FINAL PROJECT REPORT NARRATIVE

Program Title: Health systems strengthening using quality improvement approaches

Recipient: 20 000+ Partnership
Cooperative agreement number: U2G/PS001081-05
Budget period: April 2008 – June 2015

Principal Investigator: Jennifer Reddy until February 2015, then Bernhard Gaede, UKZN
Business Official: Jordache Chetty until March 2015, then Dasarath Naidoo, CRH, UKZN
Responsible Person: DVC (research) Prof Blackledge
CONTACT ADDRESS: Centre for Rural Health, 4th Floor, George Campbell Building, Howard College, UKZN, Durban

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List of Acronyms

AIDS	Acquired Immunodeficiency Syndrome
ANC	Antenatal Care
ART	Anti-retroviral therapy
ARVs	Anti-retroviral (drugs)
CCGs	Community Care Givers
CCM	Community Case Management
CDC	Centers for Disease Control and Prevention
CHC	Community Health Centres
CHWs	Community Health Workers
Co-Ag	Cooperative Agreement
CQI	Continuous Quality Improvement
CRH	Centre for Rural Health
DHIS	District Health Information System
DOH	Department of Health
DOTS	Directly Observed Treatment and Support
FGD	Focus Group Discussions
HAART	Highly active anti-retroviral therapy
HEARD	Health Economics and HIV AIDS Research Division
HIV	Human immunodeficiency virus
IHI	Institute for Healthcare Improvement
IMCI	Integrated Management of Childhood Illness
KZN	KwaZulu-Natal
KZN DOH	KwaZulu-Natal Department of Health
MCH	Maternal and child health
MCNWH	Maternal, child, neonatal and women's health
MCWH	Maternal, child and women's health
M&E	Monitoring and evaluation
MEPI	Medical Education Partnership Initiative
NDOH	National Department of Health
NHLS	National Health Laboratory Services

NSP	National Strategic Plan
PCR	Polymerase Chain Reaction
PHC	Primary Health Care
PI	Principal Investigator
PMTCT	Prevention of Mother to Child Transmission
PNM	Perinatal meetings
QI	Quality improvement
QM(s)	Quality Manager(s)
RCT	Randomized controlled trials
UKZN	University of KwaZulu-Natal
UNICEF	United Nations Children's Fund
US	United States of America
PEPFAR	Presidential Emergency Plan for AIDS Relief
WHO	World Health Organization

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Section A – Cooperative Agreement Background

In 2008 the University of KwaZulu-Natal (UKZN) responded to a competitive call for proposals by the U.S. Centre for Disease Control and Prevention (CDC) to address the unacceptably high rate of mother-to-child transmission of HIV in South Africa. This was seen to be a key component of the overall response to the HIV pandemic in South Africa. The 20 000+ partnership comprising of the UKZN, the KwaZulu-Natal Department of Health (KZN DOH) and the Institute for Health Care Improvement (IHI) was awarded a 5 year grant by the CDC to improve the performance of the prevention of mother-to-child transmission (PMTCT) Program in KwaZulu-Natal, South Africa. As part of this partnership, UKZN entered a Cooperative Agreement (Co-Ag) with CDC.

By the end of 2013 the project had implemented quality improvement (QI) approaches in the project area which contributed to a dramatic decrease in mother-to-child transmission of HIV. The Co-Ag was extended by a no-cost extension to 2015 and included work to consolidate the gains made, build capacity in the district and provincial structures around the QI approaches for health systems strengthening. Following discussions with the national Department of Health (NDOH)the project was broadened in 2012 to providing Community Health Workers (CHW's) with support and supervision in the context of maternal and child health care.

The purpose of the grant was to provide financial and programmatic assistance to South African universities that were working on HIV and AIDS prevention, care and treatment programs. A particular focus of the award was to support the U.S. and South African Government in the expansion and strengthening of HIV and AIDS-related activities under the President's Emergency Plan for AIDS Relief (PEPFAR) in South Africa. The activities implemented were aligned with the South African National Department of Health's (NDOH) national priorities and required a focus on health systems strengthening to improve health outcomes. At the time, NDoH sought to increase access and quality of the PMTCT program – and within the focus of UKZN Department of Pediatrics an increasing concern regarding the vertical transmission of HIV to infants drove much of the project objectives.

In consultation with the CDC, NDOH and the project a further component was added to the project as an amendment to explore the function of community health care workers in a more focused maternal and child health intervention.

Section B – Narrative by Program Area

Background and Introduction

Between 2006-2008 there was an unacceptable gap in the performance of the South African PMTCT program. At the time perinatal transmission of HIV in South Africa was high (>20%) with tens of thousands of unnecessary infections of infants occurring around the time of birth despite existing PMTCT programs (Rollins, 2007). Numerous obstacles contributed to the failure of national and district health systems to successfully operationalize the PMTCT recommendations. While in some cases there were genuine deficiencies in human and physical resources, as well as incomplete training, our experience in rural and urban South African PMTCT programs pointed to a widespread failure to reliably deliver the sequence of simple steps in the processes of care (e.g. determining a mother's HIV status, reliable dispensing of prophylactic drugs). Additional transmissions of HIV from the mother to the child occurred due to inappropriate infant feeding choices by HIV-infected mothers either because of poor antenatal counselling and/or lack of support from health workers. At the time UNAIDS estimated that only 34% of HIV infected expectant mothers were accessing ARV prophylaxis globally (UNAIDS, 2006).

In August 2006, Dr Zungu, then Deputy Director General in the KZN DOH, requested a multi-disciplinary team to develop an operational plan to improve the quality of PMTCT services. The team included the KZN DOH representatives from each of the 11 health districts and academics from the Departments of Paediatrcs, Obstetrics and Gynaecology, Public Health as well as the Health Economics and HIV/AIDS Research Division (HEARD) and the Centre for Rural Health (CRH), all from the University of KwaZulu-Natal (UKZN).

The project, now known as 20 000+, was established specifically to decrease perinatal HIV transmission by more than 50% (from levels of >20% to <10% infection rate). The project used proven continuous quality improvement (CQI) methods to rapidly scale-up locally tested strategies to strengthen PMTCT services. "20 000" is the number of HIV infections in newborn children that the project planned to prevent each year in KZN Province if the program was successfully implemented and scaled-up to the whole province.

The 20 000+ project started being based at the facilities in 3 districts in KZN Province, namely Ethekwini, Ugu and Umgungundlovu districts. It was recognized that interventions to improve services would be required both in the facilities offering PMTCT services as well as in the community to ensure optimal access and provision of care.

Following discussions with the NDOH, in 2012 through an amendment of the Co-Ag a further component was added which supported community-based services. This component of the project was implemented only in Ugu district.

The specific goals and objectives are listed below.

Goals and Objectives

Facility-based aspect of the project

Overall aim:

The overall aim of the project was to reduce perinatal HIV transmission from mothers to their children within 2 years and improve overall child survival within 5 years in three districts of KZN through health system strengthening activities including the introduction of new PMTCT protocols at facility level.

Specific objectives:

- To implement systems improvement activities that would increase the effectiveness of PMTCT services across three districts of KZN Province;

- To support rapid implementation of effective PMTCT activities in particular "opt-out"[1] HIV testing, "fast-track"[2] referral for HAART for mothers with CD4 count < 200, and introduction of dual ARV prophylaxis for mothers and infants;
- To monitor and evaluate the effect of these processes and document the health system responses and obstacles to the quality improvement activities;
- To augment and develop health systems improvement capacity at provincial, district and facility/primary health care level to initially sustain effective PMTCT services. The approach could be applied to any other health domain and service delivery
- To determine the cost-effectiveness of these quality improvement activities
- To disseminate findings rapidly in order to facilitate scaling up of similar approaches elsewhere

Once the original aim of the 20 000+ project had been achieved, in 2011 the project engaged with NDOH and KZN DOH regarding other priority areas. The NDOH was particularly interested in exploring the role of Community Health Workers (CHWs) [known as Community Caregivers (CCGs) in KZN] and their role in bridging the gap between communities and primary health care facilities particularly in the context of maternal and child health and improving the uptake of ARVs.

The need for community based interventions has arisen out of the little progress South Africa has made towards achieving improvements in child and maternal mortality. If deaths among mothers and children are to be reduced, improved coverage of currently available interventions is a key priority. CCGs are employed in many areas of KZN and have the potential to provide accessible, appropriate promotive and preventive services at community level, to improve continuity of care during pregnancy and the postnatal period, and to increase coverage of key interventions by improved linkages to primary health care services. Although CCGs have been shown to be effective in improving coverage of maternal, child, neonatal and women's health (MCNWH) interventions

[1] "Opt out" HIV testing refers to a system where HIV testing is offered to all clients rather routinely rather than making HIV counseling and testing optional where client would need to "opt in".
[2] "fast track" refers to a system where mothers with a CD4 count of less than 200 for initiation of HAART to the ARV clinic would not be joining the waiting list and be prioritized for initiation.

elsewhere, this should not be considered an easy or low cost option. CCG programs will only be successful if there is adequate training and strong supervision and support for the CCGs.

Poor recognition of seriously ill children in the household resulting in children presenting to health facilities late in the course of the illness or failing to attend health facilities at all, is an important factor that contributes up to 70% of child deaths occurring outside of health facilities. For this reason, the World Health Organization (WHO) has developed a training package for CCGs with the goal of improving early detection of illness at home and promoting timely referral to appropriate health facilities. This package is known as Community Case Management of Childhood illness (CCM).

The principles of CQI are to feedback knowledge, to harvest local solutions gained from early implementation of interventions, and to rapidly scale-up approaches. The CQI approach had been used extensively in management and supervision of health programs and specifically in the implementation of PMTCT programs within health facilities. It had however not been used previously to support CCG activities in community settings.

Due to the dearth of the information available on how CCGs could be deployed to have a larger impact, a research project was The Co-Ag was amended to include the support for the research project within the project.

Community-based aspect of the project

Overall aim:

The overall aim of the CCG aspect of the project was to evaluate the effectiveness of the CCM of Childhood Illness Training and CQI Supervision for CCGs to support maternal and child health interventions. The amendment of the Co-Ag in 2012 supported this research project with technical and administrative oversight to the community project. This support included the introduction of CQI as part of the supervision process of CCGs as well as linking PHC clinics to the CCG activities in the community.

Primary objectives of the research project

The primary objective of the randomized control trial was to assess the impact of a HIV-adapted CCM training with CQI supervision on the following outcomes:

- Prevalence of antenatal booking before 20 weeks gestation
- Prevalence of presentation for post-natal care within 7 days of delivery
- Prevalence of exclusive breast-feeding practice
- Coverage of HIV PCR testing at 6 weeks

Secondary Objectives

The secondary objective of the RCT was to assess the impact of HIV-adapted CCM training with CQI supervision on the following outcomes:

- Proportion of women who attended antenatal care at least 4 times in pregnancy
- Proportion of deliveries by skilled birth attendant at a health facility
- Proportion of age-eligible infants who received recommended immunizations at 6, 10, and 14 weeks, and 9 months
- Prevalence of exclusive breast-feeding practice in the first 6 months of life
- Proportion of women without known HIV-positive status who received HIV test in pregnancy
- Proportion of women without known HIV-positive status who received HIV test result in pregnancy
- Proportion of HIV-positive women who received CD4 test results
- Proportion of HIV-positive women who received ARV prophylaxis in pregnancy and during delivery
- Proportion of infants born to HIV-positive mothers who received ARV prophylaxis following birth (including during breastfeeding where appropriate)
- Knowledge and practices of mothers in the community regarding: infant feeding, HIV, availability of interventions to reduce HIV transmission, newborn care practices and recognition of serious illness in children and management of childhood illnesses
- Knowledge and practices of CCGs with regards to: HIV-specific interventions to improve maternal health, reduce HIV transmission and improve child survival (e.g. counseling for HIV, encouraging early ANC booking, birth planning,

adherence to ARVs); infant feeding, newborn care practices, recognition of serious illness in children and management of childhood illnesses, and preventive and curative care for children (e.g. vitamin A, oral rehydration solution, immunizations)

- Degree of exposure to CCGs (measured by frequency of visits, and services provided)

- In addition to the RCT, a process evaluation was designed to run alongside the intervention component to measure knowledge retention over time, to closely monitor study activities, and to explore participant experiences of the intervention. The process evaluation was also designed in order for the study team to learn lessons along the way and adapt processes where necessary.

Project Sites

KZN is the most populous province in South Africa and has the highest HIV prevalence of any province in the country. In 2005, 40.7% (national average 29.5%) of pregnant women attending antenatal clinics tested HIV-positive; a significant increase from the 2003 survey at 37.5%. Beyond the significant burden of disease due to HIV, KZN also has high infant mortality rates (49.5 in 2008 ref HST website) and high maternal mortality ratio in the country (280 in 2008). Furthermore of the 10 most deprived local municipalities in the country, 4 are situated in KZN (Noble et al, 2013).

