

**FACTORS ASSOCIATED WITH DELAYED HIV DIAGNOSIS IN INFANTS IN TIER
THREE AND FOUR PUBLIC HEALTH FACILITIES IN KISUMU COUNTY, KENYA**

BY

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DECLARATION

A declaration is hereby made that this work is original and has not been presented for examination in any other University or Institution.

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DEDICATION

I dedicate my work to my nephew Kyle Hannington Wangulu and the rest of my family. You are a blessing to me.

ABSTRACT

Human Immunodeficiency Virus (HIV) is still a global challenge, with the bulk of infection in children being in sub-Saharan Africa. Six thousand six hundred and thirteen (6,613) new infections were reported in Kenya in 2015. In Kisumu County, HIV prevalence (19.9%) is 3.4 times higher than the national (5.9%). Prevention of Mother to Child Transmission (PMTCT) coverage in the County is low (60%) with 19.7% children infected in 2015. In 2016, only 3,369 infants were less than 2 months old among 6,209 infants who underwent initial HIV proviral DNA PCR testing. Consequently, probable HIV infected children who delayed HIV testing at 6 weeks of age were denied timely access to care and treatment. This has contributed to low (54%) coverage of care and treatment to eligible HIV infected children. This was a cross-sectional survey that sought to determine factors associated with delayed infant HIV diagnosis of sero-exposed infants in tier three and four public health facilities in Kisumu County, Kenya. Specifically, it sought to establish the caregiver-infant factors associated with delayed infant HIV diagnosis, to determine the health worker factors associated with delayed infant HIV diagnosis and to find out the health facility organizational factors associated with delayed infant HIV diagnosis. The study was conducted within tier three (n=6) and four (n=1) public health facilities in Kisumu County, Kenya. Systematically sampled caregivers (n=224) of HIV exposed children attending their routine clinics at the facilities, all health workers (n=51) working in Maternal and Child Health (MCH) department and administrators (n=7) of the health facilities were interviewed. Data was collected using structured questionnaires and analyzed using chi-square, multiple logistic regression analysis and Student's *t*-test. Caregiver-infant factors associated with delayed infant HIV diagnosis in Kisumu County were: lack of knowledge about specific means of mother to child transmission (OR: 6.5, 95% CI: 1.7-25.0; $p=0.006$), home delivery (OR: 5.8, 95% CI: 2.1-16.0; $p=0.001$) and non-disclosure of infant HIV exposure status to non-relatives (OR: 6.9, 95% CI: 2.0-24.3; $p=0.003$). Among health workers, there was significant difference in work relationships score among health workers who attended to infants who delayed HIV diagnosis ($M=4.0$, $SD=0.1$) and those who did not delay ($M=4.1$, $SD=0.1$); $t(222) = -2.89$, $p=0.004$. In evaluation of health facility organizational factors, there was significant difference in scores among health workers who attended to infants who delayed HIV diagnosis and those who did not delay for: job targets score ($M=76.1$, $SD=17.6$ and $M=81.8$, $SD=18.0$ respectively); $t(222) = -2.06$, $p=0.041$, evaluation on targets score ($M=71.3$, $SD=23.3$ and $M=80.6$, $SD=20.0$ respectively); $t(222) = -2.88$, $p=0.004$, and feedback after evaluation score ($M=67.0$, $SD=24.4$ and $M=78.3$, $SD=22.2$ respectively); $t(222) = -3.21$, $p=0.002$. Other organizational factors that could further delay infant HIV diagnosis in Kisumu County include long distance to central testing laboratories from facilities, use of courier services for sample transport, physical paper based result delivery and use of clinic appointments to provide results to caregivers. HIV sensitization programs need to focus on various mechanisms of HIV transmission, reduction of HIV-related stigma and the concept of early infant HIV testing. Kisumu County government should target to increase hospital deliveries from the current 69.5%. Public health facilities should promote good inter-personal relationships between health workers and adopt human resources performance management cycle as a collaborative team self-management practice. Kisumu County should also adopt point of care testing for HIV proviral DNA PCR.

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LIST OF ABBREVIATIONS

AFASS	Acceptable, Feasible, Affordable, Sustainable and Safe
AIDS	Acquired immunodeficiency Syndrome
ANC	Antenatal clinic (ANC)
ART	Antiretroviral Therapy
ARVs	Antiretroviral drugs
CHER	Children with HIV early antiretroviral therapy
DBS	Dried Blood Spot
DNA	Deoxyribonucleic Acid
EID	Early Infant Diagnosis
HAART	Highly Active Antiretroviral Therapy
HIV	Human Immunodeficiency Virus
HTC	HIV Testing and Counseling
MCH	Maternal and Child Health
NASCOP	National Aids and STI Control Program
PCR	Polymerase Chain Reaction
PMTCT	Prevention of Mother to Child Transmission
RNA	Ribonucleic Acid
TAT	Turnaround Time
UNAIDS	Joint United Nations Programme on HIV and AIDS
WHO	World Health Organization
CD4	Cluster of Differentiation 4
SPSS	Statistical Package for Social Sciences

OPERATIONAL AND DEFINITION OF TERMS

Care-giver: An individual who attends to the needs of a child. This might be the parent of the HIV exposed infant (mother or father), a relative or employees or owners of special centres which include children homes, orphanages or any other children centres that host the infants.

Child: World Health Organisation definition was adopted where a child is a person younger than 10 years of age and those between 10 and 19 years referred to as adolescents.

Cultural Access: Beliefs and traditional practices that may hinder presentation of the HIV exposed infants for testing at 6 weeks.

Delay in Infant HIV Diagnosis: Delayed infant HIV diagnosis among caregivers was defined by late (more than 6 weeks of infant age) presentation for specimen collection by caregiver-infants. This is because it is a key starting point within their control for subsequent infant HIV diagnostic processes (specimen transport, central laboratory results and results feedback) that follow. However, in its strict definition, delayed infant HIV diagnosis includes activities beyond dried blood specimen collection such as as sample transportation, laboratory analysis and results feedback to caregivers.

Disclosure Status: Willful revealing of HIV status by the infant caregiver to sexual partners, friends and or relatives.

Early Infant HIV Diagnosis (EID): Refers to timely HIV testing of HIV exposed infants on or before the 6th week of age.

Early Infant: Refers to a live infant six weeks or less of after birth.

Financial Access: Economic status of the caregivers as defined by their average monthly income levels, housing materials and the costs incurred to access testing facilities.

HIV Sero-Exposed Infant: Children born out of HIV positive mothers and are at risk of HIV infection due to intrauterine, intrapartum exposure or during breastfeeding.

Infant: Refers to a child younger than one year old. The term has however been operationalized in this study to include children less than 18 months of age.

Maternal Characteristics: In the context of the study refers to ANC attendance and place of delivery by the HIV positive mother to the infant recruited into the study.

No Delay in Dried Blood Sample Collection: A needle prick for HIV DNA testing done on or before the 6th week of age of the HIV exposed infant.

No Prolonged Turnaround Time: A timeframe of less than one month between dried blood sample collection and receipt of result from the central laboratory.

Physical Access: Geographical accessibility of health facilities by infant caregivers. This is a factor of average travel time and distance to the infants' HIV testing facility

Prolonged Turnaround Time: A timeframe of more than one month between dried blood sample collection and receipt of result from the central laboratory.

Social Support Networks: Perception and actuality that one is cared for and assistance available from family and other well-wishers either materialistic or non-materialistic.

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CHAPTER ONE

INTRODUCTION

1.1 Background

1.1.1 Epidemiology of Human Immunodeficiency Virus (HIV)

Despite efforts by local and international organizations towards fighting the Human Immunodeficiency Virus (HIV) and Acquired immunodeficiency Syndrome (AIDS) pandemic, the number of new infections (1.8 million in 2016) and AIDS related mortality (1 million in 2016) is still high (UNAIDS, 2017). Africa has the highest number of people living with HIV (Figure 1.1) (UNAIDS, 2017), majority of new HIV infections (64%) and AIDS related deaths (72%) (WHO, 2017). The epidemic in Kenya has different regional prevalence and variation by age and gender, with an adult prevalence estimated at 5.9%, which is an improvement from 7.2% in 2007 (Kenya Ministry of Health, 2016). HIV transmission in children is mainly due to mother to child transmission (MTC) and follows a similar epidemiological distribution as adults. Globally, there are 2.1 million children (0-14 year olds) living with HIV, with majority of them (88%) in sub-Saharan Africa (UNAIDS, 2017) .

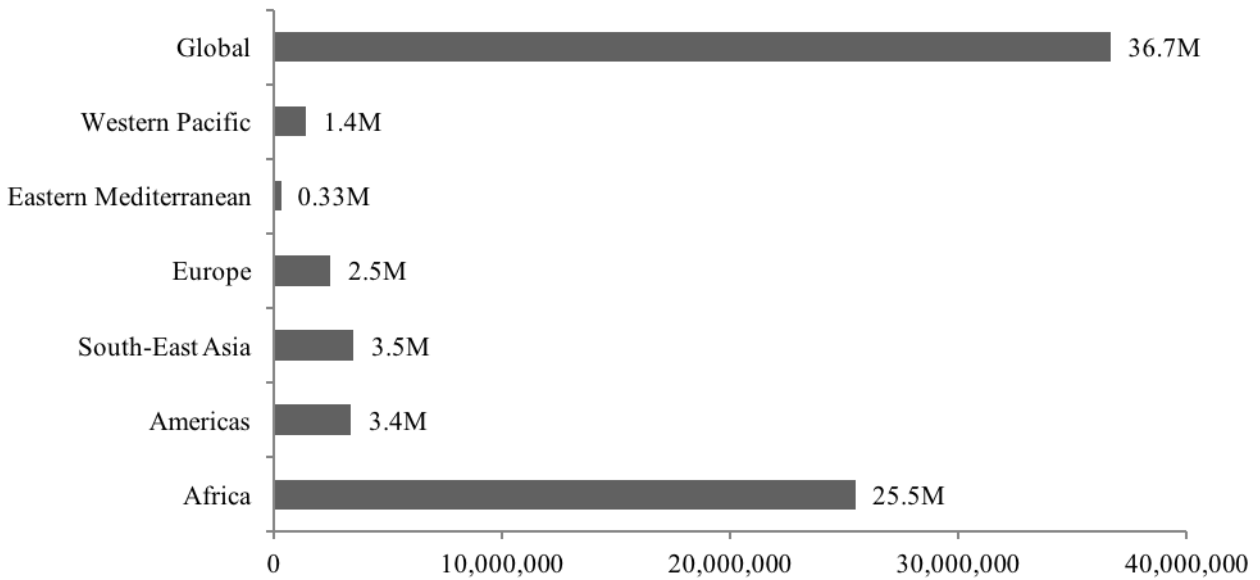


Figure 1.1: Number of people (all ages) living with HIV estimates by WHO region in 2016.

Chart regenerated from UNAIDS, 2017.

There were 98,170 children (0-14) living with HIV in Kenya with 6,613 new infections reported in 2015 (Ministry of Health, 2016). In Kisumu County where HIV prevalence (19.9%) is higher than the national (5.9%), there are 8,600 children living with HIV with an average of 909 new infections yearly (Ministry of Health, 2016). The County has a higher under five mortality rate (82 per 1000 live births) and infant mortality rate (50 per 1,000 live births) than the national figures (52 per 1,000 live births and 39 per 1,000 live births respectively), with HIV immunosuppression related conditions being listed as the leading cause of death (KDHS, 2014).

1.1.2 Prevention of Mother to Child Transmission

Children born to HIV positive mothers are at risk of HIV infection, as transmission occurs during pregnancy, labour, delivery and breastfeeding (WHO, 2012). This is because of the interaction between fetal-maternal blood during pregnancy, maternal cervico-vaginal secretions and blood

during delivery, coupled with fetal bleeding arising from birth trauma and transmission through breast milk during breastfeeding (WHO, 2010).

Mother to Child transmission of HIV can be averted through effective testing and counseling services to pregnant women, increasing access to treatment and care to infected pregnant women, safe delivery practices and exclusive breast feeding (WHO, 2012). Four key strategies are being employed by national authorities to prevent mother to child transmission. These include ensuring women of reproductive age and their partners being HIV negative through prevention strategies, avoiding unexpected pregnancies among those HIV infected and at risk through family planning and HIV testing and counseling services, ensuring HIV testing of pregnant women and timely access to effective ART by those infected during pregnancy, delivery and breastfeeding and integration into HIV care, treatment and support for infected women and their families (WHO, 2010).

