

# Reaching the First 90: Improving Inpatient Pediatric Provider-Initiated HIV Testing and Counseling Using a Quality Improvement Collaborative Strategy in Tanzania

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**Key words:** collaborative, HIV, pediatrics, provider-initiated testing and counseling, quality improvement, Tanzania

Although the United Republic of Tanzania has made remarkable progress in scaling up HIV services, substantial gaps in pediatric coverage remain (Joint United Nations Programme on HIV/AIDS, 2013). Tanzania is among the countries with the world's lowest pediatric antiretroviral therapy coverage (Joint United Nations

Programme on HIV/AIDS, 2013), and the Ministry of Health (MOH), Community, Development, Gender, Elderly and Children has prioritized expanding access to HIV testing, care, and treatment for children (United Republic of Tanzania Ministry of Health and Social Welfare, 2012).

Improving the identification of children living with HIV is a critical first step to expanding treatment coverage. In countries with generalized HIV epidemics, ill children presenting to health facilities have a higher HIV prevalence than the general pediatric population (Cohn, Whitehouse, Tuttle, Lueck, & Tran, 2016; Kankasa et al., 2009; Preidis, 2013; Wagner et al., 2015). Offering routine opt-out HIV testing to at-risk pediatric subpopulations (those presenting to health care with signs of illness or for admission, malnutrition, or tuberculosis treatment) is a high-yield identification strategy (Mutanga et al., 2012). Because these children and their caregivers are actively seeking health services and are easy to reach, they present a unique opportunity to identify those most in need of HIV care and to initiate treatment rapidly.

Since 2007, Tanzania's National AIDS Control Program (NACP) has recommended provider-initiated HIV testing and counseling (PITC) services for all children attending health facilities. National guidelines recommend rapid antibody testing using Determine HIV 1/2 and Unigold HIV1/2 for children ages 18 months and older and early infant virologic diagnostic HIV testing through DNA polymerase chain reaction analysis for children younger than 18 months. National PITC training, guidelines, and strategies have been developed, and national targets aim for 80% of attendees at any service delivery point in the health facility to receive PITC (United Republic of Tanzania Ministry of Health and Social Welfare, 2012).

Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

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<http://dx.doi.org/10.1097/JNC.000000000000066>

However, HIV testing coverage in children attending health facilities frequently falls well below this target. On-site quality assessments and supportive supervision activities conducted by ICAP at Columbia University (ICAP) and other implementing partners revealed health system barriers such as staff workload, test kit stock outs, provider role confusion, unclear workflow processes, process breakdowns, and system failures.

These observations were consistent with barriers to pediatric PITC identified by other implementers and researchers. For example, in a study conducted at six primary care clinics in Harare, Zimbabwe, Kranzer et al. (2014) identified numerous challenges to routine PITC adherence for children ages 6–15 years, despite high positivity rates. The main reasons expressed by health care workers (HCW) included perceived unsuitability of the accompanying guardian to provide consent for HIV testing on behalf of the child, lack of staff availability, and shortage of HIV testing kits. Additional facility- and provider-level barriers can include HCW concerns about privacy and disclosure in crowded inpatient spaces, perceptions of increased workloads due to pre- and posttest counseling, and limited task shifting policies that might enable more professions to conduct testing (Ahmed et al., 2013; Horwood, Voce, Vermaak, Rollins, & Qazi, 2010; Kapologwe, Kabengula, & Msuya, 2011; MacPherson et al., 2012).

The “know-do” gap between established standards of care (what we know) and the ability of health systems to produce improved outcomes (what we do) occurs in both resource-rich and resource-poor settings (Haines, Kuruvilla, & Borchert, 2004). Modern quality improvement (QI) methods help HCW bridge this gap by enabling them to use a team approach to design and implement locally appropriate process-focused change interventions that lead to sustained system improvements (Heiby, 2014). Although the NACP launched a national HIV program QI strategy, tools, and training curriculum in 2010, site-level staff had little experience actually implementing QI methods (United Republic of Tanzania Ministry of Health and Social Welfare, 2010). The purpose of our project was to build QI capacity and improve pediatric PITC coverage by designing and supporting a QI Collaborative (QIC) to catalyze swift improvement in PITC performance for pediatric inpatients.