Nationally the health care system is delivered through a district health system that is coordinated through provincial departments of health. In KZN there are 11 health districts, one of which is the Ethekwini around the city of Durban. The provincial DOH KZN was responsible for health care delivery in the province and

At the initiation of the project three districts in KZN were selected by the KZN DOH to participate in the project. The selection was based on the populations of the districts, the disease burden in the districts and the relative deprivation. At the time the 3 districts contained more than half (~5m) of the entire population of KZN (~9m) and suffered high antenatal HIV prevalence rates - Ethekwini 41.6%, Ugu 38.9% and Umgungundlovu 44.4%. Between the three districts there were over 214 primary health care (PHC) clinics and 16 public hospitals delivering 82,000 babies per year. Umgungundlovu

contains Pietermaritzburg, the second largest city in KZN Province. Durban and Pietermaritzburg both have large areas of informal housing and peri-urban areas with extremely poor communities. Ugu District had been identified as a district in KZN with one of the highest deprivation indeces (Noble et al, 2013).

Project Description

As the two components of the project, namely the facility-based aspects and the community-based aspects, had separate time lines and different objectives, the 2 aspects are reported on separately below.

FACILITY-BASED ASPECTS OF THE PROJECT

As mentioned above, the focus of the facility-based aspect of the project centered on 3 districts; Ugu, Umgungundlovu and Ethekwini.

Table 1: Number of health facilities and total registered births in participating districts in 2006

	Clinics	Hospitals	Total births (2006)
Ethekwini	107	8	51,352
Ugu	53	4	13,770
Umgungundlovu	54	4	17,486

Audience and Stakeholder participation

The 20 000+ project engaged all 48 primary health care supervisors, 214 clinics and 16 hospitals in the three districts in the improvement work.

The KZN DOH committed itself to the improvement methodology which was essentially a quality improvement program and capacity development. A description of the methodology is found in the appendix 1. The project also established itself as a partner

with the KZN DOH at provincial and district level and regular meetings were held for the different levels of stakeholders. The meetings held at different levels are detailed below:

The Provincial leadership meetings: comprised of the senior program managers of the HAST and MCNWH programs at Province and the three district managers. The interval of the meetings was twice yearly.

District 20 000+ partnerships meetings: Comprises of the District manager, other senior team members including coordinators and training staff. Meetings took place three monthly.

District Task team meetings: PMTCT coordinator, PHC coordinators, District Information officer and project team, which took place monthly.

The process of the meetings reflected strongly the unique partnership that was achieved in this project. This strongly contributed to the success of the project. The responsiveness of the district managers and the engagement of the facility staff in the processes was critical for issues raised from the facilities to be addressed. To some degree the relationship between the project and the members of the DOH at different levels facilitated a bottom-up response to policy implementation.

Methodology

Fundamental to the approach used in the facility-based aspect of the project is strengthening of the existing health system and capacity development at district and local level using CQI methodology. The 20 000+ team partnered with the Institute for Healthcare Improvement (IHI) to utilize their extensive experience and expertise in the use of CQI methodology in South Africa and other resource constrained settings. Central to this method is the use of data that tracks the processes of care, identify gaps in the healthcare system performance and monitor the effectiveness of CQI in improving targeted processes using rapid cycle change methods (see appendix for a description of the process).

Components of the QI framework

Aligned aims and set goals

Complete alignment of the aims of the program at all levels of the healthcare system is essential to the success of CQI. The 20 000+ Partnership used the IHI's "Model for Improvement," a sequential guide to improving health systems. This model encourages from the outset a clear statement of aims with highly visible targets. These aims and goals were set in partnership with the provincial department of health and district leadership to ensure complete agreement with the KZN DOH priorities.

Systems thinking

The performance of every program including PMTCT is the result of the delivery system at all levels - local understanding of the system and reconfiguration of that system is critical to effect the desired change. The team initially focused on conveying this message and demonstrating how each component of PMTCT care process was responsible for the unacceptably high perinatal transmission rate at the time. To this end, the sequence of processes in the PMTCT care pathway was mapped and assigned measures and targets to track performance of each step.

Multi-disciplinary improvement teams

The QI methodology was operationalized at two levels: district and facility level.

District level support

At the district level, a multi-disciplinary task team was established to provide guidance on strategic issues around the implementation of the PMTCT program. The team typical comprised of program managers, M&E, district information officer, PHC coordinators and supervisors. The task team met every month to review the progress of 20 000+ activities and outcomes. As part of the senior management in the district they were effective in solving health systems obstacles that impended improvement of PMTCT processes at local level. They were also an effective force in disseminating best practice and spread innovations across the district.

Facility level support

At the onset of the project, the 20 000+ team trained and mentored PHC supervisors and coordinators in quality improvement methodologies and management skills to improve key PMTCT processes. This cadre of KZN DOH staff served as change agents. Facility-based improvement teams were formed which typically included professional nurses, HIV testing counsellors, data clerks and the facility operational manager. 20 000+ quality mentors visited facilities to coach them on the use of local performance data to identify gaps in clinical care (run-charts) and then use rapid-cycle QI methods. QI tools included the plan-do-study-act cycles, the Model for Improvement, process mapping and run-chart analysis. These tools were used to test approaches to close the gaps that had been identified. Improvement teams were encouraged to test their own ideas to improve reliability of care for each step in the PMTCT cascade.

Change agents

The 20 000+ team provided mentorship and support to facilities and local QI leaders which served as change agents. Change agents are individuals (PHC supervisors, district trainers, facility operational managers or program managers) who were tasked with leading all improvement work at facility or sub-district level with their peers. They were coached on basic CQI principles and supported as they lead their teams in identifying and improving performance gaps. Other responsibilities of change agents included:

- Facilitation of improvement team meetings at local clinics (ideally twice per month)
- Documentation of changes tried and implemented
- Feedback facility performance data and information
- Interpret facility performance reports with facility staff
- Attend sub-district improvement meetings

Change ideas from frontline staff

20 000+ staff working with facility-based multi-disciplinary “improvement teams” and change agents sought novel change ideas that could be tested on a small scale in facilities within a short period of time. Best practices were shared across the district via many KZN DOH and NDOH platforms, this subsequently culminated in the development

of a change package that was also utilized in the 2009 national accelerated PMTCT plan.

Data driven improvement cycles

Reliable and accurate public health information is essential for monitoring, evaluating and identifying gaps in the healthcare system performance. These data in South Africa are collected from all district healthcare facilities and stored in the District Health Information System (DHIS). The 20 000+ team utilized the DHIS to track progress of key PMTCT processes. In the earlier part of the partnership (2008 and 2009), 20 000+ activities improved the completeness and accuracy of these data, improve local data usage and complete the feedback loop.

These data quality improvement activities included three main components:

(i) Training days on data collection,
(ii) Monthly reviews of data
(iii) Data audits.

Three data training days for health-care facility and district information officers and PMTCT program managers were held. Each one-day training session dealt with: standardizing data collection procedures; improving data quality; selecting data elements that were useful for monitoring the quality of data on PMTCT services; and providing clear definitions of those data elements. After training, each district information officer liaised on data quality with facilities in his or her district. Monthly reviews of routine data on PMTCT services were carried out in each district by the district task teams and facilities.

The initial focus on data quality and the provision of facility specific performance report resulted in the entrenchment of the culture of information use to track progress of processes in the PMTCT care pathway.

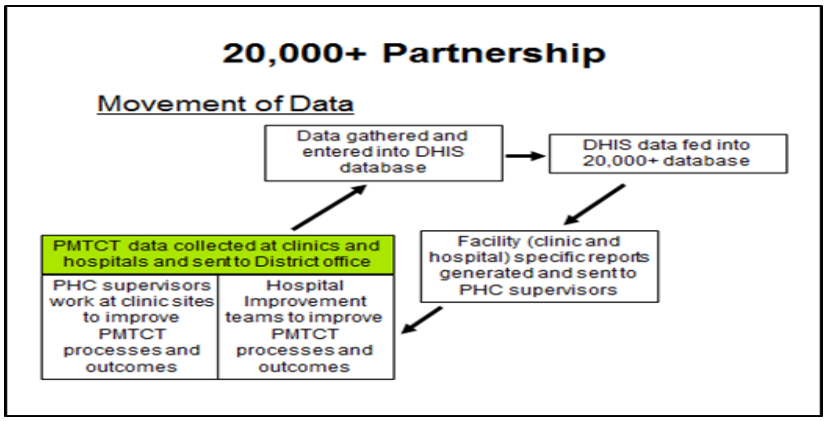

Figure 1: Movement of data

Feedback on performance data

The data generated in the clinics regarding the PMTCT program was sent directly to the district information officer. However, the routine PMTCT performance indicators were tracked locally as well by the 20 000+ team. Process indicators derived from data that continuously tracks the processes of PMTCT care at each health care site were used to target specific changes in care. Feedback of these performance indicators connected facilities to each other and to the broader narrative of district and nationwide PMTCT program performance. Sub-district meeting became vibrant as change ideas and performance data became a necessary part of these meetings and challenged all participating PHC clinics to adopt similar change ideas. Monthly dashboards were created as a quick tool to assess performance of facilities, sub-districts and district performance.

The dashboard tool that was developed is excel-based and showed both the numeric indicators against the targets over time and visually depicted the data in graphs on one page. Similar representations were created for each of the key dashboard indicators,

allowing for rapid analysis of the performance. However, the dashboard was merely the start of the conversation regarding change ideas.

Quality Improvement networks

Prior experience with large scale improvement interventions indicates that change is accelerated when successful ideas are transmitted from peer-to-peer, and when a culture of peer support can be developed. In a traditional quality assurance environment, the front line staff receives instructions to improve across a broad array of indicators in what is often a pejorative context. The purpose of the learning network was to bring together small teams (e.g. facility manager, nurse, counselor) from each health care sites at a 1 day meeting every 4 – 6 months (called a "Learning Session") to set common project aims, learn together how to map care processes, identify obstacles and solutions, learn how to test innovations and how to collect data to track improvement.

Figure 2: Quality mentorship of change agents and facilities

Learning sessions were organized into two settings (2008 – 2009):

a) Hospitals providing labour ward services: Small "improvement teams" (management, doctor, nurse, counselor) from each of the ~ 3 – 4 hospitals in each district were brought together to assist the process of improving delivery of

antiretroviral therapy to women and infants in the peri-partum period, and to improve the transfer of medical information back to the primary care sites for future HIV care.

b) Additional support for poor performing facilities. At Learning Sessions sites that were struggling were also be exposed participants from high performing sites who shared their experience and strategies for success. Through demonstrating locally-inspired successes, this mechanism was highly effective in addressing the prevailing belief that the only way to improve performance is to provide additional resources.

Between these learning sessions, quality mentors visited the hospitals and clinics with change agents (e.g. nurse supervisors) regularly (1-2 times per month) to support the teams, and sustain the improvement process. The teams then reported out to peers at subsequent learning sessions and plan new interventions for the ensuing months. It was critical to have the small team that focused on a detailed aspect of the overall project to manage and improve.

Wedge quality improvement meetings

Although learning sessions in the early years (2008 – 2009) of the project were successful, they were labor-intensive to organize as KZN DOH staff had many other responsibilities. In the latter part of 2009 going forward, the project transitioned to the use of routine DOH meetings as a platform for learning and disseminating best practice. This ensured sustainability and rapid "spread" of health systems improvement knowledge. These meetings included sub-district clinic meetings and perinatal meetings (PNM), where hospitals and feeder clinics met on a monthly basis or other **"wedge meetings"**. The "wedge" is a unit that represents a hospital with all clinics and CHCs that refer to the hospital (figure 3).

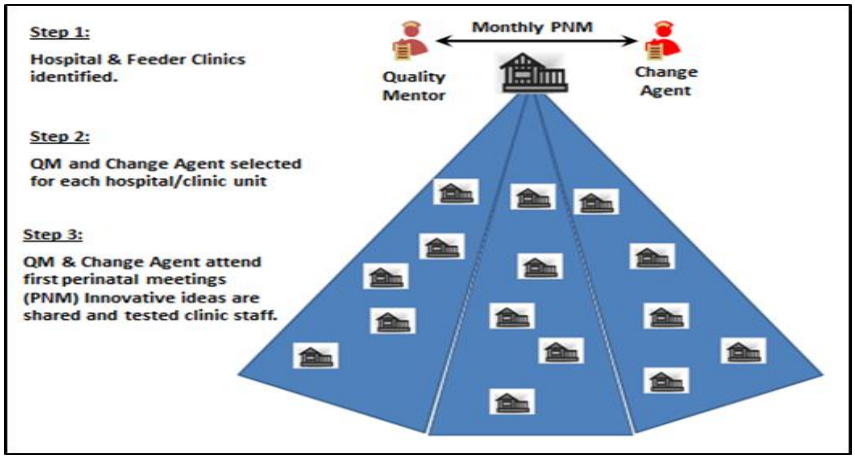

Figure 3: Quality improvement meetings arranged in a "wedge units"

The local change agent under the support and mentorship of a 20 000+ quality mentor lead these meetings. Basic quality improvement tools and skills were continuously taught to clinic and hospital staff. Data feedback to the sub-district / wedge meeting allowed assessment of performance and decisions about where to focus efforts for improvement. The focus on site specific data allowed for prioritization of the efforts of the change agent who would visit sites to improve system performance.

