BETTER IMMUNIZATION DATA
INITIATIVE

Better Immunization Data (BID) Theory of Change Narrative

BID Initiative Scale Theory of Change | Primary Outcomes 3 & 4

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Authors

The Better Immunization Data (BID) team would also like to thank the authors contributing to the content, including:

- Emily Carnahan, Monitoring and Evaluation Officer, PATH
- Liz Peloso, Global Director, BID Initiative, PATH
- Chilunga Puta, Director, BID Initiative Learning Network, PATH
- Dawn Seymour, Technical Advisor, BID Initiative, PATH
- Laurie Werner, Deputy Director, BID Initiative, PATH
- Kate Wilson, Director, Digital Health Solutions, PATH

For more information about the Better Immunization Data Initiative, see our website at http://bidinitiative.org/, or contact BIDInitiative@path.org.

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BID Initiative Theory of Change Narrative: Scaling BID Initiative Interventions - Primary Outcomes 3 & 4 (ToC 2)

***Outcome 3**: Achieved national implementation of the BID solution in one demonstration country, implementation of components of the BID solution in two other demonstration countries, and commitment toward implementation by 5-8 other country governments within Sub-Saharan Africa by 2018.*

***Outcome** 4: Significant additional resources are committed from donors, multilateral agencies, implementation organizations, or other innovative sources for financial and technical support to countries adopting and improving the BID solution by 2018.*

Introduction

The BID Initiative Theory of Change (ToC) document focuses on Primary Outcomes 3 and 4 of the BID Initiative. This narrative elaborates on the problem statement (defined below), BID Initiative hypotheses related to scaling and diffusing of solutions developed and tested to address data quality and use challenges, and the strategic approaches taken to scale within demonstration countries and across the Sub-Sahara Africa region. This ToC includes a graphic (Appendix 1) and a literature review (Appendix 2) that validate many of the assumptions included in the ToC narrative. It is important to note that this ToC is complimentary to that of Primary Outcomes 1 and 2 (ToC1) of the BID Initiative and is not intended to be a standalone document (see post-script at the end of this document).

Outcomes 3 and 4 outline the goals of the BID Initiative to design reusable solutions with the input of many, scale them within at least one demonstration country, implement sub-nationally in two other demonstration countries, and gain commitment for implementation from other countries in the region leveraging additional resources. Achieving these outcomes will require coordination, focused collaboration, and cooperation between demonstration countries, the BID Learning Network (BLN) countries, partners working with and within these countries, funding agencies, and the BID Initiative teams.

Problem Statement and Primary Challenges

Immunization service delivery in Sub-Saharan Africa is highly routinized and most countries experience similar challenges in delivering the services. These challenges are detailed in the Intervention ToC (ToC1) for Outcomes 1 and 2, and include inaccurate denominators, difficulty identifying and tracking children, lack of visibility into stock management and logistics, and inadequate data management and use capacity at all levels of the health system. Despite similar challenges across countries, there are no proven existing and replicable solutions to address these challenges and improve data quality and data use at scale. A number of foreseeable challenges stand in the way of scaling and disseminating potential BID Initiative solutions to accomplish the proposed outcomes.

- **Need to understand the impact of implementing eHealth infrastructure:** In many countries, governments have to make hard choices as to where resources are allocated. In order for a solution or innovation to be prioritized for national scale up, there must be indisputable evidence that the solution or innovation is adding value and will be worth the investment and opportunity cost incurred as a result of that investment. Likewise, the major donors who are likely to support this work are accountable to their tax payers and citizens (in the case of bilateral agencies) and to their constituents (in the case of multi-laterals). Consequently, understanding the proof of concept (or proof of principle) and the impact this can have on immunization program service delivery is a prerequisite to obtain funding and support for a generalized national deployment of a novel healthcare solution by governments, their implementing partners, and funders.
- **Lack of funding for scale:** Projects are often not initially planned to scale because the financing is not available from any one donor to scale and sustain interventions beyond the life span of an externally financed program, particularly in Sub-Saharan Africa. Too often funding is provided for development, testing, and piloting of new solutions, but is not committed for full scale implementation. This encourages the development of solutions without thinking of key criteria for scaling them such as cost, harmonization with government strategic plans, ability to replicate widely, and feasibility of the technology to be used by a high volume of users.
- **Belief that every country needs a unique solution(s) for their challenges:** Quite often there is an assumption in global health work that each challenge needs its own individual solution and therefore many projects develop brand new solutions for each challenge in each country setting. Resources are then used for development, testing, and piloting and interventions are designed without their reuse in mind. The challenge is to leverage common obstacles faced by countries to develop common solutions that can be leveraged in other places with minimal changes, thereby accelerating their diffusion.
- **Lack of interaction and information exchange among peers from different countries doing the same work:** People have more to learn from others going through the same challenge(s) and that group learning may foster more robust discussions and pro-active problem solving. However, one of the challenges of working in developing countries is the limited ability to interact with others and obtain access to contextually relevant knowledge and innovations. Opportunities to learn from others in like situations and facing similar challenges are few, and intellectual isolation is a common phenomenon. While countries experience challenges based on a country-specific context, shared challenges that go beyond national borders also exist. With no platform for discussion or interaction between countries, these shared challenges are not communicated and this results in a lack of resolution and lost collective wisdom. In this context, implementers lose out on a critical source of information and do not access the information they require to do a better job.
- **Lack of national ownership of interventions:** Often national technical leadership, accountability, and ownership of solutions (which are seen to be externally driven) are lacking, making scale up challenging. The hypothesis is that by involving countries and the national technical leadership in the identification of challenges and the design of

interventions, it will increase the ownership of the solutions themselves. Without national ownership of the interventions, there is less alignment with country needs and priorities and failure to address development challenges at their core.

- **Lack of linkages between the levels and across vertical programs of the health system:** In many Sub-Saharan Africa countries, there is a deficiency of strong linkages between different levels (e.g. health facility, district, regional, and national levels) of the health system, resulting in a lack of the cohesiveness that is required for effective scale up. This also includes the linkages across different vertical programs of the health system, such as immunization, malaria, HIV, etc. The same health workers often do the work of treatment for the various programs on the ground, but the information systems they must use may be completely different. For example, one health worker may be given multiple phones with different interfaces to report for different health programs. Policy and practice are often out of sync and interaction and coordination between the different levels and programs of the health delivery system are in need of strengthening.

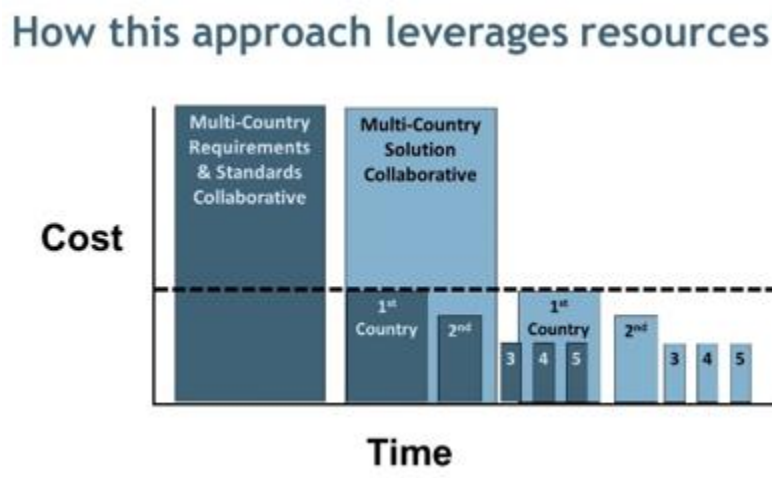
The Hypotheses

The overall BID Initiative ToC is based on the ***principal hypothesis*** that better information will lead to better decisions which will lead to better outcomes. The work being done to achieve Outcomes 3 and 4 builds upon several additional principal hypotheses.

Countries share common problems and approaches to immunizations. Therefore, the design of common solutions should be possible and will increase impact and save money over time. Creating opportunities for interaction and information exchange among Sub-Saharan Africa Ministries of Health and eHealth departments regarding these common problems and solutions will accelerate the development of an appropriate BID solution and aid in the process of adoption and scale up of that solution across the region.

Many countries today face similar challenges related to their data collection, the quality of that data, and the use of it for decision making. Therefore, to some degree it should be possible to have solutions and interventions that address these similar challenges in varying contexts within and across countries.

Providing opportunities for representatives from different countries with the same goal, to share and learn from each other, will enable countries with similar problems from similar political, social, and economic backgrounds (i.e. similar context) to tackle challenges and share innovations together. This will result in a rapid exchange of information and learning from other people's experiences that is bound to accelerate progression to designing appropriate solutions for both individual countries and for the region in the case of cross-cutting issues. This will also allow the BID solution to be developed in an appropriate and applicable way to address multiple contexts by outlining the "common" aspects that are relevant across the region. By producing a solution that is applicable to multiple contexts, this approach will also leverage resources and meet the needs of other countries at reduced cost and effort since they can adopt or adapt existing solutions.



Collaboration and joint development can produce well adapted solutions that meet the needs of other countries for much less cost and effort.

Early and sustained government and user engagement at all levels of the health system will result in contextually appropriate, acceptable, sustainable, and feasible solutions that can be scaled within and across countries.

Sustained engagement with the government and allowing the government to be in the leadership role is expected to garner the political will and commitment required to scale the BID Initiative. This engagement will give the government an opportunity to consider what is appropriate for their environment and also assess feasibility of the proposed solutions. This process should also strengthen the leadership capacity of the government to appropriately integrate the BID solution within the health system. The government will also have an opportunity to internalize the human and financial resource requirements as well as the supporting systems that are essential for implementation success and scaling up.

Involvement of users and governments in defining the common problems and solutions will increase their interest in different interventions and give them a sense of ownership in how they are designed and might be used. An increased sense of ownership, even outside of the demonstration setting, will set the stage for replication. Then packaging interventions in a way that reduces complexity and allows for limited customization will make it feasible for other countries and other implementing partners to adopt the solution.

Creating strong linkages between the different levels of the health system along the continuum of health care from health facility to national level will provide the cohesiveness and coordination essential for the effective scale up of a BID solution.

Linkages between the different levels of the health system (facility, district, region, and national) involved in delivery of health care are essential to enable effective coordination and support for essential activities. It will not be sufficient to merely introduce new policies to support the BID solution. The existing systems, processes, and practices at all levels of the health system need to adapt so that practice is congruent with national policy. To successfully support scale up of a

solution in a country, the relevant support systems at all levels of the health system, including supervision, logistics management, human resource development and resource allocation will have to support the intent to scale up.

Providing a credible proof of concept, demonstrating impact, and including a total cost of ownership (TCO) model for the BID solution will affect buy-in from national governments and external funders to the extent that they will commit resources to scaling up the BID solution.

Demonstration of credible evidence that the BID solution is feasible and fit for use in the context within which it is to be applied is expected to bring about resource commitment (in the form of financial, technical, and human resources) from donors, multilateral agencies, implementation organizations, and the national government itself. In addition, demonstrating the impact of immunization service delivery through improved data quality and use for decision-making, as well as any cost reductions and efficiency gains (essentially the return on investment), will provide more incentive to commit to and invest in the BID solution. This will overcome one of the biggest challenges to scale up – having the resources in place to implement the solution at scale – and will also provide resources for replication across the region.

Strategic Approaches

The BID Initiative has developed several strategies to speak to the challenges addressed in the problem statement. These include:

- Early and sustained engagement of national governments to achieve country ownership, aligning with country strategies, and ensuring interoperability with existing and future systems.
- Promotion of peer learning among implementing parties within and across countries through the creation of an inter-country peer learning network.
- Iteration at all levels of the health system based on user testing and feedback, resulting in a final packaged solution that engages all levels.
- Collection and documentation of evidence for stakeholders to demonstrate process, risks, and impact.
- Promotion of communication tools and engagement in key networking opportunities to increase global awareness of the BID Initiative and engage future partners (countries, funders, technical assistance partners, etc.).

As shown in the ToC2 diagram (Appendix 1), these strategic approaches are cross-cutting and overlapping. Each will be responsive to specific situations and goals, 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 3 (scale and replication) & 4 (additional resources required to scale in a country and to others) as outlined above. Beyond these outcomes is a “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 to occur later in time as the scale/replication and additional resources

have time to achieve broader impact and lead to overall impacts on health outcomes as referenced above. Given the grant time frame, the BID Initiative only has sufficient resources to commit to measuring achievement of the primary outcomes, but we have included the expected "Impact/Results" in the ToC2 to convey the anticipated ultimate, long-term results of better information leading to better decisions which will lead to better health outcomes.

