SCHOOL OF PUBLIC HEALTH,

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FACTORS CONTRIBUTING TO OUTCOMES OF THE PMTCT INTERVENTION IN THE WESTERN REGION OF GHANA

BY

MAAME POKUAH AMO-ADDAE

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DECLARATION

I do hereby declare that except for duly acknowledged citations and ideas, this thesis is an original work produced by me from a study personally undertaken under supervision. This work has never on any previous occasion been submitted in part or whole to any institution or board for the award of any degree.

CANDIDATE

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Maame Pokuah Amo-Addae

SUPERVISOR

_____

Dr Priscillia Nortey

DEDICATION

To my husband Emmanuel and children; Nana Yaa, Adom, Nhyiraba and Aseda for all the support.

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God bless them all.

ABSTRACT

Background: In 2009, when the UNAIDS called for the elimination of mother-to-child transmission of HIV (MTCT) by 2015, Ghana was found to be one of 20 countries accounting for 80% of the global burden of prevention of MTCT (PMTCT). MTCT is the main source of pediatric HIV, accounting for over 90% of cases worldwide. This study contributes to the assessment of Ghana's performance towards achieving the elimination of MTCT. The study described the coverage and outcomes of the PMTCT intervention from 2010 to 2013, assessed the knowledge of midwives regarding the intervention and sought to identify maternal and pregnancy-related factors contributing to PMTCT outcome by 6weeks after delivery in the Western Region of Ghana.

Methods: Quantitative and qualitative methods were applied in the study. Records reviews and indepth interviews were conducted to describe the PMTCT coverage and outcomes and to assess the knowledge and practices of midwives implementing PMTCT. A nested case control design was used to determine factors contributing to PMTCT outcome. The Epiinfo statistical package was used for the analysis.

Results: Facilities providing PMTCT services are available in all districts of the Region. However, 42 private facilities and CHPS compounds* offering ANC services within these districts do not conduct HIV testing for clients. From 2010 to 2013, a total of 36.3% of ANC clients (147,990 out of 408,201) were not tested for HIV. However, the prevalence of HIV among the ANC clients tested in the Region shows a downward trend from 2.3% in 2010 to 1.9% in 2013. There is low patronage of the early infant diagnosis (EID) service at the Regional Public Health Laboratory. EID records were available for only 13.4% of exposed babies from November 2011 to November 2013. Midwives providing the PMTCT service were unaware of the PMTCT national target and had weak follow-up systems to trace defaulting clients. Spousal influence and fear of the unknown was the main reason for opting out of HIV testing at ANC. None of the maternal and pregnancy-related variables studied (including age, concurrent illness, IPT compliance and birth order) was found to contribute significantly to PMTCT outcomes in the Western Region but twin delivery and female sex had higher risk of MTCT. The MTCT rate was 5.5% among a group of mothers and their babies whose ART history could not be ascertained, but surprisingly higher at 12.1% among PMTCT clients who had benefitted from ART.

Conclusion: There is adequate distribution of PMTCT services in the Western Region of Ghana. An MTCT rate of 5.5% to 12% was observed. Some gaps identified in achieving elimination of MTCT were the non-availability of HIV testing at some ANC sites, missed opportunities for HIV testing at ANC clinics and low knowledge and patronage of EID by midwives and their clients resulting in the loss of many babies along the continuum of care. Twin gestation and having a female baby may be associated with higher MTCT risk but this requires further research.

Key words: PMTCT, MTCT, risk, elimination, outcomes, ANC, EID

**Community-based Health Planning and Services (CHPS) compounds are primary level healthcare facilities operating at the community.*

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LIST OF ABBREVIATIONS

AIDS	-	Acquired Immune Deficiency Syndrome
ANC	-	Ante Natal Clinic
ART	-	Antiretroviral Therapy
ARV	-	Antiretroviral
CHAG	-	Christian Health Association of Ghana
CHPS	-	Community-based Health Planning and Services
DHIMS	-	District Health Information Management Systems
DPHN	-	District Public Health Nurse
DNA	-	Deoxyribonucleic Acid
EID	-	Early Infant Diagnosis
ENRH	-	Effia Nkwanta Regional Hospital
GAC	-	Ghana AIDS Commission
HAART	-	Highly Active Antiretroviral Therapy
HIV	-	Human Immunodeficiency Virus
HSS	-	HIV Sentinel Survey
HTC	-	HIV Testing and Counselling
MTCT	-	Mother-to-Child Transmission
NACP	-	National AIDS/STI Control Programme
OR	-	Odds Ratio
PCR	-	Polymerase Chain Reaction
PHL	-	Public Health Laboratory
PMTCT	-	Prevention of Mother-to-Child Transmission
RR	-	Relative Risk
RNA	-	Ribonucleid Acid
UNAIDS	-	Joint United Nations Programme on HIV/AIDS

UNICEF- United Nations Children Fund

WIFA - Women in Fertile Age

WHO - World Health Organization

LIST OF OPERATIONAL DEFINITIONS

Indicator/Phrase	DEFINITION
PMTCT burden	Is the extent of need for PMTCT service in a given population. It is measured by the expected number of HIV-positive antenatal clients and the trend of HIV prevalence among antenatal clients
PMTCT outcome	The end result of the PMTCT intervention determined by testing the HIV-exposed baby's blood for HIV at early infant diagnosis and the analysis of the associations of the results.
PMTCT uptake	The extent to which the expected PMTCT need is actually met. It is measured as the proportion of expected number of HIV-positive antenatal clients actually testing positive
PMTCT workload	The number of antenatal clients actually testing positive for HIV
Unmet PMTCT need	The extent to which the expected PMTCT need is not met by not testing antenatal clients for HIV.
Missed opportunity	The situation where an ANC client is not tested for HIV

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

A few years ago, children living with Human Immunodeficiency Virus (HIV) were not expected to live beyond the period of adolescence. These children may now live healthier and longer with the introduction of highly active anti-retroviral therapy (HAART) and achievements in pediatric care (Puthanakit *et al.*, 2007; Mothi *et al*, 2011; Cardoso *et al.*, 2012).

As the population of HIV-infected babies now live longer with the chronic infection, it is expected that a range of problems will arise. The disclosure of HIV serostatus to children, ensuring long-term adherence to ART, development and management of long-term toxicities of antiretroviral drugs and the sexual and reproductive health of these growing children and young adults may pose a significant challenge to the practice, skills and logistic availability of our current health systems. These challenges can be avoided by preventing pediatric HIV infection. (Hazra *et al*, 2010; Anderson & Yogev, 2012). Mother-to-child transmission (MTCT) is the main source of pediatric HIV, accounting for over 90% of cases worldwide (WHO, 2008; UNAIDS, 2010; UNICEF, 2011). In Ghana, MTCT is virtually the only cause of the infection in children under 10years of age (Ghana AIDS Commission [GAC], 2010).

In 2009, when UNAIDS called for the 'Virtual elimination' of MTCT, Ghana was found to be one of the 20 countries which contribute to 80% of the global MTCT burden (UNAIDS, 2010; WHO, 2010). The Ministry of Health adopted the theme, "Virtual elimination of MTCT of HIV by 2015" as the overall goal for the 2011-2015 scale-up plan for the

Prevention of Mother-to-Child Transmission (PMTCT) intervention in Ghana (GAC, 2010). Elimination of MTCT of HIV is defined as the reduction of new HIV infections among children by 90% or a reduction of MTCT rate to less than 5%.

WHO estimates that without any intervention, 15-45% of exposed babies (babies born to HIV-positive mothers) are likely to be infected vertically during pregnancy, labour or breastfeeding (WHO, 2014). The Prevention of Mother-to-Child Transmission (PMTCT) intervention is known to reduce this risk (Brocklehurst & Volmink, 2002; Azcoaga-Lorenzo *et al*, 2011; Anoje *et al*, 2012). The Center for AIDS Prevention Studies at the University of California (CAPS) San Franciso reported in 2002 that the MTCT rate in the United States had reduced from 20% in 1994 to less than 2% within 10 years of the implementation of the PMTCT intervention (CAPS, 2002). Ikechebelu and colleagues observed that similar success rates can be achieved in the less developed world (Ikechebelu *et al*, 2011).

Ghana has been implementing PMTCT since 2001. This intervention package involves four prongs namely, the primary prevention of HIV in women in fertile age, prevention of unplanned pregnancies among women living with HIV, preventing HIV transmission from a woman living with HIV to her infant and providing appropriate treatment, care and support to mothers living with HIV and their children and families (GAC, 2010). In 2012, 2.1% of antenatal mothers were found to be HIV-positive from the HIV sentinel survey (HSS) conducted in Ghana (National AIDS/STI Control Program [NACP], 2013). For such mothers, the third prong of PMTCT (preventing HIV transmission from a woman to her infant) must be achieved. This study therefore focuses on the implementation and outcomes of this third prong of PMTCT.

1.2 PROBLEM STATEMENT

The Western Region of Ghana is the fifth most populous region of the country (Ghana Statistical Service [GSS], 2010). It had an estimated population of 627,891 women in fertile age and over 100,000 expected pregnancies in 2012 (Ghana Health Service [GHS], 2013). The HIV prevalence in the Western Region has been higher than the national median prevalence since 2008; the only exception being in 2011 (Table 1). Among the 10 regions of Ghana, the Western Region was ranked the 4th highest on HIV prevalence among the 10 regions in the 2012 HSS (NACP, 2013).

Table 1: HSS Prevalence for Ghana and Western Region from HSS, 2008 to 2012

Year	**2008**	**2009**	**2010**	**2011**	**2012**
HSS median national prevalence	2.2	2.9	2.0	2.1	2.1
HSS Western Region prevalence	2.9	3.1	2.5	1.9	2.4

(NACP, 2013)

According to UNICEF, national effort towards achieving the PMTCT targets should be guided by studying regional epidemics to direct regional scale-up efforts, improving the availability of PMTCT services and maintaining timeliness and continuity of care for both mother and child (UNICEF, 2010). In keeping with this statement by UNICEF, a region by region analysis of the epidemic is needed.

Although raw data on PMTCT in the Western Region is available, this has not been collated and analyzed to observe the areas for improvement towards the national target of elimination of MTCT. What is also not known are the factors contributing to PMTCT outcomes in the Region.

1.3 RATIONALE

The contributing factors to PMTCT outcomes as well as gaps identified from this study will inform the development of strategies to improve the implementation and outcome of the intervention in the region. This study will also help document the performance of the Western Region in PMTCT.

1.4 CONCEPTUAL FRAMEWORK FOR ANALYSIS OF PMTCT PERFORMANCE

PMTCT coverage and outcome is as a result of the interplay of a number of factors. Some of these factors are described in Figure 1.1 below.

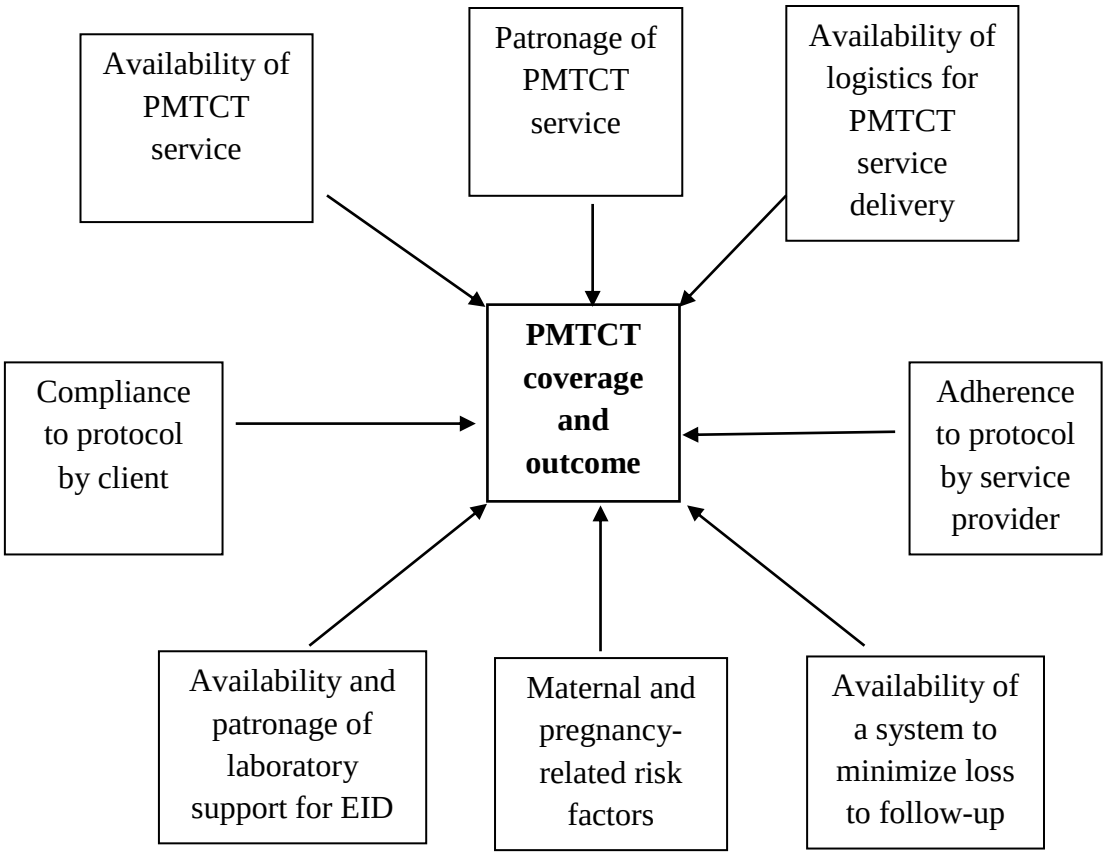


Figure 1.1 Conceptual framework of contributing factors to coverage and outcome of the PMTCT intervention

1.5 OBJECTIVES

1.5.1 General Objective

To assess the performance of the PMTCT intervention in the Western Region of Ghana towards elimination of MTCT in Ghana.

1.5.2 Specific Objectives

1. To describe the coverage and outcome of the PMTCT intervention in the Western Region of Ghana from 2010 to 2013

2. To determine knowledge and practices of midwives implementing PMTCT in the Western Region of Ghana

3. To identify maternal and pregnancy-related factors contributing to PMTCT outcome by 6weeks after delivery in the Western Region of Ghana.

CHAPTER 2

LITERATURE REVIEW

2.1 PATHOLOGY OF HIV INFECTION

The Human Immunodeficiency Virus (HIV) is the causative agent of Acquired Immunodeficiency Syndrome, AIDS. HIV is a retrovirus, belonging to the lentevirus group (Stannard *et al*, 1987). There are two types of the virus; HIV1 and HIV2. Whereas there are some differences in their morphology, HIV1 and 2 are transmitted the same way. HIV 2 however is less transmissible and progresses slower than HIV 1 (Donnelly *et al*, 1993; Martinez-Steele *et al*, 2007; Nyamweya *et al*, 2013). When a person is infected with HIV, the virus attacks the T-helper cells which help the body to fight other infections. This process leads to progressive weakening of immunity such that the individual becomes susceptible to all manner of illnesses and diseases. As HIV infection progresses, viral load becomes higher and CD4 count of the T-helper cells decreases. At end stage of the weakened immunity, the infected individual has acquired immunodeficiency syndrome, AIDS. There is presently no known cure for HIV infection or AIDS but there are antiretroviral drugs which delay the progression of the infection (WHO, 2013).

The infection spreads from person to person through the exchange of body fluids such as blood, breastmilk, vaginal secretions and semen. Although sexual contact is generally the commonest means of transmission, the exchange of body fluids can also occur during blood transfusion, the use of contaminated sharps or pregnancy, delivery and breastfeeding (Levy, 1993; UNAIDS, 2013).

2.2 EPIDEMIOLOGY OF HIV AND MTCT

The Joint United Nations Programme on HIV and AIDS (UNAIDS) reported that globally, an estimated 35.3 (32.2 – 38.8) million people were living with HIV by the end of 2012. About 2.3 million new infections occurred that same year, with 1.6 million deaths (UNAIDS, 2013). Whilst the number of people living with the infection has increased over the previous years due to anti-retroviral therapy, new infections and deaths have shown a decline since 1997, the year in which new infections peaked at 3.2 million (UNAIDS, 2011; WHO, 2014).

Sub-Saharan Africa is home to two-thirds of the world's population living with HIV (including 91% of the world's population of children living with HIV) and is clearly the worst hit by the HIV pandemic (WHO, 2014).

By the end of 2011, an estimated 3.4 million children less than 15years were living with HIV globally. Most of these children were infected by their HIV-infected mothers during the periods of pregnancy, birth or breastfeeding (WHO, 2014).

In Ghana, it has been estimated that 1.37% of the adult population in Ghana were living with HIV by the end of 2012. That same year, the HIV sentinel survey showed a median prevalence of 2.1% among pregnant women. About 30,395 of children aged 0-14years in Ghana were estimated to be HIV-infected, 1704 of them being new infections in the year (NACP, 2013). Almost all HIV infections in children in Ghana are attributed to vertical transmission from an infected mother during pregnancy, labour, delivery or breastfeeding (GAC, 2010). About 3% of all deaths among Ghanaian children aged under 5 years in 2009 were due to HIV (GAC, 2010). In 2010, out of the 18,000 deaths in Ghana attributable to HIV/AIDS, 2080 were children (NACP, 2011). HIV 1 is the predominant virus type in Ghana, accounting for 98% of cases.

2.3 MOTHER-TO-CHILD TRANSMISSION OF HIV

Mother-to-child transmission (MTCT) is said to occur when a mother transmits the HIV infection to her infant or young child. MTCT occurs mainly during pregnancy (pre-partum), labour and delivery (intrapartum) or post-partum through breastfeeding, when the baby comes into contact with the blood or other body fluids of its infected mother. There are other minor channels of transmission, as occurs in the general population. WHO estimates that without intervention, the overall MTCT risk from an infected mother to her child is 15-45% with the greatest risk period for MTCT being during labour and delivery (WHO, 2014).

The timing and channel of MTCT is outlined in Figure 2 below:

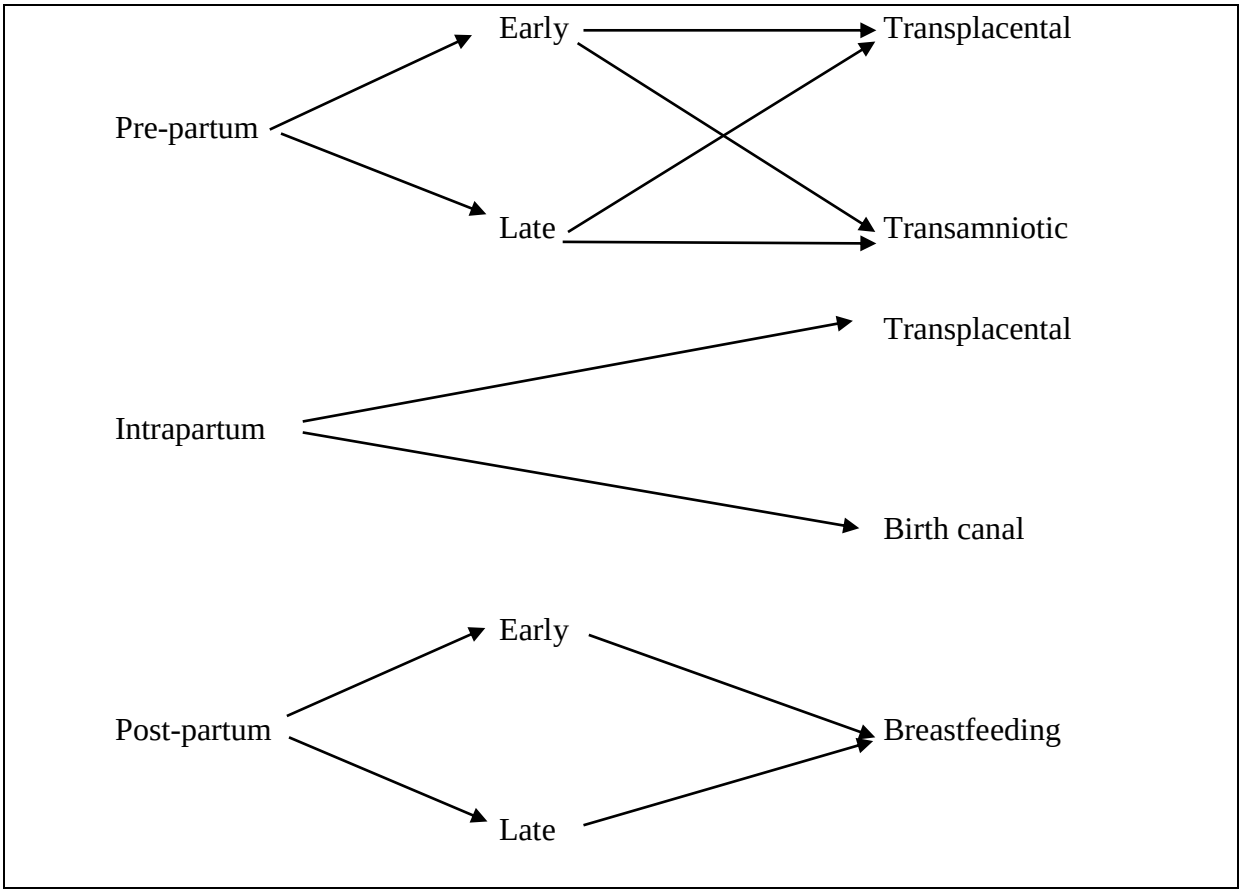


Figure 2: The Time and Place of MTCT

(Courtesy Dr Graham Taylor, Department of GU Medicine & Communicable Diseases, Imperial College, London)

Pre-partum MTCT

MTCT occurs in utero when the virus in the mother's blood crosses the placenta into the baby's circulation (Ackerman & Kwiek, 2013). De Andreis and collegues found that HIV can infect the placenta at all stages of the pregnancy (De Andreis *et al*, 1996). The transmission of HIV in utero is further evidenced by studies in which some babies were tested to have detectable amounts of the HIV virus in their blood within 48 hours after birth by DNA polymerase chain reaction (PCR) (Toth *et al*, 2001). Since it usually takes some weeks from the time of infection to have detectable amounts of the virus in the blood, it can be concluded that these babies were infected before the time of their birth i.e, during the pregnancy (in utero) (Kourtis & Bultreys, 2010; Fowler *et al*, 2007).Without intervention, there is a 5-10% of MTCT of HIV inutero (FMoH, 2007).

