



**Better
Immunization
Data Initiative**

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LANDSCAPE ANALYSIS

CURRENT & PAST PROJECTS TARGETING DATA QUALITY AND USE

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Executive Summary

The landscape analysis of existing projects reviews past and current approaches, strategies and interventions employed to drive the use of data among managers and decision makers for improved organizational performance and resource allocation. The objectives of this review are to inform the Behavior, Organization, and Practices (BOP) activities in BID Phase I, explore links between BOP and the area of work that rests within the Product Vision Team, and contribute to defining the Initiative's theory of change and M&E plan.

The final report draws on the experience of JSI, PATH and partner organizations, as well as select projects identified through conversations with the Bill & Melinda Gates Foundation. In total, over 30 projects were reviewed and analyzed in order to identify and explore key themes emerging from project experience that might be relevant to BID. This analysis explores contextual factors, drivers of success, and roadblocks to improving the allocation of resources to improve health system performance. The final landscape analysis findings were then classified across intervention categories derived from discussions with immunization program and information system experts during the BID Country Consultation Meeting (CCM) in Nairobi, Kenya (October 2013). These classifications include national/health system factors, organizational activities, information system design, individual skills, and individual motivation. Findings related to each intervention category include an overview of the topic and a summary of common barriers, key project highlights, and interventions to consider.

The majority of projects reviewed struggled with two common challenges that directly influenced the collection, quality, and use of data for decision making. First, increased demand for data and information from donors in an era of greatly expanded financing for disease-specific care, treatment, and prevention (AIDS, TB, and malaria) has resulted in a proliferation of vertical information systems for monitoring, evaluation, and program management. This fragmentation of health information systems diminishes a country's ability to manage its HMIS due to a lack of generalized support and harmonization of practices, indicators, reporting forms, etc. Health workers report data through several overlapping systems and spend much of their limited time collecting data, compiling indicators, and submitting reports, often duplicating efforts for different programs and funders. Continual and changing demands for information from donors requires frequent updates to data collection and reporting tools and a proliferation of registers and monthly report forms that often undermines data quality. The second challenge was how the limited feedback to health workers at the facility level on submitted reports creates a general perception among health staff that the data are not used or valued. Lack of feedback negatively influences the quality and timeliness of data and reporting.

This landscape analysis provides a number of possible intervention approaches that could be considered by BID to support improved data quality and use across the five classifications. For each classification, a list of interventions to consider is included. A targeted list of high potential interventions identified across the projects reviewed in the landscape analysis is included in the final section, Conclusions & Recommendations.

Introduction

As part of Phase 0 of the Better Immunization Data (BID) Initiative, the behavior, organization, and practices (BOP) team conducted a landscape analysis of existing projects to assess the approaches, strategies, and interventions to increase managers' and decision makers' use of data for improved organizational performance and resource allocation.

The purpose of this report is to inform the BOP activities in BID Phase I, explore links between BOP and the area of work that rests within the product vision team, and contribute to defining the Initiative's theory of change, and its implementation strategy and monitoring and evaluation plan.

This report draws on the experience of John Snow, Inc. (JSI), PATH, and partner organizations, as well as projects identified through consultation with the Bill & Melinda Gates Foundation. This report explores contextual factors, drivers of success, and barriers to improving the allocation of resources to improve health information system performance. It also complements the findings from the literature review.

Methods

The BOP team identified projects of interest by contacting JSI and PATH staff and scanning project databases and resources. Projects were included in the landscape analysis if they met the following criteria:

1. Project was implemented by PATH, JSI, or World Education, Inc. Projects outside JSI and PATH were included if they were identified by current BID team members who had worked on the project and could provide additional details about project activities as necessary.
2. Projects conducted during or after 2000.
3. Projects included elements of capacity building, training, or a systems strengthening approach to support the use of data for performance improvement and resource allocation.

The team then reviewed project documents (gray literature, project reports, training materials, etc.) and summarized findings in a standard matrix. From this comprehensive desk review, the team extracted project details, description of interventions, and other key pieces of information and identified gaps to be filled through consultation with available project staff. Team members conducted short key informant interviews with project staff to gather additional details on contextual factors, drivers of success, and barriers.

In total, three reviewers with technical expertise in information system performance and data quality and use¹ explored more than 30 projects. Findings from the desk review and key informant interviews were then analyzed in order to identify key experiences, strategies, or interventions that might be relevant to BID.

The findings were then sorted into intervention categories derived through workshop sessions and discussions with immunization program and information system experts from a dozen countries across Africa during the BID Country Consultation Meeting (CCM) in Nairobi, Kenya (October 2013). Several of these categories echo the key determinants of routine health information system performance (organizational,

¹ Dave Boone (JSI), Jason Walton (PATH), and Hiwot Belay (JSI)

technical, and behavioral) named in the PRISM framework, but are oriented to the information systems in immunization programs specifically.²

Intervention categories include the following:

- National/Health System factors influence the performance of information systems and include the overall structure of the health system and the policies and practices that affect the information system funding, policy, and prominence, as well as the skills of those who manage information. Donors, other external actors, and international disease control priorities also affect information system performance at this level.
- Organizational activities focus on the structure and management of human, material, and financial resources, as well as the organizational context in which information system and immunization program performance improvement takes place. Organizational determinants of immunization and information system performance include management styles and functions; organizational culture, including the emphasis placed on the use of data; practices and attitudes toward performance monitoring; planning conventions; training, in-service mentoring, and supervision; and clarification of roles, responsibilities, and opportunities for professional advancement.
- Information System Design includes the data elements and meta-data, indicators, data collection and reporting tools, information and communication technology (ICT), and policies and procedures related to the collection of data and information for use in program management, planning, and evaluation.
- Individual Skills refer to the capacity of individuals who manage immunization programs and associated information systems that influence the quality and use of information. Specific skills include data management, analysis and interpretation of data, using data for decision making, using computer hardware and software, supervision and mentoring, performance monitoring, planning, and managing material, human, and financial resources.
- Individual Motivation relates to motivation among health workers and managers to produce quality data and use it for improving immunization performance. Individuals who lack motivation do not routinely perform their information management or service delivery functions well. Staff may lack motivation if they do not possess the appropriate skills, are poorly managed (i.e. receive unclear or contradictory directives) or supported, over-burdened with tasks (or have too little responsibility), given inappropriate tools, or inadequately compensated, among other factors. Even health workers who are well-trained in data management can perform inadequately if motivation is lacking. Contributing factors to individual motivation are explored in-depth in the literature review.

Findings

Common challenges

The majority of projects struggled with two common challenges that directly influenced the collection, quality, and use of data for decision making:

² Aqil A, Lippeveld T, and Hozumi D. PRISM framework: A paradigm shift for designing, strengthening, and evaluating routine health information systems. *Health Policy and Planning*, May (2009), 24(3); 217-228.