Description of Strategic Approaches

Early and sustained engagement of national governments to achieve country ownership, align with country strategies, and ensure interoperability with existing and future systems

Engaging the government from the beginning as partners and owners of the eventual solutions changes the traditional dynamic between the country, non-governmental organization (NGO), and donor. Breaking this cycle of the "user, chooser, and dues payer" problem sets the stage for a strong partnership between the BID Initiative and the host government, and gives an opportunity for identifying roles and responsibilities for all parties involved in the endeavor. It also acknowledges the government's sovereignty and authority and emphasizes that the government has a responsibility and obligation not only to oversee but also assume responsibility and leadership for implementation of solutions that improve and increase the effectiveness of the health delivery system. This requires behavior changes for both government and the NGO. The government must take steps to lead and invest in the effort, and the NGO must agree to cede some control over specific solution choices. Sustaining this interaction and engagement of the government over time ensures that the government is no longer a passive recipient of progress reports but rather is also actively participating in and leading the design of solutions. The hypothesis is that this should lead to a greater level of acceptance of any evidence that might be adduced for a particular solution and the movement to scaling up such a solution, as well as the ability to plan for scale from the beginning.

The BID Initiative also recognizes that countries share similarities in products and practices but are not identical. To this end, the BID Initiative works with the countries to build on existing country systems and processes and experiments with solutions that are compatible with the country's context. The BID Initiative is conducting reviews of policy and strategic documents pertaining to information systems, identifying gaps and opportunities, and determining with governments how best the BID Initiative can build on what already exists and supplement government efforts and investments. This aligns directly with the BID Initiative core principles of having a "coordinated approach" and "interoperability." What can be done will inevitably vary from country to country. For example, one country may only be able to accommodate paper-based information systems while another may be able to institute an electronic system; in another it may be a mix. Whatever the case, it is the goal of the BID Initiative to align with the country strategies, priorities, and needs. Alignment enables the generation of evidence for solutions that are likely to be acceptable and workable.

The key activities that speak to this strategic approach are:

- Planning sessions with governments, including the fact finding missions prior to formalization through a memorandum of understanding.
- Landscaping existing systems and policies.
- Government leading the process to identify the challenges to be addressed.
- Continuous updates given to government throughout the process to identify and develop solutions.
- Engagement of Ministry of Health (MOH) staff in the development of solutions for all levels of the health system, through the specific model of a User Advisory Group (UAG) made up of representatives from the lower levels of the health system (facility, district and region).
- BID Initiative team member participation in key working groups related to immunization information systems at national level. (For example, in Zambia BID is represented on the national technical working group responsible for information security and setting information systems standards, which is the body that reviews and authorizes interventions and is an important body for obtaining official government consent to scale up any intervention.) BID is also able to leverage financial and programmatic resources through these kinds of associations.
- Seconding a BID team member to the immunization program at the Ministry, to provide the connection between the BID Initiative and the government and facilitate the government's involvement.
- Developing and implementing a stakeholder dissemination plan of BID Initiative activities and results to obtain and maintain stakeholder agreement over time.
- Working closely with the government and fellow NGOs to determine their strategic direction and build on existing policy, practice, and product solutions.

This strategic approach directly addresses the challenge of lack of national ownership of interventions by engaging national governments throughout and ensuring that the interventions build on existing country systems and strategies. It also addresses the challenge of lack of funding for scale by engaging national governments early in order to plan for scale in alignment with the country's priorities and systems. The BID Initiative's engagement with programs across the health system, particularly in product development, also addresses the challenge of the lack of linkages between vertical programs within the health system. These activities are expected to coordinate with the overall engagement of the government as well as the output of working with demonstration countries to incorporate partner activities (4.1.2). They will also directly contribute to the output of having a user advisory group formed and active (3.2.1) which we expect to lead to the intermediate outcomes of alignment with country systems and processes (3.1) and country ownership of BID interventions in demonstration countries (3.2). Together, these intermediate outcomes will ultimately lead to scale and replication of the BID solution (Outcome 3). We also expect that by engaging national governments throughout the process, they will be more likely to plan for and contribute their own resources which will lead to having additional resources committed for implementation (Outcome 4).

Evidence

- Yamey (2011), based on qualitative research and an extensive literature review on scaling up health interventions, has identified key success factors that include: choosing a simple intervention widely agreed to be valuable; strong leadership and governance; active engagement of a range of implementers and of the target community; tailoring the scale up approach to the local situation; and incorporating research into implementation. Further, this paper highlights the importance of country ownership and of moving away from traditional donor-recipient relationships in which donors dictate the terms in the success of national scale up programs in Africa. There is emphasis on active engagement of the recipients or targets of the intervention including government. This paper, and others quoted therein, identify factors that are associated with faster diffusion, relative advantage (i.e. innovation addresses needs of adopter), compatibility, simplicity, triability (adopter has opportunity to try it out before adopting), and observability (innovation and its results are observed by the adopter). All these are enhanced by early and sustained engagement with national governments (and other key players) to ensure alignment with government strategies and ensuring interoperability with existing and future systems (meeting the requirement for compatibility).
- Mangham and Hanson (2009), in discussing constraints to scaling up, highlight policies and management at the health sector level as a constraint. Government is best placed to address these issues and if they are fully and continuously engaged, they have the ability to smooth the way for both adoption and scaling up. They are also in a position to interact with other non– health governmental entities as necessary to ensure success.
- Pania and Peters (2012) have emphasized the need to consider the complexities of the health system and view it through the lens of complex adaptive systems (CAS). CAS are systems that have many interacting components with the capability to self-organize, adapt, and learn from experience. In this respect, the interconnectedness of different actors and their dynamic interactions across the health system closely resemble CAS. The authors therefore argue that organizational arrangements need to support the spread of access to health services. Health services in developing economies are comprised of highly heterogeneous groups of actors (policy makers, different categories of healthcare providers, managers, clients, receiving services, regulators, collaborating partners, funding agencies, etc.) intervening at multiple levels through a variety of services and functions. This scenario requires strong government leadership and engagement for successful development, adoption, and scale up of solutions.
- In their documentation of lessons learned in scaling up interventions in Africa, Larson et al. (2014) highlight the importance of government ownership and the need to communicate the fact that the intervention is a government initiative (not a donor or partner driven initiative) to every level of the health care system. If the government is going to own and prioritize an intervention, it must be aligned to that government's policy and priorities. For scale up and sustainability, it is essential that interventions become part of the national health package and linked to targets and budget lines with a regular review procedure (Oluwole et al. , 2006). National ownership has been cited as an

important ingredient for successful scaling up (Oluwole et al., 2006). It is also important to ensure that from the start what constitutes “the intervention” is clearly defined and buy-in from government and implementers is obtained (Larson et al., 2014). This makes early and sustained government engagement cardinal for success.

Assumptions

- Strengthening national immunization programs will remain a priority for the countries in which we work for the entire five year period.
- Participating country governments have, can, and will commit human and financial resources to enable active participation of their personnel in the process of designing solutions and collecting evidence for the effectiveness and appropriateness of the interventions (or packages of interventions).
- Health workers will take on this work as a part of their current job responsibilities and not view it as an additional partner “tax”.
- BID will actively participate in the government planning cycle, the government will prioritize the BID solution, and consequently include BID in national plans and budgets (which is critical to ensure scale up).
- There will be political, economic, and social stability in the countries of operation so that the work can proceed uninterrupted.
- Discussions and decisions by users (for example, through the User Advisory Group) will increase the country ownership of the BID solution.
- The BID team can innovate on top of current products and practices to integrate immunization solutions.
- Governments want to maintain their current systems and processes, or will identify alternatives if they are open to new systems.
- The BID team and government will know what other partner activities are occurring or planned for the country to ensure interoperability with any partner interventions.
- Partner NGOs have procured open products and are willing to innovate on top of them.
- Where official strategies and direction do not exist, we will be able to obtain sufficient direction from the government to ensure alignment in the future.

Risks

- Political instability or a change in government after elections can disrupt the work.
- Technology-averse health workers can derail the activity.
- Inability of the government to retain qualified and experienced personnel to facilitate scale up and maintain the system post scale up.
- Operating budget shortfalls impact the ability to maintain the interventions (e.g. money is not put aside to replace hardware as needed).
- Current products or practices will not be compatible with updated solutions and/or the cost of building on top of existing products is too expensive.
- Governments will change their plans or strategies after BID implementation has begun.

Promotion of peer learning among implementing parties within and across countries through the creation of an inter-country peer learning network

This is a deliberate effort to maximize interaction and exchange of ideas between health workers involved in the design and implementation of solutions to improve immunization information systems across countries, as well as to facilitate the acquisition of state of the art knowledge and innovations by those who need it most. This strategic approach involves the creation of a functional peer learning network (the BID Initiative Learning Network or in short BLN) that allows peers from different countries to learn from each other and use each other as sounding boards for ideas and approaches. This strategy uses a number of channels; virtual channels include a virtual discussion forum, blogs, webinars, and social media and non-virtual interactions include face-to-face design collaborative meetings and discussion meetings that include partners and other international agencies. Small grants have also been provided to participating countries to reinforce the learning process through exchange visits and activities that speak to specific design or implementation issues.

This strategic approach directly addresses the challenge that there is a lack of interaction and information exchange among peers from different countries doing the same work. It will also address the challenge of the concept that every context needs a unique solution; by engaging with peers through the BLN, members will share their common challenges and contribute to finding common solutions. Countries can share views on products and practices and discard the ones that don't work more rapidly if they actually have a forum for knowledge exchange in which these opinions are sought. By contributing to finding common solutions through the BLN, countries will be bought-in and feel more ownership of the BID solution which addresses the challenge of lack of national ownership of interventions. Finally, the BLN is a venue to share the 'proof of concept' for how BID is working in the demonstration countries which directly addresses the challenge of needing to understand the impact of implementing eHealth infrastructure.

This knowledge exchange works both vertically within a country and horizontally across countries. Within a country, one activity that leverages peer learning among implementers is the User Advisory Group (UAG). Horizontally across countries, the BLN has formed a peer advisory group to help lead BLN activities. Both of these activities are directly linked to the output of forming a user advisory group (3.2.1). The BLN will lead to refinement of the BID tools based on country input and experience, contributing to the output of BID tools being packaged and disseminated (3.3.1), the offering of regular BLN activities (3.3.2), and the countries attending the BLN activities (3.3.3). In turn, the outputs are expected to lead to the intermediate outcomes of alignment with country systems and processes (3.1), country ownership of BID interventions (3.2), targeted countries being actively involved in BLN activities (3.3), and BLN members gaining knowledge, skills, and motivation to pursue BID interventions (3.4), which will ultimately lead to scale and replication of the BID solution (Outcome 3) and the necessary resources to achieve this (Outcome 4).

Evidence

- In his 1916 book entitled ‘Democracy and Education’, John Dewey wrote: “Education is not an affair of ‘telling’ and being told, but an active and constructive process.”(Dewey, 1916). This laid the theoretical foundation of what we now call peer learning. In the mid-1980s, Edwin Hutchins developed the theory of distributed cognition (i.e. Knowledge lies not only within the individual, but also in the individual's social and physical environment). This framework encompasses the coordination between individuals and their physical environment. Distributed cognition alludes to practices whereby intellectual resources are socially shared, spreading individual cognitive resources, and allowing groups to achieve more than a single individual can. Peer learning does requires a strong personal commitment to one’s own learning as well as to that of peers in an environment where all are co-learners. The theory of connectivity, expounded in a paper by Griffiths and Guile (2003), puts emphasis on the relationship between work experience, learning, and knowledge, and Downes (2006) went a step further and argued that the learning of knowledge is distributive, that is, it is not located in any given place (and therefore not 'transferred' or 'transacted' per se) but rather consists of the network of connections formed from experience and interactions with a knowing community.
- Evidence for the effectiveness of peer learning came from Kraatz (1998) who demonstrated that social ties promote adaptation because they create high capacity information links between organizations and engender a motivation for information sharing, consequently mitigating uncertainty and providing benefits derived from insights and experiences of peers. Further, his work demonstrated that peers are more likely to imitate their successful peers rather than those that appeared to be different from them. The implication here is that if you bring equals together and sustain their interaction they will be motivated to share information and learn from each other, and this is an underlying principle for the BLN. Such a group, if sustained, can grow into a community of practice, that is, people who are engaged in a process of collective learning in a shared domain of human endeavor. In this case, development of information systems that speak to timely availability of accurate data that can be used for decision making in immunization programs (Wenger, 2013). Rada (1998) in his review noted that collaborative learning is superior to individual learning as demonstrated in 226 comparative studies, and that cooperation and achievement are positively related. He further observed that self-critiquing is higher during collaborative learning (80%) compared to learning alone (20%). These attributes of peer learning results in better outcomes and enhances adoption of best practices among peers.
- De Stobbeler and Ashford (2014) in their research demonstrated that peer enquiry is important and results in favorable outcomes, and that seeking feedback from peers is enhanced by task interdependence and psychological safety.