Intrapartum MTCT

Most cases of MTCT occur during labour and delivery. The mechanism through which this kind of transmission occurs varies. The baby may be infected either through maternal-foetal microtransfusion which occurs during contractions of labour, or through a breech in the baby's skin which exposes the virus in the mothers blood and body fluids directly to the baby's circulatory system, or as the baby swallows infected maternal fluids during delivery, the baby may become infected through a breech in the mucosal lining of the gut. The collective risk of any of these occurring without intervention is 10-15% (FMoH 2007; Jourdain *et al*., 2007).

Babies who are infected intra partum may test negative for the virus by DNA PCR within 48 hours of birth but test positive after a few weeks may show signs of early infection during the

first weeks of life. The virus will however be detectable in the baby's blood by 6 weeks after delivery (Toth *et al.*, 2001; FMoH 2007).

MTCT through breastfeeding

HIV can be transmitted from mother to child during breastfeeding. The virus may be detectable in the blood by 6 weeks of life if the baby is infected through breastfeeding in the first few days of life (Ziegler *et al*, 1985; Lehman & Farquhar, 2007; FMoH, 2007).

The estimated rick of MTCT from the intrapartum period through to breastfeeding periods is summarized in Table 2 below.

Table 2: MTCT risk during antenatal through to 24months

Transmission period	Maximum risk of HIV MTCT without intervention
During pregnancy	5-10%
During labour and delivery	10-15%
During breastfeeding after birth	5-10%
Overall risk without breastfeeding	15-25%
Overall risk with breastfeeding by 18-24 months	20-35%
Total risk of MTCT	20-40%

(FMoH, 2007)

2.4 RISK FACTORS FOR MTCT

It is known that even without any preventive strategy, about 60% of pregnancies of HIV-infected mothers will not end in MTCT (WHO, 2014). Research has revealed that many factors affect the chances of transmission. Some of these factors are discussed below:

2.4.1 Genetic susceptibility

There are conflicting views that the CCR5-Delta32 genetic mutation could influence the risk of MTCT. Whilst Cavarelli and Scarlatti (2011) did not find viral CCR5 usage a predictive maker for MTCT, Singh and Spector (2009) reported that it seems to confer strong resistance to infection by HIV. CCR5 is a protein on the cell membrane and is called a co-receptor because it works together with the CD4 protein to allow HIV entry into the cell (Blanpain *et al.*, 2002). CCR5 gene was first identified in the mid-1990s and this gene mutation is found most commonly in certain European populations, associated with resistance to other diseases such as smallpox and the Bubonic Plague.

Another mutation suggested by a study to affect susceptibility to HIV infection is the Pk gene. Cells with high levels of Pk were significantly harder to infect with HIV than cells with no Pk (Crabb, 2009). The authors of another study in Brazil linked risk of MTCT of HIV1 to rhesus type of mother (Tess *et al.*, 1998).

2.4.2 Disease Progression

It is established that the higher the maternal viral load at delivery, the higher the MTCT risk (Bultreys & Lepage, 1998).

A low CD4 count is a pointer to an advanced stage of the HIV infection or AIDS and is also a risk factor for MTCT (Delicio *et al.*, 2011).

2.4.3 HIV-RNA levels in genital fluids.

Abrams (2004) observed that high HIV-RNA levels in genital fluids at the time of labour and delivery, pose a higher MTCT risk .

2.4.4 Other maternal infections

Chorioamnionitis (infection of the placenta and membranes as well as genital infections such as Chlamydia) was found in a study in Kenya to increase the risk of in utero transmission of HIV (Mwanyumba *et al.*, 2002). Schwartz *et al* (2000) reported on the contrary that placental inflammatory lesions are not associated with an increase in the risk of perinatal transmission.

2.4.5 Nature of delivery

The risk of intrapartum MTCT is increased with long labour, prolonged rapture of membtanes, preterm delivery, difficult labour requiring episiotomy (Mandelbrot et al., 1996; Carter, 2011). Whilst Mandelbrot *et al* (1996) did not observe a reduction in MTCT rate with elective or emergency caesarian section, subsequent studies have shown a significant reduction in the MTCT rate by caesarian section prior to onset of labour independent of antiretroviral use (The International Perinatal HIV Group, 1999)

2.4.6 Race and Geographic location of birth

A greater proportion of exposed babies born in the developing world get infected as compared to those born in the developed world (Bultreys & Lepage, 1998; Tess *et al.*, 1998). This may play out a number of other factors as confounders in the relationship.

2.4.7 First Born twin

A prospective study by Duliege *et al* (1995) revealed a higher HIV transmission rate among first twin as compared to the second twin in twin deliveries. Scavalli and colleagues also had similar findings and concluded that twin pregnancy was a risk factor for MTCT (Scavalli *et al*, 2007).

2.4.8 Feeding practices

The basic act of breastfeeding exposes the baby to the virus and increases risk of transmission although being on effective ART significantly reduces this risk (Carter, 2011). However, exclusive breastfeeding poses less risk for MTCT than the practice of mixed feeding (Coutsodis, 2000; Coutsoudis *et al*, 2001)

2.5 MEASURING THE PMTCT BURDEN USING HIV SENTINEL SURVEY

The HIV Sentinel Survey (HSS) began in Ghana in 1992 and has since been one of the sources of strategic information on HIV trends in Ghana (NACP/GHS, 2013).

The HSS is a cross-sectional survey which measures the prevalence of HIV among pregnant women attending antenatal clinics (ANC). Blood samples are taken from ANC clients at 40

sentinel sites across the country and analyzed for HIV. The HSS data gives a direct reflection of the proportion of babies exposed to HIV and at risk of being infected by the mother through vertical transmission. HIV among pregnant women is also a good proxy indicator of HIV prevalence among the sexually active population. The HSS data is therefore calibrated with data from other sources to give the national prevalence.

2.6 PMTCT: THE INTERVENTION

According to the National Guidelines for PMTCT in Ghana released by the NACP for implementation since 2008, the strategy comprises the following:

1. primary prevention of HIV infection,
2. prevention of unintended pregnancies among women infected with HIV
3. prevention of transmission from women infection with HIV to their infants and
4. provision of treatment, care and support to women infants and their families.

The intervention to prevent MTCT of HIV during pregnancy, labour, delivery and breastfeeding involves the testing of every pregnant women attending antenatal clinic for HIV and includes treatment with ARVs for those found to be HIV-positive. Currently, in line with current recommendations by the World Health Organization (WHO), Ghana has adopted the use of triple ARV combination regimens from 14 weeks of pregnancy till at least one week after complete cessation of breastfeeding. Infants exposed to HIV in addition receive ARV prophylaxis daily from birth till six weeks age. This is referred to as PMTCT option B. This is a facility-based approach for the PMTCT service provision in Ghana and key service providers are the trained clinicians including midwives, pharmacists and doctors.

Aside this facility-based approach, Ghana practices outreach or community approach for the provision of care and support for mother, baby and their family. Community health workers and volunteers are key in the provision of this service.

To prevent transmission of HIV from mother to infant through infant feeding, the current strategy is to ensure that all mothers who are HIV-positive receive infant feeding counseling:

Feeding options

The mothers who wish to breastfeed are encouraged to exclusively breastfeed for the first six months after which she is advised to add complimentary feeds while breastfeeding may be continued for up to 12 months. The mother will continue to be on her ARVs for the entire breastfeeding period.

Mothers infected with HIV and who are unable to or choose not to breastfeed should only give commercial infant formular milk as a replacement feed to their HIV exposed infants when specific conditions are met. These conditions of acceptability, feasibility, affordability, sustainability and safety (AFASS) include the availability of safe water and good sanitation practices, clean and sufficient infant formula and a family that is supportive of the practice (NACP, 2008).

2.7 EVIDENCE OF THE EFFECTIVENESS OF PMTCT

It is estimated that since 1995, about 400,000 new HIV infections in children have been avoided in low- and middle- income countries as a result of increased access to the PMTCT strategy of providing effective antiretrovirals to pregnant women living with HIV (UNAIDS 2011).

In the United States, PMTCT is regarded as one of the most effective public health interventions (Marino, 2012). The implementation of the PMTCT package of HIV testing, counseling, ARV medication, delivery by caesarian section before the onset of labour and discouraging breastfeeding has reduced the risk of MTCT from as high as 25-30% without intervention to less than 2% in the United States (Fowler *et al.*, 2007; Carter, 2011; Marino, 2012). Similar trends are recorded from the Europoean Community study (EC Study, 2006).

2.8 TESTING FOR HIV IN THE INFANT

WHO recommends early diagnosis of HIV in babies exposed to maternal HIV to allow health-care providers to provide optimal care and treatment for HIV-infected babies, including offering relevant advice on infant feeding. Early infant diagnosis (EID) of HIV also relieves the mother and family of undue stress of the uncertainty of the outcome (WHO, 2007).

The HIV status of a baby can only be determined by testing the baby's blood. Two types of tests can be done: virologic or antibody testing. The choice of testing required to determine if MTCT has occurred is dependent on the age of the child and its breastfeeding status. This is because maternal antibodies may persist in the baby's blood for the first 18 months and a breastfed child remains susceptible to MTCT through exposure to the virus found in breastmilk.

In Ghana, the GAC/NACP has adopted the WHO recommendations for EID (GAC, 2012). HIV DNA PCR is the most widely used virologic test method for EID in the country. It is an automated system which provides qualitative information (yes/no) about the presence of the virus in the blood sample. EID is done in the country by PCR at or after 6 weeks of age (sensitivity > 98%) to identify most of the children infected before, during and immediately

after birth for appropriate healthcare, including ART. Testing before 6 weeks can detect in utero infection but this is not recommended by the national program as routine practice. The timing of repeat test should take into consideration the breastfeeding status of the infant. Virologic testing is also required for children who present with signs and symptoms of HIV for health care. It is recommended that for such children who are aged 9months and beyond, an antibody test should first be done, so that a further virologic test is done only for those who test reactive.

2.9 ELIMINATING HIV INFECTION IN CHILDREN

In 2012, when 62% of women received ARVs for MTCT, it resulted in 35% less children being vertically infected than in 2009 (UNAIDS, 2013). Universal coverage of ARVs among pregnant women living with HIV is key to achieving zero mother-to-child transmission of HIV.

CHAPTER 3

METHODS

3.1 STUDY SETTING

The study was conducted in the Western Region of Ghana (Fig 3). It is the fifth largest region in Ghana with a current projected population of 2,571,882 and growth rate of 2% (Ghana Statistical Service 2010). The Region was re-demarcated from 17 to 22 districts (APPENDIX 1) by the Ministry of Local Government in 2011. Eighteen of these have established Health Directorates whilst 4 districts are being managed by their 'mother' districts.

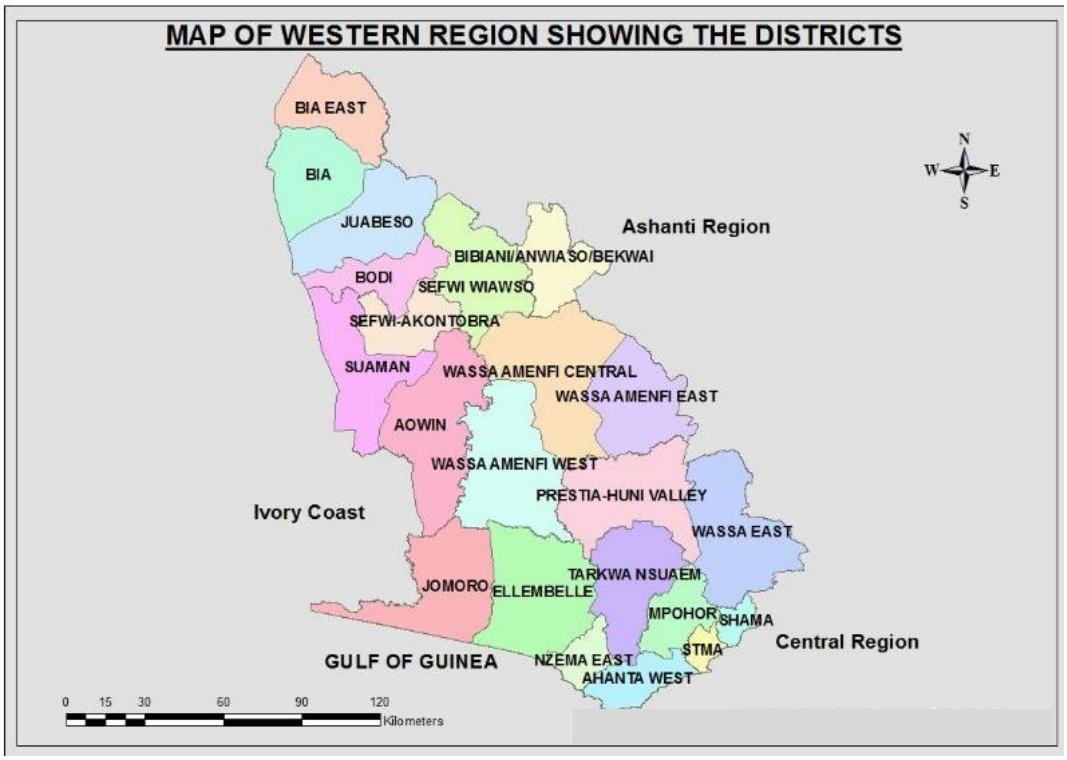


Figure 3: Map of Western Region of Ghana showing 22 demarcated districts

3.2 STUDY DESIGN

The study applied both qualitative and quantitative methods. Whilst a qualitative cross-sectional design was used to determine PMTCT coverage and outcomes as well as midwives' knowledge and practices, a nested case-control design was used to study maternal and pregnancy-related factors contributing to PMTCT outcome by 6weeks after delivery.

3.3 STUDY VARIABLES

3.3.1 The variables studied to describe the coverage and outcome of the PMTCT intervention (Objective 1) were:

i. Availability of PMTCT service delivery sites in the Western Region by 31st December 2013
   a. Number of PMTCT sites
   b. Spatial distribution of PMTCT sites
   c. Availability of PMTCT service at ANC sites

ii. PMTCT burden*
   a. Expected number of HIV-positive ANC clients
   b. Trend of HIV prevalence among ANC clients

iii. PMTCT uptake*
   a. Proportion of expected number of HIV-positive ANC clients actually testing positive

iv. Unmet PMTCT need*
   a. ANC clients not tested for HIV
   b. Estimated cases of MTCT due to missed opportunity*

**Defined under List of Operational Definitions*

v. PMTCT outcomes* at EID

   a. Proportion of ANC clients testing positive for HIV presenting samples for EID at ENRH

   b. Rate of MTCT among PMTCT clients in the Western Region at EID

   c. Characteristics of babies experiencing MTCT

**Defined under List of Operational Definitions*

3.3.2 Variables studied to determine knowledge and practices of midwives implementing PMTCT in the Western Region (Objective 2) were:

i. Knowledge about the PMTCT target

ii. Knowledge of the PMTCT protocol

iii. Timing of offer of HIV testing

iv. How continuum of care for mother and baby is maintained

v. Follow-up effort

vi. Challenges faced

3.3.3 Variables studied to identify maternal and pregnancy-related factors contributing to PMTCT outcome by 6weeks after delivery (Objective 3):

Dependent Variable: The HIV status of the baby at 6weeks at EID by PCR.

Independent Variables

1. Maternal variables:

i. Demographic characteristics

   a. Age

   b. Religion

   c. Area of residence

ii. Socioeconomic factors

   a. Marital status
   b. Occupation
   c. Highest level of education
   d. Level of income
   e. Type of accommodation

iii. Drug use

   a. IPT use
   b. Use of herbal medications

iv. Health status

   a. Concurrent illnesses during pregnancy: malaria, hypertension, diabetes, tuberculosis

v. Family support

   a. Disclosure of status to partner
   b. Partners attitude to pregnancy

2. Pregnancy-related independent variables

i. Birth order of the pregnancy

ii. Type of pregnancy (singleton/multiple)

iii. Type of delivery

3.4 DATA COLLECTION AND TOOLS

The mode, tools and data sources for data collection under each objective are displayed in Table 3.1 below.

Table 3.1: Data Collection Methods, Tools and sources

Objective	Data collection method	Data collection tool	Respondent/Data source
To describe the coverage and outcome of the PMTCT intervention in the Western Region of Ghana from 2010 to 2013	Key Informant Interview	Key Informant Interview Guide (Appendix XI)	1. Regional HIV Data manager at Regional HIV Unit 2. Health Information Officer, Regional Health Directorate 3. District Public Health Nurses
	Record review	Record Review Guide (Appendix XII)	1. Regional records on PMTCT in District Health Information Management System (DHIMS) 2. Laboratory records on EID at PHL
To determine knowledge and practices of midwives implementing PMTCT in the Western Region	In-depth interview	Interview guide (Appendix IX)	Midwives at PMTCT service delivery sites in Shama District
To identify maternal and pregnancy-related factors contributing to PMTCT outcome by 6weeks after delivery in the Western Region of Ghana	Questionnaire administration	Questionnaire (Appendix X)	PMTCT clients

3.5 SAMPLING

For objective 1, all Regional PMTCT records available in DHIMS and all PCR records available at the Regional Public Health Laboratory were reviewed. Every District Public Health Nurse available was also interviewed. Objective 2 required selection of a district in which the midwives implementing PMTCT were then sampled. For objective 3, sampling was done for PMTCT clients in the Region.

3.5.1 Selection of District

The selection of a district was based on its PMTCT workload (defined in this study as the number of ANC clients testing positive for HIV). The 4-year average PMTCT workload was calculated for the Region and each of the 22 districts using DHIMS data from 2010 to 2013. The district with its average workload closest to the median for the Region was to be selected. The workload ranged from 6 to 293 in the districts, with a regional mean of 71 and median of 55. Three districts had average workloads around the regional median: Juabeso (59), Sefwi Akontombra (51) and Shama (59). (Appendix 2). Shama District was selected for convenience of proximity.

3.5.2 Sampling for midwives in the selected district

At each PMTCT site in the selected district (Shama District), a minimum of 1 and a maximum of 3 midwives were randomly selected by balloting and subsequently interviewed.

3.5.3 Sampling for PMTCT clients

Scavalli et al (2007) assessed the risk associated with twin pregnancy and found that transmission rate in a twin gestation was 28.3% and 13.5% in singleton pregancies, adjusted Odds Ratio=2.5, p=0.002.

Applying these findings, the difference in proportions formula below was used to calculate the required sample size

$$n = (\frac{r+1}{r}) \frac{(\bar{p})(1-\bar{p})(Z_{\beta} + Z_{\alpha/2})^2}{(p_1 - p_2)^2}$$

Where n= number of cases

r= ratio of controls to a case = 2

$\bar{p}$ = A measure of variability (similar to standard deviation) = 0.265

Z_{β} = the z-score of the desired power = 0.84

$Z_{\alpha/2}$ = the z-score for the desired level of statistical significance = 1.96 for 95% confidence interval

$(p_1 - p_2)^2$ = Effect Size (the difference in proportions) = 14.8%

p_2 = proportion exposed among the control group = 13.5 %

p_1 = proportion exposed among the cases = 28.3 %

the number of cases 'n' required was calculated as 36 with corresponding 72 controls.