Outcomes

The overall goal of the project was to reduce the perinatal transmission rate of HIV to below 5% at six weeks through the improvement of the health system and PMTCT processes. With the advent of better treatment regimens and protocols, this was reduced to below 2% as would be expected if the health system was functioning well. As the PMTCT program underwent improvements and adjustments, many of the initial indicators and targets to track PMTCT processes had to be altered. Reported below are core PMTCT indicators that relates to the PMTCT processes and outcomes. All data presented below compared to the target set by the KZN DOH with its actual performance.

Early Antenatal booking (below 14 weeks)

An essential part of effective PMTCT program is early antenatal booking for pregnant women in order for them to benefit from interventions aimed at reducing the risk of perinatal transmission of HIV. The 2014 target was not reached due to a number of reasons that are beyond the influence of the health system. It was recognized that improving community engagement was the key to early antenatal booking and despite the target not being reached in 2014, there has been a steady increase in the early antenatal booking below 14 weeks

Table 2: Early antenatal booking before 14 weeks

ANC Early Booking									
	2014 Target	2007	2008	2009	2010	2011	2012	2013	2014
KZN Province	**65%**	**33%**	**33%**	**34%**	**36%**	**40%**	**45%**	**52%**	**56%**
Ethekwini	65%	30%	30%	34%	35%	38%	44%	52%	53%
Ugu	65%	39%	44%	33%	35%	33%	46%	57%	60%
Umgungundlovu	65%	51%	48%	45%	42%	47%	51%	56%	59%

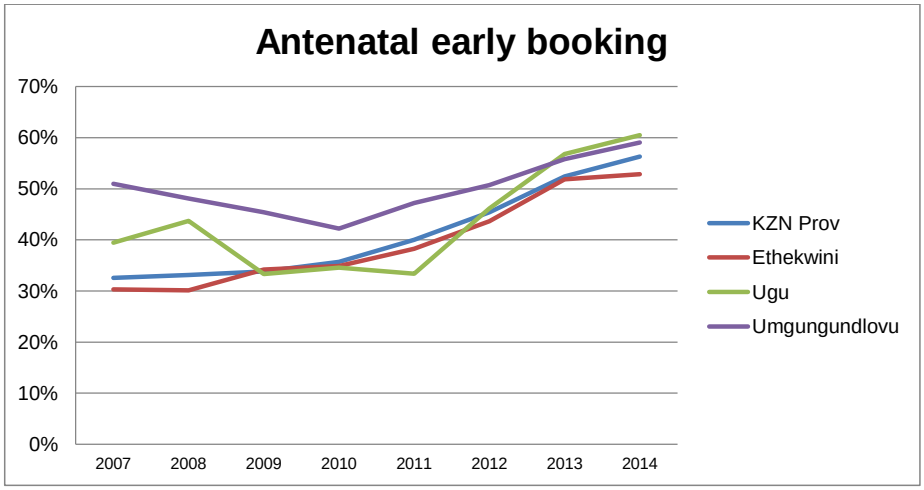

Figure 4: Early antenatal booking before 14 weeks

Antenatal counseling and testing for HIV

The sustained improvement of key process indicators in the PMTCT program is testimony to the sustained improvement in the delivery of this program. We have seen counselling and testing rates in the antenatal clinics increase from 60% to more than 95% over the project period. Presently, virtually all women who present for antenatal care consent to HIV testing and access appropriate interventions. In the past few years a new indicator tracking the re-testing of a subset of women that have a negative initial HIV test was developed. Particularly Ugu district consistently achieved high rates of testing. The naming, definition and manner in which this indicator was collected changed several times, which made it difficult to reliably track as both numerators and denominators changed. This resulted in data reporting rates of greater than 100% being reported. Despite these challenges there been a marked improvement with Ugu district reaching the 2014.

Table 3: Antenatal counselling and testing for HIV

HIV Testing Rate									
	2014 KZN Target	2007	2008	2009	2010	2011	2012	2013	2014
KZN Province	80%	76%	83%	94%	98%	196%	111%	99%	102%
Ethekwini	80%	57%	69%	71%	85%	206%	115%	104%	104%
Ugu	80%	94%	81%	113%	105%	227%	122%	106%	103%
Umgungundlovu	80%	66%	80%	138%	88%	174%	105%	96%	99%

Table 4: Antenatal HIV re-testing rates

HIV re-testing every 3 months									
	2014 KZN Target	2007	2008	2009	2010	2011	2012	2013	2014
KZN Province	80%	-	-	22%	30%	22%	47%	57%	68%
Ethekwini	80%	-	-	17%	31%	19%	41%	57%	67%
Ugu	80%	-	-	32%	33%	22%	53%	72%	89%
Umgungundlovu	80%	-	-	19%	34%	23%	57%	51%	65%

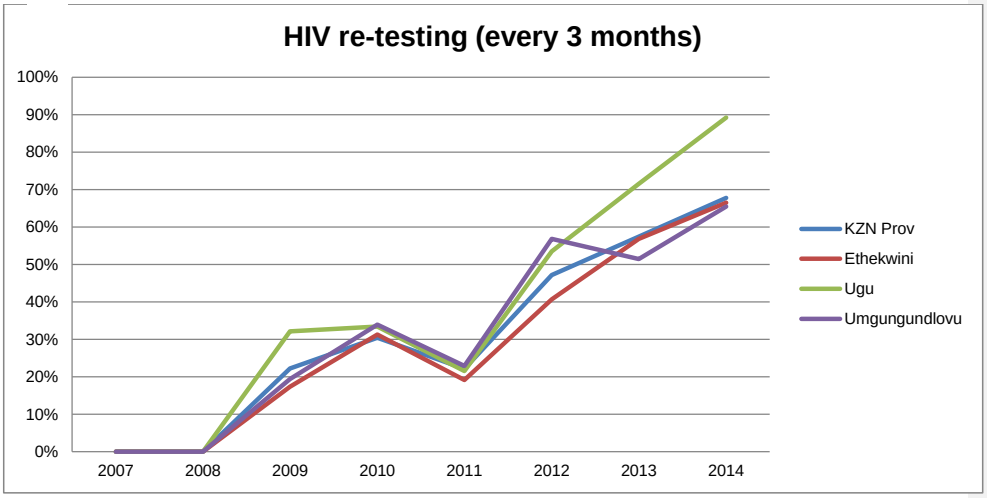

Figure 5: Antenatal HIV retesting rates

Antiretroviral therapy initiation for pregnant women

Access to life-saving ART is essential to improve the health of pregnant women, as well as preventing MTCT. There were improvements over time in the performance of this indicator, contributing to reduced transmission. The training of nurses and creation of roving teams to support ART initiation contributed to improved performance of this indicator. The simplification of ART protocols as well as the adoption of the WHO PMTCT B-option resulted more women accessing antiretroviral therapy for treatment and prevention of vertical transmission of HIV.

Table 5: Antiretroviral therapy initiation for pregnant women

ART Initiation Rate									
	2014 Target	2007	2008	2009	2010	2011	2012	2013	2014
KZN Province	**98%**	25%	145%	90%	41%	85%	93%	25%	145%
Ethekwini	**98%**	49%	115%	92%	88%	75%	88%	49%	115%
Ugu	**98%**	30%	97%	105%	81%	87%	95%	30%	97%
Umgungundlovu	**98%**	58%	114%	95%	85%	99%	98%	58%	114%

As mentioned previously, the data quality and the definition of the indicators remained a challenge, particularly in relation to the definition of the denominators. Furthermore, the variation of the indicators over the period reflects changes in the policies of who qualified for enrolment into the ART initiation. The policy change of 2013 to initiate all pregnant women onto lifelong ART changed the numerator half-way through the year and thus low rates were recorded.

Early infant testing for HIV (PCR testing)

At the beginning of the project in 2008 many infants were not reliably identified by healthcare staff for testing for HIV at their six weeks post natal or immunization visit. Initially very few PCR tests were, the team worked on this process and over time succeeded in retaining the mother-child pair in care and offer early testing. Table 5 and figure 6 illustrates the improvement in the number of infants that were tested for HIV at age six weeks.

Table 6: Early infant testing for HIV (PCR testing)

PCR testing Uptake at 6 weeks								
	2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
KZN Province	-	-	-	-	74%	86%	90%	91%
Ethekwini	-	70%	73%	73%	62%	80%	80%	85%
Ugu	-		104%	98%	91%	100%	109%	104%
Umgungundlovu	-	38%	96%	116%	100%	108%	111%	105%

This indicator was only introduced during the project period. It is evident that Ugu and Umgungundlovu were preforming well on this indicator from the start and the overall trend in particularly Ethekwini shows improvement.

Vertical transmission rate for HIV

The overall aim of the project was to reduce vertical transmission of HIV at six weeks to below 5%, this goal was reached in 2010. With the advent of better drug regimens the target was reviewed and set at below 2%. Once this target was reached the team

focused on the improvement of post natal processes including transmission at 18 months.

Table 7: Six weeks vertical transmission rate for HIV

PCR Positivity at 6 weeks									
	2014 Target	2007	2008	2009	2010	2011	2012	2013	2014
KZN Province	<5 %		8%	9%	8%	4%	3%	2%	1%
Ethekwini	<5 %		4%	10%	12%	6%	3%	1%	1%
Ugu	<5 %		23%	12%	6%	4%	3%	2%	2%
Umgungundlovu	<5 %		22%	11%	7%	3%	3%	2%	1%

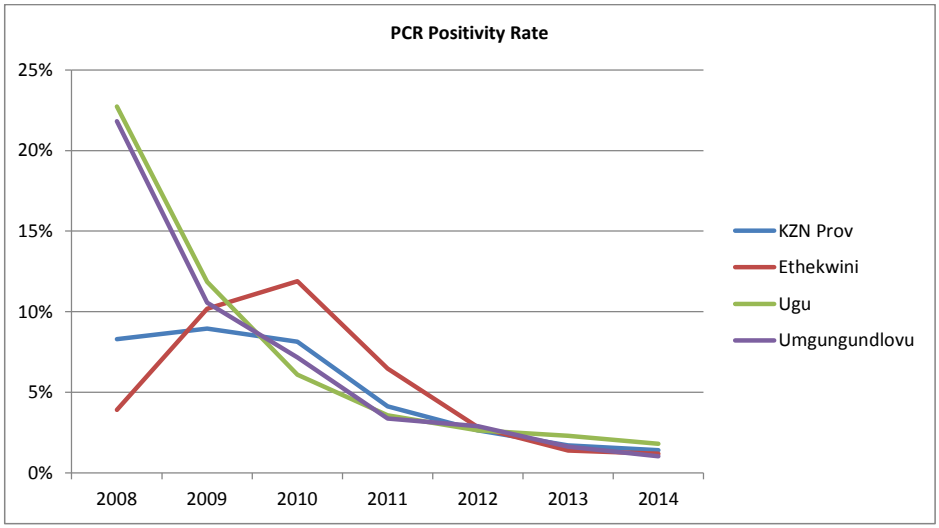

Figure 6: Six weeks vertical transmission rate for HIV over time

The dramatic decrease of the vertical transmission of mother-to-child transmission in the study period was a primary objective of the study. The initial target of the project was 10% however, with the sustained effort as well as the implementation of the new ART guidelines, a remarkable decrease of vertical transmission was achieved.

Table 8: 18 months vertical transmission rate for HIV

18 months positivity rate									
	2014 Target	2007	2008	2009	2010	2011	2012	2013	2014
KZN Prov	< 5%			18%	15%	8%	4%	2%	1%
Ethekwini	< 5%			9%	22%	9%	4%	3%	1%
Ugu	< 5%			25%	12%	12%	5%	2%	1%
Umgungundlovu	< 5%			28%	13%	6%	3%	2%	2%

The table shows that the prevention of vertical transmission was sustained with particularly dramatic decreases of infection rates in Ugu and Umgungundlovu – from 25% to 1% and 28% to 2% respectively.