Assumptions

- Basic IT infrastructure will be available to allow for virtual interactions between the different countries.
- Participating countries will commit human and financial resources to enable active participation of their personnel in the BLN.
- Participating countries will be motivated to participate in BLN activities and will derive value from their participation.
- Countries encourage and support the right participants to engage in BLN activities
- There are enough common elements across countries that BLN members will be able to identify common challenges and find solutions that are broadly applicable.
- This knowledge exchange across countries will produce more effective capacity than the current model of short term technical assistance implemented by most NGOs.
- There will be a good balance of experience from BLN country participants, so that there is opportunity for both sharing and receiving advice and support.

Risks

- Countries are not willing to take an active "driving" role in owning the product and practice design.
- Challenges to basic internet connections and/or mobile services can slow down progress of the peer learning work or frustrate the people working on designing systems.

Iteration at all levels of the health system based on user testing and feedback, resulting in a final packaged solution that engages all levels

The BID Initiative emphasizes the development of solutions based on significant input from, and testing by prospective user groups. The essential activity under this strategy is the formation of UAG in demonstration countries as a key component of the testing and planning phase of the BID Initiative. Recognizing the importance of linkages within the health system and that any successful intervention will be supported at all levels of the health system, UAGs are composed of users at different levels, from primary health care to the national level. UAG members provide guidance for iterations of interventions as well as champion the process of improving immunization information systems. At a Sub-Saharan Africa regional level, a peer advisory group for the BLN has been established to help guide BLN activities to capture participant country perspectives and input into the BID Initiative interventions so that the design remains user-centric.

The involvement of users in the design of and experimentation with various interventions (through the UAG, BLN peer advisory group, and Design Collaborative meetings which are small meetings of BLN participants on specific interventions) adds credence to the evidence generated and improves acceptability to the governments and other stakeholders. It also results in homegrown solutions that are more likely to fit into the context where they will most likely be applied. This aligns with the BID Initiative principle of "country ownership and capacity

development." Proposed interventions are being evaluated on multiple fronts, aiming to identify the best package of interventions for specific contexts. The goal of the BID Initiative is to find evidence-based solutions that are user-friendly, simple, cost-effective, robust, culturally acceptable and impactful, and also to offer alternatives for countries to experiment with so that they can identify and scale up what best suits their environment.

This user testing contributes to an iterative process to arrive at a product or practice that is appropriate for the potential users and acceptable to the government. Feedback from UAGs and BLN participants contribute directly to the iteration process and strengthen the solutions in development. To further strengthen experimentation and iterative processes, the BLN has set aside small grants to enable design countries (countries in the region participating at a significant level in attending Design Collaborative meetings and providing input into development of interventions) to carry out activities to generate evidence for how BID interventions work in their own contexts.

Finally, this iterative process will lead to a core set of proven interventions that will be packaged for adoption. Currently, many solutions (i.e. products, practices) exist but they are not readily consumable by a country. The BID package of interventions will include products, policies, and practices with guidance on how to implement and cost them. This will increase the usefulness of the package of interventions in different scenarios and provide a broad evidence base of what does or does not work. Other regions or countries can select from the full package of interventions to find those that are most applicable to address their challenges and their context.

This strategic approach addresses the challenge of lack of linkages across the levels of the health system by forming a UAG made up of participants from the health facility, district, and regional levels. It also addresses the lack of national ownership by putting country users at the center of the design process, as well as the need for political commitment, and integration across the levels of the health system. This process of testing and feedback will result in an understanding of how BID interventions are working in demonstration countries, which directly addresses the challenge of needing to understand the impact of implementing eHealth infrastructure. This activity will lead to the output of forming a user advisory group (3.2.1) which contributes to the intermediate outcomes of alignment with country systems and processes (3.1) and country ownership of BID interventions (3.2). Through the activities associated with the BLN, there will be regular BLN activities offered (3.3.2) and we expect countries to attend the BLN activities (3.3.3). The activities of packaging BID interventions together will lead to the output of BID tools being packaged and disseminated (3.3.1). Having the BID solution packaged and disseminated through the BLN (and other means) will lead to the intermediate outcome of BLN members gaining knowledge, skills, and motivation to pursue BID interventions (3.4). And since this package of interventions can be adopted by a country to fit their challenges and context, this will lead to the intermediate outcomes of alignment with country systems and processes (3.1) and country ownership (3.2). These outputs are also expected to lead to the intermediate outcomes of targeted countries being actively involved in BLN activities (3.3) and BLN members gaining knowledge, skills and motivation to pursue BID interventions (3.4), which

will ultimately lead to scale and replication of the BID solution (Outcome 3) and the necessary resources to achieve this (Outcome 4).

Iterating to a final package of interventions that enhances the linkages between levels of the health system will also improve data quality and use. As outlined more specifically in the Interventions TOC1 – improving the data flow, both to upper levels as well as the feedback back down to lower levels – will highlight the importance of the data (plus the knowledge that it is being looked at and used) which will also improve the quality.

Evidence

- User centered approaches for development of health information systems (HISs) are not new and are useful particularly when the user is an active participant in the development process (Pilemalm and Timpka, 2007), fully participating in various iterations of the innovation/product. Although there are challenges with this approach (e.g. unwillingness of users to engage in project initiation and information flow analysis), preferring to leave it to the experts as identified by Doll and Deng (1999) and also that this is a time consuming process.
- The importance of involving users and engaging them appropriately has been underlined by Canada, Mortensen, and Patnaik (2007). These authors posit that designs must be tailored to the priorities of each user group (innovators, early adopters, early majority, late majority, and laggards). This necessitates engaging end-users at every level of the process from design to full blown adoption. In this respect, Everett Rogers' seminal work 'Diffusion of Innovations' (Rogers, 2003), is pertinent. A meta-analysis of 1840 studies related to Rogers' generalized theory of diffusion of innovations indicate that there is likelihood of these theories holding, although for older studies there is a reduced level of scientific rigor (Midgley,1987).
- An earlier empirical study (Baroudi, Olson, and Ives, 1986) demonstrated that user involvement in the development of an information system increases both user satisfaction and system usage, including satisfaction with information provided by the system.
- User involvement in design has been associated with: improved quality of systems arising from more accurate user requirements, avoidance of costly system features that the prospective user neither wants nor able to use, improved acceptance levels of the system, greater understanding of the system by the user which leads to more effective use of the system, and increased participation of the user in organizational decision making (Robey and Farrow, 1982).
- Damodaran (1996) identified three levels of user involvement: informative, consultative and participative, and makes a case for the latter arguing that participative involvement allows the user to influence key system design decisions, avoiding the often observed shortfall in system abilities to meet expectations once operationalized. This paper also emphasizes the need for infrastructural and management support for user involvement

at different levels of the organization or system and stresses the point that user involvement should never become a rubber stamping process.

Assumptions

- Participation by users in the process of developing solutions will increase the relevance of the final solution to the specific context.
- Participation by users in the process of developing solutions will increase their ownership of the solution, and ideally they would be local champions.
- Participating country governments will commit human and financial resources to enable active participation of their personnel in the process of designing solutions and collecting evidence for the effectiveness and appropriateness of the solution (or packages of solutions).
- Health workers will take on this work as mandatory government work and not view it as a partner initiative that they need not pay too much attention to.
- Health workers from all levels of the health system will be involved in the UAGs.
- There is sufficient support and guidance provided to UAGs so that they can have a better understanding of the options and implications of their decisions.
- The majority of countries in Sub-Saharan Africa will find something applicable to their contexts and their challenges in the BID packaged solutions.
- There are enough common elements across countries in the region to provide for a few packaged solutions to be broadly applicable.
- We can develop step by step guidance for implementation that will be useful.
- We can make “turnkey” solutions (easy for others to adopt) for both products and practices that are meaningful.
- Increasing communication and connection across the health system will lead to greater support of and ability to replicate/scale interventions.
- Meaningful data can be provided to each level of the health system.

Risks

- There will not be sufficient willingness, time, and resources to participate in these activities (UAG, peer advisory group, Design Collaborative).
- The UAG participants do not have the background required to make some technical decisions.
- Countries or funders will not want to use interventions fully vetted in BID package but instead begin from scratch.
- Countries mix and match guidance, missing key dependencies to have successful implementation.
- Some of these interventions are too complex for turnkey solutions and will require significant technical assistance.
- There will be resistance to working across different levels of the health system in some countries.
- Risk that you will skip a layer of the health system and decrease data quality and use.

Collection and documentation of evidence for stakeholders to demonstrate process, risks, and impact

Process documentation, monitoring, and evaluation as well as documentation of risks and impact are cardinal elements of the BID Initiative because they enable the project to provide documented evidence required for the proof of principle. This will initially be done in two demonstration countries. Related to this is the dissemination of findings and learnings to key stakeholders in the demonstration countries, as well as to other governments, funding agencies, and other key stakeholders that influence adoption and scale up of solutions in non-demonstration countries. The BID Initiative disseminates information through various channels including a BLN discussion meeting involving national governments and partners each year as well as through virtual means as noted earlier. In addition, the BID Initiative takes advantage of conferences and other partner meetings (e.g. Gavi, the Vaccine Alliance, and the WHO) to disseminate information. At a local level, data use campaigns, engagement of local partners, and the UAG provide avenues for information dissemination. It is envisaged that as evidence is disseminated, stakeholders will scrutinize the evidence, pose questions, and critique it, leading to additional action that will result in the refinement of the evidence base. This aligns with the BID Initiative core principle of “research, monitoring, and evaluation” to contribute to the larger body of knowledge.

Gathering, documenting, and disseminating evidence addresses the challenge of the need to understand the impact of implementing eHealth infrastructure. Looking at this evidence will help the BID team understand what interventions should be part of the package which will lead to the output of BID tools being packaged and disseminated (3.3.1) and this evidence will be used as content for the development of communication tools (4.2.1) and can be shared as part of conducting key networking interactions (4.2.2). In turn, the outputs are expected to lead to the intermediate outcomes of targeted countries being actively involved in BLN activities (3.3), BLN members gaining knowledge, skills and motivation to pursue BID interventions (3.4), increased involvement of donors, multilateral agencies, and implementation agencies (4.1), and increased global awareness of BID interventions, activities, and evidence to support implementation (4.2), which will ultimately lead to scale and replication of the BID solution (Outcome 3) and the necessary resources to achieve this (Outcome 4).

Evidence

- Decisions to scale up interventions are typically subject to iterative policy or practice-based decision making processes involving a multiplicity of internal and external stakeholders. While policy makers may lead the process, funding agencies and political leaders play a pivotal role and this latter group must be persuaded of the relevant merits of the intervention before any action can proceed (Milat et al., 2014). Key issues requiring information to enable decision making regarding scaling up include effectiveness, reach, costs of operating at scale, and key service delivery issues, such as acceptability, fit of interventions, and delivery models (Milat, 2014). In an environment where there are competing priorities, this evidence must be rigorous and convincing.

- Funding agencies and governments require tangible evidence of the efficacy of a health intervention before committing the considerable resources required to scale up, and this is not just a matter of whether it works but whether it will work at scale within a specific context (Shelton, 2014). Public health decision making requires evidence of effectiveness and decision makers need to answer the 'how', 'when' and 'why' questions about an intervention before they can make a decision to go to scale. Of necessity, public health operates at scale in widely diverse and complex situations and a key conceptual backbone is a detailed 'theory of change' to apply appropriate evidence for each operational component (Shelton, 2014). This evidence is drawn from activities using a variety of methodologies across different settings, and such evidence must be of high quality. The fact that the real world is complex and there is situational variability makes it necessary to triangulate evidence using different methodologies and to have sufficient data to make meaningful decisions about scaling up (Shelton, 2014).
- The generally exorbitant cost of wide-scale application of public health interventions makes proof of concept a general requirement prior to scale up (Nice, 2011; Chamberlin, Efron, and Moore 2015).

Assumptions

- Participating countries will, to the extent possible, commit financial and human resources to the scale up of feasible and contextually appropriate solutions once proven.
- Demonstration countries and PATH will honestly report what is working and not working.
- Documented evidence will be instrumental in convincing countries and funders to invest in BID solutions.
- The evidence being collected in the demonstration countries is the right evidence to inform which interventions will be part of the final package of interventions.

Risks

- Negative trends in the global economy can limit the ability of potential international funders and governments to scale up and sustain interventions.
- Changing priorities of donors or countries to support the interventions, or country level issues arising (e.g. ebola like outbreak) that would impede countries from continuing.
- The BID Initiative is not able to provide sufficient evidence that the interventions are effective.

Promotion of communication tools and engagement in key networking interactions to increase global awareness of BID and engage partners (countries, funders, TA partners, etc.)

The BID Initiative team is leveraging a variety of communication channels to share updates and experiences relevant to the larger BID Initiative community. Updates on the progress of BID Initiative activities and evidence generated in the demonstration countries and BLN member countries are shared through Facebook, Twitter, email newsletters, the BID website, videos, and blog posts. These communication tools were launched in April 2014 and are updated regularly.

