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PMTCT cascade analysis in Côte d'Ivoire: Results from a national representative sample

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HIVCore

PMTCT CASCADE ANALYSIS IN CÔTE D'IVOIRE: RESULTS FROM A NATIONAL REPRESENTATIVE SAMPLE

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This publication was produced for the United States Agency for International Development. It was prepared by Stephen S. Gloyd, Julia Robinson, Serge A. Dali, S. Adam Granato, Rebecca Bartlein, Seydou Kouyaté, David Aka, Doroux A. Billy, Irma Ahoba, and Ahoua Koné.

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TABLE OF CONTENTS

ACRONYMS	VI
EXECUTIVE SUMMARY	I
INTRODUCTION	5
Primary study questions/objectives	6
METHODOLOGY	7
Study design	7
Quantitative data	8
Qualitative Data	10
Data analysis	10
Ethical approval	12
KEY FINDINGS	13
Data collection and quality	13
PMTCT performance by site	23
Factors associated with LTFU	27
Organization of PMTCT services, including perceived facilitators and barriers	28
PMTCT and comprehensive ANC	31
CONCLUSIONS AND RECOMMENDATIONS	32
Limitations	32
Discussion	33
Recommendations	34
REFERENCES	36
APPENDIX I: DATA COLLECTION FORM	38
APPENDIX II: PERFORMANCE GROUP ANALYSIS	48
APPENDIX III: SITE CHARACTERISTICS USED IN ANALYSIS	50

ACRONYMS

ANC	Antenatal care
ANC1	First antenatal care visit
ART	Anti-retroviral therapy
cART	Combination anti-retroviral therapy
ARV	Anti-retrovirals
CFA	West African CFA francs
CHR	Centre Hospitalier Régional (Regional Hospital)
CHU	Centre Hospitalier Universitaire (University Teaching Hospital)
CMS	Centre Municipal de Santé (Municipal Health Center)
CSU	Centre de Santé Urbain (Urban Health Center)
DBS	Dried blood spot
DGLS	Direction Generale de la Lutte Contre le SIDA (Health Department for the Fight against AIDS–CI)
DHS	Demographic and Health Survey
DIPE	Direction de l'Information, Planification, et Evaluation (Information, Planning, and Evaluation Department, Abidjan, CI)
FSU	Formation Sanitaire Urbaine (Urban Health Unit)
HAI	Health Alliance International
HG	Hôpital General
HIV	Human Immunodeficiency Virus
INSP	Institut National de la Santé Publique (National Public Health Institute, Abidjan, CI)
IPT	Intermittent Preventive Treatment (for malaria)
IQR	Interquartile range
LTFU	Loss to follow-up
Ma	Mean value among sites meeting identified target
Mb	Mean value among sites that did not meet identified target

MH/ML	Mean value among high/low performers
MOH	Ministry of Health
MSLS	Ministère de la Santé et de la Lutte contre le SIDA (Côte d’Ivoire Ministry of Health and the Fight against AIDS)
PCR	Polymerase Chain Reaction test (Infant HIV test)
PCR1	First Polymerase Chain Reaction test (Infant HIV test)
PMI	Protection Maternelle et Infantile (Center for Maternal and Child Health)
PMTCT	Prevention of mother-to-child transmission (of HIV)
PNPEC	Programme National de Prise en Charge (National Care and Treatment Program–CI)
PPS	Probability Proportional to Size
STI	Sexually transmitted infection
TT	Tetanus Toxoid Vaccine
USAID	United States Agency for International Development
UW	University of Washington (Seattle, WA, USA)
VCT	Voluntary counseling and testing
WHO	World Health Organization

EXECUTIVE SUMMARY

Without treatment, an HIV-positive pregnant woman has a 30 to 35 percent chance of transmitting the infection to her child. Early detection and appropriate treatment during pregnancy, childbirth, and breastfeeding can reduce those odds to less than 5 percent. Consequently, the World Health Organization (WHO) and countries around the world have instituted prevention of mother-to-child transmission of HIV (PMTCT) programs, consisting of the following “PMTCT cascade”:

- Testing for HIV at the first antenatal visit (ANC1).
- CD4 test of HIV-positive patients (optional, depending on PMTCT regimen).
- Antiretroviral (ARV) prophylaxis to mother throughout pregnancy and breastfeeding.
- ARV prophylaxis to child at delivery and throughout breastfeeding.
- HIV testing of child and immediate initiation of antiretroviral therapy (ART) for children found to be HIV infected.

In Côte d’Ivoire, as in much of Africa, PMTCT programs have performed less than optimally due to bottlenecks throughout the PMTCT cascade. These bottlenecks often cause delays in initiating care and contribute to loss to follow up (LTFU) in one or more stages of the PMTCT cascade. Understanding each step of the cascade, and the role that health system and community factors play in enabling or mitigating PMTCT bottlenecks at each step, can contribute to an increase in effective PMTCT outcomes.

To help inform the 2012 rollout of the WHO “Option B” treatment regimen¹ in Côte d’Ivoire, an assessment of a nationally representative sample of existing PMTCT programs in Côte d’Ivoire was planned and carried out by a consortium including Côte d’Ivoire’s Ministère de la Santé et de la Lutte contre le Sida (MSLS), the Université Allasane Ouattara, the University of Washington (UW), and Health Alliance International (HAI). The study was conducted under the U.S. Agency for International Development’s (USAID) HIVCore project led by the Population Council, with additional financial and technical support from the USAID office in Côte d’Ivoire. The objectives of the study were to identify bottlenecks and time delays in the PMTCT cascade, and suggest recommendations to improve current PMTCT services to optimize the impact of Option B in Côte d’Ivoire. It was hoped that findings would stimulate discussion of testable interventions to improve the PMTCT cascade as Option B is rolled out.

METHODOLOGY

Drawing from a base of 734 health facilities providing PMTCT services in Côte d’Ivoire, this study utilized primary and secondary data from a randomly selected nationwide sample of 30 sites that had served at least 10 HIV-positive patients in 2011. At each of the 30 sites, quantitative data were abstracted from available health facility registries for the period June 2011 to May 2012 and a sample of up to

¹The WHO Option B treatment regimen calls for combination ART (cART) for HIV-positive pregnant women, beginning at diagnosis of HIV infection, with duration dependent on patient CD4 count at the time of diagnosis. At the time of the write-up of this report, Option B was the official Ministry of Health-sanctioned treatment regimen for HIV-positive pregnant women in Côte d’Ivoire.

20 patient charts of HIV-positive women (n=330), as well as from a sample of up to 20 mother-child vaccination booklets (carnets²) (n=590) per site. Qualitative data, including semi-structured interviews with key informants and direct observations, were recorded by seven two-person study teams over the course of two days at each facility. Data collection was carried out over a two-week period in March 2013.

KEY FINDINGS

Registry data at the 30 sites were frequently inconsistent.

Availability of standard registries was inconsistent across the 30-site sample. On average, sites recorded and stored data related to PMTCT in 11 different registries, reports, or other unofficial data sources. Using all available data sources at the 30 study sites, 11 registry indicators were assessed. Of the 30 study sites, only five had complete registry data available for the study time period. One site had no data available for seven indicators and was excluded from registry-based analysis. Seven sites had incomplete and/or missing data on 6–10 indicators, and the remaining 17 sites had missing or incomplete data on 1–5 indicators. When on-site registry indicators were compared against the same indicators in the national database, inconsistencies were found in every indicator and at every site. On average, more than half of all indicators compared had a discrepancy of larger than 5 percent between on-site data and the same data in the national database.

Clinics demonstrated significant losses and delays throughout the PMTCT cascade.

Pooling HIV-positive pregnant women as the denominator across the 29 sites, the following rates were observed for each step of the PMTCT cascade: delivery of ARV prophylaxis and/or combination ART to the mother—77 percent; delivery of ARV prophylaxis intended for the newborn—70 percent; administration of first infant HIV test—50 percent; mother's CD4 count taken—43 percent; initiation of cART after CD4 testing—16 percent. Comparing sites located in Abidjan to those outside Abidjan, the only indicator that showed a notable difference was delivery of ARV prophylaxis intended for the newborn (77 percent vs. 60 percent respectively; two-tailed t-test assuming unequal variances gave p-value of .0308).

Using the 2011 DHS, we estimated a 91 percent antenatal care (ANC) attendance rate among pregnant women in Côte d'Ivoire. We used registry and carnet data to estimate that in all of Côte d'Ivoire: approximately 76 percent of HIV-positive pregnant women are tested for HIV in ANC, approximately 58 percent receive prophylaxis or cART during pregnancy, and only about 38 percent have their newborn tested for HIV within six weeks of delivery. Additionally, we estimated that only 32 percent of HIV-positive pregnant women in Côte d'Ivoire have a CD4 count taken to determine eligibility for cART. However, the caveat remains that the registry and carnet data were inconsistent as stated above.

²Mother-child vaccination booklets, or “carnets de mère-enfants,” do not have a commonly used English-language equivalent. Thus for the purposes of this report, the French carnets will be used as a term of reference.

Nearly one-third of sites did not create charts for HIV-positive patients.

National standards in Côte d'Ivoire require opening a clinical chart for PMTCT immediately after a patient receives a positive HIV test. We found that nearly one third of the study sites did not follow these standards. These sites reported that typically patient charts are opened when CD4 counts or clinical staging indicated eligibility for cART. This skewed our chart sample toward patients on cART, as HIV-positive patients who had not yet started cART might not have a chart.

Workforce patterns, not size and location of facility, had a significant association with PMTCT performance.

Sites were assessed for overall PMTCT performance using a composite score based on monthly rates for child prophylaxis, cART initiation, and newborn HIV testing. The 10 sites with the lowest PMTCT scores were compared with the 10 sites with the highest PMTCT scores. On average (mean), high-performing PMTCT sites had more skilled personnel and personnel trained in PMTCT-related services per 1,000 ANC1 than did low-performing PMTCT sites, including doctors (mean among high performers (M_H)=7/1,000; mean among low performers (M_L)=2/1,000; $p=.030$), nurses (M_H =7/1,000; M_L =2/1,000; $p=.043$), and laboratory technicians (M_H =2/1,000; M_L =1/1,000; $p=.021$) as well as numbers of staff trained in PMTCT (M_H =11/1,000; M_L =4/1,000; $p=.005$), and staff engaged in ART follow-up (M_H =8/1,000; M_L =2/1,000; $p=.009$). Size and location of facility did not have a significant association with PMTCT performance score, while workforce patterns were significantly associated with PMTCT performance.

Patterns of patient flow and health care environment in the study sites varied considerably.

