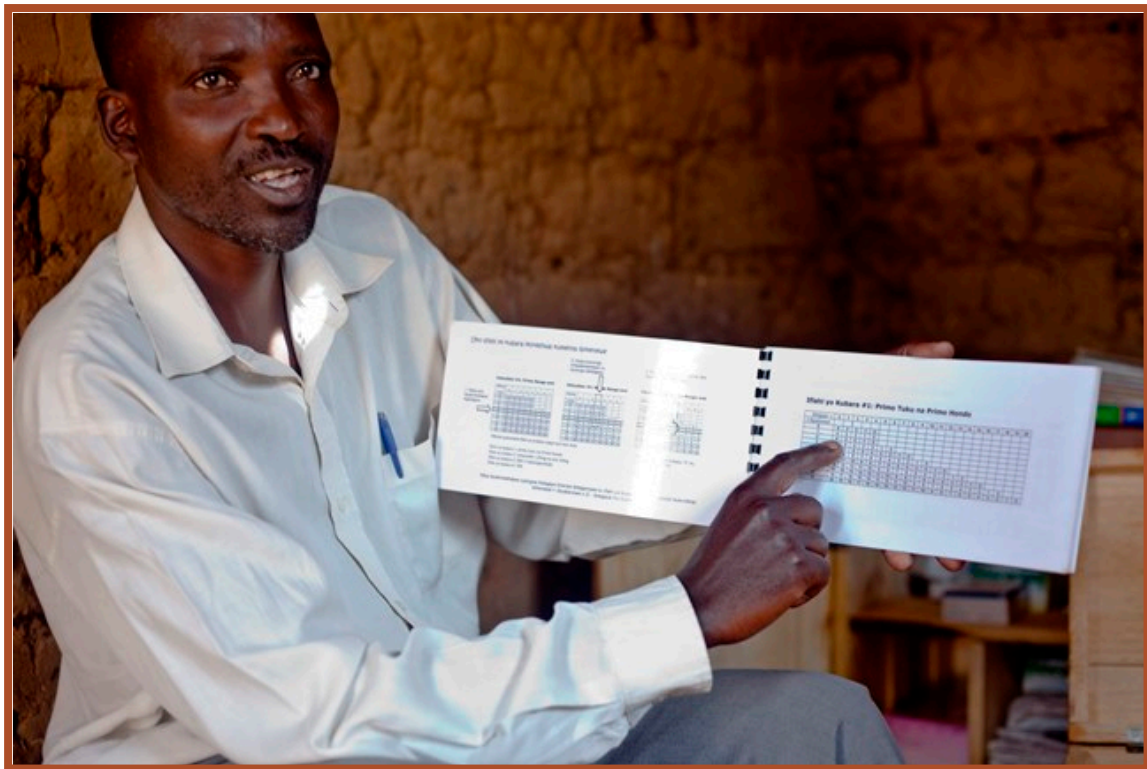


Rwanda

Community Health Supply Chain Midline Evaluation Report

April to May 2013



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SC4CCM Project

The Improving Supply Chains for Community Case Management of Pneumonia and Other Common Diseases of Childhood Project is funded by the Bill & Melinda Gates Foundation under grant agreement no. OPP1002868, beginning November 2, 2009. The grant is implemented by JSI Research & Training Institute, Inc. The project aims to demonstrate that supply chain constraints at the community level can be overcome, and that doing so may yield significant improvements in the effectiveness, scale, and impact of CCM. SC4CCM will identify, demonstrate, and institutionalize supply chain management (SCM) practices that improve the availability and use of selected essential health products for treating children under five in community-based programs.

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Cover photo: A community health worker meets with a child and her mother.



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Acronyms

ACT	Artemisinin-based combination therapy
BL	baseline
CCM	community case management
CC	cell coordinator
CHD	Community Health Desk
CHW	community health worker
c-IMCI	community Integrated Management of Childhood Illnesses
DiD	Difference-in-Differences
DOV	day of visit
DVW	data validation workshop
FGD	focus group discussion
HC	health center
HF	health facility
IMCI	Integrated Management of Childhood Illnesses
IcSCI	Incentives for Community Supply Chain Improvement
KII	key informant interviews
LIAT	Logistics Indicators Assessment Tool
LMIS	logistical management information system
LS	Learning Session
LSAT	Logistics System Assessment Tool
M&E	monitoring and evaluation
ML	midline
MOH	Ministry of Health
MPDD	Medicines Procurement and Distribution Department
ORS	oral rehydration solution
cPBF	community performance-based financing
PBI	performance-based incentive
QC	quality improvement collaboratives
QIT	quality improvement team

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RDT	Rapid Diagnostic Test
RSPs	resupply procedures
RSW	resupply worksheet
RWF	Rwandan Franc
SC	supply chain
SC4CCM	Supply Chains for Community Case Management
SOH	stock on hand
SOP	standard operating procedures
TOC	Theory of Change
TOT	training of trainers

Executive Summary

The Improving Supply Chains for Community Case Management of Pneumonia and Other Common Diseases of Childhood (SC4CCM) project, funded by the Bill and Melinda Gates Foundation and implemented by JSI Research and Training Institute, Inc. (JSI R&T), works to identify, demonstrate, and institutionalize supply chain (SC) management practices that improve the availability and use of selected essential health products in community-based programs.

In Rwanda, SC4CCM's objective is to collaborate with the Ministry of Health (MOH) Community Health Desk (CHD) to test new supply chain innovations and draw lessons on how to significantly and sustainably improve product availability at the community level and therefore enhance program effectiveness in reaching desired health program goals and outcomes.

In 2010, SC4CCM, in partnership with the MOH, conducted a baseline assessment of the community health supply chain. Based on the analysis of the baseline assessment results and consultations in country, an intervention strategy was designed for improving community health supply chains based on the following hypotheses:

- 1. Designing simple, standard procedures and tools for resupply of community health workers (CHWs) and providing appropriate training will establish the necessary foundation for a well-performing supply chain and ensure the success of subsequent efforts to improve product availability at the community level.*
- 2. Using a quality improvement approach to test innovations and generate local best practices that can be shared amongst peers in the supply chain will catalyze change in the performance of the supply chain and significantly improve product availability at the community level.*
- 3. Building on the success of the performance based incentive system at the community level in Rwanda by developing an incentive system to improve supply chain performance will significantly improve product availability at the community level.*

These hypotheses were translated into three interventions for significantly improving product availability at the CHW level:

- 1. Standard Resupply Procedures (RSPs)** – designed and introduced simple, harmonized tools and procedures to ensure that CHWs know when, how, and where to collect products. Only three simple tools are needed for the CHW resupply process: a stock card, the resupply worksheet (RSW) and the “magic resupply calculator” that the cell coordinator (CC) uses to record monthly stock data for CHWs and determine required quantities to inform the health center pharmacy. Standard Resupply Procedures were considered the foundation and cross cutting intervention, using simple tools and procedures designed to ensure that CHWs always have enough CCM products to serve clients.

2. **Quality Improvement Collaboratives (QCs)** – implemented a network of health center-based Quality Improvement Teams (QIT) to problem solve and determine how best to operationalize RSPs by identifying key challenges and local solutions. The QITs met monthly and used data collected by CCs from the CHWs in their cells during supervision visits to identify challenge areas, determine the root cause, and test activities to improve performance. The QITs tracked their performance from month to month and maintained successful practices. Once a quarter participants from QITs came together at district level Learning Sessions (LS) to share lessons learned from the previous quarters.
3. **Incentives for Community Supply Chain Improvement (IcSCI)** - tested an incentive system to motivate CCs and their CHWs for performance of supply chain tasks, mirroring the existing community level performance based finance system. A list of nine indicators was developed for the three priority supply chain areas: meeting attendance, reporting, and good inventory control procedures and CCs collected data on these from the CHWs in their cells quarterly for scoring. The indicators were weighted to reflect the level of priority of behavior necessary for improved performance of supply chain tasks.

The midline evaluation was conducted over six weeks in April and May 2013, 12 months after the last component of the learning phase was launched. The objectives of the evaluation were to assess and compare the impact of the two intervention groups (RSPs plus either QCs or IcSCI) against a group of four non-intervention districts, provide evidence about implementation and use of resupply procedures (RSP) as an effective system for resupplying CHWs, and allow the MOH to use evidence from the interventions tested by SC4CCM to identify successful SC practices to take action towards scaling up promising activities.

Key findings from the midline evaluation were:

- The resupply procedures were seen to be well implemented and achieved the objective of providing harmonized and more efficient processes to support product availability at the community level. Using CCs (rather than CHWs) as the target of this intervention allowed for easier implementation and follow up supervision.
 - Tools and processes were well understood, used, and followed
 - 86% of CCs who use the RSW are able to enter the correct quantity
 - 92% of CCs report all CHWs bring stock cards to cell meetings
- The QC intervention was well implemented and the QITs met regularly. The QIT process and LSs were considered valuable, especially as a means for improved coordination and problem solving across levels of the health system.
 - 100% of CHWs report receiving supervision, 90% citing at least once monthly visits
 - QIT meetings conducted as planned for all 3 districts
 - High availability and effective use of QIT tools by CCs and HCs
- The IcSCI intervention showed changes in performance in supply chain tasks, but change was not consistent across all indicators or districts tested. Only three indicators were seen to have significant change in all three districts.

- 79% of CCs showed copies of completed Supplemental SC checklists for the last quarter
- Product availability, as measured by CHWs with all five community case management (CCM) products in stock on day of visit, was significantly higher in the QC districts (63%) than the comparison districts (38%; $p < .001$), and non-significantly greater availability in the IcSCI group (45%) than non-intervention districts (38%). A significant decline was detected since baseline for this measure in the non-intervention districts (from 58% to 38%; $p < .01$).
 - The difference-in-differences (DiD) analysis confirmed that the significant improvement in the QC districts for this main project objective was plausibly attributable to the intervention ($p < 0.001$).

The midline data was presented to MOH national and district level staff at a National Data Validation Workshop held in Kigali in July. Participants at that workshop recommended the scale-up of the RSPs and QITs, with some modifications. Namely, the RSPs would be included within a broader, integrated training curriculum on CCM for CHWs and the learning session component of the QC intervention would not be implemented as tested due to high costs and resource requirements. Additionally, though not seen to be as effective as the QCs on improving product availability, participants recommended that one supply chain indicator be added to the community Performance Based Finance (cPBF) system in order to draw attention to the importance of supply chain tasks for CHWs. The major modification was that the RSPs would be included within the integrated training package for CHWs.

The results of this evaluation section support the project's hypothesis that to promote product availability at the community level standard resupply procedures were needed and the use of these could be strengthened by one or more additional interventions, in this case, the QCs. If implemented well, these have the potential to strengthen the community health supply chain and improve product availability of essential medicines throughout Rwanda and should be considered a priority to improve child health outcomes nationally.

Background

The Improving Supply Chains for Community Case Management of Pneumonia and Other Common Diseases of Childhood (SC4CCM) project, funded by the Bill and Melinda Gates Foundation and implemented by JSI Research and Training Institute Inc. (JSI R&T), will identify, demonstrate, and institutionalize supply chain (SC) management practices that improve the availability and use of selected essential health products in community-based programs. At the time of project inception in 2009, there was a lack of rigorous evidence to define the supply constraints on community case management (CCM) interventions; however, the widespread belief by experts in the field, supported by anecdotal evidence, was that programs are hampered by ineffective supply chains, that there could be better ways to ensure product availability within these programs, and that solving supply constraints may yield significant improvements in programs' effectiveness, scale, and impact. The project goal is to demonstrate, in three sub-Saharan African countries, that it is possible to overcome the supply chain constraints to effective community-based treatment of common diseases of childhood and bring effective interventions to scale.

Community based health services have played and continue to play a significant role in Rwanda in bringing health information, services, and commodities to clients who otherwise might not have reliable access to such goods and services. Community health in Rwanda is defined as health services provided by community health workers (CHWs) at the Umudugudu or village level. According to the Rwanda National Community Health Policy, community health is seen as a holistic and integrated approach that takes into account the full involvement of communities in planning, implementation and evaluation processes, and assumes communities to be an essential determinant of health and the indispensable ingredient for effective public health practice.¹

CCM, or community Integrated Management of Childhood Illnesses (c-IMCI) as its often called in Rwanda, is an important component of the community health policy and offers the potential to significantly increase uptake of, and access to, a variety of health commodities and services, for children under five. CCM is a strategy to deliver lifesaving curative interventions for common childhood illnesses in the community, in particular where there is little access to facility-based services.² Targeting the conditions that cause the most child death in developing countries, CCM brings curative health care to children in those communities that are hardest to reach.

Ensuring adequate supplies are available has not always been easy or successful and anecdotal evidence suggests that one of the biggest obstacles to providing quality community based treatment is the lack of, or ineffectiveness or inefficiency of, SC systems necessary to ensure availability of essential medicines at this level.

Strengthening the SC represents an essential part of the success of community based health services in Rwanda. Community health has inherent challenges that require unique SC considerations, including the educational level of CHWs, the location of the CHWs, and the lack of basic resources and facilities for storing and transporting products.

¹ National Community Health Policy, Ministry of Health Rwanda, 2008

² CORE Group, Save the Children, BASICS and MCHIP, 2010. *Community Case Management Essentials: Treating Common Childhood Illnesses in the Community*. A Guide for Program Managers. Washington, D.C.

In Rwanda, SC4CCM's objective is to collaborate with the Ministry of Health (MOH) and its CCM and SC partners to learn how to significantly and sustainably improve the availability of pediatric medicines at the community level. The project believes that learning how to achieve significant improvements in SCs for CCM and other products managed at the community level will lead to significant improvements in product availability to treat sick children at the community level.

A baseline assessment was the starting point to identifying the obstacles and gaps in the supply chain and developing simple, sustainable and affordable solutions to test and measure what interventions have the highest potential to significantly improve supply chain system performance at this level.

Summary of Baseline Results

SC4CCM, in partnership with the Rwanda MOH and the National University of Rwanda, School of Public Health, conducted a baseline assessment of the community health supply chain in September-November 2010. Results from the baseline were validated in consultation with health workers at all levels of the system and then used to identify chronic weaknesses in the community health supply chain. Intervention strategies were designed based on the premise that clear SC management procedures needed to be established as a foundational approach, and that subsequent improvements should then aim to result in significant rather than incremental change. An equally important characteristic, especially given the vast network of volunteer CHWs that exist in Rwanda, was that all interventions needed to be sustainable from a resource perspective if taken to scale. Developing the strategy was an iterative process, as the project consulted widely with MOH counterparts and local implementers at all levels of the system and concurrently performed analyses on the sustainability of the approach.

The key gaps identified during the assessment that were found to be influencing product availability among CHWs were:

1. Product availability at the resupply point was a factor in predicting product but was not the only predictor.
2. No standard operating procedures (SOPs) or standard formula for calculating resupply quantities for CHWs existed.
3. There was a lack of basic SC knowledge and skills among CHWs.
4. CHW supply chain data was not visible at any higher level of the system, therefore rendering it difficult to use logistics data for decision making
5. There was insufficient storage and organization for existing drugs and supplies.
6. There was a lack of motivation for CHWs to travel to collect supplies.

The baseline results indicated that only 49% of CHWs who managed all five health products used to treat three common childhood illness (pneumonia, malaria and diarrhea) had all five tracer medicines (amoxicillin, ORS, zinc, Primo Rouge, Primo Jaune) in stock on the day of visit (DOV), whereas 70% of ten district pharmacies surveyed had all five key products in stock on the day of visit, and 60% of the 85 health centers surveyed had them all in stock, indicating slightly better product availability at higher levels, though these products are only used at the CHW level.

However, this means that at baseline only about half of CHWs could provide the full range of services to treat any child who might present with one of the three illnesses.

Furthermore, when CHWs were asked what their greatest challenges in managing health products were, 33% responded a lack of remuneration, 27% insufficient transport, 11% storage containers, and 3% stated stock out at the resupply point. Almost 90% of CHWs reported that they travel by foot to the resupply point, with the remaining using bikes (10%) as mode of transportation. Almost 20% of the CHWs had insufficient storage for existing medicines and supplies.

Intervention Description

Based on the results from the baseline assessment and analysis within the context of the theory of change (TOC) (found in Appendix A), SC4CCM in consultation with the MOH and other in country stakeholders developed an intervention strategy for improving community health supply chains based on the following hypotheses:

1. *Designing simple, standard procedures and tools for resupply of CHWs and providing appropriate training will establish the necessary foundation for a well-performing supply chain and ensure the success of subsequent efforts to improve product availability at the community level.*
2. *Using a quality improvement approach to test innovations and generate local best practices that can be shared amongst peers in the SC will catalyze change in the performance of the SC and significantly improve product availability at the community level.*
3. *Building on the success of the performance based incentive system at the community level in Rwanda by developing an incentive system to improve SC performance will significantly improve product availability at the community level.*

These hypotheses were translated into three interventions for improving the performance of the community level supply chain:

The first intervention, **Standard Resupply Procedures (RSPs)**³, aimed to establish a solid foundation of procedures, tools and skills for the community level SC. The goal of the design was to keep the system as simple as possible while ensuring that CHWs always have enough products to serve their clients. The training approach relied on a cascade method where districts train appropriate health center (HC) staff and cell coordinators (CCs), who are primarily responsible for collecting and reporting logistics data and ensuring supplies reach all CHWs in their cells. Designating reporting and transportation responsibilities to the CC was a deliberate design decision aimed at promoting quality of logistics reporting and ensuring the training rollout is affordable for the public health system. To meet these objectives, requirements were condensed so that only three simple tools are needed for the CHW resupply process: a stock card, the resupply worksheet

Figure 1: Magic Calculator

Balance →	0	1	2	3	4	5	6	7
↓ Cons.								
0	4	3	2	1	0			
1	4	3	2	1	0			
2	4	3	2	1	0			
3	6	5	4	3	2	1	0	
4	8	7	6	5	4	3	2	1
5	10	9	8	7	6	5	4	3
6	12	11	10	9	8	7	6	5
7	14	13	12	11	10	9	8	7
8	16	15	14	13	12	11	10	9
9	18	17	16	15	14	13	12	11
10	20	19	18	17	16	15	14	13

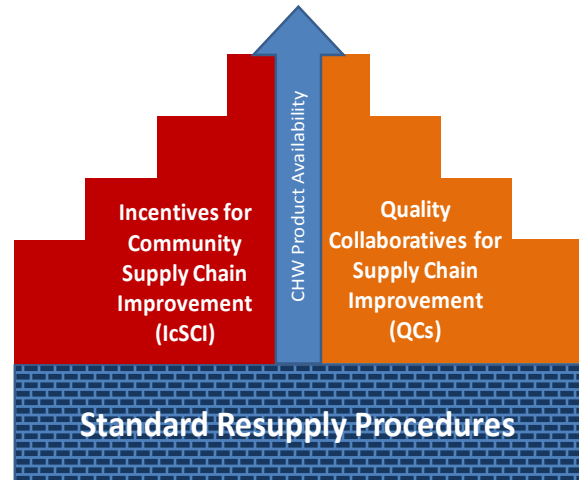
³ While the Standard Resupply Procedures on their own may only contribute incrementally to improvements in product availability, their successful implementation is expected to bring about the following outcomes: To lay the foundation for an efficient and effective supply chain by ensuring that staff responsible for performing supply chain roles have the necessary knowledge, skills and capacity, To improve data visibility and accuracy to the HC (resupply point) for effective decision making, To improve regularity of transport of products between HC and CHWs, To ensure that CHWs always have enough products to serve their clients, but don't significantly add to supply chain wastage by holding excessive inventory.

and the magic calculator (Figure 1).