Additionally, the BID team will share results through “brown bag” presentations, outreach efforts with donors, and have a presence at key networking interactions and conferences that are relevant to national immunization systems and integrated delivery of care. For example, in 2014-2015 the BID Initiative had a presence at the Inaugural Conference of the International Association of Immunization Managers (IAIM), Asia eHealth Informatics Network conference, the mHealth Summit, Gavi Alliance data quality meetings, as well as one-on-one meetings with USAID, Gavi, WHO, AFRO, and others.

One of the BID Initiative principles is to work through a coordinated approach. The BID team will coordinate with other key initiatives and organizations to collaborate on and/or share experiences to strengthen national immunizations systems and integrated delivery of care. The team will also actively reach out to promote funding, of other partners or directly to countries, and would consider this as a “win” for the BID Initiative approach. There is a deliberate effort underway to understand what other activities are being implemented by partners in BID Initiative demonstration countries and develop a stakeholder outreach plan that includes those activities that can be integrated with BID Initiative activities. It is expected that this effort will result in partners in demonstration countries agreeing to link their activities with the BID Initiative and/or leverage their own funding or in-kind resources toward implementation of the BID solution.

This strategic approach addresses the challenge that there is a belief that every country needs unique solutions(s) for their challenges. By partnering with other implementing organizations the BID Initiative team will leverage existing resources to assist in scaling the BID solution, rather than working in silos where other organizations are developing their own specific solution(s). This approach also addresses the challenge of a lack of interaction and information exchange among peers from different countries doing the same work, as the BID team will actively reach out to implementing partners doing similar work to engage them in rolling out the BID solution. This strategic approach also addresses the challenge of needing to understand the impact of implementing eHealth infrastructure because the BID Initiative will disseminate evidence about the BID experience in demonstration countries. The activities that are part of this strategic approach will lead to the outputs of having a stakeholder outreach plan developed (4.1.1), working with demonstration countries to incorporate partner activities (4.1.2), developing communication tools (4.2.1) and conducting key networking interactions (4.2.2). These outputs are expected to lead to the intermediate outcomes of increased involvement of donors, multilateral agencies, implementation organizations, etc. (4.1) and increased global awareness of BID Initiative interventions, activities, and evidence to support implementation (4.2), which will ultimately lead to scale and replication of the BID solution (Outcome 3) and the necessary resources to achieve this (Outcome 4).

Evidence

- There is growing evidence of the impact of social media on diffusion of innovations. It has been reported that peer support or pressure and shared values influence people’s decisions with respect to new innovations and choices (Mustaffa, Ibrahim, Wan Mahmud, Ahmad, Chang Peng & Mahbob, 2011). Social media is therefore a potential

tool for rapid information diffusion through peer interaction such as content sharing (Zhan, Huaxia & Whinston, 2014). These authors provide some evidence for the effectiveness of social media.

- Cardon and Marshall (2015) have presented survey results that indicate that whilst businesses still to a large extent use traditional methods of team communication, the projection is that social networking tools will be the primary tools for team communication in the near future.

Assumptions

- BID communication tools (Facebook, Twitter, email newsletters, BID website, blog posts, etc.) are reaching the right target audience to increase awareness of BID.
- Increased awareness of BID will lead to increased demand for the BID solutions through commitments to implement and/or contribute resources.
- There are activities being implemented (or planned for implementation) in BID Initiative demonstration countries that are aligned with the goals of the BID Initiative.
- Partner organizations will be willing to align funding and/or in-kind resources with the BID Initiative to achieve a greater impact.
- Partnering with others will make it easier to achieve scale and/or to have a greater impact on data quality and use.
- Partners will agree to implement parts of the BID solutions even if they did not design it.

Risks

- Partners and funders will be distracted by other initiatives or efforts and not make time to engage with the BID Initiative.
- We may create a demand that we are not able to fill given current global capacity in some of the areas, in particular around eHealth.
- Coordination with partner organizations will take significant time and resources to manage the relationship and coordinate activities.
- Donors will not want to fund projects that they did not design.
- Long funding cycles and little wiggle room in current contracts will make short-term alignment difficult.
- Since BID is using a somewhat different “holistic” approach there is a risk that it will not be well understood and will be mistaken for solely a technology project.

Post-script: Synergy with Intervention Theory of Change (ToC1)

This “Scaling BID Interventions Theory of Change” (ToC2, outlining Primary Outcomes 3 & 4 of the BID Initiative work) should be read in close accompaniment with the “BID Interventions Theory of Change” (ToC1) document that outlines the theory behind Primary Outcomes 1 & 2 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 we will evaluate the total cost of ownership of the BID Initiative 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 interventions, donors that want to provide funding to support their 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 and economic evaluation in our demonstration countries (ToC1) in that same circular fashion.

Finally the expectation is that the impacts/results in ToC1 (more children being vaccinated, culture of data use, etc.) are the ultimate impacts 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 same impacts magnified for more countries across the region.

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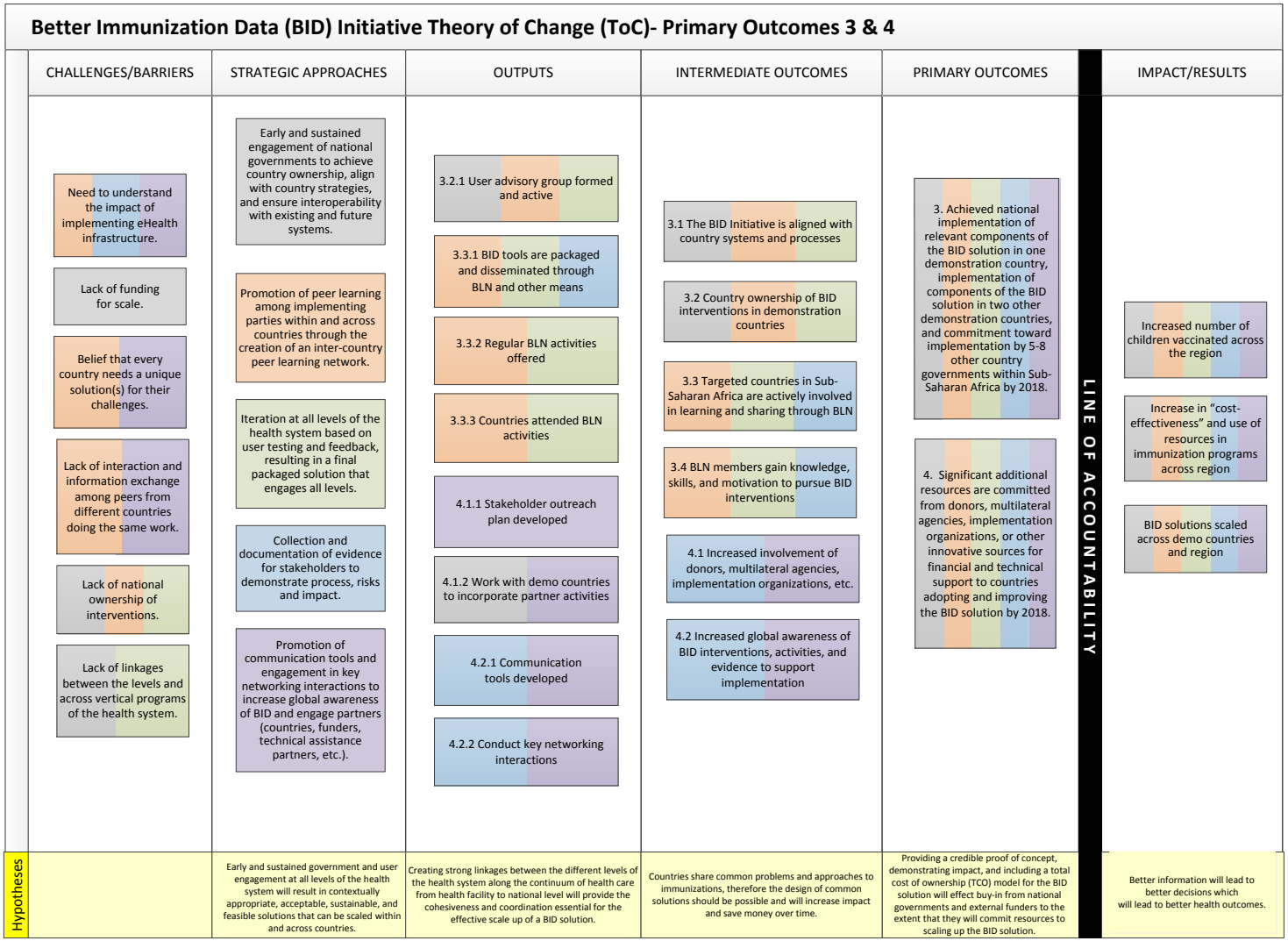
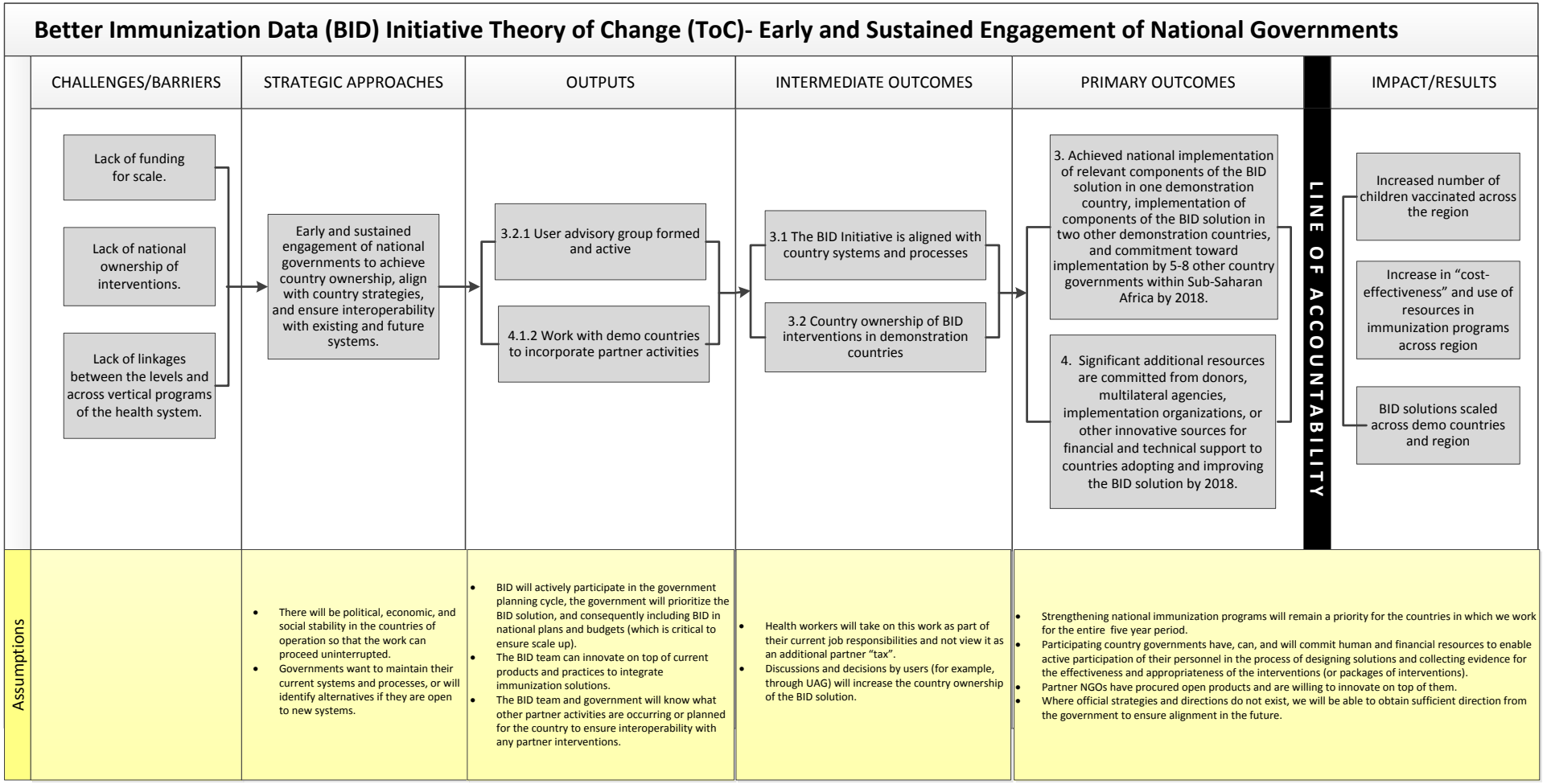
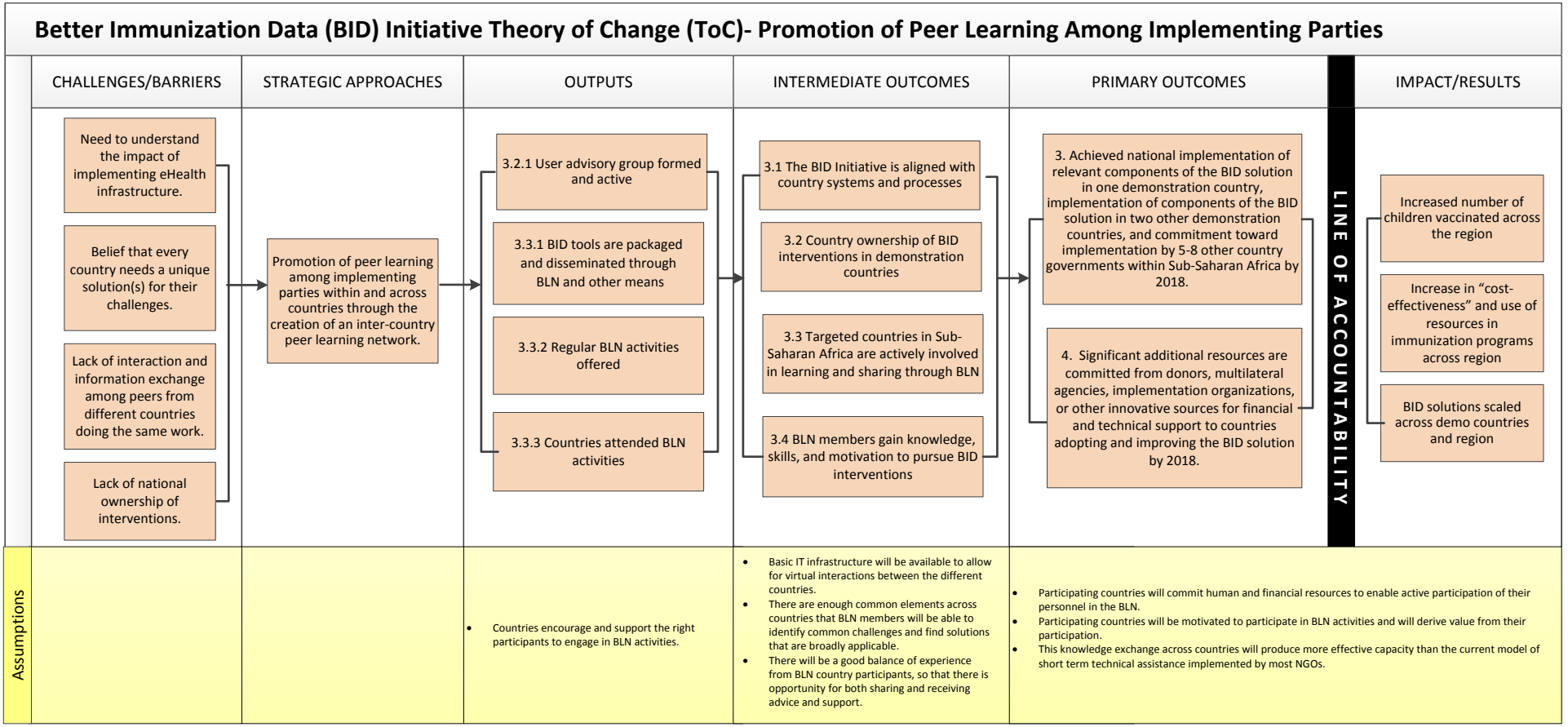
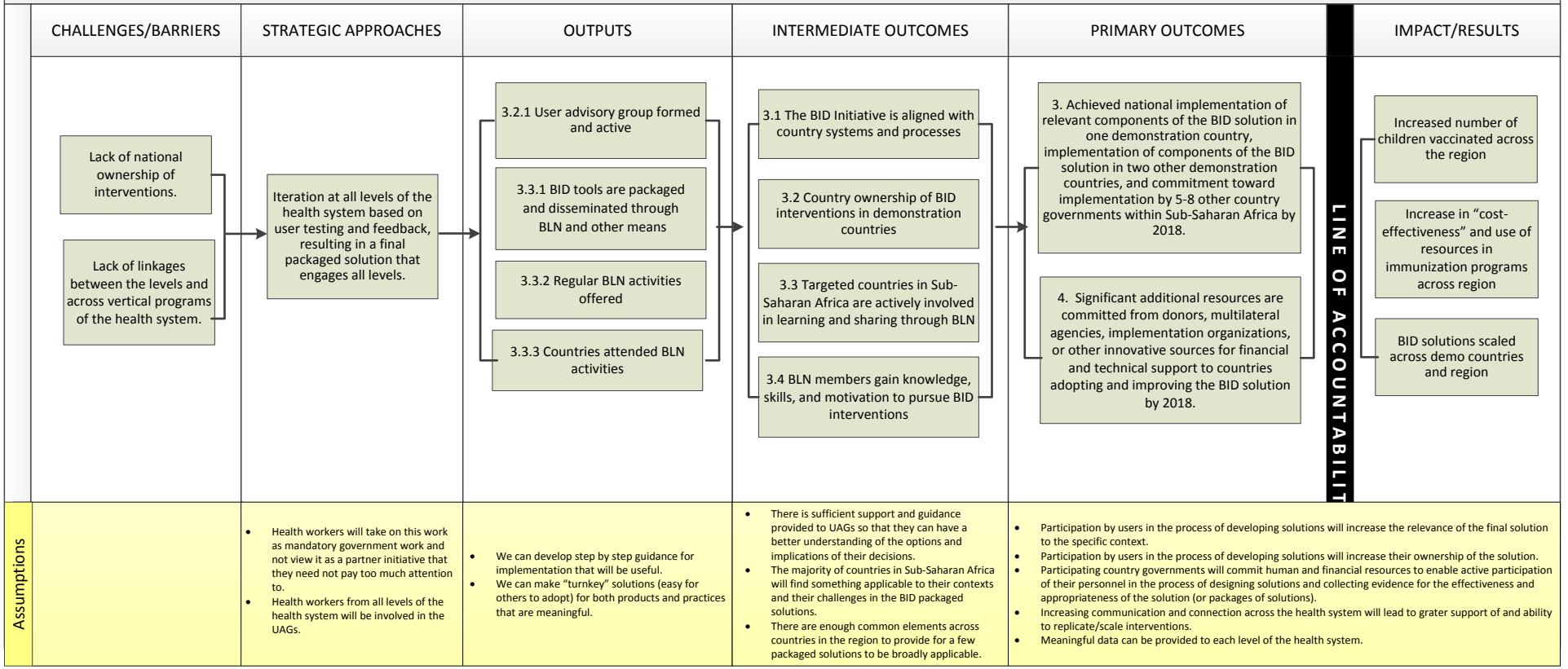
Appendix 1- Scale Theory of Change