1. Increased demand for data and information from donors in an era of greatly expanded financing for disease-specific care, treatment, and prevention (AIDS, TB, and malaria) has resulted in a proliferation of vertical information systems for monitoring, evaluation, and program management. This fragmentation of health information systems diminishes a country's ability to manage its HMIS due to a lack of generalized support and harmonization of practices, indicators, reporting forms, etc. Health workers report data through several overlapping systems and spend much of their limited time collecting data, compiling indicators, and submitting reports, often duplicating efforts for different programs and funders. Continual and changing demands for information from donors requires frequent updates to data collection and reporting tools and a proliferation of registers and monthly report forms that often undermines data quality.

2. Limited feedback to health workers at the facility level on submitted reports creates a general perception among health staff that the data are not used or valued. Lack of feedback negatively influences the quality and timeliness of data and reporting.

Intervention categories

Findings related to each intervention category (national/health system, organization, design of the information system, individual skills, and individual motivation) include an overview of the topic and a summary of the following:

- **Common barriers**—impediments to HIS performance (and by extension, health system performance) identified and addressed by the projects.
- **Key project highlights**—observations related to interventions selected for their role in improving information system or organizational performance. All interventions are included in Annex 1 (Project Matrix).
- **Interventions to consider**—successful strategies identified across one or more project and a short 'menu' of interventions for consideration in the BID.

Examples of interventions are linked by reference number to their relevant project summary in Annex 1. Detailed descriptions of the interventions and their results, as well as enabling factors and lessons learned are presented in Annex II.

I. National and Health System

National and health system-level conditions, incentives, and support influence the performance of health information systems, particularly in terms of data quality and strategic use of data. Interventions aimed at introducing new technologies or encouraging more frequent and focused use of data for management and performance improvement rarely succeed without higher level commitment to stimulating and supporting change. National-level financing flows, the use of performance-based financing, staffing patterns and pre-service training, and the supply of information tools are common areas of system-level investment to support better information systems.

Common Barriers

Barriers to health information system performance that are linked national and health system level conditions include:

- Policies and investments do not promote adequate information for setting health system priorities (#21, 24, 26) or evidence-based resource allocation (#21, 24, 26)
- Lack of independent governance mechanisms for the health and information system (#15, 21, 26)
- Lack of ownership of health and information system interventions

Key Project Highlights

Several projects reviewed for the landscape analysis aimed to improve health sector efficiency and management through reform of the health system as a whole using policy reforms, governance interventions, and the decentralization of health program management. Information system improvements often played a role in this process.

The Uganda Program for Human and Holistic Development (UPHOLD, #24) sought to strengthen capacity in 34 districts for the improved delivery, planning, management, monitoring, and effective use of social services in three integrated social sectors: health, education, and HIV and AIDS. One of the strategies employed by UPHOLD was to decentralize management of the health system to the district level, permitting greater acuity in action planning to address specific needs in each health district, and financing grants to address identified priorities. UPHOLD also developed a system of monitoring using LQAS, which permitted district-level estimates of important survey-based indicators for monitoring performance of the district health system and linking routine monitoring to performance improvement strategies. The ability to set health priorities and plan at the district level using information specific to each district permitted greater efficiency in resource allocation and management. The STAR-EC project (#25) also used LQAS survey for performance monitoring and planning at the district level.

The Nigeria Targeted States High Impact Project (TSHIP, #21) seeks to improve health practices and outcomes among the most vulnerable groups through a strengthened policy environment at the state and LGA levels. Activities include policy development and engagement, advocacy, demand creation, increased allocation of resources for primary health care, and more efficient and effective utilization of resources. Policy reform is driven by data (e.g. service utilization, program monitoring, surveillance) to make service delivery more efficient and improve resource allocation. TSHIP is an example of the kind of holistic approach that BID is employing to improving use of data to address gaps and improve health program outcomes.

The Rebuilding Basic Health Services Project (RBHS) in Liberia (#22) uses performance-based financing linked to reported performance metrics to improve health system management as part of its effort to assist the Liberian Government to re-start the Liberian Health System after a 15-year civil war. In this approach, payments from the Government of Liberia to NGOs who are managing the health system in specific districts is linked to evidence of system performance using carefully selected health and management indicators. The decentralization of management and pay-for-performance supported by data-linked incentives is intended to improve system efficiency.

The ZdravPlus II Project (#26) (Abt. Associates with JSI), a USAID-funded project in the Central Asian republics of the former Soviet Union, aimed to strengthen governance, leadership, and capacity through: 1) the design

and implementation of evidence-based policies, laws, and guidelines, and cost-efficient institutional structures, roles, and relationships; and 2) health system finance reforms (including pooling of health funds, provider payment systems, health insurance, and basic benefit and outpatient drug benefit packages).

The Common Requirements for Logistics Management Information Systems (#32) project was designed to develop a model enterprise architecture that supports the development of sustainable, scalable, and affordable national health information systems. The project utilized the Collaborative Requirements Development Methodology (CRDM), which can be applied across countries and segments of the health care system to manage information. The project's objectives were to: 1) develop a general methodology for determining and documenting health information system user requirements and; 2) apply this methodology to produce requirements addressing supply chain as one of the core functional domains of a national health system. A key finding from this project was the understanding and insight that while programs and countries are indeed different in many ways, when carefully examining the fundamental supply chain work and activities—handling pharmaceuticals, vaccines, and medical supplies—there are a great deal of similarities and efficiencies that can be leveraged across country contexts.

Interventions to Consider

Recommendations for intervention approaches to strengthen the link between system level interventions and interventions to improve information system performance include: independent oversight, stakeholder engagement, promotion of country ownership, decentralization of management, and partnerships with NGOs and other donors to mobilize resources and leverage economies of scale in implementing joint activities.

Activities for consideration identified by the landscape analysis include:

1. Develop a technical working group to oversee/advocate for HMIS strengthening activities, integrating existing working groups where possible (#15)
2. Strengthen advocacy efforts within the MOH at all levels of the health system to promote ownership (e.g. the extent to which system actors feel responsible for system outputs) of the HMIS/data/reporting (#10, 13, 14, 15,16), i.e.;
 - a. Improved clarity of reporting requirements and mechanisms for reporting (i.e.. fee-based/private providers) (#10)
 - b. Create routine data analysis and use meetings (#13)
 - c. Direct meetings with policy makers to present analyzed data/findings to argue for allocation of resources to identified needs (#14)
 - d. Create a technical working group to monitor system performance and respond to identified weaknesses (#15)
 - e. Adapt standard tools to local context and formalize their use into routine practice through SOPs (#16)
3. LQAS surveys for district-level estimates of health indicators for planning, management, monitoring, and evaluation (#24, 25).
4. Policy review/reform (#21, 22, 24, 26)
5. Capacity building to increase staff skills in health program management and financing (#21, 22, 24, 26)
6. Application of performance-based financing activities to use data to reward high-performing districts or facilities (#22)

II. Organizational Context (MOH, region, district, facility)

The organizational context of HIS performance relates to the structure and components of the system in which data are collected and transformed into useful information for managing and improving health services. The organizational level can relate to health care workers, teams at district and facility level and linkages between them and to higher-level authorities. It can also reflect the culture of the organization, specifically incentives and other interventions used to motivate staff and ensure accountability while providing the impetus for the use of data.