Inclusion criteria

All HIV-positive women enrolled in PMTCT care at the selected facilities in the Western Region who had attained at least 34weeks of gestation were recruited into the study by consent until the desired sample size was attained or the five months for data collection period had elapsed. These mothers recruited at the ANC clinics formed the cohort from which the cases and the controls were selected.

Definition of Cases and Controls

Case: A PMTCT client whose baby tested positive for HIV at 6 weeks by PCR

Control: A PMTCT client whose baby tested negative for HIV at 6weeks by PCR

Sampling for Cases and Controls

All incident cases were selected. Two controls were randomly selected for each case from the same PMTCT site as the case or the geographically nearest site. The controls for each case were the first two PMTCT clients receiving their HIV-negative EID results after the case.

Selection of controls from the same PMTCT site was to reduce confounding effect of quality of care, including counseling.

3.6 DATA QUALITY CONTROL MEASURES

3.6.1 Pretesting of Questionnaires

Questionnaires were pretested at the Shama Health Centre by the data collection team to ensure that questions asked were clearly understood by participants. Some questions were revised to improve clarity.

3.6.2 Training of Data Collection Personnel

The data collection team, comprising a Pharmacist, 2 Nursing Officers and 2 Community Health Nurses were trained to administer the questionnaire uniformly.

3.6 DATA ANALYSIS

3.6.1 The plan for analysis to describe the coverage and outcome of the PMTCT intervention in the Western Region of Ghana from 2010 to 2013 (Objective 1) is described in the Table 3.2 and 3.3 below.

Table 3.2 Plan for analysis of coverage of PMTCT services

FACTOR/ VARIABLE	OPERATIONAL DEFINITION OF FACTOR/VARIABLE	INDICATORS TO MEASURE FACTOR/VARIABLE
Availability of PMTCT services	A measure of geographical accessibility to PMTCT service	1. Number of PMTCT service sites
		2. Spatial distribution of PMTCT sites
		3. Number of antenatal clinics providing PMTCT service
PMTCT Burden	Is a measure of the need for PMTCT services in a given population.	1. Expected number of HIV-positive antenatal clients (using HSS prevalence) This was calculated by multiplying HIV prevalence by expected number of pregnancies for the year. Prevalence used in this formula was the national median prevalence obtained from the HSS for that year. The HSS report for 2013 had not been made available by NACP at the time of completion of this report therefore an assumed prevalence of 2.1% was used, on the premise that the national prevalence had remained the same (2.1%) for 2011 and 2012. Expected pregnancies were calculated as 4% of total population from 2010 to 2012 but as

FACTOR/ VARIABLE	OPERATIONAL DEFINITION OF FACTOR/VARIABLE	INDICATORS TO MEASURE FACTOR/VARIABLE
		3% of the total population for 2013, as directed by the Regional Health Information Unit of the Western Region.
		2. Trend of HIV prevalence among antenatal clients tested. Using data available in the DHIMS, the annual prevalence of HIV among ANC clients tested was calculated as the proportion of ANC clients testing positive for HIV among the total number of ANC clients tested for HIV in a given year. Annual prevalence thus calculated from DHIMS data was then compared to prevalence figures obtained in the HSS for the Western Region.
PMTCT Uptake	The extent to which the expected PMTCT need is actually met.	1. Proportion of expected number of HIV-positive antenatal clients actually testing positive This was compared to ANC coverage which was calculated as proportion of expected ANC registrants (expected pregnancies) actually accessing ANC services
Unmet PMTCT need	The extent to which the expected PMTCT need is not met by not testing antenatal clients for HIV	1. Proportion of ANC Clients not tested for HIV
		2. Estimated Number of New Cases of

FACTOR/ VARIABLE	OPERATIONAL DEFINITION OF FACTOR/VARIABLE	INDICATORS TO MEASURE FACTOR/VARIABLE
		MCTC Due to Missed Opportunity This was calculated applying the MTCT rate without PMTCT intervention among the estimated numbers of HIV-positive mothers missed through non-testing for HIV at ANC.

Table 3.3: Plan for analysis of PMTCT outcomes

VARIABLE/FACTOR	INDICATORS TO MEASURE VARIABLE
Patronage of EID services by district	Proportion of PMTCT clients whose samples were sent for EID at ENRH PHL
MTCT rate at EID	Proportion of samples testing positive for HIV at EID from PCR records at ENRH PHL
MTCT risk by person, place and time	
Continuum of PMTCT care	Number of target clients served along the stages of ANC and PMTCT service delivery.
MTCT rate among cohort	Proportion of mothers in the cohort whose babies test positive for HIV at 6 weeks

3.6.2 Data analysis to determine knowledge and practices of midwives implementing PMTCT in the Western Region (Objective 2);

The interviews was recorded and transcribed, then analyzed for themes and significant quotes.

3.6.3 Data analysis to identify maternal and pregnancy-related factors contributing to PMTCT outcome by 6weeks after delivery in the Western Region of Ghana (Objective 3);

Epi Info was used to calculate odds ratios and fishers exact propabilities as a test of significance of the factors that were studied (listed under variables).

3.7 ETHICAL CONSIDERATION

Ethical clearance to undertake the study was sought and obtained from the Ghana Health Service Research Unit. All potential interviewees were requested to give verbal or written consent before interviews and administration of the questionnaire, after the objectives of the study had been read or explained to them. Data was also coded to provide confidentiality.

CHAPTER 4

RESULTS

4.1 COVERAGE AND OUTCOMES OF THE PMTCT INTERVENTION IN WESTERN REGION OF GHANA

4.1.1 The PMTCT Coverage across Districts

The PMTCT coverage was described by the availability of PMTCT service, the PMTCT burden, the PMTCT uptake and the unmet PMTCT need.

a. Availability of PMTCT Service Delivery Sites

Number and type of PMTCT sites

Out of a current total of 421 health facilities in the Western Region, 131were known to the Regional HIV unit as PMTCT sites. Follow-up information obtained from 14 out of 18 District Public Health Nurses (DPHNs) yielded an additional 51, giving a total of 182 facilities which provide PMTCT in the districts (Appendix III). Four DPHNs were not available for interview.

PMTCT service is provided at all levels of health care delivery. This includes government facilities: Regional Hospital, District Hospital, Polyclinics, Health Centres and CHPS compounds, as well as private facilities: Hospitals, Clinics and maternity homes. Christian Health Association of Ghana (CHAG) institutions and quasi-government health institutions also provide the service.

Spatial Distribution of PMTCT Sites

The map below (Figure 4.1) shows a fairly even spatial distribution of 176 PMTCT sites in the Western Region. Co-ordinates for the other 6 facilities were not available at the time of completion of this report.

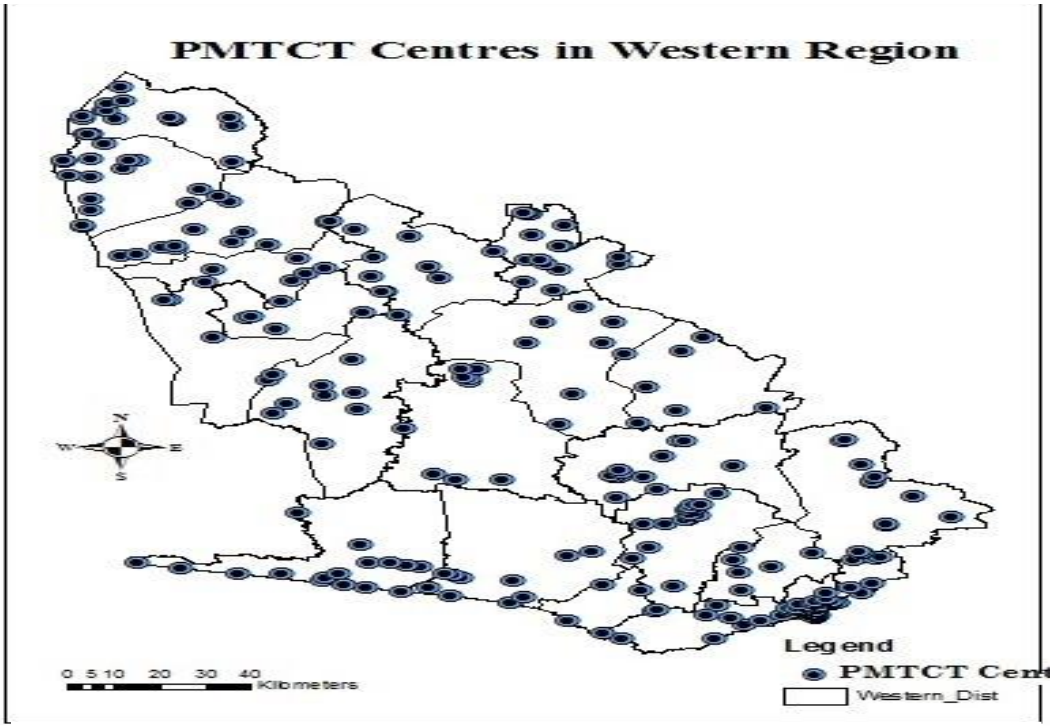


Figure 4.1: Map of Western Region Showing Spatial Distribution of 176 PMTCT Sites

Availability of PMTCT Service at ANC Sites

There were 42 facilities which provided ANC but were not included in the list of PMTCT sites provided by the DPHNs. All 42 facilities were private clinics, CHAG institutions or CHPS compounds. (Appendix IV)

b. PMTCT Burden

The PMTCT burden described in this study was measured by the expected numbers of PMTCT clients and by the trend of HIV prevalence among ANC clients from 2010 to 2013.

Expected Number of PMTCT Clients

The number of ANC clients expected to require the third prong of the PMTCT intervention was calculated as:

[(HIV prevalence) x (expected number of pregnancies for the population for a given year)].

A total of 8,690 clients were expected to require the third prong of PMTCT from 2010 to 2013 (Table 4.1).

Table 4.1: Annual Statistics on PMTCT Burden for Western Region of Ghana, 2010-2013

Year	National HSS Prevalence a	Total Population** B	Expected Pregnancies c = b x d (d = proportion of total population	Expected Number of Clients Requiring PMTCT e = [a x c]/100
2010	2.0	2,792,754	111,710 (4%)	**2,234**
2011	2.1	2,886,583	115,463(4%)	**2,425**
2012	2.1	2,743,300	109,732(4%)	**2,304**
2013	2.1*	2,745,070	82,352(3%)	**1,729**
Total				**8,690**

*assumed

**Source: Western Regional Health Information Unit

Trend of HIV Prevalence Observed Among ANC Clients Tested For HIV

Analysis of the DHIMS raw data revealed a downward trend in Western Regional HIV prevalence among ANC clients tested over the period, from 2.3% in 2010 to 1.9% in 2013 with a peak in 2012. Prevalence by HSS also declined from 2.5% in 2010 to 2.1% in 2012 (Figure 4.2).

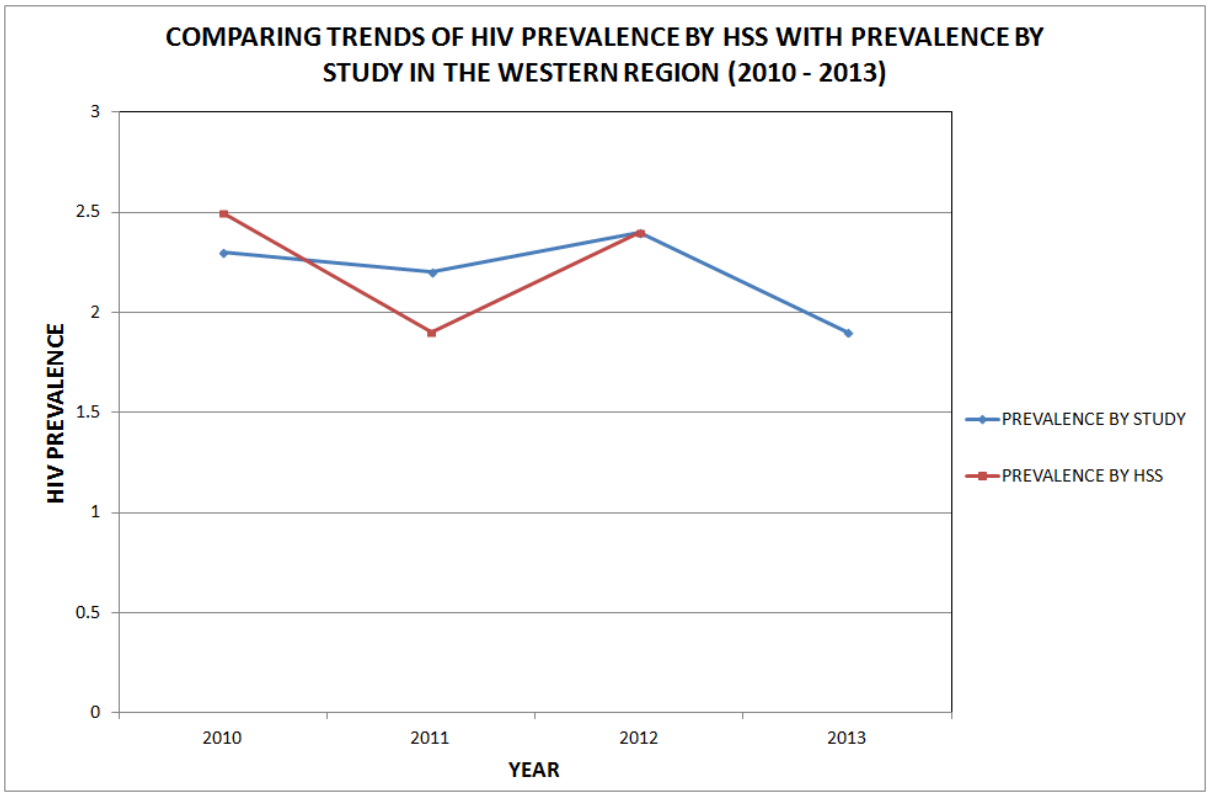


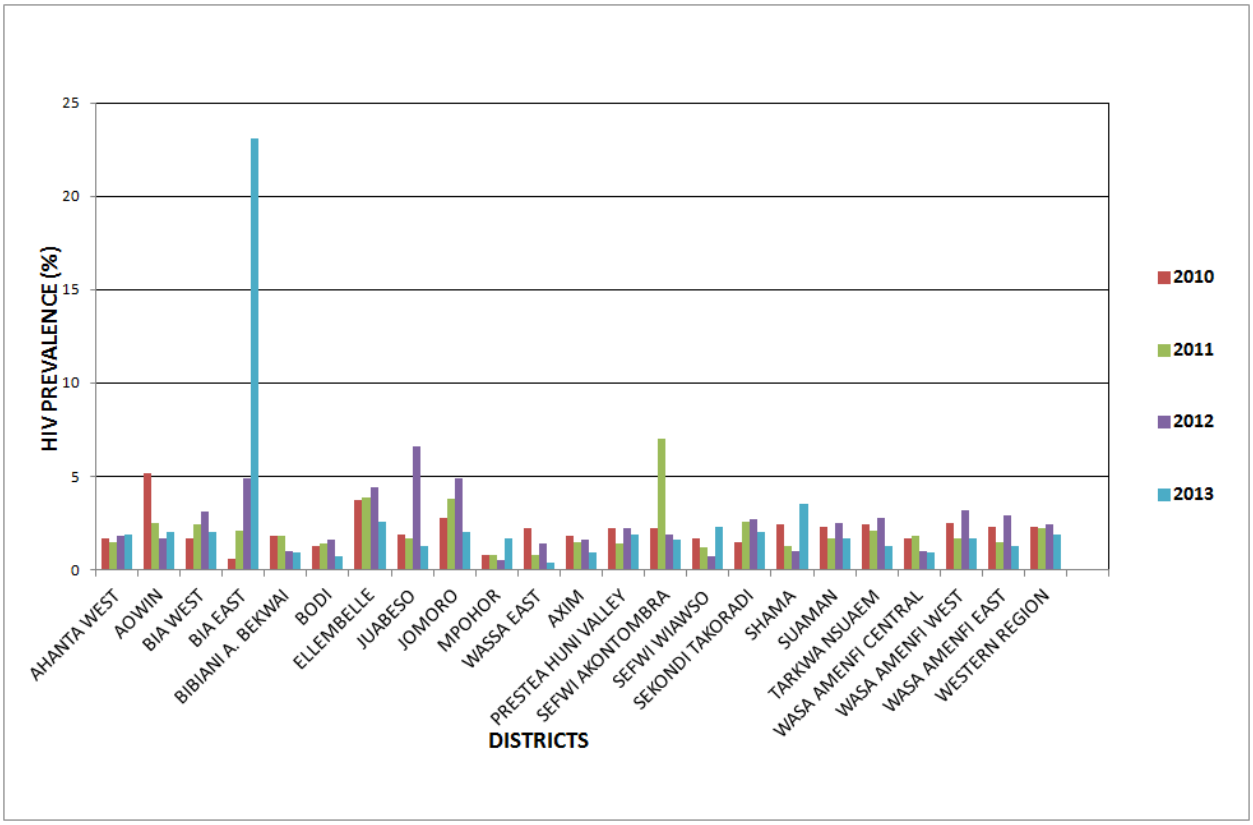
Figure 4.2: Trend of HIV Prevalence by Study and by HSS, Western Region, 2010 to 2013

District Trend of HIV Prevalence among ANC Clients Tested

The highest annual prevalence recorded was in 2013 for Bia East when 91 out of 394 ANC clients tested positive for HIV (23.1%) and lowest in Wasa East for the same year at 0.40% (13 out of 3213 ANC clients). Two districts, Ellembelle and Jomoro over the 4-year period consistently recorded prevalence higher than the regional figure. Bibiani Anhwiaso Bekwai

was the only district which showed a consistent decline in ANC prevalence of HIV from 1.85 in 2010 to 0.90 in 2013.

The district by district prevalence among ANC clients tested for HIV from 2010 to 2013 (Appendix VI) was calculated from DHIMS and is graphically shown in Figure 4.3 below.



(Calculated from Western Region DHIMS Data 2010-2013)

Figure 4.3: Trend of HIV Prevalence among ANC Clients Tested by Districts in the Western Region of Ghana, 2010 to 2013

c. PMTCT Uptake

The annual PMTCT uptake was calculated as the proportion of actual number of ANC clients testing positive for HIV to the number expected to test positive for HIV that year.

It was observed from the analysis of DHIMS data that from 2010 to 2013, the annual PMTCT uptake in the Region ranged between 56.9% and 78.2%. This was compared to the ANC coverage for the period, where ANC coverage was measured as the ratio of the actual number

of ANC clients to the expected pregnancies for a given year. Unlike the PMTCT uptake that was consistently less than 100%, the ANC annual coverage in the Western Region was higher, ranging from 138 to 148% (Figure 4.4).

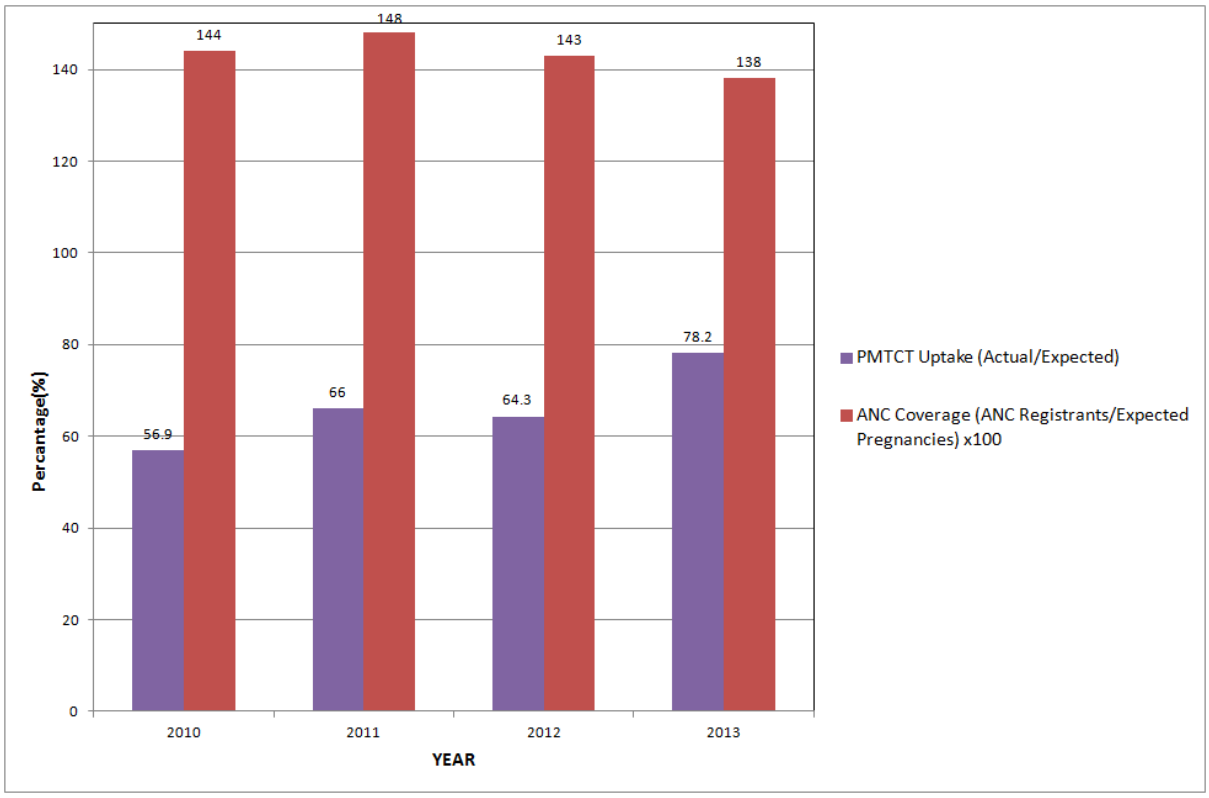


Figure 4.4 Annual PMTCT Uptake and ANC Coverage in the Western Region of Ghana, 2010 to 2013.

d. Unmet PMTCT Need

The PMTCT unmet need described in this study is a measure of the extent of missed opportunities, where a missed opportunity describes a situation where an ANC client was not tested for HIV.

