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RESEARCH AND EVALUATION REPORT

Evaluation of the Costs and Benefits of an HIV Care Coverage Improvement Collaborative in Uganda

JUNE 2011

This report was prepared by University Research Co., LLC (URC) for review by the United States Agency for International Development (USAID). It was authored by Juliana Nabwire (URC), Rosamund Southgate (University of Oxford), Edward Broughton (URC), Nigel Livesley (URC), and Esther Karamagi (URC). The HIV coverage collaborative and this study were funded by the U.S. President's Emergency Plan for AIDS Relief (PEPFAR) and carried out under the USAID Health Care Improvement Project, which is made possible by the generous support of the American people through USAID.

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DISCLAIMER

The views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development (USAID) or the United States Government.

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ABBREVIATIONS

AIDS	Acquired immune deficiency syndrome
ANC	Antenatal care
ART	Antiretroviral therapy
ARV	Antiretroviral
COPE	Client oriented, provide efficient
HC	Health center
HCI	USAID Health Care Improvement Project
HIV	Human immunodeficiency virus
MoH	Ministry of Health
OI	Opportunistic infection
PEPFAR	U.S. President's Emergency Plan for AIDS Relief
PLHA	People living with HIV and AIDS
QI	Quality improvement
STI	Sexually transmitted infection
URC	University Research Co., LLC
USAID	United States Agency for International Development
USh	Uganda Shilling
US\$	United States Dollar
WHO	World Health Organization

EXECUTIVE SUMMARY

In November 2009, the Ministry of Health (MoH) of Uganda and the USAID Health Care Improvement Project (HCI) initiated an improvement collaborative in 14 HIV treatment clinics to increase the proportion of people living with HIV and AIDS (PLWH) who are under HIV clinic care. Among participating health centers, five addressed low coverage by improving efficiency of clinic operations. The hypothesis underlining this approach is that increases in productivity with the same health care worker inputs at the clinic will decrease waiting times and generally improve the patient experience, which will in turn lead to an increase in the number of individuals with HIV in clinical treatment.

The purpose of the study is to measure the effectiveness of the improvement collaborative in terms of improved staff efficiency, decreased wait times, and improved worker productivity and relate these benefits to the cost of the program. Specifically, we answer four questions:

1. Did the improvement collaborative intervention change patient waiting times?
2. Did the improvement collaborative intervention change the level of staff productivity?
3. What was the cost of the collaborative?
4. How did the cost of the collaborative compare to its benefits?

Description of the Intervention

Quality improvement (QI) teams at these five facilities began testing changes to improve efficiency and increase their capacity to see more patients. A learning session was held in October 2009. Coaching visits were conducted by either the HCI collaborative coordinator or the MoH regional coordinator on a monthly basis during which the experiences of implementing changes were shared among the teams. The first action period ran from October 2009 until the second learning session in May 2010. Key changes facilities tested during this period included:

- Introducing a triage system where a nurse conducts a brief, structured assessment of clients' health on arrival and assigns stable clients to a short consultation with one of several clinic nurses and less well clients to a longer consultation with a physician (Mubende Hospital, Kabuyanda Health Center, and Maddu Health Center)
- Re-organizing the physical layout of the clinic to reduce congestion and more clearly indicate pathways that clients should follow through the clinic (Maddu Health Center, Ntwetwe Health Center, and Kinoni Health Center)
- Introducing a rotation system to ensure that at least one staff member was allocated to each service in the clinic (Maddu Health Center and Ntwetwe Health Center)
- Pre-packing drugs before clinics so that dispensary staff did not have to spend time counting out drugs for each client during consultation hours (Kabuyanda Health Center, Maddu Health Center, and Ntwetwe Health Center)
- Seeing stable clients every two months instead of monthly to reduce the patient load (Kabuyanda Health Center and Ntwetwe Health Center).

Methodology

This study used a pre-/post-intervention design in which we compared baseline measures taken before the start of the collaborative in October 2009 to the endline measures on the same indicators collected in May 2010. Key indicators of success were patient waiting time, staff time utilization, clients seen per staff member, staff time saved, and cost of the intervention. Client flow was determined by giving patients a form to complete during their clinic visit. Staff productivity was measured by direct observation by the researchers. A structured interview of clinic managers was used to collect data on

the clients seen per staff member, staff time saved, and the cost of the intervention. Costs were considered from the perspective of HCI and the MoH.

Results

At Kabuyanda Health Center, average waiting times decreased for all HIV clinic services; the facility experienced a two-thirds decrease in patient waiting time, from 198 minutes to 61 minutes ($p < 0.001$). In Maddu Health Center, waiting times decreased significantly for registration, increased for dispensing, but overall there was no statistically significant change ($p = 0.65$). In Ntwetwe Health Center, the average total time spent at the clinic decreased from 253 minutes at baseline to 136 minutes at follow-up. For staff productivity in Maddu, there was an increase in productive time from 57% at baseline to 81% at follow-up ($p = 0.02$). Three sites saw more clients per staff member per week at follow-up, one site saw fewer, and one site did not change. Combining the five sites, there was no statistically significant difference in clients seen per staff member ($p = 0.89$).

At the four sites showing overall time savings, these equate to staff cost savings of up to 456,822 USH (US\$203) per clinic day. This is the monetary value of the time saving attributable to the collaborative, not an actual decrease in MoH expenditure. Since all clinic managers reported that staff spent the saved time assisting in other areas of the site, this time saving equates to sites having 1.0-4.1 additional staff members per clinic day (given an eight-hour work day). At all five sites, those interviewed ascribed the change in clinic hours to the QI interventions which they had introduced.

The cost of the collaborative for seven months until the end of April 2010 was estimated as 36,637,491 USH (US\$16,269) while staff-time cost savings for the five sites was \$227 per week. This means that the collaborative would break even after 72 weeks or less than 16.5 months, assuming the improvements in clinic efficiency were maintained.

Discussion

Our results suggest that the improvement collaborative implemented at these five facilities significantly decreased client waiting times by facilitating some or all of the following changes in clinical practice: pre-packing drugs before clinics, triaging clients before consultation, ensuring all clinic areas are suitably staffed, and having a clear and signposted path of client flow through the clinic. The changes also allowed clinics at all five sites to finish their work two to three hours earlier, suggesting that the QI interventions improved clinic efficiency. Four of the five sites closed earlier at follow-up than at baseline despite seeing the same or more clients per staff member per week. The remaining sites, closed earlier but saw fewer clients per staff member per week at follow-up, possibly due to commencing outreach clinics and the expansion of clinic teams.