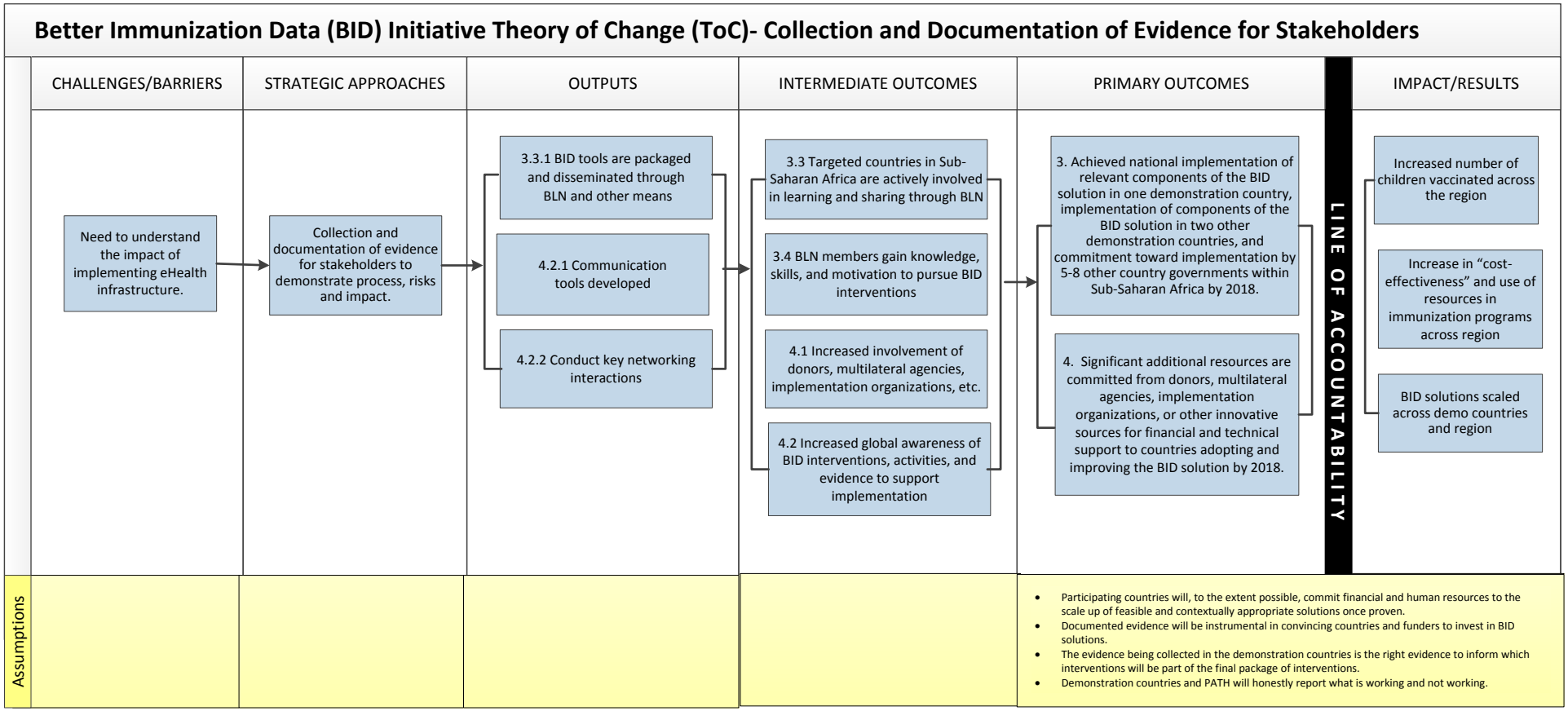

Better Immunization Data (BID) Initiative Theory of Change (ToC)- Early and Sustained Engagement of National Governments
CHALLENGES/BARRIERS
STRATEGIC APPROACHES
OUTPUTS
INTERMEDIATE OUTCOMES
PRIMARY OUTCOMES
IMPACT/RESULTS
Lack of funding for scale.
Lack of national ownership of interventions.
Lack of linkages between the levels and across vertical programs of the health system.
Early and sustained engagement of national governments to achieve country ownership, align with country strategies, and ensure interoperability with existing and future systems.
3.2.1 User advisory group formed and active
4.1.2 Work with demo countries to incorporate partner activities
3.1 The BID Initiative is aligned with country systems and processes
3.2 Country ownership of BID interventions in demonstration countries
3. Achieved national implementation of relevant components of the BID solution in one demonstration country, implementation of components of the BID solution in two other demonstration countries, and commitment toward implementation by 5-8 other country governments within Sub-Saharan Africa by 2018.
4. Significant additional resources are committed from donors, multilateral agencies, implementation organizations, or other innovative sources for financial and technical support to countries adopting and improving the BID solution by 2018.
LINE OF ACCOUNTABILITY
Increased number of children vaccinated across the region
Increase in "cost-effectiveness" and use of resources in immunization programs across region
BID solutions scaled across demo countries and region
Assumptions
There will be political, economic, and social stability in the countries of operation so that the work can proceed uninterrupted.
Governments want to maintain their current systems and processes, or will identify alternatives if they are open to new systems.
BID will actively participate in the government planning cycle, the government will prioritize the BID solution, and consequently including BID in national plans and budgets (which is critical to ensure scale up).
The BID team can innovate on top of current products and practices to integrate immunization solutions.
The BID team and government will know what other partner activities are occurring or planned for the country to ensure interoperability with any partner interventions.
Health workers will take on this work as part of their current job responsibilities and not view it as an additional partner "tax".
Discussions and decisions by users (for example, through UAG) will increase the country ownership of the BID solution.
Strengthening national immunization programs will remain a priority for the countries in which we work for the entire five year period.
Participating country governments have, can, and will commit human and financial resources to enable active participation of their personnel in the process of designing solutions and collecting evidence for the effectiveness and appropriateness of the interventions (or packages of interventions).
Partner NGOs have procured open products and are willing to innovate on top of them.
Where official strategies and directions do not exist, we will be able to obtain sufficient direction from the government to ensure alignment in the future.