Organizational interventions to improve information system performance focus on providing a supportive environment for individuals and teams. They include steps to clearly define roles and responsibilities through standard operating procedures, supervision, and mentoring of task completion and competency, and institutionalizing best practices such as data quality assurance, data analysis and use mechanisms, while encouraging team-based decision making and quality improvement.

Common Barriers

Organizational barriers to health information system performance include:

- Lack of evidence-based management (information culture) due to inadequate data and information (#4, 13, 14, 15, 21, 22, and others)
- Inadequate training infrastructure, including experienced trainers, standardized training curricula, and resources for training (#13, 14)
- Lack of governance or oversight of management and performance of the health information system (#15)
- Poor-quality, infrequent, or under-resourced supervision (#30)
- Frequent staff turnover (#7)
- Lack of accountability for job performance (#16)
- Lack of adequate funding for ongoing IT support (upgrades, maintenance) (#5).
- Lack of accountability for timeliness and quality of reporting at facility level (#4)
- Lack of prioritization of data reporting throughout the health system (general)

Key Project Highlights

Many of the interventions reviewed for the landscape analysis aimed at strengthening organizational aspects of health information systems. Notably, many of the interventions that affect organizational level also affect individual skills (through capacity building and training activities) and individual motivation (through increased accountability structures and systems for improving health workers' efficiency and satisfaction in their day's work).

The MEASURE Evaluation data quality assurance activity in Botswana (#16) sought to institutionalize data quality by adapting the Routine Data Quality Assurance Tool (RDQA) to the Botswana health system context and formalizing its use through the development of policies and standard operating procedures (SOPs) for health workers at different levels such that data quality assurance became a regular feature of their workflows. Similar standardization and formalization of data quality assurance was achieved by MEASURE Evaluation in Cote d'Ivoire (#13) and Nigeria (#14). SOPs allow health workers to know exactly what is

expected from them, and for their jobs to be completed in the event of their absence. They also make health workers more accountable since they clearly state responsibilities and eliminate ambiguity from roles and responsibilities of staff.

Similarly, the use of data for decision making was formalized by several projects in the form of routine data and information review meetings among peers, which permit the regular analysis and interpretation of program results. Peer meetings allow colleagues to compare findings and share and critique interpretations. The fact that they occur regularly ensures that data are analyzed and used routinely and this important step is not left to chance. Projects that instituted the use of routine data review meetings among peers included MEASURE Evaluation in Ethiopia (#15) and Cote d'Ivoire (#13), the Supply Chains for Community Case Management Project (SC4CCM) in Malawi (#17), TSHIP (#21), and the Family Planning Data System (#27).

Interventions to Consider

Recommendations for intervention approaches to strengthen immunization system performance at the organizational level include: peer-peer networks; communities of practice; leadership and ownership of the process by the Ministry of Health; increased staff accountability; and the use of standardized tools (e.g. RDQA) to support routine monitoring of and action planning to improve data quality.

Specific activities to consider based on the landscape analysis include:

1. Clarification of health staff roles and responsibilities (#10)
2. Establishing standard operating procedures (#10, 16)
3. Use of RDQAs (#13, 16)
4. Establishing data-use peer networks through routine data-use meetings (#13,15,17,21)
5. Support for adequate post-implementation support (supervision/training) and ongoing long-term technical support (#9).

III. Design of Information System

Information system design relates to how information is gathered, summarized, analyzed, transmitted, stored, and disseminated. Information systems can be simple (paper-based, few indicators) to complex (integrated data warehouse) and should reflect the capacity of the country to support the system and the information needs of stakeholders.

Interventions aimed at improving health system performance by changing the design of the information system vary, and the majority the interventions reviewed for the landscape analysis fall into this category. Interventions ranged from the implementation of new electronic systems to improve data quality and availability to integration of information systems to improve efficiency and reduce burden on health workers. Other interventions streamlined health workers' work-flows through computer automation (cellphones for data entry, electronic registers, etc.). When considering how the design of information systems impacts the use of information for decision making, particular attention should be paid to the design of the user interface, reporting tools, and routine reports and visualizations generated by the system. The simpler and more user-friendly the interface is, the greater the potential for routine use in the process of targeting and delivering immunization services.

Common Barriers

The barriers to health information system performance that are inherent in the design of the information system include:

- Multiple, poorly harmonized reporting practices/lack of standardization of data collection and reporting tools, indicator definitions, data elements, etc. (#9)
- Burden placed on health workers from the collection of too much, often redundant data to satisfy the needs of multiple donors and the MOH (#13,14,15)
- Late or incomplete reports due to lack of infrastructure for reporting
- Inappropriate or inadequate storage of data (general)
- Lack of feedback mechanisms (general)
- Inappropriate or inadequate use of information and communication technology (general)
- Inability to ensure that software remain up-to-date with program needs (i.e. new vaccines) and advancements in software design (#10)
- Fragmentation of information systems, overlapping systems (#11,13,14)
- Software version control (#8)
- Poor internet connectivity, often necessitating dual reporting (#5, 8)
- Delays in the development and rollout of the software reduces both training and implementation periods (#10)

Key Project Highlights

Eight of the projects reviewed were logistics management information systems (LMIS) aimed at improving data quality and availability and streamlining workflows through computer automation. They include:

- Project Optimize, a collaboration between WHO and PATH in Albania (#5), Senegal (#6), South Sudan (#7), Tunisia (#8), and Vietnam (#11)
- SC4CCM Project in Malawi (#17)
- USAID | DELIVER Project in Tanzania and Ghana (#18, 19)

All projects developed new electronic LMIS to improve vaccine stock management. Some employed mobile phones for data entry, and Web-based analysis and use of data for decision making. All these projects helped improve the accuracy, timeliness, and availability of data while reducing the burden of reporting for supply chain workers. In addition, they reduced the required number of data elements to a manageable level and provided real-time/automated data visualization.

The Malaria Control and Evaluation Partnership in Africa (MACEPA) (#2) used mobile phones for reporting community-level malaria surveillance, treatment, and supply chain indicators into the DHIS2 (District Health Information System, an online health management information system developed by the Health Information Systems Project. Notable features of MACEPA were the use of low-cost mobile phones, which kept costs down and reduced the risk of phone loss, the use of hosted servers (Amazon Web Hosting), and linking 'air-time' allocation to reporting.

Three projects sought to create computerized immunization registries to better track child immunization status and ensure all children are up-to-date on immunizations. The Digital Immunization Registry from Project Optimize-Vietnam (#9), Project Optimize-Albania (#5), and the Ghana Health Services SENE Pocket Digital Assistant (PDA) Project (#28) worked to improve immunization service delivery by providing real-time data on child immunization status, sending SMS reminders to parents, and reducing workload for health workers by automating data management processes. The SENE Project pioneered the use of PDAs (2004) for the collection of child immunization data and was the first mHealth intervention by the Ghana Health Services.

