Africa Routine Immunization System Essentials – Systems Innovation



FINAL REPORT August 01, 2012

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2.0 ACRONYMS

ARISE	African Routine Immunization System Essentials		
ARISE-SI	African Routine Immunization System Essentials – Systems Innovation		
BCG	Bacillus Calmette Guerin (TB vaccine)		
CHC	Child Health Card		
CSO	Civil Society Organization		
DHI	District Health Inspector		
DHO	District Health Officer		
DHT	District Health Team		
DPT	Diphtheria Pertussis Tetanus		
DHIT	District Health Improvement Team		
EPE	External Panel of Experts		
EPI	Expanded Programme on Immunization		
FG	Focus Group		
GAVI	Global Alliance Vaccines and Immunization		
GoU	Government of Uganda		
GIVS	Global Immunization Vision and Strategy		
HC	Health Center (synonymous with HU- Health Unit)		
HFs	Health Facilities		
HMIS	Health Management Information System		
HSD	Health Sub District		
HU	Health Unit		
HUIT	Health Unit Improvement Team		
HUMC	Health Unit Management Committee		
IZ	Immunization		
JSI	John Snow Inc. Research and Training Institute Inc.		
LC	Local Council		
MDG	Millennium Development Goal		
MoH	Ministry of Health		
MUSPH	Makerere University School of Public Health		
NGO	Non-Governmental Organization		
NIDs	National Immunization Days		
NNT	Neonatal Tetanus		
OPV	Oral Polio Vaccine		
PDSA	Plan-Do-Study-Act		
QI	Quality Improvement		
RED	Reaching Every District		
RE	Realist Evaluation		
RI	Routine Immunization		
TT	Tetanus Toxoid		
UNEPI	Uganda National Expanded Programme on Immunization		
VHT	Village Health Team		
VPD	Vaccine Preventable Disease		
WHO	World Health Organization		

WHO/AFRO	WHO African Regional Office
UNICEF	United Nations Children's Fund
UNEPI	Ugandan National Expanded Programme on Immunization
USAID	United States Agency for International Development
5 Ps	Microsystem Assessment of Purpose, People, Professionals, Process,
	Patterns

3.0 EXECUTIVE SUMMARY

Background

As countries begin to reach higher coverage rates for routine immunization, the challenges to fully immunize the last twenty percent of children may be different from the approaches used to reach the first 80%. (1) Those who are "unreached" have been identified as coming from populations living in peri-urban areas who do not fully utilize accessible services; from rural and urban populations with access to services, but who drop-out; from remote rural populations with poor access to services; and from marginalized groups and sects. (1) Approaches to bring immunization services to these children, and/or these children to immunization services, requires that local strategies be developed in partnership with communities, taking into account context and culture and simultaneously asking the questions and addressing the issues of "why" these children are not immunized. (1-3) Similar to many African countries, Uganda's success in reaching high levels of immunization coverage has varied over time but has been improving rapidly over the past decade; e.g., 37% DPT3 FY 2000-01, to 44% DPT3 FY 2005/06 and then 83% DPT3 coverage FY 2009/10. There is great concern now in Uganda about its ability to sustain these rates and/or reach the WHO goal of 90% DPT3 coverage, especially in light of the decline of coverage to 76% DPT3 for FY 2010/11(4).

Upon request of the Bill and Melinda Gates Foundation a partnership was formed between Dartmouth College, John Snow Research and Training Institute Inc. (JSI) and Makerere University School of Public Health (Makerere), and Ministry of Health (MoH) Uganda, to test whether local innovations for reaching hard to reach children for immunization could be developed using a quality improvement approach. Through this partnership we developed The Africa Routine Immunization Systems Essentials – System Innovation (ARISE-SI) research initiative. The goal of ARISE-SI was to assess whether the Microsystems Approach (a Dartmouth College quality improvement approach that is grounded by systems thinking, and coupled with intensive coaching) could provide the right tools to help health systems and communities develop local solutions for reaching hard to reach children and families preventing decline and stagnation of relatively high immunization rates in the future.

The ARISE-SI research team, four physicians and two nurse PH.D researchers designed ARISE-SI to address three primary research questions:

- What are the barriers and enablers associated with maintaining and continuing to improve already high levels of routine immunization coverage?
- What changes or interventions can be made to remove or alter those factors that are causing stagnation in immunization coverage?
- What are effective ways, and under which circumstances, to reach the unreached and why?

Methods

ARISE-SI was initiated in January 2011 and was completed in June 2012. The District of Masaka was selected by the Uganda National Expanded Program on Immunisation (UNEPI) Manager as the primary study site based on its higher performance for routine immunization and strong District leadership team. Within the Masaka District we recruited five Health Unit study sites based on predetermined exclusion criteria. The ARISE-SI intervention included: (a) completion of a baseline assessment of each Health Unit's routine immunization system, (b) development of improvement teams at each Health Unit and at the District level, (c) implementation of four educational workshops each grounded in the principles of action learning, and (d) intensive coaching of improvement teams between workshops. The implementation period for the intervention was from June 2011 to March 2012. A mixed-methods approach using qualitative and quantitative data and a realist evaluation approach were used to answer the research questions.

Findings

From the data analysis and evaluation of the ARISE-SI approach, the following conclusions have been drawn. This multi-component intervention was:

- implemented successfully within the timeframe of the grant,
- well-received by participants as evidenced by increasing participation,
- effective in increasing participant knowledge and skills about QI and RI,
- effective in empowering teams to self-select aims, develop measures, identify barriers and solutions, and implement PDSA cycles of change,
- associated with improving processes and structural aspects of immunization delivery at static and outreach locations in all Health Units.

Recommendations

From the research findings, the ARISE-SI team made three clear recommendations. First, that systems strengthening approaches focused on RI consider the capacity of the Microsystem for generating and sustaining innovations for improvement. Second, that the MoH develop an educational initiative for improvement science that emphasizes systems thinking, leadership, and coaching. Finally, that more research be initiated to assess whether this problem-solving approach of using empowered teams from multiple systems levels can complement, or serve as a vehicle for operationalizing conventional and highly structured immunization programs.

Conclusions

The Microsystems approach shows promise as a problem-solving method for public health systems. This was especially true in regard to routine immunization, where effective strategies and approaches for reaching the unreached might best be designed locally where the nuances of community context are known, and can most readily be taken into account.

4.0 INTRODUCTION

As one path forward to attaining the global target of 90% childhood immunization coverage, the Global Immunization Vision and Strategy "commits all stakeholders to unprecedented efforts to reach the hard-to-reach." (5) In countries with higher coverage rates, the challenges to fully immunize the last twenty percent of children may be different from the approaches used to reach the first 80% that were focused on infrastructure development. (1) Those who are "unreached" are identifiable coming from populations living in peri-urban areas who do not fully utilize accessible services; from rural and urban populations with access to services, but who drop-out; from remote rural populations with poor access to services; and from marginalized groups and sects. (1) Thus, approaches to bring immunization services to these children, and/or these children to immunization services will require that local strategies be developed with communities taking into account context and culture and simultaneously asking the questions and addressing the issues of "why" these children are not immunized. (1-3)

The Africa Routine Immunization Systems Essentials – System Innovation (ARISE-SI) is a research initiative implemented through a partnership between Dartmouth College, Makerere University School of Public Health (Makerere), John Snow Inc. Research and Training Institute Inc. (JSI) and the Ministry of Health (MoH), Uganda. The goal of ARISE-SI is to address the problem of improving immunization rates in already high performing Districts through a research initiative. The specific purpose of ARISE-SI was to assess whether a clinical Microsystems approach has the potential for developing local solutions in high-performing health Districts (coverage close to 80%). Should this approach show promise, it will provide a path forward over the long term to help prevent decline and stagnation of already high immunization rates.

This Systems Innovation approach consisted of teaching front-line Health Unit teams the content of the Dartmouth Microsystem Improvement Curriculum, (6) and coaching them as they applied this learning to quality improvement projects focused on routine immunization. The aim was to determine whether Health Unit teams could successfully be helped to develop insight into, and alter, factors affecting routine immunization in their local context.

Three primary research questions were addressed by ARISE-SI:

- What are the barriers and enablers in one high performing health District and selected Health Unit areas associated with maintaining and continuing to improve already high levels of routine immunization coverage?
- What changes or interventions can be made to remove or alter those factors that are causing stagnation in immunization coverage?
- What are effective ways, and under which circumstances, to reach the unreached and why?

The Microsystems Approach is a person-centered, systems framework which provides a way of understanding the current realities that exist in a health care setting. This approach has been widely and effectively applied in clinical settings in the United States and Europe to address issues associated with inpatient, outpatient, emergency department, long term care, and neonatal intensive care. (7-15) Based on this understanding, the Microsystems Approach, as applied in this initiative, offers a set of quality improvement methods for improving care associated with a public health issue, for example routine immunization, and in a developing country, such as Uganda. (16) While Uganda has many quality improvement projects being currently implemented in the country, the initial focus and funding for this work in the past decade has been on HIV AIDS, (17-23) but has over time expanded to other program initiatives such as integrated primary care and maternal child health. The ARISE-SI team believes that ARISE-SI is the first initiative that applies a systematic quality improvement based on the Microsystems approach to the issue of routine immunization in Uganda.

5.0 BACKGROUND: UGANDA'S ROUTINE IMMUNIZATION STORY

Similar to many African countries, Uganda's success in reaching high levels of routine immunization coverage has varied over time. Table 6 describes several of the milestones in Uganda's journey toward improvement. Much of the variation has been linked to factors that are not in control of care givers or the government, e.g. civil unrest and donor shifts in funding priorities. There is concern in Uganda now about its ability to reach the WHO goal of 90% DPT3 coverage, especially in light of the decline in coverage rates from 83% DPT3 in FY 2009/10 to 76% FY 2010/11(4).

Date	Factors Affecting Immunization	Impact on Immunization Rates
1962-1970	Uganda establishes a comprehensive immunization program	BCG usage at 70%; Uganda one of the first countries in Africa certified for smallpox eradication (early 70s)
1970-1980	Civil unrest, economic and infrastructure devastation	BCG coverage at 1%
1983	Uganda National Expanded Programme on Immunization (UNEPI) established	Goal of UNEPI is to revive RI services and ensure full RI coverage of infants and women of childbearing age
1987	Universal Childhood Immunization initiative is launched to achieve 80% coverage as of 1990	Uganda initiates RI services in every District
1991	Measles coverage goes from is 40% in 1986 to 78% in 1990	Uganda ranks among the top 10 countries for improving measles coverage
Early to mid-1990s	Donor funding shifts to eradication of poliomyelitis, elimination of neonatal tetanus, and to new vaccines; Decentralization of immunization program by GOU to District s	Districts not ready to assume responsibility for immunization program and this results in declining coverage rates
2001-2006	Coverage again begins to increase starting in 2001	In 2006 91% of children age 12 to 23 months had received BCG, 64% received three doses of DPT, 68% were vaccinated against measles. The percentage of children fully immunized was 37% in 2000-01, increasing to 44% in 2006.
2007-2009	Coverage is again of concern and wild polio outbreaks are reported	Estimated 590,000 children unimmunized against DPT3 for 3 consecutive birth years and 652,711 unimmunized against measles
2009	UNEPI developed its 2010 – 2014 multiyear plan for immunization.	The goal of UNEPI's plan is "to achieve a reduction of childhood morbidity and mortality by 2015 as stipulated in the Millennium Development Goals (MDG)".
2010	The GIVS goal for all countries to reach at least 90 % national vaccination coverage, with 80% coverage across all District s. (5)	Increased national attention on the RI system as evidenced by the many documents and reports developed during this time (24-30)

Table 6: Key Factors Associated with Uganda's Immunization Program

From the 1990s to the present, Uganda has participated in many studies to evaluate and improve its RI system. (31-35) In 2007 the Uganda National Expanded Programme on Immunization (UNEPI) published a comprehensive training manual (36) focused on service delivery for operational level health workers. This manual provides standard training materials and references in explicit detail focused on every level of the health system for RI (National, District, and Health Facility levels). In addition, the manual incorporates Reaching Every District (RED) (37, 38) a strategy which was launched in Uganda in 2003 (37) to raise immunization coverage and provide a platform for integrating additional child survival interventions with RI services. Both the UNEPI National Trainer and the ARISE-SI team used the UNEPI training manual (*Immunization Practice in Uganda*) and the RED strategy (3) as the primary references and benchmarks for the technical aspects of the initiative.

6.0 ARISE-SI OVERVIEW

ARISE-SI is a subcomponent of a larger grant initiative, African Routine Immunization Systems Essentials (ARISE), that is being implemented by John Snow Inc. Research and Training Institute Inc. (JSI) and the Makerere University School of Public Health, Uganda. The goal of ARISE is to create a stronger evidence base of the drivers of routine immunization (RI) system performance. This large regional study will provide key insights for systems strengthening by identifying factors associated with high performing and low performing RI systems across several regions of Africa (three countries -Ethiopia, Ghana, and Cameroon- with 4 districts per each country). The review will be accomplished with key stakeholders and will inform future decisions related to RI system strengthening initiatives. (*per Jenny Sequeira, JSI*)

ARISE-SI was intended as a pilot initiative to assess the feasibility of a new approach addressing the challenge of "reaching the hard-to-reach" for RI. Specifically, ARISE-SI sought to determine whether the Microsystems Approach was promising for improving immunization coverage rates beyond 80% in resource poor countries in Africa, such as Uganda. This pilot initiative provided the tools and methods to enable frontline workers (those engaged in getting a child to the vaccines and the vaccines to a child) to assess the local RI system, and consider adapting it to respond to the local context and meet the needs of local providers and communities. ARISE-SI was a research initiative with IRB approvals from both Makerere University School of Public Health and Dartmouth College. The initial concept and hypothesis was supported by a "System Strengthening Framework" which is described in Figure 3 below.

Figure 3: Original Framework Created to Describe ARISE-SI



System Strengthening Framework

The system levels recognized in the Microsystems approach are that of the Microsystem, Mesosystem, and Macrosystem. (6) The working definitions for each level of system are as follows:

- Microsystem the level of system where a group of health professionals come together to provide care for a small population of people (the Microsystem includes the people and the community from which they come).
- Mesosystem the level of system that links Microsystems and describes the journey a person has through the system to have a complex need fully met. This level of system may also provide the support needed to allow the need to be met as in the case of a District supplying resources for RI.
- Macrosystem the level of system that supports all of the Microsystems and Mesosystems in a given situation. This level of system can vary a great deal in terms of size and scope ranging from a small hospital to a national system for immunization.

The System Strengthening Framework (Figure 3), designed based on the ARISE-SI team's initial understanding of the health system structure in Uganda, defines the Macrosystem as the national RI system at the level of the Ministry of Health (i.e., UNEPI – national policy and procedures, budgets etc.); the Mesosystem as the District Health system (supervision, budgets, local policies and procedures); and the Microsystem as the "sharp end" of the system; i.e., the place where the health system interfaces with the client and where the service is delivered. Thus, for the purposes of this initiative, the Microsystem was defined is the point where a caregiver, with child, comes together with the Health Unit staff to receive the service of immunization. It is recognized that this "service" happens within a community and that each community and local Health Unit function within the context of many cultural and socioeconomic factors that will influence the effectiveness of the functioning of this system. For the purposes of this research, the main concerns were with (a) learning about the unique context and mechanism of each Microsystem, (b) implementing interventions appropriate to that unique Microsystem, and (c) bringing about system strengthening by creating a local "engine for change" focused on the specific outcomes of interest, that of fully immunized children.

The framework above also clearly demonstrates the importance of the linkages, and influences of each level of system on other levels. The idea of building system knowledge was incorporated into the design of ARISE-SI. While focusing the intervention at the Microsystem level, the intervention concurrently included and incorporated input and context from the Mesosystem to the Macrosystem. Additionally, an important piece of the work entailed paying attention to both the demand (people want the service being offered) and supply (the services are available) sides of the systems equation. For the past thirty years, countries have focused their efforts to increase immunization coverage on building the infrastructure that supports the supply side of this equation. (1) The intent of ARISE-SI, as depicted in this framework, was to understand the supply side of the RI system in

the local areas where ARISE-SI was implemented, while focusing primarily on the demand side of this equation.

Finally, it was recognized that the work of improving a RI system cannot be implemented within an academic vacuum. Thus, as the framework was used to design and build the intervention, the ARISE-SI team continued to take into account the context important at each system level and worked to redesign the framework in response to the team's increased understanding of these factors. For example, some of the contextual factors that were considered as this framework was developed are summarized in the bullet points below:

- There are many factors that influence peoples' behavior regarding immunization, including culture, beliefs, politics, economic realities, etc. In addition, getting a child immunized is but one of many competing interests in regard to keeping children healthy (other important interests include providing food, clothing, shelter, health care, and a safe environment in which a child can thrive).
- The immunization program is but one aspect of a larger portfolio of services. Other priorities and projects compete for the same resources and attention of the same Health Unit staff and District level staff. Also, at larger Health Units the service infrastructure is much more complex, thus RI and its importance to the larger mission of the unit may have even a lower priority based on other larger and more acute health issues (child birth, surgery etc.).
- The Districts provide support supervision to the Health Units as well as budgets, supplies and logistical support. As Districts have responsibility for the overall health and welfare of the full District population, their time and resources are also allocated across multiple competing interests.
- Uganda has a long history of building and working to improve its RI system. At the National level it has accomplished exemplary work developing policies and procedures for RI system function and application. (36) In addition, in partnership with WHO, Uganda has developed a District level strategy for enhancing and improving this system over the long term. (3)

6.1 Partnerships

Exploratory meetings between Dartmouth College, JSI, the Ugandan Ministry of Health (MoH), and Makerere University School of Public Health (MUSPH) started in November 2011. The meetings produced an agreement to proceed with ARISE-SI through the Makerere University IRB process. With support from the MoH, ARISE-SI was implemented as a collaboration between Dartmouth College faculty, MUSPH faculty, and JSI staff. **Appendix A** provides a list of the personnel who worked to implement ARISE-SI.

In addition to the professional partners, ARISE-SI worked in close partnership with five primary care Health Units from Masaka (Microsystems), the Masaka District Health Team (Mesosystem) and with a designated partner from the Ministry of Health (MoH, the Macrosystem) to implement this initiative. Each Health Unit (HU) formed a multidisciplinary Health Unit Improvement Team (HUIT) comprised of unit staff. The HUITs worked closely with community health workers and leaders. The District also created a District Health Improvement Team (DHIT).

6.2 Internal Panel of Experts

The ARISE-SI Internal Panel of Experts for RI system innovation (IPE) served as an internal reference group for this innovation work in Uganda. **Appendix B** provides a list of the 15 members of the IPE and their affiliation; this includes two ARISE-SI team members from Uganda. IPE members represented complementary areas of expertise in the areas of RI, community health and development, health systems strengthening and organization, health policy, and public/private partnerships in health.

The purpose of the IPE was two-fold. First, the IPE strategically guided the ARISE SI team at key points during the course of the initiative. The IPE was developed to provide advice to the ARISE-SI team at critical junctures in design and implementation. This was accomplished through in-person meetings in Kampala. Second, the IPE served as a core group of key stakeholders and representatives from the health sector and community whose participation in ARISE-SI helped to validate the initiative's work and garner host country national ownership of the interventions implemented over the course of the initiative. The IPE aided in ensuring internal country buy-in for ARISE-SI. When the ARISE-SI team was in Uganda to host workshops they concurrently hosted IPE meetings. Four IPE meetings were held (Jan 2011, June 2011, Sept 2011 and June 2012). At each IPE meeting the initiative was described, findings up to that date were discussed and input regarding best next steps for the initiative was solicited from IPE members. IPE member input was incorporated into the design of the initiative and planning was accomplished in an iterative fashion. In February 2012, ARISE-SI team members met individually with each IPE member to obtain input on how best to summarize and present this report and findings from the initiative in Uganda. The ARISE-SI team disseminated the research findings to the IPE on June 20, 2012. In the course of working together with the IPE members, the ARISE-SI team has had the benefit of their history, technical expertise, and careful, thoughtful consideration of the initiative. This input has enhanced the value of ARISE-SI.

6.3 External Panel of Experts

An international external panel of experts (EPE) was established during initial planning of ARISE-SI to provide technical support and assistance as this initiative was being developed and implemented. The EPE panel members were chosen for their expertise and knowledge of international health and systems strengthening, economics and finance, expanded programs on immunization, routine immunization, quality improvement, evaluation including realist evaluation, and Africa. Three meetings of the EPE were held (Sept 2010, Aug 2011, and April 2012). During the final EPE meeting the ARISE-SI team obtained input on the findings and recommendations of the initiative. **Appendix C** provides a list of the EPE members and their current affiliations.

7.0 THE ARISE-SI INTERVENTION

7.1 Overview

The ARISE-SI intervention was a formal teaching approach that was intentionally designed to foster communication and linkages between the five selected Health Units, District health leadership of Masaka and the local communities in the Health Unit service areas. The intervention was designed to create a safe space for the Health Units to learn from and teach each other about what works in what context regarding routine immunization (RI). The teaching approach was informed by a baseline assessment, grounded by an action-learning process and supported by intensive coaching. Teaching and coaching happened at workshop sessions and during site visits to the Health Units and the District Health Office. The ARISE-SI Coach was coached by Dartmouth faculty. The focus of the intervention was the quality improvement (QI) projects developed by the teams and applied to the RI system.

An intensive focus on cross systems thinking and improvement as implemented through such an action learning model, required that resources were available to support both the educational and coaching components. This included training of the coach, as well as funding and supporting the logistics and operations and improvement work. For example, human resources to implement such a program were tied to the faculty, coach, local staff and community volunteers. There was an opportunity cost associated with these resources as participants in such an initiative were not available to perform all of their usual work functions. Additional, resources to support travel, meetings, lodging, meals and educational materials were also required. Finally, because this approach took local context into account in the development of the educational program; as well as promoted ownership and local buy-in to the application of improvement science, it required additional resources initially to obtain the long-term investment in such a process that was required for long term sustainability.

The intervention was implemented from June 2011 to March 2012. During this time, the ARISE-SI team conducted a baseline assessment of each Health Unit's routine immunization system, and conducted four educational workshops with participants from five Health Unit Improvement Teams (HUIT) and one District Health Improvement Team (DHIT). The ARISE-SI team provided intensive coaching to the teams during action periods between workshops (Figure 4). *No external resources were provided to the teams or the District to conduct their projects.*

Figure 4: ARISE –SI Timeline



Workshops were conducted intermittently in four sessions beginning in June, 2011 and ending in February 2012. Each workshop was held in Masaka City which was readily accessible to all participants. Members of the five newly formed HUITs as well as the DHIT participated in each workshop. During these nine months and during the time period of the workshops, the ARISE-SI team also made site visits to each Health Unit and to the District Health Team's office to follow up on teaching assignments, provide technical information, and to facilitate and provide coaching for team meetings. Teaching at each workshop was conducted by ARISE-SI faculty from Dartmouth College and Makerere University; by the local Ugandan Coach and by the UNEPI representative.

7.2 Baseline Assessment

An assessment of the five "P" domains – Purpose, People, Professionals, Process and Patterns of each Health Unit as well as focus group meetings with caregivers was accomplished during the baseline assessment. Information from this assessment informed the understanding of the local context of each Health Unit area.

5 "P" Assessment

Each Health Unit's baseline assessment workshop had four goals: 1) develop a Health Unit Improvement Team (HUIT) that included community members; 2) learn and practice skills for team meetings and recognize the importance of a diverse team composition for improvement work; 3) complete an assessment of the routine immunization system of the Health Unit based on the 5P framework (Purpose, Professionals, People, Process, Patterns); 4) prepare the HUITs for the upcoming ARISE-SI *Problem Identification Workshop* during which the HUITs would be responsible to teach the ARISE-SI faculty and other HUITs about their RI systems. The 5P framework has been proposed by Nelson, Batalden and Godfrey (6) as an important and effective approach for understanding a system's core functions including enablers and barriers to accomplishing the mission/vision for which a system has been designed. Making the 5P elements visible and explicit to the HUITs was the first step toward helping them start the process of inquiry that would facilitate their ability to appropriately identify an improvement project that they could accomplish during ARISE-SI. (See **Appendix D** for the full 5P Assessment Report).

Workshop participants included HU staff and community members (n=14-16). Presentation and implementation of workshop materials took about two hours. The Baseline Assessment Workshop was designed to build and transfer ownership of improvement work to the HUIT. Each workshop:

- was participatory,
- used principles of Action-Learning,
- facilitated readiness of the HUIT to present their 5P summary to their peer teams at the three day Problem Identification Workshop,
- used concrete examples of each HUs own data (from their homework), and
- employed team meeting techniques and development of team meeting skills.

Caregiver Focus Groups

In-person care giver focus groups were held in each Health Unit service area. Participants were recruited through Health Unit Visiting Health Team members and included caregivers of young children who would be willing to talk about immunization and perception of immunization in the local area. Eight to ten participants were recruited to participate in a focus group meeting for two hours. All participants were asked to sign a consent form which described ARISE-SI and informed them that data from the focus group would be used as part of the research. A structured interview guide was developed for this work and used during these meetings. Meetings were held in local public areas such as at schools, homes of community leaders or local outdoor meeting places.