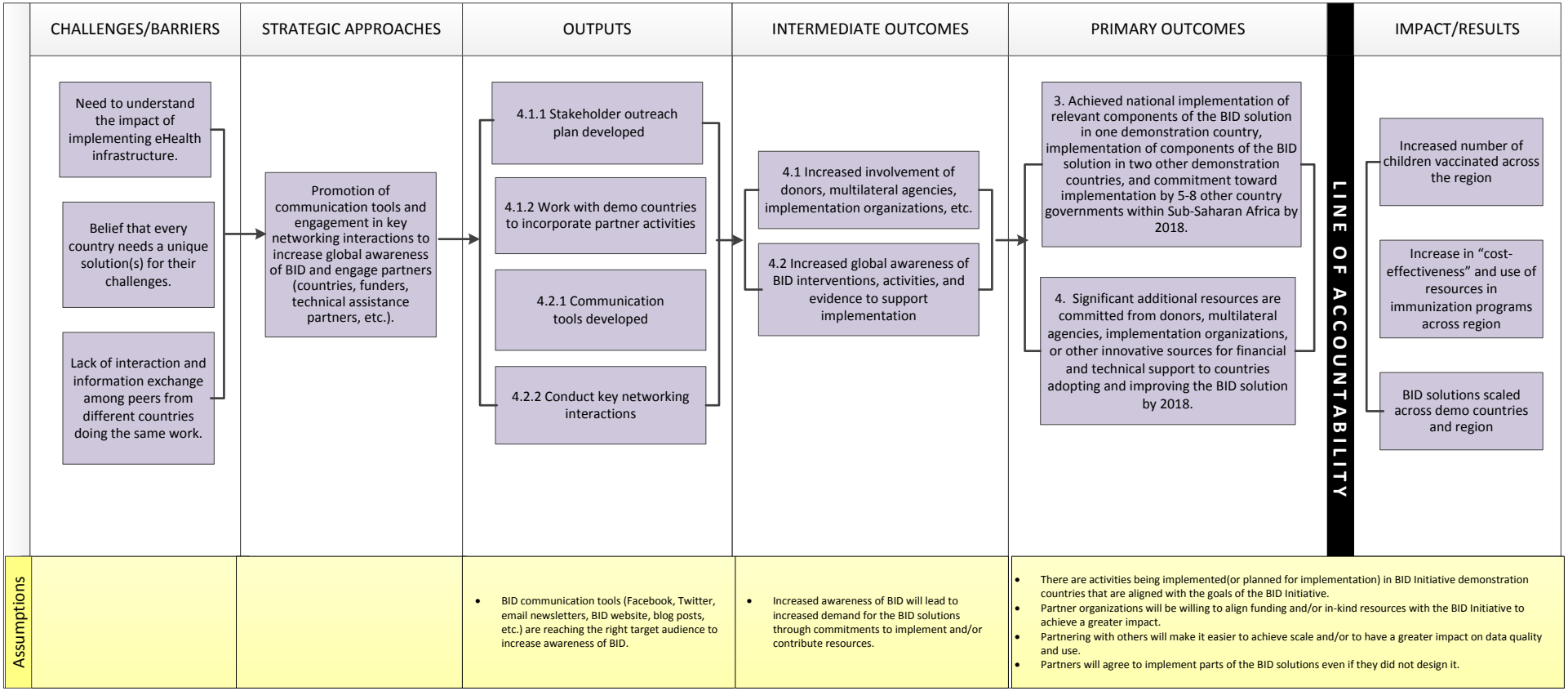

Better Immunization Data (BID) Initiative Theory of Change (ToC)- Promotion of Peer Learning Among Implementing Parties
CHALLENGES/BARRIERS
STRATEGIC APPROACHES
OUTPUTS
INTERMEDIATE OUTCOMES
PRIMARY OUTCOMES
LINE OF ACCOUNTABILITY
IMPACT/RESULTS
Need to understand the impact of implementing eHealth infrastructure.
Belief that every country needs a unique solution(s) for their challenges.
Lack of interaction and information exchange among peers from different countries doing the same work.
Lack of national ownership of interventions.
Promotion of peer learning among implementing parties within and across countries through the creation of an inter-country peer learning network.
3.2.1 User advisory group formed and active
3.3.1 BID tools are packaged and disseminated through BLN and other means
3.3.2 Regular BLN activities offered
3.3.3 Countries attended BLN activities
3.1 The BID Initiative is aligned with country systems and processes
3.2 Country ownership of BID interventions in demonstration countries
3.3 Targeted countries in Sub-Saharan Africa are actively involved in learning and sharing through BLN
3.4 BLN members gain knowledge, skills, and motivation to pursue BID interventions
3. Achieved national implementation of relevant components of the BID solution in one demonstration country, implementation of components of the BID solution in two other demonstration countries, and commitment toward implementation by 5-8 other country governments within Sub-Saharan Africa by 2018.
4. Significant additional resources are committed from donors, multilateral agencies, implementation organizations, or other innovative sources for financial and technical support to countries adopting and improving the BID solution by 2018.
Increased number of children vaccinated across the region
Increase in "cost-effectiveness" and use of resources in immunization programs across region
BID solutions scaled across demo countries and region
Assumptions
Countries encourage and support the right participants to engage in BLN activities.
Basic IT infrastructure will be available to allow for virtual interactions between the different countries.
There are enough common elements across countries that BLN members will be able to identify common challenges and find solutions that are broadly applicable.
There will be a good balance of experience from BLN country participants, so that there is opportunity for both sharing and receiving advice and support.
Participating countries will commit human and financial resources to enable active participation of their personnel in the BLN.
Participating countries will be motivated to participate in BLN activities and will derive value from their participation.
This knowledge exchange across countries will produce more effective capacity than the current model of short term technical assistance implemented by most NGOs.

Better Immunization Data (BID) Initiative Theory of Change (ToC)- Iteration at all Levels of the Health Sytem



Assumptions					
		• Health workers will take on this work as mandatory government work and not view it as a partner initiative that they need not pay too much attention to. • Health workers from all levels of the health system will be involved in the UAGs.	• We can develop step by step guidance for implementation that will be useful. • We can make "turnkey" solutions (easy for others to adopt) for both products and practices that are meaningful.	• There is sufficient support and guidance provided to UAGs so that they can have a better understanding of the options and implications of their decisions. • The majority of countries in Sub-Saharan Africa will find something applicable to their contexts and their challenges in the BID packaged solutions. • There are enough common elements across countries in the region to provide for a few packaged solutions to be broadly applicable.	• Participation by users in the process of developing solutions will increase the relevance of the final solution to the specific context. • Participation by users in the process of developing solutions will increase their ownership of the solution. • Participating country governments will commit human and financial resources to enable active participation of their personnel in the process of designing solutions and collecting evidence for the effectiveness and appropriateness of the solution (or packages of solutions). • Increasing communication and connection across the health system will lead to grater support of and ability to replicate/scale interventions. • Meaningful data can be provided to each level of the health system.


Better Immunization Data (BID) Initiative Theory of Change (ToC)- Collection and Documentation of Evidence for Stakeholders
CHALLENGES/BARRIERS
STRATEGIC APPROACHES
OUTPUTS
INTERMEDIATE OUTCOMES
PRIMARY OUTCOMES
IMPACT/RESULTS
Need to understand the impact of implementing eHealth infrastructure.
Collection and documentation of evidence for stakeholders to demonstrate process, risks and impact.
3.3.1 BID tools are packaged and disseminated through BLN and other means
4.2.1 Communication tools developed
4.2.2 Conduct key networking interactions
3.3 Targeted countries in Sub-Saharan Africa are actively involved in learning and sharing through BLN
3.4 BLN members gain knowledge, skills, and motivation to pursue BID interventions
4.1 Increased involvement of donors, multilateral agencies, implementation organizations, etc.
4.2 Increased global awareness of BID interventions, activities, and evidence to support implementation
3. Achieved national implementation of relevant components of the BID solution in one demonstration country, implementation of components of the BID solution in two other demonstration countries, and commitment toward implementation by 5-8 other country governments within Sub-Saharan Africa by 2018.
4. Significant additional resources are committed from donors, multilateral agencies, implementation organizations, or other innovative sources for financial and technical support to countries adopting and improving the BID solution by 2018.
LINE OF ACCOUNTABILITY
Increased number of children vaccinated across the region
Increase in "cost-effectiveness" and use of resources in immunization programs across region
BID solutions scaled across demo countries and region
Assumptions
Participating countries will, to the extent possible, commit financial and human resources to the scale up of feasible and contextually appropriate solutions once proven.
Documented evidence will be instrumental in convincing countries and funders to invest in BID solutions.
The evidence being collected in the demonstration countries is the right evidence to inform which interventions will be part of the final package of interventions.
Demonstration countries and PATH will honestly report what is working and not working.


CHALLENGES/BARRIERS
STRATEGIC APPROACHES
OUTPUTS
INTERMEDIATE OUTCOMES
PRIMARY OUTCOMES
IMPACT/RESULTS
Need to understand the impact of implementing eHealth infrastructure.
Belief that every country needs a unique solution(s) for their challenges.
Lack of interaction and information exchange among peers from different countries doing the same work.
Promotion of communication tools and engagement in key networking interactions to increase global awareness of BID and engage partners (countries, funders, technical assistance partners, etc.).
4.1.1 Stakeholder outreach plan developed
4.1.2 Work with demo countries to incorporate partner activities
4.2.1 Communication tools developed
4.2.2 Conduct key networking interactions
4.1 Increased involvement of donors, multilateral agencies, implementation organizations, etc.
4.2 Increased global awareness of BID interventions, activities, and evidence to support implementation
3. Achieved national implementation of relevant components of the BID solution in one demonstration country, implementation of components of the BID solution in two other demonstration countries, and commitment toward implementation by 5-8 other country governments within Sub-Saharan Africa by 2018.
4. Significant additional resources are committed from donors, multilateral agencies, implementation organizations, or other innovative sources for financial and technical support to countries adopting and improving the BID solution by 2018.
LINE OF ACCOUNTABILITY
Increased number of children vaccinated across the region
Increase in "cost-effectiveness" and use of resources in immunization programs across region
BID solutions scaled across demo countries and region
Assumptions
• BID communication tools (Facebook, Twitter, email newsletters, BID website, blog posts, etc.) are reaching the right target audience to increase awareness of BID.
• Increased awareness of BID will lead to increased demand for the BID solutions through commitments to implement and/or contribute resources.
• There are activities being implemented(or planned for implementation) in BID Initiative demonstration countries that are aligned with the goals of the BID Initiative.
• Partner organizations will be willing to align funding and/or in-kind resources with the BID Initiative to achieve a greater impact.
• Partnering with others will make it easier to achieve scale and/or to have a greater impact on data quality and use.
• Partners will agree to implement parts of the BID solutions even if they did not design it.

Appendix 2- BID Scale Theory of Change (ToC) - Literature Review

Introduction

The Better Immunization Data (BID) Initiative (http://bidinitiative.org/) has a vision to empower countries to enhance immunization and overall health service delivery through improved data collection, quality, and use. The goal is to design a replicable and sustainable solution by taking an approach that brings together information system products, data management policies, and the practices of people that use them, to be tested in a few countries and packaged to deploy at scale in many. The BID Initiative also has embedded within it a peer learning network (the BID Learning Network (BLN)) that is intended to accelerate diffusion of knowledge, ideas, lessons learned, and innovations arising out of the BID Initiative activities and that of other entities involved in similar endeavours. This literature review is intended to support the development of a theory of change model that will enable effective monitoring and evaluation of the activities related to the goal of scaling up, and will review theories of scaling, peer learning, networking, and diffusion.

This review is focused on Outcomes 3 and 4 of the BID Initiative:

- **Outcome 3:** Achieved national implementation of the BID solution in one demonstration country, implementation of components of the BID solution in two other demonstration countries, and commitment toward implementation in 5-8 other countries within Sub-Saharan Africa by 2018.
- **Outcome 4:** Significant additional resources are committed from donors, multilateral agencies, implementation organizations, or other innovative sources for financial and technical support to countries adopting and improving the BID solution by 2018.

Theories Related to Scale

“Scaling up” is the process by which health interventions shown to be efficacious on a small scale and/or under controlled conditions are expanded under real world conditions into broader policy or practice (Milat et al., 2013 & 2014a). Decisions to scale up interventions are typically subject to iterative policy or practice-based decision making processes, usually including internal and external stakeholders. While policy makers may lead the process, funding agencies and political leaders play a pivotal role, and this latter group must be persuaded of the relevant merits of the intervention before any action can proceed (Milat et al., 2014b). Key issues requiring information to enable decision making regarding scaling up include effectiveness, reach, costs of operating at scale, and key service delivery issues such as acceptability, fit of interventions, and delivery models (Milat, 2014b).