A cost-benefit analysis of the coverage collaborative showed that, assuming the improvements were sustained, the cost savings in terms of staff time saved would be equal to the total cost of the intervention after 16.5 months. Sensitivity analysis showed that this result changed the most with changes in the cost of the staff time spent on collaborative activities. If the collaborative was conducted by the MoH in facilities not currently part of the collaborative, costs would be lower and the break-even point would be reached even sooner.

I. INTRODUCTION

Uganda has a very high disease burden from HIV/AIDS burden; prevalence among adults aged 15-49 years of Uganda is 5.4%.¹ While Uganda's Ministry of Health (MoH) states that prevalence is stable,² it remains higher than the East African regional prevalence of 4.7% and the global average of 0.6%. The burden of disease on society is exacerbated by a shortage of health workers. The MoH explains that, despite 72% of the households in Uganda living within five kilometers of a health facility, health care utilisation is limited due to poor infrastructure, a lack of drugs and other supplies, and the shortage and low motivation of the health care workforce. A 2007 study showed that Uganda has 1.2 doctors per 10,000 population and 13.1 nurses and midwives, well below the World Health Organization (WHO) minimum recommended level of 22.8 health care professionals per 10,000 population.³ The MoH reported that in November 2008 only 51% of government-approved HCW posts were filled; a situation it describes as 'critical'. Insufficient training capacity, low remuneration, poor working conditions and international migration were the main reasons cited for the poor recruitment and retention of HCW across Uganda, particularly in rural settings.

The Ugandan MoH in partnership with USAID's Health Care Improvement Project began the Quality of Care Initiative to improve health care quality and outcomes for those living with HIV/AIDS since 2006. In October 2009, 120 outpatient HIV clinic and health centers across the country were divided into seven QI interventions according to region for the next wave of the initiative. Each collaborative focused on a specific area of care. The collaborative that is the subject of this study focused on an intervention to increase the proportion of people living with HIV and AIDS (PLWH) who are under HIV clinic care. Participating sites were asked to concentrate on clinic inefficiencies that directly affect the clinics' function and ability to enroll more people in care. The underlying hypothesis for the collaborative was that improving clinic efficiency will enhance the client experience of HIV clinics and lead to an increase the retention of clients in care.

The aim of this study is to assess the costs and effectiveness of the coverage collaborative in terms of the efficiency of the HIV clinics. Specifically, we answer four questions:

1. Did the collaborative change patient waiting times?
2. Did the collaborative change the level of productivity of the staff?
3. What was the cost of the collaborative?
4. How did the cost of the collaborative compare its benefits?

A. Description of the Uganda HIV Coverage Collaborative

Fourteen sites around the towns of Mbarara and Masaka in the south-western Uganda were recruited for the collaborative. The nine sites not included in this report were not actively engaged in the collaborative at the time of this study because of personnel changes or other logistics issues and were therefore not considered part of the intervention group. The first learning session was held in Mbarara in October 2009. Thereafter coaching visits - shared between the HCI collaborative coordinator and HCI regional coordinators - were carried out every month. The coaches gave guidance to the site QI

¹ WHO. Global Health Observatory [internet]. 2010. Available from: <http://www.who.int/gho/en> [accessed 29 June 2010].

² Government of Uganda, Ministry of Health. National Health Policy: Reducing poverty through promoting people's health. Kampala: Government of Uganda; 2009. Available from: http://www.health.go.ug/index.php?option=com_content&view=article&id=66:policies&catid=25:the-project&Itemid=85 [accessed 29th June 2010].

³ World Health Organization. The World Health Report 2006: Working together for health. Geneva: WHO; 2006.

team and shared the experiences and results from other sites in the collaborative. In this way, they were the medium for collaboration among teams in between the learning sessions. The first action period of the collaborative (when teams test changes) ran from October 2009 until the second learning session in May 2010. Five of the 14 participating sites addressed low coverage by working to improve clinic efficiency. These five sites are hereafter referred to as the “coverage collaborative.”

During the first learning session some ideas were developed on how to improve efficiency in the HIV clinics. When participants returned to their facilities, the specific problems and the implementation of changes were discussed and new ideas were developed to address their particular needs. During subsequent coaching visits, the coaches shared details on changes being implemented at other facilities, so that sites could learn from experiences from other sites. A summary of the interventions introduced at each site is presented in Table I. Mubende Hospital, Kabuyanda Health Center (HC), and Maddu HC introduced a triage system where a nurse conducts a brief, structured assessment of clients’ health on arrival and assigns stable clients to a short consultation with one of several clinic nurses and less well clients to a longer consultation with a clinician. Prior to the introduction of a triage system, all clients would be seen by a nurse and then reviewed by a clinician (although at Kabuyanda HC the clinician review would be omitted for the small proportion of clients where the nurse felt it unnecessary). This system was generally perceived by the collaborative coordinator and QI teams members to create a bottleneck in client flow.

Maddu HC, Ntwetwe HC, and Kinoni HC revised the physical layout of their clinics to reduce congestion and more clearly indicate pathway clients should follow through the clinic. Maddu HC and Ntwetwe HC also introduced a duty roster to ensure that at least one staff member was allocated to each service in the clinic. Kabuyanda, Maddu, and Ntwetwe Health Centers began pre-packing drugs before clinics so that dispensary staff did not have to spend time counting out drugs for each client during the clinic. Kabuyanda HC and Ntwetwe HC also began seeing stable clients every two months instead of monthly to reduce clinic sizes.

Table I: Schedule of implementation of changes at the clinics

Change Implemented	Date Implemented by Facility				
	Ntwetwe HC	Maddu HC	Kabuyanda HC	Mubende Hospital	Kinoni HC
Pre-packing Septrin prescriptions	Nov 09	Nov 09	Feb 10		Mar 10
Introduction of triage nurse	Nov 09	Nov 09		Nov 09	Mar 10
Creation of side lab for obtaining CD4 samples	Nov 09				
Change in physical flow of clients in HIV clinic	Nov 09			Jan 10	Mar 10
Introduction of two-month ARV supply for stable patients	Dec 10				
Introduction of registration book to encourage staff punctuality		Nov 09			
Reallocation of staff to increase support for triage nurses		Jan 10		Nov 09	Jan 10
Reorganization and display of duty roster for staff allocation		Feb 10	Feb 10		
Allocation of staff to the HIV clinic		Mar 10	Feb 10	Jan 10	Feb 10
A new counselor started work			Feb 10		
Utilization of a larger physical space for clinic				Apr 10	
Allowing nurses to prescribe medicines for stable patients				Jan 10	

II. METHODOLOGY

A. Design

This study used a pre-/post-intervention design in which we compared baseline measures taken before the start of the collaborative in October 2009 to the endline measures on the same indicators collected in May 2010.