Integration of parallel information systems can improve data quality and reduce burden on health workers by streamlining data systems and prioritizing indicators. Integration was conducted by MEASURE Evaluation in Cote d'Ivoire (#13) and Ethiopia (#15), and Project Optimize in Tunisia for LMIS (#8).

Other interventions include designing information systems for disease-specific programs, such as the Nigeria National Response Information System (NNRIMS) (#14) and an electronic medical record (EMR) and automated data analysis and reporting system, SIGDEP, in Cote d'Ivoire (#13), both for facilitating the management of HIV and AIDS programs (MEASURE Evaluation).

The Enhanced Strategic Information Project (ESI) in South Africa (#23) expanded the functionality of the DHIS2 application to conduct an in-depth quality assessment of reported data by modifying source codes to assess completeness of data reporting from health facilities and districts, and monitor trends.

MEASURE Evaluation in Ethiopia (#15) took a more holistic approach by designing a new computer application to support decentralized and synchronized data management. The eHMIS is a data warehouse for the Province of SNNPR (Southern Nations, Nationalities, and Peoples' Region) in Ethiopia, centered on a master facilities list, the Health Systems Reference Database. The system supports hybrid online/offline data entry and data use, a decision support system (DSS) for automating data analysis and facilitating data use, a mobile decision support system (MEDSS), which pushes analyzed data to users' smartphones, an electronic integrated disease surveillance system, and an electronic medical catalog system.

The experience of implementing these information system design interventions provides insight into best practices for innovation.

Interventions to Consider

Given the volume of material on information system design there are a number of recommendations for intervention approaches to strengthen immunization system performance through appropriate information system design:

- Users should be involved in information system requirements, tool development, and changes in workflow. In addition, users should be consulted on the design and development of standard reports and dashboards to ensure tools and information products meet their needs for data analysis and use.
- Cell phones or PDAs for data collection/use are effective at streamlining workflows and freeing time for patient care. However, low-cost phones reduce costs and the risk of loss, while the ability to report over multiple networks improves connectivity and reporting rates.
- Adapting established materials saves resources and improves user acceptability of new products.

- Commitment from leadership is essential for uptake of new systems.
- ICT solutions should only be introduced in areas that have the infrastructure to support them. For example, the introduction of Web-based solutions in areas with problematic connectivity creates burden on health workers, leads to incomplete data or duplicative reporting when staff resort to legacy paper-based systems.
- Ensure sufficient product development and testing time.
- The complexity of the information system should be appropriate for the level at which it is being implemented. For example, health districts may not require a data analysis module with functionality as sophisticated as those at national and regional levels.
- Ensure availability of local expertise to manage and troubleshoot the system after implementation.
- Ensure ongoing technical support and training for new users at lower levels of the health system.
- Ensure that adequate financial support to provide maintenance and ongoing trainings is established at the onset of the introduction of new technologies.

Specific activities to consider based on the landscape analysis include:

1. Customizable dashboards for the national, regional, and district, individual-level (indicators/data elements) (#13, #15)
2. Standardized reporting tools (#13)
3. Integration of parallel systems (#8, #13, #14, #15)
4. Electronic registries of clients (#5, #9, #13)
5. Hybrid Web-based/stand-alone electronic information system, DHIS2 (#22)

IV. Individual Skills

People in health systems (care providers, facility and system managers, support staff, etc.) require skills to complete tasks assigned to them. Often these skills are developed in pre-service training, such as nursing school or public health programs in universities. Other skills are acquired during in-service training that includes periodic refreshers on existing skills for existing tasks, or the introduction of new skills for providing new services. Skills can also be acquired less formally, such as through mentoring or supervision, or even independently by self-motivated health workers.

Common Barriers

Many of the interventions reviewed focused on developing skills of health information system personnel to collect, report, and use program data for planning and management. Building the capacity of health workers is perhaps less exciting than implementing a new electronic system, but the painstaking work of skills development is critical to improving health information system performance. Barriers to improved performance related to individual skills include:

- Inadequate training (infrequent, poor quality, lack of standardization) (#9,10)
- Inadequate IT skills (#8)
- High staff turnover (#4, 7)
- Insufficient or inappropriate tools (general)
- Lack of guidance and supervision (#30)

- Lack of feedback mechanisms
- Inadequate leadership

Key Project Highlights

Interventions reviewed for the landscape analysis that aimed to improve individual skills include:

- The provision of job aids (documentation on how to perform tasks) (#4, 13, 14)
- SOPs to standardize practice and ensure accountability (#13, 16)
- The use of GIS to expand data analysis capabilities and pin-point needs (#12)
- Electronic point-of-service guidance for health care workers (#3)
- Provision and training in the use of electronic tools to facilitate data analysis and the use of data for decision making (general)
- Training in data demand and information use (identifying barriers to data use, linking data producers with data users, decision calendars, stakeholder engagement, information use mapping—the linking of data sources with routine decisions) (#13, 14, and elsewhere)
- Supportive supervision and mentoring (#30, 31)
- The use of service quality improvement techniques (“plan, do, study, act” (PDSA) quality improvement techniques):
 - Reach Every District – Quality Improvement (RED-QI)—addressing higher priority problems using small rapid, doable changes that can be tested and vetted for adoption quickly, adaptation at local level. Universal Immunization through Family Health Services (#20)
 - Standards-Based Management and Recognition (SBM-R)—a variation on PDSA that introduces recognition for health workers that successfully improve service quality (#21)
 - Continuous trainings and technical assistance (#7,11)
 - Ensuring availability of the guidelines (#7,11)

Examples of projects reviewed that aim to strengthen system performance through interventions targeted at individual skills are the CDC’s East Africa Training Project (EATP, #30) and the Strengthening Technical Assistance for Routine Immunization Today (START, #31) project.

The EATP is implementing a model of supervision founded on the identification of field projects for district-level EPI managers or surveillance officers utilizing mentors in Ethiopia, South Sudan, and Uganda. The model deviates from traditional supervision in that the objective of the field projects is to choose a sub-district that is underperforming in a particular component and to conduct a root-cause analysis, identify possible solutions, and create an action plan to address the problem. Issues surrounding data quality or data use arise frequently during the root-cause analysis. The use of knowledgeable mentors enables analytical skills and overall comprehension of a particular the problem to be enhanced and nurtured.

The CDC is implementing a similar capacity-building project focusing on district-level immunization staff in Uganda under the START project. Through the use of RED tools, the project works with staff to assist with micro-planning and improving data quality through data quality assessments. Emphasis is placed on data quality to improve discrepancies between registers, tally sheets, and reports. While still in its inception phase, initial results demonstrate an interest within the immunization staff to utilize the RED tools. Additional quality improvement activities targeting universal coverage outcomes, including Gates-funded work in Ethiopia (#20), are included Appendix 1.