Proof of Concept

It is inevitable that funding agencies and governments require tangible evidence of health interventions before undertaking to commit the considerable resources required to scale up such interventions. As noted by Shelton (2014), it is not just a matter of whether it works but whether it will work at scale within a specific context (Shelton, 2014). Public health decision making requires evidence of effectiveness and decision makers need to answer the 'how', 'when', and 'why' questions regarding an intervention before they can make a decision to go to scale. Of necessity, public health operates at scale in widely diverse and complex situations, and a key conceptual backbone is a detailed 'theory of change' to apply appropriate evidence for each operational component (Shelton, 2014). This evidence is drawn from activities using a variety of methodologies across different settings, and such evidence must be of high quality. The fact that the real world is complex and there is situational variability makes it necessary to triangulate evidence using different methodologies and to have sufficient data to make meaningful decisions about scaling up (Shelton, 2014). Going to scale is costly and resource intensive, making a viable proof of concept a general requirement for any public health intervention that is to operate at scale (Nice, 2011; Chamberlin, Efron, and Moore 2015).

In addition to requiring a proof of concept, Yamey (2012) identified specific barriers to scale up in low and middle income countries including; simplicity of interventions, the need to equip "scale up leaders", identifying health workers dedicated to scale up, reaching and engaging communities, matching the best delivery strategy to the specific health problem and context, and the need to raise the low profile of implementation science (Yamey, 2012). All these factors should be considered in the process of generating a proof of concept that is required to convince authorities in these countries to go to scale with interventions.

Aside from providing a proof of concept, there are other challenges to scaling up. A key challenge is that scale up will not occur overnight, but rather it often takes years. As time passes, financing priorities by government and international financiers may change, governments may change (with the possibility of change in policy), and agency managers and staff may move on (Hartmann and Linn, 2008). These authors propose that pilots should be designed with scale up in mind and the whole approach to scale up must be systematic in understanding that this is a dynamic process which takes time. This process needs leaders and champions who are in for the long haul (Hartmann and Linn, 2008; Chopra, Daviaud, Pattinson et al., 2009). These leaders and champions should be visionary, persistent, well connected to major stakeholders and constituencies, and able to build up authority and provide guidance (Hartmann and Linn, 2008).

BID Initiative approach: To address some of these issues, the BID Initiative has adopted a user-centric approach to design which has an embedded process of iteration at all levels of the health system based on user testing and feedback, with a view to arriving at a final packaged solution that engages all levels.

User-Centered Approach

User-centred approaches for the development of health information systems (HISs) are not new and have been shown to be effective when the user is an active participant in the development process (Pilemalm and Timpka, 2007), fully participating in various iterations of the innovation/product. Key challenges with this approach include unwillingness of users to engage in project initiation and information flow analysis, preferring to leave it to the experts (Doll and Deng, 1999) and the additional time and human resources required. However, the importance of involving users and engaging them appropriately has been underlined by Canada, Mortensen and Patnaik (2007). These authors posit that designs must be tailored to the priorities of each user group (innovators, early adopters, early majority, late majority, and laggards). This necessitates engaging end users at every level of the process from design to full blown adoption. In this respect, Everett Rogers' seminal work 'Diffusion of Innovations' (Rogers, 2003), is pertinent. A meta-analysis of 1840 studies related to Rogers' generalized theory of diffusion of innovations indicates that there is likelihood of these theories holding although for older studies there is a reduced level of scientific rigor (Midgley, 1987). An earlier empirical study (Baroudi, Olson, and Ives, 1986) demonstrated that user involvement in the development of an information system increases both user satisfaction and system usage, including satisfaction with information provided by the system. Finally, user involvement in design has been associated with improved quality of systems arising from more accurate user requirements, avoidance of costly system features that the prospective user neither wants nor is able to use, improved acceptance levels of the system, greater understanding of the system by the user which leads to more effective use of the system, and increased participation of the user in organizational decision making (Robey and Farrow, 1982).

Damodaran (1996) identified three levels of user involvement including informative, consultative, and participative, thus making a case for the latter arguing that participative involvement allows the user to influence key system design decisions and avoid the often observed shortfall in system abilities to meet expectations once operationalized. This literature review also emphasizes the need for infrastructural and management support for user involvement at different levels of the organization or system and stresses the point that user involvement should never become a rubber stamp process.

In addition to vision and drivers, Hartmann and Linn (2008) based on their research, state that interventions to be scaled up need 'space to grow' that includes financial, political, policy, institutional, cultural, partnership and learning space. Effective scale up requires diligent implementation of the intervention at every level of the health system and there must be accountability for service provision, otherwise there is a failure to deliver (Chopra, Daviaud, Pattinson et al., 2009). Connectivity and linkage between the different levels of the health system is therefore important for successful scale up (Oluwole et al., 2006).

Yamey (2011), based on qualitative research and an extensive literature review on scaling up health interventions, has identified key success factors that include choosing a simple intervention widely agreed to be valuable, strong leadership and governance, active engagement of a range of implementers and of the target community, tailoring the scale-up

approach to the local situation, and incorporating research into implementation. Further, this literature review highlights the importance of country ownership and of moving away from traditional donor-recipient relationships in which donors dictate the terms in the success of national scale up programs in Africa. There is emphasis on active, participative engagement of the recipients or targets of the intervention including government. This literature review, and others quoted therein, identify factors that are associated with faster diffusion including relative advantage (i.e. innovation addresses needs of adopter), compatibility, simplicity, triability (adopter has opportunity to try it out before adopting), and observability (innovation and its results are observed by the adopter). All of these are enhanced by early and sustained engagement with national governments (and other key players) to ensure alignment with government strategies and to ensure interoperability with existing and future systems (meeting the requirement for compatibility).

BID Initiative approach: The BID Initiative has consequently adopted the participative model for user involvement based upon these various theories.

Government Ownership

Mangham and Hanson (2010) discuss constraints to scaling up, highlighting policies and management at the health sector level as a constraint. Government is best placed to address these issues and if they are fully and continuously engaged, they have the ability to pave the way for both adoption and scaling up and are in a position to interact with other non–health governmental entities as necessary to ensure success.

Paina and Peters (2012) have emphasized the need to consider the complexities of the health system and view it through the lens of Complex Adaptive Systems (CAS). CAS are systems that have many interacting components with the capability to self-organize, adapt, and learn from experience. In this respect, the interconnectedness of different actors and their dynamic interactions across the health system closely resemble CAS. The authors therefore argue that organizational arrangements need to support the spread of access to health services. Health services in developing economies comprise highly heterogeneous groups of actors including policy makers, different categories of healthcare providers, managers, clients receiving services, regulators, collaborating partners, funding agencies, etc., and intervene at multiple levels through a variety of services and functions. This scenario requires strong government leadership and engagement for successful development, adoption, and scale up of solutions.

In their documentation of lessons learned in scaling up interventions in Africa, Larson et al. (2014) highlight the importance of government ownership and the need to communicate that the intervention is a government initiative (not a donor or partner driven initiative) to every level of the health care system.

Limited political commitment, shortage in human and financial resources, and unreliable data have all been indicated as obstacles to scaling up interventions that have been shown to work (Kurowski et al., 2007; Prata et al., 2010). If government is going to own and prioritize an intervention, it must be aligned to that government's policy and priorities; and for scale up and sustainability, it is essential that interventions become part of the national health package and

linked to targets and budget lines with a regular review procedure (Oluwole et al., 2006). National ownership has been cited as an important ingredient for successful scaling up (Oluwole et al., 2006). It is also important to ensure that from the start of any project, what constitutes “the intervention” is clearly defined and buy-in from government and implementers is critical in this regard (Larson et al., 2014).

Often, a critical limitation in undertaking scale up activities is cost – not just getting the money but determining how much is needed and making appropriate budgetary allocations (Johns and Baltussen, 2004; Alistar and Brandeau, 2012). Costs are specific to both the type of intervention and its particular setting (Johns and Torres, 2005). However, there are general principles that can be applied in determining these costs including taking into account the urban/rural dichotomy, distinguishing economies and diseconomies of scale, making distinctions between different types of costs, a thorough assessment of human resource capacity, and availability (Johns and Torres, 2005).

Theories Related to Peer Learning

From time immemorial education theorists and educators have challenged the teacher–led model of learning and in his 1916 book entitled democracy and education, John Dewey wrote: “Education is not an affair of ‘telling’ and being told, but an active and constructive process.”(Dewey, 1916). Similarly, Paulo Freire in his book *Pedagogy of the Oppressed* (Freire, 1968) likened the traditional teaching framework as a banking system in which students are empty vessels in which knowledge and concepts are to be deposited. Views such as these have led to the evolution of learning theories that have sought to address the limitations of traditional models of learning. In the mid-1980s, Edwin Hutchins developed the theory of distributed cognition which states that “knowledge lies not only within the individual, but also in the individual's social and physical environment” (Hutchins, 1991). This framework encompasses the coordination between individuals and their physical environment. Distributed cognition alludes to practices whereby intellectual resources are socially shared, spreading individual cognitive resources and allowing groups to achieve more than a single individual can. These theories have given rise to what we now call “peer learning”. Peer learning is not intended to be an outright rejection of the teacher-student hierarchy, but it does imply a strong personal commitment to your own learning and to your peers in a learning environment where all are co-learners. The theory of connectivity, expounded in a paper by Griffiths and Guile (2003), puts emphasis on the relationship between work experience, learning, and knowledge. Downes (Downes, 2006) went a step further and argued that the learning of knowledge is distributive, that is, it is not located in any given place (and therefore not 'transferred' or 'transacted' per se) but rather consists of the network of connections formed from experience and interactions with a knowing community.

From theory to objective evidence, the work by Kraatz (Kraatz, 1998) showed that social ties promote adaptation because they create high capacity information links between organizations and engender a motivation for information sharing; consequently mitigating uncertainty and providing benefits derived from insights and experiences of peers. Further, his work demonstrated that peers are more likely to imitate their successful peers rather than those that

appeared to be different from them. The implication here is that if you bring equals together and sustain their interaction, they will be motivated to share information and learn from each other. Such a group if sustained, can grow into a community of practice, that is, people who are engaged in a process of collective learning in a shared domain of human endeavour, such as the case of the development of information systems that speak to timely availability of accurate data that can be used for decision making in immunization programs (Wenger, 2013). Rada (1998) in his review noted that collaborative learning is superior to individual learning as demonstrated in 226 comparative studies, and that cooperation and achievement are positively related. He further observed that self-critiquing is higher during collaborative learning (80%) compared to learning alone (20%). These attributes of peer learning result in better outcomes and enhance adoption of best practices among peers. Further, De Stobbeler and Ashford (2014) in their research demonstrated that peer enquiry is important and results in favourable outcomes, and that seeking feedback from peers is enhanced by task interdependence and psychological safety.

BID Initiative approach: It is the intention of the BID Initiative through its BLN, to support peer learning that will result in the emergence of a community of peers in Africa who share a common passion for immunization information systems that generate timely high quality data; data that can bring to fruition the fundamental goal of the BID Initiative, namely that countries' health services are empowered by improved data collection quality and use. An underlying principle of the BLN is that bringing equals together will motivate their sharing of information and learning from one another.

Peer learning networks take different forms, but the form that the BID Initiative is concerned with is cooperative learning where peers work together in pursuit of a specific shared goal within a structure that creates positive interdependence (Topping, 2005). Methods for peer learning vary on a number of organizational variables including from where participants are coming (e.g., different countries or institutions), place (location of operation), characteristics of whether they play the "helper" or "helped" role, or whether or not equal opportunity involvement is emphasized (where everyone functions as helper and helped) among other things (Topping, 2005). Other factors include context, objectives, and required frequency of interactions. A theoretical model of processes influencing peer learning effectiveness has been proposed by Topping and Ehly (Topping and Ehly, 2001) based on existing research. The key processes include:

- **Organization and engagement** – Goals, plans, individualization, interactivity, immediacy, and variety.
- **Cognitive conflict** – To reduce primitive cognitions and beliefs.
- **Scaffolding and error management** – Zone of proximal development (ZPD) (i.e., what a learner can do with guidance) management, information modulation, modelling, monitoring, error detection, diagnosis, and correction.
- **Communication** – Embodying and crystalizing thought into language, listening, explaining, questioning, simplifying, prompting, rehearsing, reviewing, summarizing, speculating, and hypothesizing.

- **Affect** – Motivation, accountability, modelling, ownership, and self-disclosure.