It was observed from the DHIMS data that not all ANC registrants were tested for HIV (Appendix V). Analysis of the data showed that the average annual untested proportion of ANC clients over the 4-year period from 2010 to 2013 was highest in the Bia areas of the

Region, with 80.1% in the Bia East district, 74.1% in Bodi District and 70.9% in Bia West. Mpohor District recorded a low proportion of untested ANC clients at 3.2% whilst the Sekondi-Takoradi Metropolis tested more than its registered ANC clients by 10% (Figure 4.5).

As a region, an annual average of 36.3% of the ANC registrants was not tested for HIV (Appendix VII).

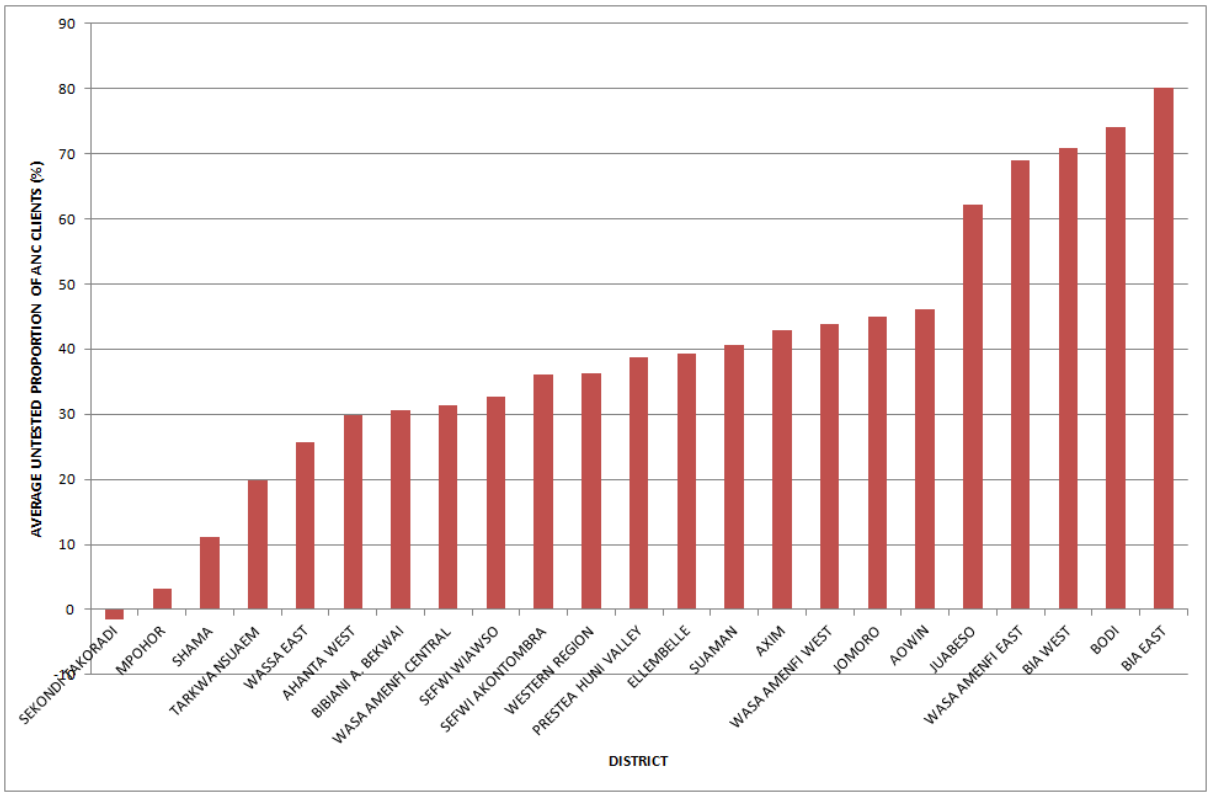


Figure 4.5: Graph Showing Annual Average Proportion of ANC Registrants Not Tested for HIV by Districts of the Western Region, 2010 – 2013

Estimated Number of New Cases of MTCT Due to Missed Opportunity

Over the four year period, it was observed that 36.3% of ANC clients (147,990 n=408,201) were not tested for HIV. Applying the national HSS prevalence for each individual year, a

total of 3071 HIV positive ANC clients were expected to have been missed. Using the WHO MTCT rate without intervention of 15 to 45%, a minimum of 461 and maximum of 1382 new cases of vertical transmission of the HIV infection are estimated to have resulted from missed opportunity to test ANC clients for HIV (Table 4.2).

Table 4.2: Estimated Number of Infected Babies Due to ANC Clients Not Tested for HIV in the Western Region of Ghana, 2010 – 2013.

	Year				
	2010	2011	2012	2013	Total
Number of ANC clients not tested for HIV	36699	32459	45636	33196	147990
Expected number of PMTCT clients missed	734	682	958	697	3071
Estimated number of infected babies born to missed PMTCT clients at 15% MTCT rate	110	102	144	105	**461**
Estimated number of infected babies born to missed PMTCT clients at 45% MTCT rate	330	307	431	314	**1382**

CALCULATED FROM WESTERN REGION DHIMS DATA 2010-2013

4.1.2 PMTCT outcomes at EID in the Western Region

Records on 379 samples for EID sent to the Effia Nkwanta Hospital Public Health Laboratory (ENRH PHL) from 22nd November 2011 to 12th November 2013 were compiled and reviewed (Appendix VII). The 2-year period was the period during which service for EID by polymerase chain reaction (PCR) was available at the ENRH PHL.

Patronage of EID services

The number of samples received at the ENRH PHL was compared to the number of ANC clients who tested positive in each district for 2012 and 2013. Seventy-nine (79) records had missing entries on submitting facility. Available records showed that over the period, either some districts did not send any samples to the Regional Public Health Laboratory or failed to indicate the names of the facilities submitting the sample on the EID request form. These 9 'silent' districts were Wasa East and Mpohor Districts of the southern zone of the region, Prestea Huni Valley, Aowin and Suaman districts of the middle zone and Bia East, Bia West, Bodi and Juaboso of the northern zone.

EID sample submission rate ranged from 0% in the 'silent' districts to 43.75 in Bibiani Anhwiaso Bekwai district, where 35 samples from 80 ANC clients were submitted in 2012 and 2013. As a region, out of the 2,834 ANC clients who tested positive over the 2-year period, the PMTCT outcome could be determined for 13.4% (379, n=2834).

MTCT Rate at EID

As shown in Table 4:3 below, twenty-one out of 379 samples received at the ENRH PHL tested positive for HIV by PCR, translating to an MTCT rate of 5.5 (95% CI=3.5% - 8.5%). It is emphasized here that the ART status of these 379 babies and their mothers could not be ascertained.

Table 4.3: MTCT at EID, ENRH PHL, November 2011 to November 2013.

Number of Samples Tested	Number Testing Positive	MTCT Rate (%)
379	21	5.5

Analysis of MTCT Risk

a. MTCT Rate by Sex of Babies

The sex of the HIV-exposed babies was not recorded for 14 samples. For the remaining 365, there was an even distribution of males and females; 51% (187) females and 49% (178) males. MCTC rate among the female babies was 6.4%, but lower among the males at 5.1%. (Table 4.4)

Table 4.4: EID Results by Sex at ENRH PHL, November 2011 to November 2013

	EID results		
Sex	Negative	Positive	Total
Female	175	12 (6.4%, n=187)	187
Male	169	9 (5.1%, n=178)	178
Missing			14
Total	344	21	379

OR= 0.78, p=0.57

b. MTCT Rate by Age at Which Samples are Taken

A total of 97 records had missing data on the age at which sample was taken. As shown in Table 4.5 below, among the remaining 282 records, only 14.9% (42, n=283) had been taken at the recommended age of 6weeks. At least 191 samples (67.7%, n=379) were taken after 10weeks of age.

Table 4.5: Distribution of Age at Which Samples for EID Were Taken

Age Range	Frequency	Percent
Less Than 6weeks	1	0.3%
6weeks	42	11.1%
7 - 10weeks	47	12.4%
11 - 52weeks	171	45.2%
1 to 1.5years	20	5.3%
Missing	97	25.6%
Total	379	100.0%

The MTCT rate was higher for the group whose samples were taken at or before 6 weeks of age; 6.8% (3, n=44), as compared to 5.0% (12, n=238) for the older group (Table 4.6).

Table 4.6: EID Results by Age Group at ENRH PHL, November 2011 to November 2013

	EID RESULTS		
Age group	NEGATIVE	POSITIVE	TOTAL
6 weeks or less	41	3 (6.8%)	44
More than 6 weeks	226	12 (5.0%)	238
Missing	91	6	97
TOTAL	358	21	379

OR=0.73, fishers exact probability=0.42

c. MTCT Rate By Type of Gestation (Singleton Versus Twin)

There were 8 sets of twins whose samples were analyzed for HIV. For six pairs of twins, both twins tested negative. One set of twins both tested positive at 6weeks and for another set there were discordant results as the male twin tested positive whilst the female tested negative for HIV at 8months.

As shown in Table 4.7, MTCT rate among singletons was 5.0% (18, n=363) whilst MTCT rate among twins was higher at 18.8% (3, n=16). Further analysis among first and second twins was not possible since this information was not provided in the data captured from the EID request form.

Table 4.7: EID Results by Twin Status at ENRH PHL, November 2011 to November 2013

	EID Results		
Twin Status	Negative	Positive	Total
Singleton	345	18 (5.0%)	363
Twin	13	3 (18.8%)	16
Total	358	21	379

OR=4.4, Fisher exact=0.05

d. MTCT Rate by Submitting Facility

Seventy-nine (79) records had missing data on submitting facility. From the analysis of available data, the highest MTCT risk occurred among babies whose samples were submitted by Bibiani Government Hospital; 14.3% (5, n=35). The 5 babies who tested positive from Bibiani included a set of twins. MTCT rate by facilities are shown in Table 4.8 below:

Table 4.8: MTCT rate by PMTCT Site

Facility	Number of Samples Submitted	Number of Samples Testing Positive for HIV	MTCT rate (%)
Apowa Health Centre	1	0	0
Asankragua	6	0	0
Axim Government Hospital	9	1	11.1*

Bibiani Government Hospital	35	5	14.3*
St Martin De pores Hospital, Eikwe	21	1	4.8
Effia Nkwanta Regional Hospital	115	6	5.2
Essikadu Hospital	2	0	0
GHAPOHA hospital	5	0	0
Half Assini Government Hospital	15	0	0
Sefwi Asafo	5	0	0
Sefwi Wiawso Government Hospital	29	1	3.4
Shama Health Centre	13	1	7.7*
Takoradi Hospital	18	1	5.6
Tarkwa Government Hospital	41	3	7.3*
Wasa Akropong Government Hospital	10	0	0
Missing	54	2	
Total	379	21	5.5

* Higher than Regional rate

Summary Cascade of Continuity of PMTCT Care in the Western Region, 2012 To 2013

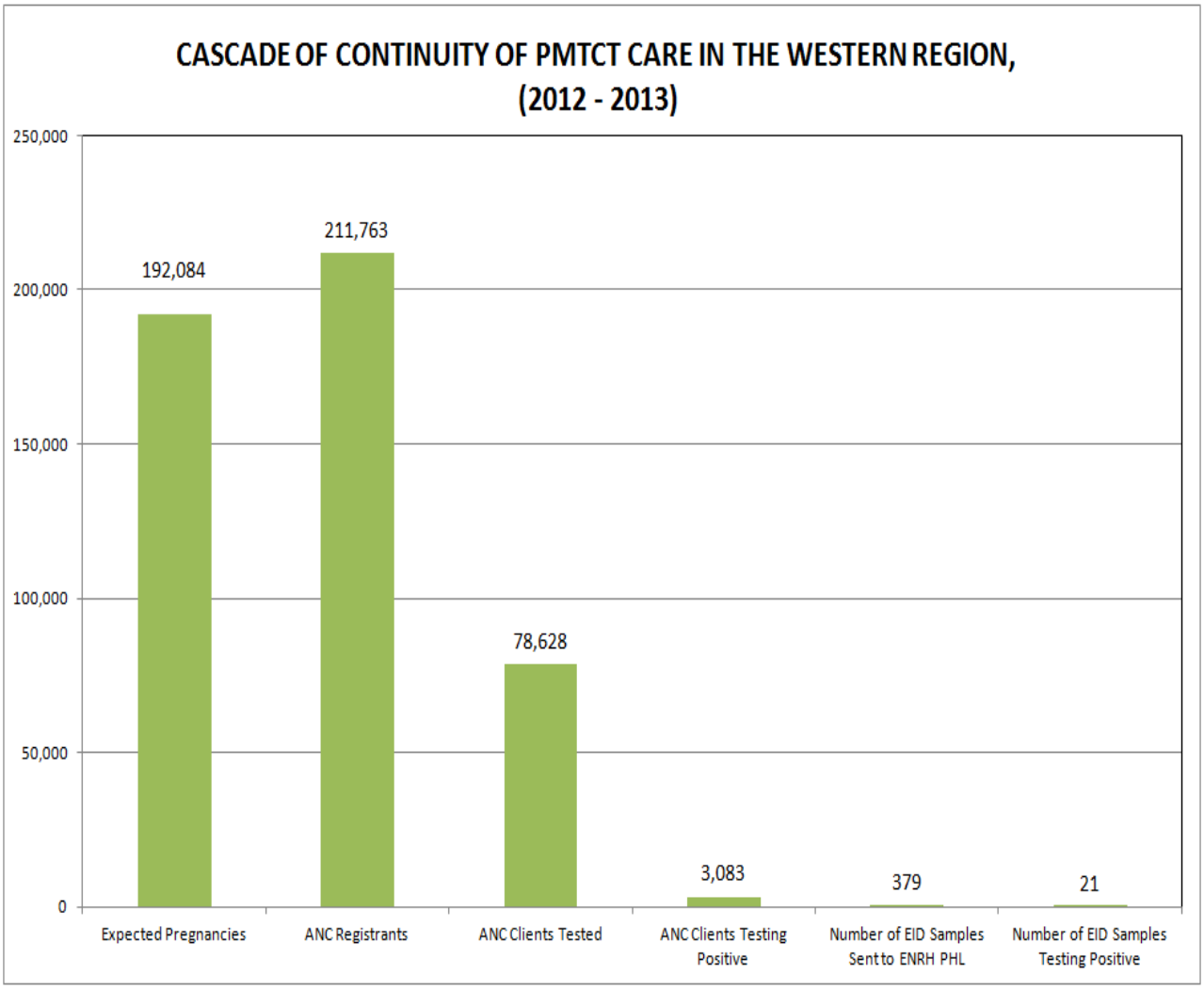


Figure 4.6: Cascade of PMTCT Services, Western Region, 2010 – 2013

The summary cascade of PMTCT service in the Western Region over the 2-year period (Fig 4.6) shows that more ANC clients than expected were registered. The reason for this phenomenon was not investigated in this study but may be as a result of double reporting or clients from outside the Western Region accessing care in the region.

4.2 KNOWLEDGE AND PRACTICES OF MIDWIVES IMPLEMENTING PMTCT IN THE WESTERN REGION OF GHANA

Table 4:9 below shows the distribution of midwives in the Shama District and the proportion interviewed.

Table 4.9: Distribution of Midwives Interviewed By Facility

Facility/PMTCT site	Number of Midwives Providing PMTCT	Number Of Midwives Interviewed	Percentage Of Midwives Interviewed
Shama Health Centre	7	3	42.8
Supomu-Dunkwa Health Centre	3	1	33.3
Benedict Hospital	2	1	50
VRA Hospital	5	1	20
Total	16	6	37.5

4.2.1. Knowledge about National Target for PMTCT

Only 2 out of the 6 (33.3%) midwives were aware of a national target for PMTCT but only one midwife however could correctly state the target. Both midwives had had her formal training in PMTCT within the past year (in 2013). The wrong answer given was, *" I think it (MTCT) was to reduce it by 2015 but I can't remember the exact figure".*

Of the other 4 midwives who were unaware of a national PMTCT target, one had not had any formal training in PMTCT whilst the others had been trained in 2006, 2010 and 2012 respectively.

4.2.2 Knowledge About 4-Prongs of PMTCT

One midwife (16.7%) knew about the 4 prongs of PMTCT, but could not correctly state them. This midwife was the same one who had correctly stated the National PMTCT target.

She answered, *"1. To prevent primary HIV infections among women, 2. To prevent mother to child transmission using ARVs. As for the other two, I will have to check my notes to be sure"*

4.2.3 Practice of PMTCT during Antenatal to Post Delivery Period

Time of Testing (Initial and Repeat)

The offer of HIV testing is first given at registration (first antenatal visit) by all the midwives interviewed. However, if it is not done, it is continued to be offered at each visit.

For those who test negative at registration, two of the midwives do not conduct the test again at a later gestational age. Other responses indicated that the test is repeated, *"at 34 weeks", 'before they deliver'* and *'at 36 weeks, if the kits are not in short supply'.*

Qualification for ARVs

All six midwives correctly said that every ANC client who tests positive for HIV qualifies to receive ARVs, irrespective of her CD4 count.

Time of Initiation of ARVs

Five of the midwives said the ART was initiated for the PMTCT client as soon as she was referred to the ART clinic for drugs. The midwife who had not had formal training in PMTCT said treatment should start "*in the second trimester, as long as it will not harm the baby".*

Source of ARVs (Site)

The ART site where mothers receive their drugs depends on the preference of the mothers. However, the two preferred sites mentioned were Effia Nkwanta Hospital and Shama Health Centre.

4.2.3 Reasons why Some Mothers Refuse HIV Test

Two midwives had experienced a client each opting out of doing the HIV test over the past year. These two midwives normally carry out the test themselves as part of focused antenatal care whilst the other 4 midwives add a request for HIV test to the laboratory as part of the routine tests done for their clients at registration. Reasons the midwives reported to have been given by the mothers for opting out were: *"My husband doesn't want that", "I have to tell my husband first"* and *"I am afraid"*.

In one instance, although the woman kept refusing, the midwife persisted in offering the test at each visit and eventually got the client to accept the test, which turned out positive.

4.2.4 Continuum of Care

Completion of the midwife's role for PMTCT

All midwives interviewed indicated that their work ends at 6weeks after delivery, when the mother comes for her postnatal visit. No reference was made to the knowledge of the outcome of the PMTCT intervention in response to this question, although the interviewer probed to find out the package of services rendered during that postnatal visit.

Follow-up Effort for defaulting PMTCT clients

Five out of the 6 midwives had ever experienced default by PMTCT clients. Three of the 5 midwives said they did nothing about it, since they assumed that they would *"continue care somewhere else".* Two midwives whose PMTCT clients defaulted said they made the effort to call the clients on phone and one midwife had ever followed up to the defaulter's home. In the long run, *"some come back, some don't"*. The engagement of community health workers to trace defaulters was not mentioned.

4.2.5 Practice of EID

Knowledge about timing for EID

Two midwives did not know anything about EID. These were the midwife who had not had any formal PMTCT training and another who was trained in 2010. All the 4 midwives who knew about EID correctly identified the right time for EID as 6 weeks after birth.