Interventions to Consider

Recommendations for intervention approaches to strengthen immunization system performance at the individual skill-level include: supportive and frequent supervision; providing qualified mentors familiar with health system context; frequent communication; developing and implementing standards for training; capacity-building plans based on training needs assessment; identifying and addressing basic IT training needs to facilitate use of the information system; ensuring that supporting documentation is readily available; and harmonization of and parsimony in information-gathering.

Specific activities to consider based on the landscape analysis include:

1. Training and supervision (#7)
 - a. Data use (#4, 14)
 - b. Outreach planning (#1)
 - c. Computer skills (#9, 18)
2. Integration with community health worker network (#20)
3. Competency-based indicators to assess performance

V. Individual Motivation

Individual motivation or lack thereof is often an underlying factor that affects all aspects of an individual's work both positively and negatively. Often, interventions attempt to integrate the targeted individual within some or all phases of the product or program design to instill ownership and promote adoption of the technology or behavior. Such extrinsic motivating factors are frequently leveraged for long-term sustainability considerations. Conversely, the provision of equipment, airtime, or access to internet are intrinsic motivators often employed by programs to empower the individual to feel involved and directly benefited by the intervention. Intrinsic motivators provide immediate rewards but draw into question the ability of such rewards to be sustained over a long period of time or at scale. The interventions reviewed applied both forms of motivational considerations with varying levels of success. However, the underlying impact of motivation was an ongoing consideration in many of the interventions.

Common Barriers

The context in which national, regional, district, and sub-district level staff utilizes and participates in data varies tremendously. However, the findings from the interventions reviewed demonstrate common challenges that serve as a disincentive to adopting and integrating the new technologies or resources into their routine activities. These include: 1) lack of computer or IT skill; 2) lack of confidence in data and reporting; 3) inadequate or non-existent supervision; 4) established workflows and routine practices; and 5) connectivity issues and the availability of technical resources.

One of the most oft-cited inhibitors was lack of computer skills (#8, 10) or familiarity with the given technology, i.e. mobile phones (9). A factor resulting from this lack of expertise with a given technology is an initial increase or disruption to an individual's workload (#3, 8, 11). Additionally, the commitment to invest the time and effort to learn and integrate the technology into an individual's routine activities can be further

challenged by connectivity issues (#5, 8, 9) and a lack of IT resources (#10). These compounding factors can contribute to an individual's underlying lack of confidence with the utility of data, reporting structures, and the ability these tools have to improve the workload of the individual (#4). The hesitation and lack of motivation is often coupled with inadequate or non-existent supervision that does not foster or nurture the adoption and application of data use at these varying levels of the health system.

Key Project Highlights

Potential benefits of introducing new technologies or streamlining reporting include reducing administrative burdens on frontline health workers, decreasing the time required to generate useful reports, and empowering individuals to make informed decisions about the resources at their disposal. This should contribute to an individual's motivation for adopting the new technology or resource. The projects reviewed highlighted strategies to assist with improving individual motivation.

In the project MACEPA (#2), data-focused community health workers were responsible for overseeing and uploading health reports completed by a cadre of community health workers into DHIS2. These data-focused CHWs were the only people initially provided with a mobile phone as part of the project. However, by consistently reporting timely data, the community health workers were able to work toward having access to a cheaper non-Java-enabled phone (compared to the initial phones distributed) and receive additional airtime. Distribution of these phones and provision of airtime improved the local communication channels among health workers, particularly the CHWs, to support timely response to malaria infections.

A strategy applied in Project Optimize (PATH) involved targeted users in the development and design phase of the intervention and technology. While promoting close collaboration between IT and health staff is not always easy and may contribute to additional delays, Project Optimize in Albania (#5) had health workers contribute to the development of formal documentation for user requirements, which facilitated a common understanding from the start of the project. This level of involvement helped health workers remain committed to the project despite challenges with regard to system expectations during the testing phase.

The level of complexity of the technology must take into account the level of capacity that a targeted individual possesses. Thus, the level of complexity should diminish as it moves down the health system. For instance, in Project Optimize Tunisia (#8) the Web-based Vaccination Supplies Stock Management system was designed to be a powerful software tool, but many of its options were not necessary at lower levels of the supply chain. Therefore, it was designed to have the capabilities of hiding options so that users at lower levels (at a district store, for instance) do not feel overwhelmed by the dashboard.

Many of the strategies discussed in the organizational section also impact individual motivation, including peer review, team based decision making, and routine application of data quality assessments. See the organizational section for additional details.

Interventions to Consider

Recommendations for intervention approaches to strengthen immunization system through improving individual motivation include:

- Providing incentives
 - Providing equipment (i.e. cellphones (#2), computers, internet connectivity)

- Link reporting to 'air-time' allocations (#2)
- Early involvement with development and design of the technology or resource
 - Inclusion of end-users in the design phase (#5)
 - Local ownership (#7)
- Focus on reduced and streamlined workflows
 - Automation of data processes reduces workload (#7)
 - Responsiveness to user needs (#7)
 - Simplified tasks (#11)
 - Improved user experience (less time to perform tasks, i.e. data entry, transmission, aggregation, and analysis) (#15)
- Appropriate level or sophistication of technology
 - Tech solutions appropriate to level in health system (#8)
 - Complexity of the system adjustable to level (#8)
 - Software compatible with user skills (ease of use of interface) (#9)
 - Only applied at levels with capacity to implement (i.e. regional, some districts) (#11)
 - Simple design (SMS) allows use of personal cell phones by HWs and lowers cost and training requirements (#18)
 - Ease of use (#11, #15)
 - High-level of acceptability of SMS in target population (#9)
 - High ownership of mobile phones (99%) among CHWs (#15)
- Supportive supervision
 - Support from management (#7)
 - Training and supportive supervision (#7)

Specific activities to consider based on the landscape analysis include:

1. Communities of practice for knowledge sharing (#2)
2. Mentorship programs (EATP, #30) using internal or external mentors through local or remote designs.
3. Mobile supervision (EATP, #30)

Conclusions & Recommendations

This landscape analysis provides a thorough (but not exhaustive) list of possible interventions that could be considered by BID to support improved data quality and use across the five classifications. Across the various domains and levels of the system discussed throughout the landscape analysis, there are a number of possible interventions BID could consider integrating into a package of activities to support improved data quality and use from the facility to the national levels. Many of the interventions discussed in past project experiences were echoed in the literature review conducted as an additional part of the BID work planning process.

From the list of possible interventions, the following have shown particular promise for adaptation by BID.

Improving reporting systems and coordination structures:

- At the national level, develop a technical working group to oversee/advocate for HMIS strengthening activities, integrating existing working groups where possible. At regional and district levels, develop similar small committees or task forces to oversee any changes or adaptations to the existing HMIS to ensure consistency in how changes are implemented and training is conducted.
- Ensure the use of standardized reporting tools, and provide clarification of staff roles and reporting requirements to ensure consistent expectations across both public and private sector facilities, ensure completeness of data for a given district or region by capturing all service providers, and ensure standard operating procedures are in place to guide staff on routine reporting requirements.
- Develop customizable dashboards for performance tracking across levels of the health system, including fusion electronic/paper-based approaches to provide graphs, charts, and other analytic tools to districts or facilities where electronic tools are inaccessible.
- Implement electronic client registries to allow for individual tracking and follow up.