## **Methods**

### ***Collaborative Quality Improvement Collaborative Design***

The QIC approach is a well-defined improvement method, in which health care facilities partner to address a quality

challenge over a specified period, often 12–18 months (Catsambas et al., 2008; Franco & Marquez, 2011). A quality challenge is identified, along with a problem statement, an aim statement, and shared indicators. Multiprofessional QI teams are established at each facility. After baseline training and orientation, each site is supported to identify contextually appropriate interventions and conduct rapid iterative tests of change using the Model for Improvement and its plan-do-study-act (PDSA) cycles (Catsambas et al., 2008). Facilities then come together for quarterly meetings, in which they compare progress and share interventions and innovations. Between learning sessions, facilities receive monthly site support and QI coaching visits. In addition to building QI capacity and improving outcomes, QICs also generally develop a “change package” of tools and approaches that can then be disseminated to additional facilities (Catsambas et al., 2008; Franco & Marquez, 2011).

ICAP worked with NACP, regional and district health teams, the Centers for Disease Control and Prevention, the Ariel Glaser Pediatric AIDS Health Care Initiative (AGPAHI), and the Christian Social Services Commission (CSSC) to design and implement the QIC. Preparations began in August 2014, and the project included stakeholder engagement, identification of site selection criteria, development of aim statements and indicators, and baseline data collection and analysis. It focused on children between the ages of 18 months and 15 years, following the national definitions of “pediatric” and “child” as persons younger than 15 years of age and excluding children younger than 18 months who required early infant virologic testing via DNA polymerase chain reaction (United Republic of Tanzania Ministry of Health and Social Welfare, 2012). Baseline data were collected for the period between January and March 2015, and the QIC was implemented between May 2015 and March 2016.

The project was conducted at 24 health facilities supported by the U.S. President’s Emergency Fund for AIDS Relief in Simiyu and Geita Regions, 2 high HIV prevalence areas in northern Tanzania. The sites included 7 district hospitals, 16 health centers, and 1 dispensary. Each facility met site selection criteria, including the presence of a pre-existing QI team consisting of nursing and medical staff, laboratory staff, child health nurses and clinical officers, PITC focal nurses, and HIV counseling and testing nurses and counselors.

Formal aim statements were developed for the QIC, with all sites working to achieve the following between May 2015 and March 2016: (a) increase pediatric inpatient PITC coverage rates (proportion of admitted

children and adolescents offered HIV testing) to 80% or higher and (b) ensure that at least 90% of children and adolescents living with HIV are referred to care and treatment. Shared performance indicators and operational definitions were developed for the QIC and included the following:

- The percentage of children and adolescents admitted to adult inpatient departments who were tested for HIV and received their test results;
- The percentage of children and adolescents admitted to pediatric inpatient department who were tested for HIV and received their test results;
- The percentage of newly diagnosed children living with HIV diagnosed through opt-out testing enrolled at care and treatment clinics; and
- The number of days of test kit stock outs per month/number of days per month.

### **Baseline Data Collection**

In May 2015, the 24 project teams convened for an initial learning session, at which they reviewed retrospective data from the 24 participating facilities to assess performance over the prior 3 months (January–March 2015). These aggregate monthly data were abstracted from health facility registers by facility staff using a standardized paper-based tool. ICAP staff then entered the data into an EXCEL database and conducted descriptive analyses.

### **Quality Improvement Collaborative Implementation**

As above, teams from the 24 project sites attended an initial 1-week learning session in May 2015. The workshop provided refresher training using the MOH national QI curriculum, which outlined the NACP QI approach, including the Model for Improvement and its PDSA methods (Catsambas et al., 2008), enabling participants to apply QI methods to the challenge of improving inpatient pediatric PITC. Facility teams conducted root cause analyses using process maps and fishbone diagrams to identify process gaps, system weak points, and system breakdowns related to pediatric inpatient PITC coverage. Using a brainstorming process, teams then selected appropriate change ideas that were logically linked to the gaps and breakdowns identified during root cause analysis. Teams then returned to their facilities and used PDSA methods to test their initial change ideas.

Following the initial learning session, AGPAHI and CSSC provided ongoing, site-level, supportive supervision and mentoring on QI methods and data quality assurance

to the QI facility teams. AGPAHI and CSSC staff visited sites monthly; ICAP and MOH staff joined these site visits quarterly. Each month, site QI teams reviewed performance and challenges with the implementing partners and MOH staff providing supportive supervision, brainstormed about which changes were or were not working, and made decisions about which interventions to initiate, continue, or drop.