Project successes and highlights

- **The project contributed to the reduction of HIV transmission rates (from between 25%-28% to 1%-2%)** and exceeded its primary targets.
- **Changing the culture of information management and use** at a primary health care, district and provincial levels.
- **Improved linkages between hospitals and feeder clinics**.
- **The establishment of multi-disciplinary teams** with the outcome of resolving bottlenecks and reducing delays by facilitating referrals and fast-tracking patients.
- **Using CQI methodology to improve service delivery** has meant that staff at different levels understand and use data.
- **Working with community care givers (CCGs)** in bridging the gap between communities and primary health care facilities.
- **The project led to program integration and extension**

❖ Changing the culture of information management

Changing the culture of information management at a primary health care, district and provincial level and ensuring its sustainability has been the pillar of our work.

At the time that we commenced our work, there was no standardized mechanism for district and provincial PMTCT program managers to review their performance over time. There was little belief that the data reported in the DHIS reflected accurately and reliably, the delivery of services at different levels of care. At the time the baseline analysis of the quality of DHIS data revealed that up to 60% of PMTCT data were missing in the DHIS. There has been a remarkable shift in the culture of data feedback, data usage and data management as a result of the 20 000+ project. The ownership of data has been built into the system, and the KZN-DOH leadership now steer this process successfully.

We have facilitated a close working relationship between data and program managers. The additional support given to information officers has been beneficial, and has contributed to large scale improvement of data quality. The reporting of data over time to identify trends in PMTCT processes is also a new skill that has been introduced to both program

A dashboard of key indicators in the PMTCT program was selected for regular reporting, setting the pace for the national PMTCT program, which has followed suit.

KZN was bench-marked as the province that has the best quality data in the PMTCT program nationally.

Program and Information managers are now able to identify gaps and provide solutions to close them, using their data. This capacity continues to be used and has been extended to monitor other key programs, like perinatal and maternal deaths. Data triangulation was also encouraged and district program coordinators are tracking positive PCR results from National Health Laboratory Services (NHLS) services, and comparing them to DHIS results as a result of mentorship in this project. They have also embarked on processes to track the PCR positive babies in order to close all gaps pertaining to early infant.

❖ Improving linkages between hospitals and feeder clinics

The linkage of hospitals to feeder clinics has been an achievement that the project is proud of. It has made data feedback a priority at these meetings, and has helped hospitals and feeder clinics to share accountability for program delivery, and to set joint aims and targets. It has also contributed to seamless referral between levels of care, and, in some cases, the offering of technical support and assistance from hospitals as they were exposed to the realities at clinic level. There is no longer blame apportioned to facilities. The display of data acts as a stimulus to improved performance through peer pressure, and a mechanism for collaborative learning. These meetings were further strengthened in FY 06 through the extension of the monitoring of key perinatal indicators in meetings between hospitals and feeder clinics.

❖ Working in multi –disciplinary teams

In order to deliver comprehensive PHC services, it is essential for collaboration amongst different disciplines and program managers. One example of such collaboration was the inclusion of staff from the NHLS in task team meetings to resolve bottlenecks as a result of delays in the turn-around times of laboratory results. This contributed to reductions of more than 100% in some facilities- in both rural and urban areas. Planning for integrated service delivery with relevant managers e.g. including the Nutrition manager as in planning for PMTCT has contributed to improved implementation of the new infant and young child feeding policy.

❖ Using CQI methodology to improve service delivery

Staff at different levels of the KZN DOH (provincial, district and facility level), are now able to use data. They also participate in meetings with feeder hospitals where data feedback is given. Staff who have engaged with our mentors well were able to expand this knowledge to other programs. It has been very rewarding to see operational managers use run charts to track program performance in the TB or the cervical cancer screening programs.

Celebrating success and promoting collaborative learning are also key components of CQI. We have created forums at which staff is commended for their good work, and a non-punitive approach is taken when poor performance is found in indicator performance. Using data helped to identify facilities that needed additional support, and the provision of this support was provided together with a supervisor from the KZN DOH ensuring the sustainability of the approach.

❖ Program integration and extension

Building on the success of the project towards saving the lives of mother and children, the team expanded to work on postnatal processes to improve testing coverage of HIV-exposed children at 18 months of age. Another indicator that was tracked is early antenatal booking, so that all prongs of the PMTCT program are addressed.

As described earlier, a central aspect of the program was to build capacity, embed the activities within the KZN DOH activities and support the expansion. The integration of the methodologies was achieved to a high level with a number of activities continuing within

the KZN DOH after the 20 000+ staff withdrew. Particularly the wedge meetings became institutionalized and have continued.

The commitment of the DOH within the clinics, districts and within the KZN DOH to take the processes forward was evident at a final meeting of the project, which was attended by leadership from the DOH KZN at all levels of the service from the 2 districts the program worked in. Rather than being see to be the 'death' of the project, the image of 'cutting of the umbilical cord' was used by a number of presenters to represent a new birth and a growing up.

Other successes

Technical support to the National Department of Health

The past 7 years have seen a growing involvement in our support for the NDOH, as targets changed and the new NSP was developed. We have contributed to the QI approach in the Action Framework, and have supported provincial meetings in Limpopo and Eastern Cape. We are also involved in supporting UNICEF in scaling up QI for the Action Framework.

Setting up a centre/ unit for health systems strengthening at UKZN

We have had keen interest shown in our work by other funders, which include Atlantic Philanthropies and the Elma Foundation. This has contributed to the sustainability of our QI efforts. Besides supporting programmatic work, they have also set aside funds for the creation and strengthening of this work at UKZN. Meetings have been held with the Dean and Head of the School of Nursing and Public health who are supportive of this initiative. With the recent incorporation of the 20 000+ team into the Centre for Rural Health (CRH) at UKZN, health systems innovation and quality improvement has become one of the focal areas of the CRH.

The focus area seeks to link the research embedded in the DOH KZN with efforts to increase the teaching of QI in the under-and postgraduate courses in health professional education at UKZN. A number of other efforts at UKZN such as the Medical Education Partnership Initiative (MEPI) and the project focusing on Rural Academic Excellence by the CRH share similar goals.

Collaboration in supporting the development of National Core Standards

The 20 000+ project was subcontracted to train PHC supervisors in QI in 2012 to support the development of the National Core Standards. These supervisors focused on the 6 priority quality areas in health (i.e. reducing waiting times, improving staff attitudes, improving drug availability, improving infection control, and the cleanliness of health facilities.

Support for PHC re- engineering

We have contributed to the training of the district specialists and provincial mentors employed by HST to support the specialist teams, using a QI approach. The research that we conducted with CCGs in the Ugu district has also provided us with valuable insight into the effectiveness of using the QI approach to supervise CCGs and this has been fed back to the Provincial and National DoH.

Adaptation of the WHO Maternal and neonatal modules to include HIV

We have worked on the adaption of WHO maternal and neonatal modules to include HIV and this has been widely acclaimed by UNICEF. After requests from UNICEF we worked on these modules further to adapt their modules for the sick child and the well child.

Strong partnerships

DOH- Strong partnerships have been created since the inception of our work in 2008. The project has worked closely with leadership and KZN DOH staff members and has responded to need and priorities in the department.

PEPFAR / CDC- We have worked in close collaboration with our activity managers at CDC, and have been visited by US ambassadors in recognition of a best practice in South Africa. Dr Frieden has been highly appreciative of our work in improving public health information.

IHI has built capacity in our staff to train and disseminate QI practice. We are part of a larger network that collaborates on learning in common areas across Africa, and internationally. We are also working closely with improvement partners in South Africa.

Impumelelo awards

Our project has twice been awarded the Impumelelo award which recognizes and rewards organisations that work with vulnerable groups, and contribute to sustained improvement. The award was won in 2009 and 2012, and the award money was used to train mid-level and senior leadership, who undertook improvement projects that improved the delivery of the PMTCT program. These funds were used for collaborative learning with DOH program managers.

COMMUNITY BASED ASPECT OF THE INTERVENTION

As mentioned in the introduction, the community-based component of the 20 000+ project was added in 2012 following discussions with the NDOH and KZN DOH and was set up to respond to a direct request to explore the functioning of CCGs. The 20 000+ part of the study focused specifically on the technical support and QI processes as part of the intervention. The community-based aspect of the project was conducted in Ugu Health District, located in KZN, South Africa. Ugu District has a population of 704,000 with 76% of the population living in rural areas. Improving access to services for such a sparsely distributed population has been an ongoing challenge faced by the District.

Ugu District is led centrally by a strong and motivated District Health Management Team with a District Health Manager, Chief Medical Officer and Program Coordinators. There are 47 fixed primary healthcare clinics, 14 mobile clinics, three district hospitals, one regional hospital, and one specialized hospital located throughout the district.

At the time of the study there were 12 CCG facilitators, 32 CCG supervisors and 956 CCGs providing services to communities in Ugu district (1 CCG supervisor: 25 CCGs).

The community-based component of the project sought to evaluate and assess the functioning of CCG using a community case management (CCM) approach of integrated management of childhood illness (IMCI). This approach goes beyond the traditional community IMCI in the sense that it included more specific algorithms of assessing and referring individual cases, rather than merely giving the key messages of Community IMCI.

Methodology

Both quantitative and qualitative data were collected in order to evaluate and document the intervention. This included a trial based in the community where CCGs were randomly placed into control and intervention groups. A household survey was then undertaken among households of participating CCGs before and after implementation of the intervention, and an in-depth process evaluation including both quantitative and qualitative elements was conducted.

The trial was conducted to test the theory that implementation of an integrated HIV-adapted community case management (CCM) training with continuous quality improvement (CQI) supervision for CCGs is effective in improving uptake of key interventions outlined in the updated WHO guidelines on HIV and infant feeding, and in the South African PMTCT guidelines. Our analysis is a pre- vs. post-intervention analysis.

The process evaluation was designed to run alongside the intervention study to closely monitor intervention activities, to measure knowledge retention over time, and to explore participant experiences of the intervention. The process evaluation also allowed the study team to learn lessons along the way and adapt intervention processes where necessary.

The process evaluation generated different types of data from varying sources at different time points including knowledge questionnaires, tracking information in the form of excel spreadsheets and graphs, in-depth interviews, focus group discussions and learning session evaluations.

The intervention

The intervention was made up of five components and implemented by the 20 000+ project staff. These included the development of the HIV adapted CCM curriculum, training of the intervention CCGs using the adapted CCM materials, 3 day CQI training, CQI supervision, and quarterly learning sessions.

HIV-Adapted CCM Curriculum

The CCM manuals were adapted for HIV content. While the original WHO materials did include some references to HIV, additional detail on HIV was added to these materials given the importance of HIV in the African region, and in KZN in particular, as a major cause of maternal and child morbidity and mortality.

CCM Training

Each training session lasted two weeks with 25 participants in each group. A total of 75 participants were trained. Of the 75 participants, 60 were CCGs and 15 were CCG supervisors. Each CCG supervisor formed a mentoring group with four CCGs. The training was based on the above-mentioned HIV -adapted CCM curriculum. The training was conducted by four skilled professional nurses, three of which were trained quality mentors who played a key role in the CQI intervention that followed. The first week of training covered antenatal care and caring for newborn at home and the second week covered caring for the sick child in the community. A variety of training methods were employed including role plays, videos and clinical training.

Training on continuous quality improvement (CQI)

Three-day training was provided to the 15 CCG supervisors and one additional CCG from each of the 15 groups on the quality improvement supervisory methodology (CQI). The training was facilitated by three Quality Mentors who were professional nurses with quality improvement expertise. The training covered leading and facilitating teams, the use of CQI tools and data usage.

Continuous Quality Improvement (CQI) Mentoring meetings

The 15 intervention CCG groups attended two weekly face-to-face CQI mentoring meetings with the study quality mentors over a period of 15 months. These groups were made up of one CCG supervisor and four CCG's. The purpose of the CQI mentoring

meetings was to provide supervision and support to CCG's following on from the CCM training and to mentor CCG supervisors in providing supervision to their group of CCG's.

Learning Sessions

Every quarter, the Quality Mentors along with the CCG mentoring groups met together to review progress towards meeting their objectives. The purpose of the learning sessions was to bring CCG groups together so that learning and sharing of experiences could occur across groups.

Findings

Intervention tracking

The tracking of the scheduling, completion and attendance of the CQI mentoring meetings was completed monthly. In the first 3 months, during the set-up phase of the project, scheduled and completed mentoring meetings did not reach the required meetings per group. However, once the intervention was fully established a marked improvement was evident as the mentoring meetings progressed. This is shown in the figure below.