Results from interviews and observations demonstrated that the patterns of patient flow as measured by the number and order of steps through PMTCT services in the study sites and the health care environment, varied considerably. Long wait times, insufficient infrastructure, lack of medical and office equipment and tools, inability to ensure confidentiality, and poor ventilation were common barriers expressed by key informants and observed by interview teams. Additionally, the key informants' estimates of time between ANC1 and the return of CD4 results to the patient significantly differed between high-performing PMTCT sites and low-performing PMTCT sites (M_H =5.1 days; M_L =11.4 days; $p=.001$); however, reported time elapsed derived from patient charts revealed actual median delays of 19.5 and 31 days respectively. In most sites, health care worker dedication and engagement were seen as facilitators of patient retention.

CONCLUSIONS AND RECOMMENDATIONS

This nationally representative sample of antenatal clinics performing PMTCT in Côte d'Ivoire demonstrated widespread problems in infrastructure, patient flow, and quality of care. Complete and accurate record-keeping was the exception rather than the norm. Significant losses and delays were observed throughout the PMTCT cascade, including poor retention for prophylaxis (both mothers and newborns), PCR testing, and CD4 testing. The higher performing sites had significantly greater numbers of skilled personnel and PMTCT training of skilled health personnel than the lower performing sites.

The burden and confusing nature of so many registries as well as extremely high levels of data inconsistencies between on-site data and national data suggest that monitoring and evaluation should be greatly simplified. More focused attention to fewer indicators, fewer reports, and fewer registries would likely improve their usefulness in monitoring and evaluation. In addition, a system for cross-checking issues of on-site adherence to national protocols (both clinical and administrative), availability of necessary supplies, and effective communication (supervision and feedback) between district and facility levels should be established.

The results of this assessment suggest that antenatal care clinics in Côte d'Ivoire may struggle with the national rollout of Option B, where adequate assessment, medication, and follow up of every HIV-positive pregnant woman will be necessary for effective results. A systematic focus on patient follow up with adequate charting and communication with patients is critical to success. A robust evaluation of the rollout is also recommended. We expect bottlenecks and challenges will likely occur, which will need to be identified and addressed to maximize the efficiency and impact of this critical intervention.

INTRODUCTION

Without treatment, an HIV-positive pregnant woman has a 30–35 percent chance of transmitting the infection to her child. Early detection and appropriate treatment during pregnancy, childbirth, and breastfeeding can reduce those odds to less than 5 percent. Consequently, the World Health Organization (WHO) and countries around the world have instituted prevention of mother-to-child transmission of HIV (PMTCT) programs, consisting of the following “PMTCT cascade”:

- Testing for HIV at the first antenatal visit (ANC1).
- CD4 test of HIV-positive patients (optional, depending on PMTCT regimen).
- Antiretroviral prophylaxis to mother throughout pregnancy and breastfeeding.
- Antiretroviral prophylaxis to child at delivery and throughout breastfeeding.
- HIV testing of child and immediate initiation of antiretroviral therapy (ART) for children found to be HIV infected.

In 2012, HIV prevalence among pregnant women in Côte d’Ivoire was 3.74 percent, with a mother-to-child transmission rate of 18 percent (9,291 new child HIV infections annually). In order to attain the goal established by the Côte d’Ivoire Ministère de la Santé et de la Lutte contre le Sida (MSLS) of a 3 percent mother-to-child transmission rate by 2015, there is much work to be done in the 869 sites nationwide that implement PMTCT (Ministère 2012a).

In Côte d’Ivoire, as in much of Africa, PMTCT programs have performed less than optimally due to bottlenecks throughout the PMTCT cascade (Painter et al. 2005). These bottlenecks often cause delays in initiation of care and contribute to loss to follow-up (LTFU) in one or more stages of the cascade. As a result, low levels of prophylaxis leading to inadequate reductions in transmitted infections, as well as lower-than-expected rates of initiation of ART for eligible mothers, have been observed. Problems occur in all aspects of the health system, including utilization and delivery of care. Patient flow (reception, clinical staging, CD4 testing, etc.), facility practices (laboratory, pharmacy, counseling, etc.), adequate workforce, and patient transport (especially when multiple visits are required) are just some examples of factors that can contribute to bottlenecks and subsequent LTFU. Understanding each of these health system and community factors and their impact on each step in the cascade can help identify and resolve bottlenecks and obstacles to effective outcomes—including reception of timely treatment and prophylaxis for HIV-positive mothers and/or newborns (Mate et al. 2009).

In 2012, the MSLS launched the 2012-2016 National PMTCT Scale-up Plan, which embraces the WHO “Option B” treatment regimen (Ministère 2012b). Option B calls for combination ART (cART) for HIV-positive pregnant women, beginning at diagnosis of HIV infection, with duration dependent on patient CD4 count at the time of diagnosis: women with $CD4 \leq 350$ at diagnosis continue to receive cART for life, while those with $CD4 > 350$ at diagnosis continue to receive cART until one week past cessation of breastfeeding (or through childbirth if not breastfeeding) (WHO, UNAIDS, and UNICEF 2010; WHO 2010; IATT M&E Working Group 2012; IATT, UNICEF, and WHO 2013).

To help inform the rollout of Option B, an assessment of existing PMTCT programs in Côte d'Ivoire using a national representative sample was planned and carried out. The objectives were to identify bottlenecks and delays in the PMTCT cascade, identify best practices to improve current PMTCT services, and optimize the impact of Option B in Côte d'Ivoire. The assessment was intended as a program evaluation for Côte d'Ivoire and to stimulate discussion of testable interventions to improve the PMTCT cascade as Option B is rolled out.

The study was conducted by staff members of the Côte d'Ivoire's Ministère de la Santé et de la Lutte contre le Sida (MSLS), including the special AIDS programs (DGLS, PNPEC); the Institut National de Santé Publique (INSP); the Université Allasane Ouattara; the University of Washington (UW); and Health Alliance International (HAI). The study was conducted under the U.S. Agency for International Development's (USAID) HIVCore project with additional financial and technical support from the USAID office in Cote d'Ivoire.

PRIMARY STUDY QUESTIONS/OBJECTIVES

Among HIV positive pregnant women in 30 randomly selected antenatal care (ANC) clinics in Côte d'Ivoire providing PMTCT:

1. What is the distribution of time delays and/or LTFU among ANC clinics between the various stages of the PMTCT treatment cascade?
2. What are the differences in levels of time delays and/or LTFU along the treatment cascade among the 10 highest performing and 10 lowest performing ANC sites selected in the study?³
3. What are the principal factors associated with care and treatment delays and/or LTFU in the PMTCT cascade?
4. What are the perceived facilitators and barriers to carrying out each PMTCT cascade step, and what are potential interventions to improve PMTCT effectiveness?

A secondary objective was to measure the association between performance of comprehensive ANC—measured by proportion of attendees receiving tetanus immunization, malaria prophylaxis, and syphilis screening during their ANC visits—and performance of PMTCT.

³See Methodology section for performance criteria and methodology.

METHODOLOGY

STUDY DESIGN

Drawing from a base of 734 health facilities providing PMTCT services in Côte d'Ivoire, this study utilized primary and secondary data from a randomly selected nationwide sample of 30 sites that had reported at least ten HIV-positive patients served in 2011 (DIPE 2012). Of the 320 health facilities eligible for inclusion in the study, 30 sites were randomly selected using Probability Proportional to Size (PPS) methodology, based on the number of women reported HIV-positive in ANC in 2011 in the national database. The sample size of 30 clusters was chosen as a large enough number to offer a reasonably representative view of PMTCT implementation at sites serving ten or more HIV-positive patients each year in Côte d'Ivoire, while ensuring a feasible sample size for data collection within the time and budget constraints of the study.

Among the 30 sites included in the study, 12 sites (40 percent) were located in the metropolitan area of Abidjan, six sites (20 percent) were located in other major cities in Côte d'Ivoire, and the remaining 12 sites (60 percent) were located in small towns or rural areas distributed throughout the country (Figure 1). Quantitative and qualitative data were recorded by seven two-person study teams—made up of one supervisor and one data collector—over the course of two days at each facility. Data supervisors were chosen from a pool of MOH, INSP, and HAI technical advisors. Data collection was facilitated by local MOH health facility staff familiar with the assigned site's registries and patient flow. A two-day training was held in Abidjan prior to data collection and a data collection guide was distributed to ensure consistency among data collection teams. Data collection was carried out over a 12-day period in March 2013.

Figure 1 Two maps (national & Abidjan) showing distribution of study sites

* See page 11 for discussion of performance groupings

QUANTITATIVE DATA

Quantitative data were abstracted at each site from the following sources:

1. Available on-site health facility registries.
2. A sample of up to 20 patient charts of HIV-positive women (range: 2 to 20).
3. A sample of up to 20 mother-child vaccination booklets (carnets).

At each facility, a data collection team examined all available PMTCT-related on-site registries—including ANC registries, PMTCT registries, and others (Table 3)—in order to abstract relevant data pertaining to women who received antenatal care during the period June 2011–May 2012. This time period was selected to ensure that all mothers included in the study data had given birth by the date of data collection. A sample size of 20 patient charts and 20 carnets was selected from each site as a sample that could be feasibly recorded within the established timeframe for data collection and analysis, while providing sufficient power to distinguish LTFU and/or delays of >15 percent between high and low performing sites. However, for each of the above data sources, final sample sizes (n) were determined by on-site availability of the registries, charts, and carnets on the day of data collection. Specific data collection methodology by source included the following:

1. *Registries:* At each site, data collectors identified all available registries, recorded the completeness of data entry in each registry, and maintained a record of registries used for data collection. For each of the following indicators, total numbers per month were abstracted from the relevant on-site registry:
 - First ANC visits (ANC1).
 - Pregnant women tested for HIV during ANC1.