B. Indicators and Data Collection Tools

Indicators for the evaluation were developed through discussion with HCI staff in Uganda and Bethesda, Maryland. To assess improvements in HIV clinic efficiency, four indicators were selected: client waiting times; staff time utilization; number of clients seen per staff member per week; and staff time saved. The first two of these are process indicators, while the latter two are outcome indicators.

The cost of the collaborative was collected from HCI accounting records supplemented by information gathered in the structured interview with clinic managers. The costs for staff time were determined from MoH salary records.

Table 2 summarizes the indicators chosen for evaluation of the coverage collaborative and the tools used to assess each one.

Table 2: Coverage collaborative indicators and study data collection tools

Indicator	Tool	Sites sampled
Client waiting times	Client flow tool	2
Staff productivity	Time utilization tool	1
Clients seen per staff member per week	Structured interview tool	5
Staff time saved	Structured interview tool	5
Cost of the collaborative	Structured interview tool	5
Description of successful interventions	Structured interview tool	5

A client flow tool was used to measure baseline client waiting times at two sites (Maddu and Kabuyanda health centers) in October 2009. Each client attending a clinic on a data collection day was given a client flow form (Appendix 1). This is a modification of the client oriented, provider efficient (COPE) evaluation tool described elsewhere.⁴ Clinic staff noted the time the patient arrived at each area or service of the clinic, what time staff at that service commenced seeing the client, and what time they finished. This allowed waiting and contact times to be calculated for each client. Follow-up client waiting times were measured at the same two sites in May 2010. At Ntwetwe HC, the QI team themselves measured the total time spent by patients at the clinic from a sample of 10 randomly selected clients each month.

Staff productivity was measured for five staff members at Maddu HC at baseline in October 2009 and follow-up in May 2010. A time utilization tool previously developed and piloted by HCI in Niger was employed (see Appendix 2). Each data collector followed one to three staff members for one day, using the tool to note activities in five-minute intervals. Activities were classified as productive or unproductive, and a percentage of productive time out of total time was calculated. Unproductive time

⁴ Thuo M and Lynam P, Improving service quality. *Afr Link*, 1994: Oct; p. 7-8.

was defined as any period in which patient care or work duties were not taking place. An example is unscheduled break times taken to attend to personal matters. Regularly scheduled break times were not considered unproductive.

The numbers of clients seen per staff member per week were obtained by conducting structured interviews with clinic managers and reviewing clinic attendance registers (see Appendix 3 for the structured interview form). The number of staff on duty was defined as the number of clinical officers and all other clinical staff on duty at the HIV clinic for the given time period. It does not include cleaners, security guards, and others not involved directly in patient care. The average number of clients seen per week per staff member was then obtained by calculating the average number of clients seen per week in the one-month baseline or follow-up period and dividing this by the number of staff members on duty during the month.

Data on staff time saved were also obtained from the structured interviews in all five sites. Average clinic closing times at baseline and follow-up were ascertained along with detailed information on staff mix and numbers. At sites where clinics closed earlier, details on staff activity during this free time were recorded. If the time was used by staff to carry out tasks necessary to introduce and maintain efficiency interventions (such as pre-packing drugs before clinic to save pharmacy time during clinics) this was taken into account. Where staff numbers and mix had changed, this was also taken into account as either extra or fewer staff hours. Costs were assigned to staff time savings using estimated average monthly salaries for each level of health care worker (see Appendix 4).

Stakeholder meeting and learning session costs included venue rental, refreshments, transportation to the venue for all participants, and the time of the HCl staff. Any per diems paid to HCl or MoH staff participants were also included. Regularly salaried time costs for MoH staff were not included because this was considered a part of their normal work duties and did not incur additional costs not covered by the per diem payments. Coaching visits and the coordinator's salary included all transportation and time costs for the coaches and proportion of the salary of the coordinator commensurate with their level of effort for administration and participation of coaching visits. Site costs for QI team meetings and coaching visits included all time costs associated with participation in the team meetings and coaching. Costs were calculated for just the five sites in this study. All costs were recorded in Ugandan Shillings (USh) and converted to United States Dollars (US\$). We used the Bank of Uganda mid-market exchange rate of 26th July 2010: 2252 USh = 1 US\$.

C. Data Collection

The data collection team consisted of the collaborative coordinator and two regional coordinators. The same individuals collected baseline data on client waiting times and staff productivity. They received training on the use of the tools prior to deployment to the field.

Baseline client waiting time data and staff productivity data had been collected using the same methods during visits in October 2009. Endline data collection and staff interviews took place in May 2010. Data collectors visited Maddu and Kabuyanda on one HIV clinic day to apply the client flow tool, time utilization tool, and structured interview tool. Information on collaborative costs was collected during May 2010.

III. RESULTS

A. Client Waiting Times

Figure I shows average client waiting times at baseline and follow-up at Kabuyanda HC for three activities. Average waiting times decreased for all HIV clinic services and average total waiting time decreased by more than two-thirds from 198 minutes to 61 minutes ($p < 0.001$).