In Kenya, the PMTCT program was initiated in 2000. It has been scaled up with nearly 10,000 health facilities offering PMTCT interventions by 2012. There has been an increase in Antenatal Clinic (ANC) attendance by expectant mothers with 95.4% of pregnant women between 2008 and 2012 attending an antenatal clinic (ANC) at least once during their pregnancy (NASCO, 2012). The HIV testing rates at ANC were as high as 94.4% among those who gave birth in 2012. Infected pregnant women attending ANC are placed on maternal prophylaxis or treatment during their pregnancy to prevent mother-to-child transmission of HIV infection. Antenatal clinics therefore serve as a key capture point for HIV infected women who can be followed up to ensure their new borns are tested at 6 weeks (WHO, 2008).

1.1.3 Infant HIV Diagnosis Framework

HIV virus detection by virological testing is the diagnostic gold standard method in infancy. Serological tests for HIV antibody detection cannot be used reliably for confirmatory diagnosis of HIV in infants (Read, 2007). This is due to the fact that maternal HIV antibodies can persist for 18 months and result in false positive test. Negative serological results only suggest that the infants are unexposed to the HIV virus from the mother (WHO, 2008). With scientific advancement, HIV virus transmitted by the mother to her child can be detected in the infant's blood as early as 6 weeks through virological tests in the laboratory; HIV Proviral Deoxyribonucleic Polymerase Chain Reaction (Proviral DNA PCR), HIV Ribonucleic Acid Polymerase Chain Reaction (RNA PCR) or the P24 antigen test (Lambert *et al.*, 2003).

Virological testing at 6 weeks age is to be able to detect all the in utero and intrapartum infections by a single complex and costly test in a low resource setting (Sherman *et al.*, 2005). Virological testing at 6 weeks also coincides with the infant's first immunization visit and therefore practical from a programmatic perspective. According to the Kenyan HIV Testing and Counseling (HTC) algorithm (Figure 1.2); HIV exposure status of all infants should be established at the 6-week immunization visit or at first contact thereafter, using maternal medical information, all HIV-exposed infants are offered routine proviral DNA Polymerase Chain Reaction (PCR) testing at the 6-week immunization visit, or at the earliest opportunity for infants seen after 6 weeks of age, infants with an initial positive HIV proviral DNA PCR results are presumed to be HIV infected and started on antiretroviral therapy (ART) in line with national guidelines. ART should be initiated in all HIV-infected children aged 10 years and below, regardless of WHO stage or CD4 count.

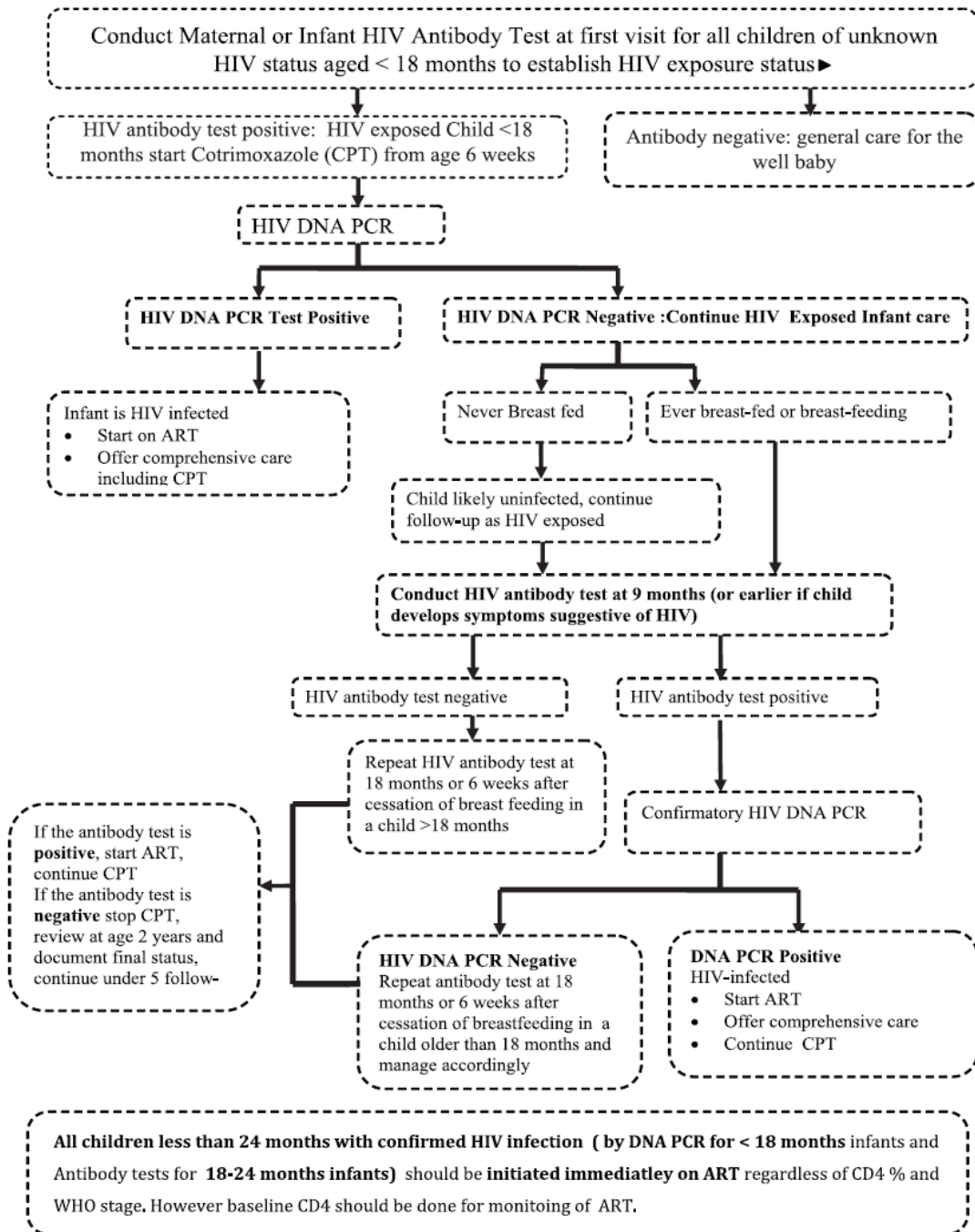


Figure 1.2: HIV Testing and Counseling Algorithm for Infants

Reprinted from Guidelines for PMTCT of HIV/AIDS in Kenya, NASCOP, 2012.

1.1.4 Significance of Early Infant HIV Diagnosis

The goal of early infant diagnosis (EID) is to identify infants born of HIV seropositive mothers and establish the HIV infection prior to the development of clinical disease to facilitate treatment and follow up (Violari *et al.*, 2008). ART and prophylaxis against opportunistic infections has become affordable and available in remote settings with free services being offered by national programs. This is of little benefit and can only be utilized by infants if HIV infections can be picked early (Dube *et al.*, 2012).

All confirmed HIV infected children less than 10 years of age should be initiated into ART irrespective of the stage of the infection (WHO, 2012). Delaying the diagnosis would therefore delay initiation of treatment. Early initiation of care and treatment in HIV exposed infants has been seen to have better treatment outcomes, prognosis and increased survival (Song *et al.*, 2007). Without access to prophylaxis, treatment, and supportive care, there is a high risk of mortality for HIV-infected children less than 2 years old with around 33% dying at an age less than 1 year and 50% dying by the age of 2 years (Newell *et al.*, 2004). In a previous study of Children with HIV Early Antiretroviral Therapy (CHER) in South Africa, it was demonstrated that ART provided within the first 6-12 weeks of life resulted in 96% survival at 12 months (Violari *et al.*, 2008).

Decision-making on infant feeding choices is crucial and is based on the infants' exposure status and/or confirmed HIV status. In a sero-exposed but HIV-uninfected baby, the mother can be counseled to practice exclusive breastfeeding or replacement feeding when it's acceptable, feasible, affordable, sustainable and safe (AFASS)(WHO, 2012). For those who are HIV-exposed but uninfected, counseling on care and prevention measures help to ensure that they remain uninfected (WHO, 2010).

Early diagnosis also ensures directed use of essential resources to children in need of treatment and care. This promotes effectiveness, minimizes wastage and underutilization of budgeted resources by government and non-governmental health systems (Ghadrshenas *et al.*, 2013).

Early infant diagnosis promotes the psychosocial well-being of families and communities by reducing potential stigma, discrimination and psychological distress for HIV-uninfected children and even increases the chances of adoption for orphans. For parents and families, it facilitates life-planning for their children whether HIV infected or not (Ghadrshenas *et al.*, 2013).

1.1.5 Delay in Infant HIV Diagnosis

In United States of America (USA), Infant HIV testing with HIV-1 Proviral DNA or RNA assays are performed within the first 14 days of life, at 1 to 2 months of age, and at 3 to 6 months of age (Read, 2007). Diagnosis of HIV exposed infants at birth has been tried in different settings and has been seen to identify in utero infections at the earliest opportunity (Rivka *et al.*, 2013).

Delayed HIV diagnosis among sero-exposed infants is a common problem in sub-Saharan Africa; Tanzania (Nuwagaba-Biribonwoha *et al.*, 2010), Zambia and Uganda (Sutcliffe *et al.*, 2014), South Africa (Sprague *et al.*, 2011) and Kenya (NASCOP & Ministry of Public Health & Sanitation, 2012). In Kenya, only 28% and 64% of HIV Exposed Infants (HEI) were tested within 2 months in 2010 and 2011, respectively (NASCOP & Ministry of Public Health & Sanitation, 2012). The increase was attributed to key interventions; increased Antenatal and post natal care attendance, early identification and cohorting of HIV positive pregnant women for PMTCT services and an increase in number of women delivering under skilled attendance (NASCOP & Ministry of Public Health & Sanitation, 2012). The percentage has since improved to 68% which is still below target (100%) (Ministry of Health, 2016).

In Kisumu County, only 2,926 infants were tested for HIV at 6 weeks despite having as many as 4,827 infants on prophylaxis and 3,090 reported deliveries by HIV positive mothers in 2011 (NASCOP, 2013). In 2016, only 3,369 infants were less than 2 months old among 6,209 infants who underwent initial HIV proviral DNA PCR testing in Kisumu County (NASCOP-EID, 2016). Consequently, probable HIV infected children who had not undergone HIV testing at 6 weeks were denied timely access to care and treatment. This has contributed to low (54%) coverage of care and treatment to eligible HIV infected children in Kisumu County despite the 100% requirement by the national guidelines (Ministry of Health, 2016).

Infant HIV testing cascade (Figure 1.3) in Kisumu County involves presentation of HIV exposed infants in health facilities by their caregivers on or before 6 weeks of age for evaluation and specimen collection. Antibody screening is done within health facilities and HIV positive specimens are transported to central HIV proviral DNA testing laboratories for virological testing. After laboratory analysis, results are relayed back to facilities for clinician decision-making on care and treatment of the infants. Delay in this cascade can occur at various stages; infant presentation for evaluation and specimen collection within health facilities, specimen transportation, central laboratory analysis, relay of results back to facilities or notification of caregiver-infants for result collection.

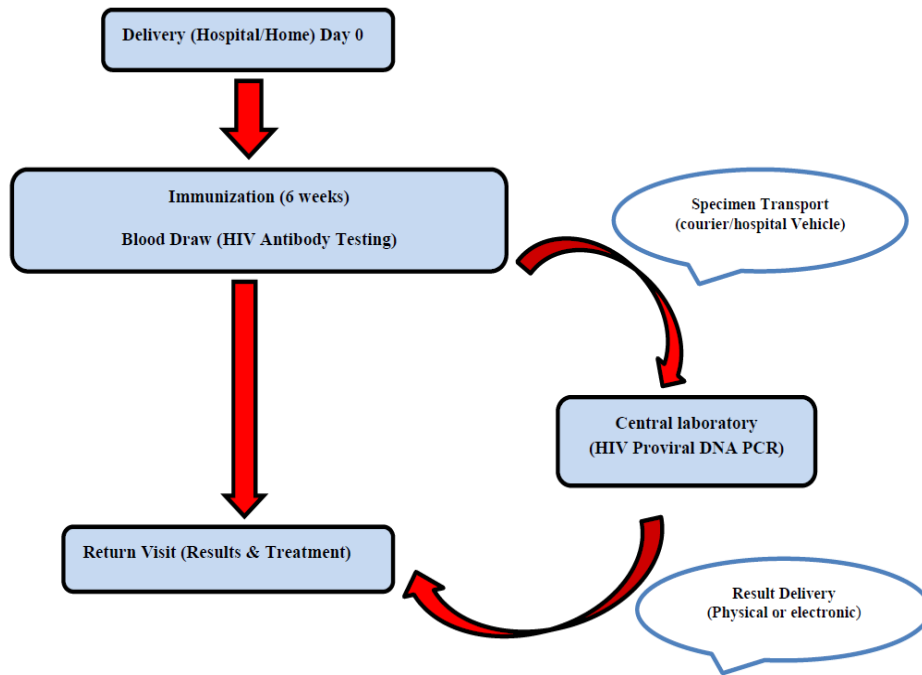


Figure 1.3: A sketch of Infant HIV Testing Cascade in Kenya

Source: Regenerated from NASCOP, 2012.