Standard Resupply Procedures was considered the foundational and cross cutting intervention; CHWs were trained to use simple tools and procedures designed to facilitate information and product flow between CHWs and their resupply point, a critical prerequisite for ensuring that CHWs always have enough CCM products to serve clients (see Figure 2).

Strategically and purposefully, the second and third interventions built upon the first intervention and explored two different ways of implementing the RSPs with a view to significantly improving SC practices amongst CHWs and therefore product availability at the community level. In the second intervention, **Quality Improvement Collaboratives (QC)**, a network of Quality Improvement Teams (QITs) test innovations and generate best practices in how to close the gap between actual and desired SC performance as a way to catalyze system-wide change in the supply chain. The QC approach establishes quality improvement teams (QITs) at each health center (HC), comprised of HC staff and cell coordinators (CCs).

Figure 2: SC4CCM Interventions in Rwanda



Elements of the QIT process include:

- The CCs make home visits to individual CHWs, provide supportive supervision and gather data on selected performance areas.
- Individual QITs meet monthly at HCs to review the data the CCs collected and track progress against a pre-determined performance objective using simple tools. The process used by QITs during the Action Periods is the data driven Plan-Do-Study-Act (PDSA) cycle. Teams identify problems and solutions to implementing the RSPs and close performance gaps.
- District level staff provide coaching and/or supervision support during Action Periods for QITs and individual team members in the use of the QC tools, methods and use of RSPs.
- Quarterly Learning Sessions bringing together members of each QIT from a district to share learnings and experience from the past three months.

Within the QIT, HC staff and CCs took the lead in bringing CHWs associated with that QIT on board with the QIT/QC objectives. They supervised and coached CHWs on their performance of their resupply procedures, engaged the CHWs in identifying problems, made changes in their practice, and tested changes in order to better apply the RSPs. QIT members ensured data use and documentation of the QIT actions via simplified QIT tools to collect and analyze data, do a root cause analysis, develop a SMART (Specific, Measurable, Attainable, Relevant, Time-Bound) objective, create an action plan, and maintain a documentation journal.

QCs aimed to establish a network of health center-based quality improvement teams with shared objectives and indicators on how to best operationalize RSPs.

As part of the third intervention, *Incentives for Community Supply Chain Improvement*⁴ (IcSCI), the project designed an incentive system for motivating CCs and their CHWs to achieve supply chain performance targets for the SC tasks believed to have the most impact on product availability. Cell coordinators received a monthly allowance to contribute towards their telecommunication and transport costs related to supervising CHWs and the entire cooperative received a quarterly incentive based on the target levels achieved by CHWs in the cooperative.

IcSCI built on and aimed to strengthen the commodity SC portion of the existing community performance-based financing (cPBF) scheme for CHWs currently in place in Rwanda as a means of improving delivery of health services at the village level. Through the existing cPBF system, robust national structures are in place to implement, validate, monitor and evaluate existing schemes, and CHWs are organized into self-managed cooperatives. The incentive system worked by determining a key set of health indicators for cooperative members/CHWs to achieve; after submitting results every quarter, cooperatives received incentive payments from HCs related to their achievement levels. The objectives of this intervention were to:

- Improve performance in three priority SC areas by providing monetary incentives to CHWs through their community cooperatives if they achieve certain SC performance goals.
- Promote record keeping and use of data for decision making at district and lower levels.
- Reduce transportation and communication barriers by providing monthly allowances to CCs to help them stimulate changes in behavior of CHWs.
- Use the existing cPBF structure and processes to the greatest extent possible while implementing the IcSCI intervention to facilitate its integration into cPBF should it prove to be successful.

A list of nine indicators was developed for the three priority SC areas of meeting attendance, reporting and good inventory control procedures. The indicators have been weighted to reflect the level of priority of behavior necessary for improved performance of SC tasks at the community level, and to prevent “gaming” so that CHWs don’t hoard product (rather than dispensing to clients) in order to get extra points.

IcSCI aimed to build upon and strengthen RSPs by using the existing PBF scheme for CHWs to incentivize CHWs to improve supply chain performance.

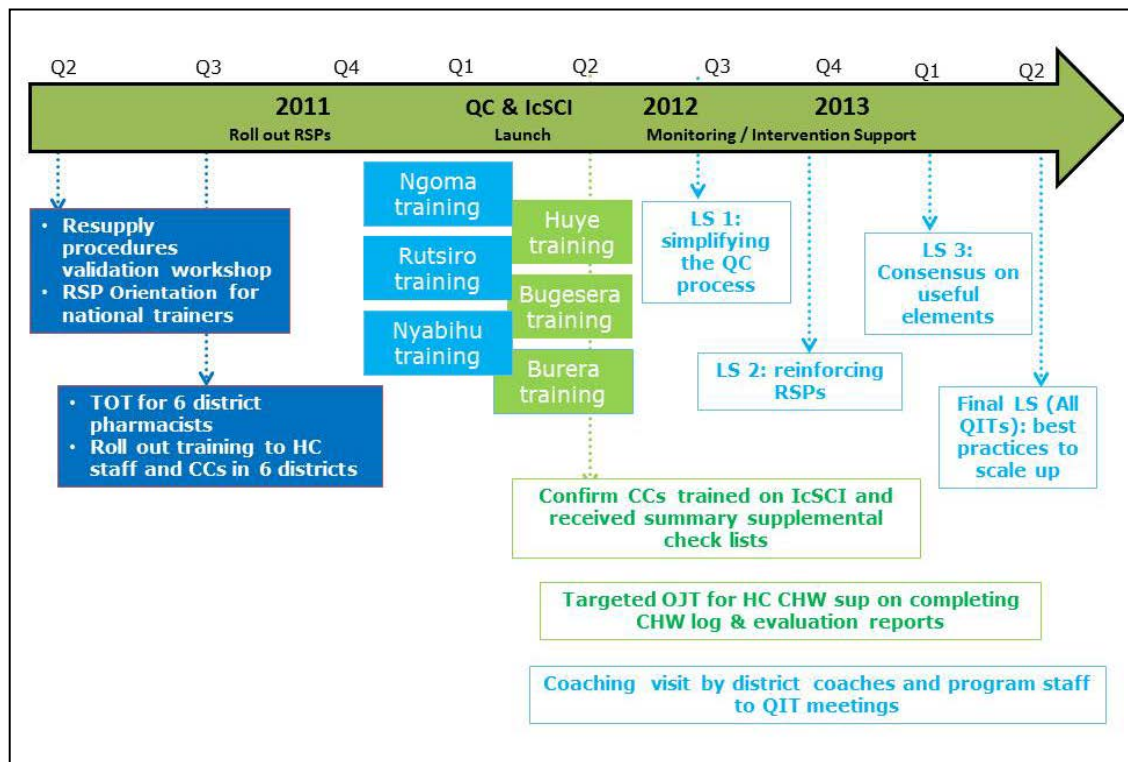
⁴ Successful implementation of the (IcSCI) intervention was expected to bring about significant improvements in product availability at the community level as a result of significant improvements or 100% attainment of the following indicators:

- The proportion of CHWs (binomes) who attend health center monthly meetings
- The proportion of CHWs for whom stock card data is included on all resupply worksheets
- The proportion of CHWs with stock cards for CCM products
- The proportion of CHWs with stock cards for CCM products where physical inventory matches stock card balance
- The proportion of CHWs with no expired CCM products
- The proportion of CHWs who have at least one treatment for a five year old child in stock, for each CCM product
- The proportion of cell coordinators who present complete resupply worksheets during monthly health center meetings
- The proportion of cell coordinators who presented complete resupply worksheets without any calculation errors during monthly health center meetings
- The proportion of cell coordinators who need products, who collect them for their cell from the pharmacy after health center meetings.

In addition to these three interventions, SC4CCM worked at the national level to establish, support and build capacity in quantification and supply planning for CCM products. Recognizing that product availability at the national level – or first mile of the supply chain – was a critical prerequisite for ensuring product availability at the community level, SC4CCM took a catalytic and advocacy role in resource mobilization and coordination for CCM commodity security, with an emphasis on pediatric- and supply chain- friendly products. The purpose was to ensure that appropriate CCM products for CHWs were effectively quantified for and that sufficient funding could be made available for their purchase by working with the MOH to create systems for identifying and sharing important information on product need, supply plans, and any availability gaps between donors and partners at the national level to support commodity procurement.

These RSPs were formally launched by the project, in collaboration with the MOH, in six districts in 2011 (see Figure 3). In early 2012 the other two interventions were launched in three districts each. The QC approach was implemented in Ngoma, Nyabihu, and Rutsiro districts, while the IcSCI approach was implemented in Bugesera, Burera, and Huye districts.

Figure 3: Intervention Timeline



Purpose of the Midline Evaluation

The comparison of baseline and midline community level product availability data, as well as other key logistics indicators, was intended to show impact of two SC interventions (QC, IcSCI) against a group of four comparison districts. The evaluation provided evidence regarding the success of the standard CHW RSPs and their supporting interventions in improving community level product availability in Rwanda. Finally, the midline assessment provided rigorous evidence around the interventions tested by SC4CCM in order to both support the MOH of Rwanda to take action towards scaling up promising activities and for consideration by country programs outside of Rwanda that seek to improve supply chains for CCM.

Objectives of Midline Evaluation

1. Assess and compare the impact of the two intervention groups (QC, IcSCI) on improving SC performance at the community level against a group of four baseline but non-intervention districts
2. Provide evidence about implementation and use of RSPs as an effective system for resupplying community health workers
3. Use evidence from the interventions tested by SC4CCM to identify successful SC practices to support the MOH to take action towards scaling up promising activities.

Primary Outcomes To Be Measured

CHWs have usable and quality essential medicines available when needed for appropriate treatment of pneumonia and other common diseases of childhood. A full list of core indicators is attached in Appendix B.

Methodology

The midline evaluation used a combination of qualitative and quantitative evaluation methods to do extensive analysis of conditions after implementation in order to identify the most promising interventions in each country. Assessment tools developed by JSI under the first USAID | DELIVER PROJECT and validated through extensive use in a wide variety of countries worldwide were tailored for the SC4CCM data requirements.

Qualitative

Logistics System Evaluation Tool and Key Informant Interviews

One qualitative instrument that was applied is called the Logistics System Assessment Tool (LSAT). The LSAT is normally a two day group discussion covering all areas of a logistics system with questions that can be scored and tracked over time as indicators. For the purpose of the Rwanda midline, the LSAT tool was adapted for several small group discussions with key informants around targeted areas that directly affect the supply chain for CCM commodities. Topics stem from the original LSAT tool and include quantification, procurement and financing of CCM commodities. Additional qualitative data was collected from stakeholders through key informant interviews (KII).

Focus Group Discussions

SC4CCM held six focus group discussions (FGDs) with approximately ten participants each at the HC level, one in each of the intervention districts, on topics related to the interventions. These FGDs were intended to delve into CHW, CC, and CHW Supervisor opinions on the intervention design and impact on the supply chain. For the QC districts this included eliciting information on lessons learned from the process - what worked, what did not work - and identification of SC best practices for potential scale up. The FGDs aimed to identify the change(s)/practice(s) from each HC that had the greatest contribution on SC performance and product availability. For the IcSCI districts, the FGDs gathered feedback on the impact of SC performance incentives including their perceived influence on motivation, behavior change related to SC practices, and ideas for continued use/adaption in scale up phase.

Quantitative

Logistics Indicators Evaluation Tool (LIAT)

The Logistics Indicators Assessment Tool (LIAT) was the primary quantitative tool used for the midline. The LIAT is a well-known tool for assessing stock status and other quantifiable aspects of a SC. It has been modified to focus on community level SC issues and for the Rwandan context. LIAT forms also provided the basis of regular project monitoring by SC4CCM's in-country staff. Data to measure core indicators (Appendix B) were collected by the LIAT through structured interviews with CHWs and with health facility and/or warehouse staff at all levels of the system. The data collection also included physically counting the amount of key CCM products kept at each level of the system (including stock kept by the CHWs), storage conditions, and certain aspects of record keeping and reporting.

LIAT data were collected in May 2013, one year and six months after the RSP intervention was launched and a year after the QC and IcSCI interventions were initiated. Data collection forms were formatted to a web-based program called Magpi (formally EpiSurveyor) and loaded onto Nokia e71 and e63 smart phones. Forms were pre-tested, updated and re-loaded for the survey. Data were uploaded directly from phones to the Magpi database on a daily basis, eliminating the need for paper questionnaires and streamlining the data entry process.

SC4CCM worked with a local evaluation partner in Rwanda, CRT Regional LTD, to collect data. This partnership helped to improve efficiency and build local ownership of the results and promote data collection capacity. The role of the local partner was to oversee the LIAT fieldwork and conduct and transcribe notes from the FGDs.

The same regions and districts sampled for the baseline were purposefully visited for the midline (Figure 4). The criteria for district selection included: areas where the project worked and some areas where it would not; presence of a range of CCM partners and interventions, including partners with whom SC4CCM worked most closely; and appropriate geographic, socioeconomic, and cultural variation. Of ten baseline evaluation districts, six were randomly grouped for testing interventions:

- | | | |
|-------------|---|-------|
| 1. Huye | } | IcSCI |
| 2. Burera | | |
| 3. Bugesera | | |
| 4. Rutsiro | } | QC |
| 5. Nyabihu | | |
| 6. Ngoma | | |

The other four districts visited at baseline received no intervention:

1. Musanze
2. Ruhango
3. Rwamagana
4. Gasabo

Figure 4: Intervention Districts

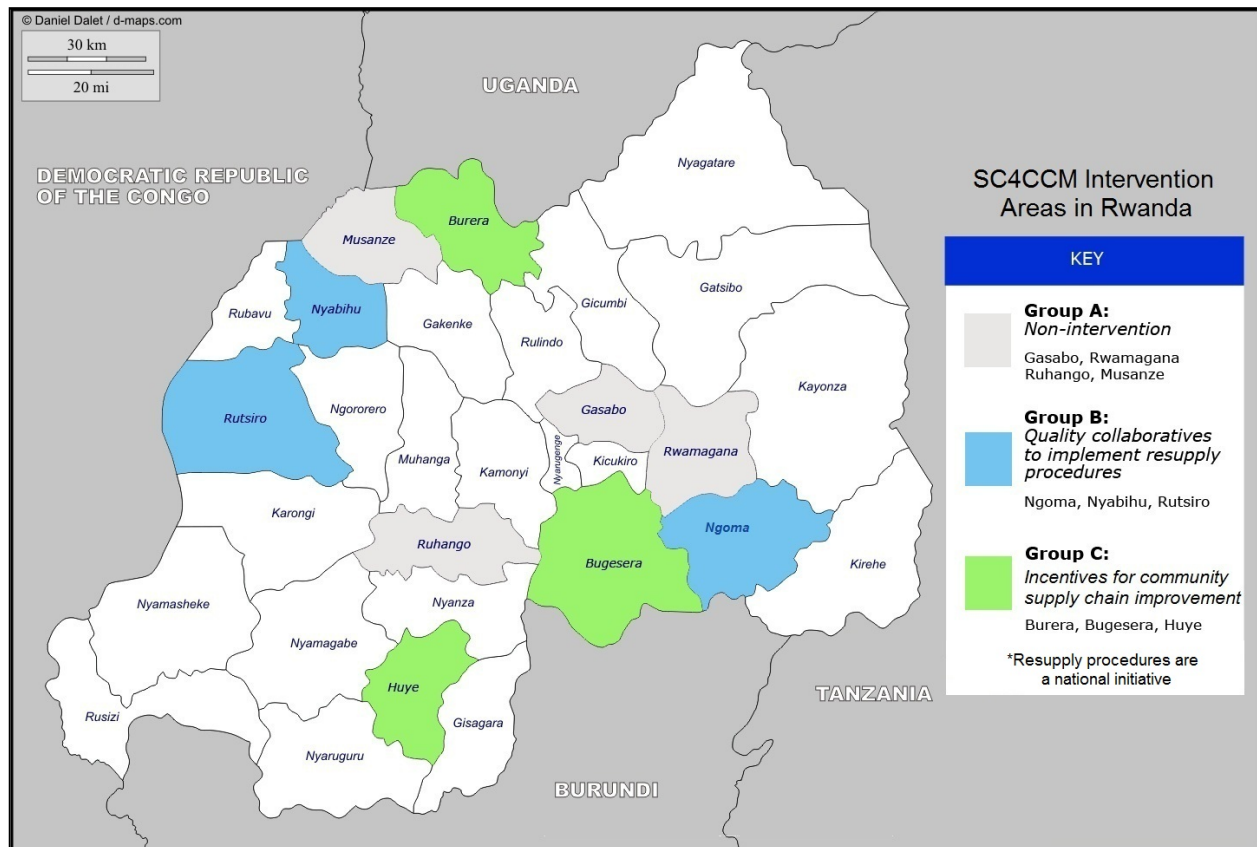


Table 1: Sample size by intervention group, baseline and midline

	QC		IcSCI		NI		Total	
	Ngoma, Nyabihu, Rutsiro		Bugesera, Burera, Huye		Gasabo, Musanze, Ruhango, Rwamagana			
	BL	ML	BL	ML	BL	ML	BL	ML
District	3	3	3	3	4	4	10	10
Health Center	30	31	31	37	39	40	100	108
CCs*	NA	70	NA	78	NA	NA	NA	148
CHWs	85	105	102	116	134	128	321	349

*Cell Coordinators were active participants in SC4CCM interventions, but otherwise have no role in CHW resupply. Therefore, the survey interviewed CCs in intervention districts at midline only.