Patronage of EID Service

"The laboratory officer is called to take the sample", "she goes to Effia Nkwanta to do it" and *"I don't know"*, were the responses given to the question about who takes the baby's sample for EID. According to the midwives, all samples taken were sent to ENRH PHL. However, records on EID samples received at ENRH PHL indicated receipt of samples from only one facility in the Shama District; Shama Health Centre. The laboratory technician who took the sample or the client herself collects the results from the PHL. When the client collects the result, she usually does not communicate with the midwife what the result was but rather sends it to her ART clinic. In situations where the laboratory technician collects the result from the PHL, he hands it over to the midwife who in turn communicates the results to the client.

4.2.6 Challenges in PMTCT Implementation

The challenges reported by the midwives were, *"sometimes we run out of testkits", "I need a refresher training to know the current things" and "After some mothers test positive, they stop coming to the clinic"*.

4.3 FACTORS CONTRIBUTING TO PMTCT OUTCOMES IN THE WESTERN REGION OF GHANA

A total of 98 pregnant women were eligible to be recruited into the study over the period from February to June 2013 but only 68 gave their consent to be part of the study. EID results were obtained for 33 of the 68 exposed babies by the end of the data collection period. These 33 formed the cohort from which cases and controls were selected. All the 33 mothers had benefitted from ART.

4.3.1 MTCT rate in the cohort of PMTCT clients

Four mothers in the cohort of 33 had their babies testing positive for HIV at EID, giving at MTCT rate of 12.1% (95%CI: 3.4% - 28.0%).

4.3.2 Demography of PMTCT Clients Interviewed

The ages of the PMTCT clients ranged from 23 to 44 years with a median of 30 years. More than half (26 = 78.8%) of the respondents were receiving PMTCT care at the Effia Nkwanta Regional Hospital. Other respondents were from Shama Health Centre (3), Takoradi Hospital (2), GPHA Hospital and Essikadu Hospital (1 each). Majority (11) respondents had completed JHS as their highest educational level attained. Majority of respondents (97%) were married, 1 was widowed whilst 3 were never married but were courting. Their relationship with their partners had lasted from 2 to 17 years with an average of 7.68years. Twenty-one respondents (63.6%) were self-employed mainly as petty traders. Twenty-nine respondents made a monthly income not exceeding 500GHS. Demography of respondents is summarized in Table 4:10 below.

Table 4.10: Demography of PMTCT Clients in the Cohort

	Frequency	Percent
AGE GROUP		
15-20	4	12.1%
21-25	14	42.4%
26-30	7	21.2%
31-40	7	21.2%
41+	1	3.0%
Total	33	100%
HIGHEST EDUCATIONAL LEVEL		
None	9	27.3%
Primary	3	9.1%
Junior High School	11	33.3%
Senior High School	4	12.1%
Tertiary	5	15.2%
Post-Graduate	1	3.0%
Total	33	100%
EMPLOYMENT STATUS		
Self Employed	21	63.6%
Employed	6	18.2%
Unemployed	5	15.2%
Apprentice/Student	1	3.0%
Total	33	100%
PMTCT SITE		
ENRH	26	78.8%
Essikado Hospital	1	3.0%
Ghapoha	1	3.0%
Shama Health Centre	3	9.1%
Takoradi Hospital	2	6.1%
Total	33	100%

4.3.3 Analysis of Maternal and Pregnancy-related Factors

None of the maternal and pregnancy-related factors studied showed significant influence on outcome of PMTCT by EID at 6 weeks after delivery as shown in the Table 4.12 below by the fishers exact test statistic obtained in the analysis.

Table 4.12: Results of analysis for Maternal and Pregnancy-related factors

Factor	Exposures Defined	For General Group Of Respondents		For Case/Control Analysis	
		Point Estimate (Confidence Interval)	Fishers Probability	Point Estimate (Confidence Interval)	Fishers Probability
Maternal Age	Young (less than 35years) and older (35 years and above)		0.20	1.80 (0.12 – 26.2)	0.59
Religion	Christianity vrs islam		0.57	OR=UNDEFINED RR= 0.64 (0.41 – 0.99)	0.67
PMTCT care site	ENRH vrs others	RR=0.86 (0.75 -0.99)	0.58	OR=1.00 (0.06 – 15.99)	0.75
Accomodation	Shared accommodation vrs not shared			OR= 1.67 (0.15 -18.88)	0.57
Marital status	Married vrs not married	RR= 0.86 (0.74 – 0.99)	0.58	OR=UNDEFINED RR=0.60 (0.36 -0.99)	0.42
Occupation	Employed or engaged vrs unemployed	RR=0.86 (0.74 -0.99)	0.50	OR=UNDEFINED RR=0.60 (0.36 – 0.99)	0.42

Factor	Exposures Defined	For General Group Of Respondents		For Case/Control Analysis	
		Point Estimate (Confidence Interval)	Fishers Probability	Point Estimate (Confidence Interval)	Fishers Probability
Level Of Income	Low income (less than 100GHC) versus higher income (>100GHC)	OR=0.23 (0.02 -2.54)	0.23	OR=0.20 (0.1 – 2.91)	0.27
Type Of Accomodation	Shared accommodation versus self-contained				
IPT Compliance	Complete (3 and above doses) versus incomplete (less than 3 doses)	OR= 0.11 (0.00 – 1.51)	0.12	X^2 =3.54	0.17
Herbal Drug Use	None of the respondents reported use of herbal preparations during pregnancy				
Concurrent Illness In Pregnancy	Any concurrent illness versus none	OR=0.09 (0.00 – 2.07)		OR=1.00 (0.05 -18.92)	0.76
FAMILY SUPPORT	Good family support= mutual knowledge of partner status + supportive attitude of partner	None of the respondents had good family support			
Knowledge of successful PMTCT		RR=1.18 (1.00 -1.39)	0.36	OR= UNDEFINED RR=1.80 (1.00 – 3.23)	0.25

Factor	Exposures Defined	For General Group Of Respondents		For Case/Control Analysis	
		Point Estimate (Confidence Interval)	Fishers Probability	Point Estimate (Confidence Interval)	Fishers Probability
Birth order	Multip (order>=3 versus order<3)	1.25 (1.00 – 1.56)	0.12	OR=UNDEFINED RR= 1.80 (1.00 3.23)	0.25
Type of pregnancy: Singleton or multiple	All pregnancies under study were singleton				
Mode of delivery	All cases and controls delivered by spontaneous vaginal delivery.				

CHAPTER 5

DISCUSSION

5.1 Discussion

AVAILABILITY OF PMTCT SERVICE AT ANC SITES AND THE ROLE OF MIDWIVES IN THE PATRONAGE OF THE SERVICE

This study demonstrates a fair availability of the PMTCT service in the Western Region of Ghana. This physical availability of 182 PMTCT sites must be complemented by availability of trained human resource and logistics for service delivery. PMTCT sites are available in every district and our findings suggest more sites exist at the district level than the Regional HIV Unit is aware of. At least 3 PMTCT sites are available in every district. Our findings show that the service is available at different types of facilities providing the service; government facilities (Regional Hospital, District Hospitals and polyclinics, Health Centres and CHPS compounds), as well as private facilities (hospitals, clinics and maternity homes) and Christian Health Association of Ghana (CHAG) institutions.

A report by NACP indicated that in 2009, only 9% of facilities in the Western Region provided PMTCT (NACP, 2009). Our study calculates that currently, 43.2% (182, n=421) of facilities provide the service in the Western Region. This demonstrates an improvement in the availability of the service in the Region. Forty-two facilities, comprising only CHAG institutions, private clinics and CHPS compounds however do not provide HIV testing at their ANC clinics. This creates a gap in access to PMTCT for the pregnant HIV-positive women who receive their ANC care at these facilities.

According to the current national PMTCT guidelines, the main entry point to PMTCT is provider-initiated routine offer of HIV testing (opt-out option) at ANC clinics. We found that patronage of ANC service in the Western Region is high, consistently recorded at over 100% coverage for the 4-year period studied. This presents a unique opportunity to test an equally large number of pregnant women for HIV in order to identify those who need the third prong of PMTCT. Our findings indicated however, that almost 40% of ANC clients are not tested every year across the Western Region. This resulted in only 57% to 78% of expected PMTCT clients being identified through testing from 2010 to 2013. In 2009, the Region reported that 94% of ANC clients were tested for HIV (GAC, 2010). This decline observed in HIV testing rate from the 2009 figure is unexpected with the increase in physical availability of PMTCT service and the introduction of the opt-out option for HIV testing over the same period.

The low rate of HIV-testing during ANC observed in our study is similar to rates observed in studies by Rispel *et al* in South Africa in 2009 (67%), and in Wa in the Upper West Region of Ghana by Nyuzaghi *et al* (62%) in 2011 (Rispel, Peltzer, Phaswana-Mafuya, Metcalf &Treger, 2009; Nyuzaghi, Ohene, & Odoi-Agyarkol, 2011). In the Zheijiang Province of China, a higher HIV-testing rate of 98.6% was achieved among pregnant women in 2013 (Zhang *et al*, 2014).

Ghana has adopted the routine opt-out option for the past few years to increase the HIV-testing rate among pregnant women (GAC, 2010). In our study, we interviewed midwives and sought to find out if opting-out by clients was a major contributor to clients not being tested. Findings from our study suggest that in the Western Region, very few clients actually opted-out of testing for HIV. The few clients who opted-out were among those whose HIV tests were being conducted by their midwives, rather than clients whose HIV tests were done at the laboratory as part of all other routine tests done at registration. HIV testing by midwives as part of focused antenatal care could therefore create opportunity for clients to

opt-out. Reasons cited for opting-out expressed fear of testing positive and spousal control. This is similar to findings by Perez in Zimbabwe (Perez, Zvandaziva & Engelsmann, 2006). We concluded that opting-out was not a major cause of ANC clients not being tested for HIV and that instead, the test is not offered to majority of these clients because the midwives interviewed could only recall few instances of opt-out among the numbers not tested.

We found that Midwives offering PMTCT services are generally unaware of the PMTCT target and 4-pronged approach to PMTCT, especially for those who had had their PMTCT training or refresher training a year or more prior to the study. The study also demonstrates that there are lapses in following the PMTCT protocol by midwives, particularly in the offer of HIV testing to ANC clients who had tested negative at registration. Knowledge of the PMTCT outcome for their clients does not appear to be priority for the midwives. Inaccurate information on prescribed feeding options is given by some midwives to their clients which may be detrimental to the PMTCT outcome. Inadequate effort is made to trace defaulting PMTCT clients. The midwife is a key human resource in the delivery of PMTCT service. No effort should be spared in ensuring that they are well-trained and re-trained and also made accountable for the outcome at EID for their PMTCT clients at 6weeks after delivery. Literature search reveals that not many studies, (if at all), have documented the knowledge and practice of the midwife in PMTCT. However, authors of a meta-analysis of 829 papers on loss to follow-up of HIV-exposed infants concluded that there was unacceptable infant loss to follow-up from PMTCT programs (Sibanda, Weller, Hakim & Cowan, 2013).

PMTCT COVERAGE

The total of 147,990 ANC clients were not tested for HIV over the 4-year period from 2010 to 2013, translating to a possible figure of between 461 and 1382 new cases of pediatric HIV (using WHO rate of MTCT of 15-45% without intervention). The Western Region, and Ghana as a whole is not likely to achieve the target of eliminating MTCT if the phenomenon of missed opportunities (ANC clients not tested for HIV) continues at this magnitude.

Although results from our study showed a decline in the PMTCT burden (expected number of HIV-positive pregnant women) in the Western n Region of Ghana from 2,234 in 2010 to 1729 in 2013, the observation cannot be attributed to reduction in prevalence per se. This is because there was a dip in the Region's population after the 2010 census and also a dip in the proportion of the total population estimated as expected pregnancies. The declining trend we observed of prevalence of HIV among ANC clients actually tested would therefore be a stronger indicator of progress towards reducing the need for the third prong of PMTCT. Similar declining trends were observed in 17 out of 21 countries participating in a study of young pregnant women (UNAIDS, 2010).

This decline in HIV prevalence among ANC clients observed in our study is corroborated by findings in the HSS (NACP, 2013), although the absolute figures obtained were however not the same. This finding raises the question of the use of routine PMTCT data and data obtained from annual sentinel surveillance survey. The similar trends we observed between routine and surveillance data suggests that routinely-collected data can compliment but not replace the HSS data. Routine data may be used ahead of HSS data to monitor progress in order that action needed to be taken is not delayed. A study on the use of routine PMTCT data in Rwanda did not explore similarities in trends between routine data and surveillance

data but observed a significant difference in magnitude of HIV prevalence from routine data and from surveillance data (Francoise *et al*, 2011). Seguy *et al* in Kenya, as well as Young *et al* in Mozambique also concluded that routine PMTCT data should not replace surveillance data due to observed variation in data quality (Seguy *et al*, 2006; Young *et al*, 2013).

From the district by district analysis of PMTCT coverage and outcomes in our study, the Bia districts (Bia West, Bia East and Bodi) were identified as major contributors to the negative PMTCT indices in the Region by their low HIV testing rate, high missed opportunities, high HIV prevalence and low patronage of EID services. Further study of the PMTCT implementation in these districts is needed to understand the barriers in order to appropriately address them. The Sekondi-Takoradi Metropolis recorded the highest PMTCT uptake (actual number of PMTCT clients/expected number of PMTCT clients). It is not clear if confirmatory tests conducted at Regional Hospital (located in the metropolis) for clients referred from other facilities in the Region are captured as new PMTCT clients in the metropolis. The availability of a biometric system for capturing HIV clients in general and PMTCT clients in particular could improve the reliability of data captured at facilities since double capture would be identified.

MTCT RATE

In our study, we calculated the MTCT rate among two groups of exposed babies. These were a larger group of 379 HIV-exposed babies whose samples were received and tested at the ENRH PHL over a 2-year period from November 2011 to November 2013, and a smaller group of 33 who formed the cohort of our nested case control study. The use of ART could

not be ascertained for mothers and babies of the larger group but for the smaller group, all mothers and babies had received ARVs as part of the PMTCT intervention. MTCT rate in the larger group was 5.5% (95% CI; 3.5 - 8.5%) but surprisingly higher at 12.1% (95% CI; 3.4% - 28.0%) in the smaller group. This finding is at variance with what is expected and cannot be explained without further investigation, although the small sample size obtained for the case-control study may have been a contributory factor. As should have been the case, Ikechebelu *et al* observed a lower rate of 2.8% among for mothers who had had HAART than the rate of 37.5% for mothers who had not. Afe and colleagues (2011) also observed a lower rate of vertical transmission (9.6%) for mothers who had benefitted from the PMTCT package than in those who had not (22.5%) (Afe *et al*, 2011).

It must be noted that the Western Region could only account for the PMTCT outcomes at EID for only 13.4% of the ANC clients who tested positive. This means that the actual MTCT rate in the Western Region could be very different. It is possible that samples for EID from exposed babies in the Western Region are sent to adjoining Ashanti and Central Regions for EID. A comprehensive Region by Region search and analysis of EID results at the various public health laboratories may give a more accurate picture.

MATERNAL AND PREGNANCY-RELATEDFACTORS CONTRIBUTING TO PMTCT OUTCOMES

Univariate analysis in the nested case control part of our study identified no significant maternal and pregnancy-related factors which contribute to the PMTCT outcome by 6weeks after delivery in the Western Region of Ghana. This finding could be due to the small number of cases obtained for the study (4 out of the required 36). The few cases of exposed babies testing HIV positive at 6 weeks is however a success story for the PMTCT

intervention in the Region. The nested case control part of the study did not identify significant factors but the analysis of the 379 EID results in our study revealed a higher but not significant transmission rate of 6.4% among female babies than 5.1% among male babies (OR= 0.78, p=0.57). The factor that showed some significance as a risk factor was twin gestation. MTCT rate among twins was 18.8% and 5.0% among singletons (OR=4.4, Fisher exact=0.05). Similar findings were made by Taha and colleagues that the sex of the baby is a determinant of PMTCT outcome, with the female being more at risk (Taha *et al*, 2005) and by Scavalli *et al* that twin birth is a determinant of MTCT risk, with the first twin being at higher risk (Scavalli *et al*, 2007).

Others studies observed that maternal age less than 30 years increases the risk (Torpey *et al*, 2012), disclosure of HIV status to spouse/partner influenced MTCT risk (Torpey *et al*, 2012) and maternal tuberculosis increases risk (Gupta *et al*, 2011). Whilst Ayisi *et al* (2004) found that low-density maternal malaria reduces risk, Inion and colleagues concluded that placental malaria has no correlation with MTCT (Inion *et al*, 2011).

5.2 Limitations

The limitations of this study were as follows:

- ✓ Possible errors in the newly-evolving DHIMS database,
- ✓ The small sample of HIV-positive babies (cases) obtained,
- ✓ The inability to interview 4 (out of 18) District Public Health Nurses
- ✓ The non-inclusion of information on history of HAART use for the group of 379 whose EID results were analyzed.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1: Conclusion

The study demonstrated a fairly wide availability of PMTCT sites in the Western Region of Ghana. It showed a declining prevalence of HIV among ANC clients in the Western Region of Ghana. It however revealed a high PMTCT unmet need due to a low HIV testing rate, despite a high ANC registration rate. There is low patronage of EID services at the ENRH PHL. The two-year MTCT rate by the end of November 2013 was 5.5 – 12.1% (95% CI: 3.4% - 28.0%). The Bia districts of the Region require further situational analysis in order to develop appropriate strategies to improve the status of PMTCT implementation, especially in the proportion of ANC clients tested.

Lapses were identified in the midwives' knowledge and practice of PMTCT in the area of repeating the HIV test for a client who initially tests positive, in their knowledge and practice of EID and in giving advice on feeding.

The study did not establish any maternal and pregnancy-related factors which contribute to PMTCT outcome by 6 weeks after delivery but suggests further research into risk of MTCT associated with multiple gestation in Ghana.

6.2 Recommendations

Based on the findings of this study we recommend to:

The District and Regional Public Health Units to

1. Introduce PMTCT services at all ANC sites either by training the staff or by establishing referral linkages to PMTCT sites
2. Conduct further analysis of the PMTCT performance by districts to develop appropriate district-specific strategies to address weak performance
3. Develop a defaulter-tracing system to reduce loss to follow-up.

The Western Regional HIV/STI Comprehensive Care Unit to

1. Establish a system for regular update of PMTCT sites in the Western Region by the District Health Directorates,
2. Conduct regular training and refresher trainings for midwives offering the service with emphasis on their contribution to the National PMTCT target.

The National AIDS/STI Control Program to

1. Collaborate with the National Health Insurance Scheme to introduce a biometric system of registration of ANC clients to reduce double reporting and improve follow-up of the PMTCT outcomes.
2. Re-design the EID request form to provide opportunity to capture relevant data on risk factors, including history of the use of HAART by mother and baby.