1.1.6 Tier Three and Four Health Facilities in Kisumu County

Kenya Ministry of Health purposed to improve service delivery by categorising health facilities into levels of care in the National Health Sector Strategic Plan II (NHSSP, 2005-2010). The following levels of care delivery were designed: Level 1, community level, being a foundation that included Village Health Committees (VHC) through which households and individuals could participate. Levels 2 and 3 (dispensaries, health centres, and maternity/nursing homes) handled activities related to promotive and preventive care and also provided various curative services. Levels 4-6 (primary, secondary and tertiary hospitals) undertook mainly curative and rehabilitative activities. Kenya Health Sector Strategic Plan III (KHSSP, 2012–2017) reviewed this categorization by using tier system to redefine levels of care delivery as shown in the table 2.1.

Table 1.1: Levels of care delivery in Kenya

<i>Category</i>	<i>Description</i>
<i>Tier 1</i>	Community
<i>Tier 2</i>	Dispensaries, Health Centres, Maternity and Nursing Homes
<i>Tier 3</i>	County level – Subcounty and County Referral Hospitals
<i>Tier 4</i>	National level – National and former Provincial Teaching and Referral Hospitals

Source: Kenya Health Sector Strategic Plan III (KHSSP, 2012–2017)

Kisumu County has 276 health facilities that include Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH), a tier four public health facility which serves as a main referral center for the 6 tier three health facilities (Kisumu County Hospital, Kombewa County Hospital, Chulaimbo County Hospital, Ahero County Hospital, Muhoroni County Hospital, and Nyakach County Hospital). Tier three facilities serve the sub-county population with JOOTRH (tier four) as their main referral center. These facilities (Tier three and four) operate on a 24 hour schedule with both in and outpatient facilities. They also have basic infrastructure; trained personnel, electricity, equipment and capacity to handle pregnancy and delivery complications by HIV positive mothers and pediatric complications with less referrals. In addition to the free services for sick children visiting public facilities, the infrastructure provides for a greater pool and volume of clients and effectiveness in infant HIV testing. It was therefore scientifically prudent to evaluate why even with the infrastructure, delays in early infant diagnosis was still being experienced in such facilities.

1.2 Statement of the Problem

According to the Ministry of Health in 2016, HIV prevalence in Kisumu County (19.9%) is 3.4 times higher than the national (5.9%). Children (n=8,600) are living with HIV with an average of 909 new infections yearly. PMTCT Coverage remains low (60%) as per the County HIV profiles by Ministry of Health in 2016. About 19.7% children were infected with HIV in 2015, showing over 100% increase from 2013. According to Kenya demographic health survey in 2014, the County has a higher under five mortality rate (82 per 1000 live births) and infant mortality rate (50 per 1,000 live births) than the national figures (52 per 1,000 live births and 39 per 1,000 live births, respectively), with 501 HIV related deaths reported the same year.

According to NASCOP, 2,926 infants were tested for HIV at 6 weeks despite having as many as 4,827 infants on prophylaxis and 3,090 reported deliveries by HIV positive mothers in 2011. In 2016, only 3,369 infants were less than 2 months old among 6,209 infants who underwent initial HIV proviral DNA PCR testing in Kisumu County. Consequently, probable HIV infected children who had not undergone HIV testing at 6 weeks of age were denied timely access to care and treatment. According to Ministry of Health in 2016, this has contributed to low (54%) coverage of care and treatment to eligible HIV infected children in Kisumu County despite the 100% requirement by the national guidelines.

Caregivers of HIV exposed infants, health workers and organizational factors within the health facilities play a key role in ensuring all HIV infected infants are captured at an early age so that they can be enrolled into care. Each role-player in this line faces different challenges whose effects on the timing of early infant diagnosis have not been evaluated in Kisumu County. Tier three and four public health facilities operate on a 24-hour schedule with both in and outpatient facilities. They also have basic infrastructure; trained personnel, electricity, equipment and

capacity to handle pregnancy and delivery complications by HIV positive mothers and pediatric complications with less referrals. The infrastructure provides for a greater pool and volume of clients and effectiveness in infant HIV testing. It was therefore scientifically prudent to evaluate why even with the infrastructure, delays in early infant diagnosis was still being experienced in such facilities.

1.3 Justification

Understanding factors that delay early infant HIV diagnosis will help in informing practical and programmatic strategies that are essential in early identification of HIV infected infants in order to link them into care. This has been shown to have better treatment outcomes, prognosis and increased survival among HIV infected children.

Interventions derived from findings and recommendations from this study will be contributory in attainment of both global and local health targets. In this regard, the study is in line with sustainable development goal (SDG) number three which among other interventions, proposes to end preventable death of newborns and children under 5 years of age and end epidemics such as AIDS. It is also in line with first and second strategic directions of Kenya AIDS Strategic Framework (KASF) 2014/15-2018/19. These first and second strategic directions target to reduce new HIV infections and improve health outcomes and wellness of all people living with HIV respectively.

1.4 Objectives of the Study

1.4.1 General Objective

The general objective of this study was to determine factors associated with delayed HIV diagnosis in infants in tier three and four public health facilities in Kisumu County, Kenya.

1.4.2. Specific Objectives

The specific objectives of this study were:

- a) To establish Infant-care giver factors associated with delayed HIV diagnosis in infants in tier three and four public health facilities in Kisumu County, Kenya.
- b) To determine health worker factors associated with delayed HIV diagnosis in infants in tier three and four public health facilities in Kisumu County, Kenya.
- c) To find out health facility organizational factors associated with delayed HIV diagnosis in infants in tier three and four public health facilities in Kisumu County, Kenya.

1.4.3. Research Questions

The study looked at the following research questions:

- a) What are the Infant-care giver factors that are associated with delayed HIV diagnosis in infants in tier three and four public health facilities in Kisumu County, Kenya?
- b) What are the health worker factors that are associated with delayed HIV diagnosis in infants in tier three and four public health facilities in Kisumu County, Kenya?
- c) What are the health facility organizational factors that are associated with delayed HIV diagnosis in infants in tier three and four public health facilities in Kisumu County, Kenya?

CHAPTER TWO

LITERATURE REVIEW

2.1 Infant-Caregiver Factors That Delay Infant HIV Diagnosis

Care-givers to HIV exposed infants are responsible for the infant needs that include their health. The care-givers are expected to ensure the HIV exposed infants are presented to the health facilities for dry blood spot sample collection for HIV testing (NASCO, 2012). Maternal obstetric and infant factors like emergency caesarean section, low birth weight and infant hospitalization could independently lead to late infant HIV diagnosis (Tejiokem *et al.*, 2011), perhaps due to the morbidity that prevents elective seeking of HIV testing. This was however not the case in Malawi, where caesarean section and infant hospitalization were not associated with delay in infant HIV diagnosis and loss to follow up (Ioannidis *et al.*, 1999). Not attending ANC clinics, late HIV diagnosis during pregnancy and absence of prophylaxis for PMTCT have also been associated with a higher risk of delay in infant HIV diagnosis (Ahoua *et al.*, 2010; Tejiokem *et al.*, 2011). This is because antenatal clinic attendance, PMTCT services and hospital delivery among HIV positive pregnant mothers familiarizes them with the testing system and are perhaps more aware of the importance of testing infants for HIV. Given the roll out of PMTCT services and the increased antenatal attendance (90%) by pregnant mothers in Kenya (NASCO, 2012), it is expected that more HIV exposed infants be diagnosed of HIV at an early age. In Kisumu County however, only 60% attended atleast four recommended ANC visits, with 69.5% of pregnant women delivering within hospitals (KDHS, 2014).

Financial access still remains a challenge in the health sector in resource limited countries (Fatmi & Avan, 2002). Despite the free testing service for infants, household economics still limit the choice and opportunity of health seeking behavior for caregivers due to indirect expenses

involved in accessing the facility like transport and registration charges at facilities (World Bank, 2002). This is supported by some studies which positively correlate poor socioeconomic conditions (low education level, farming, long distances and cost of transport) to late infant HIV diagnosis (Hassan *et al.*, 2012; Ioannidis *et al.*, 1999; Uchudi, 2001). This is however not the case in Cameroon where results in a study showed no significant association between delay in infant HIV diagnosis and poor socioeconomic conditions (Tejiokem *et al.*, 2011). Forty percent of the population in Kisumu County live below the poverty line (Kisumu County, 2013), with a county poverty index of 30% (NAS COP, 2014). According to Kenya Demographic Health Survey 2014, 24.9% of women in Kisumu had only attained part of primary education or no education at all (KDHS, 2014). Poverty and low education levels have been associated with high HIV prevalence rate in the former Nyanza province where the county is located (Odundo & Owino, 2004). It is important that such factors be evaluated to establish any significant associations with delayed infant HIV diagnosis.

In the same study in Cameroon, no significant association was seen in caregivers who did not disclose their HIV status and delay in HIV diagnosis among their infants (Tejiokem *et al.*, 2011). This is despite the significant role played by disclosure, stigma reduction, support networks in presentation for HIV testing among pregnant women and caregivers (Hassan *et al.*, 2012; Sprague *et al.*, 2011), which can be extrapolated to influence the timing of the care-givers presenting the infants for HIV testing. Cultural beliefs and practices affect perceptions of illness, death and health seeking behavior among individuals. These have previously been a bottleneck to HIV testing and good health seeking behavior (Dube *et al.*, 2012). High HIV prevalence rate in Kisumu County, in part, has been attributed to traditional cultural beliefs and practices by the Luo ethnic group who are the majority inhabitants (Juma *et al.*, 2014). It is important to

determine whether any existent myths, taboos, cultural beliefs and practices among caregivers in this setting would deter early infant HIV testing.

Media access in Kisumu County remains high, with 90.2% of the population having access to a newspaper, radio or television weekly (KDHS, 2014). With extensive health education on HIV through mass media, there has been increased knowledge, awareness and acceptance among HIV infected people. It is not yet clear if after such interventions, cultural beliefs and practices, disclosure status, stigma and support networks still play a significant role in delayed infant HIV diagnosis.

2.2 Health Worker Factors That Delay Infant HIV Diagnosis

Health workers play a substantive role in infant HIV diagnosis where they are involved actively in health education during the antenatal follow ups and delivery points (WHO, 2012). They encourage HIV positive women to present their newborns for testing at 6 weeks, provide necessary human resource for decision making in HIV testing, perform dried blood spot sample collection, they follow up infant results and schedule caregivers for result collection and initiation into care (WHO, 2008). Improving health workers' performance has been seen to improve healthcare services (San Francisco Business wire, 2005) that include early identification of HIV infected infants.

Low and middle income countries, including Kenya, have always been faced with a human resource crisis in the health sector, with a high health worker to population ratio and poor terms of employment (WHO, 2006). In Kisumu County, the doctor to population ratio is 1: 44,634 and nurse to population ratio is 1: 2,383 (Kisumu County, 2013). This is way higher than the one recommended by the World Health Organization (WHO); 1:1,000 and 1:500 for doctors and nurses respectively. In 2013, there were 1,406 HIV exposed infants on follow up in the tier three

and four facilities in Kisumu County who were attended to by 56 health workers of different cadres (medical officers, clinical officers, nurses and nurse aids) at the MCH departments. The same health workers also attend to routine MCH clinic visits; antenatal, postnatal and pediatric care. Strained health worker to patient ratio has been shown to result in workplace stress, fatigue, burnout, demotivation that adversely affect their productivity (WHO, 2016). It will therefore be important to determine Kisumu health workers' motivation levels and job satisfaction during their role performance in infant HIV testing.