- Pregnant women tested for HIV during any ANC visit.
 - Pregnant women found to be HIV-positive.
 - HIV-positive pregnant women enrolled in care.
 - CD4 counts done.
 - HIV-positive pregnant women eligible for cART.
 - Pregnant women put on cART.
 - HIV-positive pregnant women who received antiretroviral drugs (ARVs) as prophylaxis for themselves.
 - HIV-positive pregnant women who received ARVs as prophylaxis for their newborns.
 - First infant HIV tests (PCR1)—polymerase chain reaction (PCR)—done.
 - Positive PCR1s.
2. *Patient charts:* Patient charts were assessed at each facility starting with those belonging to HIV-positive women tested in PMTCT care services in May 2012 and working backwards chronologically until 20 patient charts had been assessed or the supply of eligible charts was exhausted (some sites did not have 20 charts available which fit into the study parameters, therefore less than 20 charts were analyzed at that given site). One site (Assuamé) did not have any patient charts available on the day of the study. From each available chart, we recorded the date of:
- HIV test.
 - Blood draw for initial CD4 count.
 - Return of CD4 results to the facility.
 - Return of CD4 count to the patient.
 - Establishment of eligibility for lifetime cART.
 - Initiation of cART.
 - Blood draw for PCR of newborn.
 - Return of PCR result.
 - Last contact between the patient and the health center.
3. *Carnets:* At each facility, a convenience sample of 20 carnets belonging to women who brought their infants to immunization services at the PMTCT site on the day of data collection were abstracted to obtain information on key PMTCT and ANC information (Rollins et al. 2007). Carnets are issued to all pregnant women during their first ANC visit and are kept by the mother throughout her pregnancy and well-baby care services. Information abstracted from each carnet included the following:
- Site of issue of the carnet.
 - Price (CFA) paid by the woman for the carnet.
 - Distance traveled to the site.
 - Gravidity.
 - Parity.
 - # of living children.

- # of stillborn and deceased children.
- Total # of ANC visits for index pregnancy.
- # of clinics visited for ANC.
- Whether mother received HIV test and if so, the result.
- Whether mother received intermittent preventive treatment (IPT) as malaria prophylaxis, and if so, how many times.
- Whether mother received syphilis screening.
- # of doses of tetanus toxoid vaccine (TT) received.

QUALITATIVE DATA

Qualitative data were collected at all 30 sites to identify characteristics of the PMTCT cascade and perceived facilitators and barriers to its successful completion. Data collectors conducted semi-structured interviews with one key informant at each site (30 total), including two clinic directors, 23 physicians, three nurses, and two midwives. Key informants were chosen based on their availability and their knowledge of on-site PMTCT services. Data collectors took written notes, and made observations regarding patient flow through the PMTCT care steps at each site. Key informants were asked to describe each step of on-site PMTCT services, including approximations of average time elapsed from one step to the next, and whether or not off-site referrals or return visits were required to ensure comprehensive PMTCT care (see Appendix I: Data Collection Form). This format allowed data collectors and key health center personnel to discuss perceptions of program strengths and weaknesses—and contributing factors—of carrying out each PMTCT cascade step. The observations and interviews also included assessment of other clinic activities, laboratory processes, medicine and material flows, and workforce availability, which might influence the site's ability to deliver comprehensive care.

Additional qualitative information collected on-site included:

- Type of facility.
- Geographical access to facility.
- Stock outs (medicines, laboratory reagents).
- Availability of CD4 testing.
- PCR tests and other key laboratory tests.
- Availability and timeliness of test results (HIV, CD4, PCR).
- Task shifting (official and unofficial).
- Presence of a physician at the facility.

DATA ANALYSIS

Data collection forms were processed by project team members in Abidjan and in Seattle to identify and correct for instances of inconsistency. Once the data were combined into a single project database, steps in the PMTCT treatment cascade were identified and detailed at each site by cross-checking on-site PMTCT registry data with related on-site registries and with data from the aforementioned patient charts, carnets, and qualitative interviews. Based on data availability, the following nine standard indicators were selected for use in constructing the PMTCT cascade:

- ANC testing: Identification of seropositive pregnant women through HIV testing in ANC.
 - # of ANC1
 - # of women tested for HIV during any ANC visit
- HIV-positive follow-up: Identification and delivery of appropriate prophylaxis for HIV-positive pregnant women and HIV testing of newborns.
 - # of pregnant women who tested HIV-positive.
 - # (%) of HIV-positive pregnant women who received prophylaxis or cART for themselves⁴.
 - # (%) of HIV-positive pregnant women who received prophylaxis for their newborns.
 - # (%) of PCR1 done.
 - # (%) of CD4 count tests done.
 - # (%) of HIV-positive pregnant women eligible for cART.
 - # (%) of HIV-positive pregnant women newly initiated on cART.

Using registry data alone, we calculated LTFU rates at each site for the time period of June 2011–May 2012. We then compared the on-site registry data with data from the MSLS national database, as well as with carnet data pertaining to LTFU rates. Additional analyses were conducted using patient chart data to calculate the number of days elapsed between steps in the PMTCT cascade. The time between each step was then compared with national and/or international targets/recommendations for the amount of time elapsed between each step of the cascade.

A PMTCT performance score (PMTCT score) was calculated using registry data for each of the 29 facilities included in analysis (one site, Assuamé, was excluded from registry-based analyses due to very large amounts of missing data and interruption of PMTCT services during the study period). According to the study protocol, we initially used rates of initiation of cART as the sole indicator to determine PMTCT performance (number of HIV-positive pregnant women started on cART/number of identified HIV-positive pregnant women receiving ANC). However, during a preliminary presentation of results to major stakeholders in Abidjan, a consensus of MOH officials and co-authors suggested we identify a performance score methodology based on a composite of multiple indicators. A PMTCT score was assigned to each facility based on the average (mean) of the retention rate of HIV-positive pregnant women at three different stages in the PMTCT cascade. The three indicators used included the proportion of HIV-positive pregnant women who 1) received ARVs as prophylaxis for their child; 2) initiated cART; and 3) had a first HIV test (PCR1) administered to their newborn.

Each site was assigned a PMTCT score using the above indicators that placed it into one of three performance groups. The 10 facilities with the highest PMTCT scores were labeled “PMTCT high performers” and the 10 facilities with the lowest PMTCT scores were assigned to a “PMTCT low performers” group. The remaining nine facilities were assigned to a “PMTCT medium performers” group. (See Appendix II: Performance Group Analysis). We similarly assigned each facility an ART score and grouped them accordingly by performance.

⁴Traditionally, reception of ARVs as prophylaxis is recorded separately from initiation of cART. However, because cART serves as prophylaxis during pregnancy, we have combined the two to better understand the proportion of women who have received some form of effective prophylaxis for PMTCT.

In order to identify principal factors associated with our measure of overall site PMTCT performance, a selection of site characteristics, including size, location, processes of care, and workforce distribution and training (see Appendix III: Site characteristics used in analysis) were compared using Student's t-tests between PMTCT high performers and PMTCT low performers. The same site characteristics were also used to assess significant differences in site performance at each step of the PMTCT cascade between sites that met PEPFAR and/or MSLS retention targets during the time period, and sites that did not.

Qualitative data were analyzed and compared between sites to assess patient flow within PMTCT services and perceived facilitators and barriers to successful completion of the PMTCT cascade. Data included the number of steps and amount of time it took for a patient to get through the PMTCT cascade, difficulties and constraints encountered during different steps, availability (or quality) of infrastructure or difficult conditions present at the health facility, and suggestions from either the manager of the health facility or researcher. Some direct quotes from the data collection teams were transcribed and translated for analysis.

In order to address the proposed secondary objective of the study, data abstracted from carnets were analyzed to measure the association between performance of PMTCT and comprehensive ANC. Since most of the ANC visits from carnets took place at the facility where the carnets were collected, we assumed that data in the carnets reflected facility performance (see limitations for further discussion). A comprehensive ANC performance score (ANC score) was calculated using carnet data for each of the 29 facilities included in the analysis. The ANC score was based on the average (mean) of three ANC service indicators (malaria prophylaxis, syphilis screening, and tetanus immunization) for each facility. The malaria prophylaxis and syphilis screening indicators were calculated for each site based on the percentage of carnets that indicated administration to the patient of IPT (n=588) and a syphilis test (n=587), respectively. The tetanus immunization indicator was calculated for each site based on the average (mean) proportion of number of doses recorded in each carnet to the “expected number of TT doses administered⁵” (n=576). Ten ANC high performers, 10 ANC low performers, and 9 ANC medium performers were identified by ranking the sites by ANC score. (See Appendix II: Performance Group Analysis.)

ETHICAL APPROVAL

The assessment was reviewed by the Health Alliance International/University of Washington Ethical Review Committee in June 2012 and subsequently by the Population Council. These committees considered this assessment a national PMTCT program evaluation and thus determined it to be “non-research.” The assessment was also approved by the Côte d’Ivoire Comité National d’Ethique et de la Recherche on February 18, 2013.

⁵*Expected number of TT doses administered* was calculated based on the WHO recommendation for TT administration (WHO 2006) and the number of pregnancies recorded in each carnet.

KEY FINDINGS

DATA COLLECTION AND QUALITY

Tables 1 & 2 list the 30 study sites—separated by the 12 sites located in Abidjan (Table 1) and 18 sites located outside of Abidjan (Table 2)—and select characteristics for each site, including number of first antenatal care visits (ANC1) between June 2011 and May 2012, number of HIV-positive women identified in ANC during the same time period, and numbers of select personnel working at each facility.

Table 1 List of Abidjan sites with select site characteristics

Site	Region	District	Type [§]	#ANC1 [†]	#HIV+ [‡]	# of personnel [‡]		
						MD*	Nurse	Mid-wife
Akromianbla	Abidjan 2	Treichville–Marcory	CSU	517	28	4	1	5
Abobo Baoulé	Abidjan 2	Abobo-Est	CSU	860	44	2	3	5
Gyneco-Treichville	Abidjan 2	Treichville–Marcory	CHU	307	47	6	0	0
Vridi Canal	Abidjan 2	Koumassi–Port Bouet–Vridi	CSU	965	48	3	1	2
Anoumabo	Abidjan 2	Treichville–Marcory	FSU	1,289	55	4	5	7
Agban	Abidjan 1	Adjamé–Plateau–Attécoubé	CSU	1,698	66	3	4	6
Anono	Abidjan 2	Cocody–Bingerville	CSU	1,483	67	5	2	9
Yop.Attié	Abidjan 1	Yopougon-Est	HG	1,082	76	27	24	46
220 Logements	Abidjan 1	Adjamé–Plateau–Attécoubé	MAT	3,058	135	8	7	18
Ste Thérèse	Abidjan 2	Koumassi–Port Bouet–Vridi	CSU	2,960	148	0	2	5
Wassakara	Abidjan 1	Yopougon-Est	FSU	2,664	173	8	2	8
El Rapha	Abidjan 2	Abobo-Ouest	CS	1,859	181	9	3	2
Abidjan—Median				1,386	67	4.5	2.5	5.5
Non-Abidjan—Median (see Table 2, next page)				1,014	29	1	2	2

[§]Types of health facilities include: University teaching hospital (CHU); Urban health center (CSU); Urban health unit (FSU); General hospital (HG); Maternity (MAT). See list of acronyms for French translations.

[†]Data abstracted from on-site registries.

[‡]Data obtained during key-informant interview.