Promoting routine monitoring of data quality:

- Identify simple routine assessment and action planning tools, such as LQAS surveys, routine data quality assessments, or the use of other quality improvement tools to allow facility and district staff to self-assess the quality of their data and develop roadmaps to support routine analysis of and use of the information for program planning.

Capacity building and improving supportive supervision to support the use of data for decision making:

- Create mentorship programs using internal or external mentors, with communication facilitated through both local and remote approaches to allow for broader reach of the mentoring network; this approach could be linked to the development of mobile supervision tools.
- Establishing data-use peer networks through routine data-use meetings at the district level to foster a culture of analysis, information sharing, and problem solving across health facilities. These could be managed or facilitated by key members from the district or regional task forces noted previously.

Ensuring sustainability of improvements in data quality and use:

- Integration with and leveraging of existing networks of community health workers or other community administrative structures to support the routine tracking of clients and supporting routine community mobilization to promote timely access to immunization services.
- Use competency-based indicators to assess health worker performance through routine performance appraisal, linked to structured advancement and training opportunities for high performing staff members, promoting routine monitoring of data quality and use of information for planning as part of performing well on the job.
- Develop a long term budget and plan to support for adequate post-implementation support (supervision/training) and ongoing long-term technical support around data quality and use. Particular attention should be paid to training and supervision around developing analytical capacity,

data use, outreach planning, and computer skills more broadly, as electronic systems penetrate lower levels of the health system.

Any of the recommendations above could be packaged and implemented in a variety of ways, and must be tailored to the local country context. While much can be learned from past project experiences, the BID Initiative provides the opportunity to test various combinations of interventions and identify high priority interventions to scale nationally or replicate across countries. Thoughtful documentation of how any of these interventions are implemented and why they work, or fail, within a given country context will be a valuable contribution to the global health body of literature, as details on how and why various data quality and use interventions were implemented is limited in the published literature.

Appendix: Project Matrix

| No. | Organization | Project | Intervention Type | Level | Category | Lessons Learned (drivers/enablers) | Barriers |
|-----|--------------|---|---|-------------------------------------|---|--|---|
| 1 | PATH | E-health immunization – Ghana: | Increasing Immunization Coverage in Ghana Through Identification of eHealth Services that Transform Service Delivery -Application of e-health technologies – identification and application of common mHealth technical building blocks combined with CRDM | National | Design of Information System | -Defaulter prevention -Defaulter tracing -Clinic/outreach planning: provide planning information | |
| 2 | PATH | MACEPA - The Malaria Control and Evaluation Partnership in Africa | Mobile phones for reporting malaria surveillance, treatment and supply chain indicators from community level into DHIS2 | Community-based | Design of information system; individual motivation | -Integration with national HMIS - wider stakeholder buy-in. -A large and consistent user base -communities of practice for data sharing -Hosted server option less expensive -Ability to work with multiple cell network providers -Simpler phones keep cost down -Find a good local training partner -Link reporting to 'air-time' allocations | The broad spectrum and scope of DHIS2 and having individual pieces integrate with other health areas and partners/implementers. |
| 3 | PATH | Mobile Midwife Platform | Clinical decision support device for midwives and data entry system using Open Data Kit on Android phones. | Community-based, facility-based | Individual skills; Individual motivation | -Leverages abilities of all care-givers, reduces capacity weaknesses -Adaptability -Community engagement | Mobile phone use can be disruptive to existing workflows (among less-experienced users) |
| 4 | PATH | PHRplus - Improving the analysis and use of Vaccine Preventable Disease Surveillance Information in Georgia | Guidelines, job aids, capacity building, supervision and mentoring at district and health facilities | District Health Facility | Individual skills | Capacity building for data use | -Unavailability of phones and electricity in health facilities -Low levels of health care utilization -Poor reporting of data from private providers -Lack of confidence in the utility of data products |
| 5 | PATH | Project Optimize – Albania: Immunization Information System (IIS) | Implementation of an online immunization information system that can record immunization data and manage vaccine stock. | National, district, health facility | Design of information system; individual skills | -Automation of analysis simplifies tasks -Inclusion of end-users in the design phase | - Including end-users in development increases development time -Data volume in larger facilities (populating historical data) -Poor internet connectivity -Routine maintenance costs of IT |

| No. | Organization | Project | Intervention Type | Level | Category | Lessons Learned (drivers/enablers) | Barriers |
|-----|--------------|--|---|--|---|--|---|
| 6 | PATH | Project Optimize – Senegal: Computerized LMIS for Moving Warehouse | Improve vaccine stock management through linking moving warehouse to LMIS | One region | Design of information system | -Potential for decreased workload and availability of vaccines -Sufficient project test time to show results and convince doubters | -Entrenched focus on outcome indicators (coverage) in response to donor requirements |
| 7 | PATH | Project Optimize – South Sudan: Logistimo | Mobile phone and cloud-based vaccine stock management information system | National, Regional, District | Design of information system | -Automation of data processes reduced workload -Responsiveness to user needs -Local ownership -Support from management -Training and supportive supervision -Support from external partners | -Staff turnover |
| 8 | PATH | Project Optimize – Tunisia | Computerized logistics management information system (LMIS) – VSSM- an open-source software application (WHO) | Country-wide (dependent on connectivity) | Design of information system; Individual skills | -Landscape analysis of information systems in place – building on what exists/works -Well defined user requirements -Local expertise – ability to troubleshoot/locally adapt electronic information systems without external support -Tech solutions appropriate to the level of the health system – web-based components don't work without reliable connectivity -Complexity of the system adjustable to the level | -Cost of web-hosting prohibitive to government sustainability issues -Lack of/unreliability of internet connectivity -Lack of computer skills of expected users -Initial increase workload of implementing new system at periphery -Version control |
| 9 | PATH | Project Optimize-Vietnam: Digital Immunization Registry | An electronic immunization registry - mobile phones to enter child vaccination data and computer application data management and analysis/use | One district, 17 communes | Design of information system; Individual skills | -Software compatibility with user skills (ease of use of interface) -Availability of computers and internet connectivity -Reasonably priced mobile phone usage -High level of acceptability of SMS in target population -Adequate technical support for IT and users at peripheral sites. -Program leaders effective communication of vision | -HCWs level of experience with mobile phones -Instability of internet connectivity -Cost of scale-up -Variability of reporting practices impacts on IS system design/functionality |