Analysis

Quantitative Data

Quantitative data from the LIAT survey were analyzed to understand changes in product availability and other key supply chain performance indicators. It was also used to investigate whether changes could be attributed to the interventions implemented.

CCM product availability on the day of visit was analyzed both for individual products (amoxicillin 125 mg tablets, Primo Rouge tablets (ACT 1 x 6), Primo Jaune tablets (ACT 2 x 6), ORS sachets, and zinc 10mg tablets, Rapid Diagnostic Tests [RDTs]), and as a bundle (e.g. “all 5” products). The bundle “all 5” indicator did not include RDTs because tests were not widely available or mandated for use in the CCM program at the time of the 2010 baseline. The core indicator “all 5 products in stock” is the “gold standard” for CHWs in Rwanda, as the ultimate measure of success for the CCM supply chain reaching down to the community level.⁵

Using a difference-in-difference design data were analyzed to understand if any portion of change in product availability over the intervention period was attributable to the interventions by comparing baseline to midline figures between the intervention and non-intervention groups. Districts chosen at the beginning of the project were matched into intervention groups as much as possible in terms of geographical and demographic characteristics and other external dimensions, in an effort to make the groups as similar as possible to control for outside influences and ensure the product availability at baseline was approximately at the same point in both groups. As a result any total change in product availability less natural changes over time minus change attributable to external factors (that also appeared in the non-intervention group), were considered as the change attributable to SC4CCM interventions.⁶

⁵ At the baseline, alternate formulations of two tracer drugs were used by the CCM program. Amoxicillin 250 mg tablets were used instead of 125 mg tablets, and zinc 20 mg tablets were used instead of 10 mg tablets. For the purpose of this midline, those commodities were considered as same over time, since they were used to the same end. Several non-CCM tracer products, such as those used for family planning services, were included in baseline but not midline for comparison analysis.

⁶ Other forms of quantitative data contributed to the midline such as quarterly performance scores from the incentive database for all IcSCI districts and support checklists at the health centers.

The project also looked at the incentives scores and payment amounts collected over four quarters in the incentives database created for the IcSCI districts. This data was available by HC for all nine indicators by quarter across the year of the intervention.

Qualitative Data

SC4CCM systematically analyzed qualitative data from the midline evaluation activities. For FGDs, notes-based analysis was used following each session. Results from multiple focus groups were synthesized into narratives that link directly to project indicators and highlight discussions pertinent to successful implementation. Focus groups were used as appropriate to further explore or clarify aspects of indicators that are normally collected quantitatively. For example, HC staff were asked about the use of the new procedures for CHW resupply.⁷

Data Validation Workshops

Data Validation Workshops (DVWs) were conducted with stakeholders from all levels of the community health supply chain. During this workshop, participants explored the results from the evaluation to validate and provide additional interpretations of the results. Then based on the results and their experiences with the intervention they identified an intervention package for scale up. The additional interpretations of the results are included in this report to add *depth* to the data. Three DVWs were conducted; one for each intervention group that explored the specifics of the intervention and then one national workshop that looked at the results across the three intervention groups and develop one recommendation for the country.

Use of Information

Rwanda's intervention strategy emerged from a comprehensive baseline assessment that helped identify major priorities and develop a TOC model (see annex A) to strengthen supply chain management systems to support CCM for child health. Results of the midline evaluation have been used to evaluate the success of supply chain strengthening interventions and validate the TOC. These results shared with all stakeholders for the CCM system in Rwanda and their input solicited in identifying promising interventions for scale up.

This midline evaluation provided the comparison point with which to measure the impact of supply chain interventions on improving product availability at the community level. Results were considered in conjunction with program records review, focus groups and routine monitoring and evaluation (M&E) data that has been collected throughout the life of the project.

Limitations

- Non-intervention districts did not roll out the standard RSPs as planned, therefore the midline results cannot separate the effect of RSPs from other two intervention components.
- Shortages of ACTs early in 2013 may have impacted incentive scores where in-stock was included; however, scores were overridden when stockouts were caused by national shortages (because the ACTs were not included in the scoring scheme).

⁷ Other forms of qualitative data were used during implementation that also fed into the qualitative dataset, such as the feedback from learning sessions, self-assessment surveys, verbal voting exercises.

Tracer Product List for Midline Evaluation

The following products were used as tracer indicator products during the evaluation:

- Amoxicillin 125 mg tablets
- ORS sachets
- Zinc 10 mg tablets
- Primo Rouge tablets (1x6)
- Primo Jaune tablets (2x6)
- RDTs

Results

The following results of the Rwanda midline data are presented by first showing data specific to the implementation of the different components of the intervention strategy – standardized resupply procedures, quality collaboratives and incentives for community supply chain improvements. Although RSPs were an integral element of both interventions, some results are presented separately to demonstrate the ability of these procedures to meet our objective of creating a robust, easy to use system to harmonize how CHWs receive products and improve data visibility. Finally, results from the QCs and IcSCI interventions are compared to the control group in relation to supply chain performance.

Data presented here is a combination of survey data, FGDs, analysis of the incentives database, and feedback during DVWs in country.

Context

Key informant interviews and the LSAT were used to collect data on the contextual changes that occurred in Rwanda and in the CCM program during the course of the intervention period. In reviewing the results of the midline evaluation it is important to understand the context and factors that may have influenced the implementation of this study design and the results presented here. For example, in non-intervention sites, all districts did not roll out the standard RSPs as originally planned.

At the national level, there were changes in specific product dosages for CHWs, for example at baseline, CHWs used amoxicillin 250mg for the treatment of pneumonia, and by midline national policy had changed so that CHWs were provided with 125mg tablets of amoxicillin instead. Similarly, at baseline CHWs had 20mg tablets of Zinc and at midline the dosage had been changed to 10mg tablets. Along with the changes in product strengths, a new drug box was introduced, which may have affected storage practices. While the midline assessment made adjustments for the changes in products, it did not examine whether the change in dosing had supply chain implications or prescribing implications.

Resupply Procedures (RSP)

Intervention Description and Intervention Support

Developing standard resupply procedures involved first coordinating with the Community Health Desk (CHD) of the MOH as well as ensuring that consistency and flow with the existing supply chain procedures from the HC to central level occurred. The project team worked with CHD to understand typical product use and demand patterns at the CHW level and then translated these into recommended resupply quantities, calculated based on consumption from the past month. The procedures were then validated by users and stakeholders in a review workshop and finalized accordingly.

Documents were developed that clearly outlined the system and procedures and contained roles and responsibilities and job aids that provided step by step instructions for each task. The job aids were intended for use by district and HC staff but were designed primarily with visuals to be appropriate for CCs use as well.

A training of trainers (TOT) was conducted for district pharmacists in all six focus districts in the second half of 2011. District pharmacists then rolled out the system through cascade training of HC pharmacy staff, CHW Supervisors and CCs. In designing the intervention it was decided that the CCs would be the key link between the CHW and the HC level and be the target of training from both a cost and effectiveness perspective. The resupply function would be more effective if HC pharmacy staff only had to resupply 8-10 CCs rather than 100+ CHWs, and training ~3000 CCs would be much less costly than training 30,000 CHWs on the intervention. Therefore CCs were the only types of CHWs that were trained on the RSPs – other CHWs relied on the CC to make the system work, and were responsible only for bringing stock cards to their monthly meetings with cell coordinators⁸. The key tools employed by the CC were the stock cards, RSW and the magic calculator (also known as the *fiche de calcul*). All trainees were provided with tools (e.g. job aids, RSWs) to enable the new procedures to be operationalized.

The monthly process is that CHWs and their CC meet as a cell before monthly meetings at the HC. At this cell meeting, CHWs bring their stock cards, the CC reviews them and records their consumption for the past month and stock on hand (SOH), and uses the magic calculator to determine how much of each product each CHW needs. The CC then aggregates the data for each product on the RSW, gives this aggregated order to the HC Pharmacist to prepare, and then after the HC meeting, receives the resupply order for the cell and distributes products to CHWs, per the quantities each needed.

Stock Card Availability and Use

The availability and use of stock cards on the day of visit (DOV) was higher in the intervention groups (see Figure 5), pointing to the importance of the supplemental interventions (described below) to ensure the RSP is adopted and well implemented along all levels of the supply chain. Stock cards existed before the RSP intervention, but the intervention has clearly increased the use of stock cards. With the exception of Primo Jaune (ACT 2x6), for which stock card availability in QC districts was about the same as non-intervention districts, CHWs visited in the intervention groups had significantly greater availability of stock cards for all products compared to non-intervention at midline.

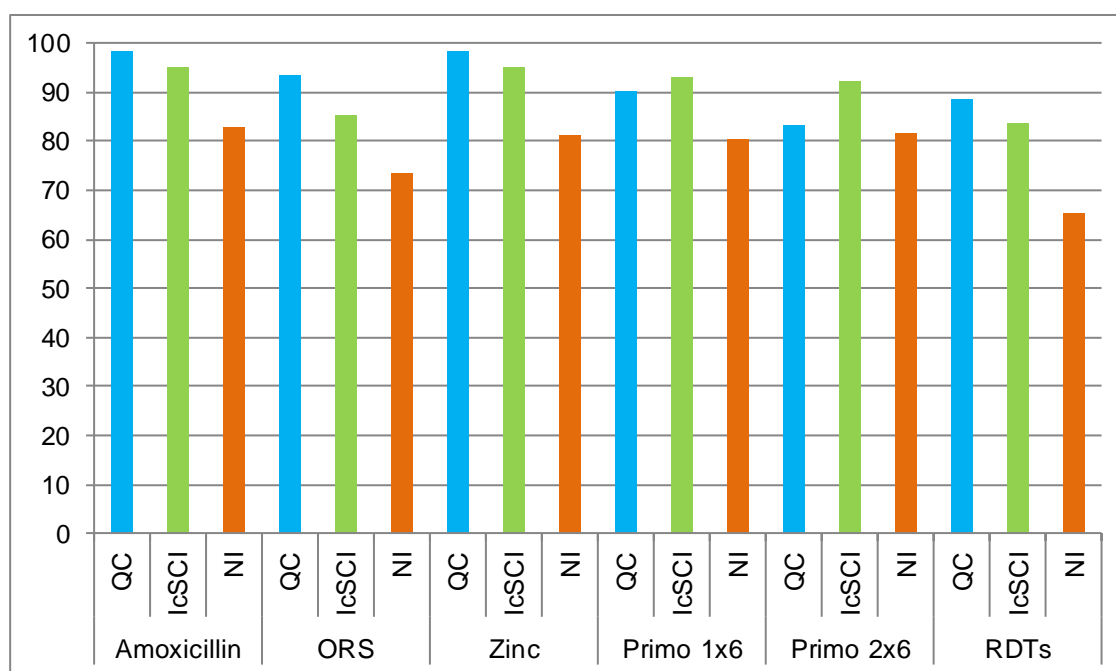
In addition to examining stock card use, the midline looked at the frequency of cell meetings and what occurred in those meetings. All (100%) CCs interviewed reported holding regular cell meetings to compile stock data. All CHWs reported attending such meetings. At those meetings most CHWs (92%) brought the stock cards to the meetings. Almost none of the CCs interviewed (99%) reported having any problems completing the RSW for the cell they are responsible for prior to the monthly meeting.

Resupply Determination

The RSP intervention was designed with the premise that the CC would work with the data collected to determine the resupply quantities for the CHWs in their cell. At midline it appears that CCs are indeed doing that in the QC districts (91% of the time) and IcSCI districts (86% of the time), but in non-intervention sites there was much more variation in response of who

⁸ This could take place at their home or other convenient location on a monthly basis.

Figure 5: Percent of CHWs with stock card by product on DOV



calculated resupply quantities (only 18% of CHWs reported that CCs determined their resupply quantity), which would be expected given that the RSP intervention had yet to be implemented in the comparison districts.

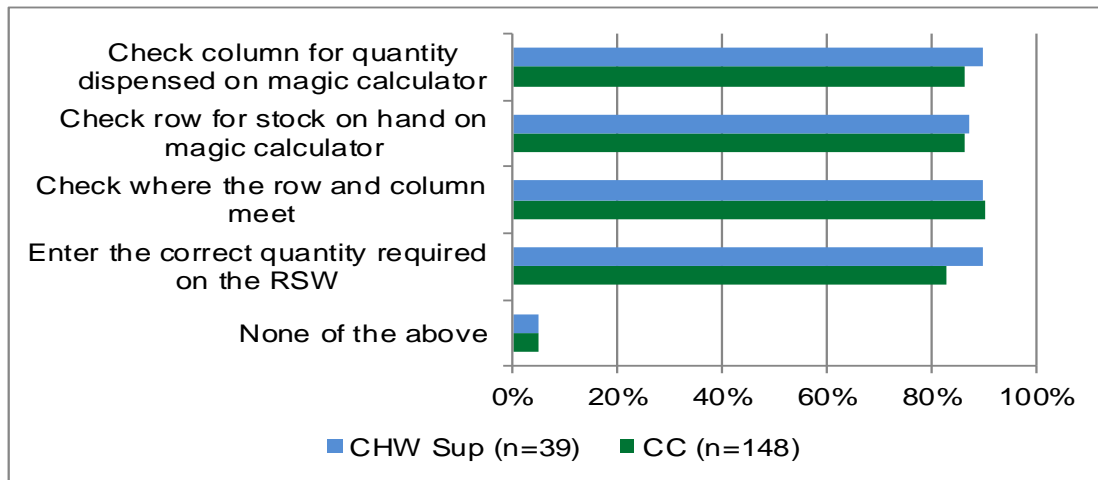
A higher percentage of CHWs in the intervention districts also reported receiving resupplies every month (77% in QC and 83% in IcSCI) than CHWs in non-intervention sites (64%). When asked how the resupply quantities were determined, CHWs in the intervention sites were more likely to report use of the magic calculator than those in the non-intervention sites (50 and 53% in QC and IcSCI districts, respectively, compared to 17% in non-intervention districts). Still, the use of the magic calculator was much lower across the board than was expected; this may be because the question was asked of CHWs not the CCs who actually use the magic calculator, so the CHWs may not either know about it or may not know its name. The data gathered during the FGDs indicated that CCs in intervention districts used the magic calculator regularly and appreciated not having to determine the quantities themselves for each CHW.

“The fiche de calcul is like a bible to us...it tells us what the CHW needs exactly. And the CHW knows it’s the exact amount required because s/he can read it.”(Pharmacy Manager, Nyabihu)

Competency in Using Resupply Worksheet

The interviewers asked CCs and CHW Supervisors to show how they calculated quantities required for CHWs and observed how CCs and CHW Supervisors completed the RSW. They found high levels of competency among the four key steps required for completion of the RSW using the magic calculator: 1) check the column for the quantity dispensed on the resupply worksheet; 2) check the row for SOH on magic calculator; 3) find where the row and column

Figure 6: Percent of CCs, HC CHW Supervisors using the RSW correctly



intersect on the magic calculator (resupply quantity); and 4) enter the correct resupply quantity on the RSW (see Figure 6).

Of the 148 CCs surveyed, 83% were able to enter the correct quantity required (see Figure 7). There was very little difference in competency among CCs with regards to the RSW between QC and IcSCI groups.

Resupply Process at the Health Center

On the DOV, almost 70% of HC Pharmacy Managers had copies of the RSWs from all cells associated with their HC, while an additional 26% had copies from at least some of their cells (see Figure 8). It should be noted that there was wide variation on this indicator amongst districts in both intervention groups.

As many as 95% of CCs reported picking up products for the CHWs in their cell immediately after the monthly meeting (as was considered ideal per project design). Also following intervention design, most CHWs reported receiving products from their CC (93%). As intended, the CCs played an important role in coordination of resupply data and were the primary source of resupply products for the CHWs.

Figure 7: Percent of CCs able to complete the RSW for the cell prior to the last HC meeting

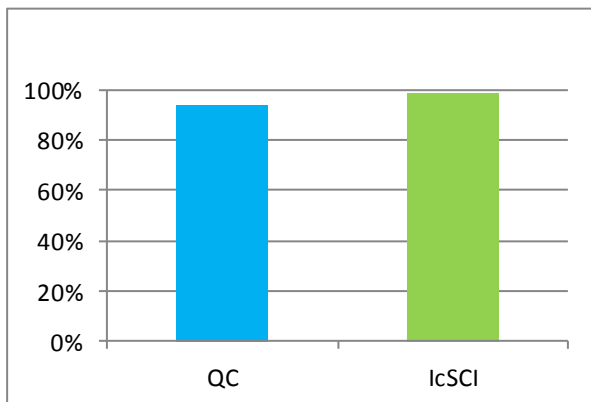
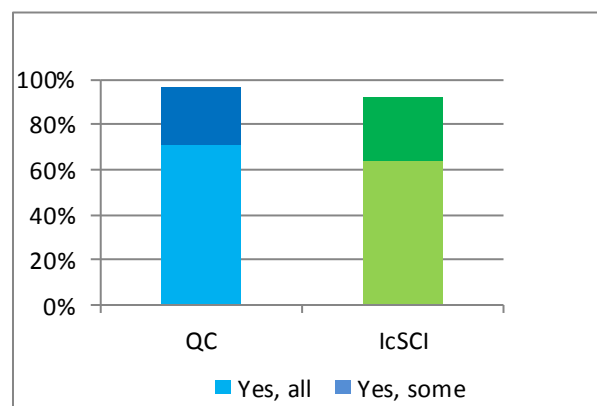


Figure 8: Percent of HCPMs with copies of RSWs from cells



The evidence demonstrates that the RSP process created a strong foundation for good stock management and well founded decisions about resupply quantities. The data collected indicates that the process was well implemented at all levels and appears to have alleviated confusion in how CHWs received supplies (as articulated in this quote from a focus group discussion below). Per the design, CCs were able to play an important role in the coordination of resupply data and process and were the primary source of resupply for CHWs, reducing the number of unnecessary trips to the HCs. The tools were available and for the most part used correctly and the additional monthly meetings between CCs and the CHWs in their cells happened as expected. All of these findings support the result that more regular monthly resupply processes were seen in the intervention districts compared to the non-intervention districts, as would be expected knowing that there was no standardized RSPs for CHWs in place.