ICAP facilitated quarterly follow-up learning sessions, convening facility QI teams to present their progress toward their aims, describe change ideas and PDSA cycles, and share lessons learned about service delivery barriers, outcomes, and best practices. The quarterly meetings provided site-level staff with the opportunity to publicly compare their progress with that of peer health facilities and to share promising practices and tools with one another.

On completion of the QIC in March 2016, project results were shared at a final stakeholder meeting that included MOH, NACP, regional and district health leaders, implementing partners, and U.S. President's Emergency Fund for AIDS Relief agency representatives. During this final dissemination meeting, higher-performing facilities were invited to present their data, change innovations, lessons learned, and plans for sustainability. The presentations to high-level leadership were designed to promote QIC facility staff recognition and reward higher performance and innovations.

### **Data Collection, Management, and Analysis**

During the intervention period (May 2015–March 2016), site-level QI teams collected aggregate performance data each month; AGPAHI and CSSC shared it with ICAP using standardized paper forms and plotted it on annotated run charts during monthly team meetings. ICAP staff entered the data into a Microsoft Excel spreadsheet that was systematically reviewed on a monthly basis for data quality. If errors were identified, facilities were contacted to obtain correct information. Microsoft Excel 2010 was used to generate monthly descriptive statistics and graphs showing progress toward aim statements for each participating facility as well as performance of the collaborative as a whole.

Aggregate data were analyzed quarterly and at the conclusion of the project. QIC indicator performance was assessed for each participating facility during the 11-month period (May 2015–March 2016), and the range, mean, and median across facilities were calculated. For months where the denominator was zero (for instance, no children were identified as HIV infected), it was assumed that the aim was met.

**Table 1. PITC Facility Change Ideas**

<b>Change Idea</b>	<b>How the Change was Implemented</b>
<b>Staff training</b>	
On job training for untrained nurses on QI and PITC	All IPD nurses received one-time orientation on PITC testing and QI from a trained QIC participating team member. Training included information on testing guidelines, documentation, and how to use the testing algorithm.
Mentor and orient staff on proper use of PITC guidelines, including documentation	All IPD staff received mentoring on proper PITC testing documentation in the PITC Register, Admission Register, logbook, and monthly report.
Mentor and provide site supervision to IPD staff on a weekly basis	MOH QI focal persons reviewed the number of children admitted and tested each week. They also monitored staff rotation and testing data, and gave feedback to each shift on their strengths and weaknesses.
Improve counseling and health education skills of staff	All staff received an in-service training on the importance of HIV testing for children and counseling techniques with mothers and other family members.
Introduce "No Child Discharged without Knowing HIV Status" hospital policy	Staff received an orientation to a new policy in which IPD nurse was responsible for checking the HIV status of all admitted children prior to discharge and linking to treatment, if needed.
<b>Staffing matrix</b>	
Include all medical staff on the QI team	QI team included all medical providers and staff who participated in PITC in any capacity (e.g., registration, counseling, report development) to ensure everyone was contributing to QI activities.
Identify dedicated nurse to follow-up on pediatric testing in ward	During each shift, one PITC-trained nurse was assigned to follow up on pediatric PITC testing completed during the previous shift.
Allocate PITC nurse during every shift to perform pediatric PITC	During each shift, PITC-trained nurse was assigned to pediatric PITC testing and documentation.
Assign a focal person for PITC at all entry points every morning	A focal person was identified to test children at all IPD entry points.
Identify dedicated staff to monitor test kit distribution and consumption	During each shift, one PITC-trained nurse was assigned to monitor test kit consumption and distribution.
Identify dedicated staff to monitor PITC documentation	During each shift, one PITC-trained nurse was assigned to monitor PITC documentation.
<b>Workflow process</b>	
Include pediatric PITC testing information in shift handover reports	On-duty IPC nurse provided written bed-to-bed report on the number of children admitted and the number who received PITC testing. If a child was not tested, report included rationale for not testing, if any. Patients needing testing were flagged. Incoming staff reviewed file, tested eligible children, and documented actions.
Include pediatric PITC testing information in morning meeting	Night supervisor provided a written report and oral description of patients admitted and tested to incoming staff at morning clinical meetings.
Monitor pediatric PITC during daily clinical rounds	Each day, ward supervisor reviewed the number of children admitted and the number of children tested, as documented in the PITC Register and logbooks.
Assign a pediatric PITC testing target for each shift	Staff agreed to test a minimum (target) number of children during each shift. Target number per nursing shift varied depending on staff workload and other shift-related issues, such as number of admissions.