7.3 Teaching Approach

The four workshops of ARISE-SI were the pillars of the intervention. During these workshops the six improvement teams met together in Masaka City for two to three days to share the work they had accomplished and what they had learned and to acquire new tools and information for moving their improvement projects forward. The following attributes (39) are valued by the teaching faculty. They:

- viewed themselves as participating in a dialogue between equals,
- were open to change and new experiences/seek to learn from helping activities,
- were genuine in entering into personal relationships with learners rather than needing to adhere to the prescribed role of the teacher,
- accepted and trusted the learner as a person of worth (unconditional positive regard), and
- had empathy (nonjudgmental understanding, both intellectual and emotional) for the learner's perspective.

These attributes and the teaching approach attempted to "create space" in the workshop for real learning. (40) The overall approach took into account the following methods: scaffolding (meant to empower students with their own authority by providing them a framework from which to try out new knowledge); praxis or periods of action and reflection (to create space for learning by doing); (41) constructivism (to enhance discovery learning as related to problem solving); (42) spaced lectures (to help incorporate action-learning); (43) group work (to enhance social interaction); (44-46) and communication (focused on inquiry teaching and brainstorming. (47) Illustrative examples of how methods were applied are provided in the bulleted points below.

- The ARISE-SI team set the stage for every teaching session with the mantra "all learn all teach" and then practiced this through example. At every workshop the improvement teams presented their work on their improvement projects to their colleagues for review.
- The local teams were seen as the context/content experts on their local areas and presented to us and their peers about their project from this perspective.
- Careful and considerate facilitation by the ARISE-SI faculty provided a safe environment for open discussion about what all were learning and for sharing of tips and suggestions on improving local projects.
- The language used in all teaching materials was simplified and modified where possible (e.g., "ramp of improvement" was changed to "ladder of improvement" at the suggestion of the Ugandan colleagues and "patients" in the 5P model was replaced with "people" since subjects of immunization are usually healthy).
- Teaching methods were highly interactive and participatory. When possible games were used to illustrate key concepts of quality improvement. For example, the paper airplane game was used to teach the use of PDSA cycles.
- The content and method of teaching was modified and refined after each workshop, based on the assessed needs and learning level of the participants.
- During the workshops, the ARISE-SI team emphasized the need, when conducting quality improvement (QI), to start with small aims and change ideas that can be accomplished with existing resources and that can be planned and implemented immediately.
- Teaching sessions that focused on the RI system and immunization were accomplished through a review of basic concepts and facts of immunization including policies and procedures for vaccine inventory management and maintenance of cold chain.

7.4 Action Learning

The intervention and teaching approach were grounded by Kolb's experiential model of learning based on the belief that more people "act their way into believing than believe their way into acting" (page 216). (6) Thus, one learns by "doing".

Figure 5: Kolb's Experiential Model of Learning



Adapted from Kolb (1984) and Welck (2000)

The overall teaching plan for "action learning" was established to accommodate the four major components depicted in Figure 5. Explicitly, the ARISE-SI team guided each of the improvement teams through an assessment of their own RI system and their estimation of internal priorities and available resources. This work elicited for them (and ARISE faculty), their own understanding (concrete experience) of their local RI system and how it interfaced with the community and District. From this experience, the teams made (observations and reflections) as they worked together in the educational setting. Then, grounded in this new awareness of their HU routine immunization system function and capacity, they were asked to select a specific aim for improvement that was within the sphere of influence and control of their local HUIT team. The scope and magnitude of the specific aim and the timeline for achieving it was left to the discretion of individual teams (formation of abstract concepts and generalizations). As the teams worked through the process of improvement, applying the improvement tools and knowledge gained from the workshops, they learned to evaluate the changes they were making using local level process and RI data. Continuous adjustments were made to their initial plans, measures and processes to leverage outcomes desired (testing implications of concepts in new situations).

7.5 Intensive Coaching

Coaching is a key element of the intervention. The Microsystems approach, as implemented through ARISE-SI, required that each team be assigned an improvement coach with expertise in QI. The coach's role was to mentor the teams by helping them to use team meeting skills so that their meetings were efficient and effective, and apply the right QI tools and methods to their improvement work as they moved forward on their projects. During the process of the work, the coach recognized the improvement team for its expertise on local content and context and guided them in their experiential learning process. Intensive coaching is seen as a critical element for sustaining and formalizing continuous improvement within organizations. (48-51)

Initial Training and Subsequent Support of the Coach

The Coach received extensive training in the art and science of coaching during the entire initiative. The training of the ARISE-SI Coach was performed by Dartmouth faculty with experience in Microsystem coaching. Figure 6 shows the conceptual underpinning of developing the ARISE-SI Coach. The initial steps (on the left side of the figure) modeling, orientation to the basics of coaching, modeling again, and reflection occurred prior to and during the beginning of the ARISE-SI intervention. The steps of distance coaching, reflection, real-time coaching, and reflection (the right side of the figure) were repeated with each subsequent workshop during the ARISE-SI intervention.

Figure 6: Steps Involved in the Development of the ARISE-SI Coach



March – June 2011

July 2011 – February 2012

The Coach was supported in the following ways: (a) attended a two-day 'coach the coach' session at Dartmouth (March 2011) focused on coaching theory; (b) was coached by phone for 1-2 hours every week on how to support the activities of the improvement teams, and provide technical support and tools for data collection at the Health Unit level; and (c) was provided one-on-one coaching by ARISE-SI faculty through briefing and debriefing sessions specific to coaching sessions.

Summary of the Coaching Interface with the Improvement Teams The Coach contacted each team about every week by phone, and also visited each Health Unit every month. During these phone calls and visits the Coach ensured that the teams were conducting the activities they had planned, provided encouragement and technical support (e.g. with data collection and analysis, or with change management), helped teams prepare presentations for the workshops, and to communicate their needs and barriers to the District Health Team. The Coach also encouraged the teams to reflect on their attempts to improve RI processes and outcomes, identify lessons learned, and facilitated a reinforcement of learning about the QI principles taught in the workshops and the site visits.

7.6 Educational Content

The educational content of the workshops included: (a) the Microsystems approach including three major conceptual models which were the underpinnings of the educational sessions: an ecological model of embedded systems, the Model for Improvement, and the Ladder of Improvement; (6) (b) information on RI and vaccines; and (c) use of immunization data for improvement. Between workshops sessions, participants practiced the concepts taught by "doing" the improvement work. The ARISE-SI faculty developed homework assignments and workbooks to be completed between workshop sessions.

Fostering Communication and Linkages across System Levels

The ARISE-SI team included District leadership and a designee from UNEPI as participants, technical assistance experts, educators, and coaches to foster communication and linkages between the different levels of the RI system; i.e., the Microsystem (community and Health Unit), the Mesosystem (the District), and the Macrosystem (UNEPI/MoH).

The five members of the District Health Improvement Team (DHIT) were active participants in all of the workshops and received site visits and regular coaching visits, similar to the Health Units, which focused on their own unique improvement project. In addition, and unplanned by the ARISE-SI team, the District Health Inspector (DHI), who serves as the interim District Health Officer when the DHO is out of the District, assumed key roles in ARISE-SI that provided him direct personal experience and participation in every level and aspect of activities of this initiative.

The DHI accompanied the ARISE-SI Coach to the Health Units (Microsystem) during the periods between the workshops. Thus, he became well acquainted with the coaching approach that was being implemented to support the work of improvement and he was able to communicate directly to both Health Unit staff about their work and to the community leaders and VHTs about their issues. At the Mesosystem level, the DHI became the key technical assistance advisor to the Health Units at the workshops. At every workshop, the DHI made himself (and his team members) available to research and respond to all technical and logistical questions that arose during the workshop discussions. This support became so helpful to the ARISE-SI team and to the Health Units that it was institutionalized as "just in time" support. At each workshop a flip chart was put on the wall at the beginning of every meeting and participants were encouraged to write down any technical questions that arose for them during the proceedings. At the end of the day, the DHI took these questions home and returned the next day with the answers. At the Macrosystem level, the DHI represented the DHO at the regular IPE meetings where the team interfaced with the Manager of the Uganda National Expanded Program of Immunization (UNEPI).

The National Trainer for UNEPI attended all workshops in the capacity of technical expert and teaching faculty. Over the life of ARISE-SI, the National Trainer also became much more involved in the implementation of this initiative at the Health Unit level. On several occasions she joined other ARISE-SI faculty and the Coach at the HUIT meetings. During this time, she provided technical assistance and support addressing real time issues that she observed when she was in each unit (for example, the correct way to monitor the temperature of the refrigerators). The topics the National Trainer reviewed during the workshops and/or during visits to the Health Units focused on immunizations and vaccines and included higher level discussions on the importance/need for immunization, the history of immunization in Uganda, the mission, vision, goals of UNEPI, operational components of the RI system, and the roles and responsibilities of personnel at each level of the system. She also provided detailed information during her educational sessions including information on: the immunization schedule, vaccine inventory management, vaccine storage and monitoring, maintenance of records and documentation regarding immunization, program management, drop-out rates, management of rumors and misconceptions, training of the VHTs and policies for opening a BCG vial. In addition, the National Trainer taught formal sessions at each of the four workshops.

Linkages were also fostered between Health Units and the community health workers by encouraging the involvement of Village Health Team members (VHTs) and mobilizers in the monthly HUIT meetings (conducted by the teams themselves), as well as in the teaching and planning sessions conducted at each Health Unit by ARISE-SI faculty and the Coach. Initially, these on-site faculty-run meetings were held in English, but subsequently, the meetings were conducted in Luganda, the native language of most of the participants and the community health workers.

Promoting Cross-Team Learning

The ARISE-SI team set the stage at each educational session for cross team learning. At all the workshops attended by the six teams, each team presented (five using handwritten flip charts and one using slide presentation software and a projector) the improvement work accomplished in their Health Unit (or the DHIT) until that time point. Teams summarized, in brief, their more remote work and presented the more recent work in detail. After each team presentation, participants from other teams asked questions, sought clarification and provided suggestions and comments to other teams. Following the presentations, the faculty conducting the workshop emphasized the important learning points from the presentations, used examples from the work of the teams to illustrate how the teams were using QI principles and methods they had learned previously, and also pointed out the similarities among all the teams in the aims selected, measures used, barriers and enablers encountered, and changes selected by them. The topics summarized in Table 7 below were taught to participants during ARISE-SI.

Activities	Content and Tools		
Baseline Assessment	 Formation of a team and teamwork, including meeting skills 		
Meeting skills	(setting an agenda, timekeeping, facilitation, meeting		
	evaluation, meeting minutes).		
5P assessment	• Self-assessment of each Health Unit (Microsystem) by their own		
	staff focused on the domains of purpose, people, personnel,		
	process, and patterns (the 5P model)		
Workshop I	 Selection of a theme and global aim for immunization. 		
Problem Identification	 Selection and delineation of a specific aim 		
	Measurement for improvement including selection of process		
	and outcome measures, developing operational definitions,		
	data collection methods, data analysis, display (emphasizing		
	the superiority of time-ordered data over grouped data) and		
	interpretation (including the use of run charts to identify		
	medians, shifts, trends and runs). This topic was, in particular,		
	reinforced by one of the faculty members spending time		
	individually with the Health Management Information System		
	(HMIS) staff member during site visits to each HU.		
Workshop II	Use of fish-bone analysis		
Implementation	 Identification of barriers and facilitators 		
	 Selection and implementation of changes for improvement. 		
	How to conduct Plan-Do-Study-Act cycles.		
Workshop III	Reflective practice: This workshop focused on "reflection" as		
Reflective Practice	an important practice of improvement work. At this time we		
	stopped, took a breath and assessed where participants were		
	with the improvement work and how all wanted to move		
	forward together. The ARISE-SI team completed an initial		
	analysis of the qualitative data to identify cross cutting themes		
	describing factors associated with the improvement work and		
	then developed questions about these themes to make		
	drivera of change (progress		
	a Technical educational agaziana forward on PL data and		
	• Technical educational sessions focused on Al data and		
Workshop IV	Summary of the improvement work accomplished by each of		
Transition	the teams. Recap of all educational session using pictures of		
Transition	narticipants "applying the lessons learned" and activities		
	again to reinforce major concepts being taught		
The Way Forward:	Continuation of improvement activities in concert with		
Continuous Improvement	Ugandan Coach for the months of April. May, and June.		

8.0 SETTING AND PARTICIPANTS

The study, conducted from January 2011 until March 2012, involved five Health Units in the Masaka District and one District Health Team. Health Units were recruited based on a feasibility assessment and predetermined exclusion criteria. A mixedmethods approach using qualitative and quantitative data and a realist evaluation approach were used to answer the research questions.

8.1 Study Setting

Uganda has a population of more than 33.3 million people (2010). (52) Of this population, approximately 87% live in rural areas and 29% live below the \$1.25/day international poverty line (2000-2009). (52) The female adult literacy rate is 78% (2005-2010) and the child mortality rate is 99 per thousand children below age five (2010). (52) In 2007, expenditure on public health was 1.6% of GDP and general government expenditure on health represented 10% of total government spending. (53)

Uganda is organized into 80 administrative District s which are further divided into subunits down to the village level: counties, sub-counties, parishes, and villages. The National Health System, a decentralized, hierarchical network of facilities and providers from public and private sectors, is embedded within this structure. (20, 54)

The public health sector is comprised of households, communities, and villages with Villages Health Teams (VHTs), who help deliver basic health services to households and communities, recently acknowledged as the formal front line component of the health system (Health Unit level 1) (55) followed by Health Units II, III and IV levels, and hospitals.

ARISE-SI was implemented in five Health Units in Masaka District (population 249,200). Masaka is primarily rural, comprised of two counties, 9 rural sub-counties, 39 parishes and 352 villages, and one municipality (Masaka, population 74,100). (Data provided by Mr.Muhamed Bukenya, Health Inspector, District Health Team, Masaka District and are from the National Uganda Bureau of Statistics population projections for 2011-2012.)

Table 8 outlines the functions of the public health system infrastructure in Uganda Districts. This infrastructure has implications for systems level thinking promoted by ARISE-SI.

Health Unit I: VHT	 A satellite health facility with no definite physical structure In a village may be first touch with health system Each village has 4 VHTs VHTs are volunteers with some training 	First level of formal health sector; provides link between Health Units and households Facilitates health promotion, service delivery, community participation and empowerment, and access to and utilization of health services
Health Unit II	 Closest structural health facility to the community One in every Parish Serves a few thousand people Outpatient clinic, treats common diseases and provides antenatal care Staff recommended: enrolled nurse, midwife, 2 NA, and a health assistant 	Provides outpatient care, community outreach services, and linkages to VHT
Health Unit III	 One in each sub-county Handles referrals from HU II and makes referrals to HU IV General outpatient clinic, maternity ward, and laboratory Staff recommended: senior clinical officer and full staff component of 18 	Provides basic preventive, promotion and curative care; support supervision to HU IIs under its jurisdiction; lab services for diagnosis and maternity care
Health Unit IV	 Serves a county or a parliamentary constituency Is a mini hospital with an operating theater to perform uncomplicated surgeries Has inpatient wards for women, men and children Conducts planning and management Health management information activities Run by a senior medical officer and another doctor 	Provides clinical services including surgery and inpatient services; support supervision to HU IIs and HU IIIs under their jurisdiction; takes referrals from lower health level Health Units
District Health Office	 Policy implementation and planning Human resources management and development Quality assurance and support supervision Disease and epidemic control/disaster preparedness Advocacy for health services Health systems research Health management implementation system activities 	Provides direction, technical advice and support to the Health Units

Table 8: Uganda's Public Primary Health System Infrastructure (54)

8.2 Selection of Study Participants

Selection of District

From January 2011 to February 2012 ARISE-SI was implemented, in Uganda. The MoH worked with the ARISE-SI team to identify one higher performing District with the leadership capacity, political readiness, and leadership to accommodate this research. The Masaka District, a resource-poor, rural District, was chosen as the focus for this initiative. Masaka had relatively high (85% DPT3) childhood RI performance over the past three years (DPT3 coverage rates based on country reported data were 83% in 2007, 77% in 2008, and 96% in 2009. Excluding the 12 District s with average coverage rates greater than 100%, the median DPT3 average coverage rate for the same three years, across the remaining 68 District s was 76% (range 23% to 100%. Thus, in this rank ordering, 42 Districts had DPT3 rates lower than Masaka, and 23 had DPT3 coverage rates higher than Masaka). (56)

8.3 Feasibility Assessment – Selection of Health Units

A Feasibility Assessment was conducted in January 2011 to provide data and information for selecting Health Units for the ARISE-SI study. Quantitative and qualitative data were used to select the study sample. Five Health Units (HUs) were selected from the 33 Health Units in the District based on eight exclusion/inclusion criteria. HUs were excluded if they were: (a) located outside of the Masaka District, (b) a hospital, (c) only an outreach site (no refrigerator for storing vaccines), (d) had provided less than 250 DPT1 antigen doses per year for the past two years, and (e) were further than an hour by car from the center of the city of Masaka.

After applying the exclusion criteria, seven HUs remained in the pool. Of these seven, five were included in this research study based on inputs from Key Leader Interviews of the DHT members and HU staff (the In Charge, RI focal person, Health Management Information System person and others). These interviews were conducted in-person as semi-structured interviews. In these interviews the ARISE-SI team looked for evidence of leadership capacity and interest and readiness for improvement work, as well as contextual factors such as whether facilities were adequate and manageable enough to support the initiative locally. For example, one HU was excluded because it was in the middle of a large scale construction project. Final HUs were selected to fit a profile of the variation of Health Units across Uganda. Thus, the team was seeking to select one Health Unit from each HU level (Levels II, III, and IV) and at least one non-governmental HU (Figure 7).



Figure 7: ARISE-SI Inclusion and Exclusion Criteria for Selection of Health Units

8.4 Study Sample of Health Units

The ARISE-SI team purposefully selected a sample of HUs that represented the diversity of the HU levels and governance in Uganda (Table 9). In the sample, the team included one Level II HU, two Level III HUs, and two Level IV HUs. All HUs were government run except for Butende which is non-governmental. One unit was in a rural area, three in peri-urban areas, and one (Masaka Municipal Council) was in the heart of the city of Masaka. Service area populations varied across the HUs as did their reported rates of immunization coverage and drop outs. All units (except Masaka Municipal Council- MMC) were understaffed in some areas based on recommended MoH standards for overall unit staffing. However, when asked, staff participating in the first HU assessment reported that they had enough staff to support the functioning of their RI program. MMC was a unique case when it came to staffing because it was a HU II staffed at the level of a HU IV due to its unique physical location at the headquarters of the health sub District in the heart of the city.

HEALTH FACILITIES WHERE WE IMPLEMENTED ARISE-SI					Annual Volume DPT1	
Name of Health Facility	Type of Health Facility	Gov/Non	Rural/Urban or Periurban	Service Area (Parish) Population (2010-11)	DPT 1 volume (08-09)	DPT1 volume (09-10)
Masaka District Health Office	District Administrative	G	U			
Masaka Municipal Council	HUII	G	U	6,300	184	892
Bukeeri	HU III	G	R	12,400	392	355
Butendi	HU III	N/G	PU	7,000	434	467
Kiyumba	HU IV	G	PU	9,800	185	494
Kyannamukakaa	HU IV	G	PU	23,900	544	488

Table 9: Overview of Characteristics of Health Units Selected

8.5 Description of Improvement Teams

Six multidisciplinary teams were formed. One Health Unit Improvement Team (HUIT) consisting of four to seven members was formed at each of the five Health Units (a total of 5 HUITs). One District Health Improvement Team (DHIT) consisting of five members was composed of District Health Team members.

The ARISE-SI team identified four HUIT members as core members of each team. These members had to be included as team members at each unit and composed the nucleus of the team and RI system functions: (1) the Clinical Officer/in-charge (In-Charge), (2) the RI Focal Person, (3) the Health Management Information System staff member (HMIS), and (4) a community member. The RI focal person held different credentials across Health Units including nursing assistant, health visitor, comprehensive registered nurse and public health nurse. Several teams included Health Unit inspectors, nursing officer, health assistant and nursing assistants.

9.0 DATA COLLECTION AND EVALUATION

9.1 Data Collection

Quantitative and qualitative data were used. Data were collected over the entire course of the initiative, beginning with the feasibility assessment in January 2011.

Quantitative Data

Measures of ARISE-SI Intervention

The primary focus of the quantitative measures was related to the level and type of engagement of participants in the multifaceted intervention. Process measures were collected by the ARISE-SI team to describe participant attendance at HUIT meetings and workshops, meeting evaluation ratings of HUIT coaching sessions and workshop evaluations. Data collection occurred during and immediately after each aspect of the intervention. Data collected by the HUITs and DHIT related to their improvement project processes were also collected and analyzed.

Routine Immunization

A secondary focus of the quantitative measures was related to routine immunization (RI). These measures were secondary due to the fact that the period of intervention was brief (9 months); thus not long enough to evidence changing immunization coverage rates (the ultimate goal of demonstrating success in reaching the unreached) required a longer period of time to assess. The RI schedule of interest for this initiative is listed below in Table 10.

Vaccine	Protection Against	Schedule
BCG	Tuberculosis	birth
		birth, 6, 10, 14,
OPV	Polio	weeks
DPT,	Diphtheria, Tetanus,	
HibHep	Pertussis (whooping cough), Hepatitis B	6, 10, 14 weeks
Measles	Measles	9 months

Table 10: Routine Immunization Schedule Expected for Ugandan Children

A fully immunized baby in Uganda at one year of age would have had one BCG dose, 4 doses of OPV (oral polio vaccine), 3 doses of DPT (DPT1, DPT2, DPT3) and one dose of measles. DPT 3 is used as a marker for the effectiveness of the RI system, e.g., higher rates of DPT3 would connote a higher functioning system. (57) Data on numbers of children immunized were provided by the District Health Inspector as received from each Health Unit. Data were captured monthly and stratified by static and outreach HUs for the eight different antigens (BCG, DPT1, DPT2, DPT3, Polio1, Polio2, Polio3, measles). DPT dropout rates were calculated using the following formula: [(#DPT1-#DPT3)/#DPT1] x 100. Given small numbers, data for numbers of antigens and dropout rates were calculated for 6 month intervals. Data were available from July 2007 to January 2012.

Qualitative Data

Qualitative data were obtained from: (a) key leader interviews and focus groups conducted during the feasibility assessment, (b) caregiver focus groups conducted during the baseline assessment workshop, (c) workshop notes, (d) HUIT and DHIT storyboards, (e) onsite coaching meeting notes and Coach reflections, and from (f) workshop evaluations including "*Before and After Action Reviews*", (58, 59) formal workshop evaluations, and ARISE-SI team members' reflections on workshop implementation.

All key leader interviews and focus groups were conducted as in-person interviews using a structured interview process and standardized questions. Caregiver focus group and workshop participants were provided information on ARISE-SI and how data were to be used during the initiative. They then signed standard research consent forms prior to participating in any data collection activities. Consent forms were provided in English and Luganda, and read aloud in Luganda prior to signing. Participants were given opportunities to ask questions, and assured that participation was voluntary.

External Evaluation of ARISE-SI

Outside reviewers from the Center for Program Design and Evaluation at Dartmouth College (CPDE) evaluated the process and learning outcomes of the initiative. A mixed methods triangulation design in which qualitative and quantitative data are collected simultaneously, was used to explore the major constructs chosen for the CPDE Evaluation. Data were collected in-person with participants during their final ARISE workshop held in February, 2012. Methods consisted of five focus group sessions and a comprehensive written questionnaire completed individually by the same participants. Trained Ugandan researchers who were not part of the project team oversaw the administration of the questionnaire and conducted the focus groups. No project team members were present during the questionnaire administration or the focus groups and both were conducted prior to teaching sessions to reduce socially desirable responses. All completed questionnaires, focus group audio recordings and typed transcripts were kept sealed and protected from viewing by the project team. This outside evaluation provided a method to validate the findings from the ARISE-SI ongoing evaluation efforts.

10.0 ANALYSIS

10.1 Overview

A high level schematic of the data sources and analysis used to document and evaluate the intervention is depicted in Figure 9.

Figure 9: ARISE-SI Analysis Plan



10.2 Quantitative Analyses

ARISE-SI Intervention

Intervention measures represent the primary quantitative outcomes for ARISE-SI. Data related to attendance at workshops and HUIT meetings were summarized in tabular form. Average participation was calculated for each meeting. Evaluation ratings were averaged and summarized in tabular form as well. Mean values for each measure were reported by intervention phase (beginning, middle, and end).