“[Prior to RSP implementation] it was jungle law and often many CHWs went away empty handed. The quick ones took away too many drugs which kept expiring in the community...As a result of all this confusion; [we] were in constant conflict with pharmacy staff...now...total harmony reigns between us and the pharmacy staff. No unnecessary drugs are expiring.” (CHW Supervisor, Ngoma)

Quality Collaboratives (QCs) – Health Center Quality Improvement Teams

The objective of this intervention was to test a quality improvement collaborative approach by implementing quality improvement teams at the HC level to find solutions to challenges in operationalizing resupply procedures at the CHW level, and share best practices through a peer-to-peer learning approach.

The QC approach establishes QITs at each health center comprised of three key HC staff and the CCs associated with the HCs (usually 7-10 CCs per HC). QIT members use data collected from CHWs in their cells to identify performance gaps between desired and actual performance in use of the product RSPs and then try to close those gaps by testing activities, tracking performance over time, and maintaining practices that improve performance. One performance objective is selected quarterly and the QIT identifies activities to address that objective and tracks performance month to month over the quarter.

Key elements of the QIT process include:

- **The CCs make home visits** to individual CHWs, provide supportive supervision, and gather data on selected performance areas using a standardized supervision checklist.
- **QITs meet monthly at HCs** to review the data the CCs collected and track progress against a pre-determined performance objective using simple tools. The process used by QITs during the monthly and quarterly meetings is the data driven *Plan-Do-Study-Act* (PDSA) cycle. Teams identify problems and solutions to implementing the RSPs and measure performance to close gaps.
- **District-level staff provide coaching** and/or supervision support during the quarterly action periods for QITs and individual team members in the use of the QC tools, methods and use of RSPs.

QITs included HC staff – CHW Supervisors, Pharmacy Store Managers, Data Managers – and the CCs associated with that HC. District staff – including the District Hospital M&E Officer, M&E Officer from Mayor’s Office, District Pharmacist, District Data Manager, and District CHW Supervisor provided support and oversight to the QITs in their district.

Intervention Description and Intervention Support

The QC approach involved training QIT members and coaches on their respective roles, setting up the parameters for monthly QIT meetings, establishing a mechanism for distributing facilitation allowances to CCs to assist with monthly data collection and to district coaches to facilitate their coaching responsibilities, and determining the purpose and agenda for the quarterly learning sessions (LS) (Figure 9).

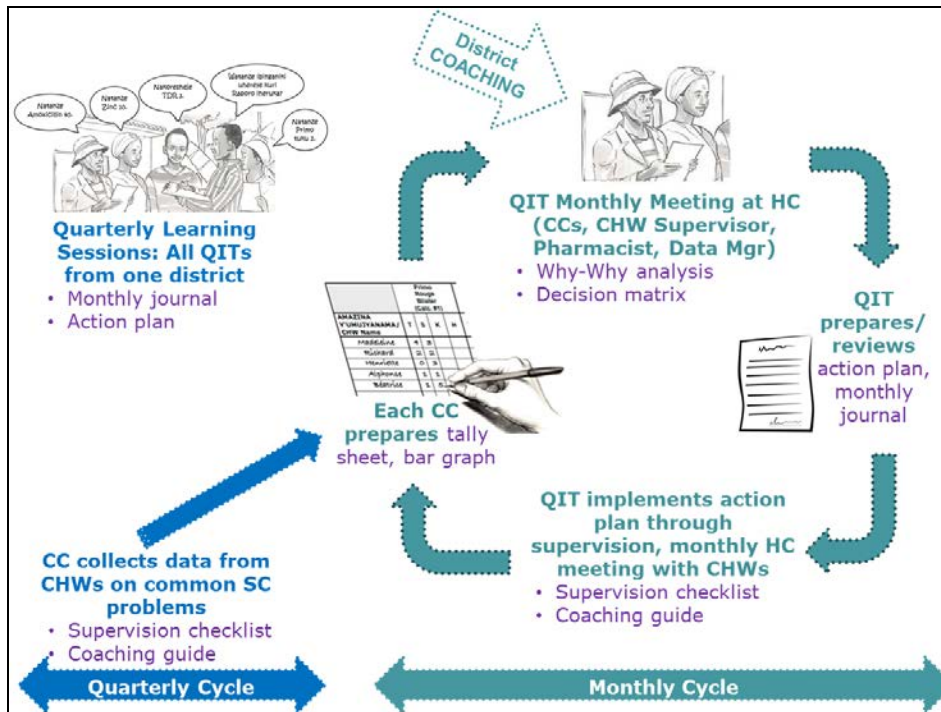
Materials to support a five day training for 100+ members in each of the three districts were developed, including manuals and guides and six different tools to be used in data collection, and monitoring and evaluation of the QIT progress by its members. The training strategy and plan, and the design of the launch workshop, were designed and implemented to meet the needs of both the QITs and the district coaches. All participants in the QC intervention sites developed a shared understanding and basic knowledge and skill set relevant to the basics of quality improvement (including data collection and management) so that they could take part in the QITs, and the larger QC approach.

All QIT members and additional district staff participated in the five day workshop, although CCs only attended two of the five days, so as to simplify their role and comprehension of the intervention. Three workshops consisting of QIT members from four HCs each were held to launch the QC in Ngoma; three workshops with QIT members from five HCs each were held to launch the QC in Nyabihu; and three workshops to accommodate 17 HCs were held in Rutsiro.

After the training and kick off of the intervention, project staff followed up and conducted joint coaching visits with district staff to the monthly QIT meetings at each HC. Each quarter of work on one objective culminated in quarterly LSs at the district, where a selected number of staff from each QIT participated to share their lessons learned, challenges, and identified good practices.

During the first quarter it became evident that some of the QIT forms and tools were too complicated and the monthly QIT meetings were running much longer than anticipated. In response to these concerns, SC4CCM worked with the MOH to simplify the tools and develop a guide on how to hold an effective meeting. These streamlined tools and processes were introduced to QITs and district coaches from all three districts at the first LSs held at the end of the first quarter.

Figure 9: Diagram of QIT process



Supervision

Supervision is a key component of the QIT approach because this is the source of the data that the QITs use to measure performance. The CC is supposed to use a standard supervision checklist to supervise all CHWs in their cell at least once a quarter. These checklists are intended to be used to identify and anticipate any supply chain problems. In the QC districts, 99% of CCs reported visiting all CHWs on a quarterly basis and collecting the required supply chain data. To confirm CC’s recall of the quarterly visits, CHWs were also asked if they received supervision. All (100%) interviewed CHWs reported receiving supervision, with as many as 90% stating the supervision visits happened at least once a month. The corroboration between supervisor (CC) and supervisees (CHWs) further strengthens these reported results. Supporting the quantitative data, in interviews CHWs often stated how much they appreciated the CCs supervision visits. CHWs perceived these visits as greatly improving overall communication between the CHW and the HC—with the CC as the link between the two. The CHWs also said that CC visits help reinforce RSP adherence. As stated above in the intervention description, monthly allowances were provided to the CCs to facilitate supervision visits.

“The facilitation [allowance] was very important in helping conducting regular supervision visits. Without this facilitation, it will be almost impossible to sustain the QC approach in our district.” (CHW Supervisor, Rutsiro)

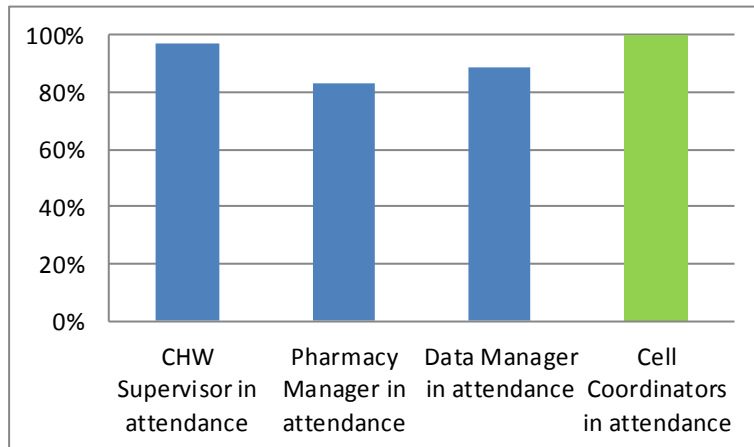
“Supervision visits are the foundation of the QIT approach.”

Monthly QIT Meetings

The QITs met monthly at the HC. At these meetings the teams would use the QIT tools (tally sheets, bar graphs, decision matrix, why-why analysis, action plan, monthly journals) to identify

a performance gap, develop an objective for improvement, and agree upon activities to match the objective, which are documented in an action plan. At following meetings in the quarter the team would assess their progress towards the supply chain objectives for improvement and whether their activities were having the desired impact of if they needed to try something else. District coaches also attended the monthly QIT meetings.

Figure 10: QIT members present at QIT meetings



The following team members would attend the QIT meetings: CHW Supervisors, pharmacy store managers, data managers, district coaches and CCs. As shown in Figure 10, there was high attendance at the QIT meetings, with CCs attending 100% of the time and pharmacy managers attending slightly above 80% of the time (still quite high). Overall, 75% of expected members attended a given QIT meeting. The high attendance and the regularity at which the group

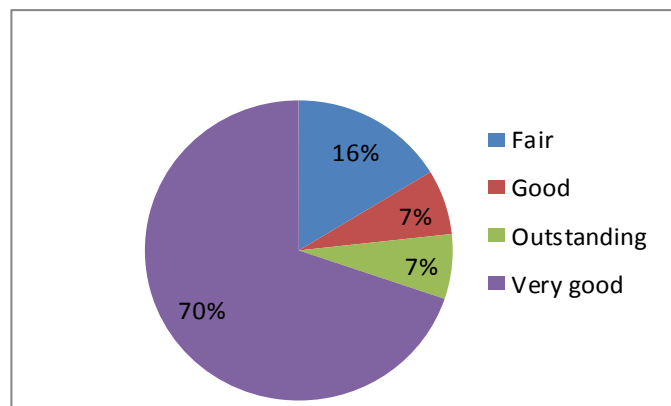
met appear to have contributed to better learning, trust and problem solving. Overall the QIT process had a positive effect on strengthening team relationships as well as on supply chain practices. These meetings were very highly valued, with over half of the QITs in the QC districts meeting after the final LS (in other words, after SC4CCM was no longer supporting the intervention).

“...the QIT has built such a good relationship along the entire chain. For me the biggest prize has been to learn how to work on plan and be able to achieve it every month.”
 (Pharmacy Manager, Ngoma)

District Coaching

As mentioned above, district coaching was also supposed to have occurred at the QIT meetings. When asked how helpful the coaching visits were, most HCs rated the coaching as very good. Still, it should be noted that district QIT coaching visits did not occur as often as the intervention had planned for, with only about 60% of HC CHW Supervisors stating that the district coaches ever visited their QIT. At the DVWs it was determined that coaching by district-based coaches was not feasible every month, and would be most valuable at the start of each quarter

Figure 11: Helpfulness of coaching visits as reported by participants in final LS



to help identify solutions for complex problems that required more expertise than existed among HC staff (for more information on this please see the recommendations section).

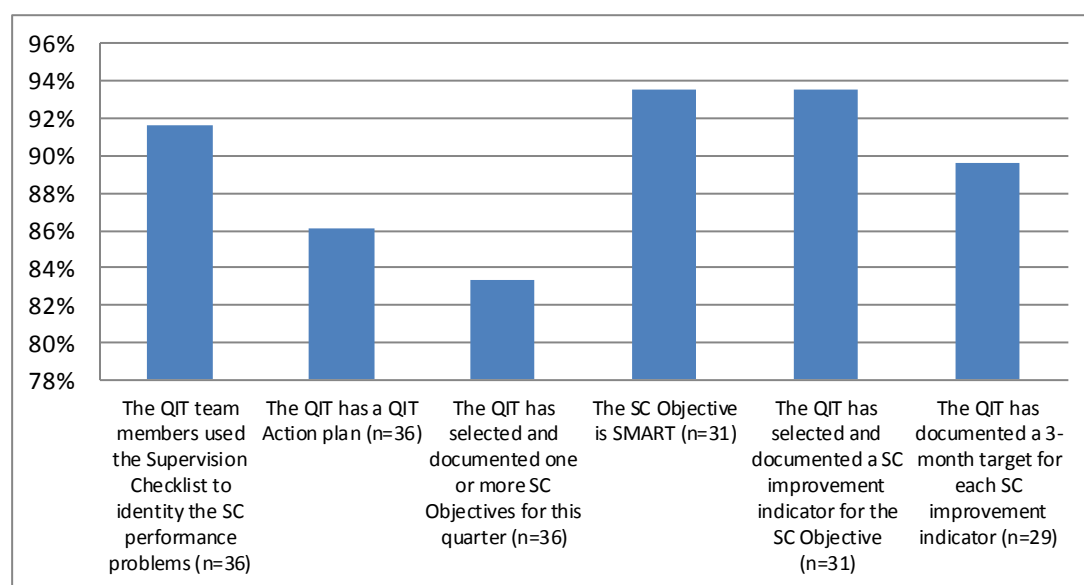
In a survey taken at the final LS on the value of coaching, 77% rated it as either outstanding or very good and 16% as fair.

QIT: Tools and Skills

The CCs in all three of the QC districts placed a very high value on the tools used in the QIT process. Over 90% of the CCs could show the interviewer the tally sheet and the bar graph for the last month of QIT at the interview. Of those 90% that could show the tally sheet and bar graph, there was 90% agreement between the two records, demonstrating accurate use of the tools. These statistics indicate that not only were the tools available and being used, but they were in being used accurately.

During intervention support visits, interviewers also examined participants' skills in QIT processes⁹. All scored above 70% in the six assessed QIT skills (see Figure 12). QIT participants were also asked about their perception of the value of the QIT process and responders reported that identifying root cause analysis, collecting and interpreting data, collaborating with partners, finding solutions to those problems and preparing the action plans were the most useful parts of the QIT processes.

Figure 12: Assessment of skill in QIT processes



⁹ Skills in QIT process include: the team uses the supervision checklist to identify supply chain performance, the QIT has a QIT action plan, the QIT has selected and documented a SC objective, the objective is SMART, the QIT has selected and documented a SC indicator, and the QIT had documented a 3 month target for the indicator.

Quarterly Learning Sessions

On a quarterly basis, all the QITs in a district would meet in a LS. At these facilitated sessions, participants would share lessons, successes, and challenges in their effort to strengthen the use of RSPs, with an emphasis on peer-to-peer learning.

Qualitative data gathered from various sources and validated at the national DVW confirmed how useful the quarterly LSs were. A full 100% of those who attended a LS reported learning something that directing improved their supply chain performance. Many participants cited these sessions to be extremely valuable and often cited as the most useful part of the entire QC process. This process was what best enabled peer-to-peer learning.

“Learning Sessions were very important. Each group would exhibit their achievements and challenges. This allowed us to learn from those who had faced a similar challenge in the past and how they solved it.”(CHW Supervisor, Nyabihu)

Incentives for Community Supply Chain Improvement (IcSCI)

Intervention Description and Intervention Support

The objective of the IcSCI intervention was to create an incentive system to motivate cell coordinators and their CHWs to achieve supply chain performance targets for nine key supply chain tasks believed to have the most impact on product availability (Table 2). The IcSCI activity was structured to ensure that the SC incentives could be affordable yet sufficient to motivate CHWs to engage in different behaviors. At the same time, the types of incentives and mode of distribution had to be consistent with the existing cPBF system to facilitate integration if the intervention proved to be successful. Thus to initiate the stream of activities, the project conducted focus groups in the three intervention districts in October 2011 to identify indicators and options for suitable incentives. After narrowing the design down, the proposed incentives were then validated through district meetings with the CHWs and health centers from the same three districts in December 2011. The project worked with the MOH to assign values to the nine indicators, weighted based on their level of influence on product availability.

SC4CCM consulted extensively with relevant departments within the MOH to ensure that the flow and design of the incentives was as consistent as possible with the existing cPBF system. Because the cPBF is a fully integrated system, the two aspects that had to be managed separately by the project included the flow of funds from the central level (SC4CCM) to the HC level (after which it mirrored cPBF) and the database in which data was captured and used to determine payments for each cooperative. Until the intervention was proved to be successful, these aspects could not be integrated into cPBF due to the additional work that would be needed to adapt the existing systems. The project worked with the MOH to develop a database to capture IcSCI indicators and created job aids and training materials to support the intervention. The IcSCI intervention was launched by conducting two one-day trainings at each district (three district hospital staff from each district, four participants from each HC, including the CHW cooperative president, for a total of 27-36 per day of training, depending on the number of HCs per district).