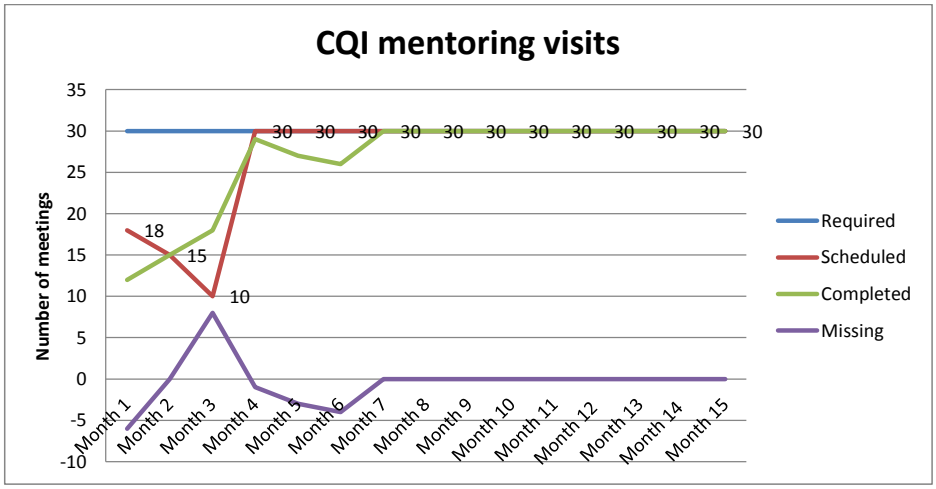

Figure 7: CQI mentoring visits

CCGs had a very high rate of CQI mentoring meeting attendance over the period of the intervention with few drop outs.

Household survey

Mothers aged 18 years and older with an infant under the age of one year residing in the households served by participating CCGs were interviewed at the beginning and end of the intervention.

Coverage of CCG visits during antenatal and postnatal period

Mothers were asked whether a CCG had visited them in their home during their recent pregnancy and after the baby was born, and if so, about the activities of the CCG during the visit. Mothers served by CCGs in the intervention group were more likely to have been visited by a CCG during pregnancy and in the postnatal period (see table below). Mothers served by intervention CCGs were also more likely to have received key information about danger signs, early ANC attendance, and HIV. Such mothers were also more likely to have been assisted with breastfeeding by the CCG. However, of note is that overall coverage of these interventions increased significantly in both intervention and control groups. The table below shows the coverage of CCG visits and activities in the antenatal and postnatal period

Table 9: Exposure to CCG visits and activities during antenatal and postnatal period

	Pre Intervention	Post Intervention

	23 APRIL 2012 TO 3 AUGUST 2012			4 NOVEMBER 2013 TO 31 MARCH 2014		
	Intervention N=366	Control N=370	Total N=736	Intervention N=296	Control N=310	Total N=606
Did the CCG visit during pregnancy? (yes)						
	N= 366 79 (21.6)	N=370 111 (30.0)	N=736 190 (25.8)	N= 286 224 (78.3)	N=307 90 (29.3)	N=593 314 (53.0)
Group Difference	OR=0.64, 95%CI 0.35,1.2, p=0.15			OR=9.5, 95%CI 0.5.0, 18.0, p<0.001		
Change – I-C, Baseline – 12 months	OR=14.9, 95%CI 8.6,25.7, p<0.0001					
Antenatal period						
Among mothers who received a visit						
Did CCG talk to you about attending the ANC as early as possible in pregnancy?						
	N=77 59 (76.6)	N= 107 95 (88.8)	N= 184 154 (83.7)	N=224 217 (96.9)	N=90 76 (84.4)	N=314 293 (93.3)
Group Difference	OR=0.43, 95%CI 0.17,1.1, p=0.08			OR=6.9, 95%CI 2.1,22.5, p=0.001		
Change – I-C, Baseline – 12 months	OR=16.1, 95%CI 3.9,66.8, p=0.0001					
Did CCG talk to you about danger signs in pregnancy? (Yes)						
	N=77 54 (70.1)	N=107 86 (80.4)	N=184 140 (76.1)	N=224 214 (95.5)	N=89 70 (78.7)	N=313 284 (90.7)
Group Difference	OR=0.50, 95%CI 0.21,1.2, p=0.12			OR=7.7, 95%CI 2.5,23.1, p=0.0003		
Change – I-C, Baseline – 12 months	OR=15.2, 95%CI 4.3, 54.1, p<0.0001					
Did CCG talk to you about going to the clinic for postnatal care? (yes)						
	N=77 62 (80.5)	N=107 91 (85.1)	N=184 153 (83.2)	N=224 216 (96.4)	N=89 76 (85.4)	N=313 292 (93.3)
Group Difference	OR=6.9, 95%CI 1.8,26.7, p=0.005			OR=5.0, 95%CI 1.6,15.6, p=0.005		
Change – I-C, Baseline – 12 months	OR=6.9, 95%CI 1.8,26.7, p=0.005					
Did CCG talk about how you should feed your baby after the birth? (Yes)						
	N=77 53 (68.8)	N=107 92 (86.0)	N=184 145 (78.8)	N=224 211 (94.2)	N=89 74 (83.2)	N=313 285 (91.1)
Group Difference	OR=6.9, 95%CI 1.8,26.7, p=0.005			OR=3.7, 95%CI 1.3,10.2, P=0.01		
Change – I-C, Baseline – 12 months	OR=7.9, 95%CI 2.3,26.9, P=0.001					
Postnatal period						
Did the CCG visit you in the first month after your child was born?						
	N= 365 90 (24.7)	N=370 104 (28.1)	N=735 194 (26.4)	N=286 215 (75.2)	N=306 94 (30.7)	N=592 309 (52.2)
Group Difference	OR=0.83, 95%CI 0.47,1.5, p+0.52			OR=7.2, 95%CI 3.9,13.1, p<0.0001		
Change – I-C, Baseline – 12 months	OR=8.6, 95%CI 5.0,14.8, p<0.0001					
Did your CCG help with you with breastfeeding?						
	N=89 65 (73.0)	N=103 84 (81.6)	N=192 149 (77.6)	N=215 194 (90.2)	N=94 74 (78.7)	N=309 268 (86.7)
	OR=0.73, 95%CI 0.25,2.1, P=0.56			OR=3.1, 95%CI 1.3,7.8, P=0.01		
	Time 1 vs Time 2: p =0.001					
Did the CCG talk to you about danger signs in newborn babies? (Yes)						
	N=89 49 (55.1)	N=103 83 (80.6)	N=192 132 (68.8)	N=215 175 (81.4)	N=94 65 (69.2)	N=309 240 (77.7)
	OR=0.33, 95%CI 0.15,0.72, P=0.006			OR=2.5, 95%CI 1.2,5.0, P=0.01		
	Time 1 vs Time 2: p <0.0001					

Mothers care-seeking behaviour

To assess care-seeking behaviour mothers were asked whether over the past six months there had been any occasion when they had needed to go to the clinic for themselves or for their child but did not do so for any reason. The table below shows that after the intervention, mothers served by intervention CCGs were less likely to report having needed to go to the clinic for themselves or for their child but having not gone. This suggests improved care seeking among mothers in the intervention group compared to the control group. There was no difference in the time or the cost of clinic attendance between mothers in the intervention and control group or at different time points.

Table 10: Access to care among participating mothers

	Pre Intervention			Post Intervention		
	23 APRIL 2012 TO 3 AUGUST 2012			4 NOVEMBER 2013 TO 31 MARCH 2014		
	Intervention N=366	Control N=370	Total N=736	Intervention N=296	Control N=310	Total N=606
In past 6 months have you needed to go to clinic but did not for any reason* (%)	73 (20.0)	92 (24.9)	165 (22.4)	64 (21.6)	97 (31.3)	161 (26.6)
Group Difference	OR 0.71, 95% CI 0.43-1.1, p=0.16			OR 0.55, 95% CI 0.33,0.90, p=0.02		
Change – I-C, Baseline – 12 months	OR=0.77, 95% CI 0.46-1.3, p=0.34					
In past 6 months your child/ren needed to go to clinic but did not for any reason (%)	65 (17.8)	78 (2.1)	143 (19.4)	46 (15.5)	76 (24.5)	122 (20.1)
Group Difference	OR=0.78, 95%CI 0.47,1.3 P value=0.33			OR=0.53, 95%CI 0.31,0.91 P value=0.02		
Change – I-C, Baseline – 12 months	OR=0.68, 95%CI 0.38,1.2 P=0.18					
Time to clinic, Hours (median, IQR)	0.50 (0.42-1.0)	0.50 (0.33-1.0)	0.50 (0.42-1.0)	0.50 (0.46-1.0)	0.50 (0.33-1.0)	0.50 (0.33-1.0)
Group Difference	β=0.07, 95%CI -0.07,0.21 p=0.33			β=0.03, 95%CI -0.12,0.18 p=0.68		
Change – I-C, Baseline – 12 months	β= -0.04, 95%CI -0.17,0.10 p=0.55					
Cost of transport to clinic (South African Rands), Median (IQR)	7 (0-9)	5 (0-9)	6.9 (0-9)	6 (0-10)	6 (0-10)	6 (0-10)

Group Difference	β=0.67, 95%CI -2.1,3.4 p=0.64			β= -0.91, 95%CI -3.8, 1.9 p=0.53		
Change – I-C, Baseline – 12 months	β= -1.6, 95%CI -3.4, 0.29; p=0.10					

*reasons included: no money for transportation, did not have child care, could not take time off work

Mothers: Coverage of antenatal, intra-partum and post natal care

During the household survey mothers were asked about their attendance for care at the health facility during their most recent pregnancy, delivery and after the birth of the baby. There was no significant difference in the access to care reported by mothers served by intervention and control CCGs, either before or after implementation of the intervention.

Mothers were also asked about the coverage of HIV and PMTCT services at baseline and post intervention. The care reported among mothers served by intervention and control CCGs was not significantly different either before or after implementation of the intervention.

Reported infant feeding practices

Mothers were asked about how they had fed their youngest child. Mothers in the intervention group were statistically more likely to report having exclusively breastfed their infants for the first 6weeks of life in the post intervention survey than mothers in the control arm. Mothers served by intervention CCGs were also more likely to report that they were exclusively breastfeeding at the time of the interview compared to control mothers.

Table 11: Reported infant feeding practices

	Pre Intervention			Post Intervention		
	23 APRIL 2012 TO 3 AUGUST 2012			4 NOVEMBER 2013 TO 31 MARCH 2014		
	Intervention N=366	Control N=370	Total N=736	Intervention N=296	Control N=310	Total N=606
INFANTS >6 weeks	**N=319**	**N=312**	**N=631**	**N=263**	**N=280**	**N=543**
How was your baby fed for first 6 weeks of life?						
Breastfeeding only (%)	207/317 (65.3)	226/312 (72.4)	433/629 (68.8)	194/253 (76.7)	181/278 (65.1)	375/531 (70.6)
Formula only or Mixed Feeding (%)	110/317 (34.7)	86/196 (27.6)	196/629 (31.2)	59/253 (23.3)	97/278 (34.9)	156/531 (29.4)
Group Difference	OR=0.74, 95%CI 0.49,1.1, p=0.13			OR=1.7, 95%CI 1.1,2.7, p=0.02		
Change – I-C, Baseline – 12 months	OR=2.3, 95%CI 1.4,4.0, p=0.001					
INFANTS < 6 months	**N=200**	**N=199**	**N=399**	**N=148**	**N=152**	**N=300**
Infant ever breastfed (%)	164/198 (82.8)	166/199 (83.4)	330/397 (83.1)	128/144 (88.9)	123/151 (81.5)	251/295 (85.1)
Group Difference	OR=0.96, 95% 0.54,1.7, p=0.87			OR=1.7, 95%CI 0.86,3.5, p=0.12		
Change – I-C, Baseline – 12 months	OR=1.8, 95%CI 0.78,4.3, p=0.17					
Infant currently exclusive breastfeeding (all women) (%)	45/200 (22.5)	50/199 (25.1)	95/399 (23.8)	45/148 (30.4)	27/152 (17.8)	72/300 (24.0)
Group Difference	OR=0.87, 95%CI 0.52,1.5 p=0.60			OR=2.0, 95%CI 1.1,3.6, p=0.03		
Change – I-C, Baseline – 12 months	OR=2.3, 95%CI 1.1,4.6, p=0.03					
HIV+ mothers	**N=55**	**N=54**	**N=109**	**N=43**	**N=40**	**N=83**
Infant currently exclusive breastfeeding (HIV+ mothers) (%)	6/55 (10.9)	8/54 (14.8)	14/109 (12.8)	8/43 (18.6)	7/40 (17.5)	15/83 (18.1)
Group Difference	OR=0.63, 95%CI 0.19,2.1, p=0.45			OR=1.0, 95%CI 0.31,3.5, p=0.54		
Change – I-C, Baseline – 12 months	OR=1.7, 95%CI 0.32,8.4, p=0.54					
HIV- mothers	**N=140**	**N=144**	**N=284**	**N=97**	**N=109**	**N=206**
Infant currently exclusive breastfeeding (HIV- mothers)	38/140 (27.1)	42/144 (29.2)	80/284 (28.2)	33/97 (34.0)	19/109 (17.4)	52/206 (25.2)
Group Difference	OR=0.93, 95%CI 0.51,1.7, p=0.83			OR=2.4, 95%CI 1.1,5.0, p=0.02		
Change – I-C, Baseline – 12 months	OR=2.6, 95%CI 1.1,6.0, p=0.03					

Mothers' knowledge about HIV and maternal health

An important function of CCGs is health promotion and providing health education at the household level. During the household surveys mothers were asked about their knowledge of maternal and child health issues. The questions were derived from the information considered most important in the CCG training materials

To assess their knowledge mothers were asked the following questions:

- When should you go for your first antenatal visit?
- How many antenatal visits should you go to during your pregnancy?
- What are danger signs that would make you take a newborn baby to the clinic? (list)
- What are the danger signs in pregnancy? (list)

For those mothers identified as HIV positive:

- When should your baby have an HIV test?
- Why is it important for an HIV positive pregnant woman to have a CD4 count taken?