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Table 1. (continued)

Change Idea	How the Change was Implemented
Facilitate regular (weekly or monthly) QI PITC team meetings	Monthly QI meetings involved all medical providers and staff who participated in PITC in any capacity (e.g., registration, counseling, report development) to ensure everyone was contributing to QI activities. The PITC focal person was responsible for organizing, leading, and documenting meetings.
PITC focal nurse to conduct weekly internal supportive supervision visits to IPD wards	PITC focal nurse, in collaboration with QI focal person, conducted weekly check-ups to ensure all children admitted the day before were tested and, if not, flagged those children for testing that shift.
Commodity management	
Improve timeliness of test kit ordering to avoid stock outs and ensure fair distribution between clinics	Staff used national tools to track test kit consumption, which the PITC focal person used to develop a weekly forecast report for each department to avoid stock outs.
Develop and use a logbook to monitor use of test kits	PITC nursing staff developed and used a logbook to monitor stock of test kits and reports on test kit use. Test kit logbook was shared with laboratory staff who were responsible for test kit supplies.
Increase and prioritize distribution of test kits between pediatric IPDs	PITC focal person collaborated with laboratory to ensure that additional rapid test kits were prioritized and reserved for IPD use in case of shortage. Testing data were reviewed with laboratory to ensure that as IPD testing increased, test kit supply forecasting and ordering were done correctly.
Documentation	
Ensure data quality and completeness by monitoring pediatric patients tested against admission and National Inpatient registers	During regular meetings, patient testing information from health facility admissions was compared to information in the PITC registers. Testing documentation quality and completeness were reviewed.
IPD nurse to label all pediatric IPD files with a sticker after child received PITC testing	Once a child was tested, the file was marked with a sticker (or handwritten note, if stickers were not available) indicating the date of testing to minimize retesting and unnecessary use of test kits.
PITC focal nurse to post written reminders at nursing station to HCW for pediatric PITC testing	A written reminder to provide and document PITC testing of children at all entry points was posted on all notice boards and at all nursing stations.
IPD nurse to identify and document children who had been tested prior to IPD admission	Patient register indicated whether a child had been tested prior to admission into the IPD (e.g., tested at OPD or earlier IPD admission).
Maintain pediatric treatment cards with dates of testing in hospital	All pediatric treatment cards with information about testing history were stored in the hospital.
Develop and use checklist, logbook, or tracking sheet to monitor PITC testing	Staff developed and implemented an internal monitoring tool to track PITC IPC testing.
Referral processes	
Escort all pediatric patients from IPD to CTC	Newly HIV-diagnosed patients escorted by medical attendant or peer educator to CTC for enrollment. Transfer-out feedback provided by a CTC officer documented in each patient file.
Enroll all children on-site from IPD (if need to attend other CTC, transfer out)	All children were enrolled in CTC at the site during IPD stay or immediately on discharge. If a client wanted to transfer to another facility, that procedure was done through CTC staff. All newly diagnosed pediatric clients were enrolled at CTC before leaving the facility

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Table 1. (continued)

Change Idea	How the Change was Implemented
Client and family education	
Health education on HIV counseling and testing	Information on HIV counseling and testing given to all client caretakers to inform them of advantages of HIV testing for whole family and importance of early identification.
Sensitize parents and guardians about importance of testing children for HIV	Nurses and physicians verbally emphasized the importance of testing children to patient's parents and guardians during daily morning inpatient rounds.

Note. CTC = care and treatment center; HCW = health care worker; IPD = inpatient department; OPD = outpatient department; PITC = provider initiated testing and counseling, MOH = Ministry of Health; QI = quality improvement; QIC = Quality Improvement Collaborative.

In addition to descriptive statistics, performance during the 3-month baseline period (January–March 2015) was compared to that during the final 3 months (January–March 2016) of the intervention period using the chi-squared test of independence. Due to a national HIV test kit stock out in April 2015, this month was excluded from this analysis.

### Ethical Review

The project received nonresearch determination from the Columbia University Institutional Review Board (protocol: IRB-AAAP4519), the Centers for Disease Control and Prevention Center for Global Health Office of the Associate Director for Science, and the Tanzania National Institute for Medical Research.