| No. | Organization | Project | Intervention Type | Level | Category | Lessons Learned (drivers/enablers) | Barriers |
|-----|--------------|--|--|---|--|---|--|
| 10 | PATH | Project Optimize-Vietnam: Fee-based Immunization Reporting | Web-based application that enables users to report fee-based immunization services being provided | Four provinces | Design of Information System | -Committed leadership -Availability of IT -Sound policies and procedures in advance | -Lack of computer skills among intended users -Flexibility in updating software (e.g. for new products) -Availability of computers and internet -Poor selection of IS developer |
| 11 | PATH | Project Optimize-Vietnam: VaxTrak - Computerized LMIS | Computerized logistics management information system (VaxTrak) to track vaccine stock and facilitate monthly reporting on immunizations given. | National and Regional levels, plus 13 provinces, 13 districts in one province | Design of Information System | -Only applied at levels with capacity to implement (i.e. regional, some districts) -Ease of use -Simplified tasks | -Competing/duplicative information systems -Non-standard forms that do not match IS interface -Initial increased workload to learn new system |
| 12 | JSI | MEASURE Evaluation – Tanzania: GIS for Resource Allocation | Training and mentoring, use of GIS analysis, and linking data with action tools adopted to support better use of information on Iringa’s HIV situation for program planning and decision making in selected councils | One district in Iringa Province | -Individual Skills | -Committed leadership | |
| 13 | JSI | MEADSURE Evaluation – Cote d’Ivoire | Implemented 8 interventions in line with the conceptual framework and logic model for improving the use of information in decision making: 1. Assessing data use context (PRISM) 2. Engaging data users and data producers (promotion of routine data use fora) 3. Data quality assurance (integrate DQA/RDQA into standard procedures) 4. Standardized reports 5. Data availability – SigDep (HIV/AIDS information System and EMR) 6. Identification of information needs 7. Leadership development 8. Standard operating procedures and other policy reform to foster data use | National, Regional, District, Health Facility | -Individual skills -Organizational | -Committed leadership -Provision of easy to use, standardized tools (information systems and dashboards, RDQA) | |
| 14 | JSI | MEASURE Evaluation – Nigeria | -Information system development (NNRIMS) -Capacity building and training for data management, analysis and use, -NNRIMS database – electronic report from State level -Data quality assurance including RDQA -Data Demand and Information Use training and capacity building | National, regional, 3 state pilots | -Individual skills -Organizational -Design of information system | -Committed leadership -Monitoring and supervision | |

| No. | Organization | Project | Intervention Type | Level | Category | Lessons Learned (drivers/enablers) | Barriers |
|-----|--------------|---|--|---|--|--|---|
| 15 | JSI | MEASURE Evaluation – Ethiopia: Computerized HMIS data processing and reporting system at regional, zonal and woreda levels in SNNPR | A computer application to support decentralized and yet synchronized data management. eHMIS is comprised of the following interrelated tools: <ul style="list-style-type: none"> •Health system reference database (HSRD)- health facility master list •Decision support system (DSS) •Mobile Decision Support System (MEDSS) •Electronic medical catalog system (eMCS) •Electronic integrated disease surveillance response system •Performance Review Teams (PRTs) and routine data use meetings at every level •HMIS information use guide and training manual | -SNNPR Province -eMCS: 19 hospitals, 9 health centers | -Individual skills -Organizational -Design of Information System | -Promoting and Building regional ownership –the regional health bureau (RHB) driving the system to get the desired benefits from it -TWG to oversee and advocate for HMIS performance -Adaptation to local context -Improved user experience (less time to perform tasks e.g. data entry, transmission, aggregation and analysis) | Budget constraint led to sustained reliance on external assistance for HMIS supplies, supportive supervision and monitoring |
| 16 | JSI | MEASURE Evaluation – Botswana: Integration of data quality assurance mechanisms and tools into standard operating procedures of MOH | <ul style="list-style-type: none"> •Customizing the RDQA tools; pre-testing the tools in the field with several levels of the health system; •Consensus building workshops to tailor the SOPs to local needs; •Preparing two SOPs (DQA and application of routine data quality audits); •Preparing curricula for training staff from central MoH and districts. | | -Organizational -Individual Skills | Leadership and ownership of the process by MoH -Use of standardized tool (RDQA) | Key champion from the national leadership left for graduate school, resulting in a loss of momentum in rolling out the training. |
| 17 | JSI | SC4CCM – Supply Chains for Community Case Management - Malawi | Enhanced Management with cStock and DPATs: <ul style="list-style-type: none"> •cStock - SMS and web-based, open-source logistics management information system for reporting, calculating resupply, managing and monitoring community-level health products. •DPATs - District Product Availability Teams - meet monthly to review performance plans and data, decide on actions to improve performance | 21 of the 29 districts | -Design of Information System -Individual Skills -Organizational | -High ownership of mobile phones (99%) among CHWs -Good network coverage -Ease of use -Limited number of data elements | Dashboards for program M&E were designed in Excel to be accessible to health workers, but were built without a strong plan, making the product bulky and table, rather than visualization, heavy. |
| 18 | JSI | USAID DELIVER Project Task order 4&7: The ILS Gateway - SMS Reporting System for Reproductive Health – Tanzania | ILSGateway - Mobile health alert and reporting system to increase the availability and visibility of logistics data and improve the use of logistics data for supply chain decision making. <ul style="list-style-type: none"> -GIS and data dashboards to map supply chain and contraceptive security and other data, track performance and visually display data to promote informed advocacy and decision making. -Training to build computer skills among health workers, particularly at the district level. | Pilot in 2010 in one province (6 commodities) -2011 scale up nationally (4000 HFs, 20 commodities) | -Design of Information System -Individual Skills | -Simple design (SMS) allowed use of personal cell phones by HWs and lowered costs and training requirements | |

| No. | Organization | Project | Intervention Type | Level | Category | Lessons Learned (drivers/enablers) | Barriers |
|-----|--------------|---|---|---|--|---|---|
| 19 | JSI | USAID DELIVER Project – Use of mobile technology for supply chain early warning system: Ghana | Early Warning System - simple mobile phone technology to report on stock levels of selected family planning, HIV and malaria commodities Negotiated and acquired a tool free short code for submission of data into the system at no cost to providers. | Nationwide -DELIVER (7 regions) - Focus Regional Health Project (FRHP) 3 Regions | -Design of Information System | -Stakeholder engagement | -Slow uptake by managers |
| 20 | JSI | Universal Immunization through Improving Family Health Services (UI-FHS) – Ethiopia (2011-2015) | Operations research to to learn, document and share evidence on how universal immunization could be achieved through affordable, sustainable and practical approaches to continuously reach all women and children with vaccines. -Operationalizing RED by integrating strengthening elements of Quality Improvement (QI) and Plan-Do-Study-Act (PDSA) performance improvement -“RED-QI” - addressing larger priority problems using small, rapid, doable changes that can quickly be tested and vetted for adoption, adaption or abandonment at local level -Capacity Building -Peer learning exchanges | three “learning” woredas: Arbegona, Assaieta and Hintalo Wajerate in SNNP, Afar and Tigray regions | -Individual skills | -Functional health extension program and community organizations such as women development army (HDA) | -Inadequate infrastructure, socio-cultural differences in pilot woredas |
| 21 | JSI | TSHIP - Nigeria Targeted States High Impact Project (Sokoto, Bauchi) | Improved health practices and outcomes among the most vulnerable groups through: <ul style="list-style-type: none"> • Use of data for decision-making -data review meetings, capacity building, targeted results dissemination to key community stakeholders, advocacy • Use of standards-based health management & recognition (SBM-R) at select HFs • Improved overall capacity to plan, manage and evaluate primary health care programs. • Strengthened policy environment at the State and LGA levels -policy development and engagement, advocacy, demand creation • Improved allocation of resources for primary health care • More efficient and effective utilization of resources. | State, District, Health Facility | -Design of Information System -Individual Skills -Organizational | | |