Routine Immunization Data

Analyses of RI Data informed the secondary outcomes for ARISE-SI. A subset of the eight antigens was selected for analysis (DPT3, DPT1 and BCG). Data on number of children immunized were analyzed using two methods. First, analysis of variance (ANOVA) was used to assess for differences between the 8-month period of the ARISE-SI intervention (Jun 2011-Jan 2012) compared to previous similar periods (Jul 2007-Jan 2008, Jul 2008-Jan 2009, Jul 2009-Jan 2010, Jul 2010-Jan 2011). These analyses were conducted by static and outreach Health Units separately for each antigen DPT3, DPT1 and BCG. Data were stratified by the site where the antigen was given; i.e., static site or outreach site. Statistical significance was considered present if associated p<0.05. The second analysis looked at changes in number of children immunized monthly using moving range statistical process control charts. Baseline period for each control chart was the 23-month period prior to the ARISE-SI intervention (Jul 2009-May 2011). Control limits were set at 3-sigma. The following rules of special cause variation were used in the control chart analysis: 8 or more points consecutively above or below the average, 1 or more points above the upper or below the lower control limit, 2 of 3 consecutive points more than 2-sigma from the average. (60, 61) Data for numbers of specific antigens provided and dropout rates were plotted in 6-month intervals over time; but were not analyzed for statistical changes.

10.3 Qualitative Analysis

All qualitative data were analyzed using NVIVO 9. Qualitative data sources were organized within NVIVO by source type (workshop notes, Coaching notes, Coach reflections, etc.) and date, thereby enabling comparison of findings over time. An iterative coding and data reduction process (62, 63) was applied using NVIVO to identify themes initially, and then as new data were added over time, to reanalyze all data which generated new themes as the initiative progressed. Emerging themes were validated by ARISE-SI investigators through discussion and reflection.

10.4 Realist Evaluation Analysis

Realist evaluation is an approach using a combination of qualitative and quantitative data to refine an initial set of theories based on specific learning about a complex intervention in multiple contexts. The result of a realist evaluation is a set of middle-range theories.
Realist Evaluation Overview

Realist Evaluation (RE) is a method for learning about what works for whom under what circumstances (64-66). Realist Evaluation is conducted by systematically tracking interventions and outcomes, as well as the mechanisms that produce the outcomes, the contexts in which these mechanisms are triggered, and the content of the interventions. This approach has been implemented to understand nuanced outcomes of complex interventions in healthcare and academic settings.(64-71) ARISE-SI's primary concern is not with improvement of RI coverage rates per se, although it is hoped that the intervention might show initial promise and lead to an increase in numbers of children immunized. The ARISE-SI team formulated a rudimentary theory that implementing the Microsystems Approach would trigger causal mechanisms that would bring about innovative systems changes.

The team began the research having a theory derived from generalizable evidence (reports and documents and literature) and an initial hypothesis: The ARISE-SI Microsystems Approach provides a framework to inform the development of local solutions to address the complex problem of reaching the last 20% with Routine Immunization. ARISE-SI accomplishes this by making explicit the mechanisms, contexts and outcomes of the RI solution. The RE process entails an iterative approach (Figure 8) similar to the experiential leaning process. Thus, RE is a conceptual and methodological fit to this approach to improvement.



Figure 8: Cycle for Realist Evaluation

Realist Evaluation Steps

A summary of the data analysis for the realist evaluation is described below in Steps1-7. In addition, the data analysis process provided a means of applying a quantitative method for comparing variables within and across HUs to explain differences in outcomes that offered a degree of consistency among raters. The specific output of this analysis is a set of revised theories about how RI works under the specific contexts of the HUs in Masaka District.

Step One: Data synthesis occurred through a process of comparative analysis,(63, 72) which enabled pattern identification across HUs. This process resulted in the development of a set of high-level themes describing key factors related to RI system improvement that were common across HUs and were validated with HUIT and DHIT participants during the Reflection Workshop in December. The following ten themes initially emerged as being important for understanding the context of RI within the framework of the intervention:

- Communication
- Community involvement
- Innovations
- Knowledge of RI
- Leadership
- Sense of team
- The unreached
- Use of data
- Use of QI tools
- Temporary fixes to system level problems

Step Two: From December to February additional data were added to the data-base and these data were analyzed and reanalyzed resulting in a broader, more comprehensive set of themes (Table 11).

High Level Themes	Common Descriptors for Each Theme across Health Units
Leadership	Single leader involvement
	 Interplay between them
Participation in Training	Overall attendance
	 Involvement of others (mostly VHTs - but also staff)
Collaboration/Sense of Team	 Developmental journey – started at one point and ended up at another
	Use of skills
Community	• % VHT
Engagement/Involvement	Baseline- community relations
of VHT	Engagement, integration of VHT
Use of Data/QI	Variation across HUs
	 Baseline capability/facility with data
	Uses of data over time
The Unreached	Related to culture
	 Shift in awareness from (a) there are children who are unreached
	for routine immunization, to (b) active outreach to find these
	children and connect them to RI
	 Building Village Health Team members linked to unreached into
	HUIT
	Definition, engagement/activation in approach to reaching
Communication	Use of native language
	Development of networks that link HU to community
Cross-Systems Linkages	 Inclusion of DHIT in workshops and in coaching,
	 Type of system link (community, DHIT, public-private)
	 Strength (Kiyumba little to none, others stronger)
Sense of Efficacy	How did it manifest?
Temporary fixes to system level problems	• Туре
Innovation	• Туре
Enablers to RI	Engagement with community/mothers
	Focus on process enablers:
	approachability of staff
	use of data
	doing the work
Barriers to RI	Scope of influence
	 Emphasized importance of consistent leadership involvement,
	supplies, culture, access, shift in locus of control
1	

Table 11: High Level Themes and Common Descriptors

Step Three: The team then developed an intricate spreadsheet which categorized these themes across three time segments for each Health Unit: Beginning, Middle and End, and operationalized these segments as follows:

- The Beginning included activities and findings from January through June of 2011, providing baseline context. These activities and the documents they generated included the Feasibility Assessment, workshop pre-work, Baseline Assessment (caregiver focus groups and 5 P assessment), June workshop (Problem Identification), and the post-workshop onsite PDSA planning coaching session.
- The Middle encompassed the period from July through October, and included four onsite coaching sessions, and the September (Implementation) workshop.
- The End spanned the time from November through February, and included four coaching sessions, and the December (Reflection) and February (Celebration and Transition) workshops.

Step Four: Processes or changes across time within each High Level Theme were summarized by Health Unit. These summaries were displayed in an excel spreadsheet enabling comparison across units.

Step Five: Common descriptors for each theme across Health Units were developed by two investigators through an iterative exploratory process which captured elements common across the HUITs (Table 11 above).

Step Six: These common descriptors were then used by three investigators to develop indicators of successful implementation of the ARISE-SI intervention (Table 12).

Table 12: Indicators of Successful Implementation

Integrity of cold chain
Meetings of HUIT
Community involvement
Use of data
Knowledge of unreached
Use of tools to do PDSA
Achievement of goal for PDSA
Link to other levels of system
Dropout rate
Total children immunized
Children Immunized Static
Children immunized Outreach

Step Seven: Each HU was examined and rated for evidence of change (none, minimal, moderate, or strong on a 0-4 scale) in each indicator over the course of the initiative. Three investigators completed independent analyses of these indicators for each Health Unit, and reconciled differences in their ratings to come to 100% agreement on HU scores across indicators. This final set of scores was used to identify and describe patterns in similarities and differences in contexts, possible mechanisms and outcomes, and relationships between them that support the development of testable propositions or middle-range theories. (63, 66)

This phase of the analysis generated three types of findings. First, the team created a summary for each HU that described in detail the HU's improvement journey during ARISE-SI. These summaries with specific data for each HU are found in **Appendix E and F**. Second, the team used the thematic analysis to create a specific illustrative example of key themes for each HU (see Section Three of Findings). Finally, the team generated a set of revised hypotheses for how it believed the findings from ARISE-SI in Masaka can inform thinking about HUs, communities, levels of system and RI practices (see Section Four of Findings).

10.5 External Evaluation Analysis

Data from the questionnaire were entered into Excel and then results were imported into SPSS (version 15.0) for descriptive statistical analysis. Respondents' scores were converted to numerical representations ranging from 1 to 5, where one was associated with the lowest rank on the scale and five with a high score. Surveys were analyzed in aggregate to identify overall trends, and secondary analyses were done to compare findings by team and by an individual's role on their team. To analyze the semi-structured focus group data, one CPDE researcher developed a preliminary coding scheme based on grounded theory technique x in which codes are drawn from the text and coding involves frequent comparative analysis of the data. An additional member of the team reviewed all of the codes independently, and additions or deletions of codes were made to finalize the coding scheme. All the data were then coded and overall themes were identified (see **Appendix G**).

11.0 FINDINGS

11.1 Overview

A summary of the overall findings from this research are presented below. Section One provides a discussion of the overall findings from the implementation of the Microsystems Approach. Section Two summarizes what was learned about barriers and enablers to improvement of the routine immunization (RI) system. In Section Three the AIMs, measures and changes that were the focus of the team's improvement projects are described, followed in Section Four by a summary of the findings from the analyses of the RI data. Sections Five and Six focus on the findings from the realist evaluation. The realist evaluation that the ARISE-SI team accomplished was helpful for describing the contextual differences that explained variations in the improvement process and outcomes across the five Health Units (HUs). Realist evaluation also was an important tool for understanding the permeable barriers across systems. (In **Appendix D** additional detailed information of the findings from the baseline assessment are provided, and in **Appendix G** the results of the external evaluation of ARISE-SI are summarized.)

11.2 Section One: The Microsystems Approach

ARISE-SI Plan and Timeline

The original design of hosting four workshops with intensive coaching of the HUITs and DHIT by the Ugandan Coach in between each workshop (five coaching sessions were held) was adhered to. Although the ARISE-SI team had initially planned to conduct some site visits during the implementation period, the team learned early on how valuable these visits were to the teaching faculty and to the improvement teams. Thus, in addition to the workshops and coaching sessions the ARISE-SI team also participated in coaching/teaching sessions at each HU during the timeframe of each workshop (four coaching/teaching site visits). By the end of the implementation period the team felt less of a need for the on-site visits and recognized that as the improvement teams progressed in their understanding and application of improvement principles, their work together was more efficient, and the on-site visits were or would soon become a burden on their time rather than a benefit to them.

The Ugandan Coach

A Ugandan professional was identified and hired as the National ARISE-SI Manager and Coach. The Coach had extensive experience in the field of RI, having worked for UNEPI during the years when UNEPI was being developed. The Coach also had experience as a trainer and had held a previous leadership role in the *Community Problem Solving and Strategic Development Approach*, Basics II, (73) a program which aimed to link health workers with VHTs as a vehicle for improving RI. These previous work experiences, as well as a large network of colleagues at the MoH, UNEPI and at the District levels, placed the Coach in a unique position and created a natural opportunity for him to serve as the "link" or translator across the "systems" of RI.

Community Input on Routine Immunization System

In June 2011, the ARISE-SI evaluation team members interviewed 103 community member caregivers in five caregiver focus groups – one in each of the five high performing health service areas in Masaka District. Focus groups were held at sites separate from the HUs, ranged in size from 15 to 36 participants that included mostly women, and followed a guided interview schedule. No Health Unit staff members were present, however community health workers participated in each focus group. Focus group questions were translated orally from English to Luganda throughout the focus group session. (The *ARISE-SI Focus Group Interview Guide* is available upon request.) The aggregate results of the community focus groups were reported to the five HUITs and the DHIT. All teams reported this information to be helpful. Many teams noted that this information was either new to them, or helped to reinforce ideas they had about the perspective of the community. Below a summary of the findings are provided:

Caregiver focus groups - high level findings

Most people in each of the five health service areas get their children immunized. Although some participants offered that there were people in their communities who did not immunize their children, they did not provide specifics, so it was unclear whether their perception was based in rumor or experience. Most participants had children who were immunized- although in at least one focus group not everyone present answered the question, and in another, participants differed in their opinions about this issue. Some participants reported that "some people complained that immunization was bad for kids" but that they themselves did not see any problems. In another focus group, a community health worker related that 15% of children in their area are not immunized, and that he goes into the villages and records immunization statistics, so he has a sense of their level of success regarding the immunization rate in his service area.

Focus group participants knew which health service area they lived in and where to go for immunization. Participants reported going to both static and outreach sites. VHTs and community mobilizers are involved and participants know who they are. VHTs or community mobilizers were present at each focus group. In one service area, the community mobilizer had worked the night before to ensure that participants would attend the focus group. Participants reported varying travel distances to either static or outreach sites. Participants identified both positive and negative incentives for vaccinating children.

Caregiver input on why families get their children immunized

Participants in each group identified a host of expected reasons in favor of immunization. All mentioned that "children don't die when they get immunized and that immunization "helps to get some diseases away and puts some out of existence." As a result of immunization, children get strong, become healthy and are protected by stronger immune systems. "Even If they get sick, they don't get as sick". Caregivers also stated that "even when children get measles they can still play." Several men in one focus group agreed that they "... now go to the hospital

with our women for prenatal visits, and are beginning to also do the same for immunization." Financial reasons were also raised within three of the focus groups. One person stated that immunizing their children "...helps a family save money for the future and if the child is not immunized he will get sick."

Caregiver input on why families do not get their children immunized

Caregivers identified a "fear for lameness" as one reason caregivers do not immunize children. They cited personal experience with their unimmunized children getting sick that caused them to change their minds and get their children vaccinated. In one focus group, participants talked about recent education efforts to dispel rumors, which resulted in the community leader realizing that the costs to community and families of caring for unimmunized sick children was great, and that community members were "...being misled by people we did not know" who were spreading rumors about the bad effects of vaccines. Some caregivers noted that the hospital refused to provide treatment to children who were not fully immunized, and that this could be a reason a caregiver would decide to vaccinate an unimmunized child. Men used to stop women from getting child immunized, but now when his child not immunized it presents a difficulty for the man, himself." A woman in another focus group explained, "... in this area having a child with no immunizations is a problem for the man. The HU won't see a sick child without an immunization card and the schools won't let a child in school without an immunization card. So, men have to take the child to a hospital for treatment or to a different school."

Caregiver input on how to improve the routine immunization system

Further information about barriers and enablers was gleaned from asking caregivers what they would do to improve the system. Participants in one focus group stated that they would "have HU staff change their attitude and not be rude." They also suggested linking a requirement for immunization documentation to school enrollment: "...whoever comes for admission to school has to have an immunization card". One participant who was a teacher was very interested in learning about immunization – how to know if children had been fully immunized- so that he could encourage parents of students. One parent also suggested "...information should be revised for primary school children and taught in the schools as they will become future mothers and fathers." Participants also suggested linking a requirement for immunization to receiving medical treatment at a HU or hospital. One stated, "I would put in a system of NOT treating a child until he is immunized. Whoever comes would carry a health card." Another said that "every child who comes to HU would be immunized before he left".

Across all the groups participants recognized the important role of community leaders in improving immunization rates. Participants stated that leaders should make sure all people are immunized, stating, "The community leaders go to the villages – they go to the HU, they talk to the parents/they check on drugs and know if they are delivered." During campaigns they go round to advertise for immunization. Health workers should go with the local village chairperson (LC) and do mobilization with the community..." One father recognized the role of community members in helping the leaders mobilize. In addition to helping the leaders mobilize, participants identified steps that could be taken on a more personal level. For example, if a person knows that a child is not immunized, he or the chairperson can ..." can go and tell them the dangers... if one child is not vaccinated against measles he can affect all children."

Forming the Improvement Teams: Five Health Unit Improvement Teams (HUIT) & One District Health Improvement Team (DHIT)

Each core HUIT was composed of members based on key role functions as established at the onset of ARISE-SI: (1) the In Charge of the HU, (2) the Health Management Information Systems (HMIS) staff member, (3) the RI focal person, and (4) one community leader. Because the workshops were to be conducted in English, the community leader was excluded from the workshops unless he/she had good English language capacity. However, the ARISE-SI team allowed Health Units to choose up to six staff persons to attend each workshop. While none of the teams elected to bring a community member to the workshop, every team brought staff members in addition to the core HUIT (Table 13).

Staff Role	Bukeeri	ММС	Butende	ККК	Kiyumba
In Charge	Х	х	х	х	x
RI Focal person	х	х	х	х	x
HMIS Focal person	х	х	х	х	x
Other Staff Invited to Team:					
Mid Wife	х		x		
Senior Health Inspector		х		х	
Senior Health Assistant		х			
Health Assistant				х	
Nursing Officer					х
Nursing Assistant		2	х	х	x
TOTAL	n=4	n=7	n=5	n=6	n=5

Table 13: Summary of Roles Represented on Each HUIT

Core members of the five HUITs agreed to meet over the life of ARISE-SI during the "activity periods". One community leader was a member of each core team and attended these meetings on a regular basis. During the nine months of implementation, it was observed that the number of community members as well as the number of staff members included in these HUIT meetings increased as the improvement work progressed (Figure 10).





The DHIT consisted of five members including the District Cold Chain Officer, District Nursing Officer (responsible for support supervision for the routine immunization District level system), HMIS (responsible for coalition of Health Unit immunization data to aggregated District level statistics), District Health Educator (responsible for all VHT training) and the District Health Inspector (leads when the District Health Officer is not available). In addition, the District Assistant Drug Inspector joined this team toward the end of the research.

Participation was high at each workshop for all team members. The DHIT had perfect 100% attendance of all members at the four workshops. Participation in the workshops of the three English speaking members of the Core HUIT was almost 100%. In two separate cases, the In-Charge did not attend a workshop but in both cases this was due to scheduling conflicts and the ARISE-SI team was made aware of these in advance. Participation was high at every HUIT meeting and workshop, even though all team members were faced with other competing priorities for their time. Teams completed all homework assignments and came to the workshops ready to present their work. Every team completed at least two cycles of change (Table 14).

Role	Bukeeri	ММС	Butende	ККК	Kiyumba	Mean			
IC	93	71	86	79	79	81.6			
RI focal	100	79	100	71	79	85.8			
HMIS focal	100	86	100	100	100	97.2			
Community (VHT)	78	78	100	89	100	89			
Mean	92.75	78.5	96.5	84.75	89.5	88.4			
Community member attending HUIT meetings (n=9)									

Table 14: Overall Attendance Rates for Core Members of Improvement Teams

Other Core attending all HUIT meetings plus workshops (n=14)

11.3 Section Two: Barriers and Enablers

<u>Overview</u>

ARISE-SI participants moved beyond merely identifying longstanding barriers and enablers to RI to recognizing that they could, in their own spheres, address some of the barriers. This was evidenced by the changes they chose to implement as well as by a shift in perspective that reflected systems thinking. (74, 75)

Identifying Enablers and Barriers of Systems Performance

Using the Microsystems Approach the ARISE-SI team was able to identify key enablers and barriers to routine immunization (RI) system performance and put in place a process to start addressing some of these entrenched issues. Perceptions about barriers and enablers to RI were elicited from HU staff and caregivers at the beginning of ARISE-SI: (a) key leader interviews (KLI n=21) administered during feasibility assessment, (b) Village Health Team member focus groups (FG n=3) administered during feasibility assessment, (c) baseline assessment of caregiver focus groups (n=5), and (d) Health Unit staff and community member descriptions of "what works and what doesn't work" during the baseline assessment of Microsystem patterns (n=5). As shown in Tables 15 and 16, most of the barriers and enablers noted were identified by both caregivers and HU staff District Health Team members (staff), indicating agreement between these two groups. Staff identified additional barriers and enablers to those identified by caregivers. As part of a larger group reflection during the December workshop, participants pointed out that they have moved beyond merely being able to "realize and list problems" to being able to "act on the problem identified".

Table 15: Enablers to RI Identified through Feasibility & Baseline Assessments (Jan-June 2011)

	Enablers Id	entified b	by:	
Enablers	Caregivers	Health Unit Staff	Caregivers & Health Unit Staff	Changes Implemented through Improvement Project
Immunizations provided at no cost	х	х	x	Opened outreach sites; Adjusted clinic schedules for caregiver convenience
Accessible services				
Approachable, competent staff	X	х	x	Brought to attention of staff at HUIT meeting
Supplies in stock (vaccines, CHCs)	X	x	x	
Reliable schedules	х	Х	x	Adjusted clinic schedules for caregiver convenience; Staff arrived to clinic on time
Schools require immunization for enrollment	х	х	х	
Community Involvement	х	x	х	Engaged VHT in outreach processes and HUIT activities; Collaborated with civic and religious leaders to improve immunization rates
Leadership	х	Х	Х	Developing through team meetings
Monthly meetings to discuss unreached	х			Met with civic and religious leaders; Specifically addressed at improvement team meetings
Integrated outreach		Х		
Active staff (RI focal person)		x		Cross-trained to expand available pool of RI staff; Increased staffing on immunization clinic days
Effective and timely reporting		х		Addressed through data collection and use of data through improvement work
Mothers of child- bearing age are immunized		x		
Public messaging, mobilizing campaigns		x		Planning to use radio as medium for increasing awareness of routine immunization

Table 16: Barriers to RI Identified through Feasibility & Baseline Assessments (Jan-June 2011)

	Barriers Ide	ntified by:		
Barriers	Caregivers	Health Unit Staff	Caregivers & Health Unit Staff	Changes Implemented through Improvement Work
Inconsistent follow up	х	x	x	Developed systems for tracking (VHT registers and including phone numbers as available in the clinic registry, education of VHT on immunization schedules, use of CHCs, and tracking of CHCs) to improve consistency of follow up.
Outreach unavailable	X	x	X	Opened outreach sites
Family issues	Х	X	X	
Transportation	x	x	x	Redistributed discretionary funds to pay boda boda driver to deliver staff and supplies to outreach; maximized use of transportation resources
Lack of Resources (stockouts)	х	x	x	Issued 2 gas cylinders to each Health Unit.
Long lines	Х	х	х	Redesigned flow of caregivers and
Insensitive staff attitudes	x	x	x	In Charge brought to the attention of staff at HUIT meeting
Cultural beliefs	х	x	x	Enlisting religious/ civic leaders to encourage caregivers to have children immunized.
Need more sensitization about RI	х	x	x	Enlisting religious /civic leaders to encourage caregivers to have children immunized.
Unaware of schedules	х	x	x	Posted immunization clinic schedules; VHT informed community members and caregivers of clinic schedules
Mothers miss clinic		x		
Transient population		x		
Staff absent		X		
VHT too busy		Х		
No allowance for VHT		X		
Hx of sickness or death from Immunization	x			

<u>Reflection on Enablers and Barriers: A Shift in Perspective Over Time</u> ARISE-SI participants shifted their thinking about how they identified issues as either enablers or barriers to improvement work over the nine months of implementation. While more barriers than enablers were identified at the beginning, the teams (in aggregate) identified more enablers (n=28) than barriers (n=13) associated with their specific improvement work by the end of the intervention (Table 17).

ENABLERS AND BARRIERS TO IMPROVEMENT WORK IDENTIFIED BY HUITS IN DECEMBER 2011														
	Buk	eeri	ММС		Bute	Butende		ККК		mba	D	HT	TOTALS	
	Enabler	Barrier	Enabler	Barrier	Enabler	Barrier	Enabler	Barrier	Enabler	Barrier	Enabler	Barrier	Enabler	Barrier
Leadership	1					1	1		1	1	1		4	2
Community Engagement			1		1	1	1						3	1
Communication					1	1	1			1	1		3	2
Use of QI tools			1				1		1				3	0
Use of Data			1		1		1				1		4	0
Knowledge of RI								1	1				1	1
ниіт	1		1		1		1		1				5	0
Records Management	1									1			1	1
Funding											1		1	0
Harsh Weather		1											0	1
District Health Improvement Team							1						1	0
Transport		1						1					0	2
Supplies		1		1								1	0	3
VHT	1												1	0
Time management	1												1	0
													28	13
									Total En	abler &	Barrier =	41	68%	32%

Table 17: Summary of Enablers and Barriers Identified by HUITs (at the End of ARISE-SI, December 2011)

Furthermore, some HUITs were able to recognize some of the same factors as both enablers and barriers. For example, participants in one HUIT identified leadership as an enabler when they cited the importance of "good interpersonal relations" recognizing that the In Charge was "co-operative, and provided logistics, and verbal motivation", and as a barrier when they noted that some leaders demonstrate "low and irregular turn up for meetings". Another HUIT recognized mobilizers, VHTs, Local Council Members and religious leaders as enablers through sensitizing caregivers to bring children for immunizations, but that lack of community engagement is a barrier when leaders fail to turn up for community meetings about RI. It is important to also note that factors themselves listed as enablers and barriers by the end of ARISE-SI suggested that the teams were functioning at a higher level of systems thinking (74-77) compared to the beginning of the initiative. These identified factors represented a shift from the narrow view reflected in the barriers and enabling factors identified at the beginning of the initiative to include factors that represented systems characteristics (6, 75, 78) (e.g., leadership, communication, and interrelationships between systems components).

Enablers identified at both the beginning and the end of the initiative included having supplies in stock, community involvement/engagement, leadership, and effective and timely reporting/records management. Of the barriers identified at the beginning of the initiative by both caregivers and providers, only transportation and lack of resources were identified at the end.

11.4 Section Three: HUIT and DHIT Improvement Projects

The ARISE-SI intervention encouraged each team to develop a deep understanding of the possible reasons for stagnation of immunization coverage at the HU (or in the District for the DHIT). Based on this knowledge, each improvement team chose a focus for an improvement project that resonated with the team. For example, three HUs chose to focus on reducing dropout rates (Bukeeri, MMC, and Kyannamukaka), one chose to increase the number of children immunized (Butende), one chose to reduce wait times for mothers (Kiyumba), and the DHT chose to focus on the cold chain supply of gas cylinders. All of these changes have a basis in what is already known to produce a strong RI system. Yet, a single focus was not adopted across teams.