The National Public Health Reference Laboratory to

1. Establish a system of reporting where EID results are shared with the PHL in the Region where PMTCT care was given.

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APPENDICES

APPENDIX 1

DISTRICTS OF THE WESTERN REGION, MARCH 2014

NO	DISTRICT NAME	STATUS
1	AHANTA WEST	Fully Functional
2	AOWIN	Fully Functional
3	BIA WEST	Fully Functional
4	BIA EAST	Not Fully Functional
5	BIBIANI A. BEKWAI	Fully Functional
6	BODI	Not Fully Functional
7	ELLEMBELLE	Fully Functional
8	JUABESO	Fully Functional
9	JOMORO	Fully Functional
10	MPOHOR	Fully Functional
11	WASSA EAST	Fully Functional
12	AXIM	Fully Functional
13	PRESTEA HUNI VALLEY	Fully Functional
14	SEFWI AKONTOMBRA	Fully Functional
15	SEFWI WIAWSO	Fully Functional
16	SEKONDI TAKORADI	Fully Functional
17	SHAMA	Fully Functional
18	SUAMAN	Not Fully Functional
19	TARKWA NSUAEM	Fully Functional
20	WASA AMENFI CENTRAL	Not Fully Functional
21	WASA AMENFI WEST	Fully Functional
22	WASA AMENFI EAST	Fully Functional

APPENDIX II

PMTCT WORKLOAD PER DISTRICT IN THE WESTERN REGION, 2010 -2013

	PMTCT Worload= Number of clients testing positive				
	2010	2011	2012	2013	4-year average
AHANTA WEST	**17**	39	48	54	40
AOWIN	**159**	97	29	64	87
BIA WEST	**27**	39	45	34	36
BIA EAST	**2**	7	21	91	30
BIBIANI A. BEKWAI	**73**	66	33	47	183
BODI	**6**	9	7	3	6
ELLEMBELLE	**151**	192	134	93	142
JUABESO	**31**	39	144	20	59
JOMORO	**88**	102	105	65	89
MPOHOR	**9**	12	7	22	13
WASSA EAST	**23**	17	48	13	25
AXIM	**25**	28	32	13	31
PRESTEA HUNI VALLEY	**66**	72	73	77	72
SEFWI AKONTOMBRA	**28**	109	36	29	51
SEFWI WIAWSO	**82**	47	27	126	70
SEKONDI TAKORADI	**162**	389	352	267	293
SHAMA	**32**	38	33	131	59
SUAMAN	**26**	24	13	18	21
TARKWA NSUAEM	**127**	139	129	83	120
WASA AMENFI CENTRAL	**47**	48	26	18	35
WASA AMENFI WEST	**60**	67	101	50	70
WASA AMENFI EAST	**31**	21	39	34	32

Range of 4-year average PMTCT workload range = 6 -293

Regional Mean = 71, Median =55

APPENDIX III

PMTCT SITES (DATA SOURCE: Regional HIV Unit)

S.T.M.A	
S.D.A CLINIC	
EFFIA NKWANTA REGIONAL HOSPITAL	
JEMIMA CRENTSIL HOSPITAL	
KWESIMINTSIM HOSPITAL	
TAKORADI HOSPITAL	
GHAPOHA HOSPITAL	
STRADFORD MARTENITY HOME	
ESSIKADO POLYCLINIC	
NEW TAKORADI	
HOLYCHILD CLINIC	
BRITE LIFE MARTENITY	
ABIYE GOD'S GRACE MARTENITY	
	12
TARKWA NSUAEM	
TARKWA GOVERNMENT HOSPITAL	
IDUAPRIEM CLINIC	
GMC HOSPITAL	
GOLDFIELDS HOSPITAL	
AMI MEMORIAL HOSPITAL	
NEW ATUABO CLINIC	
DOMPIM CLINIC	
NSUAEM HEALTH CENTRE	
SIMPA HEAL POST	
	9
PRESTEA HUNI-VALLEY	
ABOSO HEALTH CENTRE	
PRESETEA GOVERNMENT HOSPITAL	
S D A CLINIC WASSA NKRAN	
HUNISO CHPS COMPOUND	
INSUSIDING CHPS COMPOUND	
DAMANG COMMUNITY CLINIC	
AWUDUA COMMUNITY CLINIC	
BOGOSO HEALTH CENTRE	
HUNI VALLEY HEALTH CENTRE	
	9

SHAMA DISTRICT	
SHAMA HOSPITAL	
INCHABAN HEALTH CENTRE	
SUPOMU DUNKWAA H/C	
V R A HOSPITAL	
ST. BENEDICT CLINIC	
	5
ELLEMBELLE DISTRICT	
NKROFUL H/C	
ESIAMA H/C	
ASASETRE H/C	
ANYINASE H/C	
KWESIKROM CHPS COMP.	
NANA BENIE H/C	
	6
JOMORO DISTRICT	
ELLUBO HEALTH CENTRE	
HALF ASSINI HOSPITAL	
TIKOBO NO. 1	
TAKINTA CHPS COMP.	
NEWTOWN H/C	
J'WGARF H/C	
	6
SEFWI-AKONTOMRA DISTRICT	
SEFWI-AKONTOMRA HEALTH CENTRE	
NSAWORA H/C	
ASANTEKROM CHPS COMPOUND	
APRUTU CHPS COMPOUND	
	4
SEFWI-WIAWSO DISTRICT	
SEFWI-WIAWSO GOVERNMENT HOSPITAL	
ABOAGYEKROM H/C	
ST. JOHN OF GOD HOSPITAL ASAFO	
GREENSHIELD CLINIC	
SUI H/C	
ANYINABRE H/C	
LIZZY MARTENITY HOME	
BENCHIWA H/C	

PABOASE H/C	
BOAKO H/C	
ABRABRA H/C	
	11
WASSA AMENFI EAST	
WASSA AKROPONG GOV'T HOSPITAL	
DAWURAMPONG CHPS	
OPONG VALLEY H/C	
NANANKO CHPS	
WASSA AFRANSIE H/C	
JAPA CHPS ZONE	
WASSA SAA H/C	
	7
AOWIN SUAMAN DISTRICT	
AKONTOMBRA NKWATA H/C	
AQUAI ALLAH H/C	
BOINSO H/C	
DADIESO H/C	
ENCHI GOV'T HOSPITAL	
PRESBY H/C	
YIWABRA H/C	
SEWUM H/C	
	8
AHANTA WEST DISTRICT	
APOWA H/C	
AGONA AHANTA	
DIXCOVE GOV'T HOSPITAL	
MARY AKOBAH EWOO	
PRINCESS TOWN H/C	
ABORA H/C	
	6
NZEMA EAST DISTRICT	
AXIM GOV'T HOSPITAL	
GWIRA BANSO H/C	
KUTUKROM H/C	
BAMINANKOR H/C	
	4
BIBIANI ANWIASO BEKWAI	
SEFWI WENCHI H/C	

SEFWI BEKWAI GOV'T HOSPITAL	
ASANWINSO CLINIC	
HUMIJIBRRE CLINIC	
AHWIASO CLINIC	
	5
WASSA AMENFI WEST	
ASANKRAGUA CATHOLIC HOSPITAL	
ADJAKAA MANSO H/C	
AGONA AMENFI H/C	
AKYEKYERE CHPS ZONE	
KYEIKROM CHPS	
MANSO H/C	
	6
MPOHOR DISTRICT	
BOPP LTD CLINIC	
AYIEM CHPHS	
ADUM BANSO COMMUNITY CLINIC	
MPOHOR HEALTH CENTRE	
DOMAMA CHPS	
AKUTUASE COMMUNITY CLINIC	
ATOBIASE COMMUNITY CLINIC	
IT IS TH LORD MATERNITY	
NSADWESO CHPS ZONE	
ATIEKU HEALTH CENTRE	
GLORY OF GOD MATERNITY HOME	
SEKYERE KROBO COMMUNITY CLINIC	
SEKYERE HEMANG CHPS ZONE	
DOMPIM COMMUNITY CLINIC	
ADANSI COMMUNITY CLINIC	
MANSO COMMUNITY	
DABOASE HEALTH CENTRE	
	17
BIA DISTRICT	
ESSAM MATERNITY	
PRESBY H/C	
C.O.P CLINIC	
ARHINFULKROM CHPS	
PEACE MATERNITY HOME	
ANGELA CATHOLIC CLINIC	
CHRISTO NTI MAT. HOME	
ASEMNYIMAKROM H/C	
OSBERT MAT. HOME	

KWAME NKRUMA CHPS	
CLINIC ST. LUKE	
ESSEM MAT.	
BIA D H A	
KAASE HEALTH CENTRE	
	13
JUABOSO DISTRICT	
JUABOSO GOV'T HOSPITAL	
ANNA'S MAT. HOME	
AHIBENSO MAT HOME	
	3
Total	131

APPENDIX IV

PMTCT sites

DATA SOURCE: District Public Health Nurses

DISTRICT	PMTCT SITES	ANC SITES NOT PROVIDING PMTCT
AHANTA WEST	DPHN NOT INTERVIEWED REGIONAL DATA RETAINED	
AOWIN-SUAMAN	1. AKONTOMBRA NKWANTA H/C 2. AQUAI ALLAH H/C 3. BOINSO H/C 4. DADIESO H/C 5. ENCHI GOVT HOSPITAL 6. PRESBY H/C 7. YIWABRA H/C 8. SEWWUM H/C 9. ACHIMFO H/C 10. PAPUESO CHPS 11. KWAHU PENTECOST CHPS 12. JEMA CHPS 13. KWASUO CHPS 14. AMA DANSOWAA MATERNITY HOME 15. KORDJOUR CHPS 16. SDA CLINIC	1. PAPUESO CHPS 2. KWAHU PENTECOST CHPS 3. JEMA CHPS 4. KWASUO CHPS 5. KORDJOUR CHPS 6. SDA CLINIC
BIA WEST BIA EAST BODI	17. ESSAM H/C MATERNITY 18. PRESBY H/C 19. COP CLINIC 20. ARHINFULKROM CHPS 21. PEACE MATERNITY HOME 22. ANGELA CATHOLIC CLINIC 23. CHRISTO NTI MATERNITY HOME 24. ASEMNYINAKROM H/C 25. OSBERT MATERNITY HOME 26. KWASI NKRUMAH CHPS 27. CLINIC ST LUKE 28. ESSAM HOSPITAL 29. KAASE HEALTH CENTRE 30. KWAME TAWIAHKROM CHPS	7. ARHINFULKROM CHPS 8. CRISTO NTI MATERNITY HOME 9. KWAMETAWIAHKROM CHPS
BIBIANI A. BEKWAI	31. SEFWI WENCHI CLINIC 32. SEFWI BEKWAI H/C 33. ASAWINSO CLINIC 34. HUMJIBRE CLINIC 35. AHWIASO CLINIC 36. BASIPELE CLINIC	10. REDEEMERS

	37. CHIRANO H/C 38. BDH 39. DIVINE LOVE HOSP 40. REDEEMERS 41. GBC HOSP	
ELLEMBELLE	42. NKROFUL H/C 43. ESIAMA H/C 44. ASASETRE H/C 45. ANYINASE H/C 46. KWESIKROM CHPS COMPOUND 47. NANA BENIE H/C 48. ST MARTIN DE PORRES HOSP 49. SALME H/C 50. AIDOOSUAZO CPS 51. AMANEKROM CHPS 52. AWULAE BLAY CHPS 53. NYAMEBEKYERE CHPS 54. ASANTA CHPS 55. AMPAIN REFUGEE CAMP 56. AKROPONG CHPS 57. A. BOKAZO CHPS	
JUABESO	DPHN NOT INTERVIEWED REGIONAL DATA RETAINED	
JOMORO	58. ELUBO HEALTH CENTRE 59. HALF ASINI HOSP 60. TIKOBO NO 1 61. TAKINTA CHPS COMP 62. NEWTOWN H/C 63. J'WARF H/C 64. TWENEN CLINIC 65. EKABEKU H/C 66. SAMEYE H/C 67. TIKOBO 2 CHPS 68. SILOAM CLINIC	
MPOHOR	69. BOPP 70. AYEM CHPS 71. MPOHOR H/C 72. ADANSI 73. BOTODWINA 74. MANSO 75. ANGU CHPS 76. BOMBA CHPS 77. DOMINASE CHPS	
WASSA EAST	78. DABOASE H/C 79. SEKERE KROBO CLINIC 80. GLORY OF GOD 81. SENCHEM CLINIC 82. NSEIDWESO CHPS 83. NEW SUBRI CHPS 84. BEENUYIE CHPS 85. ATIEKU H/C 86. CHRISTIAN ADOCK AND SONS	11. NEW SUBRI CHPS 12. BEENUYIE CHPS 13. CHRISTIAN ADOCK AND SONS 14. ADIEMBRA CHPS 15. ANYINABRIEM CHPS

	87. SEKYERE HEMANG CHPS 88. ADIEMBRA CHPS 89. ANYINABREM CHPS 90. DWENASI 91. AKUTUASI 92. ATOBIASE 93. DOMMAMA 94. AHMADIYA HOSP	
AXIM		
PRESTEA HUNI VALLEY	95. ABOSO H/C 96. PRESTEA GOVT HOSP 97. SDA CLINIC 98. HUNISO CHPS 99. INSUSIDING CHPS 100. DAMANG COMMUNITY CLINIC 101. DAMANG COMMUNITY CLINIC 102. AWUDUA COMMUNITY CLINIC 103. BOGOSO H/C 104. HUNI VALLEY H/C 105. HIMAN H/C 106. BOMPIESO H/C 107. ASOAMPA CHPS 108. ASIKUMA CHPS 109. ASEDA HOSP 110. SAB MATERNITY HOME 111. BONDYE CHPS	
SEFWI AKONTOMBRA	112. SEFWI AKON H/C 113. NSAWORA H/C 114. ASANTEKROM CHPS 115. APRUT CHPS 116. KOFIKROM CHPS 117. KRAMOKROM CHPS 118. AKAAKROM CHPS 119. YAWKROM CHPS 120. NKWADUM CHPS 121. CHORICHORI CHPS 122. TUMUDA CHPS 123. WANSAMPO CHPS 124. YAMFO CHPS 125. EDEWANOKROM CHPS 126. TANOKROM CHPS 127. BAWAKROM 128. ABROMHIA CHPS	16. APRUT CHPS 17. KRAMOKROM CHPS 18. AKAAKROM CHPS 19. YAWKROM CHPS 20. NKWADUM CHPS 21. CHORICHORI CHPS 22. TUMUDA CHPS 23. WANSAMPO CHPS 24. YAMFO CHPS 25. EDEWANOKROM CHPS 26. TANOKROM CHPS 27. BAWAKROM 28. ABROMHIA CHPS
SEFWI WIAWSO	129. SEFWI WIAWSO HOSP 130. ABOAGYEKROM H/C 131. ST JOHN OF GOD HOSP 132. GREENSHIELD CLINIC 133. SUI H/C 134. ANYINABREM H/C 135. LIZZY MATERNITY HOME 136. BENCHIWAA H/C 137. PABOASE H/C	

	138.BOAKO H/C 139.ABRABRA H/C 140.ANHWIAM CHPS 141.AMAFIE CHPS 142.BOSOMOISO CHPS 143.ABOANIDUA CHPS 144.AHWIAA CHPS 145.AKOTI ETWEBO CHPS 146.NSUONSUA CHPS 147.ATTOKWA CHPS 148.NYAMEAGYESO CHPS 149.AKORAFO CHPS 150.ASAWINSO H/C 151.SDA CLINIC 152.KAYLESS MATERNITY HOME	
SEKONDI TAKORADI		
SHAMA	153.SHAMA H/C 154.INCHABAN CHPS 155.SUPOMU DUNKWAA CHPS 156.VRA HOSPITAL 157.ST BENEDICT HOSP 158.LIVING WELL CHPS 159.ANLO BEACH CHPS 160.DUNKWA CHPS 161.DUNKWA CLINIC 162.UPPER INCHABAN CHPS 163.BEPOSO CHPS	29. DUNKWA CLINIC
SUAMAN		
TARKWA NSUAEM	162. TARKWA GOVT HOSP 163. GMC HOSP 164.GOLDFIELDS HOSP 165. AMI MEMORIAL 166. NEW ATUABO CLINIC 167. DOMPIM CLINIC 168. NSUAEM H/C 169. SIMPA HEALTH POST 170. ESSUOSO CHPS 171. PENTECOST CLINIC 172. REDEEMER HOSP 173. BENSO H/C 174. DIANA MATERNITY HOSP	
WASA AMENFI EAST	175. WASA AKROPONG GOVT HOSP 176. DAWURAMPONG CHPS 177. WASA AFRANSIE CHPS 178. JUKWA HEMAN CHPS 179. NSUEAM 2 CHPS 180. GYEDUA CHPS 181. WAS MAMPONG H/C 182. EL-SHINA CLINIC 183. ADOM CLINIC 184.ST GEORGE MATERNITY	30. DAWURAMONG CHPS 31. JUKWA HEMAN CHPS 32. NSUEAM 2 CHPS 33. GYEDUA CHPS 34. WAS MAMPONG H/C 35. EL-SHINA CLINIC 36. ADOM CLINIC 37.ST GEORGE MATERNITY
WASA AMENFI WEST	185. ASANKRAGUA CATHOLIC HOSP 186. ADJAKAA MANSO N/C 187. AGONA AMENFI H/C	
WASA AMENFI CENTRAL		38. NOPE CLINIC

	188. AKYEKYERE CHPS 189. KYEIKROM CHPS 190. MANSO H/C 191. SAMARTEX HOSP 192. MANSIESO CHPS 193. TUABO CHPS 194. BISAASO CHPS 195. AATTOBRAKROM CHPS 196. NKANTANUM CHPS 197. ASANKRAN SAA CLINIC 198. KWABENG CLINIC 199. KWAMAN CHPS 200. WASA DUNKWA CHPS 201. AYINABIM CHPS 201. ASANKRAN BREMAN CHPS 202. NOPE CLINIC 203.GRAVEL YARD CLINIC 204. WURATEM CLINIC	
AHANTA WEST	6 FACILITIES FROM REGIONAL LIST	
SEKONDI TAKORADI	12 “	
AXIM	4 “	
JUABOSO	3 “	
TOTAL	229	

APPENDIX V

WESTERN REGIONAL DHIMS2 RAW DATA ON PMTCT, 2010 to 2013.

	2010				2011			
DISTRICTS	WIFA	ANC REGISTRANTS	TOTAL TESTED	**TOTAL POSITIVE**	WIFA	ANC REGISTRANTS	TOTAL TESTED	TOTA POSI
AHANTA WEST	26554	1349	1005	**17**	27085	3910	2620	
AOWIN	25849	5171	3074	**159**	26336	5938	3938	
BIA WEST	27700	5695	1561	**27**	29742	5279	1617	
BIA EAST	13704	1700	316	**2**	14437	1782	330	
BIBIANI A. BEKWAI	30818	4847	3953	**73**	31434	5204	3588	
BODI	14382	1850	462	**6**	14841	2167	640	
ELLEMBELLE	26918	9115	4041	**151**	29238	5960	4891	
JUABESO	26748	5366	1612	**31**	27604	5611	2321	
JOMORO	37527	4785	2344	**88**	38277	5041	2667	
MPOHOR	8819	1125	1019	**9**	9102	1337	1418	
WASSA EAST	33177	2511	1063	**23**	34238	3215	2117	
AXIM	15875	2483	1373	**25**	15511	2793	1894	
PRESTEA HUNI VALLEY	39826	5995	3615	**66**	40454	6703	4998	
SEFWI AKONTOMBRA	20698	2435	1287	**28**	21029	2331	1561	
SEFWI WIAWSO	69600	6266	3690	**82**	70992	6296	3815	
SEKONDI TAKORADI	88871	6648	9677	**162**	93100	13568	15217	
SHAMA	40983	2643	2191	**32**	41802	3232	2899	
SUAMAN	8755	1642	1087	**26**	8930	1935	1388	
TARKWA NSUAEM	33166	6409	5421	**127**	39487	7253	6622	
WASA AMENFI CENTRAL	19541	3003	1935	**47**	20166	3400	2636	
WASA AMENFI WEST	30564	5495	3571	**60**	31542	6668	3914	
WASA AMENFI EAST	30186	5721	1258	**31**	27433	5308	1381	
Western Region	670261	92254	55555	**1272**	692780	104931	72472	

	2012				2013			
DISTRICTS	WIFA	ANC REGISTRANTS	TOTAL TESTED	TOTAL POSITIVE	WIFA	ANC REGISTRANTS	TOTAL TESTED	TOTA POSIT
AHANTA WEST	27626	4113	2680	48	28179	3832	2843	
AOWIN	29810	5759	1683	29	30406	5339	3223	
BIA WEST	20363	5238	1442	45	20778	5479	1679	
BIA EAST	9894	1915	425	21	10086	1924	394	

BIBIANI A. BEKWAI	32063	6465	3259	33	32704	6829	5213
BODI	8296	1844	427	7	12078	1572	410
ELLEMBELLE	22759	5488	3046	134	23214	5811	3529
JUABESO	20770	5247	2182	144	18569	4167	1577
JOMORO	39043	4643	2122	105	39824	4470	3242
MPOHOR	6450	1393	1370	7	6580	1366	1260
WASSA EAST	25801	3305	3304	48	26317	3618	3213
AXIM	15822	3402	2044	32	16138	3219	1458
PRESTEA HUNI VALLEY	41443	6977	3377	73	42264	6643	4088
SEFWI AKONTOMBRA	21450	2838	1860	36	21879	2609	1826
SEFWI WIAWSO	72412	6140	3935	27	36930	6270	5364
SEKONDI TAKORADI	145538	14585	12789	352	148449	13663	13191
SHAMA	21319	3677	3135	33	21746	3806	3720
SUAMAN	10368	1669	529	13	6316	1585	1071
TARKWA NSUAEM	23533	7413	4601	129	24004	7488	6163
WASA AMENFI CENTRAL	16348	3349	2472	26	16676	3248	1919
WASA AMENFI WEST	25571	6004	3118	101	26082	6036	2964
WASA AMENFI EAST	21713	5328	1356	39	22147	5250	2681
Western Region	658392	106792	61156	1482	631366	104224	71028