The table below shows the knowledge score in the intervention and control groups at baseline and after the intervention. It shows that mother's knowledge of maternal and newborn health was significantly better among those mothers served by CCGs in the intervention group compared to the control group.

Table 12: Knowledge about maternal and newborn health among participating mothers

	Pre Intervention			Post Intervention		
	23 APRIL 2012 TO 3 AUGUST 2012			4 NOVEMBER 2013 TO 31 MARCH 2014		
	Intervention N=366	Control N=370	Total N=736	Intervention N=296	Control N=310	Total N=606
All women						
Knowledge Score (mean, std dev)	0.48 (0.15)	0.48 (0.15)	0.48 (0.15)	0.49 (0.18)	0.43 (0.17)	0.46 (0.18)
Group Difference	β= -0.004, 95%CI -0.04,0.03, P=0.85			β= 0.05, 95%CI 0.01,0.09, P=0.008		
Change – I-C, Baseline – 12 months	β= 0.06, 95%CI 0.02,0.09, P=0.002					
HIV+ Women	**N=99**	**N=110**	**N=209**	**N=79**	**N=82**	**N=161**
Knowledge score (2 questions) (mean, std dev)	0.82 (0.29)	0.84 (0.32)	0.83 (0.30)	0.77 (0.34)	0.74 (0.33)	0.75 (0.33)
Group Difference	β= -0.009, 95%CI -0.10,0.08, P=0.84			β= 0.03, 95%CI -0.07,0.13,P=0.57		
Change – I-C, Baseline – 12 months	β= 0.04, 95%CI -0.09,0.17,P=0.57					

Household Survey: Key Findings

- The household survey was able to show significant differences in the behaviours and knowledge among mothers living in households served by intervention CCGs compared to those served by control CCGs.
- Mothers living in households served by intervention CCGs were significantly more likely to report:
  - that the CCG visited during her recent pregnancy and that the CCG had delivered key messages about early ANC attendance, danger signs in pregnancy, the importance of attending for postnatal care, and infant feeding.
  - that the CCG had visited her after her baby was born and delivered key messages about dangers signs in newborn babies
  - that the CCG had assisted her with breastfeeding
  - having exclusively breastfed their infant to 6weeks of age and that they were currently exclusively breastfeeding

- Mothers in households served by intervention CCGs were significantly less likely to report that they had needed to go to the clinic for their own or their babies health, but had not done so.
- Mothers in households served by intervention CCGs had significantly better knowledge of key issues relating to maternal and child health.
- However, the household survey was not able to show that access to facility based services increased among mothers living in households served by intervention CCGs.

Knowledge, practices and self-efficacy

Interviews were conducted with all participating CCGs in the intervention and control group at baseline (T1), after 6months of intervention (T2) and after one year of intervention (T3). A structured questionnaire was used to determine CCG activities, their knowledge of maternal and child health, and their self-efficacy in regards to providing services to mothers and children.

CCG cohort

The retention of CCGs from the initial cohort over the one year period of data collection was high with an overall retention of 98%. One participant in the intervention group was requested to leave because she was found to be illiterate and could not participate in the intervention. One participant in the control group died between T1 and T2. Five further participants were lost in the control group between T2 and T3 due to having resigned (1), because they could not be reached (2) or because they had withdrawn from the study (2).

Table 13: Retention of CCG's in the study

Data Collection Period	Intervention	Control	Total
Baseline (T1)	60	60	120
6 Months (T2)	60	59	119
12 Months (T3)	59	55	114
Overall Retention	98%	91.7%	95%

CCG Training

CCGs were given a list of key topics in maternal, child and women's health where they are expected to provide health promotion, education and related services to mothers and children. They were asked to report whether they had received training in each of these topics. The figure below shows the reported coverage of training in each of these topics over the study period.

An increasing proportion of CCGs reported having received relevant training over the study period. For intervention CCGs training was provided at the outset of the project which included all these topics. However, the study was conducted at a time when a new policy known as the 'Framework for Accelerating Community-based MNCWH interventions' was being implemented by the KZN DOH. As a result there was a rollout of DOH training in maternal and child health for CCGs during the study period and participating CCGs in both intervention and control groups may have received this training. As a result by the end of the study period almost all participating CCGs in both intervention and control groups reported having received training in key aspects of maternal and child health care. There was no significant difference between the intervention and control groups.

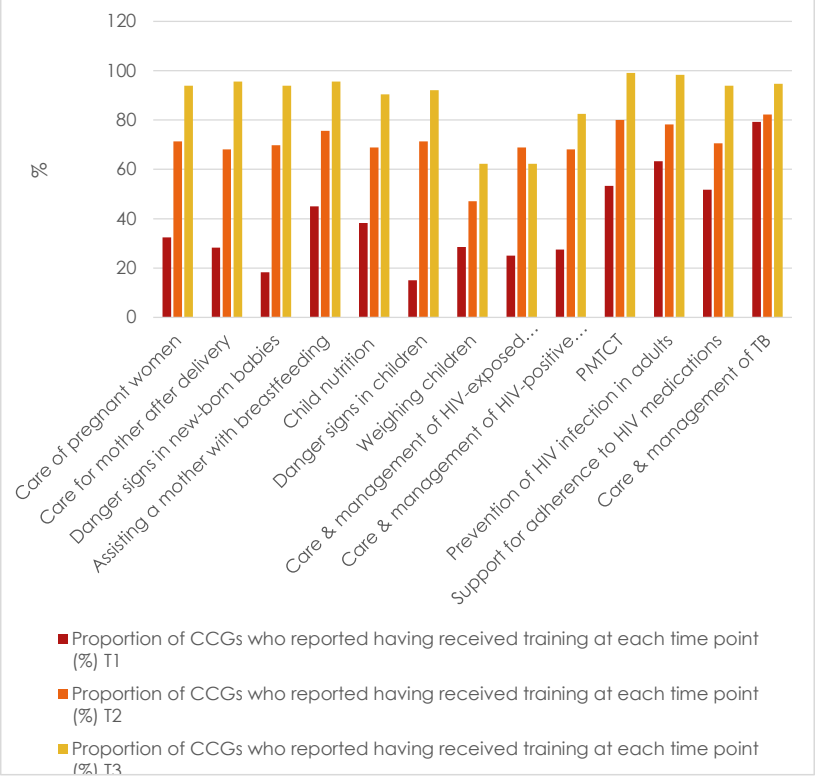

Figure 8: Proportion of CCG's reporting having received training in maternal and child health topics

CCG Activities

CCGs were given a checklist of activities within their scope of practice and asked which services they had provided to community members in the previous week. Activities included maternal, child and women's health services, HIV and PMTCT services, as well as other clinical activities like DOTS support and home-based care.

Results are shown in the figure below. This shows that the proportion of CCGs reporting having provided MCNWH and HIV services increased in both the intervention and control groups. However, the number of reported activities being provided by CCGs in other areas also increased over the same time period.

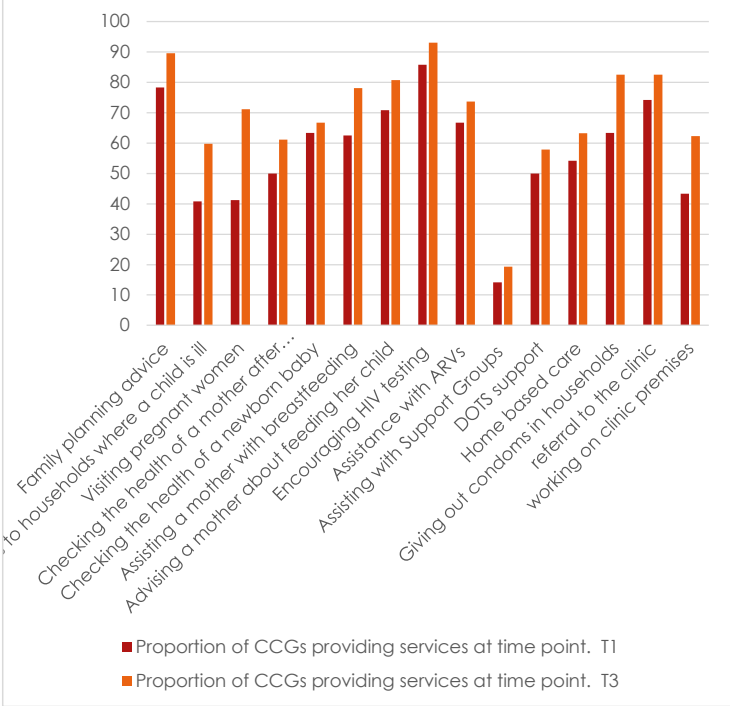

Figure 9: CCG activities

Activities reported by CCGs at start and end of intervention

Self-efficacy

All CCGs were asked to rate their ability to perform tasks in line with their expanded responsibilities for providing care for mothers and children. The questions were aimed at assessing the CCGs self-efficacy with regard to provision of key services to mothers and children.

CCG responses were scored into four categories: not confident (1), not very confident (2), somewhat confident (3), and very confident (score 4) and never done this (no score). Overall CCGs in the intervention group expressed improved self-efficacy over the period of the intervention. CCGs in the intervention group perceived their confidence in providing

care to mothers and children higher than CCGs in the control group at mid-point and end-point of the intervention (T2 and T3).

In regards to individual aspects of self-efficacy, intervention CCGs scored significantly higher vs control group for the following topics: talking to a pregnant woman about HIV; advising a pregnant woman about her own nutrition; assisting a mother with breastfeeding; explaining services available for PMTCT; doing a postnatal visit; and recognizing danger sings in pregnancy, newborn baby and postpartum mother.

CCG knowledge

CCGs were asked to respond to a series of 11 questions with discrete True/False responses relating to MCH knowledge. Knowledge was consistently higher among intervention CCGs compared to control CCGs (see figure below).

CCG knowledge score

Knowledge, practices and self-efficacy: Key Findings

- Coverage of CCGs training in maternal and child health topics improved over the duration of the study in both intervention and control groups
- Activities being performed by CCGs in all aspects of care, including maternal and child health, increased over the duration of the study in both intervention and control groups.
- Knowledge and self-efficacy related to maternal and child health topics increased over the duration of the study and was consistently higher among intervention CCGs compared to control CCGs

Qualitative data collection

In-depth interviews, FGDs and learning session evaluations were conducted at different time points in the study to explore QM, CCG and clinic staff experiences of the intervention. Topics of discussion included:

- CCM and CQI training
- CQI mentoring sessions
- Learning sessions
- Household visits
- CCG-clinic staff relationships

The key findings from the qualitative data are detailed below.

CCM & CQI Training: Key Findings

This training has made me to become very important to the community… people [community members] are now motivated to contact me whenever they have problems. That is where I saw that training was important to me because I have a better name in the community. (S17C02, CCG in-depth interview)

- All the CCGs reported that they found the CCM training to be beneficial
- QMs reported that CCGs had little MCH knowledge prior to the CCM and CQI training and were unfamiliar with simple common medical-related terms used in the materials
- QMs reported that CCM and CQI training content was adapted to an appropriate level for CCG learning
- Adapting training materials into the local language of the participants (isiZulu) was seen as important by both QMs and CCGs
- CCGs reported that constant repetition of information assisted CCGs in grasping certain concepts in the CCM training
- CCGs and QMs reported that CCGs benefited from the use of interactive teaching methods in the CCM training particularly the video material and practical sessions in the hospital
- CCGs felt that the training improved their MCH knowledge and they felt more confident in their work
- CCGs reported that the toolkit provided them with direction when conducting household visits
- CCGs reported that previously little emphasis was placed on documentation. The CCGs and QMs reported that the CQI training allowed CCGs to learn the importance of documenting information.
- The QMs and CCGs reported that the CQI training afforded team leaders with the necessary skills required to identify, analyse data and deal with problems encountered in the community.