*Full-time MDs including: generalists, gynecologists, and pediatricians

Table 2 List of non-Abidjan sites with select site characteristics

Site	Region	District	Type [§]	#ANC I [†]	#HIV+ [‡]	# of personnel [§]		
						MD*	Nurse	Mid-Wife
Neka	Gbokle–Nawa–San Pédro	Tabou	CMS	556	8	1	3	0
Ouragahio	Goh	Gagnoa	CSU	65	19	1	3	2
Tankesse	Boukani–Gontougo	Tanda	CSU	553	21	1	2	2
Sarhala	Worodougou–Béré	Mankono	CSU	685	23	1	1	2
Gabiadji	Gbokle–Nawa–San Pédro	San Pédro	CSU	1,063	24	1	2	1
Iboguhe	Haut Sassandra	Issia	CSU	1,091	24	1	2	2
Koko Ton	Poros–Tcholongo–Bagoué	Korhogo	CSU	935	24	1	1	3
Agboville	Agneby–Tiassa Mé	Agboville	CHR	1,154	24	8	28	14
Ahougnan-ssou	Gbêké	Bouaké-Nord Ouest	FSU	670	26	1	3	5
Assuame	Indénié Djuablin	Agnibilekro	CSR	642	32	0	1	1
Pietro Bonilli	Kabadougou–Bafing–Folon	Odienné	CS	868	32	1	3	1
N'Zianouan	Agneby–Tiassa Mé	Tiassalé	CSU	1,190	34	1	1	2
Dimbokro	N'zi–Ifou	Dimbokro	PMI	922	45	1	2	2
Walle	Bettier	Yamoussoukro	Private	1,087	46	8	1	2
Libreville	Tonpki	Man	CSU	2,250	70	1	2	3
Nimbo	Gbêké	Bouaké-Sud	CSU	1,976	77	2	4	4
Dabou	Abidjan I–Grand Ponts	Dabou	HG	2,021	84	5	20	19
Bassam	Sud Comoé	Grand Bassam	PMI	1,619	92	2	0	4
Non-Abidjan—Median				1,014	29	1	2	2
Abidjan—Median (see Table 1, previous page)				1,386	67	4.5	2.5	5.5

[§]Types of health facilities include: Regional hospital (CHR); Municipal health center (CMS); Rural health center (CSR); Urban health center (CSU); Urban health unit (FSU); General hospital (HG); Center for maternal and child health (PMI); and Private health center. See list of acronyms for French translations.

[†]Data abstracted from on-site registries.

[‡]Data obtained during key-informant interview.

*Full-time MDs including: generalists, gynecologists, and pediatricians

Table 3 summarizes the existence and quality of data from ANC and HIV registries at the study sites. Data collectors noted a total of 18 different official registries, reports, and unofficial data sources related to PMTCT across the 30-site sample on the date of data collection. The maximum number of PMTCT-related data sources found at one site was 13 (Wassakara) and the minimum was four (Gabiadji), with a median of 11. Table 4 (page 16) summarizes completeness of data in available registries by site. A data field was defined as *missing* if no data were available for the entire time period (June 2011–May 2012) and *incomplete* if data were not available in full across the entire time period— i.e., data unavailable for one or more months. A data field was deemed to be *complete* if it had no missing data and no incomplete data. Incomplete data across an entire data field was found in 13 sites, and missing data was found in 19 sites. Only six sites (Ahounassou, Com Akromianbla, Koko Ton, Nimbo, Vridi Canal, and Walle) had no incomplete or missing data. Additionally, data collectors noted PMTCT registries, ART registries, and patient charts that were incorrectly filled out at 10, 9, and 14 sites respectively. Of the 30 sites, one (Assuamé) had insufficient registry data (very large amount of missing data) and was excluded from registry-based analyses.

Table 3 Availability of on-site registries, reports, and other data sources on date of data collection

Registries, reports and other data sources	# of facilities
Patient charts	29
ANC registry	29
Offer of HIV test registry	29
PMTCT registry	28
ARV disbursement registry	27
VCT registry	26
Birth registry	25
PMTCT monthly report	24
Health facility monthly report	23
HIV care registry	21
ART registry	21
PCR registry	8
Birth registry for HIV+ women	2
Monthly NGO-partner report	2
DBS registry	2
Laboratory registry	1
Community advisor folder	1
Patient management registry	1

Table 4 On-site data quality (complete, incomplete, and missing data)

	ANCI	ANCI tested	Total ANC tested	HIV +	Charts opened	CD4 count taken	# of women eligible for ARV	Newly on ARV	Mother prophylaxis	Child prophylaxis	PCR I	PCR I +
Maternité 220 logements												
FSU Abobo Baoulé												
CSU Com Agban-Village												
CHR Agboville												
FSU Ahougnassou												
CSU Com Akromianbla												
CSU Anono												
FSU Com Anoumabo												
PMI Bassam												
HG Dabou												
PMI Dimbokro												
CS El Rapha												
CSU Gabiadji												
Sce Gyneco–CHU Treichville												
CSU Iboguhe												
PMI Koko Ton												
CSU Libreville												
CMS Neka												
CSU Nimbo												
CSR N'Zianouan												
CSU Ouragahio												
DU Pietro Bonilli												
CSU Sarhala												
CM Ste Thérèse de l'Enfant Jesus												
CSU Tankesse												
FSU Vridi Canal												
CMS Walle												
FSU Wassakara												
HG Yopougon Attié												
CSU Assuame												

Key		
Complete data for time period	Incomplete data for time period	Missing data for time period

CHARACTERISTICS AND LTFU IN THE PMTCT CASCADE

Using registry data collected from 29 sites, we constructed a registry-based PMTCT cascade to identify significant losses to follow-up in PMTCT care (Figure 2). In many individual sites, total HIV testing frequently exceeded first ANC visits because the standard indicator used in testing registries in Côte d'Ivoire combines all tests at ANC, including second and third tests. Fifteen sites used a modified registry which included an indicator for HIV testing at ANC1 (see discussion of ANC testing, below). Of the HIV-positive pregnant women identified, more mothers were recorded as having received prophylaxis (prophylaxis and/or cART) than their newborns. Only half of newborns were tested with PCR. At the time of the study period, Côte d'Ivoire's MOH followed WHO Option A prophylaxis and treatment guidelines. For provision of prophylaxis or cART to the mother, 10 of 29 sites reported coverage of less than 80 percent. For newborn prophylaxis, 13 of 29 sites reported coverage of less than 75 percent, and 19 of 29 sites reported PCR testing of less than 65 percent.⁶

Figure 2 PMTCT cascade of 29 study sites (Registry based), June 2011–May 2012

Next, we compared the study data with data from the national PMTCT database in order to assess consistency between on-site and nationally-reported data. Figure 3 depicts two cascades of the same 29 sites during the same time period⁷ (July 2011–December 2011). The first cascade (dark blue) represents

⁶For each indicator, data from sites have been compared against targets taken from the PEPFAR Country Operational Plan for Côte d'Ivoire and MSLS targets (Table 9).

⁷Quarterly national data were available for the 2011 calendar year. By selecting the time period July 2011–December 2011 we were able to directly compare national data from quarters 3 and 4 with the corresponding monthly data abstracted from on-site registries.

data taken directly from on-site registries and the second (light blue) represents data from the national database. Registries at the 29 study sites reported greater numbers of women tested, fewer HIV-positive women, more CD4 tests performed, and more women newly enrolled in cART than the national database.

Figure 3 Comparison of on-site data with national PMTCT database data for 29 sites, July–December 2011

[†]For purposes of comparison, “mother prophylaxis” in Figure 3 does *not* include women on cART in both on-site and national database data (See footnote 4, page 11).

Percent changes in the nine PMTCT cascade indicators (see above) were calculated between on-site registry data and corresponding data from the national PMTCT database for all 29 sites. Data discrepancies occurred in all indicators and at all sites. Three sites (Ahougnassou, Gabiadji, N’Zianouan) had no data discrepancies for seven out of nine indicators and less than a 5 percent discrepancy in one additional indicator. Four sites (Com Akromianbla, Dabou, Dimbokro, Yop. Attié) had discrepancies greater than 5 percent for all nine indicators. The median number of indicators at each site with discrepancies larger than 5 percent was five (out of nine).

ANC testing

Figure 4 shows the variability in the proportion of women reported as tested at ANC1 based on the data source and HIV testing variable used. The standard national registry collects the total number of HIV tests performed in ANC. Modified registries, in addition to the previous variable, also collect the number

of HIV tests administered during ANC1. Lastly, carnet data are tied directly to the individual women and offer direct information about whether or not the mother was tested for HIV. The following data were observed:

- At the 29 sites with usable registry data, 38,347 women were registered as having had an ANC1 and 42,162 HIV tests were registered as having been performed (110 percent). These included multiple tests on some pregnant women, tests on women who did not attend their ANC1 at the same site and occasional tests on non-pregnant women. Of the registered tests, 1,741 (4 percent) were noted positive.
- 15 sites had modified registries that identified HIV tests administered during ANC1. Of the 19,173 women who attended an ANC1 at these 15 sites, 17,958 (94 percent) were registered as having been tested, of which 889 tested positive (5 percent).
- 590 carnets were available at and examined from all 30 sites. Of these, 489 (83 percent) women were recorded as having been tested during their pregnancy⁸, of whom 37 (6 percent) were recorded as being positive.

Figure 4 HIV testing by source of data (numbers and proportions)

HIV testing rates recorded in carnets varied substantially by site of ANC1, from 86 percent of women who attended ANC1 at a public MSLS site to 55 percent of women who attended ANC1 at NGO or other private clinics (Figure 5).

⁸Although there is no nationally-recognized standard way to register HIV tests or results in the carnets, midwives used locally recognized codes to indicate tests and results.

Figure 5 HIV testing by site of first visit (carnet data)

Figure 6 shows the entire cascade by proportion of all HIV-positive women in the general population retained at each step. We estimated overall national coverage of the PMTCT cascade by extrapolating from the registry and carnet data. We used the 2011 DHS to estimate the number of HIV-positive women attending ANC1 (step 1 of the cascade). We assumed that 1) HIV-positive and HIV-negative women were equally likely to receive antenatal care and 2) women attending vaccination clinics are representative of the universe of women receiving antenatal care. We used the weighted carnet data to estimate proportions tested at ANC (step 2) and used registry data to estimate the remaining steps.