Similarly, the changes selected by teams were decided on by the team itself to best address the selected goal. Thus, there were a broad set of changes implemented across the teams. Three teams made changes to ensure adequate RI staffing (MMC, Butende and Kyannamukaka). One team (Bukeeri) made changes to open outreaches. Two teams worked to engage VHTs to enhance mobilization of mothers (Bukeeri and MMC). Two teams worked on RI processes at the HU (Kiyumba focused on training, documentation and scheduling; and Kyannamukaka focused on triage by Child Health Cards). The DHIT focused on changing tracking and increasing accountability for gas cylinders. Table 18 summarizes the aim, measures, and changes for the first PDSA cycles undertaken by each of the HUITs. All teams were successful in implementing their changes and completing their improvement cycles

Table 18: Aims,	Measures and	Changes for	Each Impro	ovement Team	in PDSA 1

PDSA 1	Bukeeri	ММС	Butende	Kyannamukaaka	Kiyumba	DHT
AIM 1	↓ DPT1–DPT3 dropout rate from 7% to 0% by Jul 2012	↓ DPT1–DPT3 dropout rate from 20% to 10% by Jul 2013	\uparrow % children immunized (DPT1–DPT3) from 60% to 75% by Oct 2012	↓ DPT1–DPT3 dropout rate from 12% to 6% by Jan 2013	↓ % mothers and caretakers who wait > 1 h from 80% to 20% by Oct 2011	个 # static HUs w/ 2 gas cylinders from 0 to 25 by Jun 2012
Changes 1	HC to call its 22 VHTs to call mothers to discuss next RI return date Restart 4 outreaches per month	 ↑ # RI staff to 3 on most days; 2 on outreach days. All 72 VHTs visit 25 homes w/in 2 months with RI message 	↑ static RI staffing to 2 on RI day Arrival by 10 am at outreaches	Triage to ask all mothers if babies have had RI; if "YES", does she have child's Health Card	Train 15 staff on RI admin technique, schedule, and documentation 2 vaccinators on duty on RI static day For RI room: Purchase RI Client Arrival Book and clock	Create cylinder tracking form. All staff to contribute if a cylinder lost
Measures 1	 # VHTs contacted during Jul-Aug # mothers contacted by VHTs # outreaches per month in July-August 	# days/wk RI staffing goal is met # VHTs reaching 25 homestead visits over 2 months	# staff on duty for RI on static RI days # times/month staff is on time to outreaches	% mothers whose children have had RI % mothers whose children had RI who have CHC)	# staffs trained/session in July # staffs on duty/ RI static day Waiting time in RI room	% 个 in HUs w/ 2 gas cylinders over two years. Total # gas cylinders in New Masaka

Table 19 below provides a summary of the AIM, changes, and measures for the second PDSA cycle for each improvement team. For all teams, the second round of improvement work built on what they had accomplished in the first PDSA. Some teams (MMC, Butende, Kyannamukaka, DHIT) maintained their original aim. The other teams (Bukeeri, Kiyumba) shifted their focus to address additional related goals. Over the course of ARISE-SI, the improvement efforts at the different HUs became more synergistic and achievable as the teams acquired more skills and ability to implement improvement tools.

PDSA 2	Bukeeri	ММС	Butende	Kyannamukaaka	Kiyumba	DHT
AIM 2	↓ DPT1–DPT3 dropout rate from 7% to 0% by Jul 2012	AIM Maintained: ↓% drop outs of DPT1 – DPT3 by 10% (from 20%) by July 2013	AIM maintained: 个% children immunized (DPT1-DPT3) from 60% to 75% by October 2012	AIM maintained: ↓ DPT1–DPT3 dropout rate from 12% to 6% by Jan 2013	↑% children < 5 years attending OPD with Child Health Cards from 10% to 80% by March 2012	 ↑# static HUs w/ 2 gas cylinders from 0 to 23 by June 2012* (*Decreased from 25 HUs for PDSA1 because 3 HUs have electric power and do not use gas for fuel)
Changes 2	Involve VHTs around outreach sites in mobilization and health education	In Charge to meet all 29 VHTs & encourage them to get data about immunization from the villages they serve VHTs report/share data on RI with the HU staff	Ensure that 100% of the children who come for clinical treatment have CHC and that they are fully immunized Use the VHTs to move house to house mobilizing children for immunization	Update Immunization Registers at both static and OR services. Include Telephone contacts of parents / caretakers of children for easy follow up Each VHT to visit at least 25 homesteads checking the Iz status of children VHTs to visit at least 25 homesteads Child register utilized & updated at static and OR Data collected monthly	Display posters to create awareness and reminder; one poster in each consultation room, and in waiting rooms Conduct at least one CPD session for all Medical staff Inform all VHTs about new HU policy regarding CHCs	Static units to record and follow up flow of gas cylinders. Each unit to have 2 gas cylinders

Table 19: Aims, Measures and Changes for Each Improvement Team in PDSA 2

PDSA 2	Bukeeri	ММС	Butende	Kyannamukaaka	Kiyumba	DHT
Measures 2	 # of VHTs coming to outreach with list of homes visited and children needing Immunization # of children turning up for immunization at outreaches 	% VHTs met and discussed about routine immunization per week % VHTs that share data about immunization in their villages	 # VHTs having a meeting with I/C on the importance of coming with CHC to the clinic Develop tool for monitoring # children coming with CHCs 	 # VHTs reporting about immunization status # children telephone contacts reported # VHTs w/ lists of home visited in last month # Children recorded with telephone contacts w/ mother or caregiver # children dropped out (a monthly follow up) # VHTs given children suspected to be dropped out for follow up # VHT with list of homesteads visited/month 	 #or % posters displayed in strategic places # staff attending CPD sessions # VHTs informed % mothers coming with child health cards % children < 5 years coming to HU that are fully immunized (by CHC or history) 	% HUs using tracking system properly % HUs having 2 gas cylinders

Table 19 (Cont.): Aims, Measures and Changes for Each Improvement Team in PDSA 2

11.5 Section Four: Routine Immunization Quantitative Measures

The measures of improved team engagement and illustrative examples presented above were the primary results of ARISE-SI. In addition, some quantitative information about the number of specific antigens provided to children and dropout rates prior to and during the implementation of the ARISE-SI intervention were gathered. Tables 20 and 21 below summarize these results for each HU stratified by static and outreach. (See **Appendix E** for a detailed summary of the data narrative and **Appendix F** for additional quantitative data on RI measures including ANOVA and control chart analyses for each HU).

Table 20A-E: Summary of control chart analysis of significant changes in number of children immunized during the period of ARISE-SI intervention.

A. Bukeeri HU

<u>Antigen</u>	<u>HU Type</u>	Baseline	New	<u>Change</u>	Significance
		<u>Average</u>	<u>Average</u>	<u>(Date)</u>	
DPT3	Static	23.4	36.0	Nov, 2011	p<0.01
DPT3	Outreach	2.8	37.8	Jun, 2011	p<0.01
DPT1	Static	25.3	36.3	Nov, 2011	p<0.01
DPT1	Outreach	6.3	29.8	Jun, 2011	p<0.01

B. Butende HU

<u>Antigen</u>	<u>HU Type</u>	Baseline	New	<u>Change</u>	Significance
		<u>Average</u>	<u>Average</u>	<u>(Date)</u>	
DPT3	Static	4.4	12.3	Oct, 2011	p<0.01
DPT3	Outreach	26.4			NS
DPT1	Static	4.9	10.4	Jun, 2011	p<0.01
DPT1	Outreach	32.2			NS

NS = no significant change

C. Kiyumba HU

Antigen	<u>HU Type</u>	Baseline	New	<u>Change</u>	Significance
		<u>Average</u>	<u>Average</u>	<u>(Date)</u>	
DPT3	Static	24.2	26.1	Sep, 2010*	p<0.01
DPT3	Outreach	21.3			NS
DPT1	Static	26.0			NS
DPT1	Outreach	23.3	21.4	Dec, 2010*	p<0.01

NS = no significant change

* = change occurred before intervention period

D. Kyannamukaka HU

Antigen	<u>HU Type</u>	Baseline	New	<u>Change</u>	Significance
		<u>Average</u>	<u>Average</u>	<u>(Date)</u>	
DPT3	Static	18.6			NS
DPT3	Outreach	30.3			NS
DPT1	Static	20.1			NS
DPT1	Outreach	28.6	36.4	Apr, 2011*	P<0.01

NS = no significant change

* = change occurred before intervention period

<u>Antigen</u>	<u>HU Type</u>	<u>Baseline</u>	New	<u>Change</u>	<u>Significance</u>
		<u>Average</u>	<u>Average</u>	<u>(Date)</u>	
DPT3	Static	47.3	72.0	Jul, 2011	p<0.01
DPT3	Outreach	2.6	12.9	Apr, 2010*	p<0.01
DPT1	Static	41.2	71.1	Mar, 2011*	p<0.01
DPT1	Outreach	4.5	12.8	Sep, 2010*	p<0.01

E. Masaka Municipal Council HU

NS = no significant change

* = change occurred before intervention period

Table 20 shows that there were seven significant increases in the number of children immunized during the ARISE-SI intervention period. Four of the increases occurred in Bukeeri (both DPT3 and DPT1 for static and outreach), two in Butende (DPT3 and DPT1 for static) and one in MMC (DPT3 for static). Although there were additional significant changes noted at some HUs, none of these occurred during the ARISE-SI intervention period. Table 21A-E shows results for a similar analysis using ANOVA to compare the eight months of the ARISE-SI intervention (June 2011-January 2012) with similar periods in the four years prior to ARISE-SI by each HU. The results here are the same as in Table 18, and provide more information about changes that occurred prior to ARISE-SI in number of children immunized.

Table 21A-E: Summary of ANOVA analysis for each HU comparing the same monthly period for four years prior to and during the ARISE-SI intervention.

	DPT3	DPT3	DPT1	DPT1
	(STATIC)	(OUTREACH)	(STATIC)	(OUTREACH)
Jun 07-Jan 08	22.00	24.29	22.29	27.88
Jun 08-Jan 09	18.38	12.63	19.00	13.38
Jun 09-Jan 10	22.75	10.75	26.63	10.25
Jun 10-Jan 11	21.00	3.88	24.50	5.25
Jun 11-Jan 12	27.63	37.50	28.50	29.75
ANOVA				
F	3.620	22.97	3.545	4.895
Prob	0.015	< 0.0001	0.016	0.0076

A. Bukeeri HU

B. Butende HU

	DPT3	DPT3	DPT1	DPT1
	(STATIC)	(OUTREACH)	(STATIC)	(OUTREACH)
Jun 07-Jan 08	4.00	20.71	5.43	24.43
Jun 08-Jan 09	5.88	24.25	6.50	25.75
Jun 09-Jan 10	3.63	23.00	5.00	28.50
Jun 10-Jan 11	4.75	29.88	5.00	29.25
Jun 11-Jan 12	8.38	28.25	10.38	34.13
ANOVA				
F	3.253	1.469	5.873	1.759
Prob	0.023	0.23	0.0011	0.16

C. Kiyumba HU

	DPT3	DPT3	DPT1	DPT1
	(STATIC)	(OUTREACH)	(STATIC)	(OUTREACH)
Jun 07-Jan 08	14.43	14.29	14.43	16.00
Jun 08-Jan 09	17.13	17.00	24.13	26.75
Jun 09-Jan 10	27.86	23.86	32.71	28.29
Jun 10-Jan 11	31.13	19.13	23.13	18.50
Jun 11-Jan 12	23.00	22.13	25.25	23.13
ANOVA				
F	5.628	2.295	5.707	3.029
Prob	0.0014	0.080	0.0013	0.031

D. Kyannamukaka HU

	DPT3	DPT3	DPT1	DPT1
	(STATIC)	(OUTREACH)	(STATIC)	(OUTREACH)
Jun 07-Jan 08	15.71	45.86	22.29	52.71
Jun 08-Jan 09	22.25	34.00	27.88	47.75
Jun 09-Jan 10	14.25	26.50	18.13	30.38
Jun 10-Jan 11	21.25	32.00	23.13	30.50
Jun 11-Jan 12	19.13	31.50	20.00	34.38
ANOVA				
F	1.070	1.030	1.134	2.060
Prob	0.39	0.41	0.36	0.11

E. Masaka Municipal Council HU

	DPT3	DPT3	DPT1	DPT1
	(STATIC)	(OUTREACH)	(STATIC)	(OUTREACH)
Jun 07-Jan 08	52.14	2.14	56.57	2.29
Jun 08-Jan 09	61.63	2.38	78.13	4.00
Jun 09-Jan 10	56.38	3.00	73.63	4.00
Jun 10-Jan 11	40.63	13.38	40.25	13.25
Jun 11-Jan 12	68.63	15.13	73.25	9.63
ANOVA				
F	2.688	5.983	6.722	3.076
Prob	0.048	0.0009	0.0004	0.029

11.6 Section Five: Patterns from the Data

ARISE-SI began with an initial set of assumptions about the functioning of the RI system given that this initiative was being conducted in a known high performing District, Masaka. The assumptions were as follows:

- the RI cold chain was intact and functioning well,
- the elements of RED that promote becoming a high performer in RI were in place,
- the leadership at the HU level was interested in engaging in work to strengthen RI performance,
- data were available for use by the HUs,
- the communication patterns were top-down from the MoH to the District to HUs,

- the VHT "system" was up and operational and there were good linkages and communication between VHTs and the HUs,
- RI staff at the HU were well versed/trained in policy and procedures of RI and were technically proficient in delivery of vaccines, and
- there were differences across the HUs (e.g., size, setting, type).

The intervention in ARISE-SI was a complex series of educational and coaching activities that sought to build local knowledge of the actual functioning of the RI system, provide knowledge about selecting and making change, include community members as partners in the planning and implementation of local change, and enhance understanding of how other levels of the system could enhance efforts to make successful change.

The qualitative and quantitative data collected during ARISE-SI have been summarized above (see **Findings Sections 1-3**). In this Section, several patterns noted in the data are described. Ideas about the ways in which the ARISE-SI intervention manifest in the different contexts of the five HUs are explored.

Patterns from the Data

The first pattern noted in the data is related to the functioning of the RI cold chain. The cold chain was not functioning at a high level in each of the HUs. This was recognized by <u>all</u> the HUITs and action was taken by HUs to improve the cold chain function. Progress was made in all HUs. In fact, two HUs (Bukeeri and Kyannamukaka) made this a significant focus of their improvement efforts and achieved great success in improving the cold chain challenges. Specifically, the involvement of the UNEPI National Trainer in workshops and visits to HUs provided an explicit mechanism for HUs leaders and staff to ask questions and receive information about enhancing the function of their cold chain.

A second pattern that emerged was that all HUITs found the focus on and development of effective meeting skills very helpful. HUIT meetings occurred throughout the initiative at all HUs. The use of meeting skills and roles provided a mechanism for all members of the team to have a voice in the meeting and contribute ideas. Interestingly, in all HUs the meetings included others besides the core HUIT. Thus, meetings were a mechanism for including others in the planning and implementation of change. Many HUs used this as a way to involve VHTs. These efforts were observed to be most successful in Bukeeri and Butende. However, all HUs made progress on this during ARISE-SI.

All HUs showed evidence of making use of resources from both within and across levels of systems that promote RI during ARISE-SI. For example, the workshops provided a forum in which HUIT members could pose questions of the DHT as well as the UNEPI National Trainer. This was done in an environment in which questions were encouraged, answers were developed quickly, and responses were shared in a timely manner (usually within 24 hours). In addition, as the initiative progressed the ARISE-SI team saw more evidence of the HU staff reaching out to community and religious leaders, not only to promote awareness of the importance of RI, but also to strategize and assist in breaking down barriers to get the unreached children to these essential services.

In addition, attendance of the District Health Inspector (DHI) at many HUIT coaching sessions enabled some strategic problem solving that may have prevented problems for the HU. For example, at MMC the DHI engaged with the HUIT, including VHT, to develop a plan for following up with families resistant to RI in a manner that may prevent or delay activating more punitive processes. This intervention may actually support the possibility of developing and/or sustaining trusting relationships between community and VHTs by placing a buffer between their interaction with the families and the punitive processes. At another HU (Kyannamukaka), the DHI recognized that one of the distant outreach sites they were operating was actually the responsibility of another HU. This responsibility was changed thereby conserving staffing and transportation resources for Kyannamukaka.

Each of the HUs actively discussed the population of children who are not currently being reached for RI. It is not clear that emphasis on such explicit conversations about the unreached population occurred before ARISE-SI. ARISE-SI prompted the HUITs to consider how they would approach reaching the unreached. All HUs developed a plan to address this and each HU was free to choose the approach that made the most sense to the HUIT. Some HUs chose to focus directly on outreach and engagement with VHTs (Bukeeri, Butende). Others chose to focus more on improving the routine immunization process and experience in the HU by working on wait-times and courtesy/knowledge of HU staff.

All HUITs were able to demonstrate success in learning how to apply the tools of QI to make local change. Evidence that supports this statement is found in the accomplishments of the PDSA 1 and PDSA 2 cycles of each HUIT (more details of these changes can be found in **Findings Section 3**). Thus, although there is variation in the degree to which all elements and tools of QI and systems thinking were applied across the HUs, there is evidence that all of the primary measures of ARISE-SI were successfully advanced.

There was much more heterogeneity in the secondary measures of success related to quantitative improvement in the number of children being immunized and associated dropout rates. Bukeeri, Butende and MMC all made important gains in the number of children immunized during the implementation period (mostly in the static HU). Only Bukeeri made significant improvement in the number of children immunized in the outreach units during the implementation period. Dropout rates decreased in all HUs except in Kiyumba. Interpretation of these findings needs to be put in the context of the specific changes chosen and implemented by each HU as they do not suggest that some HUs were successful, while others were not. For example, Bukeeri chose to focus on opening its outreach units at specific start-times negotiated with the community (note: these outreach units had been closed for the

several months prior to ARISE-SI). This HU was successful in implementing and sustaining this change. Thus, it is not surprising that Bukeeri showed significant improvement in children immunized in outreach units. The HUIT in Kiyumba, on the other hand, chose to focus on reducing waiting time for mothers at the HU. This team reduced wait times by 80% during the implementation period. However, it is clear that reducing wait times does not immediately lead to immunizing more children, especially in the short eight month period of ARISE-SI implementation.

11.7 Section Six: Hypotheses about the Meaning of the Patterns for Future Work (Middle Range Theories)

- The DHT and all HUs regardless of size, location or experience with prior improvement work benefited from education that activated, empowered, and promoted the self-efficacy of the staff both as individuals and as a team.
- Small HUs have a closer link to their community and can more easily work directly with the community to effect change. Both Bukeeri and Butende were able to work with VHTs quickly and easily. The training of VHTs and their incorporation into the HUIT provided ongoing input of the community in the development of the improvement strategy. The functional focus of smaller HUs on health promotion and prevention of disease within the communities to which they provide services, and the specified role of VHTs enabled the inclusion of community members and VHTs to engage and become integrated part of the HUIT, the improvement work and the solutions. The engagement allowed for the influx of new information that could be transformed into actionable knowledge (e.g., who are the unreached? how can they be accessed?). For example, identifying with and linking to families of particular religious affiliation, and in fact, recruiting a Muslim VHT to foster linkages between the HU and Muslim families who were identified as an unreached population.
- The two larger HUs had more staff with the skills to devote to improvement work which need to be balanced against the many competing demands for services. For example, in both Kiyumba and Kyannamukaka (Level IV HUs) the Focal RI person is a nurse who possesses a broad set of skills and is able to work more independently than a nurse assistant. For example, an approach to creating a successful plan for improvement that addresses the richness of the health professional and the challenge of many competing commitments involves educating and cross-training staff not focused on RI to understand and pay attention to RI issues in their daily work. At the same time, larger HUs are challenged by the broad set of competing commitments to provide the diverse array of services expected by their community.
- All HUs, regardless of size or location, benefit from seeing their data in a manner that can be used for improvement work and empowerment of staff and community members. For example, ARISE-SI team members suggested the data on numbers of antigens given and dropout rates be stratified by static

vs. outreach units. In addition, once the HUITs developed a deeper understanding of what the specific issues were regarding RI, they were then able to develop and use specific measures (e.g., wait times, number of VHT home visits, etc.) to monitor and evaluate the changes they were implementing. Such types of data allowed for more action than data presented to HUs only on aggregated coverage and dropout rates.

- Facilitating conversation among HUs and DHT members about data, barriers and enablers in an environment supportive of change was helpful. The ARISE-SI workshops gave HUs a forum in which to share their observations and learn from each other. These conversations, especially when issues arose that were common across HUs (barriers related to gas cylinders and transportation), allowed the HUs to share these issues directly with the DHT using "one voice." Such an approach of a single voice representing multiple HUs may be more effective for leveraging change than individual HUs sharing their concerns at different times with different members of the DHT. Also, the discussion of issues such as barriers and enablers by the HUIT (both at workshops and at their local meetings) allowed for the team to develop a shared understanding of the key issues. This focus provided a path for all staff agreeing to work on a small set of key issues.
- The DHT and all HUs found it beneficial to confer with other levels of the system that promoted learning about RI. For example, HUs (Microsystems) used the forum of the workshops to pose questions about RI to the DHT (Mesosystem). The DHT members worked in real-time to find the answers and address the HUs' questions. Also, the UNEPI National Trainer (Macrosystem) was able to provide information about RI to all HUs (Microsystems) during workshops related to specific questions from the HUs. The National Trainer was provided additional specific information at each of the HUs during meetings on-site.
- Measurement of the effectiveness of a change needs to be linked to the expected outcome of the change itself. The fact that Kiyumba and Kyannamukaka had the least effect on increasing the number of children immunized or reduction in dropout rates does not mean that their efforts to improve were unsuccessful. Both HUs chose to focus their efforts on improving internal processes within their HUs. The issues of reducing waiting times, enhancing staff knowledge and awareness, reliably assessing for use of child health cards are all critical issues to strengthening the RI system. However, these changes are not likely to have an immediate effect on rates of coverage or dropout (in contrast to opening an outreach unit). Improvement in those outcomes would take more time to develop than the eight months of the ARISE-SI intervention. Moreover, these changes may have benefit in Kiyumba and Kyannamukaka beyond RI making the selected changes very important for each unit.

- Reaching the "unreached" is very difficult. In all four HUs that focused on incorporating the VHTs into their improvement process, the unreached were identified by the HUIT members as children from families whose values or beliefs were adverse to immunization. In some cases, these beliefs were linked to a negative personal experience associated with immunization, or to a general understanding or beliefs about negative effects of RI. The development of communication networks that connect with caregivers at the personal level (for example, through the religious community, and through VHT home visits) may make a difference in the strength of the strategy and ultimate outcome of improved coverage and reduced dropout for families such as these.
- Although the structure of the VHT program was in place at the time of the intervention, inclusion of VHTs in the problem-solving process generated a new appreciation by HU staff for the critical role that the VHTs could play in improving the local RI system and in enhancing the overall quality of the services provided by the HU. For example, since they live closest to the community members, they are more likely to be able to identify local barriers and enablers; as well as local strategies for reaching their own neighbors and their children, than is a Health Unit staff that might live in another town. In addition, working as members of the HUITs created among the VHTs a shared purpose and sense of team that they might not have had previous to ARISE-SI. HUIT reports indicated successful outcomes resulting from the implemented changes specific to families targeted by VHTs and how VHTs are accessing these families. This success was evident for the four HUITs that demonstrated improvement in quantitative RI outcomes.
- When focusing on improvement of RI at the HU and community level, there is value in engaging those at the District level to consider how they might use the same tools and approaches to enhance the efforts for which they are responsible. The DHIT was created at the request of the District staff (not part of the original design of ARISE-SI intervention). This team worked tirelessly to address the problem of the supply of gas cylinders that has existed in the District for years. The DHIT worked on the same timeframe and under the same expectations as each of the HUs. The DHIT presented their progress at every meeting, similar to each HU. As a result of this effort by the DHIT, not only was there success at creating a new system for gas cylinders for all HUs in the District , there was also a spirit of shared responsibility for improvement at both the HU (Microsystem) and District (Mesosystem) levels. This sense of shared responsibility can enhance the likelihood of improvement.

12.0 PUTTING IT ALL TOGETHER: ILLUSTRATIVE STORIES OF TEAM IMPROVEMENT WORK

In the following section a process map of how the DHIT accomplished their improvement project is illustrated to tell the story of how this leadership team was changing the way they did business. Following this are illustrative examples summarizing the work accomplished by each of the improvement teams. These examples are provided in story form to make the point that the focus of this improvement work is, at the end of the day, to improve the health and well-being of Uganda's children.

