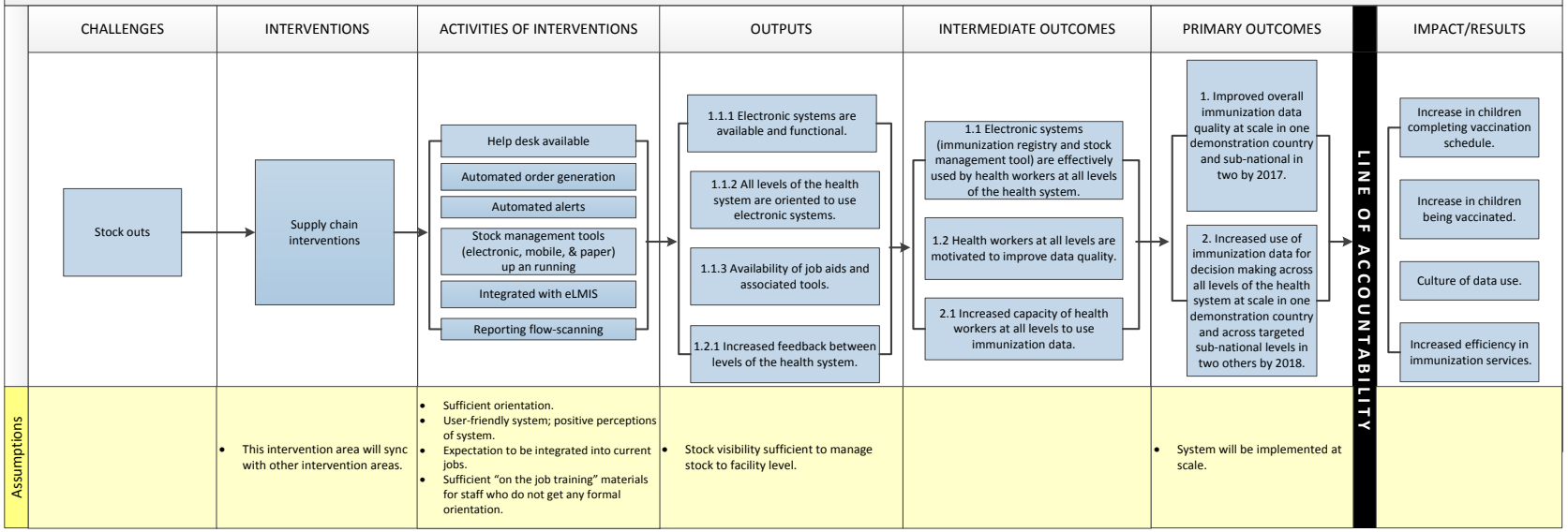
Appendix 1- Theory of Change Interventions