APPENDIX VI

ANC PREVALENCE IN THE WESTERN REGION BY DISTRICT, 2010 – 2013

DERIVED FROM DHIMS2 RAW DATA

	HIV PREVALENCE AMONG ANC CLIENTS TESTED			
DISTRICTS	2010	2011	2012	2013
AHANTA WEST	1.7	1.5	1.8	1.9
AOWIN	5.2	2.5	1.7	2
BIA WEST	1.7	2.4	3.1	2
BIA EAST	0.6	2.1	4.9	23.1
BIBIANI A. BEKWAI	1.8	1.8	1	0.9
BODI	1.3	1.4	1.6	0.7
ELLEMBELLE	3.7	3.9	4.4	2.6
JUABESO	1.9	1.7	6.6	1.3
JOMORO	2.8	3.8	4.9	2
MPOHOR	0.8	0.8	0.5	1.7
WASSA EAST	2.2	0.8	1.4	0.4
AXIM	1.8	1.5	1.6	0.9
PRESTEA HUNI VALLEY	2.2	1.4	2.2	1.9
SEFWI AKONTOMBRA	2.2	7	1.9	1.6
SEFWI WIAWSO	1.7	1.2	0.7	2.3
SEKONDI TAKORADI	1.5	2.6	2.7	2
SHAMA	2.4	1.3	1	3.5
SUAMAN	2.3	1.7	2.5	1.7
TARKWA NSUAEM	2.4	2.1	2.8	1.3
WASA AMENFI CENTRAL	1.7	1.8	1	0.9
WASA AMENFI WEST	2.5	1.7	3.2	1.7
WASA AMENFI EAST	2.3	1.5	2.9	1.3
Western Region	2.3	2.2	2.4	1.9

APPENDIX VII

UNTESTED POROPORTION OF ANC CLIENTS BY DISTRICTS OF THE WESTERN REGION, 2010 – 2013

	HIV PREVALENCE AMONG ANC CLIENTS TESTED				
DISTRICTS	2010	2011	2012	2013	
AHANTA WEST	25.5	33.0	34.8	25.8	29.8
AOWIN	40.6	33.7	70.8	39.6	46.2
BIA WEST	72.6	69.4	72.5	69.3	70.9
BIA EAST	81.4	81.5	77.8	79.5	80.1
BIBIANI A. BEKWAI	18.4	31.0	49.6	23.6	30.7
BODI	75.0	70.5	76.8	73.9	74.1
ELLEMBELLE	55.7	17.9	44.5	39.3	39.3
JUABESO	70.0	58.6	58.4	62.1	62.3
JOMORO	51.0	47.1	54.3	27.5	45.0
MPOHOR	9.4	-6.1	1.6	7.8	3.2
WASSA EAST	57.7	34.1	0.03	11.2	25.8
AXIM	44.7	32.2	39.9	54.7	42.9
PRESTEA HUNI VALLEY	39.7	25.4	51.6	38.5	38.8
SEFWI AKONTOMBRA	47.1	33.0	34.5	30.0	36.2
SEFWI WIAWSO	41.1	39.4	35.9	14.5	32.7
SEKONDI TAKORADI	-45.6	-12.1	12.3	3.45	-10.5
SHAMA	17.1	10.3	14.7	2.3	11.1
SUAMAN	33.8	28.3	68.3	32.4	40.7
TARKWA NSUAEM	15.4	8.7	37.9	17.7	19.9
WASA AMENFI CENTRAL	35.6	22.5	26.2	40.9	31.3
WASA AMENFI WEST	35.0	41.3	48.1	50.9	43.8
WASA AMENFI EAST	78.0	74.0	74.5	48.9	68.9
Western Region	39.8	30.9	42.7	31.9	36.3

APPENDIX VIII

RECORDS ON 397 SAMPLES TESTED FOR EID BY PCR AT ENRH PHL FROM NOV 2011 TO NOV 2013

sno	name	DOB	ageyears	agemonths	ageweeks	sex	facility	Testdate	result
1	SH	08/12/2011		3		F	WESTERN	12/08/2011	NEGATIVE
2	AQ	25/12/10		11		F	WESTERN	12/08/2011	NEGATIVE
3	IA	16/6/11		5		M	WESTERN	12/08/2011	NEGATIVE
4	DN	07/05/2011		4		M	WESTERN	12/08/2011	NEGATIVE
5	MY	26/8/11			7	F	WESTERN	12/08/2011	NEGATIVE
6	DA	24/8/11		3		F	WESTERN	12/08/2011	NEGATIVE
7	SA	06/05/2010	1	5		M	TAKORADI HOSP	12/08/2011	NEGATIVE
8	PNW	08/03/2011	1	4		M	TAKORADI HOSP	12/08/2011	NEGATIVE
9	QF	07/01/2011		4		F	TAKORADI HOSP	12/08/2011	NEGATIVE
10	MH	13/5/11		6		F	TAKORADI HOSP	12/08/2011	POSITIVE
11	MK	29/9/11		2		F	WESTERN	12/08/2011	NEGATIVE
12	BA	16/7/11		4		F	WESTERN	12/08/2011	NEGATIVE
13	EA	27/9/11		2		F	WESTERN	12/08/2011	NEGATIVE
14	DD	03/10/2011		8.5		M	WESTERN	12/08/2011	NEGATIVE
15	BN	07/07/2011		4.5		F	TAKORADI HOSP	12/08/2011	NEGATIVE
16	CA	26/6/11		5		F	WESTERN	12/08/2011	NEGATIVE
17	JD	21/12/10		11		F	WESTERN	12/08/2011	NEGATIVE
18	R0	13/5/11		6		M	WESTERN	12/08/2011	NEGATIVE
19	EA	15/12/10		11		M	WESTERN	12/08/2011	NEGATIVE
20	ZK	04/12/2011		7		F	TAKORADI HOSP	12/08/2011	NEGATIVE
21	AD	05/03/2011		6		F	WESTERN	12/08/2011	NEGATIVE
22	PD	14/6/11		5		M	WESTERN	12/08/2011	NEGATIVE
29	IK	03/11/2011		8		M	WESTERN	12/08/2011	NEGATIVE
32	BA	07/04/2011		4		M	WESTERN	12/08/2011	NEGATIVE
35	GQ	22/5/11		6		M	WESTERN	16/12/11	NEGATIVE
36	EB	08/03/2011		3		F	WESTERN	12/09/2011	NEGATIVE
37	AI	08/11/2011		4		F	WESTERN	12/09/2011	NEGATIVE
38	SM	06/06/2011				F	WESTERN	12/09/2011	NEGATIVE
39	SY	31/7/10		4		F	WESTERN	12/09/2011	NEGATIVE
40	DA	07/12/2011				M	WESTERN	12/09/2011	POSITIVE
41	JN	13/4/11		8		F	WESTERN	12/09/2011	NEGATIVE
42	DA	27/7/11				F	WESTERN	12/09/2011	NEGATIVE
43	BS	04/08/2011				F	WESTERN	12/09/2011	NEGATIVE
44	EKD	06/04/2011		6		F	WESTERN	12/09/2011	NEGATIVE

45	PA	30/9/10	1	2		F	WESTERN	12/09/2011	NEGATIVE
46	JD	23/2/11		9		M	WESTERN	12/09/2011	NEGATIVE
47	DE	19/7/10	1	5		M	WESTERN	12/09/2011	NEGATIVE
48	GA	28/10/10	1			F	WESTERN	12/09/2011	NEGATIVE
49	BA	17/8/11		4		F	WESTERN	12/09/2011	NEGATIVE
50	HMA	21/6/10	1	5		F	WESTERN	12/09/2011	NEGATIVE
51	RL	29/6/11		5		F	WESTERN	12/09/2011	NEGATIVE
52	EA					F	ENRH	12/09/2011	NEGATIVE
53	KBB	13/8/11		3		M	ENRH	12/09/2011	NEGATIVE
54	TE	09/11/2011		2		M	ENRH	12/09/2011	NEGATIVE
55	KQ	06/08/2011		5		M	ENRH	12/09/2011	NEGATIVE
56	EA	08/06/2011		4		M	ENRH	12/09/2011	NEGATIVE
57	CA	22/3/11		8		F	ENRH	12/09/2011	NEGATIVE
58	KK	05/10/2011		6		M	ENRH	12/09/2011	NEGATIVE
59	VKA	30/7/11		4		F	ENRH	12/09/2011	NEGATIVE
60	JB	05/04/2011		6		M	ENRH	12/09/2011	NEGATIVE
61	PP	15/3/11		8		M	ENRH	12/09/2011	NEGATIVE
62	SA	06/12/2011		5		M	ENRH	12/09/2011	NEGATIVE
63	KA	09/06/2011				M	WESTERN	16/12/2011	NEGATIVE
64	SA	20/1/11				M	WESTERN	16/12/11	NEGATIVE
65	RB	19/4/11		7		F	WESTERN		NEGATIVE
66	LME	18/6/11		5		M	WESTERN		NEGATIVE
67	ATD	03/02/2011				F	WESTERN		NEGATIVE
69	AK	18/8/11				M	WESTERN		NEGATIVE
70	EA	12/12/2010		12		F	TARKWA HOSP		POSITIVE
71	FT	31/1/11				M	TARKWA HOSP		NEGATIVE
72	CG	28/5/11				M	TARKWA HOSP		NEGATIVE
73	EA	23/7/11				M	TARKWA HOSP		NEGATIVE
74	KGF	17/5/11				M	TARKWA HOSP		NEGATIVE
75	IA	09/08/2011				M	TARKWA HOSP		NEGATIVE
76	DA	14/6/11				M	TARKWA HOSP		POSITIVE
77	SB	23/8/11				F	TARKWA HOSP		NEGATIVE
78	VD	23/3/11				F	TARKWA HOSP		NEGATIVE
79	RE	17/9/11				M	TARKWA HOSP		NEGATIVE
80	JAJ	16/6/11				F	TARKWA HOSP		NEGATIVE
81	CEO	29/8/11				F	TARKWA HOSP		NEGATIVE
82	AA	23/4/11					TARKWA HOSP		NEGATIVE
83	KMS	10/04/2011					TARKWA HOSP		NEGATIVE

84	AA	7/9/10/	1	2		M	EIKWE	14/12/11	NEGATIVE
85	LEK	09/10/2011			10	F	EIKWE	14/12/11	NEGATIVE
86	JKT	22/3/11		7		M	EIKWE	14/12/11	NEGATIVE
87	RAR	17/10/11			6	F	TAKORADI HOSP	14/12/11	NEGATIVE
88	GA	20/1/11		10		F	TAKORADI HOSP	14/12/11	NEGATIVE
89	AAPB	15/11/10	1	1		M	HALF ASSINI	14/12/11	NEGATIVE
90	AS	13/9/10	1	3		M	HALF ASSINI	14/12/11	NEGATIVE
91	DK	13/8/11		4		F	HALF ASSINI	14/12/11	NEGATIVE
92	JB	07/08/2011		5		M	HALF ASSINI	14/12/11	NEGATIVE
93	GA	05/06/2011		7		M	HALF ASSINI	14/12/11	NEGATIVE
94	PM	18/8/11		5		F	HALF ASSINI	14/12/11	NEGATIVE
95	FA	10/09/2011			6	F	BIBIANI	14/12/11	POSITIVE
96	GK	16/10/11			6	M	BIBIANI	14/12/11	NEGATIVE
97	BDA	12/05/2010		11		M	BIBIANI	14/12/11	NEGATIVE
98	BDA	12/05/2010		11		M	BIBIANI	14/12/11	NEGATIVE
99	GA	10/07/2011		2		M	BIBIANI	14/12/11	NEGATIVE
100	CQ	02/11/2011		9		F	BIBIANI	14/12/11	NEGATIVE
101	KT	26/9/11		4		M	BIBIANI	14/12/11	NEGATIVE
102	EB	18/9/11		4		F	BIBIANI	14/12/11	NEGATIVE
103	KM	10/09/2011			6	M	BIBIANI	14/12/11	NEGATIVE
104	SAMT	26/6/11		5.5		F	ENRH	14/12/11	NEGATIVE
105	ARB	15/10/11			6	M	ENRH	14/12/11	NEGATIVE
106	CKO	11/12/2010		11		F	ENRH	14/12/11	NEGATIVE
107	GM	09/03/2011				M	ENRH	14/12/11	NEGATIVE
108	BG	25/9/11		2.5		F	ENRH	14/12/11	NEGATIVE
109	DA	07/04/2011		5		M	ENRH	14/12/11	NEGATIVE
110	EK	19/5/11		7		M	ENRH	14/12/11	NEGATIVE
111	IW	20/4/11		8		M	ENRH	14/12/11	NEGATIVE
112	KE	15/1/11		11		M	ENRH	14/12/11	NEGATIVE
113	JKT	28/4/11		7		F	WESTERN	14/12/11	NEGATIVE
114	NNAM	17/3/11		8		M	WESTERN	14/12/11	NEGATIVE
115	FC	18/5/119		6		F	WESTERN	14/12/11	NEGATIVE
116	WWCO	12/09/2010	1			M	WESTERN	14/12/11	NEGATIVE
117	JA	09/11/2011		3		F	WESTERN	14/12/11	NEGATIVE
118	PE	29/9/10	1	3		M	WESTERN	14/12/11	NEGATIVE
119	PO	30/9/11		2		M	WESTERN	14/12/11	POSITIVE
120	MA	27/6/11		5		F	WESTERN	14/12/11	NEGATIVE
121	KD	09/09/2011		2		M	WESTERN	14/12/11	NEGATIVE
122	RC	04/04/2011		8		M	WESTERN	14/12/11	NEGATIVE
130	AA	10/05/2011				F	TARKWA HOSP		NEGATIVE
131	LA			5		M	TARKWA HOSP		NEGATIVE
132	IA			3		M	TARKWA HOSP		NEGATIVE
133	MJ			6		F	TARKWA HOSP		NEGATIVE

134	KA	30/9/11				M	TARKWA HOSP		NEGATIVE
135	FQ	15/10/11				F	TARKWA HOSP		NEGATIVE
136	ET	11/09/2011		4		M	WASA AKROPONG		NEGATIVE
137	ET	11/09/2011		4		M	WASA AKROPONG		NEGATIVE
138	AA			5		M	WASA AKROPONG		NEGATIVE
139	KA	10/12/2011		4		M	SHAMA H/C		NEGATIVE
140	RM	14/8/11				F	EIKWE		NEGATIVE
141	TN	06/05/2011		6		F	EIKWE		POSITIVE
142	EEM	17/5/11		7		F	EIKWE		NEGATIVE
143	RQ	02/08/2011		10		F	EIKWE		NEGATIVE
144	SA	30/5/11		6		F	EIKWE		NEGATIVE
145	DK	30/10/11		2		M	EIKWE		NEGATIVE
146	PK			7		F	EIKWE		NEGATIVE
147	BO			11		F	EIKWE		NEGATIVE
148	JS	25/3/11		8		F	EIKWE		NEGATIVE
149	BD	26/10/11			7	M	EIKWE		NEGATIVE
150	SA					M	EIKWE		NEGATIVE
151	JA			7	0	M	EIKWE		NEGATIVE
152	SK	15/12/11		0	9	M	AXIM		NEGATIVE
153	PB	24/7/11		6		F	AXIM		NEGATIVE
154	CY	29/3/11		11		F	TAKORADI HOSP		NEGATIVE
155	JKS	24/4/11		9		M	TAKORADI HOSP		NEGATIVE
156	PC	06/10/2011		8		F	TAKORADI HOSP		NEGATIVE
157	EM	12/07/2011		2		M	TAKORADI HOSP		NEGATIVE
158	BAM	16/6/11		6		F	TAKORADI HOSP		NEGATIVE
159	WB	05/04/2011		8		M	TAKORADI HOSP		NEGATIVE
160	NA	16/12/11		2		F	WASA AKROPONG		NEGATIVE
161	PA	23/11/11		3		M	SHAMA H/C		NEGATIVE
162	PD	22/11/11		3		M	SHAMA H/C		NEGATIVE
163	KP	18/11/11		3		M	SEFWI WIAWSO		NEGATIVE
164	DA	19/10/11		4		M	SEFWI WIAWSO		NEGATIVE
165	JKO	17/12/11			6	M	GPHA		NEGATIVE
166	EO	16/8/11		6		M	GPHA		NEGATIVE
167	ACO	20/10/11		4		F	GPHA		NEGATIVE
168	JM	16/4/11		10		M	BIBIANI		NEGATIVE
169	VA	14/10/11		4		F	BIBIANI		POSITIVE
170	NKA	29/6/11		8		F	BIBIANI		NEGATIVE
171	PAE	10/10/2010	1	4		F	HALF ASSINI		NEGATIVE

172	KN	25/8/11		7		M	HALF ASSINI		NEGATIVE
173	JK	31/10/10	1	1		F	HALF ASSINI		NEGATIVE
174	SJ	25/4/11		8		F	HALF ASSINI		NEGATIVE
175	CK	25/7/11		5		F	HALF ASSINI		NEGATIVE
176	EA			6		F	HALF ASSINI		NEGATIVE
177	EEC	07/03/2011		6		F	ENRH		POSITIVE
178	HN	11/02/2011		2		F	ENRH		NEGATIVE
179	BA	20/5/11		7.5		F	ENRH		NEGATIVE
180	MA	11/06/2011				F	ENRH		NEGATIVE
181	MPA	17/11/11		7		F	ENRH		NEGATIVE
182	EN	12/07/2010	1			M	ENRH		NEGATIVE
183	BK			11		F	ENRH		NEGATIVE
184	SKE	27/5/11		7.5		M	ENRH		NEGATIVE
185	MA	17/6/11		7		F	ENRH		NEGATIVE
186	EM	02/01/2011		11		F	ENRH		NEGATIVE
187	JD	23/8/11		4		F	ENRH		NEGATIVE
188	BT	06/12/2011		7		M	ENRH		NEGATIVE
189	PAB	12/08/2011				M	ENRH		NEGATIVE
190	EC	12/03/2011			7	F	ENRH		NEGATIVE
191	KA	12/06/2011			6	M	ENRH		NEGATIVE
214	HKA	07/01/2011		7		M	ENRH		NEGATIVE
215	KOS	16/11/11				F	TARKWA HOSP		NEGATIVE
216	YPK	24/11/11			9	M	TARKWA HOSP		NEGATIVE
217	RA	30/4/11		9		F	TARKWA HOSP		NEGATIVE
218	CA	11/06/2011			11	F	TARKWA HOSP		NEGATIVE
219	KA	17/8/11			22	M	TARKWA HOSP		NEGATIVE
221	SED	28/12/11			7	M	TAKORADI HOSP		NEGATIVE
222	EMD	28/12/11			7	F	TAKORADI HOSP		NEGATIVE
223	EB	25/7/11		6		M	TARKWA HOSP		NEGATIVE
224	YKK	24/11/11			6	M	TARKWA HOSP		NEGATIVE
225	EQ	19/12/11			7	F	ENRH		NEGATIVE
226	SC	16/11/10			16	F	ENRH		NEGATIVE
227	EA	30/12/11			6	M	ENRH		NEGATIVE
228	SA	08/01/2011		6		F	ENRH		NEGATIVE
229	JE	20/12/10		14		F	ENRH		NEGATIVE
230	PAK	12/10/2011			6	F	ENRH		NEGATIVE
231	CK	20/4/11		9	1	F	EIKWE		NEGATIVE
244	MADA	01/02/2012			8	F	GPHA		NEGATIVE
248	JA	01/03/2011		11		F	BIBIANI		POSITIVE
249	AM	07/03/2011		7		M	BIBIANI		POSITIVE
250	SA	25/3/11	1			M	BIBIANI		NEGATIVE

251	EN	25/1/12			6	M	BIBIANI		NEGATIVE
252	NHA	11/12/2011		4		F	ESSIKADU		NEGATIVE
253	EE	25/7/11		6		M	EIKWE		NEGATIVE
254	KA	29/11/11		2		M	EIKWE		NEGATIVE
255	MA	24/1/12		2		F	BIBIANI		NEGATIVE
256	AAW	19/9/12		5		M	BIBIANI		NEGATIVE
257	BA	04/10/2011				M	BIBIANI		NEGATIVE
258	MM	30/12/11			6	F	BIBIANI		NEGATIVE
259	KAM	13/2/11			6	M	BIBIANI		NEGATIVE
260	PV	21/12/11			6	F	BIBIANI		NEGATIVE
261	BH	18/12/11			6	M	BIBIANI		NEGATIVE
262	AI	29/12/10	1			M	BIBIANI		NEGATIVE
263	EAM	13/12/11			6	M	BIBIANI		NEGATIVE
264	EM	12/02/2011		2		F	ENRH		NEGATIVE
265	VWB	01/06/2012			6	F	ENRH		NEGATIVE
266	PN	25/8/11		6		M	ENRH		NEGATIVE
267	EA	16/11/11		3		M	ENRH		NEGATIVE
268	AFT	11/03/2011		3		M	ENRH		NEGATIVE
269	MHD	11/03/2011		3		F	ENRH		NEGATIVE
270	LA	01/11/2012			6	F	ENRH		NEGATIVE
271	MAA	29/12/11		2		F	ENRH		NEGATIVE
272	KD	12/01/2010	1	3		M	ENRH		NEGATIVE
273	KD	12/01/2010	1	3		M	ENRH		NEGATIVE
274	CK	23/12/11		2		M	ENRH		NEGATIVE
291	GB	13/07/11		8		F	GPHA		NEGATIVE
292	DD	14/2/12		3		M	AXIM		NEGATIVE
293	FM	30/6/11		8		M	AXIM		NEGATIVE
294	SB	02/11/2012			6	M	AXIM		NEGATIVE
295	BT	04/05/2011		11		F	AXIM		NEGATIVE
296	JN	02/10/2012			6	F	BIBIANI		POSITIVE
297	EA	17/12/11		3		M	BIBIANI		NEGATIVE
298	KT	29/5/11		11		M	BIBIANI		NEGATIVE
299	TO	23/2/12			6	M	BIBIANI		NEGATIVE
300	RA	06/01/2012			6	F	EIKWE		NEGATIVE
301	LM	05/10/2012		2		F	EIKWE		NEGATIVE
302	JE	05/11/2012		2		M	EIKWE		NEGATIVE
310	GE	30/11/11		5		F	AXIM		NEGATIVE
311	DQ	04/10/2012			6	F	AXIM		POSITIVE
312	LK	13/5/12		2		F	SHAMA H/C		NEGATIVE
313	EE	04/05/2012		5		M	SHAMA H/C		NEGATIVE
314	JAK	06/05/2012			9	F	SHAMA H/C		NEGATIVE
315	DK	03/12/2012		2		F	HALF ASSINI		NEGATIVE
316	MMK	23/12/11		5		F	HALF ASSINI		NEGATIVE
317	BKO	29/3/12			8	M	HALF ASSINI		NEGATIVE
320	PTM	28/9/12			6	F			NEGATIVE
321	HA	19/9/12		8		F	ESSIKADU		NEGATIVE