Figure 6 Estimated PMTCT cascade by proportion of all HIV+ pregnant women in population

[†]DHS 2011 data, [‡]Carnet data, [§]Registry data

Due to gaps in receiving antenatal care and testing for HIV in ANC facilities, it appears that nationwide only three-quarters of HIV-positive pregnant women are diagnosed during their pregnancy. More than two in five HIV-positive women do not receive antiretroviral prophylaxis for themselves, and only 53 percent receive antiretroviral prophylaxis for their newborns. Subsequently, approximately two out of five children born to HIV-positive mothers receive a first PCR test. With regards to CD4 testing and cART eligibility, only slightly more than three out of ten HIV-positive women have a CD4 count taken, which leads to only one in ten HIV-positive women being found eligible for lifetime cART due to low CD4 counts—a number which, according to the MSLS, should be closer to four in ten (Ministère 2012a). It does appear, however, that some of these women (an additional 3 percent) are identified and initiate cART through other means such as clinical diagnosis.

HIV-positive follow-up: prophylaxis and infant testing

Abidjan vs non-Abidjan sites: We compared the study sites located in Abidjan with those located outside of Abidjan. Among HIV-positive pregnant women, rates of delivery of prophylaxis for the mother, infant testing, CD4 counts, and establishment of eligibility for and initiation of cART were fairly similar. However, only 60 percent of HIV-positive pregnant women attending non-Abidjan sites received prophylaxis intended for their newborn compared with 77 percent at Abidjan sites (Figure 7). We conducted a two-tailed t-test assuming unequal variances and got a p-value of .0308.

Figure 7 PMTCT cascade: HIV+ Follow-up among Abidjan and non-Abidjan sites

[†]DHS 2011 data, [‡]Carnet data, [§]Registry data

Chart review of HIV-positive women: We selected 330 patient charts from the 29 sites with available patient charts to determine the amount of time elapsed between key processes of care in the PMTCT cascade for HIV-positive pregnant women. We calculated the average (mean) number of days elapsed between 1) HIV test and CD4 blood draw; 2) CD4 blood draw and CD4 test; and 3) CD4 test and

return of CD4 results to patient, for all patient charts with recorded values for each indicator. Suspected outliers were eliminated from analysis using the interquartile range rule for outliers (1.5xIQR). Table 5 shows the distribution of time and its relation to each step in the cascade as well as the number of women lost to follow up during each potential delay.

Table 5 Time elapsed and potential delays in PMTCT processes of care from charts of HIV+ women

PMTCT processes of care	# of charts analyzed	Avg. # days elapsed	# LTFU	Related step in the PMTCT cascade
HIV test ➔ CD4 blood draw	234	1.7	0	# CD4 count taken
CD4 blood draw ➔ Return of CD4 results to facility	251	2.5	3	# of women eligible/newly on cART
Return of CD4 results to facility ➔ Return of CD4 results to patient	237	10.2	12	# of women eligible/newly on cART

Table 6 Distribution of cART charts by # of days since last visit (cumulative percentages)

# of days elapsed	# of women on cART	Percentage of total
0	4	2
1	5	2
7	17	8
30	61	28
90	109	50
180	134	61
365	189	86
Total	219	100

Of the 330 patient charts, 221 belonged to women on lifetime cART, suggesting that chart selection was skewed towards HIV-positive women on treatment. This observation reflects inconsistencies found among site protocols for opening patient charts (see Perceived Facilitators & Barriers, below). Of these 221 charts, 219 had information on the date of last contact with patient. These 219 charts were analyzed to determine patient cART adherence. By calculating the number of days between the date of data collection and the date of last contact with patient, we were able to ascertain the number of patients who had not been recorded as returned within 90 days, and thus had likely run out of necessary medicines. As indicated in the highlighted box in Table 6, only 50 percent of women on cART had a recorded visit within 90 days

of the date of data collection. However, it is important to note here that interviewers at several sites noted that upon chart review, physicians would indicate additional recent patient visits that were not recorded in the patient charts. As such, it is possible that actual adherence rates may be higher than reported adherence rates.

Twenty-five of the 30 sites recorded at least one PCR test conducted to determine newborn HIV status during the study period. Table 7 shows the results of PCR tests for these sites. For all 25 sites, overall positivity was 5 percent. Due to small denominators, many site-specific rates are probably unreliable. Among the ten sites with 40 or more PCR test results, positivity rates ranged from 0 to 16 percent, and overall positivity was 4.5 percent.

PMTCT PERFORMANCE BY SITE

The 29 sites with adequate registry data were assigned to one of three PMTCT performance groups (high, medium, low) based on a composite PMTCT score (see Methodology). Table 8 and Figure 8 show the categorization of PMTCT performance and the HIV-positive follow up characteristics (most of which contributed to their categorization) of each performance group, respectively.

Table 7 PCR testing and results by site from registry data

	PCRI	PCR+	% PCR+
Agban	2	0	0
Akromianbla	10	0	0
Neka	7	0	0
Sarhala	10	0	0
Tankesse	22	0	0
Yop. Attié	58	0	0
Assuame	4	0	0
Pietro Bonilli	9	0	0
Nimbo	46	1	2
220 logements	44	1	2
Ste Thérèse	114	3	3
Dimbokro	32	1	3
El Rapha	175	6	3
Gyneco – Treichville	183	8	4
Wassakara	43	2	5
Dabou	58	3	5
Agboville	36	2	6
Abobo Baoulé	28	2	7
Anono	35	3	9
Ahounnassou	20	2	10
Walle	44	5	11
Bassam	51	8	16
Vridi Canal	18	4	22
Iboguhe	4	1	25
Anoumabo	5	2	40
TOTAL: PCRI > 0 (25 sites)	1,058	54	5
TOTAL: PCRI > 40 (10 sites)	816	37	4.5

Table 8 Performance groupings by PMTCT score, based on average of three indicators (% cART, % child prophylaxis, % PCRI)

	Site	PMTCT score*
LOW PERFORMERS	Kokoton	0.10
	Sarhala	0.16
	Libreville	0.17
	Anoumabo	0.18
	Bassam	0.23
	Vridi Canal	0.23
	Gabiadji	0.28
	Abobo Baoulé	0.30
	N'Ziaouan	0.33
	Iboguhe	0.33
MEDIUM PERFORMERS	Akromianbla	0.35
	Agban	0.37
	Ouragahio	0.39
	St. Thérèse	0.41
	Nimbo	0.42
	Wassakara	0.44
	220 logements	0.46
	Ahougnassou	0.49
	Anono	0.50
HIGH PERFORMERS	Pietro Bonilli	0.54
	Yop Attié	0.56
	Dabou	0.56
	Dimbokro	0.58
	Walle	0.62
	Gyneco-Treichville	0.64
	Abgboville	0.69
	Tankesse	0.70
	El Rapha	0.79
	Neka	0.83

*PMTCT score based on % cART, % child prophylaxis, % PCRI (see Methodology)

Figure 8 PMTCT cascade: HIV+ follow-up by % retained at each step for PMTCT low, medium, and high performance groups

PMTCT low performers (10 sites)

PMTCT medium performers (9 sites)

PMTCT high performers (10 sites)

[‡]DHS 2011 data, [‡]Carnet data, [§]Registry data

High performers showed higher retention rates on all steps in the cascade including those steps not used in calculating the PMTCT score (Figure 8). Provision of ARV as prophylaxis to the mother was 40 percent better among PMTCT high performers (98 percent) than among PMTCT low performers (58 percent), while the administration of CD4 blood draws among high performers (58 percent) was more than double that of low performers (24 percent).

In order to identify principal factors associated with overall site PMTCT performance, a selection of site characteristics, including size, location, processes of care, and workforce distribution and training (see Appendix III: Site characteristics used in analysis) were compared using Student's t-tests between PMTCT high performers and PMTCT low performers. Size and location did not have a significant association with performance score, while workforce patterns were significantly associated with PMTCT performance groups. Figure 9 shows distribution and training of staff at each facility weighted by the number of ANC1 registered at each site.

Figure 9 Average # of personnel and distribution of workforce per 1,000 ANC1 by PMTCT performance group

*Significant association between low and high PMTCT performance group (95% confidence)

†Notable association between low and high PMTCT performance group (90% confidence)

The following significant associations ($p < .05$) were observed between PMTCT high and low performing sites calculated by comparison of means. On average, for every 1,000 ANC1, PMTCT high performers had more:

- Full-time MDs (mean among high performers (M_H) = 7/1,000; mean among low performers (M_L) = 2/1,000; $p = .030$).
- Nurses ($M_H = 7/1,000$; $M_L = 2/1,000$; $p = .043$).
- Laboratory technicians ($M_H = 2/1,000$; $M_L = 1/1,000$; $p = .021$).
- Staff trained in PMTCT ($M_H = 11/1,000$; $M_L = 4/1,000$; $p = .005$).
- Staff who engage in ART follow-up ($M_H = 8/1,000$; $M_L = 2/1,000$; $p = .009$).

Other notable associations ($p < .10$) included the number per 1,000 ANC1 of pharmaceutical personnel, staff who initiate prophylaxis, staff trained in ART care, staff who initiate cART, and total staff employed at the facility.

Figures 10 and 11 show results from a time analysis of 181 patient charts taken from PMTCT low performers ($n=76$) and high performers ($n=105$). In low performers nearly 60 percent of women had to wait more than 30 days from the date of their HIV test to receive their CD4 count results with a median delay of 31 days. During this time 12 women (15.8 percent) were lost to follow up. In high performers only 44 percent of women had to wait more than 30 days (median delay = 19.5 days) and only one was lost to follow up.

Figure 10 Low performer—time elapsed between HIV test and return of CD4 results

Figure 11 High performer—time elapsed between HIV test and return of CD4 results

FACTORS ASSOCIATED WITH LTFU

In order to identify principal factors associated with LTFU in the PMTCT cascade, five steps (delivery of prophylaxis intended for the mother, delivery of prophylaxis intended for the child, PCR1 attendance, CD4 count blood draw taken, initiation of cART for eligible HIV-positive pregnant women) were identified and analyzed individually using registry data from 29 sites. For steps 1–3, site performance was compared to PEPFAR 2012 Country Operational Plan targets for Côte d'Ivoire. Due to recent changes in the WHO guidelines for PMTCT, current PEPFAR targets for CD4 counts (100 percent) and cART initiation (80 percent) are not relevant to the time period represented by the registry data. Thus, for steps 4 and 5, we have selected context-appropriate targets based on the MSLS' Plan for the Elimination of Mother-to-Child Transmission of HIV (Table 9).