District Leaders Change Their Way of Doing Business

Before ARISE-SI

Figure 11 illustrates the process used by the District Health Team (DHT) in managing issues related to RI prior to ARISE-SI. Pre-ARISE-SI, the DHT members worked individually representing their own specific line of work. For example, the DHT member in charge of the RI program (RI technical expert) spearheaded all operational and budgetary requests to the District Health Management Committee (DH Comm) through the District Health Officer. Interactions between the RI technical expert, DHO and DH Comm were formal, being expedited through committee work or memos. In most cases, the DHT RI technical expert advocated for his/her program alone with the DHO and the DH Comm.

Figure 11: Process the DHIT Used to Resolve Issues Prior to ARISE-SI



* While all DHT members MIGHT attend DHComm meetings they usually attend to support requests from their own line of work – they do not typically all come in support of the same request.

After ARISE-SI

The process developed during ARISE-SI and used by the DHT members to advocate for the funds needed to purchase the 22 gas cylinders is depicted in Figure 12.



Figure 12: Working of the DHIT During and Subsequent to ARISE-SI

First five of the DHT members are now functioning as a team; the District Health Improvement Team (DHIT). The DHIT members meet regularly to explore issues relevant to the routine immunization system. This new team works in a coordinated manner to address the specific AIMs that they self-identified during ARISE-SI. They accomplish their planning through in-person meetings that are structured with a clear purpose, goals and objectives. The RI technical expert is no longer left alone to resolve systemic issues related to RI. The DHIT together advocated with the DHO for the funds for the gas cylinders. In addition, all DHIT members attended the DHComm meeting to support the RI technical expert as she made the formal request for funds to the DHComm. These process differences represent a change in how usual business is conducted from a formal authoritative, traditional model to a more participatory, team-based interactive and problem-solving focus.

The District Health Team

THE STORY OF THE GAS CYLINDER:

Applying an Improvement Process to a Difficult Long-Term Problem of Gas Cylinder Supply Yields Positive Results for the Masaka District, Uganda



Setting: The Masaka District Health Office is the government administrative office which oversees health service delivery in the Masaka District. In addition to management of other health programs, this District Office is responsible for routine immunization service delivery and management of the cold chain. For at least the past ten years, there has been only one gas cylinder in each of its 33 Health Units instead of two. This shortage affects the cold chain. For example, during the time it takes to refill the one existing cylinder (up to one month), vaccines may be improperly stored with potency compromised, may be wasted and routine services may be interrupted, resulting in lower immunization coverage.

Approach Taken by Team: The District Health Improvement Team participated in ARISE-SI working in collaboration with UNEPI and five Masaka Hus. During ARISE-SI, the team actively participated in four workshops and on-going coaching focused on a quality improvement project chosen by the team. At the first workshop the District Health Improvement Team (DHIT) was formed. The team acknowledged that the lack of a second gas cylinder was affecting the District's ability to provide quality services. Thus, the DHIT chose to focus on obtaining a second gas cylinder for <u>every HU in the District</u> (not just for the five who were participated in ARISE-SI). Using the knowledge gained through the workshops, and from the ARISE-SI Coach, the team developed an improvement plan to address the entrenched problem of the gas cylinders. They used QI tools to identify leverage points of action and barriers and enablers to this work. The DHIT initiated a process whereby they negotiated this improvement plan among themselves and then with the DHO. Subsequently, the DHIT and DHO, together as a team, proposed and negotiated with the District Health Committee reallocation of existing health services resources from the Primary Health Care budget to this problem. The DHIT had a clear vision of the impact that this reallocation would have on other services. The DHIT also proposed, and then instituted, a tracking system to monitor the flow of the gas and gas cylinders.

Results: The team procured a total of 22 gas cylinders, the total needed to supply each unit using gas (11 use electricity or solar) with 2 gas cylinders. These cylinders have been delivered to each HU and the monitoring of cylinders has been integrated into the quarterly support supervision process. The team also developed a rigorous inventory control process in which physically count cylinders daily and weekly and tally this against the stock cards.

Lessons: A recalcitrant cold-chain problem was quickly solved without any external funding by using two million Ugandan shillings from existing funds. For over ten years, getting a second gas cylinder for every Health Unit seemed like an insurmountable problem. However, when we took a team approach and used the structured process and QI tools of the Dartmouth Microsystem Quality Improvement Approach we were able to implement small, and then bigger steps of change and solve this problem. We now know that it is essential for us to take ownership for finding solutions to problems such as these and that with the right tools and approach it is possible for us to lead these changes.

The Bukeeri Health Unit

THE STORY OF THE MOTORCYCLE

With No Outside Resources a Health Center III Opens Four Outreaches that Had Been Closed for the Past Eight Months.



Setting: Bukeeri is a small rural HUIII located in Buwunga Sub County which is about five square miles in size. Many roads in and around Bukeeri are hard gravel and some are dirt. The clinic is one of five in the Sub County responsible to provide primary health care to the sub county population (47,882 people). Bukeeri is responsible to provide routine immunizations at the clinic and at four outreach sites located in the surrounding villages to the 10,000 people in their service area. The MoH, through the UNEPI program, provides each HU III a motorcycle and staff use this as their primary mode of transportation to outreach sites. However, during the several months before ARISE-SI the HU motorcycle had broken down and there was no money to repair it. Smaller and smaller numbers of children were seen at outreaches with no children seen and the out reaches were closed completely four months before ARISE-SI (no children immunized at outreaches).

Approach Taken by Team: In June 2011 the Bukeeri Health Unit Improvement Team (HUIT) chose as its Specific AIM to open its four outreaches for all immunizations within (time frame). During the first ARISE-SI workshop in June of 2011 each of five Health Units provided a presentation to each other summarizing their routine immunization systems. At this workshop, the Bukeeri team learned that of the five Health Units, three (including Bukeeri) had motorcycles that were not working, but only Bukeeri had made the decision to close its workshop, while the other two Health Units had found the means to keep their open. At this workshop the Bukeeri team learned that there were monies in the primary health care funds allocated to "fuel" for the motorcycle and that one other Health Unit was using these funds to pay a boda boda driver to transport his staff to outreaches. The District leadership at the workshop blessed this reallocation of funds. Thus, Bukeeri chose to embark upon a similar process for funding transportation of their staff to the outreaches and reopening these sites.

Results: A boda boda driver was hired to transport staff and vaccines to the outreaches. Outreach dates and opening times were agreed to by the HUIT and this was communicated to the VHTs who then notified the mothers. The four outreaches were opened in July 2011. During the first open outreaches so many children arrived that the staff ran out of vaccines.

Lessons: The Bukeeri team learned a great deal about their own budget and how to use it to get important needs met. They also learned that other Health Unit teams as well as the District Team are important resources of information for them as they embark on their next journey of improvement.

"You get to know that if others are working in hard conditions and are able to get results, why not us?"

The Butende Health Unit

BUILDING COMMUNITY RELATIONS

Butende HU III Reaches Out to Community to Improve Routine Immunization Coverage for Children



Setting: Butende is a level III NGO run Health Unit in Bukoto East Sub-District of Masaka. It is periurban with close accessibility to Masaka by car. Butende parish has a long history of community service. In 1964 thirteen nuns began the foundation of the Butende Parish. Since Butende means "praise" the monastery took the name "Our Lady of Praise". The parish has provided health care services to its community since its inception when it had a small dispensary for emergency care. Today Butende is a thriving Health Unit that provides primary care services, including routine immunization, to about 7,000 people. In addition to the static Health Unit, it operates 5 outreaches for immunization.

Approach Taken by Team: The Butende Health Unit Improvement Team (HUIT) expanded its membership to include VHTs who were then explicitly supported by senior staff to mobilize caregivers of children for RI. The HUIT hoped to increase the number of children immunized from 60-75%. Building on their long history of established community relations, they engaged Health Unit staff and the VHTs to work together in the local communities directly with families and community and religious leaders to mobilize all children to immunization services. A plan was developed to work toward the HUIT goal. Between Sept 2011 and Jan 2012, VHTs each visited 30 households/month teaching families about the importance of RI, checking child health cards, and reminding caregivers to bring their children to be immunized. The VHTs were provided exercise books to track their work and findings. The In Charge met with the local Imam requesting that he remind families about the importance of RI. Likewise, the In Charge wrote to the LCI chairpersons and community leaders asking them to mobilize their constituencies for immunization.

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Results: Nine homes in which caregivers refused to immunize their children were identified. The In Charge personally visited 3 of these homes to address caregiver concerns. The In Charge is now working closely with religious leaders of other sects and community leaders requesting that they counsel reticent caregivers. Turn out for immunization services in some areas with hard to reach populations is reported to be improving.

Lessons: Setting an AIM, planning a change, doing a change, and tracking results were an effective approach for activating communities around routine immunization.

"You have given us a key and now we can go through." (Butende staff member talking about the ARISE-SI approach)

The Kiyumba Health Unit

A CLIENT WHO WAITS TOO LONG IS A CLIENT WHO MAY NOT COME BACK

A High Performing Health Unit Focuses Their Improvement Work on Caregiver Wait Time



Setting: Kiyumba is a Health Unit IV in a rural area in the county of Bukoto which serves a population of about 10,000 people. Health unit staff have some background with quality improvement. The unit has a strong core team and has a good track record for providing high numbers of immunizations and low drop-out rates.

Approach Taken by Team: The Kiyumba team set as their improvement Specific AIM to decrease client wait time for routine immunization. They set a target of "80% of caregivers waiting less than one hour for these services". The Health Unit staff did an assessment and determined that mothers were currently waiting for up to three hours for services. The Health Unit Improvement Team did a process map, purchased a clock and a tally book, increased the staff on clinic days from one to two, cross trained 17 staff on routine immunization, and then in a methodical and intentional way kept track of the time it took mothers to move through the system. They realized that for some time they had been seeing mothers in batches, that is, they had been waiting for a larger number of mothers to show up at the unit before they would start the education classes that are the first step in the routine immunization process. In an effort to improve their client satisfaction, and to honor client time, the staff set a start time (9am) for opening the static unit for immunization. At the set opening time, they let mothers in to the clinic and started the education sessions. Then they proceeded to move caregivers in an efficient one on one manner through each process step of the system.

Results: During the project period of eight months, Kiyumba realized a substantial drop in wait time for caregivers and reached their goal as defined by the Specific AIM. Eighty percent of mothers now wait less than one hour for routine immunization services.

Lessons: Kiyumba used quality improvement tools and an understanding of root causes to change the process of their work. They are hoping that shorter wait times will be an incentive to bring caregivers back to the clinic for next immunization.

"...to solve a problem you have to analyze and look into the root causes of the problem." (Outside evaluator focus group).

The Kyannamukaka Health Unit

VISITING HEALTH TEAM MEMBERS ARE THE LINK TO OUR CHILDREN

Health Unit Improvement Efforts Focused on VHTs Show Promise for Reaching the Hard to Reach



Setting: Kyannamukaka Health Unit is a HU IV and is built on a large piece of land with multiple buildings, including staff housing. The In Charge and staff have many duties including providing primary care, maternal child health services, deliveries, and inpatient care to the area population. The routine immunization program is only one of many programs and has recently been the focus of improvement efforts through ARISE-SI.

Approach Taken by Team: The Kyannamukaka Health Unit Improvement Team (HUIT) focused their improvement work for routine immunization on capacity building within their VHT constituents. Activities they accomplished regarding the VHTs, and in an effort to improve their RI system were to: a) train VHTs in how to read Child Health Cards, b) support each VHT in visiting 25 homesteads and checking each child's immunization record and status, c) have the VHTs include phone contacts of caregivers into the HU registry for easy follow up of children for routine immunization, d) develop a duplicate registry for the HU so that the HU registry could be taken to the field.

Results: Sixty VHTs were trained on how to read the Child Health Cards. VHTs held meetings and developed plans for their home visits. The VHTs provided the HU lists of the names of the homesteads visited during September – January with children under one year of age. VHTs identified three children who had not had their measles vaccination and they were referred to the HU for immunization. Families who were "stubborn" were scheduled to attend the Village Council meeting. Resistant families in two villages are now bringing their children for immunization.

Lessons: The VHTs are an untapped resource for improving the routine immunization system.

"Teamwork – and finding people who can help – is very important. A problem shared is a problem solved."

The Masaka Municipal Council Health Unit

INNER CITY HEALTH CENTER II RE-ENERGIZES VHT PROGRAM

Setting: Masaka Municipal Council (MMC) is a Health Unit II located in Masaka city which has several trained VHTs that have not been active since the clinic ran out of medications that they normally distribute during outreach visits (and which are an incentive for the population to attend outreaches).

Approach Taken by Team: The HUIT selected a global aim of reducing the DPT1-DPT3 dropout rate from 20% to 10% by July 2013. They adopted a multipronged approach to this issue including reenergizing the VHT program for outreach. They set a specific aim that each of the 29 VHTs would visit 25 homes.

Results: MMC enlisted VHTs from villages where they knew the unreached are located, as well as from a Muslim community. Eighteen of the twenty-nine VHTs (62%) completed at least 25 home visits. Through their visits, they identified several cases of resistant families, and the HUIT is developing targeted strategies to follow-up with these individual cases. Defaulters have been identified, and motivated to immunize and complete the schedule. MMC has begun to put systems into place that will support the VHTs in their outreach efforts and improve immunization rates. For example, the HUIT has established a team of HU staff to visit homes of resistant families identified through VHT home visits. After working with the family, if this team is unsuccessful in persuading the family to immunize their children, the DHT will work with the family to try to avoid involving the local authorities, if possible. The team now carries vaccines with them as they make home visits so that they are prepared to vaccinate as soon as parents agree. There has been an increase in identification of defaulters, outreach attendances, and DPT3 immunizations for static as well as outreach sites noted.



Lessons: Through the results of these enhanced outreach efforts in which unimmunized children were identified, the HU staff gained a greater appreciation for the important role that the VHTs play in the routine immunization system. We have learned that finding local solutions, such as engaging influential people in problem-solving can be used "with or without ARISE".

"We engage in participatory planning...where we sit with VHTs...this did not happen before...we used to plan without involving VHTs".

13.0 STRENGTHS AND LIMITATIONS

ARISE-SI was designed with an implementation period of eighteen months. However, due to late start up and pressures to meet funding deadlines; the intervention was implemented in half of the time proposed in the original design, a period of only eight months (June 2011 – February 2012). Although the ARISE-SI team sees promising results for participant uptake of systems thinking, the improvement process, and data use, the team was unable to partner with the participants in their work on thinking through the work of sustaining their momentum after the conclusion of ARISE-SI. In addition, participant experience with applying improvement tools was limited. Participants completed two to three rounds of application. Because of this compressed timeframe, the balance between practicing the tools and preparing for and attending workshops was skewed in that the times between workshops was very short and too compressed for optimal time for experiential learning of this type. Likewise, the compressed timeframe required intensive activity with the improvement teams over a very short timeframe which put extra pressure on their work lives which, for the In Charges at least, are already driven by multiple expectations and competing interests.

Mixed methods were used to evaluate the impact of the ARISE-SI intervention. Where results from these methods converged the team was able to make stronger inferences about the intervention, (for example triangulation of the survey data on what participants thought they learned during the workshops with results from an analysis of participant improvement work gives greater confidence in the ARISE-SI impact statement). (79) Most importantly, however, using a mix of methods provided the ability to study this complex intervention from many angles and draw richer conclusions about this type of initiative than would have been possible if ARISE-SI had used only one method of evaluation. For example, if only quantitative methods were used to report on changes in RI data overtime, it would not then have been possible to report on the richer impacts of this initiative, and the team would have had a narrower and weaker discussion about whether the results from the study were promising.

The ARISE-SI team was composed of members with diverse backgrounds which optimized the ability to adapt the intervention as it was being developed to accommodate the cultural and contextual nuances of the participants and their work environment. If this work were replicated or scaled up, it is recommended that a team be developed with more balance between senior and mid-level faculty as a strategy to make such work more cost effective.

Analysis of RI data was accomplished to provide a benchmark of success based on usual benchmarks and outcomes. Because this initiative's implementation period was short and because the population denominators at the HU service areas are unreliable, it was not expected to achieve changes in RI rates at these small areas of analyses. Rather, and in keeping with the Feasibility Assessment criteria, the team monitored and evaluated changes in RI volume for key antigens over the life of the initiative and realized improvements that can be associated with ARISE-SI implementation. Due to the short time period of this initiative and limited data availability, the team could not rigorously assess outcome measures such as dropout rates and immunization coverage.

It is important to note in this section that ARISE-SI brought no additional funds for improvement work to the Health Units or to the District. While the intervention was funded through grant funding for faculty time, travel, per diem and workshop expenses, there was no grant funding earmarked for the Health Units or District level improvement work.

Finally, ARISE-SI was implemented first and foremost as research under IRB scrutiny and this added great value to the work, as well as to the promotion of the science of improvement in general. Because of its research focus, ARISE-SI attracted skilled and senior level faculty from both Dartmouth College and Makerere University. Under the IRB, all participants gave their consent to the researchers for ARISE-SI to use their stories and data to gain knowledge about and improve the routine immunization system. Data were collected carefully and summarized in a manner to protect individual level confidences. These parameters encouraged participants to feel free to provide input on the educational sessions as well as their self-report of knowledge, skills and attitudes about this initiative. Also, implementing ARISE-SI and evaluating over the course of the educational sessions using both quantitative and qualitative methods and realist evaluation design allowed the team to summarize with confidence what worked and did not work in the initiative and that this approach to systems improvement has merit.
14.0 CONCLUSIONS

The Microsystems approach (including coaching) can be successfully applied in a public health setting in a relatively high-performing District in Uganda. ARISE-SI successfully implemented the proposed intervention as designed. Within the context of the one District of Masaka, ARISE-SI achieved its goals of delivering an educational program that resulted in increased knowledge and skills of participants in improvement science and its application, and produced changes in care delivery and data collection to track process and outcomes related to routine immunization (RI). Outside reviewers from the Center for Program Design and Evaluation at Dartmouth College (CPDE) completed a separate evaluation of the process and learning outcomes of the initiative. ARISE-SI team members including Dartmouth faculty did not participate in this evaluation. Thus, CPDE researchers separately concluded that the initiative achieved its goals of delivering an educational program that was well received by the participants, resulted in increased knowledge and skills of participants in improvement science and its application, and produced changes in care delivery services and data collection to track process and outcomes related to RI. This outside evaluation validated the findings and conclusions reached by the ARISE-SI researchers and team.

The Coaching component of ARISE-SI provided support and consistency to the participants on a regular basis. The consistent and regular meetings with the incountry Coach provided a way for the Health Unit teams as well as the District team to be engaged in the work of ARISE-SI even when the faculty was not in the country or readily available. Previous work experience in the area of RI, and an established network of colleagues in this field proved useful for the Coach's ability to provide technical support and assistance about RI policy and procedures. Thus, while it is important for a Coach to have had training and expertise in the science of improvement, it was also beneficial for the Coach to additionally be familiar with the subject matter for improvement.

ARISE-SI was implemented in a District and Health Units with leaders who had been identified as being skilled as well as interested in research. ARISE-SI was implemented in Masaka District which, at the time of implementation, reported average performance on typical RI rates. Masaka was identified by UNEPI as having a strong District -level leadership team that would be interested in such research. Likewise, although each Health Unit met the criteria of the feasibility analysis, strong Health Unit leadership and interest in this type of improvement work were also determining factors for site selection. Thus, since support of leadership is an established factor in high-performing health care organizations, (12) it is acknowledged that ARISE-SI was implemented within a system positioned for success due to this factor. In Health Units or District s where the leadership is weak or where improvement efforts are mandated rather than sought, initiative results might not be as positive.

The ARISE-SI intervention led to enthusiastic team participation, satisfaction with teaching, and positive process and structural changes.

The five Health Unit and the District Improvement teams completed at least two PDSA cycles of change within the ARISE-SI timeframe. Changes focused on issues important to each team, e.g., ensuring adequate RI staffing, opening outreaches, engaging VHTs to enhance mobilization of caregivers, improving documentation and scheduling for RI, and purchasing and tracking gas cylinders. The successful outcomes of these locally designed projects suggest that effective strategies and approaches for reaching the unreached may need to be designed locally.

The outside reviewers found that the participants appeared to be committed to continual improvement of RI and sustaining the improvement work they had started through ARISE-SI.

Engaging community members and Health Unit staff in the baseline assessment of their local routine immunization system as well as in the problem identification component of ARISE-SI resulted in the development of solutions that took local context into account.

All HUs, regardless of size or location, benefited from seeing their data in a manner that could be used for improvement work. Local level data created a sense of ownership of the problem as well as solutions and helped to energize and empower the staff and community members in the work of improvement. Examples of the value of local level data are provided below.

- ARISE-SI team members suggested the data on numbers of antigens given at each Health Unit and dropout rates be stratified by static vs. outreach units. Once this was accomplished, the Health Unit staff and the VHTs gained a clearer picture of how resources could be used more effectively to reach the unreached.
- In one Health Unit area, after reviewing the data on static vs. outreach sites, the In Charge realized that she was paying for transportation and staff time to go to outreaches where the local residents were not coming for services. As a result of these insights, the In Charge and staff have negotiated regular days and start times for routine immunization outreaches with the communities, have retrained local VHTs to read child health cards, and have provided support to the VHTs to negotiate with difficult families.
- When the HUITs developed a deeper understanding of the specific issues regarding RI, they were then able to develop and use specific measures (e.g., wait times, number of VHT home visits, etc.) to monitor and evaluate the changes they were implementing. Such types of data are more closely linked to potential and targeted actions, than are the aggregated coverage and dropout rates data typically presented to HUs.

Providing a space for shared learning across the systems responsible for RI services (UNEPI, the District, the Health Units, and the community) enhanced the development of innovative solutions that addressed entrenched barriers to system performance.

Implementing the ARISE-SI intervention with the DHT as a participating improvement team alongside the HUITs created an opportunity for cross system teaching, learning and problem solving that would not have happened had the DHT chosen only to "observe" the process. Having representatives from each "system level" learning the process of improvement together created a shared language and understanding of the methods and principles of this work and a deeper understanding of each system's roles and responsibilities for system strengthening. On their own the HUs could not have addressed the issue of the lack of gas cylinders in the District. And, on their own, the District had not been able to resolve this issue. However, by working together, the immediate problem was resolved (all Health Units now have two gas cylinders) and a strategy has been agreed on by the Health Units and District leadership to monitor and track the gas cylinders to assure that none of them are "lost" in the future thus assuring that this facet of the cold chain can be counted on by everyone.

The DHT and all HUs found it beneficial to confer with other levels of the system that promoted learning about RI. For example, HUs (Microsystems) used the forum of the workshops to pose questions about RI to the DHT (Mesosystem). The DHT members worked in real-time to find the answers and address the HUs' questions. Also, the UNEPI National Trainer (Macrosystem) was able to provide information about RI to all HUs (Microsystems) during workshops related to specific questions from the HUs. The National Trainer was provided additional specific information at each of the HUs during meetings on-site.

Facilitating conversation among HUs and DHT members about data, barriers and enablers in an environment supportive of change was helpful. The ARISE-SI workshops gave HUs a forum in which to share their observations and learn from each other. These conversations, especially when issues arose that were common to all HUs (barriers related to gas cylinders and transportation), allowed the HUs to share these issues directly with the DHT using "one voice." Such an approach of a single voice representing multiple HUs may be more effective for leveraging change than individual HUs sharing their concerns at different times with different members of the DHT. Also, the discussion of issues such as barriers and enablers by the HUIT (both at workshops and at their local meetings) allowed for the team to develop a shared understanding of what the key issues actually are. This focus provided a path for all staff agreeing to work on a small set of key issues.

The Microsystem Approach shows promise as a problem solving method that enables the application of innovative solutions to entrenched local barriers which are road blocks to improved RI system performance. The barriers and enablers identified during ARISE-SI were consistent with those identified in the literature over the past decade (34, 80-84) and are similar to those identified by Ministry of Health officials in their Review of Immunization 2010 (UNEPI Report). During ARISE-SI implementation, improvement teams moved beyond merely identifying long-standing enablers and barriers to RI system performance to recognizing that they could autonomously effect change by addressing system-level factors such as leadership, communication, and interrelationships between systems components.

15.0 RECOMMENDATIONS

The following recommendations were developed by the ARISE-SI team in partnership with the Ugandan participants of ARISE-SI, with input from the ARISE-SI Internal and External panel of experts, as well as from JSI leadership.

Recommendation #1: Promote a Systems Strengthening Approach that Considers the Capacity of the Microsystem for Generating and Sustaining Innovations for Improvement

The findings from the implementation of ARISE-SI resulted in a redesign of the ARISE-SI original systems strengthening framework. In this redesigned framework (Figure 13), the Microsystem is provided the most space in the model (at its center, or core) and is described as the "engine of change" in a systems strengthening approach.



Figure 13: The Revised ARISE-SI System Strengthening Framework

The Microsystem includes both the Health Unit and its staff, and also the community, community leaders, and the Village Health Team members who link the community to the health system for RI. The two red arrows embedded within the Microsystem borders suggest that the work of improvement is iterative and on-going; and in addition, is generated from the local level to meet the needs of the population it exists to serve.

By defining the Microsystem as including both the local Health Unit and the community it serves, this framework honors the fact that local leaders and community residents are able to identify system issues and innovative solutions that take local context into account directly for addressing these issues.