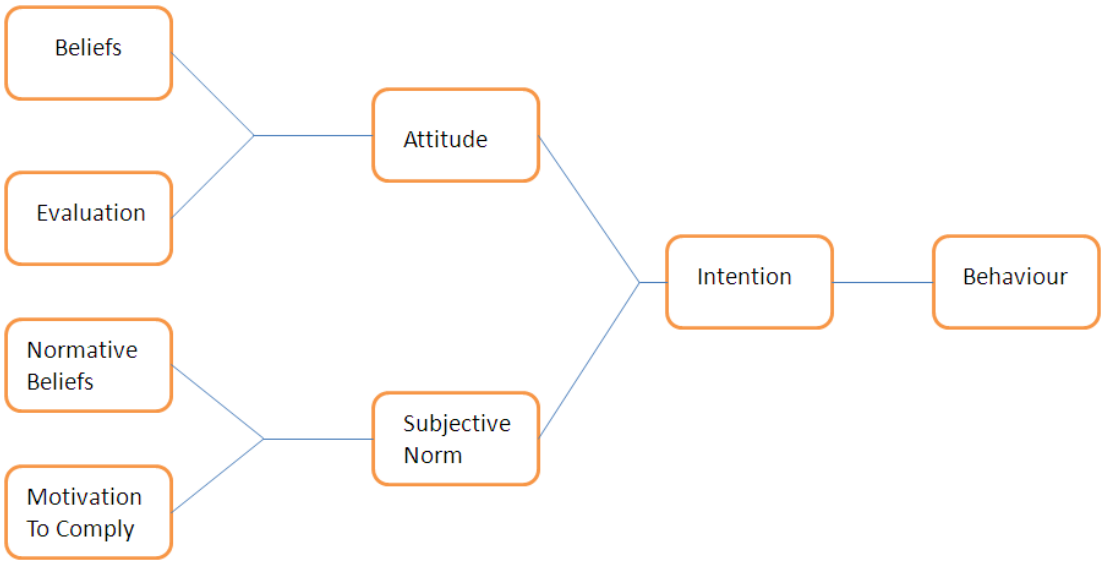
These processes lead to peers extending their current capabilities (accretion), modifying current capabilities (re-tuning), or rebuilding new understanding (restructuring). Ultimately this leads to a shared understanding between peers (Topping, 2005) and forms a foundation for further progress. Successful peer learning enables and facilitates an increased volume of engaged and successful practice resulting in consolidation, fluency, and automaticity of core skills, with the prospect of generalization of concepts learned from a specific situated example to varied contexts in multiple communities of practice. As this occurs, explicit and implicit feedback and re-enforcement occurs among peers where self- monitoring and regulation takes root. Metacognition, self-attribution, and self- esteem are expected to ensue when this happens.

Theories of Diffusion

Information systems (IS) theory and research leans heavily on Diffusion of Innovations (Rogers, 1995) and the Theory of Planned Behaviour (Ajzen, 1991). Diffusion of Innovations theory defines innovation as an idea, practice, or object that is perceived as new and diffusion as the process in which an innovation is communicated over time among the members of a social system (Rogers, 2003). Adoption is defined as a decision to fully use an innovation. Decision makers go through a number of stages from initial knowledge of an innovation to full adoption, and this has been called the “innovation decision process” (Rogers, 2003). Within this milieu, five characteristics of the innovation have been reported to influence the decision to adopt, including relative advantage, compatibility; complexity, triability, and observability (Tornatzky and Klein, 1982), and of these Tornatzky and Klein (1982) identified relative advantage, perceived compatibility, and complexity as the key elements influencing the decision makers’ propensity to adopt across the board (Tornatzky and Klein, 1982).

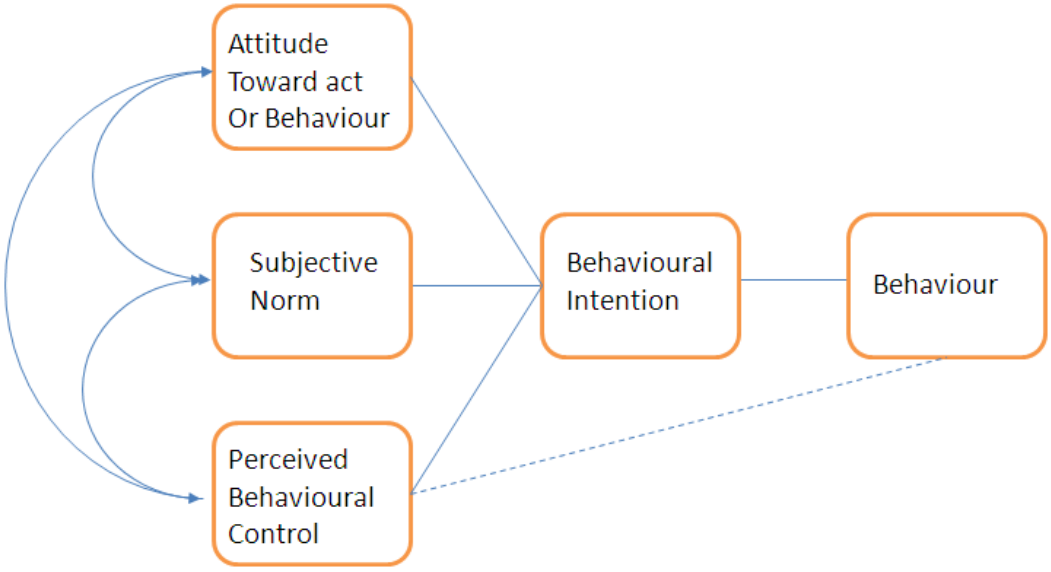
The Theory of Planned Behaviour (Ajzen, 1991) is based on research and expectancy value models (Fishbein and Ajzen, 1975) and builds on the Theory of Reasoned Action (Ajzen and Fishbein, 1980). The Theory of Reasoned Action is depicted in Figure 1.

Figure 1: The Theory of Reasoned Action (Imported from: Southey, 2012)



The Theory of Planned Behaviour, summarized in Figure 2, attempts to delineate the variables and iterations between those variables that are responsible for decision making behaviour. This model depicts that behavioural intentions are a function of the decision makers' attitude toward the behaviour, the referent subjective norms of the decision maker, and the decision makers' perceived control over the behaviour ((Weigel, Hazen, Cegielski, & Hall, 2014).

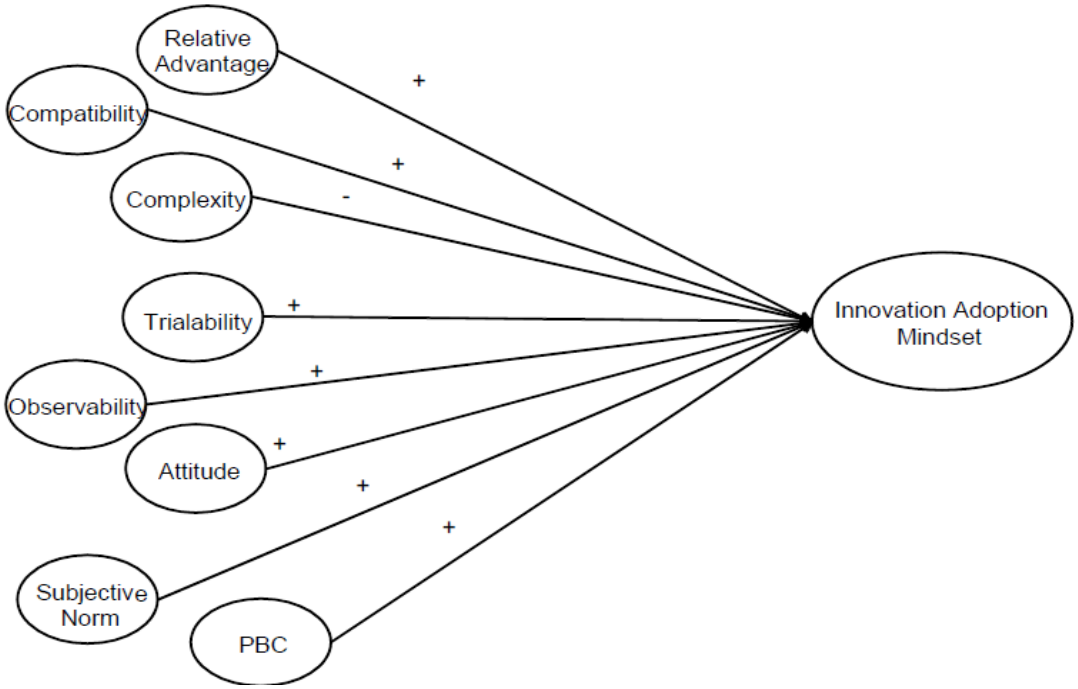
Figure 2: Theory of Planned Behaviour (Imported form Southey, 2012



Based on a meta-analysis of over 50 research studies, Weigel et al. (Weigel, Hazen, Cegielski, & Hall, 2014) have developed an Innovation Adoption –Behaviour (IAB) model which combines the Innovation Diffusion and the Theory of Planned Behaviour and have identified key factors that affect the propensity to adopt and implement innovations, namely: relative advantage,

compatibility, complexity, triability, observability, attitude, subjective norm, and perceived behavioural control as summarized in Figure 3.

Figure 3: Innovation Adoption-Behaviour (IAB) Model (imported from Weigel, Hazen, Cegielski, & Hall, 2014) NB PBC= Perceived Behavioural Control



In the IAB model, attitude toward behavior indicated the largest correlation with adoption propensity; the remaining elements except complexity, which had a negative correlation (- 0.28), were in the medium effect category (0.33-0.43), (Cohen, 1992).

One can conclude that the characteristics of an innovation as well as behavioral elements (as elaborated in the theories cited) are significantly correlated to adoption propensity, and are therefore important issues to consider in diffusion and in the design of theories of change.

The modelling and forecasting of the diffusion innovation has been researched intensively, and a review by Meade and Islam (2006) has made recommendations on forecasting new product diffusion where there is little data (often the case in many situations), as well as guidance given on model selection and forecasting for different scenarios including the diffusion of a single innovation in a single market, diffusion across several countries, and diffusion across several generations of technology.

The diffusion of a single innovation in a single country between introduction and saturation will be an “S” curve, and two extreme hypotheses explain this curve based on population dynamics. The three factors considered in deriving this shape are: (1) individuals are influenced by the desire to innovate (co-efficient of innovation, p); (2) a need to imitate others in the population (coefficient of imitation, q); and (3) the proportion of adopters at time is [F (t)], such that the probability that a potential adopter adopts the innovation at time (t) is driven by [p+ q F (t)]. The

sum of co-efficient of innovation and the coefficient of imitation (p+q) controls scale and q/p controls shape (must be greater than one to have an S shape) (Bass, 1962). Rogers (1962) postulated that as populations are heterogeneous in their propensity to innovate, initially the proportion of the population that adopts an innovation will be few (2.5%), followed by the early adopters (13.5%), then by the early majority (34%), then the late majority (34%), and finally the laggards in the rear (16%). This implies that people in a system have a threshold for adoption and that innovators have a very low threshold. However, as the innovation is adopted by more people, the social pressure reaches more thresholds. As individual thresholds for adoption are normally distributed, this creates an "S" shape of diffusion.

Diffusion of the same innovation across countries benefits from earlier adopting countries, in that historical data is available for predicting diffusion in later adopting countries (Mead and Islam, 2006). Norton and Bass (1987) proposed a modified model for diffusion across several generations of technology. The Norton-Bass model essentially asserts that each generation of innovation attracts incremental population segments of potential adopters and further, later generations may attract potential earlier adopters (Norton and Bass, 1987).

In as much as most of this theory emanates from the commerce sector, the health sector can adapt these principles to predict diffusion, understanding the underlying mathematical principles and population distribution patterns.

An emerging important factor in diffusion of innovations is the use of social networking tools such as Facebook and Twitter. There is growing evidence of the impact of social media on diffusion of innovations, and it has been documented that peer support or pressure and shared values influence people's choices with respect to new innovations and choices (Mustaffa, et. al, 2011). For instance, peer popularization of the use of Facebook makes this a potential tool for rapid information diffusion through peer interaction such as content sharing (Zhan, Huaxia & Whinston, 2014). These authors provide some evidence for the effectiveness of social media as a tool for rapid exchange and spread of information. In addition, Cardon and Marshall (2015) have presented survey results that indicate that whilst businesses still mostly use traditional methods of team communication, the projection is that social networking tools will be the primary tools for team communication in the near future.

BID Initiative approach: An important role for the BLN is to support the diffusion of BID products, whether these be related to immunization information systems, practices, or policies. Of particular interest to the BID Initiative and the BLN is diffusion within a single country as well as across several countries. Based upon the various theories and learnings, the BID Initiative is investing in various communication tools to engender rapid information exchange and learning amongst peers.

Conclusion

Developing a theory of change for scale up will have to take into account the various aspects pertaining to interventions and implementers as elaborated in this short literature review. The documents cited herein on scale up interventions, identify key issues around scaling up. These include: the need to generate credible evidence for an intervention that can lead to the decision

to go to scale, fitness for use of the intervention and its acceptability and ownership by the users, political commitment, leadership, and championship, connectivity and coordination at all levels of the health system, financing, and the learning that must happen. Further, with regard to the health workers and other implementers involved, the theories around peer learning and the appropriateness of the learning opportunities offered, and the adoption or adaptation of elements described in the theories of diffusion and planned behavior, need to be incorporated into the framework for facilitating the scale up of the BID Initiative's solutions.

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