### Results

In the 3 months prior to QIC initiation (January–March 2015), the 24 sites admitted 7,020 children; of whom, 2,671 (38%) received PITC services. This rate was considered to be the performance baseline for Aim 1. Of the 2,671 children tested, 47 (1.8%) were found to be infected, and 45 (96%) of these were linked to care, the performance baseline for Aim 2.

All sites participated in the QIC throughout the 11-month intervention period, had active QI teams, and received supportive supervision and QI coaching as planned. The QIC learning sessions were well attended, with 80–88 participants attending each of the four learning sessions. QI teams used the PDSA method to identify and test a wide array of facility-driven change ideas, including improvements in staff and client education, staffing patterns, workflow, commodity management, documentation, HIV test kit management, and referrals (Table 1).

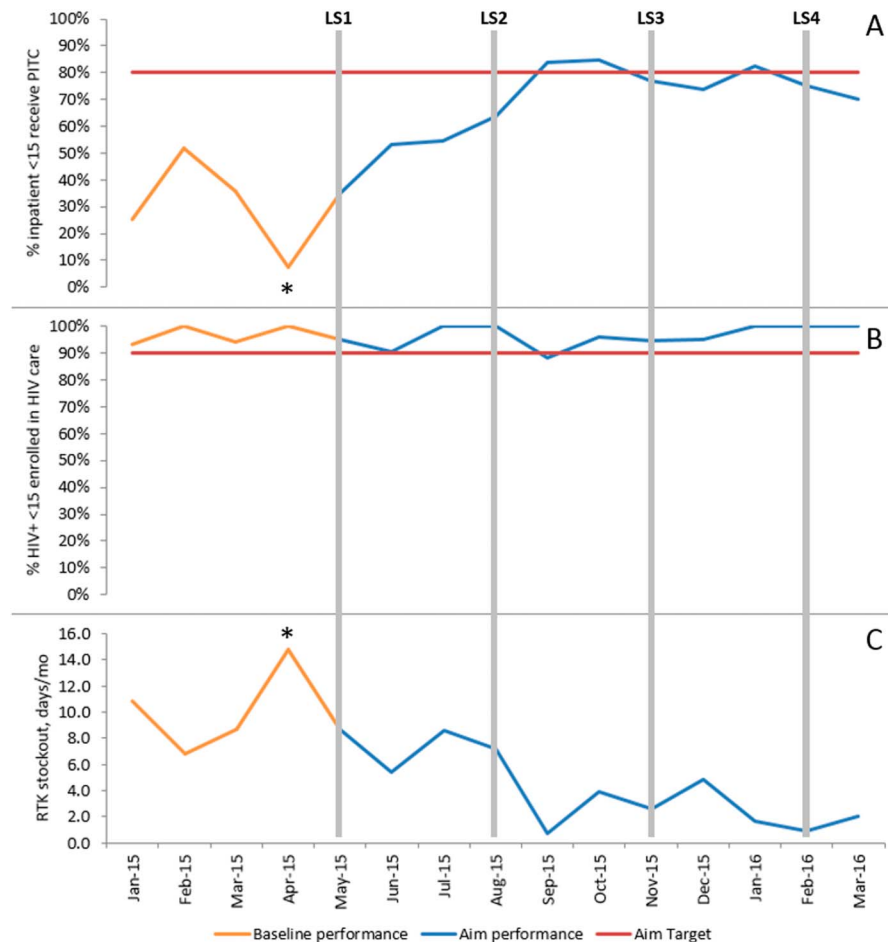
By the end of the QIC, each of the participating health facilities met or surpassed the 80% coverage target for Aim 1 at least once, taking a median of 3 months to achieve the target (Figure 1; Table 2) and meeting the performance target for a median of 5 months (Figure 1; Table 2). In the final 3 months of the QIC (January–March 2016), the sites admitted 6,172 children; of whom, 4,662 (76%) were tested; this difference was statistically significant from the 38% found at baseline ( $p < .001$ ). There were no differences observed between regions or types of facilities.

The proportion of children testing positive for HIV infection remained stable over time, at 1.8% (47/2,671) during the baseline period and 1.9% (88/4,662) during the final months of the intervention period. Linkage (Aim 2) remained high throughout, with 45 of 47 children living with HIV (96%) linked to care at baseline and 88 of 88 (100%) linked to care in the final months of the intervention period (Figure 1; Table 2). These stable prevalence and linkage rates combined with an increased PITC coverage resulted in a 96% increase in the number of children living with HIV linked to care.