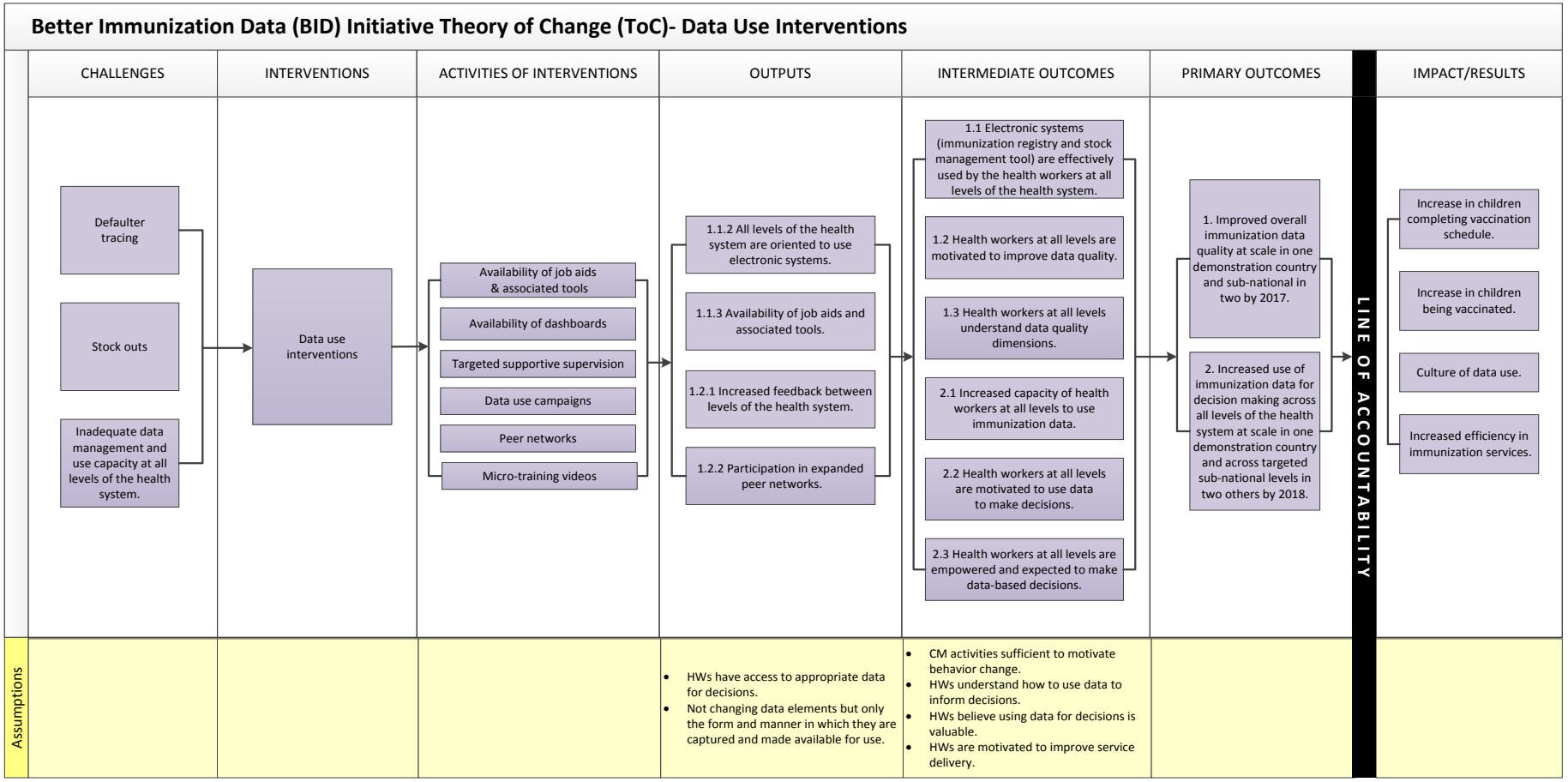


Better Immunization Data (BID) Initiative Theory of Change (ToC)- Electronic Immunization Registry (EIR)



Better Immunization Data (BID) Initiative Theory of Change (ToC)- Supply Chain Interventions





*** CM = Change Management* *HW= Health Workers*

Appendix 2- Better Immunization Data (BID) Initiative Intervention Descriptions- Tanzania

Government officials working to enhance immunization coverage in Tanzania have been hampered by limited and often unreliable and inaccurate data that may not reflect the actual challenges on the ground. During the initial planning stage for the BID Initiative in Tanzania included working with the Ministry of Health and Social Welfare (MoHSW) and other key stakeholders of the immunization program to identify the primary challenges facing the Immunization and Vaccine Development (IVD) Program related to data quality and data use. The list of challenges identified were as follows:

- Inaccurate or uncertain denominators for calculating immunization rates.
- Difficulty identifying infants who do not start immunization or who drop out (defaulter tracing).
- Lack of unique identifiers for infants.
- Poor data visibility into supplies at the facility level to district-level data and stock.
- Complex data collection forms and tools.
- Insufficient supply chains and logistics management.
- Inadequate data management and use capacity at all levels of the health system.

With this information and the ongoing collaboration of the MoHSW and other partners, the BID Initiative Tanzania team spent several months developing and testing various interventions to address these challenges. This included the formation of a User Advisory Group (UAG) made up of members from across the health system in the Arusha region, such as nurses, district immunization officers, and regional immunization officers and community leaders. The UAG along with four health facilities worked closely with the team to provide valuable input to the various interventions in their design and development. The result of this work was the formation of three key intervention areas as outlined below—electronic immunization registry, supply chain & logistics management, and creating a data use culture. Each intervention area includes multiple facets that address different levels or types of facilities, and different approaches to achieve the larger goal of the intervention area. This document outlines the specifics of each intervention, what issues it addressed, and how it works.

Electronic Immunization Registry

What is it?

To address a number of the critical data-related challenges facing immunization programs that were identified with government officials and partners in Tanzania, one of the largest and most intricate interventions developed is the national electronic immunization registry, which will ensure all children are registered from birth and do not miss a potential life-saving vaccine.