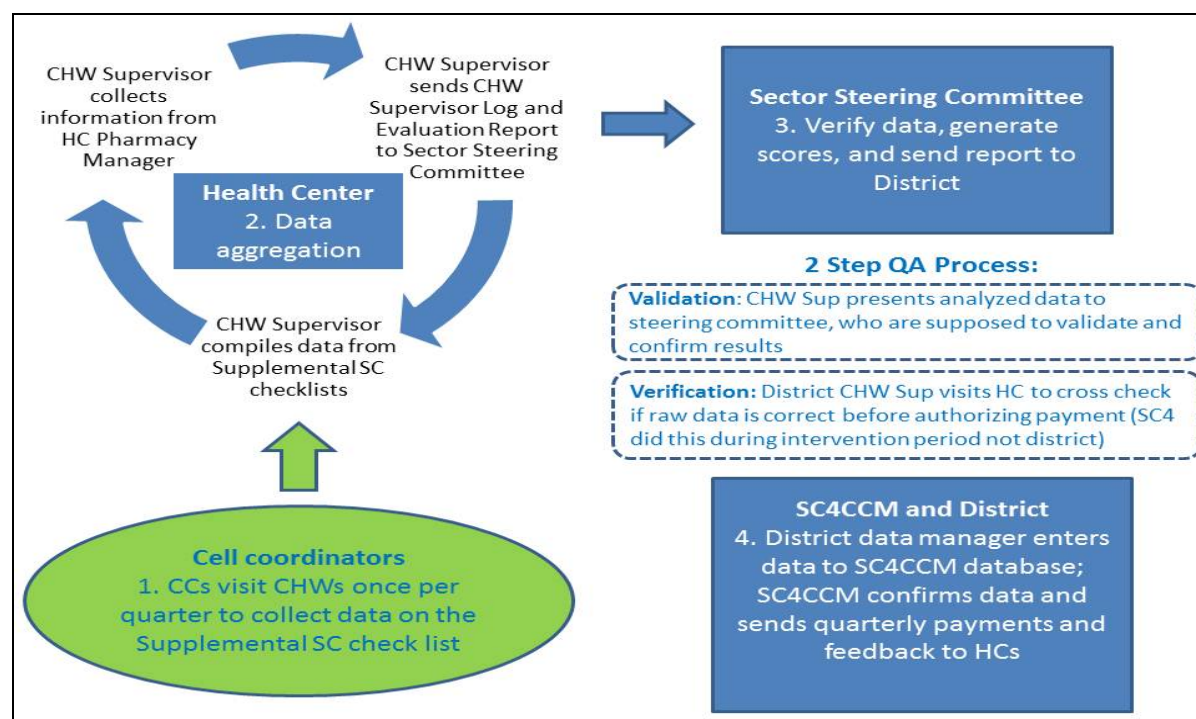
Table 2 - Table of IcSCI indicators and weighted value

Indicator No.	Indicator name	Weighted value
1	The proportion of CHWs (binomes) who attended health centre monthly meetings in the past quarter	5
2	The proportion of CHWs for whom stock card data was included on all resupply worksheets in the past quarter	15
3	The proportion of CHWs with stock cards for CCM products* on day of visit	10
4	The proportion of CHWs with stock cards for CCM products* where <i>physical inventory matches stock card balance</i> for all on day of visit	15
5	The proportion of CHWs with no expired CCM products* on day of visit	5
6	The proportion of CHWs who have at least one treatment for a five year old child in stock, for each CCM product* on day of visit	15
7	The proportion of cell coordinators who presented complete resupply worksheets during monthly health centre meetings, in the past quarter	10
8	The proportion of cell coordinators who presented complete resupply worksheets <i>without any calculation errors</i> during monthly health centre meetings, in the past quarter	10
9	The proportion of cell coordinators who need products, who collect them for their cell from the pharmacy after health center meetings, in the past quarter	15
	TOTAL	100

The intervention relied on CCs to collect data from CHWs on performance of basic supply chain tasks. This information is scored quarterly for each cooperative and used to determine a payment amount for each cooperative (% score corresponds to % of a possible RWF 300,000 per cooperative per quarter). Figure 13 illustrates the flow of information to support the IcSCI intervention.

The project established a distribution mechanism for monthly allowances for CCs and quarterly incentive payments to cooperatives through agreements with HCs in the three districts. Project staff were meant to go on verification visits with district staff to evaluate HC Steering Committee reports and provide feedback prior to paying incentives; however, in practice these MOH verification visits did not happen regularly so it was not possible to conduct as regularly as planned.

Figure 13: Diagram of IcSCI intervention process



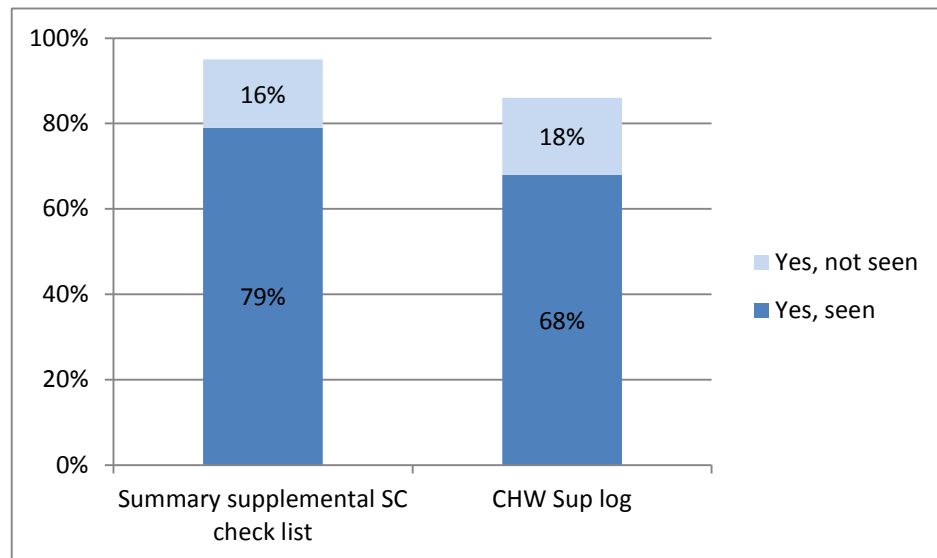
Data Collection and Aggregation

To support this process, CCs conducted quarterly visits to all the CHWs in their cell to collect data on the supply chain indicators. The CCs received a monthly allowance¹⁰ that was to be applied for transport and communication costs to facilitate these CHW visitations. At these visits the CCs used a standardized supplemental SC checklist to collect and aggregate the data from each CHW. All (100%) of the CCs reported submitting the supplemental SC checklist every single month of the intervention, and as many as 79% of those CCs were able to show copies of the most recent checklist to the interviewer.

CCs then provided the HC CHW Supervisor with the compiled SC data for their cells. The CHW Supervisors aggregate and present the data and SC indicator scores to the steering committee every quarter. As many as 97% of interviewed CHW Supervisors reported submitting the supervisor log to the steering committee every quarter (Figure 14).

¹⁰ A total of almost 6000 dollars was paid out to 218 CCs for data collection over the four quarters of the intervention.

Figure 14: HC CHW Supervisors with the IcSCI tools



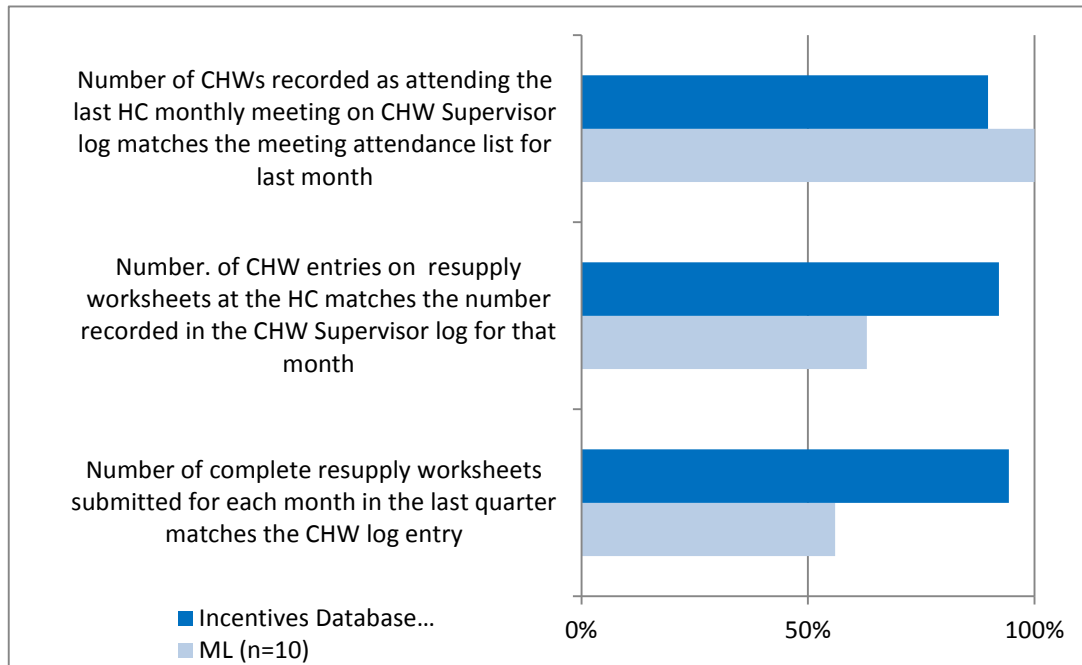
The IcSCI process appeared to have worked as intended at the CC and HC level. With the compliance rates as high as reported above, it can be inferred that neither the CCs nor the CHW Supervisors had difficulties collecting, aggregating and submitting data for submission to the steering committee.

Data Validation and Verification

The next step in the process was for steering committee members to validate the indicator scores (checking the scoring sheet against that reported by the CHW Supervisor) and indicate how much incentive would be awarded. While 89% of the health sector steering committee members reported no challenges to validating the CHW log and evaluation report, when compared with data verification done by the SC4CCM team through intervention support and during the midline data collection, there appeared to be a mismatch with actual reports at HCs (when examined) compared with the data from the incentives database.

Figure 15 shows the mismatch between what was found in the incentives database and midline verification. The discrepancies appear to be greater for the indicators that required more time/attention by the CHW Supervisors (for example, where calculation was involved) compared to more routine tasks. It has been hypothesized that given the tremendous amount of work for a CHW Supervisor to do, there was limited time for reviewing RSWs and they possibly felt burdened by the set of nine indicators to report on each quarter. Clearly challenges existed with the validation process (see recommendations section for more information.)

Figure 15: Comparison of Midline data with last scores from IcSCI database

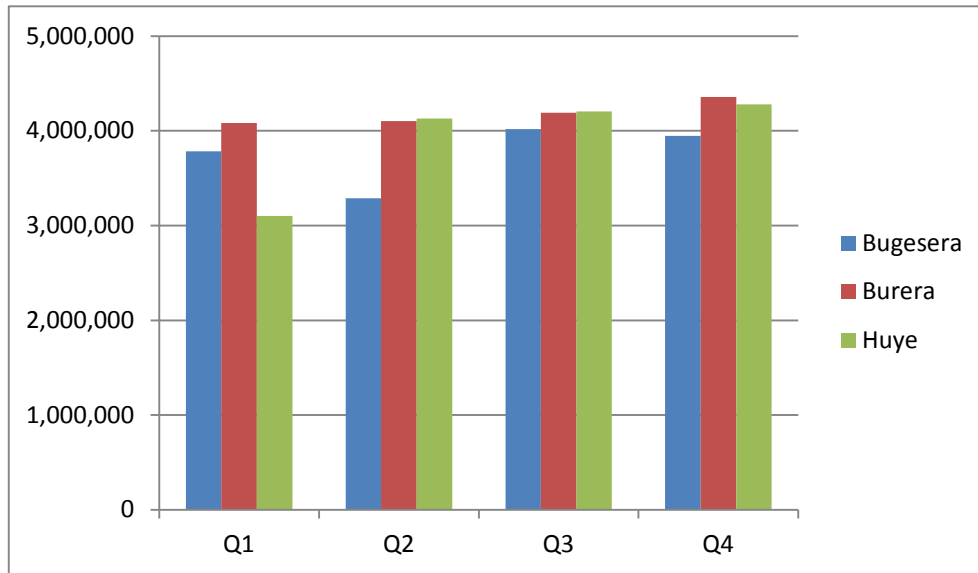


Feedback on SC Performance and Incentive Payments

Once the districts reviewed and entered scores into the database, SC4CCM worked with the district data managers to finalize the incentive amounts to be paid. While the project design intended the districts to provide the feedback to the cooperatives on their scores and payments, in practice it was the HC CHW Supervisor that provided the feedback on SC indicator scores at the HC monthly meetings. 77% of CCs surveyed reported that they received feedback on their supply chain performance scores and 84% report receiving feedback on the financial payment their cooperative received. Still, 100% of the CHW Supervisors reported discussing SC performance with CHWs at the monthly meeting. The most frequent topics discussed were recording, reporting and stock cards.

Distributing and accessing the incentive payments did not appear to be a problem, 89% of CHW Supervisors reported that cooperatives had indeed been able to pay out the incentives for targets reached on the supply chain indicators (Figure 16). To interpret this graph note that ~48 Million Rwandan Francs (approx. USD \$76,000) were paid out to 44 health centers in the three districts over the four quarters. The maximum a health center could ‘pay out’ was the equivalent of USD \$500. Over the four quarters the amount paid out slowly increased with an average of \$415 dollars per health center in the first quarter and an average of \$476 in the last quarter.

Figure 16: Incentive payments by district by quarter in Rwandan Francs



Summary of Indicator Performance

Given the hypothesis that incentives could be used to change behavior and improve attention to supply chain tasks, performance scores for the indicators were a cornerstone of this approach. Using quarterly data from the incentives database, significance testing was conducted to examine change in performance over the four quarters in which the intervention was implemented. Please refer to Table 2 with the nine supply chain indicators. Performance among the three IcSCI districts against these nine indicators can be divided into three sub-sections to evaluate trends and make sense of the data.

Indicators with no statistically significant change

Figure 17: Percent of CHWs who attend monthly meetings

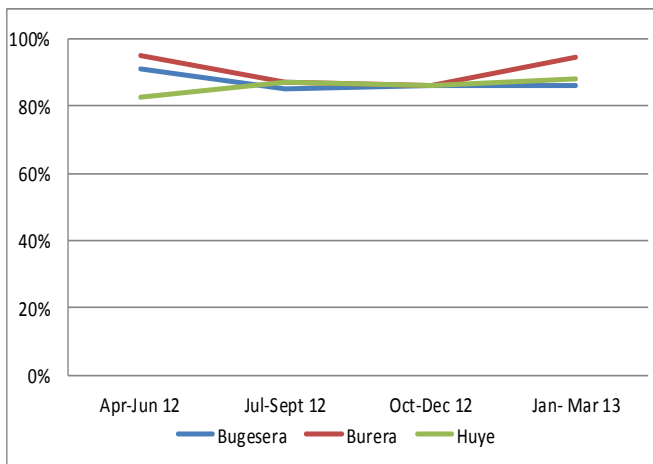
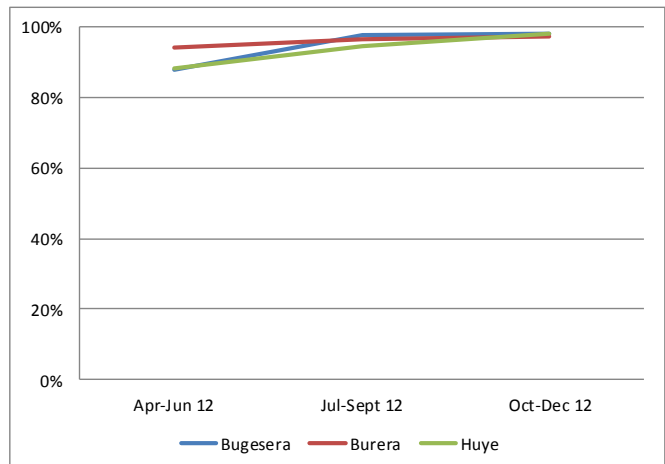


Figure 18: Percent of CHWs with no expired CCM products on DOV



Two of the indicators showed no statistically significant change over the intervention period. Given other time demands and the volunteer nature of the CHW role, 100% attendance at monthly cell meetings was very hard to achieve. Unlike indicator 1 (attendance) which was low, indicator 5 (no expired product) was high at baseline and maintained high level of performance, hence the difficulty in detecting a statistically significant change.

Indicators with statistically significant change detected in the district of Huye

In the next group of indicators, only the district of Huye improved over time, likely because it had the lowest starting performance level for these four indicators. As there was more ‘room for improvement’ compared to the other districts (already performing well on these as indicated in the graphs below), only Huye demonstrated statistically significant improvement among these indicators. The indicators related to the RSW are particularly impressive.

Figure 19: Percent of CHWs with stock card data included on all RSWs

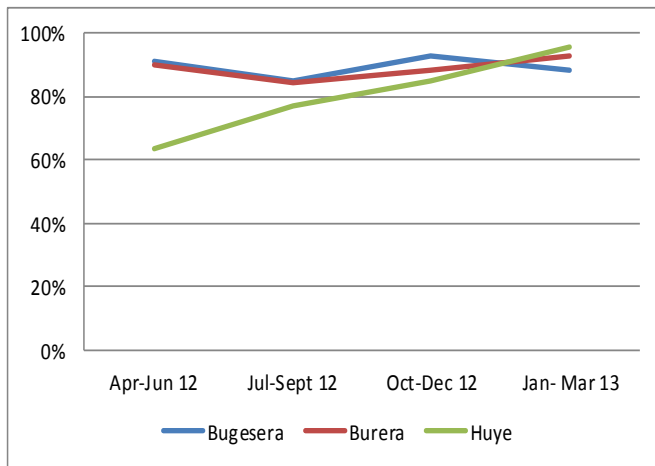


Figure 20: Percent of CHWs with stock cards for CCM products on DOV

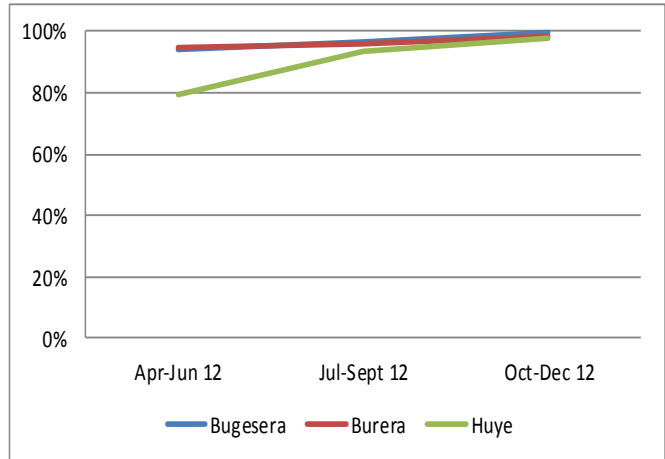


Figure 21: Percent of CCs who present complete RSW

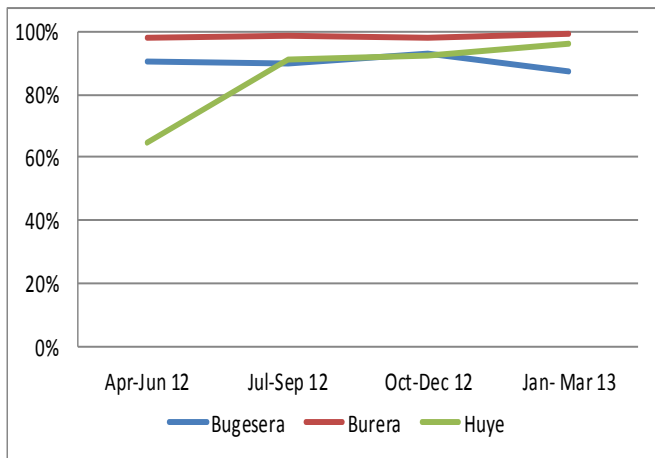
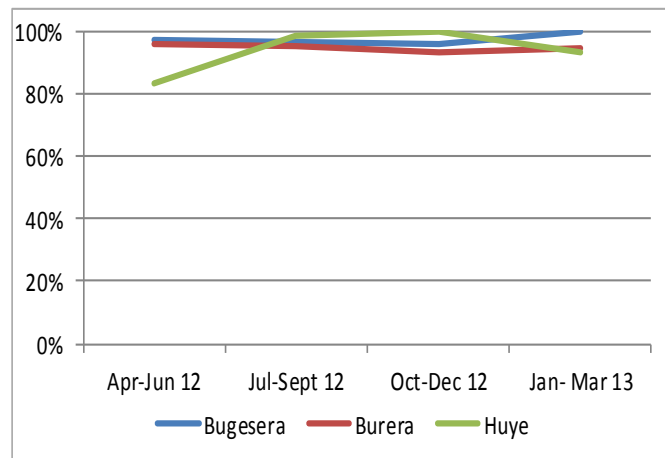


Figure 22: Percent of CCs who need and collect CCM products after HC meeting



Indicators with statistically significant change detected in all districts

Three indicators showed significant improvement for all three intervention districts across the four quarters, regardless of starting level of performance. These indicators proved to be effective in improving performance and maintaining that performance over time, regardless of where the district started. Note that the first indicator presented here (indicator 4, % of CHWs with stock cards where inventory matches balance) was recommended to be rolled out at national level (see recommendations section for further information).