Figure 1: Average client waiting times at Kabuyanda Health Center

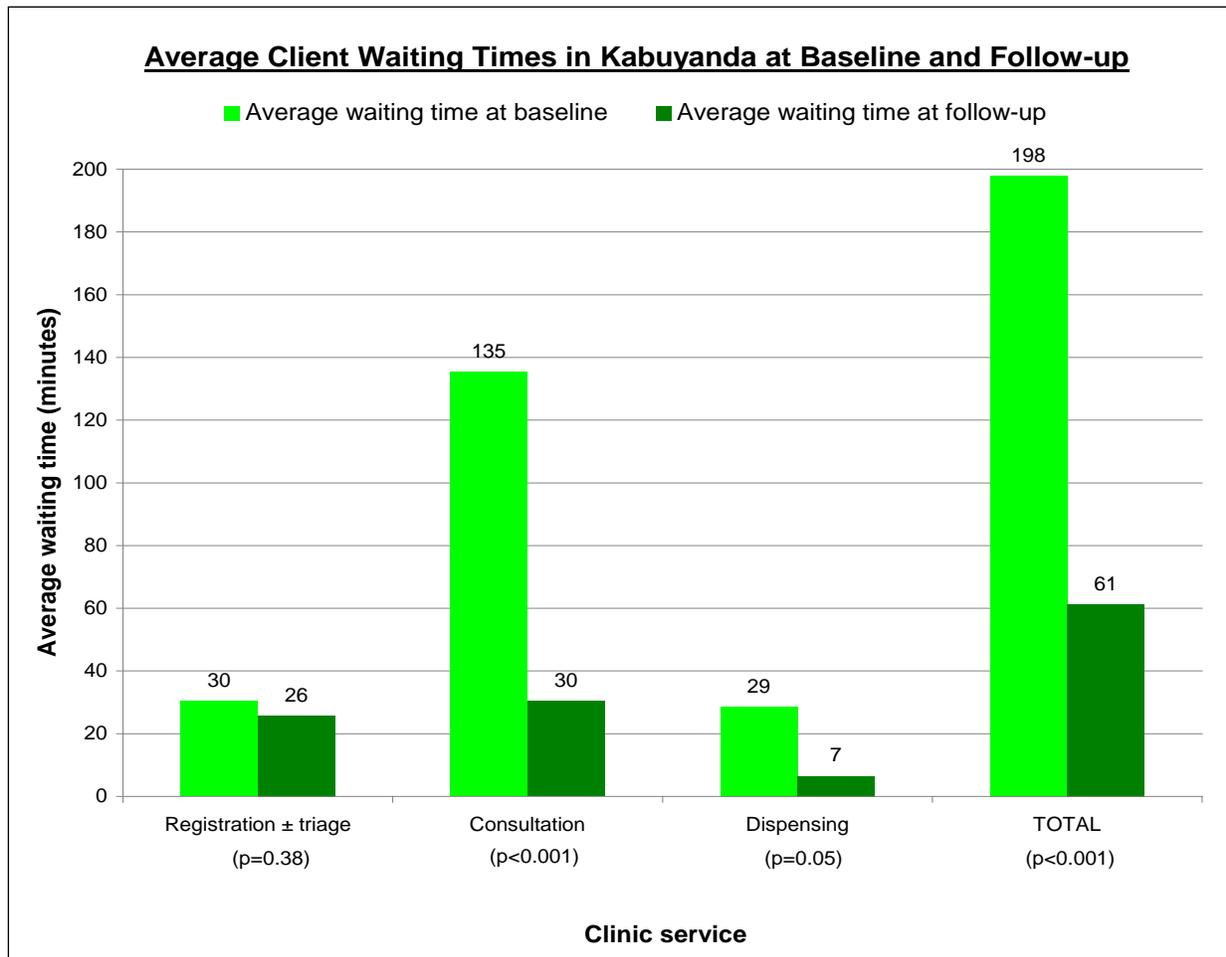
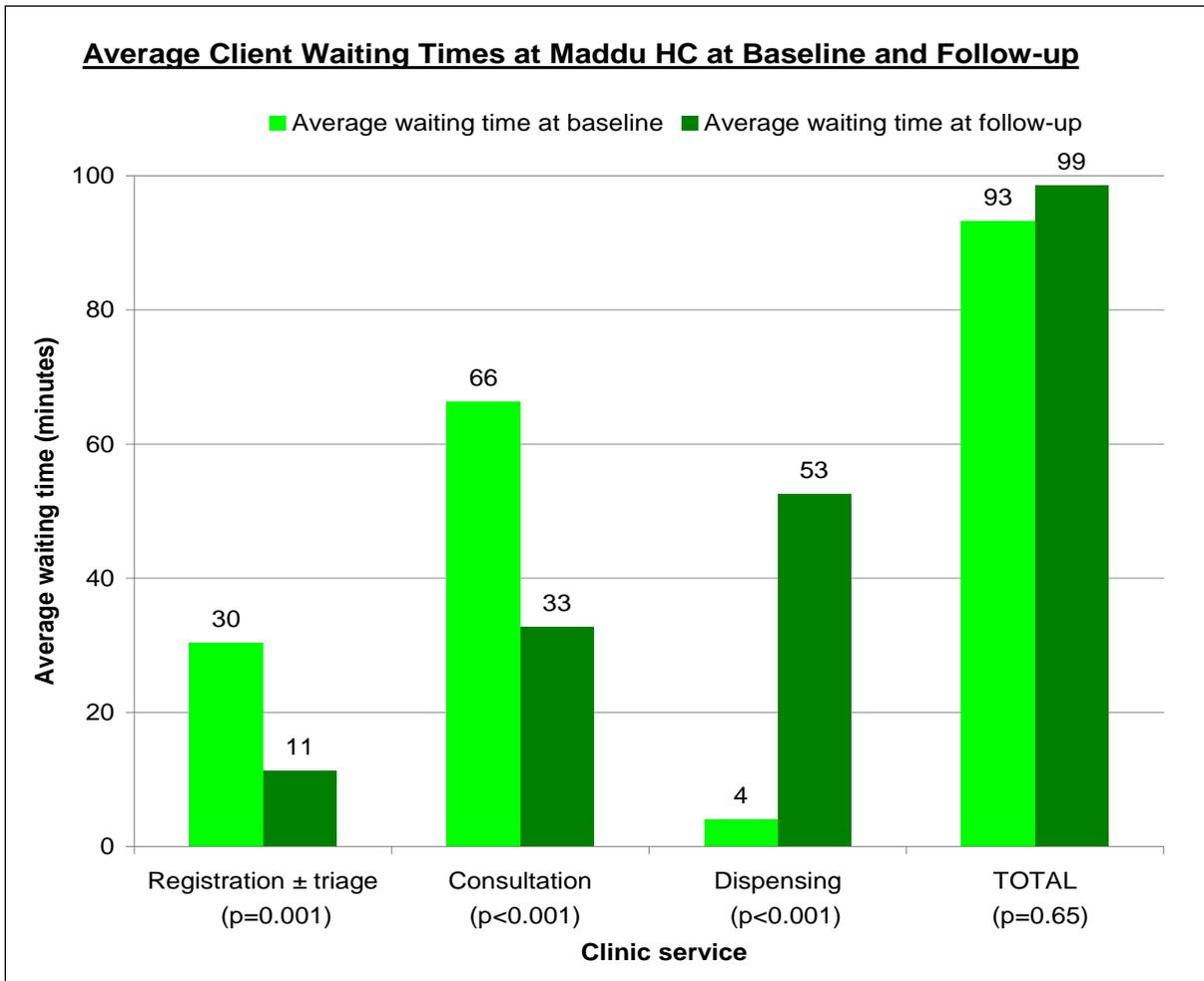


Figure 2 shows average client waiting times at Maddu HC. Average waiting times decreased significantly for registration, even with the introduction of triage at the time of registration, and consultations. However times increased markedly for dispensing. Average total waiting time therefore increased by 6%, but this was not statistically significant (p=0.65).