322	HA	19/9/12		8		M	ENRH		POSITIVE
323	ND	30/10/11		8		F	ENRH		NEGATIVE
324	IN	05/05/2011		10		M	ENRH		NEGATIVE
325	EP	29/1/12			6	F	ENRH		NEGATIVE
326	EK	10/08/2011		5		M	ENRH		NEGATIVE
327	SKE	19/10/10	1	5		M	ENRH		NEGATIVE
328	AR	15/10/11		5		M	ENRH		NEGATIVE
329	SB	21/8/12		6		M	ENRH		POSITIVE
330	SB	21/8/12		6		F	ENRH		POSITIVE
331	MA	01/04/2012		2.5		M	ENRH		NEGATIVE
332	AA	23/12/11			6	F	BIBIANI		NEGATIVE
333	BF	03/05/2012			6	F	BIBIANI		NEGATIVE
334	SAJ	09/07/2011			6	M	BIBIANI		NEGATIVE
335	SAS	09/07/2011			6	M	BIBIANI		NEGATIVE
336	JY	24/2/12		2		M	BIBIANI		NEGATIVE
337	AN	12/03/2011			6	M	BIBIANI		NEGATIVE
338	NYE	02/02/2012			6	M	TAKORADI HOSP		NEGATIVE
339	AAA	26/1/12			6	F	TAKORADI HOSP		NEGATIVE
340	AJ	27/3/12			6	M	SEFWI WIAWSO		NEGATIVE
341	WM	22/3/12			6	M	SEFWI WIAWSO		NEGATIVE
342	AM	03/11/2012			6	F	SEFWI WIAWSO		NEGATIVE
343	JN					M	SEFWI WIAWSO		NEGATIVE
344	SD					M	SEFWI WIAWSO		NEGATIVE
345	EKG					F	SEFWI WIAWSO		NEGATIVE
346	MNAA					F	SEFWI WIAWSO		NEGATIVE
347	EPG					F	SEFWI WIAWSO		NEGATIVE
348	CA					M	SEFWI WIAWSO		POSITIVE
349	PA					M	SEFWI WIAWSO		NEGATIVE
350	MD					F	SEFWI WIAWSO		NEGATIVE
351	POK	03/09/2012			6	M	SEFWI WIAWSO		NEGATIVE
352	AKB	12/02/2012			8	F	SEFWI WIAWSO		NEGATIVE
353	APG	12/02/2012			8	F	SEFWI WIAWSO		NEGATIVE
354	VP	13/01/12			8	F	SEFWI WIAWSO		NEGATIVE
355	GAN			6		F	SEFWI WIAWSO		NEGATIVE
356	JA	15/4/12			15	M	SEFWI ASAFO		NEGATIVE
357	GO	18/2/12			24	F	SEFWI		NEGATIVE

							WIAWSO		
358	VYA	14/08/12			6	F	SEFWI WIAWSO		NEGATIVE
359	MC	29/8/12			6	F	SEFWI WIAWSO		NEGATIVE
360	RS	26/7/12			11	F	SEFWI WIAWSO		NEGATIVE
361	AM					F	SEFWI WIAWSO		NEGATIVE
362	EA	23/9/12			7	M	SEFWI WIAWSO		NEGATIVE
363	SAA	24/8/12			14	F	SEFWI WIAWSO		NEGATIVE
364	AA	10/07/2012			8	F	SEFWI WIAWSO		NEGATIVE
365	DG	21/3/12				F	APOWA H/C		NEGATIVE
366	BCY					F	ASANKRAGUA		NEGATIVE
367	AG				6	F	ASANKRAGUA		NEGATIVE
368	EO	09/09/2011		6		M	AXIM		NEGATIVE
369	BC	17/3/12				F	WASA AKROPONG		NEGATIVE
370	EN	14/2/12		1		F	WASA AKROPONG		NEGATIVE
371	AN	13/12/11				M	WASA AKROPONG		NEGATIVE
372	BB	03/12/2012					WASA AKROPONG		NEGATIVE
375	NB	21/10/11		5		F	ENRH		POSITIVE
376	KG	17/1/12				M	SEFWI WIAWSO		NEGATIVE
377	FN	21/1/12				M	SEFWI WIAWSO		NEGATIVE
378	EF	20/2/12				M	SEFWI WIAWSO		NEGATIVE
379	EA	24/1/12			7	F	SHAMA H/C		NEGATIVE
380	RA					F	SEFWI ASAFO		NEGATIVE
381	IA					M	SEFWI ASAFO		NEGATIVE
382	LA					F	ASANKRAGUA		NEGATIVE
383	IM					M	SEFWI ASAFO		NEGATIVE
384	RC					M	SEFWI ASAFO		NEGATIVE
385	WA					M	TARKWA HOSP		NEGATIVE
386	HD	13/11/11				F	TARKWA HOSP		NEGATIVE
387	SP	29/11/11				F	TARKWA HOSP		NEGATIVE
388	NKC	16/10/11				M	TARKWA HOSP		NEGATIVE
389	BK	11/04/2011				M	TARKWA HOSP		NEGATIVE
390	LA	12/05/2011				F	TARKWA HOSP		NEGATIVE
391	AOD	17/1/12				F	TARKWA HOSP		NEGATIVE
392	MD	20/12/11				F	TARKWA HOSP		NEGATIVE

393	DA	26/10/11				F	TARKWA HOSP		NEGATIVE
394	LC	16/5/11				M	TARKWA HOSP		NEGATIVE
395	DOA	09/06/2011				M	TARKWA HOSP		POSITIVE
396	PKA	27/6/11				M	TARKWA HOSP		NEGATIVE
397	EA	25/8/11				M	TARKWA HOSP		NEGATIVE
398	KO	20/10/11				M	TARKWA HOSP		NEGATIVE
399	BA	31/3/13		2		F	WASA AKROPONG		NEGATIVE
400	SO				6	F	ASANKRAGUA		NEGATIVE
401	IA	13/4/13		2		M	WASA AKROPONG		NEGATIVE
402	YD	27/5/13			11	F	ENRH		NEGATIVE
403	BS	25/4/13				F	ENRH		NEGATIVE
404	BA	14/4/12				F	ENRH		NEGATIVE
405	JNAA	29/1/11				F	ENRH		NEGATIVE
406	BV					F	ENRH		NEGATIVE
407	BP					F	ENRH		NEGATIVE
408	HO	03/04/2013		4		M	ENRH		NEGATIVE
409	FT	19/1/13		7		M	ENRH		NEGATIVE
410	FT	19/1/13		7		M	ENRH		NEGATIVE
411	NK	05/09/2013			11	M	ENRH		NEGATIVE
412	KA	06/10/2013			6	M	ENRH		NEGATIVE
413	PAY	24/11/12		8		F	ENRH		NEGATIVE
414	IO	16/6/13		6		M	ENRH		NEGATIVE
415	RA	28/4/13		6		F	ENRH		NEGATIVE
416	BN	07/01/2012	1	1		F	ENRH		NEGATIVE
417	EEJ	08/05/2013		3		F	ENRH		NEGATIVE
418	GG	06/07/2013			4	M	ENRH		NEGATIVE
419	AS					F	ENRH		NEGATIVE
420	FKM	27/3/12	1	4		M	ENRH		NEGATIVE
421	GAN	06/03/2013		15		F	ENRH		NEGATIVE
422	PS	24/6/13			10	M	ENRH		NEGATIVE
423	SA	04/07/2013		4		F	ENRH		NEGATIVE
424	PA	29/5/13			10	M	ENRH		NEGATIVE
425	NM						ASANKRAGUA		NEGATIVE
426	GDA					F	ASANKRAGUA		NEGATIVE
427	AD						ENRH		NEGATIVE
428	YN	29/4/13			14	M	ENRH		NEGATIVE
429	FS	25/6/12		14		F	ENRH		NEGATIVE
430	FB	06/05/2013			8	F	ENRH		NEGATIVE
431	DE	14/4/13		4		M	ENRH		NEGATIVE
432	BO	06/07/2013			10	F	ENRH		NEGATIVE
433	IBM	19/5/13		3		M	ENRH		NEGATIVE
434	NAAE	29/10/12		9		F	ENRH		NEGATIVE

435	CRG	21/3/13		6		F	ENRH		NEGATIVE
436	HS	24/4/13		4		M	ENRH		NEGATIVE
437	DS	16/4/13		4		M	ENRH		NEGATIVE
438	RA	17/9/12		11		M	ENRH		NEGATIVE
439	ME	14/5/12		14		M	ENRH		NEGATIVE
440	JD						ENRH		NEGATIVE
441	SD	28/3/13		3		F	ENRH		NEGATIVE
442	KD	30/4/12				M	ENRH		NEGATIVE
443	KPS	05/02/2012				M	ENRH		NEGATIVE
444	MD	29/5/12				F	ENRH		NEGATIVE
445	AE	05/01/2012				F	ENRH		NEGATIVE
446	ONA	28/2/12		3		F	ENRH		NEGATIVE
447	JA	28/4/12		2		M	ENRH		NEGATIVE
448	JD								NEGATIVE
449	MAO								NEGATIVE
462	EFP						ENRH		NEGATIVE
463	FAO						ENRH		NEGATIVE
464	BFN						ENRH		NEGATIVE
465	DA						ENRH		NEGATIVE
466	AAY					F	ENRH		POSITIVE
467	EM						ENRH		NEGATIVE
468	IE						ENRH		NEGATIVE
529	AG	30/5/13			6	F	SHAMA H/C		NEGATIVE
530	NKT	22/8/12				M	SHAMA H/C		POSITIVE
531	DE	05/07/2013				M	SHAMA H/C		NEGATIVE
532	AA	06/04/2013				F	SHAMA H/C		NEGATIVE
533	CA	03/06/2013				F	SHAMA H/C		NEGATIVE
534	BC					F	SHAMA H/C		NEGATIVE

APPENDIX IX

DATA COLLECTION TOOLS

KEY INFORMANT GUIDE (FOR MIDWIVES)

Thank you for granting me this interview. The information we gather will help us to improve the implementation of PMTCT.

1. Code:
2. Do you know national target: Y N
    a. If yes, what?
3. Are you aware of 4-pronged approach? Y N
    a. If yes, what are they?
4. When was your last PMTCT training or refresher?
5. When do you test your ANC clients for HIV?
6. When they test neg at that time, do you do any re-test later?
    a. If yes when
7. Which ANC client qualifies to be put on ARVs
8. What's your ARV source for your clients?
    a. Same site
    b. Refered
        i. Referral sites
9. Why do some ANC clients refuse the test?
10. Do you know about EID? Y N
    a. Time
    b. Type of sample
    c. Who takes sample
    d. Who collects results
    e. When collects results
    f. If not you, do you get to see or know the results?
11. What action do you take when PMTCT client stops attending ANC
12. When does your work as a midwife end for the PMTCT client?
13. Have you experienced any PMTCT client's baby test positive before?
    a. If yes, what did you do about the situation?
14. For your PMTCT client whose baby tests negative at 6 weeks, what advice will you give concerning feeding?

Thank you for your time.

APPENDIX X

DATA COLLECTION TOOLS: QUESTIONAIRE (PMTCT CLIENTS)

INFORMED CONSENT FORM

RESEARCH TOPIC: FACTORS CONTRIBUTING TO OUTCOME OF THE PMTCT INTERVENTION IN THE WESTERN REGION OF GHANA

Principal Investigator (Student): Maame Pokuah Amo-Addae

Address: School of Public Health, University of Ghana, Legon

Tel: 0240144696 Email: mamoaddae@yahoo.co.uk

General Information:

This study is one which will contribute to the elimination of mother-to-child transmission of HIV. We would be grateful if you would answer these questions voluntarily to help us achieve this aim.

Possible Risks and Discomfort

The research will not pose any physical risks to you although you may be required to spend about 30minutes of your time to answer the questions. Your baby will have a drop of blood taken from a prick on the sole of his/her foot which will be used in the lab to determine whether he/she is infected or not. This would have been done routinely, even in the absence of the study.

Possible Benefits

You may not personally benefit immediately from this research but the findings would benefit Ghanaians in general because of its potential to guide the Ghana Health service with information as to how to achieve a generation free of HIV.

Confidentiality

All the information obtained from you and from the analysis of the blood sample would be handled confidentially and used for the purpose indicated for the study.

Compensation

This is a purely voluntary participation that is required of you and no monetary compensation is available.

Choice of Participation

You are free to choose to participate or not to participate. If you decide not to participate, this will not affect the care you receive in any way.

If you agree to participate, you are free to decide to end your participation at any time.

Contact Numbers

If you have any questions or problems relating to your participation in the study, please call:

Dr. PriscilliaNortey, School of Public Health (0243303362) or Maame Amo-Addae, School of Public Health(0240144696)

VOLUNTEER AGREEMENT

The document detailing the risks, discomforts, benefits and procedures involved in the research work entitled "FACTORS CONTRIBUTING TO OUTCOME OF THE PMTCT INTERVENTION IN THE WESTERN REGION OF GHANA" has been read and adequately explained to me. I have been given ample opportunity to have any questions I may have answered to my satisfaction. Consequently, I agree to participate as a volunteer.

…….. ……..

Signature or Thumbprint of Volunteer Date

If a volunteer cannot read the document, then a Witness is needed:

I was present during the reading and explanation of the consent document to the volunteer; all questions from the volunteer were duly answered and the volunteer agreed to participate in the study.

……
……

Signature of Witness Date

I certify that the purpose and nature of the research, the potential benefits and possible discomforts associated with participating in this research have been explained to the volunteer who has agreed to voluntarily participate.

……..
…….

Signature of Person Who Obtained Consent Date

QUESTIONNAIRE

CODE NUMBER: GESTATIONAL AGE AT RECRUITMENT:_____weeks

DATE OF INTERVIEW: INITIALS OF INTERVIEWER:

INTERVIEW SITE:

1. DEMOGRAPHY
    i. Age of respondent
    ii. Date of birth of child:
    iii. Place of usual Residence :
    iv. Highest educational level completed
        1. None
        2. Primary
        3. JHS
        4. SHS
        5. Tertiary
        6. Post graduate
        7. Vocational/technical
    v. Religion
        1. None
        2. Islam
        3. Christianity
        4. Other _____

2. SOCIOECONOMIC STATUS
    i. Marital status
        1. Single (never married) and currently in no relationship
        2. Single (never married) but courting
        3. Married
        4. Divorced

5. Widowed
6. Other _____

ii. Type of employment

1. Self-employed
2. Employed
3. Unemployed
4. Apprentice/student
5. Other _____

iii. If learning a trade or employed,

1. State type of work_____

iv. Income level per month

1. Less than 100ghc
2. 100-500ghc
3. >500 – 1000ghc
4. >1000ghc

v. What type of accommodation do you live in?

1. Self-owned self-contained
2. Self-owned compound
3. Rented self-contained
4. Rented compound

3. FAMILY SUPPORT: DISCLOSURE OF STATUS TO PARTNER

i. How long have you been in the relationship with your partner?

ii. Is your partner aware of your HIV status

1. Yes
2. No

If No, go to vii.

iii. If yes,
    1. how did he get to know?
        a. I told him
        b. Other _____

iv. When did he get to know your staus?
    1. Before you got pregnant
    2. During the pregnancy

v. how would you describe your partner's initial attitude to the pregnancy?
    1. happy
    2. Did not want it
    3. Supportive
    4. Other _____

vi. Did his attitude change after he knew your status?
    1. Yes _____
    2. No _____

        a. If yes, how did it change?
        _____
        _____
        _____

vii. Do you know your partner's HIV status?
    1. Yes
    2. No

viii. If yes, how did you get to know?
    1. He told me
    2. Other _____

4. <u>REPRODUCTIVE HISTORY: PARITY</u>

i. How many times have you been pregnant since you go to know that you were HIV positive?
ii. How many children have you had since you go to know that you were HIV positive?
iii. What is the birth order of this child?
iv. Have you lost any child to death?

If yes,

1. How long ago did this unfortunate incident happen?
    a. Less than 1year ago
    b. 1 to 2 years ago
    c. More than 2 years ago
2. What was the Cause of death
    a. AIDS
    b. Other. State _____
3. What was the age of that child at the time of death? _____

v. How old is your youngest living child before this recent/current pregnancy? _____years _____months

vi. What is the HIV status of the youngest living child before this child you just had?
    1. Positive
    2. Negative
    3. Have not checked

5. ADHERENCE TO IPT
    i. How many doses of fansidar (the 3 white tablets) did you take during the pregnancy?
    ii. How many doses recorded in ANC card
        1. One
        2. Two
        3. Three
        4. None

6. NON-ORTHODOX (HERBAL) MEDICATIONS USE DURING PREGNANCY
    i. Which herbal medications did you take during the pregnancy?
        1. None
        2. Other_____
            a. What was the purpose of the herbal drug (s) _____ _____ _____ _____

7. MEDICAL HISTORY: CONCURRENT ILLNESSES DURING PREGNANCY, DURATION OF DIAGNOSIS OF HIV IN RELATION TO CURRENT PREGNANCY, NUTRITIONAL LEVEL
    i. Did you have any of the following illnesses during pregnancy?
        1. Hypertension
        2. Diabetes
        3. Malaria
        4. Tuberculosis
        5. Other _____

    ii. When did you get to know that you were HIV positive?
        1. Before the pregnancy
        2. During the pregnancy
            a. How did you feel about the pregnancy when you learnt that you were HIV positive?
            b. Did the feeling change?
            c. If yes, why?
        3. During labour
        4. After delivery

    iii. What was your last hb recorded before delivery? (check ANC records)

8. KNOWLEDGE AND EXPECTATION OF THE MOTHER WITH RESPECT TO THE PMTCT INTERVENTION

   i. Did you do anything to reduce the risk of transmission of HIV to your child?
      1. Yes
      2. No

   ii. If yes, what? (tick all that apply)
      1. I took drugs given me at the hospital
      2. I was already on ARVs
      3. I took herbal medication
      4. I abstained from unprotected sex during the pregnancy
      5. I opted for caesarian section
      6. I prayed
      7. Others_____

   iii. If no, why not?
      1. There's nothing I could do about it
      2. I was not given any information about what I could do
      3. I don't believe in doing that
      4. Other _____

   iv. Do you know any HIV positive whose exposed baby was HIV negative?
      1. Yes
      2. No

   v. If yes, how did she achieve that
      1. By taking ARVs
      2. By praying
      3. Other _____

9. FERTILITY CHOICES

   i. How many more children did you want to have before you learnt that you were HIV positive?

   ii. How many children do you plan to have now?

1. If more, when do you plan to have the next one?

iii. What will you do to space the births or have no more children?

1. Abstain from sex
2. Use contraceptives
    a. What type_____
3. Nothing

10. HIV STATUS OF THIS CHILD AT 6-10 WEEKS BY PCR?

i. Positive
ii. Negative

11. If child is infected.

i. Date of birth: ___/____/___ (dd/mm/yy)
ii. Sex of child:
    1. Male
    2. female
iii. Birth weight of child:_____kg
iv. Current weight of child:_____kg
v. For how long has the child been breastfed?
    1. Never
    2. Other. State:_____

Thank you for your time.