Figure 23: Percent of CHWs with stock cards where physical inventory matches stock card balance

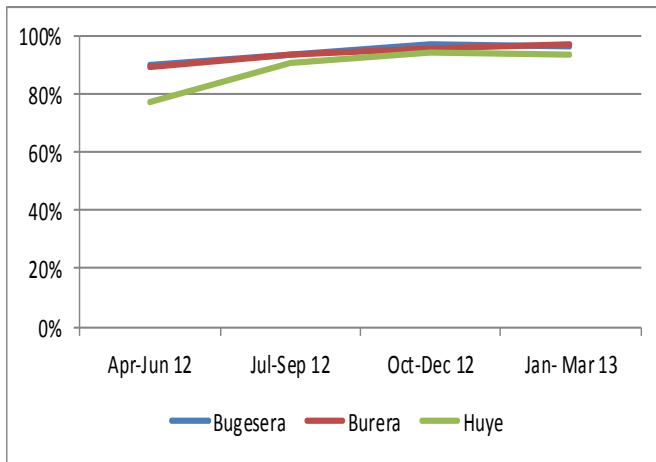


Figure 24: Percent of CHWs with at least one treatment for each CCM product on DOV

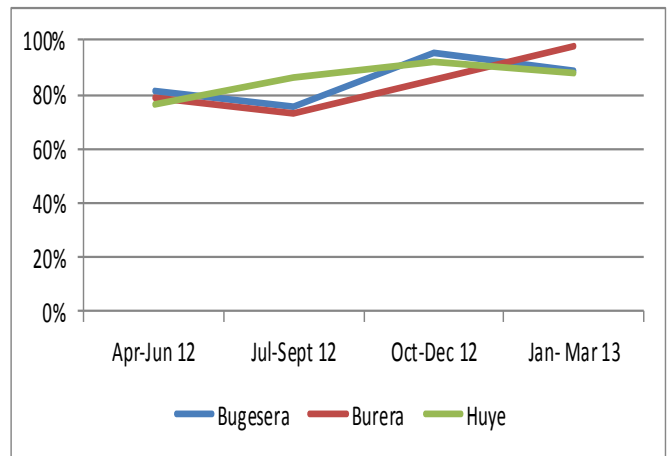
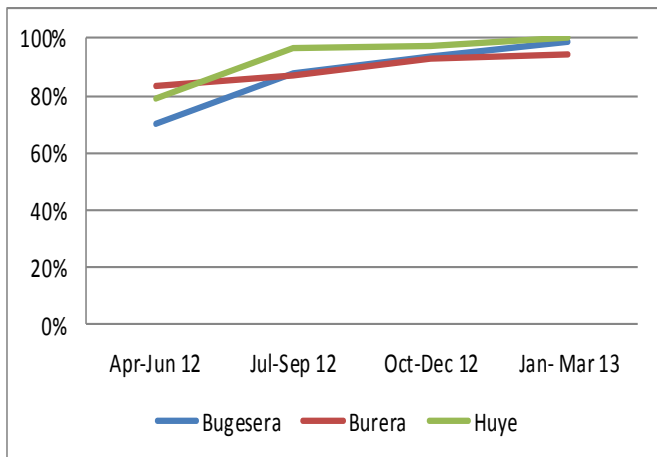


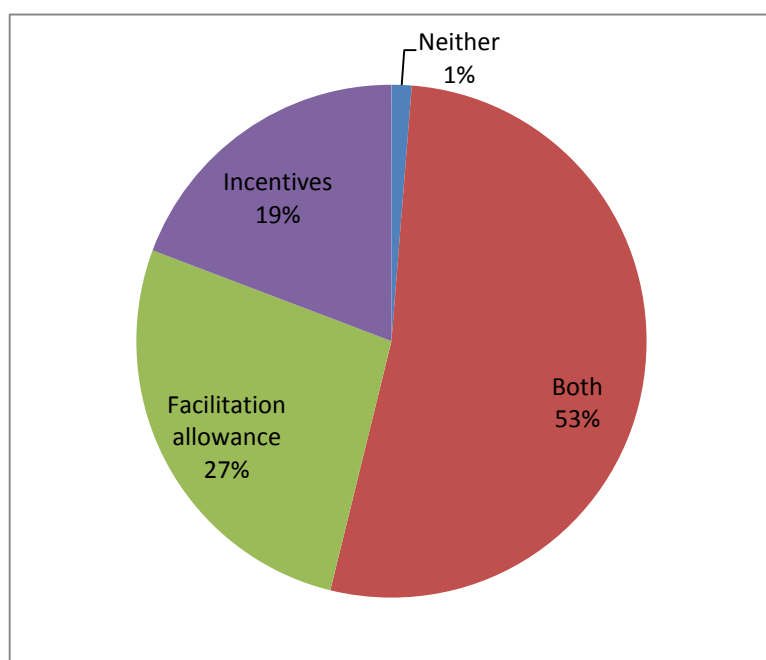
Figure 25: Percent of CCs with accurate RSWs



Role of Incentives and Allowances on SC Practices

As mentioned above, in addition to the quarterly incentives payments paid for the supply chain performance, monthly allowances were provided to the CCs to facilitate supervision visits to the CHWs in their cell. The incentives were popular across the board, with 94% of CCs reporting that the incentives contributed to the increased use of the RSPs in their cell and 92% of CHWs reporting that the incentives helped them manage their products. Interestingly, when asked in both a quantitative and qualitative manner if the incentives or the facilitation allowances were more motivating in enabling CCs to perform their tasks, the facilitation allowances were perceived to be more motivating to the CC than the incentive payments (Figure 26).

Figure 26: CCs' opinions on which is more effective in motivating CCs to perform SC tasks



Although both funds are important, the facilitation fees go directly to the pockets of the CCs and thus help them perform better on SC indicators. It helps us make calls to arrange CHW visits and affords us transport thus enhancing coordination of all activities (CC, Bugesera)

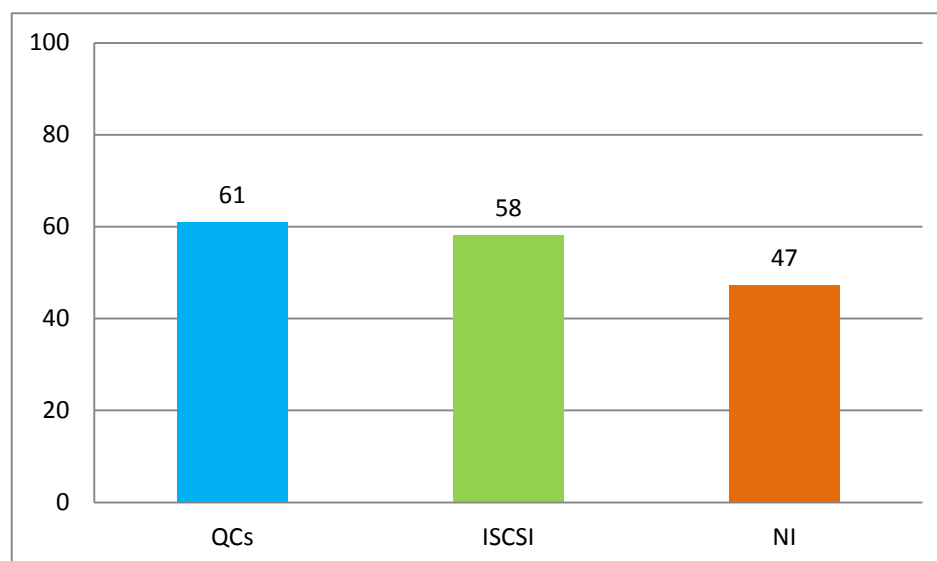
Comparing QC to IcSCI Districts

Both the QC and IcSCI interventions were meant to reinforce and strengthen RSPs and improve product management and availability for CHWs. This research design was implemented specifically to be able to examine not only intervention versus comparison sites, but also compare the QC approach to IcSCI approach to determine what elements would make sense to take to scale, if any. The midline survey looked specifically at differences regarding product storage, reporting rates and use of stock cards, all of which are key supply chain indicators.

Storage at CHW level

Over half the CHWs visited at midline maintained three key storage criteria (lock and key, area clean and dry, area insect and rodent free). The CHWs in QC and IcSCI districts performed better on this indicator, with very little difference between the two intervention groups. It should be noted that the IcSCI indicators did not reward storage-related practices.

Figure 27: Percent of CHWs that met 3 storage criteria

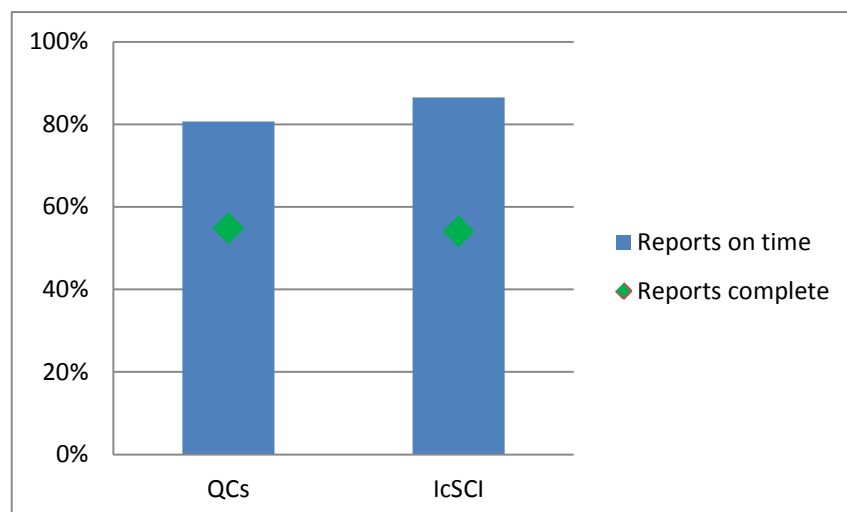


Timely and Complete Reporting

Both intervention groups (QC and IcSCI) reported high levels of on time reporting (above 80%), but completeness (measured by SOH and quantity dispensed) was lower in both groups, 55% in QCs and 54% in the IcSCI districts. It should be noted that both the intervention groups achieved a high level of consistency in using the RSW. Additionally, HC Pharmacy Managers in both intervention districts reported that 90% of CHWs or CCs were sending in the RSW from intervention districts.

“Before the new RSP, CHWs would demand and spend even up to 2 months without getting products, while commuting to the HC all the time! Now they come when all their products are pre-prepared and they receive them instantly after the meeting. This is because the resupply worksheet is submitted beforehand.” (CHW Supervisor, Bugesera)

Figure 28: Percent of CHWs that submit reports on time and completely, reported by HCPM



Stock Card Accuracy

Stock card accuracy, measured by comparing the CHW balance on the stock card to their physical inventory, was higher on the CHW stock cards in the intervention districts when compared to the CHW stock cards in the non-intervention districts (with the exception for ORS), indicating the supplemental interventions helped improve the use of stock cards. Amoxicillin was the only product with a statistically significant difference. As stock card accuracy was one of the indicators in the IcSCI intervention, it is interesting to note that in these districts the stock card accuracy ranged from 74% to 95% depending on the product, whereas the number of cooperatives that received high scores for this in the indicator database (where the CHWs had to have product inventories that matched the stock card for ALL products to meet this performance) were much higher. Though they are not measured at the same period, it does reinforce the idea that better verification is needed in the cPBF system.

Looking at stock status for the different groups it appears that fewer CHWs in the QC and IcSCI districts were under-stocked compared to the comparison districts for all products. However, it is possible that low levels of consumption also result in more CHWs being classified as overstocked. This is because CHWs are dispensed a minimum quantity of products so that they always have something to treat patients, but if average monthly consumption is zero or very low over time, even the minimum quantity will represent a higher figure in terms of months of stock, though the quantity in absolute terms is very small.

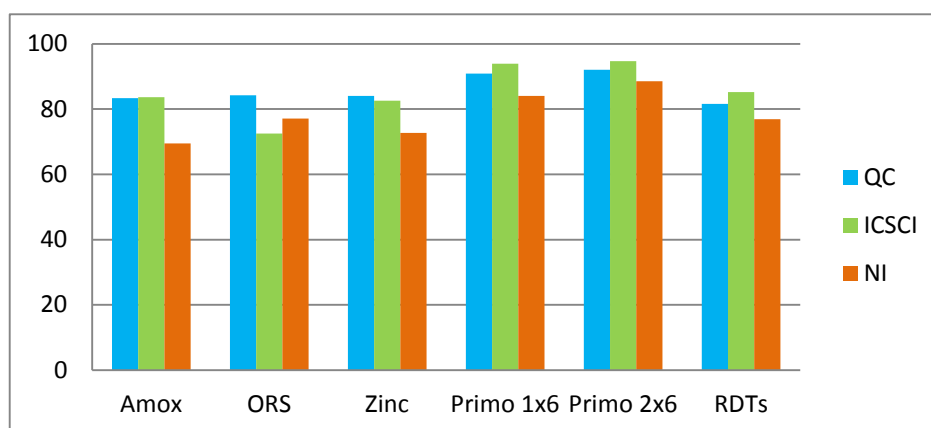
“No more out of stock arising from internal supply chain issues since we have been trained...” (Pharmacy Manager, Rutsiro)

“Resupply procedure is the method we use to obtain more products, we are now used to resupply procedures, we write down opening stock, dispensed medications, expired and resupply quantities needed and give the information to our CCs.” (CHW, Bureru)

Summary of Comparison of the Two Intervention Districts

While improvements in supply chain performance were seen across both intervention districts when compared to non-intervention districts, the QC intervention seems to have done slightly better on most or all supply chain indicators. A secondary finding of this analysis is that the incentive database results may inflate actual performance slightly, particularly when adjustments are made in the validation/verification process.

Figure 29: CHWs where physical count matches balance on stock card



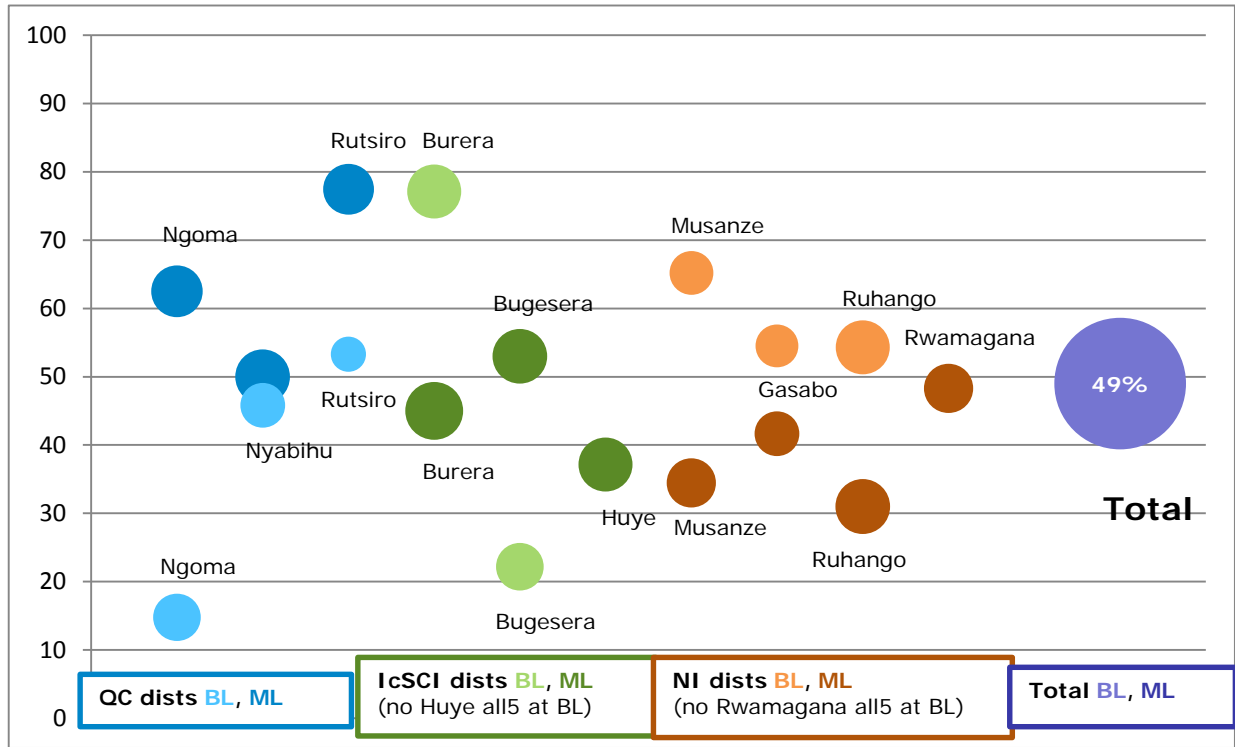
Product Availability

The evaluation found consistently higher availability of the 5 key drugs on the DOV post-intervention (at midline), with the exception of one IcSCI district - Burera. There were two districts (Huye in the IcSCI group and Rwamagana in the comparison group that had no baseline data). As mentioned in the context section of the text above, there were national level shortages which affected both the district and HC resupply points. Despite this, community level availability appeared to be fairly stable from baseline to midline measurement points—indicating that responsive supply chain at the community level. It’s worth noting that a greater proportion of CHWs manage all CCM products (with the exception of Primo 1x6) at midline than before the intervention(s) were rolled out.