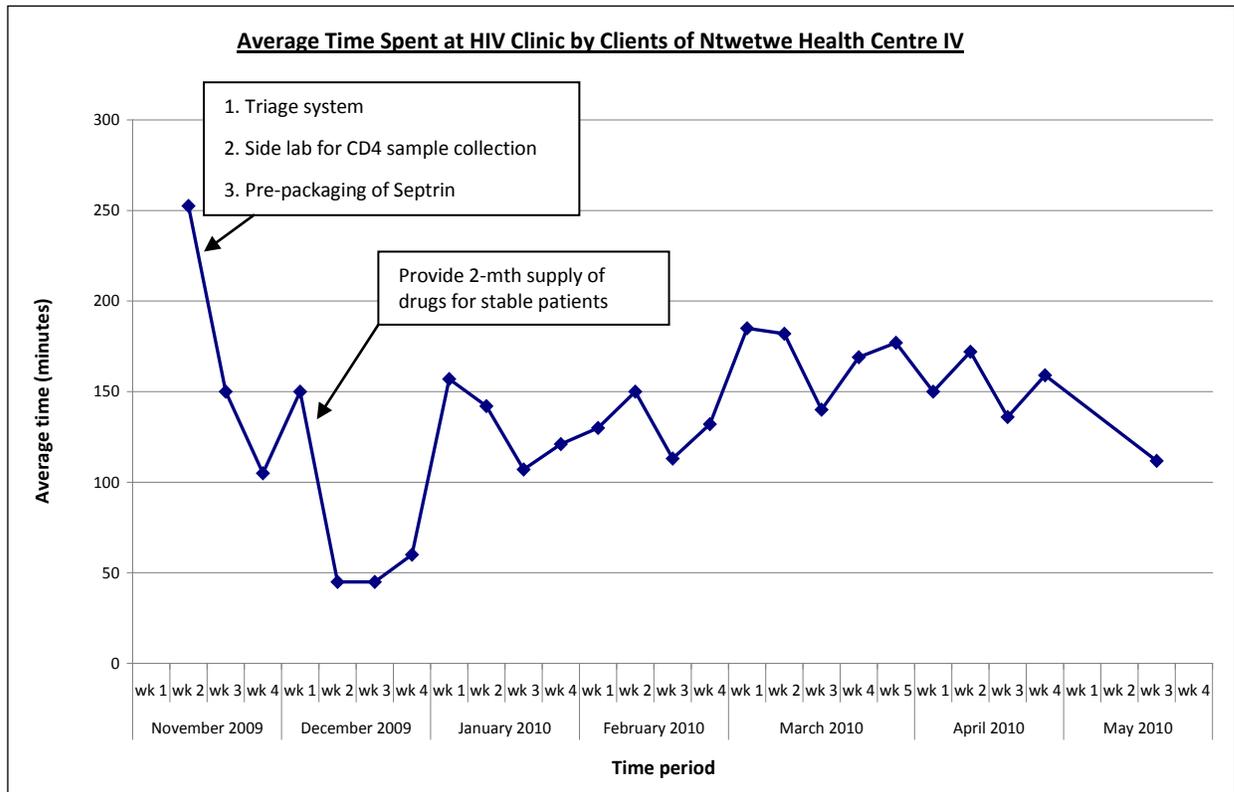
Figure 2: Average client waiting times at Maddu Health Center



B. Total Time Spent at the Clinic

The total times spent at Ntwetwe HC collected from the ten randomly selected patients in each week of the action period are shown in Figure 3. Since the individual times measured for each client were not available, and only one average time was available for the baseline period (week 2 of November 2009, the first data point on Figure 3), statistical tests were not performed.

Figure 3: Average total time spent at Ntwetwe Health Center



Average total time spent at the clinic decreased from 253 minutes at baseline (clinic held in the second week of November 2009) to 136 minutes at follow-up (clinics held in the third and fourth week of April and the third week of May 2010).

C. Staff Productivity

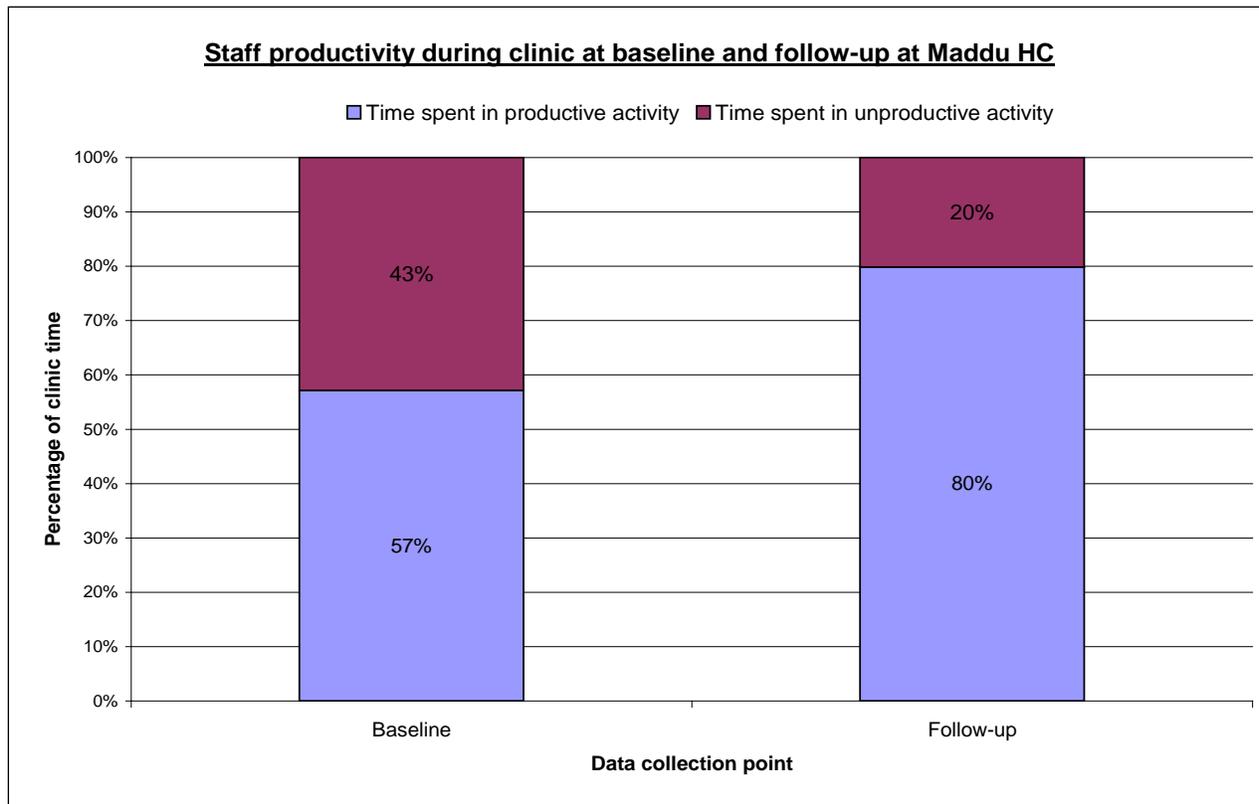
Staff productivity was measured at Maddu HC. Five staff members were assessed at baseline (one clinic physician, three nurses, one other) and five at follow-up (two clinic physicians, two nurses, one records clerk).