The registry is an electronic database that will contain all children in Tanzania and their immunization data. At facilities with electricity and high volumes of patients, children's vaccinations will be registered in an online form via a computer or tablet, while facilities with lower volumes or with inadequate infrastructure will use modified paper forms that are

compatible with the electronic system. Through scanning a barcode on the paper registry (and the same barcode will appear on the child's health record), children can be added and tracked in the national immunization registry and all facilities will have visibility into the data, notifying health workers when a scheduled vaccine has been missed.

What issues does it address?

This intervention area primarily addresses issues around defaulter tracing and planning for the provision of immunization services. Rather than going out looking for 10% more children, health workers are looking for 15 specific children by name and with their caregivers' contact information. Having this information can change everything about how a facility could plan and deliver services. Also, since the immunization registry contains all children in the country, they can tell if a child was vaccinated outside of their "home" facility. Ultimately they can even identify the patterns of where the individual seeks care, which will allow support to be targeted at those facilities that are being underutilized.

An immunization registry will also address issues related to target population estimates. If every child is entered into the national immunization registry within 48 hours of their birth, an exact number will be calculated for that catchment area, especially for children under one year of age. This can both help the calculation of coverage estimates, as well as knowing the exact population to serve for ordering stock and supplies.

Due to real time data entry, there will be no need for health workers to generate reports at the end of the month. For facilities with internet access, the registry will produce automatic reports based on the data entered and then filtered. For those facilities using paper, reports will be available within a few days and automatically uploaded by the district information officer. This stream of processes will ensure the data is timely and available to all levels of the health system. Data can be disaggregated down to the individual village and provide detailed information to help with resource allocation and planning. Since many reports can be generated from individual records, it is entirely possible to manipulate that data in multiple ways that are not currently possible.

How does it work?

When children come to a health facility for their immunization (or even just to have their weight taken during well child visits), the data will be recorded in the national immunization registry. For facilities with internet access, this can be done using a computer or a tablet in real time. For facilities using paper forms, a monthly report will be given to the facility with all of the children in their catchment area that are due for a vaccine that month. The child's weight and date of vaccination will be recorded and the full report will be submitted back to the district at the end of the month. At the district level, the reports will be scanned and automatically updated to the national immunization registry. The district information officer will then produce the report for the next month with the upcoming vaccinations due and send it to the facilities with their monthly supplies.

Every child will be entered into the immunization registry at birth (or shortly after, within 48 hours ideally). Only basic information is needed to register a child (e.g. mother's name, baby gender, village, and date of birth). This registration can be done by the health facility into the immunization registry, or in the event of a home birth, by a village representative or community health worker through Short Message Service (SMS) that will create a new record in the registry. An immunization schedule will then be automatically generated for each child. Current practice in Tanzania is to record the birth vaccine doses (BCG and OPV) on the mother's antenatal card and start the child's health card at the 6 week visit. At that time their minimal birth registration data will be confirmed and augmented (adding for example the mother's phone number) and the birth doses will be back entered. Since the birth was registered, the clinics will "expect" the child at 6 weeks and have enough information to trace them if they default on their first visit. Currently there is no way to know who does not appear for their 6 week visit.

Supply Chain and Logistics Management

What is it?

Another challenge identified with the Tanzania government officials and partners was poor visibility into supplies and stock at the facility level to district-level, and insufficient supply chains and logistics management.

The Logistics Management and Information System (LMIS) is a system that can help manage and monitor the vaccine supply chain more efficiently and effectively. Through a combination of paper and electronic methods, the LMIS will track stock (antigens and related supplies) from national stores down to the district level, and then to the facilities.

What issues does it address?

While LMIS can perform many stock management functions, the primary focus for the BID Initiative interventions is to provide visibility into vaccine stock levels throughout the system in order to prevent stock outs, avoid wastage, and allow for proper planning of distribution of supplies to meet the need.

How does it work?

Tanzania currently has an electronic logistics management information system (eLMIS) that includes essential medicines, ARV and other commodities and medicines but does NOT include any immunization related supplies. Work is underway to incorporate immunization requirements (for vaccines and immunization supplies) into this eLMIS. This work is being conducted by PATH and various partners and is not directly under the control of the BID Initiative and is also happening on a different timeline from the other two intervention areas described above.

The electronic immunization registry also includes a stock management component. The facilities in Arusha will use the stock management system in the immunization registry until the eLMIS is developed and deployed for immunizations, after which the stock management

functionality in the registry will be deactivated. Once the country is using eLMIS for their vaccine stock management, it will be connected to the electronic immunization registry so both systems can sync stock levels and vaccine usage across the country.