[Before] “we could not know who has taken what or who still has products in stock. The CHWs could bounce several times before they got any products. But now the whole procedure is completely streamlined, everyone knows resupply is once a month and the specific date.” (Pharmacy Manager, Huye)

To supplement the understanding of product availability Figure 30 is presented as well. When looking at product availability by individual product, for CHWs that managed each product at baseline and midline there was an increase in availability for most products across districts in the combined intervention and comparison districts except amoxicillin, Primo Jaune, and RDTs as show in Figure 31.

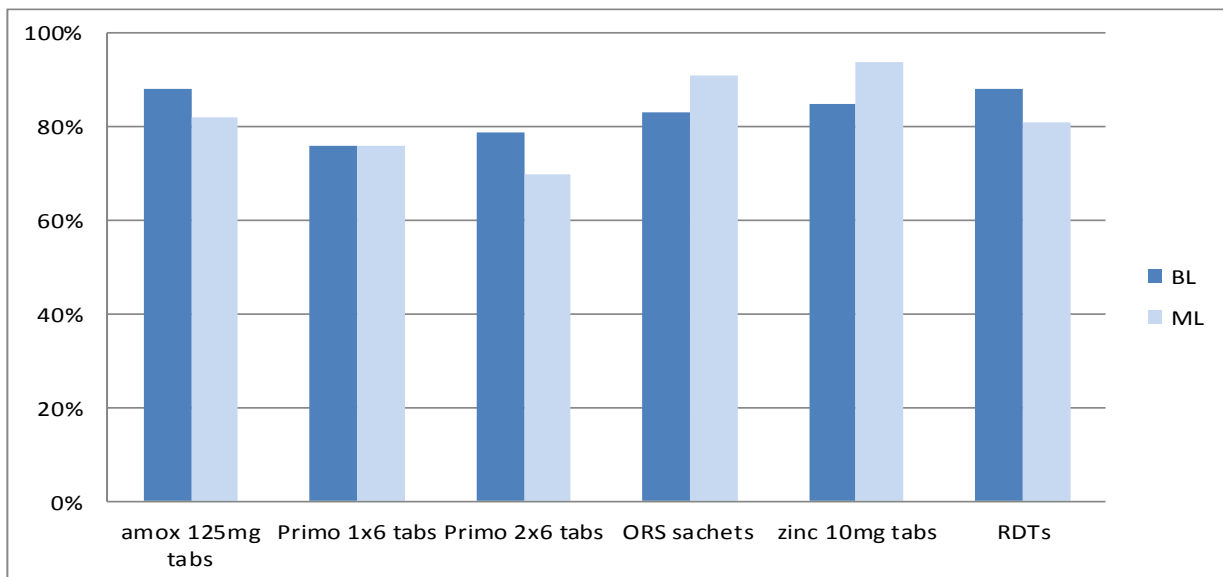
Figure 30: Percent of CHWs who had all 5 CCM products in stock on DOV



Notes on graph

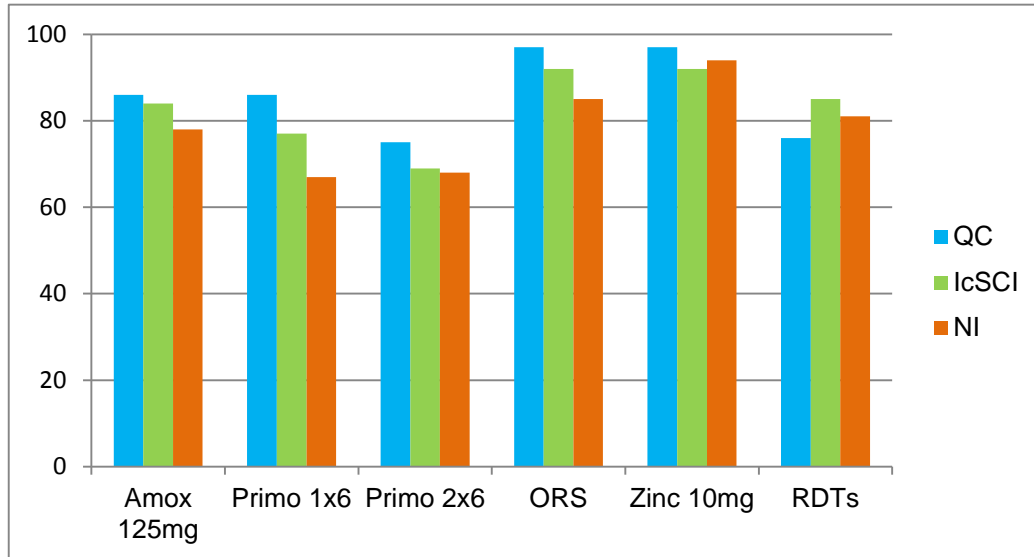
- Light shading represents baseline, dark shading represents midline
- Circle size represents sample size for district
- blue bubbles represent QC districts, green bubbles IcSCI districts and orange bubbles non-intervention districts

Figure 31: Percent of CHWs with products in stock on DOV - all districts



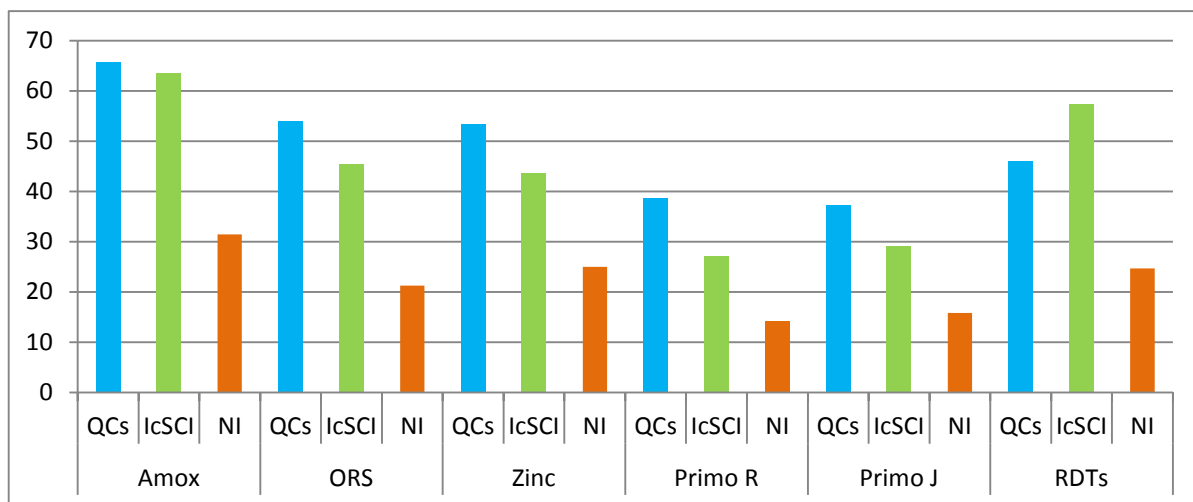
There was also better product availability for most of the products on the day of the visit for intervention sites (both QC and IcSCI) at midline compared with non-intervention sites (Figure 32).

Figure 32: Percent of CHWs in stock on DOV



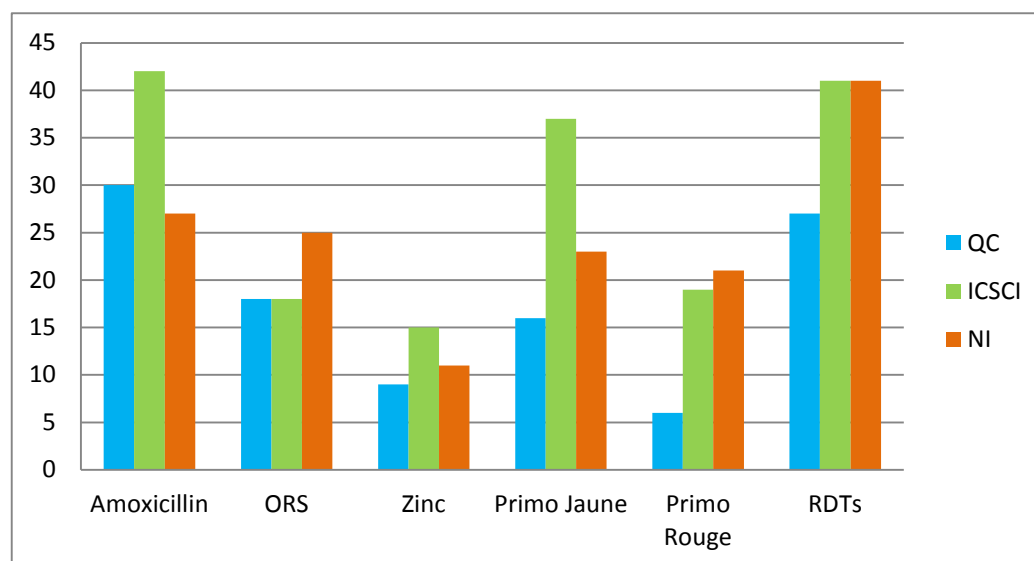
In addition to improved product availability, the intervention groups also have more months of information on CWH stock cards for the five key drugs compared with non-intervention districts, as shown in figure 33. This is a key component of the data visibility required to improve longer term decision making for the supply chain.

Figure 33: Percent of CHWs that have 3-6 months of info on SC



Comparing the number of stockouts in the past six months, the QC districts had the fewest stockouts at the CHW level, with the exception of amoxicillin. Across all groups and all products there was an average of only one stockout lasting longer than three days, which suggests short lead time and high responsiveness to stockouts (Figure 34).

Figure 34: Number of stockouts in last 6 months



A difference-in-differences (DiD) analysis was conducted across the intervention and comparison groups to detect intervention impact on the project’s key indicator, **CCM product availability** (Table 3). The regression attempts to remove factors that may affect the key interest indicator, between otherwise similar groups, in order to isolate the level of impact attributable to the interventions. Factors that were controlled for included formal training of CHWs on how to manage medicines and health products, training of CHWs in pneumonia, malaria, or diarrhea, and CHWs reporting obstacles to transport to get to their resupply health center. Limitations to this model include the real possibility that outside factors, applied unequally between groups, caused changes as well which reduce the ability to attribute change to the intervention.

Results showed a highly significant improvement ($p < 0.001$) in the QC districts compared with the non-intervention districts for the key composite indicator of all 5 CCM products in stock on day of visit (also see figure 30). The DiD detected significant improvements in availability for all products individually (p values range from $< .05$ to $< .01$ for ORS, zinc, and Primo Rouge) with the exception of amoxicillin and Primo Jaune. In the IcSCI group, a significant result was detected only for one product, Primo Rouge only ($p < .05$), but no results for other individual products or the composite indicator.

The improvements detected by the DiD are a very positive result for the QC intervention, establishing strong evidence to support scale up of this innovation as a successful method for improving CCM product availability at the CHW level of the system by removing barriers to supply chain performance. The IcSCI group results suggested a positive impact, but cannot be prescribed with confidence as the intervention group only affected availability of one product out of five.

Table 3: Difference-in-Differences (DiD) Regional Results: IcSCI and QC groups

Group Time	IcSCI ⁺⁺						QC ⁺⁺					
	IcSCI		Non-intervention		DiD ⁺	N	QC		Non-intervention		DiD ⁺	N
	Base-line	Mid-line	Base-line	Mid-line			Base-line	Mid-line	Base-line	Mid-line		
Percent of CHWs who manage all 5 products , in stock on DOV	53	46	58	37	14	351	35	62	58	36	49***	346
Percent of CHWs who manage amoxicillin tablets , in stock on DOV	93	85	85	79	-2	376	87	86	85	78	6	379
Percent of CHWs who manage ORS sachets , in stock on DOV	82	93	83	85	9	381	83	97	83	84	13*	378
Percent of CHWs who manage zinc tablets , in stock on DOV	93	93	93	95	-2	369	69	97	93	95	26*	382
Percent of CHWs who manage Primo Rouge tablets, in stock on DOV	73	79	79	67	18*	447	76	87	79	67	23**	417
Percent of CHWs who manage Primo Jaune tablets, in stock on DOV	78	71	80	67	6	443	79	76	80	67	10	419

***p<.001 **p<.01 *p<.05

+ DiD is calculated as (Intervention Midline% – Intervention Baseline%) – (Comparison Midline% – Comparison Baseline%). Results displayed represent two steps in the analysis of the data: the significance, denoted by the stars, represents the results from the multivariate logistic regression on the time-group interaction variable, which is the key independent variable of a DiD regression. Since the interaction coefficient is non-intuitive, we have instead depicted the difference over time between the intervention and non-intervention groups using the predicted probabilities resulting from the regression. Essentially, this is the net percentage point change in the intervention region once the comparison group change is subtracted.

++ Controls: CHW has formal training on how to manage medicines and health products, CHW has training in pneumonia, malaria, or diarrhea, CHW has obstacles to transport

Discussion

The results presented in the previous section support the project's hypothesis that standard resupply procedures were an important and foundational starting point to improve supply chain practices, but that strengthening their operationalization and effective use, especially to improve product availability at the community level, needed one or more additional interventions.

The midline evaluation of SC4CCM in Rwanda found significant improvement in the primary project objective - CHWs have usable and quality essential medicines available when needed for appropriate treatment of pneumonia and other common diseases of childhood – in the intervention districts. CHWs with all five products in stock on DOV showed significantly greater availability at midline in the QC districts (63%) compared with non-intervention districts (38%; $p<.001$), and non-significantly greater availability in the IcSCI group (45%) than non-intervention districts (38%). A significant decline was detected since baseline for this measure in the non-intervention districts (from 58% to 38%; $p<.01$).

The evidence shows that while both intervention groups demonstrated improvement in the key outcome – results from the QC intervention are more definitive. The difference-in-differences (DiD) analysis confirmed the significant improvement in the QC districts for this main project objective was plausibly attributable to the intervention ($p<0.001$).

The RSPs were seen to be well implemented and achieved the objective of providing harmonized and more efficient processes to support product availability at the community level. Using CCs (rather than CHWs) as the target of this intervention allowed for easier implementation and follow up supervision. The original plan had been to also be able to test the effect of the RSPs against RSPs plus one of the two supporting interventions (QCs or IcSCI); however, the RSPs did not roll out nationally as planned within the intervention period and so none of the comparison districts had the RSPs at the time of the midline evaluation. The analysis was therefore able only to look at the combined interventions compared to each other and compared to comparison districts without any community level supply chain intervention.

Based on the midline results it can be concluded that the QCs were well-implemented and had a positive impact on strengthening resupply procedures and product availability with CHWs. The monthly QIT meetings were perceived to be a key element of process. However, the crux of this intervention is the data that the CCs collect during their monthly visits to CHW; it is this data that the QITs used to prioritize areas for improvement, develop their action plans, and monitor their performance to determine the effectiveness of their activities. A bi-product of these supervision visits and monthly meetings was improved coordination and communication amongst the people at different levels of the supply chain. Another element of this intervention, the quarterly Learning Sessions that brought together members from each of the QITs and district coaches, also improved communication and the sense of teamwork amongst QIT participants. From both the quantitative and qualitative data, the multi-level teams and the support from district staff were deemed to be a very important part of the intervention. However, the amount of time it took to coordinate and prepare for the LSs, as well as funding needed to bring all participants together for a two day workshop every quarter make this a very resource-intensive part of the intervention, especially when considering implementation at national scale.

From a cost-effectiveness standpoint, there was not enough evidence to justify maintaining this aspect of the intervention given the costs required.

Another important learning during the intervention period of the QCs was around the level of complexity of the tools and process. In the original design the tools were lengthy, complicated, and suggested that QITs focus on up to three objectives per quarter. In the first month or two the SC4CCM team heard that people were confused about their roles, the use of the tools, and monthly meetings were lasting for more than four hours, which was de-motivating to participants. In recognition that this process was frustrating, SC4CCM worked to refine the tools to be less complicated, reducing the number of objectives that QITs would focus on each quarter from three to one, and provided meeting guidelines, including roles and responsibilities, a suggested agenda, and general tips to hold a short, successful meeting. The new tools were introduced at the first LS at the end of the first quarter. Feedback from QIT members and district coaches was that these tools were much easier to understand and having a meeting outline greatly improved the process and reduced the meeting times to one to two hours which was much more sustainable. We attribute this redesign step as critical to ensuring the success of the QITs and consider this a key learning in making sure that materials and expectations are tailored to use at the HC and community level.

District coaching was expected to play a big role in the QC intervention. In practice though, this did not happen as planned, primarily due to the many competing responsibilities that the district coaches have. Even though they received allowances to facilitate their movement to HCs to attend and follow up with the QITs in their district, reported attendance was much lower than expected. One consideration for roll out, if district coaching is included, would be to make this an explicit part of their job description with an expected meeting schedule so that it is not considered an add-on request to their regular work.

The IcSCI were well implemented and also had a positive impact on strengthening RSPs, though was less dramatic than the QCs. One of the purposes of testing nine supply chain indicators was to determine which one(s) should be considered for inclusion into the cPBF system; it was never envisioned that all nine would be adopted. Using the scores for each indicator in the incentives database, the analysis showed that not all were equally effective, possibly because scores for some indicators were already quite high in certain districts. Only three were significant across all districts – stock card accuracy, the % of CHWs with complete RSWs, and CHWs with at least one treatment for each CCM product in stock. While it is unclear if adding one of these would have the same effect as all nine, the expectation is that if one of these is chosen for the cPBF system it will help signal the importance of supply chain tasks and incentivize improved performance of a key supply chain task.

In order to support the IcSCI intervention, SC4CCM developed a database to track scores and incentive payments. District Data Managers were expected to check scores from their HCs on a quarterly basis and enter data into the database and then send to SC4CCM to process payments. After some initial glitches with the database this seemed to work well and not pose significant difficulty to anyone. The more difficult part was the validation of the report scores that required some back and forth between SC4CCM staff and MOH staff to finalize scores and payment amounts.