Table 9 Retention targets for five steps in the PMTCT cascade

PMTCT cascade step	Description	Target (%)
1. Mother prophylaxis	Percentage of HIV+ pregnant women who receive ARVs to reduce mother-to-child transmission	80*
2. Child prophylaxis	Percentage of children born to HIV+ mothers who receive prophylaxis	75*
3. PCR1 attendance	Percentage of children born to HIV+ mothers tested within 6 weeks of birth	65*
4. CD4 count	Percentage of HIV+ pregnant women who receive a CD4 count blood draw	50†
5. cART initiation	Percentage of HIV+ pregnant women who initiate cART	16†

*PEPFAR target (PEPFAR 2011)

†Target derived from MSLS 2012-2015 plan (Ministère 2012a)

The following significant associations were observed between sites meeting the identified targets for each step and those sites which did not, calculated by comparison of means. On average, for every 1,000 ANC1.

- The 19 sites that surpassed the 80 percent target for mother prophylaxis had more:
 - Staff engaged in ART follow-up (mean of sites which met target (M_a) = 6/1,000; mean of sites which did not meet target (M_b) = 3/1,000; $p=.033$).
 - Nurses (M_a = 5/1,000; M_b = 2/1,000; $p=.034$).
- The 16 sites that surpassed the 75 percent target for child prophylaxis had more:
 - Nurses (M_a = 5/1,000; M_b = 2/1,000; $p=.042$).
 - Midwives (M_a = 5/1,000; M_b = 2/1,000; $p=.049$).
- The 10 sites that surpassed the 65 percent target for PCR1 had more:
 - Staff trained in PMTCT (M_a = 11/1,000; M_b = 6/1,000; $p=.024$).
 - Staff engaged in ART follow-up (M_a = 8/1,000; M_b = 3/1,000; $p=.030$).

- The 13 sites that surpassed the 50 percent target for administration of a CD4 count had more:
 - Staff trained in PMTCT ($M_a = 11/1,000$; $M_b = 5/1,000$; $p = .010$).
 - Staff who initiate cART ($M_a = 7/1,000$; $M_b = 4/1,000$; $p = .036$).

There were no significant associations between the four sites that met the 16 percent target for cART initiation and the 24 sites which did not.

ORGANIZATION OF PMTCT SERVICES, INCLUDING PERCEIVED FACILITATORS AND BARRIERS

Interviews and observations by the study teams showed varied patterns of PMTCT services, as well as facilitators and barriers to care. Most sites organized the beginning of the cascade in the same fashion: some sort of reception or registration process, group counseling, individual counseling, and then routine antenatal care services. Figure 12 shows an example of a typical patient flow pattern at one facility located in an urban setting.

Figure 12 Patient flow map for one urban site

When data from interviews and observations were analyzed by performance group, the average number of days, as reported by health workers, that it took for a woman to access services from reception through cART eligibility varied from 5.1 days for the high performers, 9.2 days for the medium performers, and 11.4 days for the low performers. The average number of movements from site to site within the health facility (i.e., how many different rooms a patient would have to visit in a site) did not vary greatly (range 5.5–6.3), nor did the average number of visits to the site (range 2.6–2.7). Timing of the distribution of prophylaxis did not seem to differ among performance groups, although the high performers opened patient charts before the distribution of prophylaxis more often than the low performers (6 of the high performers vs. 3 in the low performer group).

Some sites reported that insufficient personnel at the first steps in this process led to long wait times:

There was only one consultation room at this health facility. This means that there was only one health provider who delivered ANC services each day. When there are busy days, wait times can be very long, exceeding sometimes 50 minutes. The ANC room did not have ventilation.

—Observation from an urban site

Table 10 Patient flow chart through PMTCT processes—high performing site

PMTCT service	Location	Time elapsed*
Registration	Reception hall	5 minutes
Group counseling	Reception hall	20 minutes
Individual counseling	HIV testing room	24 minutes
HIV test	HIV testing room	34 minutes
Routine ANC	ANC room	49 minutes
Announce result	HIV testing room	59 minutes
Open patient chart	HIV testing room	69 minutes
CD4 draw	Lab	3 days
CD4 results returned to patient	Doctor's office	4 days
cART eligibility	Doctor's office	4 days
cART initiation	Doctor's office	Dependent on date of eligibility
Adherence monitoring	Doctor's office	n/a
Infant follow up	Pediatrician's office	n/a

*Cumulative number of minutes through the “Routine ANC” step and days through the “CD4 draw” step.

Table 10 shows the typical patient flow at one high performing site located in Abidjan with the name of the step of PMTCT services, the location in which the services are offered, and the amount of time elapsed from the pregnant woman's first contact with the health center through the determination of whether or not she was eligible for treatment.

The way services were organized for HIV testing varied considerably among sites. Fourteen sites integrated the HIV test within the general routine of ANC services, while others referred women to another room in a different part of the facility for the rapid test. Some health workers who were interviewed often preferred a separate room for testing, as they felt it allowed for greater confidentiality and made ANC services more efficient. However, a separate testing room could also significantly add to the total time a woman had to spend receiving comprehensive ANC services, especially when the testing room was on the other side of the facility.

Interviewers also noted large differences in the timing of opening a patient chart. Of the 28 sites at which information was available regarding standard timing for opening a patient chart, 19 (68 percent) open patient charts following a positive HIV test, according to MOH protocols. Nine (32 percent) sites waited until the patient was eligible for treatment as determined by a CD4 count before opening a patient chart. As stated above, at two sites, Assuamé and Gabiadji, interviewers were not able to discern a standard timing for opening patient charts.

Timing of the distribution of prophylaxis (either for the mother or the child) varied as well, with 26 out of 30 sites distributing prophylaxis before a CD4 analysis, consistent with national protocols. Fifteen out of 30 sites distributed prophylaxis only after a patient chart was opened, and the remaining 15 sites distributed prophylaxis without recording it in individual patient charts.

Interviewers noted that the presence of multilingual staff to facilitate communication during the counseling and ANC processes was helpful, especially in the sites outside of Abidjan. While 14 sites were observed to have plenty of space and comfortable conditions for the first stages of the process, observations from the other 16 sites noted that there were not enough chairs or benches present to accommodate the patient load. At 11 sites, observers noted that a lack of a fan led to stagnant air and unpleasant conditions.

The interviewers noted varying physical conditions at the sites. The most common adverse conditions cited were lack of equipment—i.e., CD4 machines, televisions for education activities during wait times, etc. (21 sites); lack of clinical tools and job aids—i.e., posters, pamphlets, etc. (21 sites); lack of basic infrastructure—i.e., adequate space for activities, reliable electricity, running water, tables and chairs, etc. (19 sites); lack of confidentiality from either not having separate counseling spaces, half walls, or curtains (15 sites); lack of a fan which created conditions with poor ventilation (11 sites); hot temperatures (five sites); and dusty/dirty walls and floors (two sites).

The room is very dirty, dusty, and very poorly organized. There is a testing registry well filled out, but was found on the blood drawing pad. Running water is irregular because of pressure problems, and there are no curtains or screens over the windows for confidentiality. No table.

—Observation from a rural site

Many of the inadequate conditions contributed to one another. For example, the lack of confidentiality was frequently attributed to the organization of patient flow, as counseling and ANC exams were done in the same room with multiple women or health care workers present. Lack of fans and ventilation (hot conditions) prompted health workers to prop open doors or windows, which contributed to lack of confidentiality reported by health workers. Services performed in a special room, such as a community counselor's office, in which only HIV services were offered, was noted by the interviewers as possibly contributing to women experiencing stigma when receiving care.

Conversely, at one site, the day of the week on which the support group was held saw an increase in women coming to pick up their medicines. While this intensified the workload for the health care providers on that day, health care workers demonstrated their dedication to patients and the importance of the support groups in helping women cope with the disease and adhere to their treatment regimen by funding refreshments for the support group out of their own pockets.

PMTCT & COMPREHENSIVE ANC

The secondary objective of this study was to measure the association between ANC performance and PMTCT performance at each site. Among the 590 carnets taken from 29 sites, 77 percent of women received prophylaxis for malaria (IPT), 68 percent of expected TT doses were delivered, and only 27 percent of women were tested for syphilis. Sixteen sites had IPT rates of at least 80 percent, 12 sites had a TT delivery rate of at least 50 percent, and only six sites had syphilis testing rates of at least 50 percent. After assigning each site an ANC score (see Methodology), we plotted each site on a graph with the X-axis representing PMTCT score and the Y-axis representing ANC score. Figure 12 shows that there is a slight, but not statistically significant, association between ANC score and PMTCT score ($M=0.2247$; $R^2=0.1699$).

Figure 13 Association between ANC score & PMTCT score

The three sites with the highest ANC scores (Dabou, Agboville, Yop. Attié) were all PMTCT high performers and the three sites with the lowest ANC scores (Kokoton, Sarhala, Gabiadji) were all PMTCT low performers. Very high and very low PMTCT performance, however, is not necessarily an indicator of high or low ANC performance.

CONCLUSIONS AND RECOMMENDATIONS

This nationally representative sample of antenatal clinics performing PMTCT demonstrated significant losses and delays throughout the PMTCT cascade, including poor retention for prophylaxis (both mothers and newborns), PCR testing, and CD4 testing. Levels of adherence to cART were low. The higher performing health facilities, according to combined PMTCT scores, had significantly greater numbers of skilled personnel and PMTCT training of skilled health personnel than the lower performing sites. They also moved pregnant women more efficiently through their PMTCT services.

There was wide variability among the sampled clinics, and major inconsistencies in the data from different sources, especially with respect to the proportion of women HIV tested, which was recorded at much lower levels in carnets than in registries. Multiple registries and large numbers of patient charts likely contributed to inconsistent record keeping and reported data. Perceived facilitators included improvement of physical conditions and organization of services at the facilities. Inadequate physical conditions at most sites may have contributed to lower quality of data collection, lack of confidentiality, lower patient satisfaction, and a lower quality of care.

LIMITATIONS

Although this mixed-method assessment was done with a robust national sample of PMTCT sites and more than 300 chart reviews of HIV-positive women, the assessment was limited by several factors. Inconsistencies and incompleteness of registry data were widespread, and the registry analyses were cross-sectional, limiting inferences of causality. Patient charts were poorly stored and archived, making a representative sample of HIV patient charts difficult to obtain. Though the study collectors all participated in a two-day training on tools and data collection procedures in Abidjan prior to data collection, the large number of different interview teams (seven) may have contributed to different standards of data collection, especially for the qualitative interviews and observations.

The determination of high and low performers was difficult. The proportion of HIV-positive women on cART was largely determined by CD4 testing efficiency, which was quite low at some sites. The use of a combined PMTCT score was complicated since the measurement of outcome included key exposure variables (e.g., efficiency at various cascade steps) that might have otherwise been assessed for impact on PMTCT score. However, the scoring system consistently placed most sites in the same low, medium, or high range. This reinforced our judgment that our scoring system identified important and consistent performance characteristics, and therefore it was retained as a measure of performance. Moreover, the differences in cascade characteristics between high and low performers were less than anticipated, not only because the same characteristics were used to categorize the performance, but also because common and frequent problems were observed at all sites.