In South Africa, cases of staff missing out on patients' ART eligibility and poor health personnel-patient interaction have been identified as some of the weaknesses that constrain access to PMTCT services (Sprague *et al.*, 2011). Frequent late entry and high drop out among infants enrolling for early infant diagnosis and care in Kenya has been related to lack of knowledge and understanding of early infant diagnosis by service providers and consequently the caregivers (Hassan *et al.*, 2012). In Kisumu County, missed testing of HIV exposed infants by health workers as they present for immunization at 6 weeks has been identified (NASCO, 2013). This points to shortfalls by health workers as they fail to carry out HIV testing as HIV exposed infants present for care. It is important that factors related to such non-performance by health workers be evaluated. Job satisfaction, performance evaluation, organizational commitment and personal factors (skills and experience, nationality, gender, and marital status) have been identified as strong predictors of health workers' performance in Saudi Arabia (Hanan Al-Ahmadi, 2009). These variables like staff motivation levels, job satisfaction, organizational support, performance evaluation, incentives and staff inter-relationships that affect health staff performance have not been evaluated to establish their role in early infant diagnosis in Kisumu County and elsewhere in Kenya.

2.3 Health Facility Organizational Factors That Delay Infant HIV Diagnosis

Organizational systems and programs involved play a big role in infant HIV testing (Nuwagaba-Biribonwoha *et al.*, 2010) Virological testing by proviral DNA PCR, as vital as it is, remains costly in the form of significant investments in specialized laboratory equipment and highly skilled personnel. To curb this cost, middle and low income countries have employed the use of centralized laboratories at selected locations which are far from remote areas and samples have to be pooled and transported to the sites and results relayed back. This has brought about challenges in the results turnaround time (average time from sample collection to availability of results), which has been blamed for delays in early infant diagnosis in rural areas of sub-Saharan Africa; Zambia (54 days), Uganda (35–57 days) and Kenya (60 days) (Hassan *et al.*, 2012; Sutcliffe *et al.*, 2014). Kisumu County is served by two HIV proviral DNA testing central laboratories; KEMRI-CDC Kisian and Walter Reed Project-Kericho which serve a total of 316 and 201 facilities respectively (NAS COP, 2012). After specimen collection from HIV exposed infants, health facilities also have to transport specimens to the central laboratories for analysis after collection. The two central laboratories, KEMRI-CDC Kisian and Walter Reed Kericho, analysed 15,255 and 8,062 specimens from 316 and 201 facilities respectively in 2016 (NAS COP-EID, 2016). Responding to such numerous number of facilities each week has been described as a logistical nightmare leading to delay in results delivery (NAS COP, 2016). Clinic appointments to provide results to caregivers and key treatment decisions are made in view of the timing of this testing process, leading to delays in diagnosis and initiation of treatment (Hassan *et al.*, 2012).

The use of dried blood spot sample collection for HIV proviral DNA testing (Lofgren *et al.*, 2009) and mobile technologies such as the short mail service (SMS) system (Sutcliffe *et al.*,

2014) have shortened the turnaround time in result collection. Cases of delays due to misplaced files or failing to locate results when caregivers returned for appointments have also reported as a reason for delay in early infant diagnosis (Sutcliffe *et al.*, 2014). The use of computerized data management systems in the neighbouring counties, Kericho and Nandi Counties, such as HIV Infant Tracking System (HIT System) has reduced delays and improved retention among HIV exposed infants (Finocchiaro-Kessler *et al.*, 2014). Such data management systems ensure efficient and reliable patient record storage, retrieval and results dissemination to minimize cases of delays due to missing patient data. It will therefore be important to determine among other facility organization factors, the utilization of such technology among tier III and IV facilities in Kisumu County.

Health financing in Kisumu County remains a challenge with county government health expenditure of Kshs. 2,121 per capita and National Hospital Insurance Fund (NHIF) coverage of only 32% (MOPHS Finance, 2015). An analysis of available resources versus needs for HIV and AIDS response for 2015/2016 fiscal year estimated the financial gap for HIV and AIDS response to be \$22.1Million (Ministry of Health, 2016). The trickle down effect of such low health financing affects public health facilities' disposable income with resultant challenges in supply of facility consumables. Shortages or delayed supply of required commodities constrains early infant diagnosis (Hassan *et al.*, 2012; Sprague *et al.*, 2011). Collecting a dried blood spot specimen from a HIV-exposed infant requires multiple items, and the stock-out of a single component may hinder sample collection entirely (Sprague *et al.*, 2011).

Low and middle income countries including Kenya have always been faced with a human resources crisis in the health sector (Noor *et al.*, 2003). According to Kenyan Ministry of Health, Kisumu County has 70 nurses, 19 doctors and 18 clinical officers per 100,000 population

(Minsitry of Health, 2013). Such staffing shortages pose a great challenge to the health sector and additional operational tasks of early infant diagnosis increase the burden on an already busy and understaffed system (Sprague *et al.*, 2011; Sutcliffe *et al.*, 2014). However, with increased funding to counties, support by non-governmental organizations and the use of computerized clinic administration, it is expected that such work pressure be minimized.

2.4 Conceptual Framework

The framework is adopted from a three-level model by Ferlie and Shortell to demonstrate interdependence in the structure and dynamics of the health system (Ferlie & Shortell, 2001). The system is dependent on three levels: the individual patient and or caregivers, the care team, and the organization that supports the development and work of care teams (Figure 2.1).

Recent changes in health policy reflect a patient-centered approach where the role of the patient has changed from a passive recipient of care to a more active participant in care delivery (Ferguson *et al.*, 2013). The care team consists of a clinical micro system that are the primary agents of patient-centered clinical care that require support and motivation in the structure (Nelson, 2003), whereas the organization provides an overall climate and culture for change through its various decision-making systems, operating systems, and human resource practices (Ferlie & Shortell, 2001). An interplay and interdependence between the levels ensures effective implementation of patient requirements to achieve a desired outcome (Infant HIV diagnosis).

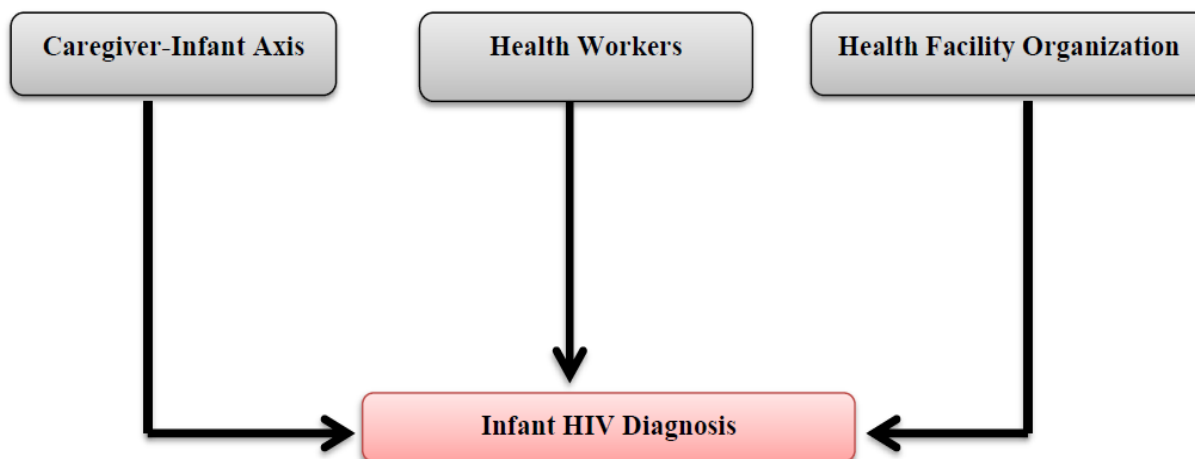


Figure 2.1: Interdependence in the structure and dynamics of the health system

Derived from The Milbank Quarterly by Ferlie & Shortell, 2001.

Several patient and or caregiver factors, for instance, their social economic status and cultural beliefs affect their health seeking behavior (Ahmed *et al*, 2005) and could result in late presentation of HIV exposed infants for dried blood spot sample collection. Caregiver-Infant variables evaluated in this study are: level of schooling, knowledge and awareness by caregiver’s about infant HIV diagnosis, infant parental status, physical access (distance from household to facility), indirect measures of financial access (housing material; roof, floor, access to electricity and tap water), cultural access (existence and belief myths and taboos about infant HIV testing), disclosure status to family, other relatives and non-relatives and existence of support (membership to a support group and a likert scale rating of such support). Such Caregiver-Infant variables according to Ferlie and Shortel’s classification are postulated as patient factors affecting care in a health system; in this case, timely presentation for Infant HIV testing within facilities. In evaluating indirect measures of financial access, physical housing quality information was used to help indicate economic status. A comparative scale from five housing

items (wall material, floor material, roof material, availability of electricity and access water facilities) was used to indicate physical housing quality and therefore economic status. For instance, use of cheap materials such as mud for floor and wall material, grass for roofing, no access to electricity and tap water indicated poor financial access (Arias & De Vos, 1996).

Role performance by the health staff concerned is also a factor of different variables like staff motivation and job satisfaction, which if suboptimal, may result in delayed sample collection, sample delivery and result transmission. Health worker variables evaluated in this study are: years of working experience by the health worker at MCH department, number of trainings (related to infant HIV testing) attended during employment period and a likert scale rating of levels of satisfaction on job motivation, general working conditions, pay and incentives, work relationships and work activities. Such variables are postulated to affect health worker role performance in Infant HIV testing such as timely and correct identification of HIV exposed Infants during their first immunization visit and timely specimen request.

Organizational factors within facilities include commodity management and use of information and technology in patient record handling and tracking, which if not properly addressed would delay diagnosis of HIV exposed infants. Facility organizational factors evaluated in this study are: cadre of facility as being tier III or IV, presence or absence of performance evaluation (target setting, evaluation of targets and feedback) to health workers at MCH (Mother and Child Health) clinic, likert scale rating of organizational support to MCH clinic health workers, presence and frequency of shortages of infant HIV testing consumables, distance from central HIV proviral DNA PCR testing laboratory, means of specimen transport from facility to central laboratory, modalities of result return from central laboratory and modalities of caregiver-infant result notification by health facilities.

CHAPTER THREE

METHODOLOGY

3.1 Study Area

Kisumu County (Figure 3.1) is one of the counties in the former Nyanza Province in Kenya, between longitudes 33° 20' East and 35° 20' East and latitudes 0° 20' South and 0° 50' South. The County is bordered by Homa Bay County to the South, Nandi County to the North East, Kericho County to the East, Vihiga County to the North West and Siaya County to the West. It is made up of Kisumu East, Kisumu West, Seme, Nyando, Muhoroni and Nyakach sub counties. Kisumu County has an estimated population of 1,117,789 people as projected by 2009 census. The population is cosmopolitan because of in-migration of people from other counties within the former Nyanza province and other parts of the country mainly due to employment opportunities, inter-marriages and available social amenities provided by Kisumu City. Children under five years are 214,883 and constitute 16.9% of the population. This is inclusive of 46,520 infants who constitute 3.71% of the population. The County has 276 health facilities that include Jaramogi Oginga Odinga Teaching and Referral Hospital (JOTRH), a tier four public health facility which serves as a main referral center for the 6 tier three health facilities (Kisumu County Hospital, Kombewa County Hospital, Chulaimbo County Hospital, Ahero County Hospital, Muhoroni County Hospital, and Nyakach County Hospital). Each sub-county has a County hospital that serve as referral centres for other health facilities within the subcounty. The County is served by one 'central' laboratory providing HIV proviral DNA PCR testing, KEMRI HIV Research Laboratory, in Kisian where dried blood spot samples have to be sent and results relayed back to facilities. Partners supporting infant HIV testing program include International Center for AIDS care and Treatment (ICAP), Family AIDS Care and Education Services

(FACES), OGRA Foundation, Kenya Medical Research Institute (KEMRI), Elizabeth Glazier Foundation, APHIA Plus and Christian Aid Relief.



Figure 3.1: Map Showing the Location of Kisumu County in Kenya

Derived and modified from www.mapsofworld.com

3.2 Study Population

The study population was HIV exposed children less than 18 months of age attending Maternal and Child health (MCH) clinics in all tier three and four facilities in Kisumu County. In 2013, there were 1,406 HIV exposed infants on follow up in the tier three and four facilities in the

County as listed below with their respective proportions against the total number on follow up: Kombewa County Hospital (170; 12%), Chulaimbo County Hospital (44;7%), Kisumu County Hospital (403; 27%), Jaramogi Oginga Odinga Teaching and Referral Hospital (471; 33%), Ahero County Hospital (134; 10%), Nyakach County Hospital (99; 7%) and Muhoroni County Hospital (85; 6%).