CQI Mentoring: Key Findings

> *It builds up my confidence because when I leave after the meetings I am oozing confidence; when I visit a household, I ooze confidence, because there is a lot that I have in my mind. I will be able to have discussions with my clients, and something good will come out of that; healthy life that we are looking for in the communities that we work in will come out of that. We want to be one with the people that we work with.* (S18C01, CCG in-depth interviews)

CCGs reported that the CQI mentoring meetings were important as they provided a platform for supportive mentorship and learning

CCGs reported that prior to the intervention, they had received minimal mentoring and supervision in their work and did not feel supported in their work

CCGs reported that recapping of information learned in the CCM training proved beneficial in reinforcing their knowledge in the CQI mentoring meetings

QMs and CCGs reported that the CQI mentoring meetings highlighted the importance of documenting information using data collection tools (CQI register and Dashboard)

Initially QMs and CCGs reported that CCGs had difficulties documenting information but as time progressed, CCGs became more confident with recording and using data to inform their practice in their daily work

CCGs reported that they not only gained knowledge and support from the QMs but also from each other

CCGs learned how to communicate with community members and how to work as a team

CCGs reported that provision of money for transport was an enabler for attending mentoring meetings

Learning Sessions: Key Findings

The learning sessions were well received by the CCGs.
CCGs found recapping of information from the CCM training to be important.
CCGs reported that the learning sessions provided them with a platform where they could learn from each other and share opinions and experiences.
The learning sessions helped CCGs better understand the use of data.
Presence of Department of Health representatives was appreciated as CCGs were able to share problems experienced with clinics directly to them.
CCGs felt that the learning sessions could be allocated more time in the future.
CCGs reported that they have benefited from participating in the study and they feel confident in their work with mothers and children.

Household Visits: Key Findings

The households are fine, they have faith in us. They are able to phone us or come to us and have discussions with us about any issues that they have. There is a big difference than in the past because previously we used to visit them and they would not pay much attention to us. We did not have knowledge about a lot of things. We could see pregnant women and we did not care much about that. We just left things as they were. However, now we are able to see and talk to such people, tell them about things that are dangerous to them and their children, all things like that. They also like to stay in touch with us. (S18C01, CCG in-depth interview)

CCGs reported that their increased knowledge and confidence due to the CCM training and CQI mentoring meetings improved their relationships with their communities

CCGs felt that their increased knowledge led to mothers having increased confidence in the CCGs

CCGs reported that initially mothers were reluctant to engage with CCGs but as time progressed there was increased trust and acceptance in CCGs

CCGs felt that the toolkits and increased knowledge led to them being respected in communities and facilitated more focused visits

CCGs felt that the counselling cards were the most beneficial tool in conducting successful home visits

CCGs said that they were able to apply lessons they had learned in the training and mentoring sessions to their daily work

CCG-Clinic Staff Relationships: Key Findings

Also when you refer someone from the community who told you that she missed her period, and you ask her to go to the clinic to get tested for pregnancy. When she gets to the clinic she is told that her pregnancy is not yet physically showing so they will not do anything to her. You find that the person now gets discouraged.(CCG FGD, round 2)

CCGs reported that support from clinic staff led to positive CCG-clinic staff relationships

Some clinic staff reported that patients showed increased knowledge and understanding of health related issues and procedures happening in the clinic resulting from health education given by CCGs at the household level

Clinic staff reported that as a result of increased knowledge, CCGs were able to relay the same health messages as clinic staff to community members

CCGs reported that in some clinics a platform was available for clinic staff and CCGs to come together and discuss challenges

However, negative CCG-clinic staff relationships were also reported by CCGs and QMs.

Some CCGs felt that their work was undermined by clinic staff leading to lack of confidence in CCG work by the community

CCGs and QMs reported that negative staff attitudes, lack of acceptance of the CCGs, lack of scheduled meetings between staff and CCGs and lack of acceptance of CCG referrals all contributed to unsupportive relationships.

CCG-Mother Observations and interviews

Following the CCM training and CQI mentorship it was felt that it was important to document the content and quality of CCG interactions with mothers around maternal and child health topics. Researchers accompanied six CCGs on two of their visits with pregnant women or mothers (total of 12 observations). CCGs and mothers were also interviewed after the interaction.

CCG-Mother Observations and interviews: Key Findings

I can say I liked it a lot because they help us. [The CCGs] do not look down upon us just because we fell pregnant while we are still young.(Mother in-depth interview)

Information from the observations and interviews with mothers and CCGs was consistent.

Both mothers and CCGs felt that the visits had gone well and that sufficient information had been given.

Researchers also felt that comprehensive and good quality information had been given in the CCG-mother visits.

Mothers reported that the CCG had given them relevant information at the first visit and this led them to value the visits from the CCG going forward.

The information and advice given to mothers seemed to strengthen the relationship CCGs had with their patients.

Mothers reported that they acted on CCG advice.

Mothers felt that CCG visits in the antenatal and postnatal period were important.

Both mothers and CCGs felt that they had a positive and trusting relationship with each other. This was consistent with the findings from the observations.

Most mothers and CCGs felt comfortable with CCGs living and working in the same communities as mothers

Conclusion and recommendations

CCG Training:

- The **CCM and CQI training approach** and materials were effective in knowledge transfer and highly appreciated by CCGs even though demanding. It is recommended that:
    - CCG training materials should be carefully developed and piloted to ensure that such materials are suitable for the educational level and context of CCGs.
    - CCG materials and the medium of training should be in the local language of the CCGs.
    - CCG materials should include a variety of learning approaches and different ways of covering the same information. CCGs required repetition of information in order to acquire new knowledge and skills.
    - Skilled and experienced facilitators should be used for CCG training, rather than lower cadres of trainers, for example community health facilitators. This is because CCG training should include ongoing assessment of the response of the CCGs to training, and allow for flexibility in the training approach to ensure that all training objectives are fully achieved.
    - Clinical components should be included in CCG training, if possible, because CCGs may not have experience of dealing with the real clinical situations. It is unrealistic to expect that CCGs can implement classroom based learning in a clinical situation without being given the opportunity to gain practical experience.

Supervision and mentoring:

- Improved **CCG knowledge, self-efficacy and practices** were sustained over time when supported by ongoing mentoring.

- A comprehensive system of support and supervision is required to support the work of CCGs and ensure that CCGs can effectively deliver consistent and appropriate messages in the household.
- CCGs are not familiar or confident with record keeping or use of data to guide their practice. Mentoring support is required if CCGs are to develop these skills.
- Repeated reviewing of knowledge and skills following training is crucial if the new knowledge and skills are to be transferred to the workplace.

- High retention of CCGs in the cohort over a 15month period and high levels of attendance at meetings, despite this participation being voluntary, shows that CCGs appreciated the opportunity to participate in mentoring activities.
- A **simplified data driven approach** can be implemented effectively with CCGs. CCGs expressed their increased sense of self-worth and professionalism and reported that they enjoyed learning about the use of data.
  - Household entry is an important skill and CCGs require support for this.
  - Professionalism and trust are crucial to the acceptability of CCGs in the household and CCGs need to be supported to develop such skills.
  - Peer learning is important and peer support should be established for CCGs.
- While these CQI supervision skills were focused on ensuring effective implementation of the CCM activities, such supervisory approaches can be used across all areas of CCG supervision, and can be used to strengthen any healthcare services offered by CCGs.
- Without supervision (CQI or other supervision approaches) investment in training may not yield good results. However, the CQI approach adopted in this study was extremely intensive and required considerable effort to establish. CCGs were also given transport money to attend meetings and this did contribute to the high CCG attendance. The feasibility of scaling up this approach needs to be further investigated.

Household visits:

- There was some **maternal behavior change**, despite the short intervention period, showing that CCGs are able to influence care practices in the household and care-seeking practices of mothers and carers.
- The in-depth interviews and FGDs also revealed that CCGs felt more confident and were more accepted by the community because of their increased knowledge.
- Household observations show that CCGs were providing comprehensive and appropriate health education messages at the household level. These messages were supported by the CCG toolkit, particularly the counseling flipcharts, which provide guidance for CCGs about how to structure their visits.
    - Tools should be provided to CCGs to support their activities in the household

Clinic relationships:

- **CCG relationships with clinics** were sometimes challenging and greater focus is needed on strengthening these relationships.
    - CCG programs should be introduced to clinics clinic staff buy-in must be obtained so that the CCG-clinic staff relationships are effective.
    - CCGs require a communication platform where they can share their challenges with appropriate managers.
    - The linkages between the community, CCGs and the clinics need to be strengthened so that a culture of teamwork can be developed with CCGs and clinic staff. This may be facilitated by the newly established ward-based outreach teams.

References

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Rollins, N., Little, D,. Mzolo,S., Horwoord, C., & Newell, M. (2007). Surveillance of mother-to-child transmission prevention programmes at immunization clinics: the case for universal screening. AIDS, 21: 1341-1347.

UNAIDS (2006). Report on the global AIDS epidemic http://www.unaids.org/sites/default/files/media_asset/2006_gr-executivesummary_en_0.pdf

Section C –Monitoring and Evaluation

Financial monitoring

The Program was administered through Innovation, a company wholly-owned by UKZN to administer external funding and projects. In 2012, Innovation was dissolved and the administration of the 20 000+ program was moved to a newly-created company, also wholly-owned by UKZN, called InQubate, which had the same purpose as Innovation. The financial monitoring of the project was performed through the standard financial practices in line with the statues of InQubate and UKZN. The program also had annual external audits which were submitted to CDC.

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Technical monitoring

From the onset, the project partnered with the Institute of Healthcare Improvement (IHI) as the technical advisor to oversee the design and implementation of the project. Improvement advisors from IHI offered assistance to the 20 000+ team and monitored the execution of the project. Regular data review on progress was conducted by the team with DOH and IHI as partners. Annual reports were also sent to CDC to ensure that the project delivers on its objectives.

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Programmatic monitoring

The program was monitored through a combination of routinely collected DHIS data which were used to monitor key PMTCT processes and data primarily collected by the project to track mentorship visits and program execution. These indicators were reported and reviewed by CDC and the 20 000+ leadership on a regular basis to ensure that the planned activities were achieved.

Section D – Products, Publications, Reports, or Presentations Developed

As mentioned above, a key outcome of the project was the significant involvement it achieved in local, provincial and national workgroups, policy forums and committees. Many of these were ad hoc and relatively informal which were critical in having a visible presence and engagement. They also created a space of trust and engagement that were the basis for more substantive engagements and sharing of lessons learnt. While much harder to quantify, these kind of engagements were critical in promoting the work the 20 000+ project achieved and ensuring a system-wide uptake. The draw-back on this approach, however is that the impact of the 20 000+ project is more difficult to evaluate and gauge.

Products

1. Change package
2. Facility Guide to data improvement
3. Facility Guide to quality improvement
4. Facility data dashboard

Publications

Five (5) full-length articles emanating from activities in this project were published in international high-impact peer-review journals. Electronic copies of these articles have been included in the project close-out submission CD. Journals in which articles were published mostly offer open-access facilitating wide dissemination of our experiences in the project. The citation of the articles is as follows:

1. Challenges for routine health system data management in a large public program to prevent mother-to-child HIV transmission in South Africa. Mate KS, Bennett B, Mphatswe W, Barker P, Rollins N. PLoS One. 2009;4(5):e5483. doi: 10.1371/journal.pone.0005483.

This paper argued for projects such as the 20 000+ to improve data quality. It showed that “Data collected and reported in the public health system across three large, high HIV-prevalence Districts was neither complete nor accurate enough to track process performance or outcomes for PMTCT care. Systematic data evaluation can determine the magnitude of the data reporting failure and guide site-specific improvements in data management”. ADS would note that CDC/PEPFAR is not acknowledged on this paper. It is unlikely that this paper received CDC ADS clearance.

2. Antiretroviral drugs in the cupboard are not enough: the impact of health systems' performance on mother-to-child transmission of HIV. Barker PM, Mphatswe W, Rollins N. J Acquir Immune Defic Syndr. 2011 Feb 1;56(2):e45-8. doi: 10.1097/QAI.0b013e3181fdbf20

This paper demonstrated that: “Introduction of more effective combination antiretroviral interventions will yield only marginal reductions in childhood HIV infections and mortality unless health systems achieve high levels of performance at each step of the PMTCT pathway. Investment in and support for the mechanisms of delivering and sustaining PMTCT interventions at scale are required if gains in maternal and child survival are to be realized in countries highly affected by HIV.”