DISCUSSION

Many of the operational and systems problems found in this assessment have been seen in other African countries (Perez et al. 2004; van't Hoog et al. 2005; PEPFAR 2008; Kinuthia et al. 2011). HIV testing has commonly been reported as greater than the number of women registered in antenatal care, and is frequently due to multiple tests of pregnant women, usually to meet national norms of testing frequency. In our study, some sites referred to a national policy recommending repeat HIV tests three months after a negative test. At other sites, performance-based financing schemes that paid providers for each HIV test may have contributed to high (and possibly excessive) levels of HIV testing. Finally, in some sites, the midwives were also responsible for testing other patients who were not pregnant. In these cases, non-pregnant women and men who came for HIV tests were likely to be registered in the PMTCT registry books.

The most concerning findings are the small proportion of women who completed the PMTCT cascade and the low adherence rates of women on cART. The published proportions of HIV-positive women and newborns that have reported receiving ARVs is highly variable (10–75 percent) in sub-Saharan Africa (Audureau et al. 2013, Horwood et al. 2010). Our estimated proportion receiving prophylaxis of 58 percent of mothers and 53 percent of infants is typical for many low-income African countries. These estimates are also within the range of MOH PMTCT database values (Figure 3) and within the ranges of the 2011–12 estimates by the Côte d'Ivoire MOH (DIPE 2012). In that document, reported prophylaxis for mothers was 60.5 percent in 2011 and 50.1 percent in 2012; for infants it was 53 percent in 2011 and 43 percent in 2012. The CD4 and PCR testing rates from our study are also within the ranges of official Côte d'Ivoire MOH data and reports from other countries in the African region.

Among the small group of women who completed the cascade and managed to get placed on cART (12 percent), the adherence of only 50 percent at three months is disturbingly low. National policy is to provide medication for 90 days; thus a large proportion seem to have discontinued or significantly interrupted treatment. It is possible that some women visited pharmacies to pick up their medicines without a recorded medical visit, though that is not a national norm. Low adherence to cART among PMTCT patients is also seen in the few studies from other African countries (Nassali et al. 2009; Micek et al. 2009). Low adherence to treatment by mothers in the postnatal period could also be a hindrance to initiation of treatment and adherence for their infants if they are HIV-positive too.

The overall PCR positivity rate of 5 percent suggests that significant prevention of HIV transmission does occur. However, unscreened newborns likely have a higher risk of transmission than screened newborns since the characteristics of not being screened might be associated with higher infection risk. Thus the 5 percent transmission proportion may represent a low estimate of the true total HIV transmission rate. The very high levels of PCR positivity in the six sites with over 20 percent positive needs to be further clarified. Additionally, health care providers noted that even among the most vigilant of mothers who bring their newborns for PCR tests, many of these women become LTFU once the child has been declared negative. Counseling on the importance of adherence and continuing care cannot only take place at diagnosis, but rather must be continued throughout the breastfeeding period. Support groups and other community activities are beneficial to keep women in treatment (Stringer et al. 2005; Van Schalwyk et al. 2013).

RECOMMENDATIONS

Improve physical conditions at ANC clinics to enhance patient care and confidentiality.

Improved physical conditions can make a difference in the utilization of, quality of, and adherence to PMTCT (Berwick 2004; Bolu et al. 2007; Doherty et al. 2009). Because onsite conditions were so commonly poor, it would have been very difficult to demonstrate a difference between high and low performers. Confidentiality was a major problem throughout. Although many midwives stated that they wanted a separate room from ANC for HIV testing, in reality, this meant that they wanted a separate room to give the woman a positive result, in order to be able to properly counsel her (up to one hour) during which time other midwives continue to provide ANC services on schedule to the women waiting. Confidentiality for the communication of test results was an issue whether it was done in the consultation room or laboratory.

Strengthen the supply chain and feedback loop to provide critical human resources, equipment, and necessary medicines.

In addition to the findings in this study which suggest the impact of critical human resources to improve PMTCT performance, availability of equipment and supplies also is likely to contribute to the ineffectiveness of PMTCT care. Because communication between the central, district, and health center level is often inadequate, requests for additional personnel, materials, or medicines is often not met. When there are stock outs at the health center level and the district is not responsive, there is no recourse or action to rectify the situation. The supply chain should be strengthened to address these issues.

Simplify and strengthen data collection, analysis, and reporting to improve service delivery.

The burden and confusing nature of so many registries is a major concern. The inconsistent completion of these registry books, as well as contradictory and confusing data emanating from them, suggests that monitoring and evaluation could be greatly simplified. PEPFAR alone has over 30 specific PMTCT indicators, most of which are inadequately filled out and rarely analyzed, at least in Côte d'Ivoire. Fewer indicators, fewer reports, and fewer registries would likely improve the usefulness of monitoring and evaluation (Gimbel et al. 2011). Routine and simple chart review of HIV-positive women would likely engage providers in frequent assessment and improvement of systems of care. Other studies have shown that a data manager or other dedicated staff member increased the likelihood that the statistics would be analyzed and used to improve patient care (Sherr et al. 2010; Gimbel-Sherr et al. 2007).

Strengthen the systems focus on PMTCT service delivery in ANC.

A well monitored and locally initiated systems approach will be critical to ensure the successful implementation of the WHO Option B regimen in Côte d'Ivoire. A systems focus on patient follow up with adequate charting and communication with patients is a good starting point (Gloyd et al. 2007). The systems approach should also be able to analyze patient flow patterns, gaps in service delivery, potential interventions for improvement, and routine measurement of progress. National, regional, and district support of the systems approach should support individual facilities in this systems effort.

Other recommendations include improving coordination of care for the mother and child (and other family members) to support retention in the system. HIV testing of partners of pregnant women may improve overall coordinated care for the mother and child and encourage retention of both patients. Mobile phone reminders and patient finding systems have promise to reduce LTFU. Finally, the staff members at the sites were pleased to have the study teams visit and show interest in their work, and they commented on how few supervision visits they receive. Increasing the level of supervision of PMTCT sites should reinforce the training given to personnel and support effective management techniques.

The results of this assessment suggest that antenatal care clinics in Côte d'Ivoire may struggle with the national rollout of Option B, where adequate assessment, medication, and follow up of every HIV-positive pregnant woman will be necessary for effective results. The systems focus, including the identification of mechanisms for effective cross-checking, would enable productive communication between patients, staff, and district leadership; ensure improved adherence to national clinical and administrative protocols; and help identify gaps in service, including human resource deficiencies. It is also recommended that a robust evaluation of the rollout be carried out to assess and address the likely bottlenecks and challenges that might occur to maximize the efficiency and impact of this critical intervention.

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OUTIL DE COLLECTE DE L'EVALUATION DE LA CASCADE PTME EN CI

J1 : Heure de Début : /.../.../ h / .../.../

J2 : Heure de Début : / / h / / !
Heure de Fin : / / h / / !

[illegible]

DATE DE DEBUT DE L'INTERVIEW: J J M M A A

DATE DE FIN DE L'INTERVIEW: / /

Nom et prénoms de l'Enquêteur _____ Nom du superviseur : _____

Signature du superviseur _____

Observations:

1 - FICHE DE PRÉSENTATION DU SITE PENDANT LA PERIODE DE L'ETUDE

Région Sanitaire : _____ District sanitaire: _____ Population totale de l'aire sanitaire : _____

Type d'établissement (cocher):

☐ CHR ☐ HG ☐ CSU ☐ CSR ☐ PMI ☐ CSU spécialisé ☐ DR ☐ Autres _____

Tableau 1. Nombre de personnel par catégorie (précisez le nombre de personnel qui a été formé en matière de PTME/PEC dans chaque catégorie listée pendant la période de l'étude juin 2011 à mai 2012)

Catégorie	Nombre	Nombre d'agent formés en PTME/Prévention	Nombre d'agents qui initient la prophylaxie	Nombre d'agents formés PEC (TARV)	Nombre d'agents qui initient le traitement ARV ?	Nombre d'agents qui font le suivi du traitement ARV ?
Médecin généraliste sur site						
Médecin itinérant						
Gynécologue						
Pédiatre						
Infirmier						
Sage-femme						
Aides-soignants						
Pharmacien						

Tableau 1 (cont.) Nombre de personnel par catégorie (précisez le nombre de personnel qui a été formé en matière de PTME/PEC dans chaque catégorie listée pendant la période de l'étude juin 2011 à mai 2012)

Technicien de pharmacie						
Biologiste						
Technicien de laboratoire						
Educateur sanitaire/ Mobilisateur social						
Conseiller communautaire						
Gestionnaire de données/ Agent moniteur de données						
Autres (précisez)						

Cochez le (s) service (s) offert (s) par l'établissement.

☐ CPN	☐ Conseil Dépistage du VIH	☐ Laboratoire
☐ PTME	☐ PEC ARV (adultes et enfants)	☐ Pharmacie
☐ PEV	☐ Soins aux PVVIH	☐ Planning Familiale
☐ Accouchement	☐ Nutrition/Diététique	☐ Diagnostic précoce

TABLEAU 2A - SALLE DE VACCINATION - CARNETS DE SANTE

Numéro d'ordre	1	2	3	4	5	6	7	8	9	10
Emission Carnet (1=même lieu, 2=autre MSLS, 3=ONG, 4=privé, 5=autre)										
Coût du carnet (CEA)										
Age de la femme (ans)										
Distance parcourue (1=<5km, 2=5-10km, 3= plus de10km)										
Etat matrimonial (m c, d, v, autre)										
Nombre de grossesse (gestité)										
Nombre d'accouchements (Parité)										
Nombre d'enfants vivants										
Nombre d'enfants mort nés et DCD										
Date CPN1 (jj mm aaaa)										
Date CPN2 (jj mm aaaa)										
Date dernière visite (jj mm aaaa)										
Nombre total de visites effectuées pour le suivi de la recente grossesse										

2B - DESCRIPTION DU CIRCUIT DE LA PTME TEL QUE PRATIQUE ACTUELLEMENT DANS CET ETABLISSEMENT

Numéro de l'étape correspondant au début du circuit du patient tel que indiqué dans le guide de remplissage : /__ /__/

Intitulé de l'étape :

Temps moyen mis à cette étape (mn) : /__ /__/

Description faite par les prestataires (locaux, forces et points à améliorer dans les activités) :

Les locaux :
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Les forces :
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Les points à améliorer :
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Observations faites par l'enquêteur :
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Après avoir parcouru le circuit, quelles sont les principales suggestions susceptibles d'améliorer les services PTME que vous fournissez à vos patients :

1. Locaux :
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2. Personnel :
.....
.....
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.....