Additional data available from Mubende Hospital indicate the extent to which a triage system can spread the load of client consultation in efforts to reduce waiting times: at baseline all 300 clients seen in the month of November 2009 received a consultation from one of the two HIV clinic clinicians. By April 2010, 61% of clients were instead seen by one of the six clinic nurses providing consultations.

Overall percentage of time spent undertaking productive activities (defined as direct or indirect patient care; preparation and personal hygiene; attending meetings; administration or training) is shown in Figure 4. There was an increase from 57% at baseline to 81% at follow-up ($p=0.02$). Sub-analysis at the cadre level was not performed given the low number of staff observed. Maddu HC introduced a triage system so that only unwell patients were seen by the clinician, and stable, well patients were seen by a nurse. They also laid out a clear path for patients to move through the clinic from one service to the next and assigned one or more staff members to each service area.

The working day observed at Maddu HC on the baseline visit day was 8.30am-5pm; at follow-up it was 8.30am-2.15pm. The average closing time reported by the clinic manager at baseline was 6pm and at follow-up was 4pm. This two-hour reduction was used for the time-saved calculations reported below.

Figure 4: Staff productivity at baseline and follow-up at Maddu Health Center



D. Clients Seen per Staff Member per Week

The average number of clients seen per staff member per week at baseline and follow-up at each site is shown in Table 3. Three sites saw more clients per staff member per week at follow-up than at baseline, one site saw fewer, and one site did not change. Sites which saw more clients per staff member at follow-up experienced no change in staff number during the action period. There was both an increase in staff members (the denominator) and an increase in the numbers of clients seen per week (the numerator) at Ntewtwe and Kinoni health centers. This led to an overall decrease in the average number of clients seen per staff member per week at Ntwetwe HC and no change at Kinoni HC. Combining the five sites, there was no statistically significant difference between average number of clients seen per staff member per week at baseline and follow-up ($p=0.89$).

Results for each individual site could not be assessed for statistical significance because inadequate data were available: staff from Mubende Hospital and Ntwetwe HC could only give monthly figures on the number of clients seen, while those at Kinoni HC and Maddu HC could only give estimates of the number of clients seen weekly. Only at Kabuyanda HC were data on the exact count of patients seen each week available.

Table 3: Number of clients seen per staff member per week

Site	Clients in active care (April 2010)	Baseline			Follow-up			Difference (y-x)
		Clients seen per week	Staff on duty	Clients per staff member per week (x)	Clients seen per week	Staff on duty	Clients per staff member per week (y)	
Mubende Hospital	1701	75	13	6	93	13	7	1
Kabuyanda HC	882	73	4	18	79	4	20	2
Maddu HC	1284	40	10	4	80	10	8	4
Ntwetwe HC	618	119	5	24	152	10	15	-9
Kinoni HC	500	40	2	20	60	3	20	0

E. Staff Time Saved

The amount of staff time saved as a result of earlier clinic closing times at follow-up compared with baseline (less any time spent undertaking QI intervention activities) is shown in Table 4. HIV clinic teams were asked to report the number of staff present and the number of clients seen. The estimated cost of this time, in terms of staff wages, is also shown.

Table 4: Staff time and cost savings

Site	Average number of staff on duty (April 2010)	Staff-hours saved per clinic day	Cost-saving per clinic day (US\$)	Cost-saving per clinic day (US\$)
Mubende Hospital	13	33	456,822	203
Kabuyanda HC	4	8	162,501	72
Maddu HC	10	13	190,910	85
Ntwetwe HC	10	-8	-418,184	-186
Kinoni HC	3	10.5	175,000	78

All five sites reported that clinic hours are now shorter in duration than at baseline, with a range of two to three hours. Ntwetwe Health Center also commenced outreach clinics and saw its staff numbers double during the action period, resulting in a net increase in staff time used (expressed here as negative time and cost savings). The outreach activities were an extension of the ART initiation and follow-up that was already occurring in the clinic, and it was therefore considered appropriate to include these new staff members in the clinic total.

At the four sites showing overall time savings, these equate to staff cost savings of up to 456,822US\$ (US\$203) per clinic day. Since all clinic managers reported that staff spent the saved time assisting in other areas of the site, this time saving equates to sites having 1.0-4.1 additional staff members per clinic day (given an eight-hour work day). At all five sites, those interviewed ascribed the change in clinic hours to the QI interventions.

F. Cost of the Collaborative

For the five sites evaluated, the cost of the collaborative for seven months until the end of April 2010 was estimated as 36,637,491 USh (US\$16,269) (see Table 5).

Table 5: Costs of the coverage collaborative

Item	Cost (USh)	Cost (US\$)	%
Learning Session & Stakeholder Meeting	12,697,738	5,638	35
Coaching trips & Collaborative Coordinator salary	14,647,019	6,504	40
Site costs for QI team meetings & coaching visits	9,292,735	4,126	25
TOTAL	36,637,491	\$16,269	

IV. DISCUSSION

A. Client Waiting Times

At Kabuyanda HC average waiting times reduced markedly for all clinic services, even with the slight increase in the number of clients seen each week (73 per week at baseline vs. 79 at follow-up). The combination of pre-packing drugs before clinic and introducing a triage system thus seems to have enhanced clinic efficiency as shown by improvement in this process indicator.

Maddu HC introduced the same two QI interventions as Kabuyanda HC and two others: first, a path of patient flow through the clinic was laid out, with clients informed which clinic services they required and where each was located; second, on each day at least one staff member was allocated to each area of the clinic. Following the introduction of these improvements, average waiting times decreased markedly for registration and consultations. Despite the changes made to clinic systems, waiting times for dispensing increased. On direct questioning of staff at the time of follow-up data collection, they reported staffing problems in the preceding months. The health care worker in the dispensary was unable to serve patients in a timely manner and was replaced shortly after this evaluation. This demonstrates some of the confounding factors that influence clinic efficiency and affect the outcome measures used in this evaluation.