The study also involved medical superintendents and healthworkers employed permanently or temporarily at Maternal and Child Health clinics (MCH) of the seven (7) health facilities.

3.2.1 Inclusion Criteria

1. Participants in the study were caregivers of HIV sero-exposed children (Children born of HIV positive mothers) less than 18 months of age attending their routine clinics at the selected health facilities.
2. All health workers of all cadres temporarily/permanently employed at the Maternal and Child Health (MCH) department.
3. All medical superintendents of selected health facilities as per the national or county health system job description.

3.2.2. Exclusion Criteria

1. Non consenting participants
2. Caregivers who had not been in custody of HIV exposed children for at least three months preceding the study or since birth if less than three months.
3. Caregivers of HIV exposed children who were less than 18 years of age and were not emancipated minors (parents of the children) were also excluded from the study.

3.3 Study Design

A hospital-based cross-sectional survey was adopted for the study. This is a descriptive study that involves measuring different variables at a single point in time.

3.4 Sampling Procedure

3.5.1 Care-givers to HIV Exposed Infants

Care-giver-infant pairs who visited the selected facilities during the time of the study were interviewed. The minimum number enrolled into the study was calculated as shown below using Fischer formula (Mugenda and Mugenda, 2003).

$p = 19\%$ (estimated HIV prevalence in Kisumu County)

$q = 1 - p = 1 - 0.19 = 0.81$; therefore, $q = 0.81$, $d =$ margin of error (0.05), $\alpha = 1.96$ {probability of making a type 1 error (Z score of 0.025; 2 sided 0.05)}

$$n = \frac{(Z \alpha/2)^2 pq}{d^2}$$

$$n = \frac{1.96^2 \times 0.19 \times 0.81}{0.05^2} = \frac{0.5912}{0.0025} = 236.48 \text{ HIV exposed infants}$$

Targeted population was below 10,000, so the final sample size (nf) was calculated as follows:

$$nf = n \div [1 + (n/N)] \text{ where } N = \text{target population} = 1406$$

This gives: $nf = 237 \div [1 + (237/1406)]$ Therefore, $nf = 202.8$

Adjusting for non-response at 10% gave a required sample size of approximately 224 respondents. This sample size was then distributed according to the proportions in the study population (HIV exposed infants visits per facility in 2013) as follows; Kombewa County Hospital (26; 12%), Chulaimbo County Hospital (7; 3%), Kisumu County Hospital (64; 29%), Jaramogi Oginga Odinga Teaching and Referral Hospital (74; 33%), Ahero County Hospital (23; 10%), Nyakach County Hospital (16; 7%) and Muhoroni County Hospital (14; 6%).

Every k^{th} caregiver of HIV exposed infant visiting the facilities was interviewed during their routine hospital visits until the sample size for each facility was attained. K was a number obtained by dividing the number of expected HIV exposed infants visits (numerator) by the caregiver-infant sample size (denominator) for each health facility in the study as follows: Kombewa County Hospital (170/26), Chulaimbo County Hospital (44/7), Kisumu County Hospital (403/64), JOOTRH (471/74), Ahero (134/23), Nyakach County Hospital (99/16) and Muhoroni County Hospital (85/14). The result (k) was approximated to the next whole number for those with decimal places as follows: Kombewa County Hospital (7), Chulaimbo County Hospital (7), Kisumu County Hospital (7), JOOTRH (7), Ahero County Hospital (6), Nyakach County Hospital (7) and Muhoroni County Hospital (7). Selection of respective k^{th} visit was done according to listing by their daily arrival at the MCH registry until the sample size for each facility was attained. Those already interviewed during their previous visit were skipped and the next was selected.

3.5.2 Health Workers

All health workers (temporary and permanent) in the MCH department of the 7 facilities were to be interviewed. Only 51 out of 56 health workers consented to participate in the study and were interviewed.

3.5.3 Health Facilities

The only tier four facility in Kisumu County (Jaramogi Oginga Odinga Teaching and Referral Hospital; JOOTRH) and six tier three hospitals (Kisumu County Hospital, Kombewa County Hospital, Chulaimbo County Hospital, Ahero County Hospital, Muhoroni County Hospital, and Nyakach County Hospital) from each sub-county were purposively selected for the study. This was based on the assumption that tier three facilities serve the sub-county population with

JOOTRH (tier four) as their main referral center. These facilities operate on a 24 hour schedule with both in and outpatient facilities. They also have basic infrastructure; trained personnel, electricity, equipment and capacity to handle pregnancy and delivery complications by HIV positive mothers and pediatric complications with less referrals. In addition to the free services for sick children visiting public facilities, the infrastructure provides for a greater pool and volume of clients and effectiveness in infant HIV testing. It was therefore scientifically prudent to evaluate why even with the infrastructure, delays in early infant diagnosis was still being experienced in such facilities.

3.5 Research Procedure

The study was carried out by research assistants who are clinical officers by qualification. Prior to data collection, they had undergone a one-day training on execution of their role as research assistants in the study. All sampled caregiver-infant pairs were approached by research assistants during the infant's routine hospital visit within the respective health facilities. Consent (Appendix IV) was first obtained and they were interviewed using a structured questionnaire (Appendix V) in a language they best understood. Information about their knowledge and awareness on infant HIV diagnosis, financial access, physical access, cultural access, family/social support networks, maternal characteristics, disclosure status and important HIV exposed infant information was recorded in the questionnaire provided.

All Health workers attached to the MCH department in respective facilities were approached by the trained researched assistants, consented (Appendix IV) and interviewed using structured questionnaires that were provided (Appendix V). Fifty one (51) health workers out of 56 that were targeted consented for participation in the study while five declined. The 51 were interviewed on factors affecting their optimal performance of infant HIV testing such as

motivation levels, job satisfaction, staff training and experience, organizational support, performance evaluation, incentives and staff inter-relationships. Their responses were recorded on the structured questionnaire by the trained research assistants.

The seven (7) medical superintendents of respective facilities were also approached by the trained researched assistants, consented (Appendix IV) and interviewed using structured questionnaires that were provided (Appendix V). All consented and they provided information on health facility organization like commodity management, sample transport networks and result delivery, use of data management tools including infant tracking/follow up systems, staffing levels, ownership and support of the PMTCT centres and the results turnaround time (TAT). All these were recorded on the structured questionnaire by the trained research assistants.

3.6 Data Management

3.6.1 Data Collection

Three sets of structured questionnaires were administered to the following groups within respective health facilities: caregivers to HIV exposed infants, health workers involved in the daily running of MCH clinics and medical superintendents of the selected facilities. For the health worker questionnaire, a five point likert type rating scale questionnaire with a cronbach's alpha reliability score of 0.76 was adopted from a survey to ascertain academic staff level of motivation, satisfaction and performance at work (Mawoli, 2011). The caregiver infant questionnaire was translated from English into Kiswahili and the local language and then back-translated into English to ensure accuracy. The questionnaires were pretested at Kisumu County Hospital and ammendments done on questions where it was necessasry.

3.6.2 Data Analysis

Data was cleaned to get rid of inconsistencies (missing values, duplicates and values that were out of range) then entered into and analyzed using statistical program for social scientists (SPSS) software package version 20 (IBM SPSS Inc., IL, USA). Specific predicted independent variables among the infant-caregiver axis (knowledge and awareness about infant HIV diagnosis, financial access, physical access, cultural access, family/social support networks, maternal characteristics and disclosure status) were compared to differences in the outcome (delay or no delay in infant HIV diagnosis).

Independent variables among the health workers (staff motivation levels, job satisfaction, staff training and experience, incentives and staff inter-relationships i.e. between supervisor/employee, employee-employee) were compared to the differences in the outcome (delay or no delay in Infant HIV diagnosis). The health system independent variables (commodity management, sample transport networks and result delivery, use of data management tools including infant tracking/follow up systems, performance evaluation and organizational support of the infant HIV testing program) were also determined.

Statistical analysis of caregiver-infant variables was done using Chi square test. Statistically significant variables associated with delayed HIV diagnosis were then inserted and analysed in a multiple logistic regression model to determine independent association with the outcome (delayed infant HIV diagnosis).

Health worker independent variables were continuous and Student's *t*-test was used in comparing means of the variables between delay and no delay infant groups. Similarly, Chi square and Student's *t* tests were also used for categorical and continuous health facility organisation

variables respectively. Statistically significant findings were reported for the predicted variables, with significance set at $p \leq 0.05$.

3.7 Ethical Consideration

Ethical approval was sought from Maseno University Ethics Review Committee (MUERC). Approval for entry into the study site was sought from the County Administration and respective Hospital Heads and a feedback report including recommendations shall be provided upon completion of the study. Informed consent was sought from participants in a language (English, Kiswahili or Dholuo) they best comprehend.

During data collection, unique identity numbers were used for each participant for anonymity. Filled questionnaires were kept under lock and key after the study. The data was also stored and backed up in electronic computer devices with only access to the researcher by use of password.

Potential risks to participants included emotional discomfort and or depression by the caregivers while unrevealing some of the hurting life events that they never wished to remember. Proper counseling and reassurance was done prior, during and after administration of the questionnaire in order to create self-confidence and motivation to caregivers. Where there was need, they were referred for further advice and assistance by respective medical personnel. Some health workers felt that their opinions as put in the questionnaires might be used adversely against them in their employment or future career events. The study ensured anonymity of respondents and their opinions were not individualized. Proper reassurance was done on this during consenting.

Benefits to participants included counselling of caregivers on optimal timing for HIV testing, schedules for revisits and importance of early entry into care for their HIV exposed infants. Those with medical or psychological complaints or symptoms were referred to respective health personnel for assistance through the available channels. These included the local administration,

clinicians, counselors and social workers. Health workers including the medical superintendents shall benefit from the results feedback session to the County health administration where their human resource and or health system concerns shall be channeled to the key decision makers. The recommended changes following the findings of the study shall definitely be beneficial to their employment terms for improved service delivery.

Outcomes of this study shall add to the knowledge on existing information on HIV among infants in Kisumu County and extrapolations done in other counties in Kenya. The results shall be used by government and non governmental agencies to inform practical and programmatic strategies that shall help in early identification of HIV infected infants in order to link them into care. County health administration can use the information to cohort HIV infected women with particular characteristics that put them at risk of delayed infant HIV diagnosis. This can be done as early as during there antenatal clinics and or during delivery. Other beneficiaries to the outcome of this study include newborn HIV exposed infants who shall have better prognosis following the implementation of study recommendations. Based on the findings, Health workers in Kisumu County and elsewhere shall be able to make evidence based clinical decisions when handling HIV infected mothers and HIV exposed newborns.

The study had limitations with potential sources of bias. It was a hospital based study within Tier III and IV facilities in Kisumu County and HIV exposed infants in Kisumu County who did not seek medical attention within these facilities were excluded from the study. In future, researchers involved in similar studies will have to adopt an approach that will be representative of all HIV exposed infants within the county. The study was also based on self-reporting by participants. There was no way of verifying whether some of the responses were accurately put. The study was also likely to have recall bias given that participants were required to give information on

past during antenatal, perinatal and even post natal period. To increase accuracy of reporting, clinic records were used to verify some elements of the questions asked. Similar approaches have been employed in similar studies, making the potential findings in this study comparable.

3.8 Plan for Data Dissemination and Utilization

The research report shall be disseminated to key authorities closely associated with the study. These shall include Kisumu County Health Minister's office, Office of the County Director of health, and County Health Management Team. The intention behind such wide dissemination is to acknowledge their involvement and share the study findings and recommendations with the public through them, with a view to explore possibilities for the implementation of key recommendations, and for further necessary research and references by other researchers in future. Furthermore, the findings from this study shall be published in an international peer-reviewed journal to ensure full dissemination to national and international scientific communities

CHAPTER FOUR

RESULTS

4.1 Introduction

Results and discussions of the study have been divided into sections. The first section provides results on characteristics of participants. It also provides the results on association of Caregiver-infant, Health worker and Health facility factors with delayed infant HIV diagnosis. The second section is a discussion of factors associated with the delay.

4.2.1 Characteristics of Respondents

4.2.1.1 Caregivers-Infant Axis

Caregivers (n=224) of HIV exposed infants from tier three and four public health facilities in Kisumu County were interviewed based on the proportion (expressed as a percentage) of their average monthly visits to the MCH Clinic as shown in Table 4.1.