| No. | Organization | Project | Intervention Type | Level | Category | Lessons Learned (drivers/enablers) | Barriers |
|-----|---------------------|--|---|---|--|---|---|
| 22 | JSI (with partners) | Rebuilding Basic Health Services (RBHS) – Liberia | Support the MOHSW in increasing access to quality basic health services and strengthening the decentralized management of the health system through Performance Based Contracting (PBC) of NGOs in seven counties. -Performance-based financing -Reform/re-design of routine health information system -Use of DHIS2 -Costing of health services -Quality assurance and quality improvement -Health Promotion | -District | -Health System -Organizational | -Decentralization -Capacity building for implementing NGOs in performance based financing | -Selection of indicators for monitoring performance is a challenge – service delivery not in control of NGO managers -Internet connectivity, -infrastructure |
| 23 | JSI | Enhanced Strategic Information Project – South Africa | Capacity building for Strategic Information for MOH and PEPFAR Implementers -Information system development for OVC and other program areas -Design and implement action plans for enhanced use of data -Technical assistance for maximizing data quality -Develop and maintain a USG results reporting database, -Create high-quality multivariate GIS mapping applications | National, Regional, District, Health Facility | -Design of Information System -Individual Skills -Organizational | | |
| 24 | JSI | Uganda Program for Human and Holistic Development (UPHOLD) | Institutionalization of LQAS for routine evidence-based planning and decision-making at district level | District | -Health System -Organizational | Decentralization of management and planning to district level | |
| 25 | JSI | Strengthening TB and HIV&AIDS Responses in East Central Uganda (STAR-EC) | Increase access to, coverage of and utilization of quality comprehensive HIV/TB prevention, care and treatment services within district health facilities and their respective communities. -Use of LQAS surveys for program monitoring at district level -Use of GIS to identify service gaps -Capacity building of civil society and indigenous organizations | District, Health facility, Community | -Organizational | -Partnerships with NGOs, other implementing partners -Engagement of local district health team - Triangulation of program routine data with LQAS findings | -cost -accessing hard to reach areas -attribution of results (x-sectional survey) -inconsistent place naming |

| No. | Organization | Project | Intervention Type | Level | Category | Lessons Learned (drivers/enablers) | Barriers |
|-----|---------------------------|--|--|--|---|---|---|
| 26 | USAID (Abt. Assoc. /JSI) | ZdravPlus II Project - Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. | ZdravPlus project supported an integrated and comprehensive approach to health systems strengthening and quality improvements in service delivery. -Strengthen governance, leadership, and capacity through the design and implementation of evidence-based policies, laws, and guidelines and cost-efficient institutional structures, roles, and relationships. -Increase equitable access to health services and supplies, through the design and implementation of health financing mechanisms, including pooling of health funds, provider payment systems, health insurance, and basic benefit and outpatient drug benefit packages. | National, Local | -Health System -Organizational -Individual Skills | | |
| 27 | JSI Health Services (USA) | Family Planning Data System | Design, development, implementation, and ongoing management of a regional data management system supporting health information exchange (HIE) for over 250 healthcare provider sites across New England. -Established Regional Data Committee that created a set of functional and operational requirements to meet both existing federal, regional, and state data reporting needs. | Regional (USA) | -Design of Information System -Organizational | | |
| 28 | Ghana Health Service. | SENE Pocket Digital Assistant (PDA) Project- An e-health Initiative in Ghana | Use of PDAs for routine health data recording and reporting with the aim of improving accuracy and timeliness of reports in Sene District of Brong Ahafo Region, in Ghana | Community-based | -Design of Information System | -Desire to reduce data collection/reporting burden in favor of patient care (PDA system estimated to reduce workload collecting data and reporting 5 days /month) | -Electric power supply -Internet connectivity -Resistance to new technology -Lack of maintenance culture |
| 29 | WHO; UNICEF | WHO National Polio Surveillance Project; UNICEF Social Mobilization Network (India) - Via Gates Foundation India | Use of service quality monitoring tools at different levels of the health system for Routine Immunization <ul style="list-style-type: none"> • RI Session monitoring tool • RI House-house monitoring tool • Block, and District monitoring tools • RI HMIS Dashboard (coverage, surveillance estimates by state) | Regional, District, sub-district, Health Facility, community | -Organizational | -Information on service quality enables identification of gaps and accurate targeting of resources for system strengthening | -Rapidly changing needs leads to constant modifications to tools and version control issues -Requires dedicated staff time to employ |

| No. | Organization | Project | Intervention Type | Level | Category | Lessons Learned (drivers/enablers) | Barriers |
|-----|--------------|--|---|----------|--|--|---|
| 30 | CDC | East African Training Project (EATP) – Ethiopia, South Sudan, Uganda (Gates recommended project) - | Capacity building project focused on training and supervision with the objective of keeping polio out of focus countries. Interventions included: <ul style="list-style-type: none"> • Series of workshops (2-4 in a year) at district level and regional level to strengthen key activities in planning, managing and monitoring program activities • Field Projects – identify poor performing areas and investigate to find causes • Project mentors • Frequent supervision • | District | -Individual skills -individual motivation | -qualified mentors familiar with health system context -formal orientation /training for mentors -frequent communication between mentors – mentees – program staff -use of cell phones for check-ins between visits for mentees | -Availability of qualified candidates to fill the role of mentor in some countries. |
| 31 | CDC | Strengthening Technical Assistance for Routine Immunization Today (START) – Uganda (Gates recommended project) | Capacity building for routine immunization through on-the-job training of district immunization staff <ul style="list-style-type: none"> • Assistance with EPI micro-planning using RED • Data quality assurance • Targeted technical assistance to health facility staff | District | -Individual skills -individual motivation | | -Limited understanding and familiarity with the RED tool and micro-planning |
| 32 | PATH | Common Requirements for Logistics Management Information Systems | This project had two main objectives; (1) develop a general methodology for determining and documenting health information system user requirements and (2) apply this methodology to produce requirements in supply chain as one of the core functional domains of a national health system. | National | - Health System | -Demonstrated that when fundamental activities are analyzed that similarities can be identified from what were perceived to be disparate systems and contexts. | |