The overall results for this process indicator suggest that a potentially significant impact on client waiting times can be made by introducing the following 'bundle' of interventions:

- Pre-packing drugs before clinics
- Triage clients before consultation
- Ensuring all clinic areas are suitably staffed
- Having a clear and signposted path of client flow through the clinic.

B. Total Time Spent at the Clinic

At Ntwetwe HC, average total time spent at the clinic decreased by nearly 50% from baseline to follow-up after the introduction of QI interventions similar to those used at Maddu HC and Kabuyanda HC (although a triage system was already in place). In addition, the clinic began seeing stable clients every two months instead of monthly in order to reduce the total number of attendees. They also took steps to increase staff productivity and recruited additional staff. In November, the majority of clients were scheduled to be seen in two months' time so that they did not need to attend clinic during the holiday season in December. Low December attendance led to shorter waiting times and a decrease in the average total time spent in clinic (Figure 3). The subsequent increase in average total time after December, when many clients were returned to monthly reviews, gives further support to a causal link between this intervention and the total time spent in clinic.

C. Staff Productivity

Increased staff productivity at Maddu HC was associated with an increase in the number of clients seen per staff member per week and significant staff time savings through earlier clinic closing times. Improved productivity was likely the result of better clinic organization and greater staff motivation. For example, better staff allocation and clinic organization were associated with improved client waiting times at registration. This was associated with a reduction in the time staff spent waiting for clients from 14% to 3% of total time for all staff members observed.

D. Clients Seen per Staff Member per Week

As in the Uganda data management collaborative study⁵, changes in this outcome indicator varied across the five sites. We cannot draw firm conclusions given the limitations of this indicator and because sites introduced an overlapping selection of QI interventions. However, the three sites which showed an increase in average number of clients seen per staff member per week had introduced a triage system during the action period. Client waiting times improved at two of these sites. Conversely, the two sites which did not introduce a triage system during the action period showed no change (Kinoni HC) or a decrease (Ntwetwe HC) in this indicator. This suggests that triage systems can improve clinic efficiency in terms of numbers of clients seen per staff member.

E. Staff Time Saved

That all five sites now finish two to three hours earlier suggests that the QI interventions improved efficiency, especially because all clinics saw more patients in the endline than in the baseline period. Clinic managers at these sites concurred, and the two sites where client flow was assessed showed reduced client waiting times for some or all clinic services, which may explain these shorter hours.

Four sites closed earlier at follow-up than baseline despite seeing the same or more clients per staff member per week, supporting the link between QI interventions and clinic efficiency. The remaining site, Ntwetwe HC, closed earlier but incurred negative time savings and saw fewer clients per staff member per week at follow-up. This is likely the result of commencing outreach clinics and the expansion of the clinic team from five to ten staff members, both of which added to staff time. Although additional staff may allow clinics to finish earlier and result in an overall time saving, a 100% increase in staff numbers is likely to necessitate alterations in clinic systems and processes to accommodate the additional personnel. It was reported that such changes were not completed by the time of follow-up data collection. Therefore this result does not necessarily contradict the findings at the other four sites.

Since all clinic managers reported that staff assist in other clinical areas when the HIV clinic closes early, the time savings across the four sites are equivalent to having between 1.0 and 4.1 additional staff members on site per clinic day (given a eight-hour work day). Given that staff spent the free time created by earlier closing times assisting with other clinics or performing other duties, these savings led to a significant improvement in the function of other departments in the health facility. If similar time savings were produced in all 328 ART-accredited clinics across Uganda, this would equate to hiring between 328 and 1345 additional health care workers. Reduced waiting times also save time for patients, resulting in further significant time (and cost) savings which were not accounted for here.

F. Cost-benefit Analysis of the Collaborative

The cost of the first six months of the coverage collaborative was estimated as 36,637,491 USh (US\$16,269) while staff-time cost savings for the five sites total to 56,049 USh (US\$252) per clinic day. This gives an average cost saving of US\$227 per week, given that Kinoni Health Center has clinics once

⁵ See Kyeyagalire et al. 2011. The Data Management Improvement Collaborative in Uganda. *Research and Evaluation Report*. Published by the USAID Health Care Improvement Project. Bethesda, MD: URC. Available at: <http://www.hciproject.org/node/2536>.

every two weeks while the other four have weekly clinics. This means that the collaborative would break even after 72 weeks or less than 16.5 months, assuming the improvements in clinic efficiency were maintained over this period. These calculations account for the improvements that occurred in these five sites only up to the time of the second learning session. As learning from the five sites spread among themselves, we would expect to see further improvements with only small increases in the total cost of the program. Therefore, it is likely that the efficiency of the intervention would increase over time.

One-way sensitivity analysis was performed on both of the cost variables and their components. A 1% increase in the cost of the collaborative would cause a 2.9% increase in the cost-benefit difference. A 1% increase in staff time savings would cause a 1.9% decrease in the cost-benefit difference. Among the specific collaborative cost components, cost to HCI of coaching trips and the coordination of the collaborative (14,647,019US\$ or US\$6504) had the biggest effect on the overall result. A 1% increase in the cost of coaching/coordination would cause a 1.2% decrease in the cost-benefit difference. Among the components of the staff time savings, Mubende Hospital had the biggest effect. A 1.0% increase in staff cost savings at this site would cause a 1.8% decrease in cost-benefit difference. Thus, a 10 percent change in any one of the input variables would have a large effect on the cost-benefit balance (up to a 2.9% change).

V. CONCLUSION

There was a substantial positive impact from the learning sessions and coaching visits that occurred as part of the collaborative improvement intervention. Coaches shared successes and challenges in other sites, and QI teams learned from one another and designed and implemented their specific changes accordingly. The results obtained in this study suggest that certain 'bundles' of QI interventions can improve client waiting times as well as save staff time. These are:

- Pre-packing drugs before clinics
- Triageing clients before consultation
- Ensuring all clinic areas are suitably staffed
- Having a clear and signposted path of client flow through the clinic
- Seeing stable clients every two months instead of monthly.

Changes in the outcome indicator 'clients seen per staff member per week' were variable and may be due to other influences upon the number of clients attending HIV clinics and the number of staff available to see them.

All five sites closed earlier by the end of the action period, equating to a net staff-cost saving of 567,049US\$ (US\$252) per clinic day across all sites, which is equivalent to US\$227/week. A cost-benefit analysis of the coverage collaborative showed that assuming the improvements were sustained, the break-even point would be reached after 16.5 months. Sensitivity analysis showed that this result changed the most with changes in the cost of the collaborative clinic staff time costs. If the collaborative was conducted by the MoH in facilities not currently part of the collaborative, costs would be lower and the break-even point would be reached even sooner.