The Framework uses white spaces between system levels to depict the fact that the Microsystem, Mesosystem, and Macrosystem are separate from each other, i.e., they each have specific roles and responsibilities in regard to the operation and functioning of the RI system. Concurrently, the horizontal arrows that stretch across the systems in the framework denote the importance of cross system support, alignment, communication, and partnership around the theme of the work and suggest that political, educational and operational infrastructures of a system be conversant and synchronized across system levels for best outcomes. The key point here is that system levels cannot function well on their own but require the support of all other system levels. Thus, the Microsystem "engine of change" only functions well when it is supported by both the District (Mesosystem) and MoH (Macrosystem). Examples of specific supports needed by the Microsystem from the Meso and Macro systems include: (a) a sense of shared purpose or aim, (b) clear roles and functions, (c) joint design of improvement efforts based on transparent sharing of data and information, and (d) open communication across systems.

In summary, the key to this revised framework is in the work of creating a local "engine for change" which functions on behalf of the whole system and in return is sustained by the whole system (the Meso and Macro systems) (85). Further research to study this model as proposed is recommended.

Recommendation #2: Develop an Educational Initiative for Improvement Science, Systems Thinking, Leadership and Coaching

There is a need for all levels of the RI system to be educated in the areas of improvement science, systems thinking, leadership, and coaching, as well as a need for practical experience using quality improvement tools. Such an educational initiative should start at the highest levels of leadership. It is also important to note that Uganda has recently developed a country Framework for Quality Assurance. Thus, the educational initiative proposed in this recommendation might be developed more generally as a learning program that would serve any/all key leadership in the Ugandan Ministry of Health as the principles and practice and tools of improvement are universal and are able to be applied to any systems strengthening initiative.

Although ARISE-SI did not provide direct additional funds to the Health Units or District in support of their improvement efforts, ARISE-SI, as implemented, was resource intensive. Trained faculty with experience in improvement science and coaching were required to develop the educational sessions, teach them and train and coach the Ugandan Coach throughout the implementation of this initiative. Because the emphasis of the teaching was on being "adaptive" to the context of each Health Unit area, ARISE-SI required the expertise of senior level teachers experienced enough to be able to think on their feet and to draw on a breadth of knowledge and experience to address the challenging questions and issues that arose in the teaching sessions.

Should Uganda be interested in the ARISE-SI approach it is highly recommended that education about key concepts of ARISE-SI be brought first to MoH Uganda leadership and that though this educational experience MoH leaders gain experience in applying these concepts and principles in their own work. Thus, as Uganda moves forward in implementing other quality improvement and system strengthening interventions initiatives they themselves are well grounded in the application of these theories and methods of problem solving.

Recommendation #3: Conduct Additional Research in Several Areas

<u>Research to test the efficiency, affordability, efficacy and outcome of this</u> <u>intervention on a larger scale.</u> While there is strong evidence from ARISE-SI that this type of approach has promise for improving the process of care delivery and improving the numbers of children who are immunized, more research is needed using a larger sample of Health Units and a longer timeframe to adequately and confidently evaluate the long term effectiveness of such an approach particularly in low resourced settings.

ARISE-SI was a small pilot study of five Health Units in one health District. It would be prudent at this point to scale up this initiative to all Health Units in the Masaka District, building on the health system and leadership capacity of ARISE-SI and to study the outcomes of this initiative over a period of two to three years. During this time period, an in depth evaluation of cost-benefits and outcomes could be completed to guide Uganda as it seeks to improve its immunization rates and outcomes. Such a scaled up research study would also help answer the question about whether this approach is helpful for high as well as low performing RI systems.

<u>Research to test whether the components of ARISE-SI are more cost effective and</u> <u>sustainable when built into the existing operational infrastructure of the RI system</u> For example, one could think about replication of ARISE-SI across the entire Masaka District. However, we recommend that in designing this scale up approach, ARISE-SI components be designed into the operational infrastructure of the existing system whenever possible; and that this new more sustainable approach be evaluated. Thus, one could think about linking the coaching function of ARISE-SI to the support supervision function in some way, using the quarterly VHT meetings and HUMC meetings to serve in part as a forum for meetings of the local HUIT; and about using the DHMC meetings as a forum for cross Health Unit learning, planning, and working together on improvement strategies that strengthen the entire District. Finally, the DHO from Masaka could facilitate spread of knowledge about QI as it is being applied in Masaka to other DHOs at their quarterly meetings. By intentionally designing ARISE-SI components into the existing infrastructure, one assures the sustainability of these components. However, leadership will be needed to guide this process in an ongoing way (for example helping teams to set appropriate agendas, keep meeting minutes, and hold each other accountable for work assignments in between meetings). In addition, on-going education of all partners will be important as the work of improvement becomes more sophisticated.

It is important that future research include an assessment of costs associated with implementation, as well as account for the potential for spread and adaption of ARISE-SI tools and methods to other system level issues such as sanitation and maternal/child health. Such an analysis should take into account unintended consequences (positive and or negative) of the impact of this redesign and also identify key variables associated with significant improvement in outcomes.

Research to assess whether this problem-solving approach of using empowered teams from multiple systems levels can complement, or serve as a vehicle for operationalizing conventional and highly structured immunization programs The "Reaching Every District" (RED) strategy describes in detail the key components of a successful Routine Immunization system and in addition, describes how its components might be implemented. ARISE-SI could provide the framework to both operationalize the RED components, and in addition evaluate their effectiveness. Figure 14 provides a summary of RED components and maps them to ARISE-SI findings and activities.

Figure 14 RED Components	Description	Baseline Assessment Findings	ARISE Activities
1. PLANNING AND MANAGEMENT OF RESOURCES: better management of human and financial resources.	At the District and facility levels, planning should identify what resources are needed to reach all target populations in a way that can be managed well and thus maintained. Good planning involves: (a) understanding the District /health facility catchment area (situational analysis); (b) prioritizing problems and designing microplans that address key gaps; (c) as part of microplanning, developing a budget that realistically reflects the human, material and financial resources available; and (d) regularly revising, updating and costing microplans to address changing needs.	 Integrated Care/SVCs: drugs draw people, Lack of interest may prevent people from coming Record Keeping, management: use of registers for tracking waiting times, home visits, follow-up calls, CHCs Roles: VHT can go to homes to Iz, know roads, residents, who is IZ, provide health ed Scheduling – waiting time important issue to mothers, reliability of schedule is important. Staffing (5 Ps) Staffing of HUs does not align with MoH (?) standards-however, HUs agreed that they are often able to provide services with the staff that they have. Supplies- CHC, vaccine and gas stockouts common across HUs. Ed and Trg: VHT, eager to learn, Training needs: HMIS, RI-Tech and QI training provided 	 5 Ps assessment- Children with CHC Re-allocation of PHC funds Hire Boda Gas Cylinders (DHT) Change Schedules Increase staffing Incorporate VHT into HUIT CHC: use of as documentation, communication Training staff in RI (Kiyumba) Better understanding of VHT assignment and HU service area (Butende)

Figure 14 RED Components	Description	Baseline Assessment Findings	ARISE Activities
		 Cold Chain – Lack of affordable fuel for transport, motorcycles in disrepair – difficult passage on roads, lack of adequate gas cylinders. 	
REACHING TARGET POPULATIONS — improving access to immunisation services by all .	"Reaching the target populations" is a process to improve access and use of immunisation and other health services in a cost-effective manner through a mix of service delivery strategies that meet the needs of target populations.	 Use of maps to identify unreached areas- HU staff know their populations. Integrated Services popular- VHT can also do Reliability of scheduling very important. 	 Incorporate VHT into HUIT VHT home visits VHT education VHT read CHC Increase staffing on RI clinic days Open outreaches Adjust hours of clinic – to accommodate working in gardens. Timely arrival at OR by Staff
LINKING SERVICES WITH COMMUNITIES — partnering with communities to promote and deliver services.	This RED component encourages health staff to partner with communities in managing and implementing immunization and other health services. Through regular meetings, District health teams and health facility staff engage with communities to make sure that immunization and other health services are meeting their needs.	 HUMC and CL involved, Many HUs using mobilizers Beginning to train VHT 	 Caregiver focus groups identified specific needs of each HU service area. VHT included on HUIT (we have data) Meeting with Religious Leaders Enlisting VHT from communities with unreached, including Muslim Working with Schools?
SUPPORTIVE SUPERVISION — regular on-site teaching, feedback	Supportive supervision focuses on promoting quality services by periodically assessing and strengthening service providers' skills, attitudes and working conditions. It includes regular	 Teams were very thankful for TA provided by UNEPI and DHT during Workshops 	 Coaching included focus on QI, use of data, data display, technical education/instruction (Winnie) Workshops focused on addressing identified

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Figure 14 RED Components	Description	Baseline Assessment Findings	ARISE Activities
and follow-up with health staff.	on-site teaching, feedback and follow-up with health staff.		Uganda, VHT Program, understanding RI rates, RI administration policies – included interactive sessions wherein HUITs educated one another on specific topic areas.
5. MONITORING FOR ACTION — using tools and providing feedback for continuous self- assessment and improvement.	District health teams and health facility staff need a continuous flow of information that tells them whether health services are of high quality and accessible to the target population, who is and is not being reached, whether resources are being used efficiently and whether strategies are meeting objectives. Monitoring health information involves observing, collecting, and examining programme data. "Monitoring for Action" takes this one step further, by not only analyzing data but by using the data at all levels to direct the programme in measuring progress, identifying areas needing specific interventions and making practical revisions to plans.	 Each HU has an assigned HMIS person on staff. Use of data for reporting prescribed rates to DHO (Iz, drop out, etc.) HMIS understand how to collect, and display prescribed data 	 Use of QI tools: fishbone, PDSA, Model for Improvement, Ladder of Improvement, operational definitions, data collection, data display, meeting skills, HUIT provide structure/process for building this engine for change Data collected and used for improvement: caregiver waiting times, # children w/ CHCs, # home visited by VHT, # OR sites open, # VHT instructed on reading of CHC, etc VHT registries and patient registries as data sources Engaging VHTs in process of collecting data and understanding how it is used for improving RI services within their HU service areas. HMIS instructing staff on role of data for improving their processes. Regular meeting of HUIT, use of meeting skills to maximize productivity of staff and time.

16.0 WAY FORWARD

ARISE-SI was a pilot research project implemented at the request of the Bill and Melinda Gates Foundation to understand if a systems-oriented educational intervention, that included communities, could improve the processes and outcomes of local routine immunization systems, improving their ability to reach hard to reach children. There are several aspects of ARISE-SI that show promise, including its emphasis on local context, leadership development, participatory educational approach, action learning, and intensive coaching. On June 19, 2012 the ARISE-SI team presented its preliminary findings and recommendations to the ARISE-SI Internal Panel of Experts and to other key stakeholders including leadership from UNEPI, the Ministry of Health, the Masaka District, UNICEF, WHO, USAID and faculty from the Makerere University School of Public Health. Discussions at this meeting helped frame the final recommendations of this report. It is the hope of this research team that the lessons learned from this research initiative will be further tested and scaled up in Uganda in an effort to promote collaborative learning about the types of approaches that work best and have the strongest impact on system strengthening and health outcomes at local levels for local populations.

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18.0 APPENDICIES

Appendix A: Members of the ARISE-SI Team

ARISE-SI TEAM	ROLE	AFFILIATION
Mark Splaine, MD, MS	Co-Principle Investigator	Dartmouth College
Fred Nuwaha, MD, MPH	Co-Principle Investigator	Makerere University
Dorothy Bazos, RN, PhD	Team Leader,	Dartmouth College
	Investigator	
Gautham Suresh, MD, MS	Investigator	Dartmouth College
Kevin Shannon, MD, MPH	Investigator	Dartmouth College
Lea LaFave, RN, PhD	Investigator	John Snow Research
		and Training
		Institute, Inc.
Patrick Isingoma	National Program Manager,	John Snow Research
	Coach	and Training
		Institute, Inc.
Jabeen Ahmed, PhD, MS	Analyst	Dartmouth College
Winifred Tabaaro	Senior Nurse Officer,	MoH/UNEPI
	Training Officer	
Wendy Abramson,MPH	Director, Systems Innovation	John Snow Research
	Component, ARISE Project	and Training
		Institute, Inc.

Appendix B: ARISE-SI Internal Panel of Experts (IPE)

Name	Affiliation
Dr. Henry Mwebesa (invited)	MoH Commissioner
Dr. Rachel Seruyange	MoH EPI Manager
Mrs. Winifred Tabaaro	MoH EPI Training
Dr. John Barenzi	Retired (MoH UNEPI Manager)
Dr. Robert Basasa	MoH Planning
Dr. Stuart Musisi	DHO, Masaka
Mr. Muhamed Bukenya	District Health Inspector, Masaka
Dr. Sabrina Bakeera-Kitaka	President, Uganda Paediatric Association
Dr. Patrick Banura	WHO/EPI RI focal person
Dr. Annette Kisakye	WHO/EPI/IDSR
Dr. Janex Kabarangira	USAID/Health
Dr. Humphrey Mgere	USAID Health Care Improvement Project
Mrs. Eva Kabwongera	Immunization Advisor, UNICEF
Mrs. Robinah Kaitiritimba	President Uganda National Health Consumers' Org
Mr. Patrick Isingoma	ARISE National Project Manager
Dr. Fred Nuwaha (Chairperson)	MUSPH, ARISE-SI Co-PI

Appendix C: ARISE-SI External Panel of Experts (EPE)

Name	Affiliation
Dr. Marty Makinen	Program Director for The Results for Development Institute's Health Workforce and Ministerial Leadership Initiative.
Dr. Bjorn Melgaard	Consultant, former WHO Director including Chief of the Expanded Program on Immunization (EPI) and Director of the Department of Vaccines and Biologicals.
Dr. Nana Twum-Danso	Director of <i>Fives Alive!</i> a partnership between the Institute for Healthcare Improvement (IHI) and the National Catholic Health Service of Ghana (NCHS).
Dr. Rashad Massoud	Senior Vice President for the Quality and Performance Institute at University Research Co. LLC. (URC).
Ms. Rachel Feilden	Consultant, evaluation and routine immunization expert.
Prof. Dr. Mashako Leonard	Former Minister of Health in DRC, now Minister of High Education and University.
Dr. Nick Tilley	Visiting professor in the Department of Security and Crime Science, University College London. Former Professor Emeritus of sociology at Nottingham Trent University.

Appendix D: Baseline Assessment – The 5Ps

Each health BA Workshop had four goals: a) develop a Health Unit Improvement Team (HUIT) that includes community members; b) learn skills for team meetings and recognize the importance of a diverse team composition for improvement work; c) complete an assessment of the routine immunization system of the Health Unit based on the 5P framework (Purpose, Professionals, People, Process, Patterns); d) prepare the HUITs for the upcoming ARISE-SI Problem Identification Workshop during which the HUITs would be responsible to teach the ARISE-SI faculty and other HUITs about their RI systems. The 5P framework has been proposed by Nelson, Batalden and Godfrey¹ as an important and effective approach for understanding a system's core functions including enablers and barriers to accomplishing the mission/vision for which a system has been designed. It was our hope that by making the 5P elements visible and explicit to the HUITs we would be able together to start the process of inquiry that would facilitate the HUITs' ability to appropriately identify an improvement project that they could accomplish during ARISE-SI.

Each afternoon following the focus group that was held in each HU area, we met with HU staff and community members (n= 14-16) for the BA Workshop. Presentation and implementation of workshop materials took about 2 hours. (The original plan was that these participatory sessions would be implemented over four hours (see proposed Agenda Appendix A). However, the reality of staff time and unit workload left us with two hours for active learning-teaching and one hour for lunch.) Traditional Ugandan lunch was provided to all participants through project funding. All participants received a transportation allowance.

The Baseline Assessment Workshop was designed to build and transfer ownership of improvement work to the HUIT. This workshop was:

- Participatory
- Used principles of Action-Learning
- Facilitated readiness of the HUIT to present their 5P summary to their peer teams at the 3 day Problem Identification Workshop
- Based the workshop materials on concrete examples of each HUs own data (from their homework)
- Employed team meeting techniques and development of team meeting skills

Purpose: Why Do We Do What We Do?

During the Overall 5P Framework Session, we had the In-Charge read the MoH purpose of a RI HU. In the "Purpose" session, we had the participants give us their words or phrases that were important to them in defining their own purpose in regard to RI. We left the teams with the flip chart notes and a homework assignment to use the notes to develop a purpose statement to be presented to the four other HUS, MoH and DHT at the ARISE-SI June workshop. We chose to teach the Purpose

¹ Nelson EC, Batalden PB, Godfrey MM. Quality by Design: A clinical Microsystems approach. San Francisco: Jossey-Bass; 2007.

section first in the 5P series as it provided context and grounding for the following elements.

In Charge reading the UNEPI mission seemed to bring the purpose this down to ground level and made meaning of the purpose for the HU staff. While several HUs had an overall mission statement they did not have a specific purpose identified for their work regarding Routine Immunization.

People: Who Do We Serve?

We chose to teach second about "People" because the learning session had been designed to be very interactive and focused on the HU staff actually teaching us about the population that they served. In this session we showed the HUIT the mapping exercise that is proposed by the MoH. We then asked the HUIT to draw their own map of their service area, to locate their HU and outreaches, major roads, villages and other important features. We then asked them to discuss this map and then locate for themselves where they felt children who were NOT immunized lived. Counts of persons who resided in specific Parishes, Villages, and overall population counts were provided by the HMIS person, either before this workshop in their homework or after the workshop in preparation for upcoming Masaka June workshop.

There were good discussions about the people who are being reached in many cases the In-Charges relied on the VHTs to correctly identify all of the roads/outreaches etc. In one HU the participants developed two maps and then put them together in their discussion work and learned from each other. The mapping exercise revealed that there were not many known "pockets" of places that could be identified as being areas where the unimmunized lived. It seemed to be a struggle for the HU staff and VHTs to describe who/where the unreached might be. The mapping exercise provided insights among a few of the In-Charges about the populations that they are serving. It became clear that some clients may come to a HU from a different HU catchment area. The mapping exercise created a forum for this discussion and interest in pursuing this discussion with other In-Charges at the Implementation Workshop. Consistently across focus groups and HUITs, the consensus was that most of the persons in these service areas do get their children immunized.

Personnel: Who Are We?

Previous to this Baseline Assessment Workshop we had asked the HUs to list the personnel who are involved in the RI system. In the BA Workshop we created a table on a flip chart and listed the personnel benchmarks proposed by the MoH for HUs based on HU structure (II, III, and IV). As an activity in this workshop we worked with all participants together to publicly fill in the staffing of their own HU as it matched up to the MoH benchmarks. Providing Ministry of Health staffing standards specific to the Health Center Level on prepared flip charts and asking the HUIT to look at these staffing standards in contrast to their own staffing status anchored the discussion.

In none of the Health Units did the staffing reality align with the standard. Regardless, some HUITs recognized that their existing staffing was satisfactory, and that they were able to do their work at that staffing level. The personnel exercise raised awareness of staffing shortages and opportunities for discussion across other HUs to learn how they allocated staffing to get the job done. There was much discussion about where staff fit into the MoH benchmark categories and many unanswered questions. We agreed that the unanswered questions could be posed to the MoH and DHT at the upcoming Masaka workshop.

Patterns: What is not Working and What Works?

Due to time constraints we were able to focus on "Patterns" only minimally. We did not use the proposed exercises in our workbook but rather used a simple table on a flip chart and asked the participants to develop a list – first of what was working well at their HU (over and over again) and then in the second column, what was not working well (over and over again). Because of the dead silence when we presented this table we knew we were in trouble. After some discussion, we were taught that no one really understood the word "well" as used in this context. The table was then changed to what was working "Good" and what was not working "Good". This wording change helped tremendously.

These patterns of what worked and what did not work at within their individual routine immunization systems are included in Tables 13 and 14. The patterns identified through this exercise aligned well with the barriers and enablers identified with the HUs' respective communities during the caregiver focus groups in the morning, although the HU providers identified more barriers and enablers than caregivers.

Process: How Do We Do Our Work?

We first reviewed what we meant by process and reviewed together quickly the process map for Routine Immunization² that has been provided to the HUs. After we discussed what a process map is, how it is used and how it relates to improvement we then engaged the participants in drawing their own process maps together using the following examples:

- We started with a simple process and first mapped out together an example of "getting to the meeting today" and did this with one participant volunteer/recruit.
- We then moved to the RI system and mapped out the process for RI within the static and outreaches was well developed among participants and using the picture of this process from the Purple Book. (2)
- Finally, we asked participants to map out the process steps that they would need to take to get to the 3 day Implementation Workshop with their

² Uganda Ministry of Health. (2007). *Immunisation practice in Uganda: A manual for operational level health workers* (2nd ed.): National Expanded Programme on Immunisation (UNEPI),

presentations completed and their teams ready to present the 5Ps to their colleagues.

The last process activity helped us to wrap up our work and get concrete about next steps for the improvement work that the teams had agreed to engage on with us. Many of the participants reported that they had never seen the process map before our meeting.

Across Health Units, we found that leadership matters. When the In-Charge was present we observed a higher level of engagement, a faster start, and a stronger sense of team and team roles. When the In-Charge was not present at the Baseline Assessment meeting (3 out of 5 meetings) other leaders came to the fore. At three of the HUs the Health Inspector or Assessor was a very strong participant to the process with excellent English skills and familiarity with the HU staff and In-Charges. They filled a leadership role in the meetings, understood budgeting and strategic planning, and had quick uptake of the content of the learning sessions.

General Conclusions

Significant themes emerged over the course of the week and are highlighted in the following sections:

Participation

Workshops included as many as 16 staff and community members; this number was too large. We had wanted one person from each parish, which increased the numbers. It is unclear whether targeting parish representation is useful for these meetings. In addition, because a stipend was provided to participants, more people may have attended than might have otherwise. In addition to geographic representation, it was also challenging to determine who from the community should participate- community health workers, village health team members, community leaders? This issue was especially germane as the system is transitioning from using community mobilizers to village health team members. Community leaders were stronger and more involved in some HUs than others.

Communications across Health Unit Services Areas

Although quarterly meetings are scheduled for VHTs, we learned that attendance is inconsistent. The In-Charges meet quarterly but the purpose of these meetings is unclear. It is also unclear who attends these meetings. Our impression is that the meetings are a formality. No mechanism currently exists for HUs to share detailed data or information about how their RI system works with other HUs

The Notion of "Team"

Participants understood the notion of team. The ability of the participants to immediately think and function in teams was much more sophisticated than we had expected. They seemed to value each other's presence. A strong sense of commitment to the community was evident among all HUITs. In-Charges appreciated our efforts to learn about the preferences of their community members through our morning focus group activities (we were explicitly thanked by one In-Charge for holding the focus group, and told that no one had ever done anything like this in their area, i.e., listen to the clients and the HU staff and community and build a program that took all of this input into account).

Our design and approach successfully prepared the HUITs to be active participants in the Problem Identification Workshop and created a partnership based on the value of all teach, all learn between the ARISE-SI faculty and the HUITs.

Appendix E: Data Narratives of Health Units

The Bukeeri Health Unit

<u>Setting</u>: Bukeeri is a governmental HU level III facility located in Buwunga subcounty and Bukoto East sub-District. Bukeeri HU is rural, isolated and not easy to reach. It serves a population of approximately 7,800 people for RI many of whom must walk up to 6km to get to the HU. Bukeeri HU provides immunizations on Thursdays at the static HU and on Wednesdays at outreach. However, no outreach had been done in eight months due to the motorcycle being broken.

Community leaders' involvement in HUMC is valued as a conduit of communication between HU and community. One of the issues identified at the beginning was the lack of communication between HU and mobilizers regarding outreaches being open. A mobilizer pointed out that he mobilized people to the outreach but no one would come. Communication about whether staff would arrive as scheduled for outreach was identified as an important issue for focus.

<u>Approach Taken by Team</u>: This HUIT built upon strong existing community-HU relations, including establishing partnerships between health workers/mobilizers and VHTs to improve access to the population.

The HUIT chose to focus on reopening the outreach. The HUIT shifted funds within its budget to address the transportation issue and hired a motorcycle to transport immunizations. Outreach dates and opening times were agreed to by team and this was communicated to VHTs, who agreed to mobilize mothers in their villages.

Also, the HUIT mobilized internal resources to address identified cultural barriers to immunization by meeting with and engaging religious leaders.

<u>Results</u>: The HUIT met regularly and had strong leadership from the In-Charge. The HMIS and RI Focal Person were always present at team meetings. More than 50% of team meetings had greater than 10 other attendees. Meetings were rated highly by participants (average of 8.4 out of 10). The HUIT had 89% attendance at ARISE-SI workshops.

The plan to reopen outreach was accomplished in June 2011 and has remained open since. VHTs have mobilized mothers and initial attendance at outreach outmatched the amount of vaccines present. Planning was adapted and this has not happened again. The HUIT developed tally sheets and registration forms to better monitor the outreach process.