Table 4.1 Distribution of Study Participants and Delayed Infant Diagnosis per Facility

	Ahero	Chulaimbo	JOOTR H	KCH	Kombe wa	Muhoro ni	Nyakach	Total
Caregiver-Infants Interviewed n (%)	23(10.3)	7(3.1)	74(33)	64(28.6)	26(12)	14(6.3)	16(7.1)	224
Proportion of Delayed Infants n (%)	5(21.7)	5(57.1)	22(29.7)	10(15.6)	6(23.1)	8(51.7)	1(6.3)	25(75)
Health Workers Interviewed n (%)	6(11.8)	7(13.7)	17(33)	7(13.7)	4(7.8)	6(11.7)	4(7.8)	51

Characteristics of the 224 caregivers interviewed are presented in Table 4.2; 92% (207) were female and majority, 96% (216), were Christians. Forty three percent (96 caregivers) had primary level of education. Majority of the caregivers, 89 % (198), were mothers to the infants

and were aged between 25 and 29 years. Most of the caregivers, 84% (189), were Luos with other tribes; Luhya, 8.5% (19), and Kisii 4.9 % (11), forming a significant proportion.

Table 4.2: Characteristics of Interviewed Caregivers

Variable		n (%)
Gender	Male	17 (7.6)
	Female	207 (92.4)
Religion	Christian	216 (96.4)
	Muslim	7 (3.1)
	Others	1 (0.5)
Level of Education	Primary	108 (48.2)
	Secondary	76 (33.9)
	Tertiary	38 (17)
	Other	2 (0.9)
Relationship to infant	Mother	199 (88.8)
	Father	14 (6.3)
	Sibling	4 (1.8)
	Other relative	7 (3.1)
Age (Years)	15-19	7 (3.1)
	>19-24	46 (20.5)
	>24-29	79 (35.3)
	>29-34	46 (20.5)
	>34-39	28 (12.5)
	> 40	18 (8.1)
Ethnicity	Luo	189 (84.4)
	Luhya	19 (8.5)
	Kisii	5 (2.2)
	Others	11 (4.9)

As shown in Table 4.3, majority, 27% (60), of the HIV exposed infants were aged between 9 and 13 months. Sixty four percent (64%; 144) had all parents alive and only 19% (44) had been confirmed positive through proviral DNA PCR. Twenty five (25%; 56) of the infants delayed the initial HIV PCR testing having presented to the health facilities after the 6 weeks recommended timing.

Table 4.3: Characteristics of HIV Exposed Infants who Participated in the Study

Variable	Category	n (%)
Infant Age (Months)	1.0 - 4.9	48 (21.4)
	5.0 - 8.9	57 (25.4)
	9.0 - 12.9	60 (26.8)
	13.0 - 16.9	38 (17)
	≥ 17.0	21 (9.4)
Parental Status	All alive	144 (64.3)
	Single Parent	71 (31.7)
	Orphaned	9 (4)
HIV DNA PCR result	Positive	44 (19.6)
	Negative	180 (80.4)
Delay Status	No Delay	168 (75)
	Delayed	56 (25)

Table 4.4 gives a summary of distribution per facility of the characteristics of caregivers (age, gender, religion, level of education, relationship to infant and ethnicity) and infants (age and parental status) who participated in the study.

Table 4.4: Characteristics of the Study Population across Health Facilities

Variable		Health Facility						
		Ahero	Chulaimbo	JOOTRH	KDH	Kombewa	Muhoroni	Nyakach
Caregiver's Age (yrs)	Median (IQR)	25 (6.0)	28 (3.0)	29 (10.0)	31 (12.0)	27 (8.3)	24 (5.5)	28.5 (6.3)
Gender [n (%)]	Male	3 (17.6)	0 (0.0)	10 (58.8)	2 (11.8)	2 (11.8)	0 (0.0)	0 (0.0)
	Female	20 (9.7)	7 (3.4)	64 (30.9)	62 (30.0)	24 (11.6)	14 (6.2)	16 (7.1)
Religion [n (%)]	Christian	23 (10.6)	7 (3.2)	67 (31.0)	63 (29.2)	26 (12)	14 (6.5)	16 (7.4)
	Muslim	0 (0.0)	0 (0.0)	6 (85.7)	1 (14.3)	0 (0.0)	0 (0.0)	0 (0.0)
	Others	0 (0.0)	0 (0.0)	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Education level [n (%)]	Primary	8 (7.4)	5 (4.6)	39 (36.1)	19 (17.6)	16 (14.8)	9 (8.3)	12 (11.1)
	Secondary	10 (13.2)	2 (2.6)	23(30.3)	27 (35.5)	7 (9.2)	4 (5.3)	3 (3.9)
	Tertiary	4 (10.5)	0 (0.0)	12 (31.6)	17 (44.7)	3 (7.9)	1 (2.6)	1 (2.6)
	None	1 (500.)	0 (0.0)	0 (0.0)	1 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)
Relationship to Infant [n (%)]	Mother	19 (9.5)	7 (3.5)	62 (31.2)	59 (29.6)	25 (12.6)	12 (6.0)	15 (7.5)
	Father	2 (14.3)	0 (0.0)	8 (57.1)	2 (14.3)	1 (7.1)	1 (7.1)	0 (0.0)
	Sibling	1 (25.0)	0 (0.0)	1 (25.0)	2 (50.0)	0 (0.0)	0 (0.0)	0 (0.0)
	Other	1 (14.3)	0 (0.0)	3 (42.9)	1 (14.3)	0 (0.0)	1 (14.3)	1 (14.3)
Ethnicity [n (%)]	Luo	18 (9.5)	7 (100)	58 (30.7)	55 (29.1)	21 (11.1)	14 (7.4)	16 (8.5)
	Luhya	2 (10.5)	0 (0.0)	8 (42.1)	5 (26.3)	4 (21.1)	0 (0.0)	0 (0.0)
	Kisii	2 (40.0)	0 (0.0)	0 (0.0)	2 (40.0)	1 (20.0)	0 (0.0)	0 (0.0)
	Others	1 (9.1)	0 (0.0)	8 (72.7)	2 (18.2)	0 (0.0)	0 (0.0)	0 (0.0)
Infant age in months	Median (IQR)	10 (8.0)	7 (8.0)	10.5 (11.0)	8 (7.0)	8 (8.6)	11.5 (4.5)	9 (5.8)
Parental Status [n (%)]	Both alive	13 (9.0)	3 (2.1)	42 (29.2)	42 (29.2)	19 (13.2)	11 (7.6)	14 (9.7)
	Single	8 (11.3)	4 (5.6)	29 (40.8)	19 (26.8)	6 (8.5)	3 (4.2)	2 (2.8)
	Orphaned	2 (8.7)	0 (0.0)	3 (33.3)	3 (33.3)	1 (11.1)	0 (0.0)	0 (0.0)

4.2.1.2 Health Workers

Fifty one (51) out of 56 health workers assigned to the MCH department in their respective facilities were interviewed with five (5) respondents declining consent. Majority were from JOOTRH as shown in Table 4.1. Majority, 43% (22), of the interviewed health workers were nurses. 39% (20) were permanently employed and 77% (17) had worked at the MCH for 2 to 5 years as illustrated in Table 4.5.

Table 4.5: Characteristics of Interviewed Health Workers

Health Workers Characteristics		% (n)
Staff cadre	Clinical Officer	29.4% (15)
	Nurse	43.1% (22)
	Nurse Aid	13.7% (7)
	Nutritionist	5.9% (3)
	Counsellor	7.8% (4)
Terms of employment	Permanent	39.2% (20)
	Temporary	60.8% (31)
Years Worked at MCH	Less than 1.0	21.6% (11)
	1.0 – 2.0	45% (18)
	2.1 – 5.0	77.3% (17)
	More than 5.0	100% (5)
Total		100% (51)

4.2.1.3 Facility Administrators

Information about organization of infant HIV testing was obtained from facility administrators (n=7). One Tier IV facility (Jaramogi Oginga Odinga Teaching and Referral Hospital), and six Tier III facilities (Ahero County hospital, Chulaimbo County Hospital, Kisumu County Hospital (KCH), Kombewa County Hospital, Muhoroni County Hospital and Nyakach County Hospital) were all included in the study.

4.2.2 Caregiver-Infant Factors Associated with Delayed Infant HIV Diagnosis

Proportions of specific characteristics in the caregivers-infant axis were compared between the Delayed Group (HIV DNA PCR testing done after 6 weeks of infant age) and the No Delay Group (HIV DNA PCR testing done on or before 6 weeks of infant age). A Chi-square (χ^2) test of association with CI = 95% and $p = 0.05$ as criterion for significance was used to determine association between the characteristics and delay in HIV diagnosis among the HIV exposed infants.

Table 4.6: Caregiver-Infant Socio-demographic Factors Associated with Delayed HIV Diagnosis in Infants

Variable	Delayed % (n)	Not delayed % (n)	Statistic	p value
Level of schooling				
None	0	1.2 (2)	$X^2=27.9, 3df$	<0.001
Primary	78.6 (44)	38.1 (64)		
Secondary	16.1 (9)	39.9 (67)		
Tertiary	5.4 (3)	20.8 (35)		
Mother-to-child HIV transmission				
Has knowledge	53.6 (30)	96.4 (162)	$X^2=63.0, 1df$	<0.001
Has no knowledge	46.4 (26)	3.6 (6)		
Parental status				
All alive	42.9 (24)	71.4 (120)	$X^2=15.17, 2df$	0.001
Single Parent	51.8 (29)	25.0 (42)		
Orphaned	5.4 (3)	3.6 (6)		
Place of delivery				
Hospital	85.7 (144)	33.9 (19)	$X^2=56.84, 1df$	<0.001
Home	14.3 (24)	66.1 (37)		

As shown in Table 4.6, delayed infant HIV diagnosis had statistically significant association with lower level of schooling $\{\chi^2 (3, n = 224) = 27.9, p < 0.001\}$, no knowledge about specific means of HIV transmission from mother to child $\{\chi^2 (1, n = 224) = 63.0, p < 0.001\}$, loss of one

or both parents $\{\chi^2 (2, n = 224) = 15.2, p = 0.001\}$ and home delivery $\{\chi^2 (1, n = 224) = 56.8, p < 0.001\}$.

Table 4.7: Caregiver-Infant Financial Access Factors Associated with Delay in Infant HIV Diagnosis

Variable	Diagnosis Delayed % (n)	Diagnosis not Delayed % (n)	Statistic	p value
Wall material				
Blocks/bricks	26.8 (15)	54.8 (92)	$X^2=4.03, 3df$	0.003
Mud/cow dung	69.6 (39)	42.3 (71)		
Timber	1.8 (1)	2.4 (4)		
Others	1.8 (1)	0.6 (1)		
Floor material				
Cement	30.4 (17)	60.1 (101)	$X^2=18.55, 2df$	<0.001
Mud/cow dung	66.1 (37)	33.3 (56)		
Tiles	3.6 (2)	6.5 (11)		
Electricity				
Yes	26.8 (15)	59.5 (100)	$X^2=18.01, 1df$	<0.001
No	73.2 (41)	40.5 (68)		
Source of water				
Tap water	14.3 (8)	37.1 (62)	$X^2=13.67, 3df$	0.003
Well	71.4 (40)	44.3 (74)		
River	14.3 (8)	18.0 (30)		
Rain water	0	0.6 (1)		

Indicators of financial access like housing material were associated with delayed infant HIV testing at 6 weeks as illustrated in Table 4.7; those staying in houses made of mud, cowdung and timber as wall material $\{\chi^2 (3, n = 224) = 4.03, p = 0.003\}$, mud or cow dung as floor material $\{\chi^2 (2, n = 224) = 18.55, p < 0.001\}$ with no electricity $\{\chi^2 (1, n = 224) = 18.01, p < 0.001\}$ and no access to tap water $\{\chi^2 (3, n = 224) = 13.67, p = 0.003\}$.

Table 4.8: Caregiver-Infant Physical Access Factors Associated with Delay in Infant HIV Diagnosis

Variable	Diagnosis Delayed % (n)	Diagnosis not delayed% (n)	Statistic	p value
Distance from facility (Km)				
10 or less	76.8 (43)	82.1 (138)	$X^2=4.88, 3df$	0.181
Between 10 and 20	21.4 (12)	11.9 (20)		
Between 20 and 30	0	3.6 (6)		
Above 30	1.8 (1)	2.4 (4)		
Travel costs incurred				
Yes	85.7 (48)	88.7 (149)	$X^2=0.35, 1df$	0.554
No	14.3 (8)	11.3 (19)		

There was no significant association between delay in infant HIV diagnosis and residential distance to the facility $\{\chi^2 (3, n = 224) = 4.88, p = 0.181\}$ and travelling costs $\{\chi^2 (1, n = 224) = 0.35, p = 0.554\}$. This is shown in Table 4.8.