HIV rapid test kit supply improved during the intervention, with the number of days per month per facility in which test kit stock outs occurred falling from 8.8 during baseline to 1.5 at the end of the project.

### Discussion

The QIC enabled QI teams at the 24 health facilities to double coverage of inpatient pediatric PITC from 38% to 76% while maintaining high linkage rates and reducing HIV test kit stock outs. Facility staff identified and tested contextually appropriate change ideas, focusing on interventions that were feasible at the site level, such as training, supervision, and management of



**Figure 1.** Aggregate achievement of aim statements and rapid test kit stock out over time. Note. \*The country experienced a stock out of rapid test kits in March and April 2015. LS = learning session; PITC = provider-initiated testing and counseling for HIV; RTK = HIV rapid test kit; <15 = younger than 15 years of age.

staff, workflow processes, and documentation. The net impact was a 96% increase in the number of children living with HIV who were identified and linked to care, from 45 at baseline to 88 at endline. These were children who might otherwise not have been diagnosed with HIV and started on life-saving antiretroviral therapy.

Our study supports the literature, which has suggested that the QIC approach empowers facility-level teams to achieve and sustain rapid improvement via peer-to-peer learning and fostering of friendly competition and innovation (Catsambas et al., 2008; Franco & Marquez, 2011). In our program, QICs were used to address a critical need in the pediatric HIV cascade and improve the identification of children living with HIV who had been previously undiagnosed.

Limitations of our analyses include the fact that the coverage indicator for Aim 1 included all pediatric inpatients, but not all children admitted to inpatient wards were eligible for HIV testing. For example, children already known to be living with HIV would not

need to be retested. Although this could have caused an underestimate of PITC performance, it should have affected both baseline and endline data equally. Another limitation was that Aim 2 was established via consensus before baseline data were available; when baseline performance was assessed, sites discovered that their referral rates were already extremely high. Monitoring of this indicator continued, but emphasis was placed on maintenance rather than improvement. As is usual for QI projects, there was no control group, so results at these 24 health facilities could not be compared to sites not participating in the QIC and cannot be generalized to other health care facilities.

## Conclusion

The magnitude of improvement in our study confirms that the QIC approach holds promise as a method with which to close the know-do gap, improve pediatric PITC, achieve national HIV program targets, and improve health outcomes.

**Table 2. Improvements in PITC Coverage With Sustained Linkage to Care**

<b>Performance Indicator</b>	<b>Target</b>	<b>Baseline (Prior to QIC) January–March 2015</b>	<b>Endline (Final 3 Months of QIC) January–March 2016</b>	<b>p-Value</b>
% of children and adolescents admitted to pediatric and adult IPD who were tested for HIV and received their test results	80%	38% (2,671/7,020)	76% (4,662/6,172)	<.001
% of newly diagnosed children living with HIV enrolled at CTC	90%	96% (45/47)	100% (88/88)	.051
<b>Aim Statement</b>	<b>QIC indicator</b>	<b>Range</b>	<b>Mean</b>	<b>Median</b>
Key QIC performance indicators (May 2015–March 2016)				
Aim 1: Increase pediatric inpatient PITC rate to 80% or higher by March 2016	Number of months facilities took to achieve aim target	0–5	2.5	3.0
	Total number of months facilities achieved or exceeded target	2–9	5.2	5.0
	Longest run of months facilities achieved or exceeded target	1–9	4.0	3.0
Aim 2: Increase linkage of children living with HIV from testing to enrollment in care and treatment to 90% or higher by March 2016	Number of months facilities took to achieve aim target	0–1	0	0
	Total number of months in which facilities achieved or exceeded target	9–11	10.7	11.0
	Longest run of months facilities achieved or exceeded target	5–11	10.0	11.0
<i>Note.</i> CTC = Care and Treatment Center; CTC = Care and Treatment Clinic; IPD = inpatient department; OPD = outpatient department; PITC = provider initiated testing and counseling; QIC = Quality Improvement Collaborative.				



## Disclosures

The authors report no real or perceived vested interests related to this article that could be construed as a conflict of interest.

## Acknowledgments

The project was supported by the President's Emergency Plan for AIDS Relief through the U.S. Centers for Disease Control and Prevention under the terms of Cooperative Agreement U2GGH000994-02. The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the funding agency.

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