Given that all of the interventions were designed around the CCs and their role as the touch point with CHWs, the supervision and facilitation allowances that CCs received from SC4CCM were

recognized as central to both interventions – promoting important contact and information sharing between CCs, the CHWs in their cells, HC staff, and district staff. These facilitation allowances to CCs were reported to be very important to CCs to conduct the supervisions that were expected of them as part of the intervention. It is important to remember that CHWs (and CCs) in Rwanda are volunteers so enabling these activities is important, as otherwise they might need to spend more time on income generating activities. From the project’s perspective there were challenges in the administration and tracking of these allowances, but the expectation is that if the MOH included these payment in their intervention, their existing processes would help streamline the payments.

Recommendations

After reviewing the analysis and findings from the midline evaluation, the participants in the National Data Validation Workshop recommended the scale-up of the *standard resupply procedures* package, with a few modifications based on lessons learned over the intervention period and feedback from MOH staff through DVWs.

Participants at the National DVW used the difference in supply chain performance levels between the intervention and control groups - *product availability was indeed increased for most products at midline and was better in intervention districts* – to guide their recommendations for a scale up package. Based on the successful results from the QC districts, the recommendations are to continue with the RSP (as will be done throughout the country as part of the newly created integrated training curriculum for CCM) as well as most parts of the QC package, particularly a token allowance for CCs and the QIT meetings¹¹:

- Include the RSP procedures and SC indicators in the CC monthly supervision checklist (already included in national integrated training curriculum for ICCM).
- Implement QIT tools and processes, including monthly QIT meetings, with the exception of two tools which were deemed unnecessary (bar graph and monthly journal)
- Use the coaching at district level once per quarter, ideally at the first QIT meeting of quarter to help with identifying the key problem to focus on for the quarter and activities to address it (rather than expect district coaches to participate monthly, so as to make time commitments more realistic)
- While the LSs were viewed as valuable, it was agreed they were too expensive for the MOH to absorb the costs and implement nationally. However, participants agreed that there should be an attempt to piggyback LSs onto other peer-to-peer sharing and learning opportunities.

While the IcSCI districts showed improvement at midline, the results were less impressive than those seen in the QC group. However, since it was never envisioned that all nine indicators would be added to the cPBF participants felt that inclusion of one or two indicators would be valuable and signal the importance of supply chain tasks. Therefore, the recommendation was to:

- Select Indicator 4 (*percent of the CHWs with stock cards where physical inventory matches stock card balance*) since it was within CHW's control and would already be collected via the CHW Supervision checklist (included in the integrated training)
- Include one of the supply chain indicators, ideally indicator #4, in the cPBF and distribute incentive payouts to cooperatives per national cPBF policy

What clearly resonated with participants of the DVW in analyzing the data and putting the findings into context was how motivating peer-to-peer learning and coming together around a formalized structure was to CCs and HC staff. Additionally, the powers of data visibility to problem solve and make good decisions clearly rose to the top.

¹¹ Participants felt that the QIT process could be applied and used for other cPBF indicators but suggested starting with only supply chain related topics. Once QIT has been successfully applied, it is believed that the QIT will naturally begin to be applied to others.

Conclusion

Improving reporting, visibility, and use of logistics data from the community level is essential to strengthening the supply chain. This flow of information lays the foundation for improving the overall availability of essential health products at the community level by improving the quality and types of decisions CCs, HCs, district and central managers are able to make with this data. Evidence from the midline assessment and DVWs showed that creating formalized teams with a mission to address the challenges they find around product availability and empowered with timely, accurate data for enhanced decision making is feasible and affordable and leads to improved supply chain performance. There is broad consensus and endorsement to scale up the RSP package of interventions to the whole country. There is also general agreement from the workshops after reviewing midline data that implementing *parts* of the QC packages and IcSCI packages are equally important to implement in order to enhance the uptake and adherence to the RSPs. The specific components of the two intervention packages (QC and IcSCI) that have been endorsed by the MOH to scale up at national level are:

- Incorporate **Indicator #4** into cPBF scheme.
- Develop and administer separate module during **first QIT meeting** to establish CC-HC QITs. At these meetings the norms for effective QIT meetings should be set.
- Provide CCs with a token **allowance** as a contribution towards communication and transport to ensure quarterly home supervision take place.
- Support **district coaching** activities once per quarter.

Of paramount importance is that the above mentioned components along with the RSP package be rolled into **one integrated supply chain training package** to be further integrated with CCM training, administered by CHD Master Trainer of Trainers. Some of the components involve high up-front costs (national training to CC level – 2,148 CCs and an additional 2,148 second CCs as of this report – on integrated curriculum and printing of supporting tools for RSPs and QCs), and then smaller recurring costs (refresher trainings and periodic reprinting of materials). For other components, it may be necessary for the MOH to mobilize funds – for example, the incentive payments for the cPBF supply chain indicator – or to alter job descriptions so that components of this work happen routinely (district coaching visits, CC supervision visits), unless resources are available to provide facilitation allowances. However, in recognition of the importance of product availability with CHWs for child health and the results seen via this evaluation the efforts are warranted. Scaling up the above described approach to the whole country is essential for strengthening the community health supply chain and improving product availability of essential medicines and should be considered a priority in efforts to achieve MGD4 goals and Rwanda’s specific plans to improve child health outcomes nationally.

Appendix A

Description of SC4CCM Theory of Change Model

The SC4CCM Theory of Change model provides the framework for the project evaluation, identification of solutions and innovations, monitoring of change and demonstration of success. The interventions and solutions proposed by SC4CCM to strengthen supply chains for community case management are based in the analysis of the relative strength of these system performance elements or causal pathways (color coding) and their preconditions (boxes).

The TOC model diagrams the pathway of change to the intermediate and ultimate goals, or long term outcomes, of the SC4CCM project (represented in the light blue boxes at the top of the diagram). Described below are the key components that make up the pathway of change.

Key components

Preconditions - The preconditions are the building blocks that the project believes necessary to achieving the long term outcomes. The preconditions are represented in the boxes below the two goals and are color coded to represent how each precondition fits into one of three hypothesized causal pathways. The size or position of the precondition box does not indicate the importance or significance of that precondition, each precondition is considered necessary for change to occur.

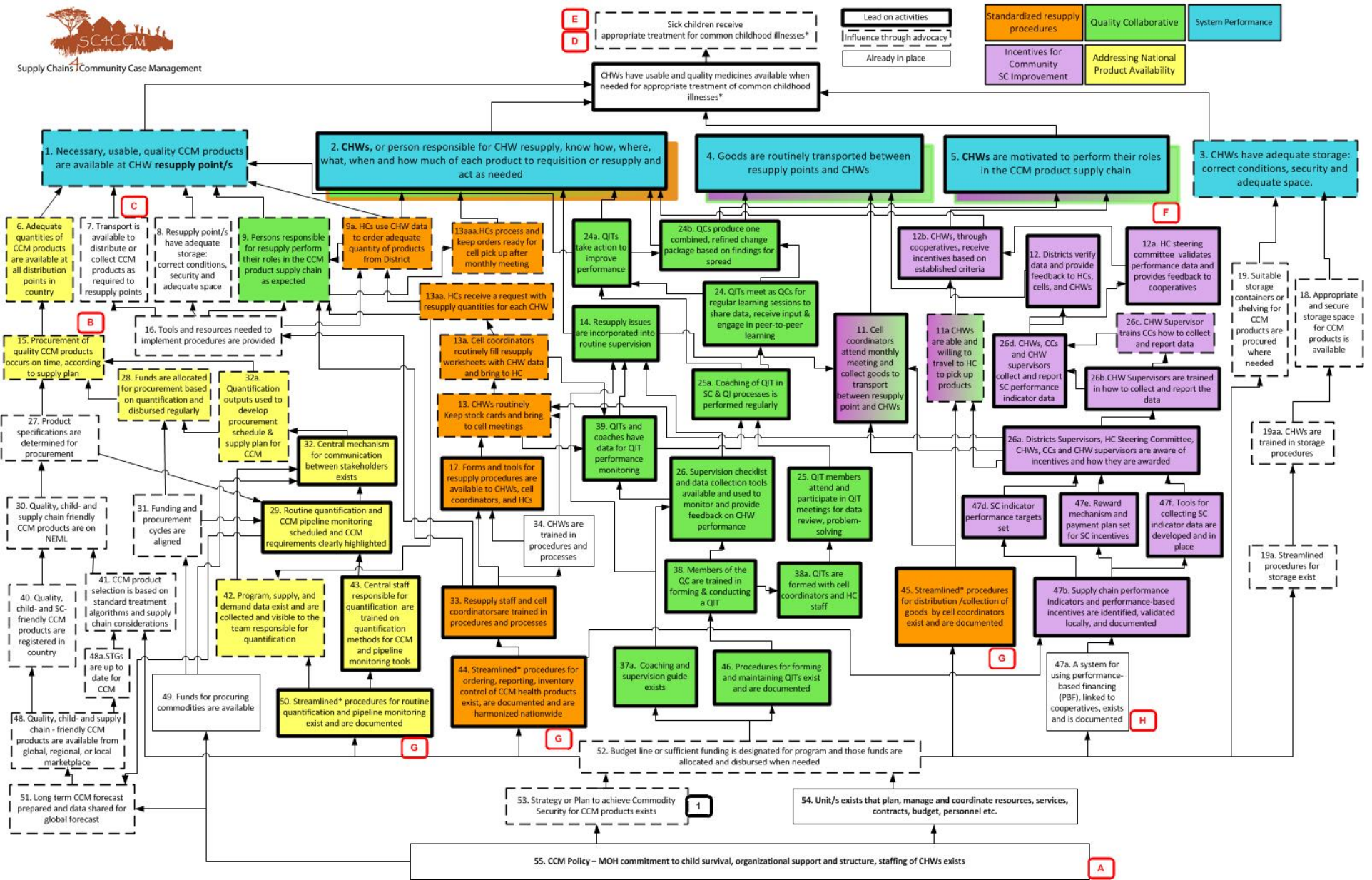
Arrows - The arrows indicate the sequence that preconditions should be addressed, with a belief that one precondition cannot be fully accomplished until the preconditions before are achieved. This sequence creates the pathway of change.

Interventions - Interventions are central to the theory of change as they describe the types of activities required to bring about each precondition on the pathway to change. Country specific interventions have been identified according to weak or missing preconditions found in the baseline evaluation. Rather than adding more detail to the diagram, these are described in detail in the implementation plan.

Indicators - Each precondition is a preliminary outcome with indicators (numbers within each precondition box) that measure the success of interventions adopted to achieve the preconditions.

Assumptions - Assumptions, represented by letters, are the necessary factors for change that are outside the project control. These assumptions demonstrate the limitations to what the project can expect to change alone and emphasize the need for collaboration with governments and partners.

Theory of Change Diagram



Appendix B: Core Indicators

Main SC4CCM Objective: (Ensure that) CHWs have usable and quality medicines available when needed for appropriate treatment of common childhood illnesses

- % of CHWs with key CCM products in stock on day of visit, by product
- % of CHWs with key CCM products adequately stocked on day of visit, by product (based on stock on hand and number of issues made)
- % of CHWs with any stockout of key CCM products in past 1 month (30 days), by product
- Mean duration of stockouts of key CCM products in past 1 month (30 days), by product
- Quantity of lost/damaged/expired key CCM products at CHW level on day of visit, by product

Pre-condition 1: Necessary, usable, quality CCM products are available at CHW resupply points

- % of resupply points with key CCM products in stock on day of visit, by product
- % of resupply points with key CCM products adequately stocked on day of visit, by product (based on SOH and number of issues made)
- Mean number of stockouts in key CCM products at resupply points in past 6 months, by product
- Mean duration of stockouts in key CCM products at resupply points in past 6 months, by product
- Quantity of lost/damaged/expired products at re-supply level, by product

Precondition 2: CHWs, or person responsible for CCM resupply, know how, where, what, when, and how much of each product to resupply

- % of CHWs/other re-supply persons trained in ordering system and processes
- % of CHWs/other re-supply persons with accurate knowledge, based on compliance with documented procedures, of:
 - the reporting processes
 - the ordering processes
 - the distribution or collection processes

Precondition 3: Goods are routinely transported between resupply points and CHWs

- % of CHWs using each type of transportation (foot, bike, truck)

Precondition 4: CHWs have adequate storage: correct conditions, security and adequate space

- % of CHWs that have:
 - Adequate storage conditions and security, according to guidelines
 - Adequate space

- Mean number of storage conditions met at CHW level

Precondition 5: CHWs are motivated to perform their roles in the CCM product supply chain

- % CHWs who receive supervisory visits
- % of CHWs who receive feedback (written or verbal)

Appendix C: Data Validation Workshop Participants

IcSCI Data Validation Workshop Participant List			
No.	Name & Surname	Location	Position
1	Mushimiyimana Colette	CS Nyamugali	ASC
2	Nyirahakizimana Perpetue	CS Nyamugali	ASC
3	Dusabeyezu Josephine	CS Nyamugali	Pharmacy Manager
4	Umurerwa Dative	CS Bungwe	Pharmacy Manager
5	Yankurije Priscile	CS Mwogo	CHWs
6	Mukacya Chrisyine	CS Gakurazo	Pharmacy Manager
7	Muhire Jonas	CS Mwogo	ASC
8	Mujawamaliya Beatrice	SC Mwogo	ASC
9	Habakurama Francois	SC Ruhuha	ASC
10	Mukeshamariya Venantie	SC Ruhuha	ASC
11	Utamura Samira	SC Kamabuye	Pharmacy Manager
12	Uwihanganye Clementine	SC Gahunga	ASC
13	Uwitije Delphine	SC Gahunga	CHWs
14	Muhire J M Vianey	SC Gahunga	CCs Supervisor
15	Des Horts Segolehe	CS Sovu	Store manager
16	Uwimana Jeanne d'Arc	SC Mbazi	ASC
17	Ingabire Fortunee	SC Mbazi	ASC
18	Karegeya Jean Bosco	SC Mbazi	CHWs
19	Mukamugenzi Clarisse	SC Rubona	ASC
20	Nyirimana Christine	SC Rubona	CHWs
21	Rudasingwa Maurice	SC Rubona	ASC
22	Sibomana Ananie	SC Ruhuha	ASC
23	Nzarerwanimana Celestin	Nyamata DH	CHWs
24	Rudasingwa Daniel	Kabutare DH	Data manager
25	Munezero Aisha	Kabutare DH	CHWs
26	Egide Muziganyi	Huye District	Director Pharmacy
27	Rurangwa Celement	Bugesera District	Director Pharmacy
28	Uwamariya Liliose	SC Kirambo	Pharmacy manager
29	Nyirahabimana Anathalie	SC Simbi	Pharmacy manager
30	Uwingabo Joseph	Burera District	Pharmacy manager

QCs Data Validation Workshop Participant List			
No.	Name & Surname	Location	Position
1	Riberakurora Sylvestre	CS Shyira	ASC
2	Ntibayazi Cresensia	CS Shyira	ASC
3	Nzabonampa Fabien	CS Cyimbiri	ASC
4	Bamazeyo J Damaceene	CS Cyimbiri	AS
5	Dusengimana J Claude	CS Kinihira	ASC
6	Habiyaremye Thacien	CS Kinihira	ASC
7	Ntiahinyuka Javier	CS Cyimbiri	CHWs
8	Izababayo J D'amour	SC Shyira	CHWs
9	Mukamurigo Euplosine	SC Kinihira	ASC
10	Hitimana J MV	Nyabihu District	Pharmacy Director
11	Umutoni Lydivine	SC Kareba	Data manager
12	Mukamugema M Claire	DH Shyira	CHWs
13	Nyirarukundo Leonille	SC Mushubati	Data manager
14	Kwizera J Nepo	SC Kirwa	ASC
15	Karibwende Francoise	SC Kirwa	ASC
16	Ugiriwabo Bernadette	SC Kirwa	CHWs
17	Uwingabire Marie Rose	SC Gituku	Data manager
18	Rutaganda Fiacre	Ngoma District	Pharmacy Director
19	Ingabire Claudine	SC Nyange	Pharmacy manager
20	Rugwizangoga Evarde	Kibungo DH	Pharmacist
21	Soeur Odette Nyirangore	SC Congo Nil	Pharmacist
22	Dusabemariya Sophie	SC Birembe	Pharmacist
23	Ntawunzambwanga Celesis	SC Gakamba	ASC
24	Ndimurwago J Damaceene	SC Gakamba	ASC
25	Nsengiyumva Emmanuel	SC Gakamba	CHWs
26	Hategekimana J Baptiste	Kibungo DH	CHWs
27	Majyambere Antoine	CS Remera	CHWs
28	Vumiriya Julienne	SC Remera	ASC
29	Bagirigomwa J Claude	SC Remera	ASC
30	D _R Mukasa Josue	Shyira Hospital	Director
31	Murorunkwere Immaculee	Murunda DH	CHWs
32	Phn Habiyambere J P	Murunda DH	Director

National Data Validation and Sustainability Workshop Participant List			
No.	Name & Surname	Location	Position
1	Umwurerwa Francine	Nyabihu District	District Health
2	Gasana Célestin	Musanze District	District Officer
3	Nsenga J Pierre	SFH/Rwanda	MCH/FP Manager
4	Ndahiro Andrew	Rwanda Family Health	District Coordinator
5	Dr Namanya Wiliam	Kibungo DH	MD
6	Ndahayo Oscar	Butaro DH	CH Sup
7	Nyiraneza Irene	Delagua Health	Supply Chain Manager
8	Rwaburindi Price	Bugesera District Health M&E Ofiicer	District
9	Tongren Eric	CDC PMI	RA
10	Andrew G Ntwali	UNFPA	Prog Officer
11	Florence Mubano	MOH	Pharmacy TF
12	Uwamahoro M Diane	CARE International	Intern
13	Umutoni B Chantal	Ruhango District	M&E
14	Kamali Mpizi Maurice	Shyira Hospital	Administrator
15	Eugène Niringiyimana	Murunda Hospital	Director
16	Nicaise Ugabinema	World Vision RWanda	Manager
17	Karamage Eliphaz	Ngoma District	M&E Officer
18	Bavuganayo Omar	Kabutare DH	Pharmacist
19	Nyiranyamibwa Ellen	Gasabo District	Director of Health
20	Mukamabana Amiel Clémence	Rutsiro District	Director of Health
21	Umuhoza M Chantal	Rwamagana District	Director of Health
22	Rutagenwa Alfred	Bugesera District	Director of Health
23	Muhawenimana Petronille	Huye District	Director of Health
24	Wane Olivier	MOH/ MCH	

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