In addition, with support from Gavi, the Vaccine Alliance, the BID Initiative is implementing barcode technology as part of this integrated stock management system. The barcodes are now on vaccine packaging to allow national, regional, and district immunization officers to track and monitor their supply of vaccines and supplies. Barcoding allows a fast and accurate way to track stock (including the stock details such as expiry date and lot numbers) throughout the system and provide real time or near real time data for better planning and logistics management.

The Electronic Logistics Management and Information System (eLMIS) can be used by district, provincial, and national managers to identify stock management issues and address them early. With the integration of barcodes, the intended outcome would reduce the burden of data entry and improve speed and accuracy.

Creating a Culture Based Around Data

What is it?

Inaccurate reporting from the sub-national to the national level is one of many barriers to improving data quality and use. Additionally, since feedback mechanisms are rarely built into existing systems, sub-national health workers do not often realize the benefits of timely, accurate, and complete data as information goes “up” and they never see it again. Rarely does practical guidance come back that could help them to improve daily tasks, such as planning for outreach campaigns, defaulter tracing, etc. In addition, local data is often difficult to properly interpret and manipulate as it is housed in large paper registers that make the data difficult to be “mine”. It is almost impossible to see patterns or trends such as geographical differences, late vaccines, and things such as session size and outreach activities. All of these can lead to better data for local service delivery decisions.

Successfully addressing these issues and others will require the testing, implementation, and scaling of a suite of interventions and activities that simplifies data flows and reporting, makes data accessible across multiple levels of the health system, and cultivates a culture of data use. Behavioral and organizational activities will be designed to generate quick, visible change in order to demonstrate the value of using data and information as part of planning, supervision, and performance improvement. It must also foster sustainable positive system changes in the way immunization services are planned, executed, supervised, and reported.

What issues does it address?

Health facilities typically assemble reports for their facility from the data they collect. The district then gathers reports to submit to the province, onward to the national level, and eventually to the global agencies. Often these reports contain valuable information that could improve operations and service delivery at each level of the health system. However, these reports may

not be available to decision makers and those delivering services, or may contain incorrect or incomplete data.

The MoHSW of Tanzania want to improve the way data is collected and used at the district level down to the facilities themselves. They are particularly interested in ways accurate information can empower communities and facilities to make better decisions. Still, providing data is not enough- what needs to happen is nothing less than a cultural shift.

Health workers at all levels of the health system need to recognize the power of data to make evidence-based decisions. In doing so, the implications and potential for streamlining their work is boundless. For example, health workers can plan outreach activities to specific children in their known catchment area for specific vaccines. Where there are defaulters, tracing to the village, child, and caregiver helps to increase vaccination rates. This actionable data assists the health worker to adjust their strategies accordingly and eventually become more efficient in their planning.

Data that compares performance amongst villages, facilities, and districts can help identify opportunities for improvement and highlight successes. For facilities that are challenged and resources are scarce, targeted support can be implemented through change management interventions such as supportive supervision, community mobilization, etc. In this way, opportunities to learn from each other are created and often address issues in an innovative way.

How does it work?

Creating a data culture that seeks improved information to make decisions, and fundamentally believes that decisions based on evidence are better than those made without data, will not happen quickly. We are working with Tanzania MoHSW to put in place change management activities and interventions to facilitate these changes.

In addition to changing attitudes, the BID Initiative interventions will seek to change individual behaviors related to the collection and use of data. The suite of interventions under development and testing in Tanzania include:

- *Micro-training videos:* Short training videos facilitated by health workers, for health workers, capturing successful best practices and innovations to improve data use at facilities.
- *Data visualization/dashboards:* Customized web-based dashboards include the most functional and relevant information at each level of the health system (facility to national) on a monthly basis.
- *Peer networking:* Communication forums established between facilities to increase informal interaction between health workers, encouraging peer-supported problem solving, and providing access to data champions.

- *Data Use Campaign:* Educational communication materials such as posters and brochures that encourage behavior change to create a local data-use culture and demonstrate the value of data use in support of other interventions.
- *Targeted supervision:* District Immunization Officers (DIVO) will use improved data and monthly reports from facilities to target monthly, onsite one-on-one capacity building with identified under-performing facilities.
- *Workflow redesign:* Adjustments required to accommodate innovations and solutions, general process flow improvements, and job aids to provide best practices and streamline immunization service provision.
- *District data use guide:* Electronic-based guide to support new technologies and paper-based forms on how to use data (targeted at both data producers and users), establishing a baseline understanding across each level of the health system.
- *Data use video games:* Analytical tools in the form of video games to improve staff decision making capacity. Pre-existing video games can be readily accessed through cell phones or computers.