3. Matériel et équipement :
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4. Organisation du travail :
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5. Autres :
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2C – TABLEAU DES DONNEES DE DOSSIERS INDIVIDUELS DU PATIENT (1-10)

ITEMS	1	2	3	4	5	6	7	8	9	10
Date de réalisation du test VIH (jj/mm/aaaa)										
Date de prélèvement pour le bilan initial (jj/mm/aaaa)										
Date de réalisation du bilan (jj/mm/aaaa)										
Date de rendu du résultat CD4 à la mère (jj/mm/aaaa)										
Date d'éligibilité (jj/mm/aaaa)										
Date de début de traitement (jj/mm/aaaa)										
Date de prélèvement PCR/DBS de l'enfant (jj/mm/aaaa)										
Date de rendu du résultat PCR/DBS de l'enfant (jj/mm/aaaa)										
La dernière date de contact de la cliente avec le centre de santé (jj/mm/aaaa)										

ND = date non disponible

2C (cont.) – TABLEAU DES DONNEES DE DOSSIERS INDIVIDUELS DU PATIENT (11-20)

ITEMS	11	12	13	14	15	16	17	18	19	20
Date de réalisation du test VIH (jj/mm/aaaa)										
Date de prélèvement pour le bilan initial (jj/mm/aaaa)										
Date de réalisation du bilan (jj/mm/aaaa)										
Date de rendu du résultat CD4 à la mère (jj/mm/aaaa)										
Date d'éligibilité (jj/mm/aaaa)										
Date de début de traitement (jj/mm/aaaa)										
Date de prélèvement PCR/DBS de l'enfant (jj/mm/aaaa)										
Date de rendu du résultat PCR/DBS de l'enfant (jj/mm/aaaa)										
La dernière date de contact de la cliente avec le centre de santé (jj/mm/aaaa)										

ND = date non disponible

TABEAU 4: POINT DES OUTILS DISPONIBLES

Parcourir les registres, dossiers, et rapports du période **juin 2011 à mai 2012**. L'établissement a-t-il les outils ci-dessous ? Sont-ils correctement renseignés, et ont-ils été en rupture au cours de la période ?

No	Outils	Ces différents outils existe-t-il dans le centre pendant la période ? (oui/non)	Les outils sont-ils correctement remplis (1 registre PTME, 1Registre TARV, 20 dossiers patients sur la période) (oui/non)	Nombre de jour de rupture (registre PTME, Registre TARV, dossiers patients sur la période)	Lieu de stockage des outils
1	Registre de CPN				
2	Registre d'accouchement				
3	Registre de PTME				
4	Registre soins VIH				
5	Cahier de proposition de test				
6	Registre CDV				
7	Registre TARV				
8	Registre de dispensation ARV				
9	Dossier patient				
10	Rapport Mensuel de L'établissement Sanitaire				
11	Rapport mensuel des activités PTME				
12	Autre (précisez)				

TABLEAU 5 : DONNEES DE PTME (01 JUIN 2011-31 MAI 2012) AVEC SOURCE

Indicateur	Source N°	Juin 2011	Juil. 2011	Aout 2011	Sept 2011	Oct. 2011	Nov. 2011	Déc. 2011	Jan 2012	Fév. 2012	Mars 2012	Avril 2012	Mai 2012	TOTAL
Nb CPN1														
Nb CPN1 testées														
Nb total de CPN testées														
Nb de FE VIH +														
Nb Dossiers FE + ouverts														
Nb conjoint dépisté														
Nb CD4 réalisé														
Nbre de FE VIH + Eligibles														
Nbre de FE VIH + nouvellement sous TARV														
Nbre de FE VIH + ayant reçu la Prophylaxie pour elle même														
Nbre de FE VIH + ayant reçu la Prophylaxie pour leurs enfants														
Nombre PCR1														
Nombre PCR1 positif														
Nbre total d'accouchements														
Nbre de conjoint VIH +														

APPENDIX II: PERFORMANCE GROUP ANALYSIS

Table I PMTCT score calculation and performance grouping

		A HIV + pregnant women	B Child prophy	C PCR I	D Newly on cART	E B/A	F C/A	G D/A	Average (E:G) PMTCT score
PMTCT Low Performers	Kokoton	24	6	0	1	0.25	0.00	0.04	0.10
	Sarhala	23	1	10	0	0.04	0.43	0.00	0.16
	Libreville	70	27	0	9	0.39	0.00	0.13	0.17
	Anoumabo	55	18	5	6	0.33	0.09	0.11	0.18
	Bassam	92	0	51	12	0.00	0.55	0.13	0.23
	Vridi Canal	48	10	18	5	0.21	0.38	0.10	0.23
	Gabiadji	24	18	0	2	0.75	0.00	0.08	0.28
	Abobo Baoulé	44	11	28	1	0.25	0.64	0.02	0.30
	N'Ziaouan	34	34	0	0	1.00	0.00	0.00	0.33
	Iboguhe	24	17	4	3	0.71	0.17	0.13	0.33
PMTCT Medium Performers	Akromianbla	28	13	10	6	0.46	0.36	0.21	0.35
	Agban	66	66	2	5	1.00	0.03	0.08	0.37
	Ouragahio	19	19*	0	3	1.00	0.00	0.16	0.39
	Nimbo	77	46	46	5	0.60	0.60	0.06	0.42
	St. Thérèse	148	53	111	20	0.36	0.75	0.14	0.41
	Wassakara	173	173	43	13	1.00	0.25	0.08	0.44
	220 logements	135	134	44	10	0.99	0.33	0.07	0.46
	Ahougnassou	26	15	20	3	0.58	0.77	0.12	0.49
	Anono	67	63	35	3	0.94	0.52	0.04	0.50
PMTCT High Performers	Pietro Bonilli	32	11	9	32	0.34	0.28	1.00	0.54
	Yop Attié	76	60	22	45	0.79	0.29	0.59	0.56
	Dabou	84	73	58	11	0.87	0.69	0.13	0.56
	Dimbokro	45	45	32	1	1.00	0.71	0.02	0.58
	Walle	46	39	44	3	0.85	0.96	0.07	0.62
	Gyneco-Treichville	47	38	47*	5	0.81	1.00	0.11	0.64
	Agboville	24	24*	24*	2	1.00	1.00	0.08	0.69
	Tankesse	21	21*	21*	2	1.00	1.00	0.10	0.70
	El Rapha	181	181*	175	71	1.00	0.97	0.39	0.79
	Neka	8	8	7	5	1.00	0.88	0.63	0.83

* Data adjusted not to exceed denominator (HIV+ pregnant women).

Table 2 ANC score calculation and performance grouping

		A # of carnets collected	B % IPT (malaria)	C % tested BW (Syphilis)	D Average % expected doses of TT administered [†] (tetanus)	Average (B:D) ANC score
ANC Low Performers	Kokoton	20	0.40	0.10	0.67	0.39
	Sarhala	20	0.75	0.00	0.52	0.42
	Gabiadji	20	0.60	0.10	0.58	0.43
	Agban	20	0.35	0.25	0.73	0.44
	Anoumabo	19	0.21	0.16	0.96	0.44
	Nimbo	20	0.90	0.10	0.49	0.50
	Tankesse	17	0.82	0.00	0.68	0.50
	Pietro Bonilli	18	0.72	0.17	0.68	0.52
	Dimbokro	20	0.70	0.25	0.63	0.53
	Ouragahio	20	0.85	0.00	0.77	0.54
ANC Medium Performers	Libreville	20	0.80	0.20	0.69	0.56
	Walle	19	0.79	0.05	0.83	0.56
	El Rapha	20	1.00	0.20	0.63	0.61
	N'Ziaouan	20	0.95	0.20	0.72	0.62
	Vridi Canal	20	0.70	0.30	0.86	0.62
	Ahougnassou	20	0.95	0.10	0.85	0.63
	St. Thérèse	20	0.85	0.45	0.60	0.63
	Neka	20	0.95	0.15	0.84	0.65
	Iboguhe	20	0.90	0.10	0.98	0.66
ANC High Performers	Wassakara	20	0.85	0.40	0.73	0.66
	Abobo Baoulé	20	0.65	0.35	1.03	0.68
	Gyneco-Treichville	17	0.88	0.59	0.58	0.68
	Bassam	20*	0.74	0.50	0.84	0.69
	220 logements	20	0.90	0.45	0.78	0.71
	Anono	20	0.80	0.50	0.84	0.71
	Akromianbla	20	0.85	0.45	0.86	0.72
	Yop Attié	20	0.65	0.55	0.96	0.72
	Agboville	20	0.95	0.50	0.74	0.73
	Dabou	20*	0.74	0.55	0.93	0.74

[†]The tetanus immunization indicator was calculated for each site based on the average (mean) of the proportion of TT doses recorded to the “expected number of TT doses administered” for each carnet collected from that site (n=576).

*At two sites (Bassam and Dabou) only 19 carnets had valid data for IPT. Column B reflects these adjusted denominators.

APPENDIX III:

SITE CHARACTERISTICS

USED IN ANALYSIS

Size	Catchment Area Population. Total ANCI visits.
Location	Abidjan/Non-Abidjan. Urban/Rural.
Processes of Care (Circuit data)	Average # of displacements. Average # of visits to health site. Patient chart opened according to national directives (Y/N). Reported (by informant) average # of days between ANCI reception and establishment of eligibility date for ART.
Workforce Distribution	# of total staff per 1,000 women attending ANCI. # of MD-generalists per 1,000 women attending ANCI. # of full-time MDs (generalist/gynecologist/pediatrician) per 1,000 women attending ANCI. # of nurses per 1,000 women attending ANCI. # of midwives per 1,000 women attending ANCI. # of non-MD health care providers (nurses/midwives) per 1,000 women attending ANCI. # of pharmaceutical personnel (pharmacist/pharm tech) per 1,000 women attending ANCI. # of laboratory technicians per 1,000 women attending ANCI. # of health educators/social mobilizers per 1,000 women attending ANCI. # of community advisors per 1,000 women attending ANCI.
Workforce Training	Proportion of staff trained in PMTCT. Proportion of staff who initiate prophylaxis. Proportion of staff trained in ART care. Proportion of staff who initiate ART. Proportion of staff who engage in ART follow-up. # of staff trained in PMTCT per 1,000 women attending ANCI. # of staff who initiate prophylaxis per 1,000 women attending ANCI. # of staff trained in ART care per 1,000 women attending ANCI. # of staff who initiate ART per 1,000 women attending ANCI. # of staff who engage in ART follow-up per 1,000 women attending ANCI.

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