Communication is reported to have improved in several domains. The HUIT agree that in case there was failure to conduct an outreach, the VHTs would receive the communication in advance. VHTs were contacted and asked to visit all households to check on the status of immunization and CHCs. Mothers were taken through how to read and complete the CHC in several villages. In addition, some religious sects that seemed opposed to health services like immunization have become supportive of RI. Rumors that immunization is bad have been decreased tremendously.



Interestingly, the numbers of children immunized has improved in both the outreach and the static Health Units during the time of the ARISE-SI project.



Lessons: This HUIT and community recognized the importance of community involvement as enabling for RI, the accessibility of HU staff (they are nice), and the value of communication about the importance of RI. As the project progressed, the HUIT specifically identified increased VHT involvement as an enabler, and particularly took advantage of the status that accompanies the role of distributing medications. By the end of the project, the HUIT recognized more specific process issues as enablers: records management, time management and reliability of staffing/schedules, and the importance of the HUIT, leadership and the VHT. They recognized the value of VHTs as enablers for mobilization at both outreach and static units. Transportation remains a barrier to RI for this HUIT, even with their hiring of a motorcyclist. However, the outreaches remain open, the VHTs are engaged, and mothers when staff are present to provide immunizations. Cultural barriers are being addressed through the active and targeted engagement of a Muslim VHT, and targeted outreach by leadership to other religious groups who do not support immunization for their children. The HUIT has identified shortage of UNEPI supplies as a barrier, and harsh weather making the roads impassable – both of which are beyond their sphere of their influence.

The Butende Health Unit

<u>Setting</u>: Butende is a non-governmental HU level III facility located in Bakungwe subcounty and Bukoto East sub-District. Butende HU is peri-urban. It was founded by 13 nuns in 1964 and the current HU opened in 1985. The HU serves a population of approximately 7,000 people for RI. Butende HU provides immunizations on Tuesdays at the static unit and on Mondays and Tuesdays at six outreach sites per month.

Community engagement is the baseline for this HU. The Father has a long history of community engagement, and the purpose of this HU, as a Catholic NGO, explicitly aims to improve the community itself.

The extensive data displays on the walls and meticulous cold chain records of the HU demonstrate an existing appreciation for tracking.

<u>Actions Taken by Team</u>: This HU built upon existing recognition of the importance of data for tracking to use data for improvement. They incorporated the VHTs into the data collection and improvement process by encouraging their active engagement in the HUIT. In addition, the commitment of the HUIT to supporting and encouraging QI efforts is demonstrated in PDSA 3 (providing resources to VHT for their own record keeping).

Initially, the HUIT focused on improving access for mothers by increasing staffing, improving staff arrival time at outreaches, changing the static immunization day, and directly involving VHTs in mobilizing families for RI. Specifically, the In-Charge clarified which VHTs are associated with the HU; then met with these VHTs to train them in use of child health cards (CHC) so they could assess these during home visits. Also, the HUIT developed a tool for monitoring number of mothers who come to HU with CHC.

<u>Results</u>: Although the In-Charge was absent at the initial meetings, she was present for every other session and displayed strong leadership. The Father also demonstrated his role as a leader during the initial sessions, and during the four coaching sessions he attended, but he does not have a direct role with the HUIT. Core HUIT attendance was high for this team at 89%, and the RI focal person attended 100%. In addition, this HU had a very active and engaged HUIT that is comprised mostly of VHTs and Mobilizers; they have a high level of consistent attendance with nine attending more than 50% of meetings and one community leader was present 100% of the time. HUIT meetings are very respectful and inclusive of all participants. HU staff has incorporated feedback from VHTs to develop a strategy for assertively following up with non-immunized. Participants rated meetings highly (average of 9 out of 10).

The HUIT had a strong sense of efficacy, as evident by their high level of organization and team cohesion. They seemed comfortable within their roles and look to each other for appropriate support (e.g., VHTs to connect with community,

In-Charge to lead, RI focal person and Nursing Assistant to provide clinical services, etc.). VHTs provide input that is valued and expressing interest in taking on more responsibility.

The HUIT enlisted VHTs from "difficult areas", and succeeded in having them make home visits. The HUIT reports some success with improving staff arrival at outreaches, but still finds that some caregivers are coming late for RI, so this continues to be an issue in some areas.

This HU built upon its existing effective communication networks, expanding them to include more religious leaders and the VHT as valuable sources of information to the HUIT.

Interestingly, mobilization by VHTs has resulted in an increase in the number of children immunized in the static unit. Given the focus of the HUIT on mothers having CHC and arrival time of health workers at outreach, it is not surprising that there were no changes in the number of children immunized across the six outreach units.







Lessons: This HUIT identified active engagement of HU staff as well as mothers as enablers to their work. They recognized the importance of the VHTs; this initiative has provided a launching to integrate VHTs into the existing HU communication network and spread it. The HUIT identified regularity in their outreach schedule as important. A community member recognized the "new faces" of the newly engaged VHTs as enablers to mobilizing for RI. HUIT members identified the HUIT as a means of getting more staff involved in RI, collaborative efforts of all members including religious leaders to effectively sensitize caregivers, and the value of communication in allowing for feedback as enablers to RI. They also explicitly identified the use of data to help identify dropouts as enhancing their efforts.

Initially, barriers identified included misinformation, lack of resources (CHCs, gas cylinders, electricity, etc.), and late arrival of mothers for immunization. A community leader identified a barrier in the administrative details related to VHT deployment. At the end, the HUIT identified as a barrier to community engagement the failure of some leaders to attend meetings, and also recognized the failure to convince some families to immunize children as another.

Finally, monitoring data monthly over time may provide important early warning signs to further changes in the number of children being immunized. For example, the control chart for DPT3 in the static unit above shows a special cause signal (significant reduction) in the number of children immunized in March-May, 2012. This suggests that the initial changes made to improve immunization rates at the static unit may not be sustaining the gains. Feedback of this information to the HU could allow for additional changes that would prevent further decline from occurring and hopefully regain the previous levels of success.

The Kiyumba Health Unit

Setting: Kiyumba is a HU level IV in a rural area in the county of Bukoto which serves a population of approximately 11,800 people for RI, with an increasing infant population. It is located about 15-20 minutes from Masaka. The facility is clean and well-organized, includes a pharmacy store, an equipped surgery theatre, and housing on site for HU staff. The unit has a strong core team and has a good track record for providing high numbers of specific antigens for immunization and low drop-out rates. It provides RI services daily at the static unit, and one day a month at each of the four outreach sites. This HUIT has some experience in QI through its work with maternal child and HIV services. Community members are engaged, and the Leadership Council is involved with routine Health Unit activities. This community identified the unreached as those who are ignorant. VHTs have identified and immunized children through their outreach. Barriers to RI identified by HU staff included outreach availability, rumors/misinformation/cultural issues, and stockouts.

<u>Approach by the Team</u>: Staff recognized the benefits of having staff and supplies on hand, and timely reporting at the start of the project and they built their changes upon these enablers to routine immunization.

PDSA 1 focused on decreasing the percentage of mothers or caretakers who wait for RI services greater than one hour from 80% to 20% by October 2011. The HUIT did a process map, purchased a clock and a register, increased the staff on clinic days from one to two, cross trained 17 staff on RI, and then in a methodical and intentional way kept track of the time it took mothers to move through the system. Reorganizing the process of immunization - conducting education sessions at 10AM for all present and move the children through the immunization process instead of walk-ins and waiting for a mass of caregivers to be present before starting process.

PDSA 2 focused on increasing the percentage of children less than five years old with child health cards (CHCs). Changes made to accomplish this included increasing awareness and reminders, educating staff and informing VHTs of the new policy: that CHCs will be checked at each visit.

PDSA 3 expands the involvement of the VHTs by including their efforts in measurement of results of the improvement work.

<u>Results</u>: This HU has an active HUIT. Various members engage in meeting roles. They used meeting skills effectively, which was reflected in positive meeting evaluations. Although the VHTs were present at the first meeting at the HU they had little involvement through most of the project until the end. All core HUIT members have attended each workshop. Only the HMIS attended 100% of the HUIT meetings, and two VHTs also had 100% attendance at these meetings. The HMIS demonstrated increasing competence as demonstrated by his ability to graph data spontaneously. In PDSA 1, the HUIT achieved their aim by September 2011 by reorganizing staffing schedules to include two vaccinators on duty on RI static days, training 17 staff in RI. However, there was a lack of commitment by staff who were not allocated to RI and although leadership established regular RI meetings, they were poorly attended.

PDSA 2 reflects HUIT recognition of the importance of increasing involvement of VHTs, who have provided education about RI and child health care policy to mothers, and are providing feedback to HUIT. VHTs are identifying unimmunized children, making home visits and providing RI.

Although recognized at the beginning, stock outs did not present as an issue as the project was underway, with the exception of lack of supplies to support QI activities/efforts).

There has been no change in volume for DPT 3 in static or outreach clinics since the implementation of ARISE-SI.







Learning: The implementation of changes that include VHT outreach indicate recognition of the importance of increasing involvement of VHTs as a component of their local RI system. Further, through their experiences with the second PDSA cycle, the HUIT recognizes a necessity to prepare a system for receiving referrals from VHTs. The HUIT recognizes the negative impact of inaccurate recording by some staff, and lack of timely reporting as barriers, and also identified inconsistent leader attendance at meetings, as well as competing commitments, and low staff motivation as barriers to routine immunization.

Enablers identified at the end of the project explicitly reflected the HUIT designed changes (e.g., increased in staff RI knowledge) in combination with engagement of HUIT, support of leadership, and use of QI tools. Although not mentioned by HUIT, changes also addressed barriers, e.g., reducing rumors and misinformation, and reducing long waiting times.

This HUIT appeared to be comfortable in drafting AIMs, changes and measures, and evaluating their progress. Their sense of self-efficacy was evident in several ways. For example, initially they intentionally adopted a broader population for their work focus than UNEPI has mandated (5 year old children v. 1 year old children), although they scaled this back by the end. This HUIT also developed its own meeting evaluation scoring system.

Evidence of cross systems activities or engagement includes recognition that there is a role for the DHT in supporting the work of HUs and that there is benefit in HUs sharing with one another. The inclusion of the Kiyumba team in CODES (Community and District Empowerment for Scale-up Project) activities, especially in presenting their ARISE work to CODES visitors, in addition to their previous application of QI principles to services other than RI, may encourage cross-systems thinking by this HUIT.
The Kyannamukaka Health Unit

<u>Setting</u>: Kyannamukaka is a HU IV located in Bukoto County in Bukoto East sub-District. This peri-urban, governmental facility provides RI services daily at the static unit, and has five outreach sites. This HU serves a population of approximately 17,500 people for RI over a large geographic service area that includes difficult to reach areas. This is a busy and understaffed unit that has functioned without a doctor on site since 2009. In addition, there is no functional motorcycle available for outreach which is perceived as a significant barrier. There is free staff housing available onsite, although there is not enough housing for all staff to reside on the campus. The In Charge has a strong leadership presence, HUIT members appear to value each other's contributions, and the importance of the VHT role was acknowledged at the beginning.

<u>Approach Taken by Team</u>: The HUIT chose as a global aim to decrease DPT1-DPT3 dropout rates by January 2013, and focused their efforts initially on ensuring that all babies receiving services have a child health card (CHC).

Changes included: (a) implementing use of registers at static and OR units, (b) expansion of registers to include phone numbers of caregivers for better follow up, (c) home visits by VHTs to identify those children who are unimmunized and/or without CHCs, and (d) a plan for staff to use phone numbers noted in the registries to follow up when children did not return for immunizations.

<u>Results</u>:

"I think we are starting to get the children who have been unimmunized."

Although they were not originally included in development of the changes for this improvement project, VHTs became integral to the improvement work over time and were actively recruited to participate in HUIT activities. VHTs have held village meetings about immunization, encouraging other stakeholders on immunization, emphasizing mothers to carry CHCs for any health service and also referred some cases for immunization (Mirundu).

In Charge attendance to HUIT meetings fell off at the end of the project but other core HUIT members as well as community members then assumed leadership roles. With the shift to Luganda during HUIT meetings, there was increased participation by all HUIT members, especially of the VHTs.

The HMIS is an effective communicator of QI to the larger HUIT, and makes data and records and files available to the team. She actively shared and taught broader HUIT about use of data. The HUIT reported that:

"The communication has been effective... we always pass on information to VHTs and mobilizers for sensitization and mobilization."

The DHI, who attended HUIT meetings with the ARISE-SI Coach facilitated staff attendance of HUIT meetings, and shifting of distant outreach to a more appropriate HU which may result in financial savings for the HU.

Specific results from changes being implemented include that many mothers realized that their children did not have DPT3 (they thought their children were fully immunized), 60 VHTs were oriented to properly reading CHCs, and one outreach site has become a static unit.

Much work is left to be done as there has been no follow up of defaulters found, Some families still refuse to immunize (this was raised by VHTs from five villages. One VHT reported that a mother refused to immunize her baby for BCG because her first baby died.), and after a VHT identified three children with suspected measles it was not reported at the Health Facility and not investigated.

"Transportation is still a big problem; the motorcycle has gone worse and beyond repair."

There have been no significant changes in immunization rates at static or outreach sites. This finding is not surprising, given the large population served, and the short period of time for which we have data.







Lessons Learned: Enablers of RI identified by staff at the beginning of the project reflect a narrow, discrete view. By the end of the project, however, core HUIT members described enablers that reflected a broader view of the RI system. This team focused on lack of transportation as the major barrier to RI at the beginning, and although it has continued to be recognized, some solutions have been identified and the team has expanded its view of potential or actual barriers that reflect systems thinking. Changes implemented by HUIT are addressing the issues identified by caregivers at the beginning of the project.

There were multiple instances over the past few months when the value of the DHIT to improvement of RI services was brought to light, and this was reflected in the shift from the In Charge's emphasis on transportation barriers linked to DHT to recognition of the DHT in facilitating delivery of EPI supplies.

VHTs recognize a role for themselves in collecting and providing data for improvement of RI system. Collaboration between VHTs who are identifying specific cases of unreached children, and staff who have the capacity to approach and followup with families through education, suggest that a fledgling system is in being built to reach unimmunized children in this service area.

The Masaka Municipal Council (MMC) Health Unit

Setting: MMC is a governmental HU Level II, located in the Masaka town. MMC serves a population of approximately 2,100 people for RI. It is the only urban-sited HU in the study, making it unique in several ways. For example, it is easier to access because most patients live within walking distance to the facility. This HU has a unique relationship to the DHO. HUIT members mentioned an adjustment in staffing (more than other HU IIs) and also the convenience of going to DHO if supplies were needed. It shares its service population, which is somewhat transient, with Masaka Hospital and other urban health providers, thus its service population is difficult to identify. The unit is in disrepair. MMC provides RI services daily at the static unit, and provides immunizations through outreach services on Wednesdays and Thursdays, rotating each week among the four outreach sites.

HU staff recognized mobilizers and VHTs as valuable components of their local health system. This HUIT and community identified multiple barriers to RI at the start, including cultural issues, lack of knowledge, and lack of resources, inconsistent accessibility, and poor staff attitudes. Interestingly, HU staff identified approachable staff, which is counter the barrier of insensitive attitudes of staff identified by both staff and community members.

Throughout the course of the project, the unreached population was consistently identified as persons or families with negative attitudes toward RI. The HUIT is proactively visiting caregivers identified by VHTs through home visits implemented as part of PDSA cycles of change.

<u>Approach</u>: MMC chose to reduce DPT1–DPT3 dropout rate from 20% - 10% by July 2013, by integrating VHTs to improve outreach (PDSA1) processes. They set a specific aim for each VHT to visit 25 homes. PDSA 2 expanded upon the initial AIM by adding that staff will report to the HU early to reduce waiting times, and continue with VHT home visiting. The HUIT added further changes to include initiating a policy that all children coming for any clinical services will be screened for immunization status. VHTs continued to 1) conduct home visits, 2) follow up on prior home visits, and 3) add new homes to their register of homes to visit, thus establishing an ongoing routine. For PDSA3, the HUIT will build upon efforts and successes to date that address relevant contextual issues by continuing changes already implemented, and use the child register to follow up with defaulters.

<u>Results</u>: Communication is central to several aspects of this HUIT's efforts including changes in communication styles to improve client relations, communicating existing and new CHC policies to caregivers, and developing systems of communications between VHTs and staff for tracking home visit findings. This HUIT had low attendance by core HUIT team members (68%). Several individual cases of illness, births, and family deaths disrupted the continuity of attendance throughout the project, but the team stayed on track and appeared to grow stronger in spite of this. Attendance of non-core (mostly VHTs and community leaders) was relatively

consistent with 5-8 attending each HUIT meeting. The HUIT is applying their meeting skills, and meetings receive high evaluation scores. As with the other HUITs, shifting from English to Luganda during meetings resulted in higher levels of engagement.

VHTs are identifying some cases of resistant families, e.g. in Muslim communities. HU staff have followed up with them with some success, and the HUIT is engaged in contingency planning regarding how to engage the DHO and others to address specific families resistant to immunization if their initial efforts are unsuccessful. Thus, the attendance of the DHI at the HUIT meetings is beneficial for discussions and for developing strategies for managing families who have unimmunized children.

HUIT staff report improved "handling of mothers", increased numbers of mothers coming to the clinic, and reduced waiting times.

Barriers to RI mentioned during HUIT meetings included lack of funds for logistics, that mothers did not bring children if they did not have CHCs, and that some VHTs do not attend HUIT meetings. Transportation remained an issue throughout the project, even though this HU serves a fairly local client population. Lack of CHCs is also a barrier.

Activating and integrating VHTs seems to have resulted in increased immunization numbers for DPT3 in in both static and outreach locations during the period of implementation of the ARISE-SI Project. The average number of children immunized in the outreach HUs is significantly higher during ARISE-SI implementation than in previous periods for 2007/2008, 2008/2009, and 2009/2010; the average is also higher than in the period for 2010/2011 but not significantly different from that period. For DPT1, ANOVA shows a significant increase in the average number of children immunized in the static HU during the period of implementation of the ARISE-SI Project compared to the same periods in 2010/2011.







<u>Lessons</u>: VHTs gained awareness from caregivers of additional barriers to RI, including fear, lack of interest or weather-related issues. Some VHTs had not been aware that children in their communities did not complete immunizations. This HUIT is examining its internal resources, and recognizing the potential of the VHTs for improving the RI system. The HUIT is building capacity into its structure by enlisting and supporting VHTs from target unreached villages including a Muslim VHT for outreach to that population.

As the project progressed, the HUIT recognized that their work with VHTs, specifically participatory planning, has enabled their successful improvement of RI systems. The HUIT recognized the value of data and use of QI tools for RI improvement, and the activities of the HUIT to review the immunization progress as an enabler to routine immunization. Data collection and utilization is institutionalized into intake processes and VHT practices.

Appendix F: Additional Quantitative Measures of RI Collected During the ARISE-SI Project

<u>Bukeeri Health Unit</u>

<u>Summary of additional findings (not presented in Appendix E)</u>:

• There was a significant increase in number of children immunized with DPT1 for both static and outreach sites during the project period.

DPT1 (Static)



DPT1 (Outreach)



Summary of Results for All Antigens:

- There was a significant increase in the number of children immunized during the project period for all antigens at both static and outreach sites
- DPT3 outreach and DPT1 outreach increased in June, 2011
- DPT3 static and DPT1 static increased in November, 2011

<u>Antigen</u>	<u>HU Type</u>	Baseline	New	<u>Change</u>	Significance
		<u>Average</u>	<u>Average</u>	<u>(Date)</u>	
DPT3	Static	23.4	36.0	Nov, 2011	p<0.01
DPT3	Outreach	2.8	37.8	Jun, 2011	p<0.01
DPT1	Static	25.3	36.3	Nov, 2011	p<0.01
DPT1	Outreach	6.3	29.8	Jun, 2011	p<0.01

	DPT3	DPT3	DPT1	DPT1
	(STATIC)	(OUTREACH)	(STATIC)	(OUTREACH)
Jun 07-Jan 08	22.00	24.29	22.29	27.88
Jun 08-Jan 09	18.38	12.63	19.00	13.38
Jun 09-Jan 10	22.75	10.75	26.63	10.25
Jun 10-Jan 11	21.00	3.88	24.50	5.25
Jun 11-Jan 12	27.63	37.50	28.50	29.75
ANOVA				
F	3.620	22.97	3.545	4.895
Prob	0.015	< 0.0001	0.016	0.0076



Butende Health Unit

<u>Summary of additional findings (not presented in Appendix E)</u>:

- There was a significant increase in number of children immunized with DPT1 for the static site during the project period.
- There was no change in average number of children immunized with DPT1 for the outreach site.



DPT1 (Outreach)



Summary of Results for All Antigens:

- There was a significant increase in the number of children immunized during the project period for DPT1 at the static site.
- There was a significant increase in the number of children immunized during the project period for DPT3 at the static site.

<u>Antigen</u>	<u>HU Type</u>	Baseline	New	<u>Change</u>	<u>Significance</u>
		<u>Average</u>	<u>Average</u>	<u>(Date)</u>	
DPT3	Static	4.4	12.3	Oct, 2011	p<0.01
DPT3	Outreach	26.4			NS
DPT1	Static	4.9	10.4	Jun, 2011	p<0.01
DPT1	Outreach	32.2			NS

NS = no significant change

	DPT3	DPT3	DPT1	DPT1
	(STATIC)	(OUTREACH)	(STATIC)	(OUTREACH)
Jun 07-Jan 08	4.00	20.71	5.43	24.43
Jun 08-Jan 09	5.88	24.25	6.50	25.75
Jun 09-Jan 10	3.63	23.00	5.00	28.50
Jun 10-Jan 11	4.75	29.88	5.00	29.25
Jun 11-Jan 12	8.38	28.25	10.38	34.13
ANOVA				
F	3.253	1.469	5.873	1.759
Prob	0.023	0.23	0.0011	0.16





<u>Kiyumba Health Unit</u>

Summary of additional findings (not presented in Appendix E):

• There was no change in the number of children immunized during the project period at both static and outreach sites.





DPT1 (Outreach)



Summary of Results for All Antigens:

- There was no change in the number of children immunized during the project period for all antigens at both static and outreach sites.
- The number of children immunized with DPT3 significantly increased beginning in September, 2010 at the static site.
- The number of children immunized with DPT1 significantly decreased beginning in December, 2010 at the outreach site.

<u>Antigen</u>	<u>HU Type</u>	Baseline	New	<u>Change</u>	Significance
		<u>Average</u>	<u>Average</u>	<u>(Date)</u>	
DPT3	Static	24.2	26.1	Sep, 2010*	p<0.01
DPT3	Outreach	21.3			NS
DPT1	Static	26.0			NS
DPT1	Outreach	23.3	21.4	Dec, 2010*	p<0.01

NS = no significant change

* = change occurred before intervention period

DPT3	DPT3	DPT1	DPT1
(STATIC)	(OUTREACH)	(STATIC)	(OUTREACH)
14.43	14.29	14.43	16.00
17.13	17.00	24.13	26.75
27.86	23.86	32.71	28.29
31.13	19.13	23.13	18.50
23.00	22.13	25.25	23.13
5.628	2.295	5.707	3.029
0.0014	0.080	0.0013	0.031
	DPT3 (STATIC) 14.43 17.13 27.86 31.13 23.00 5.628 0.0014	DPT3 (STATIC) DPT3 (OUTREACH) 14.43 14.29 17.13 17.00 27.86 23.86 31.13 19.13 23.00 22.13 5.628 2.295 0.0014 0.080	DPT3 (STATIC)DPT3 (OUTREACH)DPT1 (STATIC)14.4314.2914.4317.1317.0024.1327.8623.8632.7131.1319.1323.1323.0022.1325.255.6282.2955.7070.00140.0800.0013



<u>Kyannamukaka Health Unit</u>

<u>Summary of additional findings (not presented in Appendix E)</u>:

• There was no change in number of children immunized with DPT1 for the static or outreach clinics during the project period.

DPT1 (Static)



DPT1 (Outreach)



Summary of Results for All Antigens:

- There was a no change in the number of children immunized during the project period for all antigens at both static and outreach sites.
- There was a significant increase in the number of children immunized with DPT1 that occurred in April, 2011.

<u>Antigen</u>	<u>HU Type</u>	Baseline	New	<u>Change</u>	Significance
		<u>Average</u>	<u>Average</u>	<u>(Date)</u>	
DPT3	Static	18.6			NS
DPT3	Outreach	30.3			NS
DPT1	Static	20.1			NS
DPT1	Outreach	28.6	36.4	Apr, 2011*	P<0.01

NS = no significant change

* = change occurred before intervention period

	DPT3	DPT3	DPT1	DPT1
	(STATIC)	(OUTREACH)	(STATIC)	(OUTREACH)
Jun 07-Jan 08	15.71	45.86	22.29	52.71
Jun 08-Jan 09	22.25	34.00	27.88	47.75
Jun 09-Jan 10	14.25	26.50	18.13	30.38
Jun 10-Jan 11	21.25	32.00	23.13	30.50
Jun 11-Jan 12	19.13	31.50	20.00	34.38
ANOVA				
F	1.070	1.030	1.134	2.060
Prob	0.39	0.41	0.36	0.11





<u>Masaka Municipal Council Health Unit</u>

Summary of additional findings (not presented in Appendix E):

• There was no change in the number of children immunized with DPT1 during the project period at the static or outreach sites.