Given the shortage of health care workers in Uganda and the need for greater efficiency in health facilities, we recommend adoption of the coverage collaborative's bundle of efficiency interventions in other MoH health facilities where appropriate.

APPENDIX 1: CLIENT FLOW FORM

CLIENT FLOW FORM

Date : _____ Arrival Time: _____ : _____
 dd/mm/yyyy 24 hr hh : min

Visit Type:
 1. Initial Visit _____
 2. Follow-up visit _____

Principal reason for visit (circle one of the choices below):
 ART Initiation Drug adherence monitoring Other: (specify) _____
 ART Monitoring Drug re-supply OI/STI diagnosis or care Counselling

Secondary reason for the visit: _____ (circle one of the choices below):
 ART Initiation Drug adherence monitoring Other: (specify) _____
 ART Monitoring Drug re-supply OI/STI diagnosis or care Counselling

	Staff Initials	Time service started	Time service completed	Waiting time (in minutes)	Contact time (in minutes)
Registration	_____	_____	_____	_____	_____
Health education	_____	_____	_____	_____	_____
Consultation preparation (blood pressure, weight, etc.)	_____	_____	_____	_____	_____
Consultation	_____	_____	_____	_____	_____
Pharmacy	_____	_____	_____	_____	_____
Counselling	_____	_____	_____	_____	_____
Other 1:	_____	_____	_____	_____	_____
Other 2:	_____	_____	_____	_____	_____
TOTAL	_____	_____	_____	_____	_____
Comments	_____				

APPENDIX 2: TIME UTILIZATION TOOL

Site _____

ID: _____

Time Utilization Observation Form

Health Worker:

A

Evaluator Name: _____

Type of provider: Specialist Doctor / Doctor / Medical Officer / Nurse / Nurse's Assistant / Lab technician Pharmacist / Other

Date: _____ (dd/mm/yyyy)

Time		Productive Time						Unproductive Time				Other Time	
		Direct patient care	Indirect Care	Outreach	Administration	Meetings	Training	Cleaning/preparation, personal hygiene	Waiting for patients	Breaks	Social visits	Unexplained Absence	Other
Hour	Min												
7	00												
	15												
	30												
	45												
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APPENDIX 3: SITE MANAGER FOLLOW-UP INTERVIEW FORM

1. Date: _____ (dd/mm/yyyy)
2. Site Name: _____
3. Interviewer name: _____
4. Site manager / HIV Clinic manager name: _____
Total number of active patients registered with clinic: _____

5. Have total staff numbers changed since October 2009? Yes or No.

- If Yes: Please describe how they have changed (*for example: 1 extra nurse, 1 less pharmacist*) and why (*for example: a vacancy has been filled, the clinic is busier so more staff are needed, an employee has left and not been replaced*)

On average, how many clients were seen in the clinic per week in April 2010? (You may need to see the Clinic Register to answer this question)

On average, how many clients were seen in the clinic per week in October 2009? (You may need to see the Clinic Register to answer this question)

Currently, how many staff members are on duty on a typical clinic day? Which cadre is each of these staff members?

How many staff members would have been on duty on a typical clinic day in October 2009 and before? Which cadre is each of these staff members?

6. Does the clinic now finish earlier in the day compared with October 2009 and before?

- If Yes: Go to Q.12 - If No: Go to Q.14

On average, how many working hours does this free-up for each cadre of staff each day? (For example: 1 hour for doctors, half an hour for nurses, 15 minutes for auxiliary staff)

What do staff do with this free time? (For example: go to help at a different clinic, do admin work at the clinic, go home, don't know)

_____ now go to Q.17

7. Do staff have more spare time in the day now compared with October 2009 and before?

- If Yes: Go to Q.15 If No: Go to Q.17

On average, how many more hours of free time are available for each cadre of staff each day? (For example: 1 hour for doctors, half an hour for nurses, 15 minutes for auxiliary staff)

What do staff do with this free time? (For example: go to help at a different clinic, do admin work at the clinic, go home, don't know)

8. Has there been a monthly clinic QI team meeting every month from November 2009 to April 2010? Yes or No.

-If No, please list the months there was a meeting: _____

9. How long do these QI team meetings usually last? _____ (in hours)

Who usually attends the QI team meetings? (Please give the number of each cadre who attend)

Who usually attends the collaborative coaching sessions? (Give the number of each cadre who attend)

10. How long do the coaching sessions usually last? _____ (in hours)

What efficiency interventions has the Quality Improvement (QI) team put in place in the clinic? (Please describe briefly)

What do you (the site/HIV clinic manager) think has gone well and could be improved?

Have you received any feedback from clinic staff on the QI interventions made? Yes or No.

-If Yes, please describe what staff have said: _____

Do you think patient waiting times and/or staff productivity have changed since the start of the QI initiative in the clinic? Yes or No.

- If Yes: Go to Q.26

If No: End of questionnaire.

Do you think patient waiting times and/or staff productivity have become better or worse since the start of the QI initiative in the clinic?

- If Better: Go to Q.27

If Worse: Go to Q.28

Do you think that any improvements made in patient waiting time and/or staff productivity will continue to improve or do you think they have reached their maximum?

Has the clinic put any measures in place to ensure that QI interventions are sustainable in the long-term, once HCI/URC involvement has ended? (By this we mean measures such as protocols, policies, continued QI meetings. Please do not suggest these directly to the site manager however)

Why do you think patient waiting times and/or staff productivity have become worse since the start of the QI initiative in the clinic?

APPENDIX 4: HIV CLINIC STAFF SALARY ESTIMATES

Cadre	Monthly wage (USh)	Approximate hourly wage (USh)
Medical Officer/Doctor	750,000	34,091
Clinical Officer/Clinician	550,000	25,000
Nurse/Midwife	400,000	18,182
Data Officer/Records Officer/Data Clerk	200,000	9,091
Nursing Assistant	150,000	6,818
Senior Medical Officer	1,300,000	59,091
Laboratory technician	400,000	18,182
Dispenser/Pharmacist	450,000	20,455
Nursing Officer	550,000	25,000
Driver	200,000	9,091
Receptionist/Secretary/Admin staff	200,000	9,091
Medical Social Worker	600,000	27,273
Accountant	600,000	27,273
Volunteer/Expert Client	0	0

Notes:

1. Estimated wages stated here are pre-tax.
2. There are several levels of wage for medical officers and clinical officers; those used here are the lowest level.
3. Conversion of monthly wage to approximate hourly wage assumes that working hours are 9am-5pm and that there are an average of 22 working days per month (= average number of working days per month in 2010, not including Bank Holidays).

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