Table 4.9: Caregiver-Infant Psychosocial Factors Associated with Delay in Infant HIV Diagnosis

Variable	Delayed % (n)	Not delayed % (n)	Statistic	p value
Beliefs in Myths/Taboos about HIV testing				
Yes	7.1 (4)	1.2 (2)	$X^2=5.71, 1df$	0.017
No	92.9 (52)	98.8 (166)		
Disclosure to other relatives other than Nuclear				
Yes	14.3 (8)	36.9 (62)	$X^2=10.00, 1df$	0.002
No	85.7 (48)	63.1 (106)		
Disclosure to other persons not relatives				
Yes	12.5 (7)	44.0 (74)	$X^2=18.11, 1df$	<0.001
No	87.5 (49)	56.0 (94)		
Social support				
Yes	16.1 (9)	37.3 (62)	$X^2=8.72, 1df$	0.003
No	83.9 (47)	62.7 (104)		

Statistically significant association was also seen between cultural beliefs, social support and disclosure status as shown in Table 4.9. Delayed infant HIV diagnosis was associated with beliefs in myths, taboos and beliefs about HIV testing $\{\chi^2 (1, n = 224) = 5.71, p = 0.017\}$, non-disclosure of infant HIV status to non-relatives $\{\chi^2 (1, n = 224) = 18.11, p < 0.001\}$, non-disclosure to other relatives other than nuclear family $\{\chi^2 (1, n = 224) = 10.00, p = 0.002\}$ and not enrolling to a social support group $\{\chi^2 (1, n = 224) = 8.72, p = 0.003\}$.

4.2.3 Multiple Logistic Regression Analysis of Caregiver-infant Variables

Table 4.10 illustrates results of multiple logistic regression analysis of statistically significant caregiver-infant variables. Delayed infant HIV diagnosis was independently associated with home delivery (OR: 5.8, 95% CI: 2.1-16.0; $p=0.001$). Similarly, delayed HIV diagnosis was independently associated with lack of knowledge of mother-to-child transmission of HIV (OR: 6.5, 95% CI: 1.7-25.0; $p=0.006$) and non-disclosure to persons other than relatives (OR: 6.9, 95% CI: 2.0-24.3; $p=0.003$). All the other factors that included parental status, place of delivery, housing material (wall and floor material), access to electricity and source of water, beliefs about HIV testing, lack of disclosure to other relatives and social support were not independently associated with delay of HIV diagnosis among infants.

Table 4.10: Multiple Logistic Regression Analysis of Caregiver-infant Variables

Variable	Adjusted OR (95% CI)	p value
Level of schooling		
None	-	
Primary	4.5 (0.7-28.7)	0.999
Secondary	1.4 (0.2-8.7)	0.116
Tertiary	1.0	0.691
Place of birth		
Hospital	1.0	
Home	5.8 (2.1-16.0)	0.001
Parental status		
All alive	1.0	
Single Parent	1.5 (0.6-4.3)	0.407
Orphaned	1.7 (0.2-15.0)	0.654
Mother-to-child HIV transmission		
Has knowledge	1.0	
Has no knowledge	6.5 (1.7-25.0)	0.006
Disclosure to persons not relatives		
Yes	1.0	
No	6.9 (2.0-24.3)	0.003
Disclosure to other relatives		
Yes	1.0	
No	1.1 (0.4-3.3)	0.805
Social support		
Yes	1.0	
No	1.1 (0.4-3.2)	0.899
Beliefs in Myths/Taboos		
Yes	-	0.999
No		
Wall material		
Blocks/bricks	1.0	
Mud/cow dung	0.7 (0.1-4.0)	0.657
Timber	0.4 (0.0-7.2)	0.563
Floor material		
Cement	1.0	
Mud/cow dung	1.7 (0.4-7.5)	0.481
Tiles	1.2 (0.1-15.4)	0.876
Electricity		
Yes	1.0	
No	1.3 (0.2-8.0)	0.810
Source of water		
Tap water	1.0	
Well	1.0 (0.3-3.6)	0.949
River	0.6 (0.1-3.8)	0.601
Rain water	-	1.000

4.2.4 Health Worker Factors Associated with Delayed Infant HIV Diagnosis

All infants who delayed HIV testing at 6 weeks (n=75) in the study had been immunized at 6 weeks of age at their respective health facilities. Overall attribute score per facility was derived by averaging (sum of the six areas assessed/6) scores of the six areas (Job motivation, general working conditions, pay and incentives, work relationships, orhgnaisational support and work activities) that were assessed among health workers in respective facilities. The overall attribute score was highest (3.91) in Nyakach County hospital which had the least delay (6.3%), compared to Muhoroni and Chulaimbo (3.69 and 3.24 respectively) which had the highest delay 57.1% as shown in table 4.11.

Table 4.11: Health Worker Attributes per Facility

	Ahero	Chulaimbo	JOOTRH	KCH	Kombewa	Muhoroni	Nyakach
Job Motivation	2.83 (1.25)	3.4 (1.01)	3.19 (1.04)	3.76 (0.91)	4.33 (1.13)	3.94 (0.41)	3.54 (1.29)
General Working Conditions	3.42 (0.97)	3.64 (0.68)	3.4 (0.81)	3.71 (0.46)	4.31 (0.6)	3.58 (0.65)	4.25 (0.78)
Pay and Incentives	2.2 (1.06)	2.6 (0.91)	2.61 (0.97)	2.97 (0.86)	2.3 (1.03)	3.3 (0.79)	3.2 (0.95)
Work Relationships	4.11 (0.47)	3.81 (0.4)	4.04 (0.34)	4.05 (0.81)	4 (0)	3.94 (0.42)	4.5 (0.52)
Organizational Support	2.63 (1.25)	2.68 (0.91)	3.12 (1.13)	3.29 (0.81)	4.06 (0.25)	3.58 (0.58)	3.94 (0.25)
Work Activities	3.5 (0.71)	3.29 (0.64)	3.67 (0.68)	3.57 (0.93)	4.17 (0.39)	3.78 (0.43)	4 (0)
Overall Attribute Score	3.12	3.24	3.34	3.56	3.86	3.69	3.91
Proportion of Delayed	21.7% (5)	57.1% (4)	29.7% (22)	15.6% (10)	23.1% (6)	57.1% (8)	6.3% (1)

Overall attribute score was derived by averaging (sum of the six areas assessed/6) scores of the six areas (Job motivation, general working conditions, pay and incentives, work relationships, orhgnaisational support and work activities) that were assessed among health workers. The

overall attribute score was highest (3.91) in Nyakach County hospital which had the least delay (6.3%), compared to Muhoroni and Chulaimbo (3.69 and 3.24 respectively) which had the highest delay 57.1%.

Table 4.12: Health worker Attributes Associated with Delayed HIV Diagnosis among Infants

Variable	Delayed infants Mean (SD)	No delay infants Mean (SD)	t statistic	Df	p value
Work experience in MCH (years)	2.8 (1.3)	3.1 (1.5)	-1.44	222	0.151
Number of work related training	2.4 (1.4)	2.3 (1.3)	0.39	222	0.698
Job motivation score	3.5 (0.4)	3.5 (0.4)	-0.33	222	0.745
General working conditions score	3.6 (0.3)	3.7 (0.3)	-1.70	222	0.090
Pay and incentives score	2.7 (0.3)	2.7 (0.3)	-0.18	222	0.857
Work relationships score	4.0 (0.1)	4.1 (0.1)	-2.89	222	0.004
Work activities score	3.7 (0.2)	3.7 (0.2)	-0.62	222	0.537
Overall attribute score	3.5 (0.2)	3.6 (0.2)	-1.23	222	0.222

An average value for each score including work experience and number of work related trainings was obtained among health workers in each of the 7 health facilities. The values were then assigned to infants (both delayed and not delayed) who attended the respective health facilities.

As illustrated in Table 4.12, Student's *t*-test was done to compare the means of the score (work experience in MCH in years, number of work related trainings, job motivation score, general working conditions score, pay and incentives score, work relationships score and overall attribute score) among health workers who attended to the delayed and no delay group infants. The health

workers' score out of 5 on key attributes (job motivation, general working conditions, pay and incentives, work relationships and work activities) were all above average and had no significant difference between the delayed and no delay infant groups. There was significant difference in work relationships score among health workers who attended to the delayed group ($M=4.0$, $SD=0.1$) and the no delay group ($M=4.1$, $SD=0.1$); $t(222) = -2.89$, $p=0.004$.

4.2.5 Facility Organization Factors Associated with Delayed Infant HIV Diagnosis

All the seven centres sent their dried blood samples for HIV proviral DNA PCR to a central laboratory (Walter Reed Kericho and KEMRI-CDC Kisian) that was averagely 51 Km ($SD = 47.7$) from the facilities. Kombewa County Hospital was the furthest (142km) from the central laboratory, Walter Reed Kericho. Four out of seven facilities used a hospital vehicle to transport collected specimens to central laboratories while the rest used courier services. Real time electronic result transmission of HIV proviral DNA PCR results from central laboratories was done in five facilities. The rest had printed results delivered at physical location. Shortage of supplies (testing kits, pricks, DBS paper, screening kits) was reported during the duration one year preceding the study in JOOTRH and Ahero County Hospital. Notification of HIV DNA PCR results to patients in four facilities was based on scheduled visits whereas the rest utilized mobile phones to notify caregivers of their results. This is summarized in Table 4.13

4.13: Specimen and Results Logistics within Health Facilities

	Ahero	Chulaimbo	JOOTRH	KDH	Kombewa	Muhoroni	Nyakach
Percentage Delay	5(21.7%)	4(51.7%)	22(29.7%)	10(15.6%)	6(23.1%)	8(57.1%)	1(6.3%)
Partner support	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distance to Testing station	47 Kms	8 Kms	13 Kms	12.Km	142Kms	71Kms	63Kms
Sample transport to testing station	Courier	Hospital Vehicle	Hospital Vehicle	Courier	Courier	Hospital Vehicle	Hospital Vehicle
Result transmission from central laboratories	Electronic	Electronic	Electronic	Electronic	Physical Address	Physical Address	Electronic
Shortage of supplies (Last 6 months)	Thrice	None	Twice	None	None	None	Once
Notification of HIV DNA PCR results to patients	Mobile phones	Scheduled Visits	Scheduled Visits	Mobile Phones	Scheduled Visits	Mobile Phones	Mobile Phones

As illustrated in Table 4.14, Chi square test was used to determine the association between delay in infant HIV diagnosis and type of facility (Tier III or IV) attended by the infants and shortage of HIV rapid testing kits reported within the facilities. Attending a specific type of facility (Tier III or IV) [χ^2 (1, n = 224) = 1.32, $p= 0.251$] and shortage HIV rapid testing kits within the facilities [χ^2 (1, n = 224) = 0.01, $p=0.939$] did not show significant association with delay in infant HIV diagnosis. Student's *t*-test was also done to compare mean scores of organization practices (setting of job targets, evaluation of targets and feedback after evaluation) and support (organizational support score) as reported by health workers in facilities who attended to the delayed and no delay infant groups. There was significant difference in scores between the delay and no delay group for job targets score (M=76.1, SD=17.6 and M=81.8, SD=18.0 respectively); $t(222) = -2.06$, $p=0.041$, evaluation on targets score (M=71.3, SD=23.3 and M=80.6, SD=20.0

respectively); $t(222) = -2.88, p=0.004$, and feedback after evaluation score ($M=67.0, SD=24.4$ and $M=78.3, SD=22.2$ respectively); $t(222) = -3.21, p=0.002$.