3. Improving public health information: a data quality intervention in KwaZulu-Natal, South Africa. W Mphatswe, KS Mate, B Bennett, H Ngidi, J Reddy, PM Barker & N Rollins. *Bull World Health Organ* 2012;90:176–182 doi: 10.2471/BLT.11.092759

This paper showed that: “A simple, practical data improvement intervention significantly increased the completeness and accuracy of the data used to monitor PMTCT services in South Africa”

4. Using a campaign approach among health workers to increase access to antiretroviral therapy for pregnant HIV-infected women in South Africa. Ngidi W, Reddy J, Luvuno Z, Rollins N, Barker P, Mate KS. J Acquir Immune Defic Syndr. 2013 Aug 1;63(4):e133-9. doi: 10.1097/QAI.0b013e318291827f

This paper showed that: “A targeted campaign among health workers can accelerate access to antiretroviral therapy for pregnant HIV-infected women”

5. A case report of evaluating a large-scale health systems improvement project in an uncontrolled setting: a quality improvement initiative in KwaZulu-Natal, South Africa. Mate KS, Ngidi WH, Reddy J, Mphatswe W, Rollins N, Barker P. BMJ Qual Saf. 2013 Nov;22(11):891-8.

The paper describes how a more flexible intervention design and a mixed-methods quasi-experimental evaluation relying on both a qualitative analysis and an interrupted time series quantitative analysis was used in the to track HIV care and improvement interventions in a resource-limited setting. More flexible, context-sensitive evaluation designs offer a better balance of the need to adjust the intervention during the evaluation to meet implementation challenges while providing the data required to evaluate effectiveness.

Book Chapter

One Book chapter based on the work of the 20 000+ project was published:

Marshall, C. Whittaker, S & Reddy, J. Improving quality. *In the South African Health Reforms 2009 – 2014* eds. M P Matsoso, R J Fryatt and G Andrews. Juta, Cape Town 2015

The chapter gives an overview of the success of using QI methods to improve quality of care and the role of targeted QI in a larger process of setting norms and standards for

the health care service. The examples of 20 000+ in particular flesh out the lessons on how services can be improved at system level.

Reports

Annual reports were submitted to CDC, tracking the progress of the Project. The reports were also shared with the KZN DOH.

Regular reporting through the meetings of the partnership were submitted.

Presentations

Oral presentations

1. Antiretroviral drugs in the cupboard are not enough: The importance of health systems' performance on preventing mother-to-child transmission of HIV. Rollins, N., Mphatswe, W., Barker, P. (2009). 4th SA Aids conference, Durban 31 March – 3 April 2009
2. Human Resources: the ultimate bottle neck, how we can learn by doing: Reddy J. XVIII International Aids Conference, Vienna, 2010
3. Scaling up of prevention to mother to child transmission of HIV interventions in Kwa-Zulu Natal, South Africa, Rollins N. WHO First Global Symposium on Health Systems Research 2010, Montreux, Switzerland.
4. Using quality improvement to reach public health targets: Reddy J. 5th SA Aids Conference 2011, Durban.
5. An awareness campaign to address the commuters and taxi drivers about TB/HIV in a community in Durban, KZN. Mkhize, L. 3rd SA TB conference 12-15 June 2012, Durban
6. PMTCT and QI – sharing the results. Ngidi WH. South African Midwives Association December 2012 Gauteng
7. Sustaining changes for Mother to Child Transmission of HIV program (MTCT) processes in a resource constrained setting: A continuous Quality Improvement Initiative in KZN, South Africa. Ngidi WH, Reddy J, Wanda Z, Ndimande C, Reid Z, Magwaza N, Mthethwa L, Barker P, Rollins N. International Forum on Quality and Safety in Health Care Conference, 2012, Paris, France.

8. Addressing the 3 Delays. Reddy J. International quality and safety conference. London, 2013
9. Business Unusual approach in PMTCT – health worker experiences in an innovative large scale quality improvement program. Maphatswe W 6th SA AIDS conference, 2013
10. CCG perceptions of a community-based MCWH intervention in KwaZulu-Natal. Mntambo N, Grant M, Haskins L, Horwood C. Rural Health Conference, 2013 St Lucia, KZN
11. Evaluation of the 20 000+ QI project – participants perceptions. Dhlomo-Mphatswe W, Claessens L. PHASA, 2013
12. An Innovative approach to "working with and not for" the health workforce to improve processes of care in the PMTCT program: A CQI Approach. Ngidi W. Global Health Systems Research Symposium – Cape Town, 2014
13. An Innovative approach to "working with and not for" the health workforce to improve processes of care in the PMTCT program: A CQI Approach. Ngidi W. Global Health Systems Research Symposium – Cape Town, 2014

Poster presentations

1. Improving existing data systems in a large government-run PMTCT program in South Africa. W Mphatswe, K Mate, WH Ngidi, B Bennett, J Reddy, N Rollins, P Barker First Global Symposium on Health System Research, Montreux, Switzerland. 16-19 November 2010
2. A large scale health systems improvement project to prevent perinatal HIV infection. K.S. Mate, W. Dhlomo-Mphatswe , WH. Ngidi , J. Reddy , P. Barker , N. Rollins. First International Symposium on Health System Research, Montreux, Switzerland 2010
3. Motivating the Healthcare Workforce to improve the delivery of PMTCT services in KwaZulu Natal, South Africa. W,Mphatswe, K, Mate, H Ngidi, B Bennett, J. Reddy, N,Rollins, P,Barker·

4. Improving Data for PMTCT program management. W Mphatswe, K Mate, B Bennett, Z Luvuno, J Reddy, N Moodley, N Rollins, P Barker. International AIDS Society 2009
5. Introducing TB screening in pregnant women at first visit antenatal care in the Umzinyathi District, KwaZulu-Natal, using Quality Improvement Methodology. Luvuno Z, Shabangu G, Khoza S, Ngidi H, Reddy, J. International quality and safety conference. London, 2013.
6. Improving TB screening in pregnant women at first Visit Antenatal Care in the uMzinyathi District, KwaZulu-Natal, using quality improvement methodology. Luvuno, Z., Shangu, G., Khoza, S., Ngidi, H., & Reddy, J. International quality and safety conference. London, 2013
7. Quality improvement-Increasing access to ART for hospitalized patients with multidrug resistant TB. Luvuno, Z. Mphatswe, W., Reddy, J., Mate, K., & Padayatchi, N. SA AIDS Conference, 2013
8. An approach to motivating health workforce in improving the processes of prevention of Mother to Child Transmission Program: The use of replicable Continuous Quality Improvement Methods. SA AIDS conference, 2013
9. Supporting the implementation of Infant and Young Feeding Policy in the province that support exclusive breastfeeding for all women: integrating systems. SA AIDS conference, 2013
10. Using quality improvement approach to motivate and mobilise primary health care nurses to initiate antiretroviral on-site in a district, South Africa. Ngidi, h., Shibe, M., Mate, K., Luvuno, Z., & Rollins, N. International Forum on Quality and Safety in Health Care Conference, 2012, Paris, France.
11. Engaging the health workforce to implement the new Infant and Young Child Feeding policy guidelines in the three supported districts in KwaZulu-Natal, South Africa: Early lessons learnt. Ngidi, H., Luvuno, Z., Mkhize, L., Reddy, J., Mate, K., & Rollins. N. International Forum on Quality and Safety in Health Care Conference, 2012, Paris, France.

Section E – Challenges and Future Planning

Challenges

The project has had several challenges – particularly in its early stages, as the project did not bring in direct resources to help with service delivery. The team dealt with these issues and soon gained will and ownership for this work. At the onset of this project there was very little experience with CQI in South Africa as a strategy to improve service delivery, As such there was a sharp learning curve with regards to finding the most leveraged approaches that would result rapid scale up of the work.

An ongoing challenge within the context of the NDOH and KZN DOH is the nature of the public sector policy processes which largely operate in a top-down model. Policy is made at a 'higher' level to be implemented on the ground. The QI process seeks to address local challenges in a systematic manner, and so at times challenges policy that is slow to change and adapt.

Department of Health priorities and human resource issues

Primary healthcare facilities are responsible for the provision of all basic primary health services; this includes the expanded immunization program. Staff often had to attend trainings offered by various programs or attended to immunization campaigns leaving fewer staff members behind in the facilities that were under pressure to attend to patients. This made the scheduling of visits to facilities extremely challenging especially mentorship visits with PHC supervisors or change agent. Improvements were seen when the project transitioned to the use of sub-district meetings where all facilities were represented for CQI and targeted visits were subsequently achieved. As healthcare workers gained more CQI skills, they applied the method to other domains of care.

Level of engagement of change agents

The project had initially proposed the use of PHC supervisors as an ideal change agent to be supported and mentored to lead CQI activities in the facilities they supervise. These cadres of staff have many functions they need to fulfill thus resulting in poor PHC supervisor participation and uptake of CQI skills. In Umgungundlovu the position of "PHC supervisor" was completely eliminated also necessitating a need an urgent need

to seek an alternative change agent. The 20 000+ team engaged other willing and available DOH healthcare workers such as PMTCT or MCH program managers, facility operational managers and district trainers as change agents. This proved a more effective and CQI skills were transferred rapidly using this strategy.

Rapid change in treatment guideline for PMTCT

As new evidence on the best therapies for the prevention of vertical transmission and treatment of HIV continue to emerge, countries have had to persistently change local treatment guidelines. One of the goals the 20 000+ partnership was to improve the healthcare system that delivers all these evidence based medical therapies so as to close the implementation gap. These rapid guideline changes necessitated alterations to data elements and collection tools which often lagged behind thus making it difficult to monitor and evaluate the PMTCT program reliably.

Data quality and integrity

Access to timely complete and accurate data was a challenge, PMTCT data in the DHIS were often missing for various reasons in the early phases of the project. The extremely dynamic nature of the PMTCT guidelines and the accompanied data element tools were poorly communicated to frontline workers at times, this contributed to the unreliable recording of program data. Data collection tools, data element definition and reporting systems were not standardized especially in one of the districts.

The team focused most of its activities in year one improving the quality of these data and encouraging a culture of information use at all levels. This included a greater focus on facility and district information officers through data days and regular conference calls. The constant review use and feedback on performance indicators together with the efforts of district M&E departments contributed to improved data completeness in the DHIS.

Staff turnover within the 20 000+ partnership

As the project drew towards the end, many skilled 20 000+ staff sought alternative employment, these staff had sets of skills that were difficult to replace. The project

constantly provided CQI training and in-service training at regular intervals to ensure that the core skills of the team remained intact.

Sustainability of improvements

Sustainability of any donor funded program is a challenging, although improvement teams were formed in almost all facilities, some facilities have not consistently maintained the running of these meetings. The 20 000+ team ensured that key senior staff and change agents receive training in CQI in partnership with IHI. Mentorship activities were centered around the change agent and not the quality mentor. This focus on capacity building and the current quality improvement movement in South Africa as the new modus operandi, it is expected that this will contribute towards long term sustainability.

Section F – Program Management

The program was set up as a Cooperative agreement from CDC as a partnership between the KZN DOH and UKZN.

As mentioned previously, the program overall was administered by Innovation, a company wholly owned by UKZN, set up to manage grant-funded projects. Innovation was dissolved in 2012 and its operation transferred to an alternative company, InQubate which is also wholly owned by UKZN to perform the same function.

F.1 Administration: Human Resources

The human resources were managed through short-term contracts administered by Innovation / InQubate. The contracts were formally managed within the framework of UKZN policies and guidelines. These were applied in all matters dealing with human resources, including recruitment, disciplinary processes and performance management. The human resource section of Innovation / Inqubate was responsible for the application of and compliance with the UKZN human resource policies.

The day-to-day human resource management and performance management rested with the program director and PI, Dr Jennifer Reddy.

Due to illness, in the final year of the funding cycle of the no-cost extension the PI of the project was changed from Dr Jennifer Reddy to Dr Bernhard Gaede.

F.2 Administration: Procurement and Sub-Contracts

The program used the procurement system of UKZN through Innovation / InQubate. It followed standard procurement practices and the compliance with the policies was ensured through Innovation / InQubate.

The subcontracts were managed through Innovation / InQubate within the policy framework of UKZN and with the approval of CDC. The subcontracts included

- The agreement with IHI for the technical support and monitoring and evaluation
- The contracting of CRH to perform the community component in Ugu district, as reported above.

Section G – Budget Reporting

Tribute

This report is a tribute to Jennifer Reddy, the project director for most of the time of the project. She poured a seemingly endless stream of energy into this project and elegantly and eloquently articulated both the success of the project, but also the gaps that still needed to be addressed. Her commitment to fighting HIV, particularly among children, and improving the lives of the people of South Africa was an inspiration to many.

Jennifer fell ill in the last year of the project and died on the 2nd of May 2015.

Appendix: guide to QI methodology