DPT1 (Outreach)



Summary of Results for All Antigens:

- There was a significant increase in the number of children immunized with DPT3 during the project period at the static site.
- There was a significant increase in the number of children immunized with DPT3 beginning in April, 2010 at the outreach site.
- There was a significant increase in the number of children immunized with DPT1 beginning in March, 2011 at the static site.
- There was a significant increase in the number of children immunized with DPT1 beginning in September, 2010 at the outreach site.

<u>Antigen</u>	<u>HU Type</u>	Baseline	New	<u>Change</u>	Significance
		<u>Average</u>	<u>Average</u>	<u>(Date)</u>	
DPT3	Static	47.3	72.0	Jul, 2011	p<0.01
DPT3	Outreach	2.6	12.9	Apr, 2010*	p<0.01
DPT1	Static	41.2	71.1	Mar, 2011*	p<0.01
DPT1	Outreach	4.5	12.8	Sep, 2010*	p<0.01

NS = no significant change

* = change occurred before intervention period

	DPT3	DPT3	DPT1	DPT1
	(STATIC)	(OUTREACH)	(STATIC)	(OUTREACH)
Jun 07-Jan 08	52.14	2.14	56.57	2.29
Jun 08-Jan 09	61.63	2.38	78.13	4.00
Jun 09-Jan 10	56.38	3.00	73.63	4.00
Jun 10-Jan 11	40.63	13.38	40.25	13.25
Jun 11-Jan 12	68.63	15.13	73.25	9.63
ANOVA				
F	2.688	5.983	6.722	3.076
Prob	0.048	0.0009	0.0004	0.029



ANOVA (F = 3.076, p = 0.029)

ANOVA (F = 6.722, p = 0.0004)

Appendix G: Report of External Consultants on ARISE-SI Participant Survey and Focus Groups

Center for Program Design & Evaluation at Dartmouth

ARISE-SI Evaluation

Prepared by

Karen E. Schifferdecker and Rebecca L. Butcher March 2012

Background

ARISE-SI is a two year project to improve routine immunization (RI) coverage in medium to high functioning health District s in Uganda who were stagnating at 70-80% coverage. It was funded by the Bill and Melinda Gates Foundation, managed by JSI Research and Training Institute, Inc., and implemented in partnership with researchers at The Dartmouth Institute of Health Policy and Clinical Practice. Using methods of improvement science and Microsystem analysis, personnel from five Health Units in the Masaka District were engaged in three learning sessions, coaching in data collection and Plan-Do-Study-Act cycles between sessions, and other participatory strategies to make and test small changes that personnel identified as most important to attaining higher immunization coverage in their Health Units.

The Center for Program Design and Evaluation at Dartmouth (CPDE) was contracted by the ARISE-SI project team to provide an outside evaluation of the project. The evaluation complements the ongoing JSI Project Evaluation by providing an unbiased outside assessment of the potential influence of the teaching methods and action learning principles used in the ARISE project on the individual participants and teams and larger process and project outcomes.

CPDE worked with the project team to first identify the process and learning outcomes that were expected as a result of the project. A logic model (see Appendix A) was developed and the following major constructs were selected to focus on for the evaluation:

- Self-efficacy and Ownership
- Collaboration and Sense of Team
- Leadership
- Knowledge of System
- Knowledge of Quality Improvement (QI) Tools
- Use of QI Tools and Data
- Infrastructure and Process Changes
- Sustainability and Spread of Benefits

Methods

A mixed methods triangulation design (Schifferdecker 2009³), in which qualitative and quantitative data are collected simultaneously, was used to explore the major constructs chosen for the CPDE Evaluation. Data were collected in-person with participants during their final ARISE workshop held in February, 2012. Methods consisted of five focus group sessions and a comprehensive written questionnaire completed individually by the same participants. Trained Ugandan researchers who were not part of the project team oversaw the administration of the questionnaire and conducted the focus groups. No project team members were present during the questionnaire administration or the focus groups and both were conducted prior to teaching sessions to reduce socially desirable responses. All completed questionnaires, focus group audio recordings and typed transcripts were kept sealed and protected from viewing by the project team.

Focus groups

Participants were sorted into focus groups by their role on the improvement teams: DHT members, Health Management Information Specialists [HMIS], In/Charges and Senior Officers, and HUIT staff members. A written focus group guide (see Appendix B) was used by the facilitators to ensure consistent data gathering. Groups were conducted in English but the Ugandan researchers were able to serve as translators as needed to clarify questions in the participants' native language. Transcripts of the focus groups were typed by the same researchers conducting the focus groups and electronically sent to the CPDE evaluators for data analysis.

Questionnaire

The questionnaire consisted of a total of 81 questions to assess the constructs noted above (see Appendix C). Demographic information including team membership and role on the team were also included in the questionnaire. Respondents answered questions related to changes associated with the ARISE project at both the individual and team / Health Unit level. To reduce the potential of response shift bias and to supplement data from non-CPDE baseline assessments, respondents were asked to rate both their current ability in using a variety of quality improvement (QI) methods as well as perceived change in ability associated with the ARISE project. All but a small number of questions were scored with a five-point ordinal ranking scale, ranging from responses such as not at all, strongly disagree, none, and poor at the low end of the scale, to responses such as extensively, strongly agree, extremely well, and outstanding at the high end. Two separate surveys were created using identical questions and constructs but with team language tailored to accommodate members of both the District Health Team (DHT) and Health Unit Improvement Teams (HUIT). The Ugandan researchers provided language assistance as needed during the survey and assured participants that their responses would be kept confidential from the ARISE project team.

Analysis

We entered questionnaire data into Excel and then imported results into SPSS (version 15.0) for descriptive statistical analysis. Respondents' scores were converted to numerical representations

³ Schifferdecker KE, Reed VA. Using Mixed Methods Research in Medical Education: Basic Guidelines for Researchers. Medical Education. 2009; 43: 637-644.

ranging from 1 to 5, where one was associated with the lowest rank on the scale and five with a high score. Surveys were analyzed in aggregate to identify overall trends, and secondary analyses were done to compare findings by team and by an individual's role on their team.

To analyze the semi-structured focus group data, one CPDE researcher developed a preliminary coding scheme based on grounded theory technique (Glaser 1967⁴), in which codes are drawn from the text and coding involves frequent comparative analysis of the data. An additional member of the team reviewed all of the codes independently, and additions or deletions of codes were made to finalize the coding scheme. All the data was then coded and overall themes were identified.

Limitations of the Data

Baseline (pre-work) assessment was conducted by the JSI Evaluator in June 2011 and where applicable, the same questions were used in the CPDE questionnaire. However it was not possible to identify specific participants' scores from baseline to this CPDE evaluation to conduct paired t-tests on the data. For analyses of differences between teams or between different member roles, small sample sizes (n=4-9) limited more elaborate statistical analyses of questionnaire data at these levels. Descriptive statistics were the primary level of analysis.

Findings

Questionnaire Results

Thirty-one participants out of 32 completed the questionnaire, and results are reported by the numerical score, usually given as means with standard deviations.

Overall Findings

Participants rated their overall experience with the ARISE project with a mean score of 4 or very good ±0.48. When asked to cite the three most useful things learned in the ARISE project (openended question), the most common responses included learning how to conduct PDSA cycles, working in teams, getting a better understanding of Health Unit processes through the 5 Ps and 7 As, and gaining confidence in solving problems.

Teaching approach/activities

- The ARISE teaching approach was rated as 4.5 ±0.63 (i.e. better than to much better than) as compared to other programs or workshops participants had attended in the past.
- Respondents indicated that the specific teaching methods and activities used in the project helped them learn about quality improvement (QI), including meeting skills, coaching sessions, and setting team-specific AIMs. Mean ratings on these questions ranged from 4.2 ± 0.67 to 4.6 ±0.5.

⁴ Glaser B, Strauss A. Discovery of Grounded Theory. Strategies for Qualitative Research. Chicago: Aldine Pub. Co; 1967.

QI ability/use

- Respondents rated their own knowledge of QI as 3.9 ±0.67 (rating scale: poor-1, fair-2, good-3, very good-4, outstanding-5) and gave credit to ARISE (4.2 ±0.52 or 'a lot') for changing their knowledge of QI.
- Mean scores of participants' rating of their <u>team's</u> ability to perform 15 specific quality improvement activities (e.g. writing an AIM statement, creating flow charts and run charts, planning and implementing PDSA cycles, identifying barriers and enablers) ranged from 3.6 ±0.85 to 4.2 ±0.72 which coincides with ratings of 'moderately well' to 'very well'. Interestingly, these scores were fairly consistent across all team members within each team, even HMIS members.
- Participants rated ARISE's contribution to their team's ability to do the 15 QI activities (i.e., "Please rate if ARISE contributed to your Health Unit's ability to do the following activities") with mean scores ranging from 4.1±0.79 to 4.5 ±0.68.

Project status/sustainability

- Respondents rated their completion of their ARISE project aim as 3.9±0.73 (moderately close to very close to achieving their AIM).
- Team members also rated their project status in on a <u>six</u>-point scale. The average rating was 4.5±1.09 which corresponds to improvement in some outcome and process measures to significant improvement in outcome and process measures.
- The 11 dichotomous (yes/no) questions about changes in health/District unit processes and infrastructure revealed some concrete changes that have been made in the health or District unit since participating in the ARISE project.
 - 100% of ARISE participants stated that new data management systems had been created in their unit.
 - 94% (n=29/31) of respondents indicated that new community collaborations had been forged while 81% (n=25) reported new collaborations with District level staff (or in DHT's case, with other Meso level or Ministry of Health staff).
 - 71% (n=22/31) of respondents reported that services at their unit had expanded since the start of ARISE.
 - 65% (n=20) of ARISE participants reported that new service positions had been created (or staff reassigned to new positions) and 58% (n=18) indicated the creation of new data management positions.
 - 58% (n=18) responded that time had been granted for them to meet with other Health Units to share problems and new ideas.
 - 55% (n=17) of respondents noted that new equipment had been obtained or purchased since the start of ARISE. Less than a quarter (23%, n=7) of participants reported that equipment or technology was used differently.
 - Only 13% (n=4) of all respondents indicated that funds were distributed differently since ARISE.
 - Despite all of the new tasks and team activities associated with the ARISE project, only 13% (n=4) of respondents indicated that they spent less time on <u>other</u>

important Health Unit activities suggesting that ARISE did not divert attention away from other Health Unit priorities.

• ARISE participants were optimistic about continuing to use the methods learned in ARISE and Meso-Micro level collaborations in their Health Units with mean scores on these questions ranging from 4.2 to 4.7, "likely" to "very likely".

Team/leadership

 Respondents scored their teams high (4.1 to 4.6) on ratings of trust, level of commitment to make changes, communication skills, leadership, and other dimensions of "relational coordination". These qualities have been associated with greater sustainability of outcomes in other collaboration and organizational management literature, suggesting that participants can be successful in reaching improvement aims set through ARISE.

Comparisons between Teams

As noted, small sample sizes limited the ability to conduct statistical comparisons between different teams so results comparing teams should be interpreted with some caution.

Teaching approach/activities

 The DHT respondents (n=4) reported higher scores than the other five HUITs on overall ratings of their experience with ARISE, their overall rating of the coaching provided and of the workshops. All teams however were equally positive about the specific teaching activities used in workshops, the coaching sessions between workshops, writing AIM statements and measures, and the meeting skills they learned from ARISE.

QI ability/use

- DHT members rated their <u>individual</u> knowledge of QI and the change in their QI knowledge with ARISE as higher than scores by members of the HUITs.
- In general, respondents from the Kiyumba HUIT rated themselves lower than the other HUITs and DHT in their team's ability to do 15 QI activities. For instance, Kiyumba respondents (n=4) had a mean rating of 2.8 ±1.26 on their ability to identify barriers and enablers in their Health Unit, compared with the other four HUITs and DHT who rated themselves from 3.5 to 4.3 on the same question. However, perceptions of how much ARISE changed their ability to do those QI activities was similar across all HUITs and the DHT.
- Kyannamukaka team members rated themselves lower in likely use of improvement methods in the future compared to the other HUITs and the DHT.

Project status/sustainability

- All HUITs rated themselves similarly in terms of achieving their project aim(s): between 3.5 and 4.2 or "moderately" to "very" close. Only the DHT members scored their progress toward their main project AIM as 4.8 ±0.5, where a score of 5 corresponds to a rating of "completed".
- Teams rated their project status on a six-point scale. Butende, Masaka, and the DHT all had mean scores over 5 (\overline{X} = 5.3, ±0.96; \overline{X} =5.1, ±0.78; \overline{X} =5.3, SD =0.5 respectively) defined as "significant improvement in outcomes and processes". The average rating by Bukeeri and Kyannamukaka team members was 4 (±0.82, 1.1 respectively) which corresponded with "improvements in some outcome and process measures". Kiyumba team members

rated their progress as much lower at $\overline{X} = 3.3, \pm 0.96$, corresponding to "modest improvements in process measures" but not outcomes.

- Teams differed in the kinds of Health Unit infrastructure and process changes that occurred with ARISE.
 - Bukeeri team members all reported that a new data management person was assigned or hired with ARISE, where other teams only had partial agreement that personnel changes for data management were made. Three out of four respondents from Kiyumba reported that no new data management personnel were assigned.
 - Bukeeri and Kyannamukaka respondents reported that services were expanded at their Health Units with ARISE.
 - DHT members identified that new equipment was obtained with ARISE but surprisingly only some of the respondents from each HUIT noted the acquisition of new equipment at their Health Units.
 - All teams reported the use of new data management systems with ARISE.
 - All teams reported that new collaborations were forged with the community with ARISE. Most team members also reported increased collaborations with District level staff (or higher in case of DHT respondents), though Kiyumba had the lowest agreement on this question.
- All HUITs reported high ratings in terms of future collaborations with the District Health Office, but somewhat more modest ratings of future collaboration with other Health Units.
- DHT members responded favorably (4.8±0.5) to the questions of future collaboration with both upper level officials (i.e. Ministry of Health) and between micro and Meso levels (i.e. Health Unit / DHO interactions).

Team/leadership

In terms of the questions about team dynamics, leadership and "relational coordination" between team members, team ratings varied in only subtle ways. All teams rated their leader's effectiveness similarly, generally agreeing that leadership was strong and that they were encouraged to apply new and better methods in their units.

- Kiyumba members had the highest variability in ratings on team dynamics (n=4), indicating only modest overall ratings of satisfaction and trust between members of 3.8 ± .5 and ±0.96 respectively. Yet these same respondents reported high scores in being able to suggest changes, and knowing and respecting each other's contributions.
- Team members from Bukeeri (n=4) also had a modest overall team satisfaction rating of 3.5 ±0.58, and reported similar ratings for timely communication (corresponding with 'sometimes') and empowerment to work with different people. Trust in team members, commitment to improvement, and application of new knowledge and skills were all scored high (>4.5) by Bukeeri members.
- Team members from Butende (n=4), Kyannamukaka (n=6), and Masaka (n=9) all reported high ratings of team satisfaction, sense of trust, commitment to improvement and communication Mean scores were all greater than 4, or happening 'often' in their unit.

• With the exception of timely communication with a mean score of only happening 'sometimes', DHT members rated other aspects of team satisfaction, trust, commitment, and organization as fairly high >4.5 in most cases.

Comparison to Baseline Pre-work Assessments

24 respondents completed ARISE-SI pre-work surveys in June 2011 which included questions about work environment, leadership, knowledge and use of various QI activities and principles. While it is not possible to know if all of the respondents are consistent with the 31 people surveyed with the CPDE questionnaire in February 2012, project staff report high overlap. Where possible the same questions were used in the second questionnaire to assess pre-post effects. The main findings from the pre-work assessment indicated only slight to moderate experience / ability with QI methods. In the February evaluation participants rated their ability to do the same activities as 'very well'. These areas included writing an AIM statement, implementing PDSA cycles, using information to plan improvements, creating flow charts, and creating run charts.

Participants' ratings of their work environment and Health Unit leadership at the pre-work assessment identified the following areas in need of improvement:

- Self-motivation to make changes at work
- Planning of work assignments
- Systems thinking
- Studying causes of problems before making a change
- Cooperation and team work
- In-Charges ability to lead quality performance activities

In the follow up questionnaire, more than 90% of respondents gave ratings of 'agree' or 'strongly agree' indicating these same aspects of the work environment had improved.

Results of the Focus Groups

34 Health Unit and District team members participated in the focus groups. Five focus groups were organized by team role with the following make up:

- District Health Team members, n=8
- Health Management Information Specialists [HMIS], n=5
- In/Charge and Senior Officer personnel, n=5
- Other Health Unit staff (two groups), 8 each group, n=16

In general, the focus groups mirrored the results of the questionnaire with largely positive feedback from participants for ARISE, including its approach (workshops and coaching), its focus on participants' learning and using QI methods and the use and spread of the ARISE approach in their work. Emerging themes from the focus groups are described below with exemplar quotes to illustrate the findings.

Learning about QI approach/methods

Participants spoke highly of the workshops and coaching visits as contributing to their learning about QI, both the process and the methods. They easily described some of the processes and tools that they learned in the project and how they have used them.

The most important thing which we put in place is what to include in the PDSA because we learnt how to identify resources to put in place, how to implement what we are planning to do and then how to study the class including the tools as mentioned then also to see the trends of what is going on and then act accordingly. So the coaching and the meetings we have been getting from here have helped us a lot.

Participants frequently mentioned the rationale and importance of breaking problems down, looking at causes and starting with a small problem rather than a large problem as a way to tackle issues.

I have learnt that to solve a problem you have to analyze and look into the root causes of the problem. ARISE has taken us through the problem tree, the fish bone, those are some of the ways of analyzing data and try to come up with the proper and specific interventions.

So something small may be by-passed and thinking that it's very big and impossible to get but sometimes when you think about it and plan for it you may end up succeeding. But this one was through ARISE if maybe they hadn't come we could still be having one cylinder.

An additional important experience for participants was the collection and use of data in new or different ways to make progress on understanding potential problems and tracking progress.

Getting involved in data collection as an activity in this project besides appreciating its analysis, study to measure our performance, it is by getting involved that we realized the weaknesses we have in data management and everything regarding data.

With ARISE we have come to use the tools we had abandoned like the tally sheets, vaccine control books have now become more used rightly.

Collaborative learning with other units

Participants spoke highly of the experience to learn about QI together with members of other Health Units. They spoke mostly about learning from what other Health Units were doing, but they also suggested that comparing RI rates and progress provided an extra incentive to improve their own rates.

We can share ideas from other units and getting to know new plans e.g. health facility (name) can do immunization using MM method and you can learn that.

With that spirit of competition in quality service delivery, it has enabled us reach some level which we could not have achieved if we were working alone and not being able to go out to the communities to be challenged. You get to know that if others are working in hard conditions and are able to get results, why not us?

Collaboration within team/Health Unit, with community and between Health Unit and DHT

A primary approach and outcome of the ARISE project as explained by the participants was increased collaboration within their own team, within their Health Units and with communities they serve, particularly through increased collaboration with VHTs.

Originally, for our staff there was a group that was concerned with immunization but right now we are all involved and really take it as a concern to see that every child who comes at the Health Unit has a child health card and the staff who has seen that child has to record whether the child was fully immunized, partially or not immunized at all. We are all concerned and hence am really very impressed with this ARISE involvement. This ARISE has assisted us putting the VHT members on board because until recently these VHTs were not involved in mobilization of parents towards the immunization program but now at least they have done a tremendous work in uplifting the coverage.

In addition, or as a result of the collaboration, participants described increased ownership and responsibility felt by individual team members to do something to improve RIs. This was revealed in descriptions of sharing responsibility for making things happen, from running meetings to the actual administration of immunizations.

Now everyone is responsible. Before it used to be in-charge immunization that was responsible but now everybody is responsible so there is actually a difference.

I have learnt is to share roles whether in meetings you need to share roles not that one has to be a chair person forever. So when you share roles everybody learns even if one is away things can move.

For us at first the one who was immunizing was only one on the unit but now since this project came in everybody on the staff is involved even if the focal person is not around. Any of the staff around can do the immunization.

Participants from the Health Units and from the District team frequently mentioned how joint participation in the project assisted the DHT in better understanding and addressing barriers to improving RI at the local levels.

That is how we overcame the shortage of vaccines because originally we had problems in vaccines but due to this interaction and the involvement of the DHO and the District team, now they realized what we were suffering from, the problem of gas also came up and these two had hampered this routine immunization.

Process and infrastructure changes

Participants provided many examples of how they applied what they learned in the ARISE project to make specific changes in their care delivery process, data collection and use, and roles of personnel. Use or attainment of equipment to aid in the process were also mentioned, such as putting up a clock and attainment of the second gas cylinders.

Our in-charge bought the wall clock we wanted to record the waiting time for mothers those were the enabling factors for ARISE.

You would find that the person responsible for immunization was overloaded so now as a team we sat down and we had to find the solution to the problem she gave that she was overloaded. So another member was added onto the immunization team so they became two to ease her work.

Spread of Process and Methods to other Issues and Individuals

Participants not only described their use of the process and methods learned from ARISE in relation to RI, but their application of this approach to other issues and in other areas of their work. Some participants, however, were not ready to use the approach for other issues.

Using these ARISE tools it has helped us to identify problems in other departments.

In fact ARISE principle is going to continue say this health improvement team is not only working on immunization. It will go along handling other sections like water and sanitation, school health

We have not yet as a Health Unit of (unit name) applied the skills of ARISE in other departments..... We have not yet done it but we hope to. Let us first perfect the skills from the immunization department.

Interestingly, some participants described how they applied techniques learned in ARISE to their own personal issues, such as funding education for their children. In addition, a few participants provided examples of how they used the ARISE approach to encourage individuals, including community members, to take ownership of particular issues.

These people at the grassroots address most of the problems to us thinking that we are the only ones to address those problems but I have been taking them through the same approach to empower them so they can even look at the resources around them so that they can solve the problems themselves instead of addressing the problems to higher levels all the time.

Challenges in Project

Although feedback on the ARISE approach and projects were largely positive, participants did discuss challenges to implement different steps, including identifying changes to make, carrying out specific steps and reaching project goals to improve RI. Challenges clustered mostly in the areas of resources, equipment and personnel shortages, but also included communication and collaboration with community members.

We are improving but again we still have a problem of transport and if it was not that we would have reached the target.

There are issues like the attitudes of the health workers, commitments, even some facilitation say when some of the units are lacking transport for example which ARISE is not addressing and the District plus the ministry have to work up on and this takes time. These things affect the services.

We have some units with very low staffing levels and during the outreach session you find that work at the health facility moves at a snail speed simply because the staff are not enough.

We find it that VHTs are supposed to implement some changes but because with involving them you first need to do a coaching, having meetings with them. But because they are not facilitated you cannot call them for a meeting since some of them are from deep villages they cannot walk long distances and this system of quality improvement as we have seen we need regular couching. Any implementation that would require VHTs needs to have regular meetings with them. We always leave out the aim if we see that we cannot involve the VHTs yet it could have yielded results.

Participants also discussed the challenge of being able to show improvements in RI at the District level since other Health Units had not received the training. Some also discussed the difficulty of keeping accurate data since overlaps were difficult to account for and community members went to Health Units in other District s.

Since am aware I also want other health centers to know and if other centers are put on board they will be able to know what is required because however much we shall be campaigning immunize but they do not know what is taking place or what is needed, other people will not put in much effort there will always create a gap in our District.

Sustainability and Distribution to other Health Units

In general, participants were confident that they would continue to use the process and methods learned through ARISE to work on RI in their teams and communities.

I think we shall continue with it because we have already got the skills we have an integrated team where we have the immunization focal person and surely during our meetings we and a person responsible for immunization will be updating us and we find a way forward.

Although participants appeared to be confident that they could continue many of the activities on their own, some suggested that continued "outside" support and coaching would be important.

It will be hard for us when ARISE stops calling us. Other people may stop participating but then we may need to ask the DHT so that when they keep on that supervision and when they come at our units at least they try to tackle that part of immunization.

Participants were mostly supportive of the idea that the approach and methods of ARISE would be beneficial for other Health Units and for other problems, but they did not have clear recommendations as to how this might happen.

Now after completing the immunization and we are sure that immunization is going on well they could start on another activity but starting with one activity and leave it to go to another one the impact would not be strong.

Much as it has concentrated in five health facilities we really feel the burden of extending the similar services, the similar approach to the rest of the health facilities. It's now our task to make sure that maybe we plan and lobby for support so that we can really bring the rest on board. It's a task ahead of us.

Conclusions

This outside evaluation of the ARISE-SI project shows that the project achieved its goals of delivering an educational program that was well received by the participants, resulted in increased knowledge and skills of participants in improvement science and its application, and produced changes in care delivery services and data collection to track process and outcomes related to RI. Challenges remain for implementing changes to improve RI and data is not yet available to determine if rates of RI have improved which is the primary outcome of importance. However, participants appear to be committed to continual improvement of RI and sustaining the efforts; thus the ultimate results of the project remain to be discovered.