Table 4.14: Health Facility Organizational Factors Associated with Delay in Infant HIV Diagnosis

Variable	Delayed	Not delayed	Statistic	<i>p</i> value
Type of facility, % (n)				
Tier 3	60.7 (34)	69.0 (116)	$\chi^2=1.32, 1df$	0.251
Tier 4	39.3 (22)	31.0 (52)		
Shortage supplies, % (n)				
Yes	50.0 (28)	50.6 (85)	$\chi^2=0.01, 1df$	0.939
No	50.0 (28)	49.4 (83)		
Shortage frequency, Median (IQR)	0.5 (0-2)	1 (0-2)	-	0.853
Job targets score, Mean (SD)	76.1 (17.6)	81.8 (18.0)	$t=-2.06, 222df$	0.041
Evaluation on targets score, Mean (SD)	71.3 (23.3)	80.6 (20.0)	$t=-2.88, 222df$	0.004
Feedback after evaluation score, Mean (SD)	67.0 (24.4)	78.3 (22.2)	$t=-3.21, 222df$	0.002
Organizational support score, Mean (SD)	3.3 (0.4)	3.3 (0.4)	$t=-0.93, 222df$	0.351

As shown in Table 4.15, the median (IQR) distance to the testing station was 13 (12-59) km given that most samples were from JOOTRH, which is 13 km away. Forty one (51%; 113) of the samples were transported via courier services. Majority (82%) of the HIV DNA PCR results were transmitted back electronically and 52% (117) of the caregivers notified to collect the results by the use of mobile phones.

Table 4.15: Other Organizational Factors That Could be Associated with Delayed Infant HIV Diagnosis

Variable	Total	Delayed	Not delayed
Distance to the testing station Median (IQR) [kms]	13 (12-59)	13 (12.5-67)	13 (12-47)
Sample transport to testing station, [% (n)]			
Courier	50.4 (113)	37.5 (21)	54.8 (92)
Hospital vehicle	49.6 (111)	62.5 (35)	45.2 (76)
Result transmission from lab, [% (n)]			
Electronic	82.1 (184)	75.0 (42)	84.5 (142)
Physical address	17.9 (40)	25.0 (14)	15.5 (26)
Notification of HIV DNA PCR results to Caregivers [% (n)]			
Mobile	52.2 (117)	42.9 (24)	55.4 (93)
Scheduled visits	47.8 (107)	57.1 (32)	44.6 (75)

CHAPTER FIVE

DISCUSSION

5.1 Introduction

This section discusses the results in relation to the stated objectives. It explains the major findings of the study and compares them to the findings from similar studies done elsewhere. Subsections elaborate on the three specific objectives.

5.2 Caregiver-Infant Factors Associated with Delayed HIV Diagnosis

Caregivers of HIV exposed infants are expected to present infants for HIV testing in health facilities on or before 6 weeks of age. Some factors however make them defer this important hospital visit and subsequently delay virological diagnosis that is essential in entry into care.

Consistent with findings from Malawi (Ioannidis *et al.*, 1999) and elsewhere in Kenya (Hassan *et al.*, 2012), delayed infant HIV diagnosis in Kisumu County was independently associated with lack of knowledge about specific means of HIV transmission from mother to child. Such knowledge helps caregivers of HIV exposed infants to understand the existent risk of transmission of HIV to the infants. This would then motivate them to proactively present their infants for HIV testing and care even without probing by clinicians.

Delayed Infant HIV diagnosis was also independently associated with home delivery. This could be because of the missed opportunity for post-natal counseling on specific infant care practices including expected clinic visiting dates. In Kisumu County, 30.5% of pregnant women still deliver at home (KDHS, 2014).

There was no association between the physical distance to facility and delayed HIV testing within the specific facilities. This may reflect fear of social stigma making one to seek HIV care outside one's own community as shown in other studies (Cook *et al.*, 2012). Fear of stigmatization complicates disclosure of the infant's HIV exposure, which is a pre-requisite for

required support in the community. Non-disclosure of infant HIV exposure status to non-relatives possibly due to stigma was independently associated with delayed infant HIV testing in Kisumu County. Such non-disclosure possibly denied them access to, or utilization of, support networks including partners and community groups because of stigma as reported in other studies elsewhere (Genberg *et al*, 2009).

5.3 Health Worker Factors Associated with Delayed HIV Diagnosis

The role of Health workers in the early infant diagnosis cannot be underestimated. Missed opportunity for infant HIV testing by health workers at MCH clinics in tier III and IV public health facilities in Kisumu County is evidenced by the fact that all infants who delayed HIV testing had been immunized at 6 weeks of age within their respective health facilities. This could be due to omissions on their part by health workers who failed to correctly identify HIV exposed infants for testing. Such omissions have been identified elsewhere in literature where HIV exposed infants are immunized at 6 weeks and fail to undergo testing at that point (Woldesenbet *et al.*, 2015).

In their role performance at MCH clinics, Kisumu County health workers are atleast satisfied (scores of above 3.0) with key aspects of their working environment (job motivation, general working conditions, pay and incentives, work relationships and work activities). Such aspects therefore are not a setback to their daily task performance at the MCH clinics such as Infant HIV testing. This comes despite the reported strained health worker to patient ratio in the county (Kisumu County, 2013; Ministry of Health, 2013) that had been postulated to result in workplace stress, fatigue and burnout. Possibly, scheduled postnatal visits on appointment basis to infants has enabled proper staff planning based on anticipated clinic visits. Poorer work relationships was however identified among the health workers who attended to infants who delayed infant

HIV testing. Poor vertical (supervisor to employee) and lateral (employee to employee) interactions between workers interferes with team work. A disjointed role play among health workers interferes with their role performance that includes infant HIV testing (Hanan Al-Ahmadi, 2009). Studies elsewhere have demonstrated that such factors e.g. job satisfaction, poor employee inter-relationships, lack of employee recognition and poor working conditions negatively affect the performance of health workers (Hanan Al-Ahmadi, 2009; Awases *et al*, 2013).

Given no significant difference in staff training and experience between health workers who attended to the two groups (delayed and no delay groups), it is evident that staff experience and training are not a bottle neck to infant HIV testing in Kisumu County. Health workers at MCH clinics in tier III and IV public health facilities attended an average of two trainings in the year preceding the study and had atleast two years' experience in infant HIV testing. Staff training and experience on the process and significance of infant HIV testing is important in the early infant diagnosis cascade. It familiarizes staff on the infant HIV testing process, improves health personnel-patient interaction and reduces cases of staff missing out on infants eligible for testing and (Sprague *et al.*, 2011; Hassan *et al.*, 2012).

5.4 Facility Organization Factors Associated with Delayed HIV Diagnosis

Organizational systems and programs involved play a key role in infant HIV testing. Non-Governmental organizations have collaborated with public facilities in Kisumu County to improve health service delivery and promote research into different aspects that ensure better health outcomes. Such partnerships have helped reduce the financial gap for HIV and AIDS response in Kisumu County estimated to be \$22.1 Million (Ministry of Health, 2016). With such support however, shortage of supplies (testing kits, pricks, DBS paper, screening kits) were still

reported during the duration one year preceding the study for JOOTRH and Ahero County Hospital. This being a pointer to the trickle down effect of low health financing affecting public health facilities' disposable income with resultant challenges in supply of facility consumables. It however was not significantly associated with delayed infant HIV diagnosis as was seen elsewhere in (Hassan *et al.*, 2012; Sprague *et al.*, 2011).

In managing health workers, tier III and IV facilities in Kisumu County with poor organization practices such as not setting job targets, not evaluating targets and not giving feedback to its health workers was significantly prominent among the delayed diagnosis group. Clearly defined daily deliverables inform daily duties of health workers at MCH clinics. This includes screening and identification of HIV exposed infants in order to initiate testing. Poorly defined or lack of targets with no evaluation makes the screening process porous giving room for missed testing of eligible infants. Performance evaluation and support by the administration within health facilities to health workers in the course of their duty is important to ensure optimum job performance (Hanan Al-Ahmadi, 2009). Administrative requirements such as setting of key performance targets and periodic evaluation are also important in ensuring effectiveness and identifying areas of improvement.

Virological testing by HIV proviral DNA PCR is costly in the form of heavy investments in specialized laboratory equipment and highly skilled personnel. Public health facilities in Kisumu County use centralized laboratories at selected locations (KEMRI-CDC in Kisumu and KEMRI - Walter Reed Project in Kericho) which are far {51kms (SD=47.7)} from tier three and four public health facilities. In this regard, specimens have to be pooled and transported to the central laboratories. This brings about challenges in the results turnaround time (lag time between

sending and receiving results from central laboratory), which has been blamed for delays in early infant diagnosis in rural areas of sub-Saharan Africa (Sutcliffe *et al.*, 2014).

Given the distance, sample transportation and result delivery back to facilities poses a great challenge. Majority (51%) of the samples were transported via courier services. In addition to being unreliable, additional costs and sample losses that characterise such transport means can prolong the time between blood draw from the infant to sample delivery at the central laboratory (Khamadi *et al.*, 2008). Electronic result transmission from central laboratories to facilities in remote areas in such scenarios helps in reducing the result turnaround time. Majority (82%) of the HIV DNA PCR results were transmitted back electronically with respective facilities receiving results in real time. The rest of the HIV DNA results were paper based and were delivered to a physical location. Electronic result delivery by telephone, facsimile and internet-based result return is faster but could be limited by resource and internet availability in remote settings (Douglas *et al.*, 2010). The mobile network and internet connectivity in Kisumu County is 89% (Kisumu County, 2013) being favourable for electronic results transmission.

Within the facilities, quick notification and an immediate result receipt by caregivers is a challenge. Only 52% of the caregivers were notified to collect the results by the use of mobile phones. Proactive results notification through use of mobile phones enhances quick clinical review of caregiver-infant pairs by initiating immediate facility visits upon receipt of the notification. Clinic appointments were used to provide results to the rest (48%) of the caregivers. Such appointments lead to a delay in treatment decisions given the lag time in awaiting routine clinic visits for clinicians to make treatment decisions. Active caregiver notification of results upon being received from central laboratories can help in timely

completion of EID cascade in order to link the infected infants into care (Finocchiaro-Kessler *et al.*, 2014; Karema & Binagwaho, 2012).

CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 Introduction

This chapter gives the summary, conclusion and recommendations of the study. It is divided into three sub-sections. The first part gives the summary of the findings, the second part gives the conclusions of the study and the third part gives the recommendations that would help reduce delayed infant HIV diagnosis in Kisumu County.

6.2 Summary

Caregiver-infant factors independently associated with delayed infant HIV diagnosis include no knowledge about specific means of mother to child transmission, home delivery and non-disclosure of infant HIV exposure status non-relatives. Physical distance to facility was not associated with delayed HIV diagnosis possibly due to fear of social stigma making one to seek HIV care outside one's own community.

Health workers' role in delayed infant HIV diagnosis was evident given the missed opportunity for testing where all HIV exposed who delayed testing at 6 weeks in Kisumu County had been immunized. There was significant difference in work relationships score among health workers who attended to infants who delayed HIV diagnosis and those who did not delay. Key attributes (job motivation, general working conditions, pay and incentives, work relationships and work activities) among health workers, staff training and experience did not show significant difference between the two groups

In evaluation of health facility organizational factors, there was significant difference in scores between infants who delayed HIV diagnosis and those who did not delay for: job targets score, evaluation on targets score and feedback after evaluation score. Other factors that could further

delay infant HIV diagnosis in Kisumu County include long distance to central testing laboratories from facilities, use of courier services for sample transport, physical paper based result delivery and use of clinic appointments to provide results to caregivers.

6.3 Conclusion

Delayed infant HIV diagnosis in Kisumu County is associated with lack of knowledge about specific means of mother to child transmission, home delivery and non-disclosure of infant HIV exposure status to non-relatives among caregiver-infants. Among health workers there was significant difference in work relationships score among health workers who attended to infants who delayed HIV diagnosis and those who did not delay. In evaluation of health facility organizational factors, there was significant difference in scores between infants who delayed HIV diagnosis and those who did not delay for: job targets score, evaluation on targets score and feedback after evaluation score. Other factors that could further delay infant HIV diagnosis in Kisumu County include long distance to central testing laboratories from facilities, use of courier services for sample transport, physical paper based result delivery and use of clinic appointments to provide results to caregivers-infants.

6.4 Recommendation

6.4.1 Caregiver-Infant Factors Associated with Delayed Infant HIV Diagnosis

In order to address lack of knowledge and awareness about mother to child HIV transmission, HIV sensitization programs in Kisumu County need to focus on the substantive content of messages and include the various mechanisms of HIV transmission. This can be done during routine antenatal visits and interactive public forums e.g. vernacular radio stations, church and other social gatherings in a language understandable to the caregivers. As an evaluation of such

knowledge, caregivers can routinely be assessed on this area as part of antenatal, perinatal and postnatal clerkship in order to promote awareness and accurate understanding.

Kisumu County should target to increase hospital deliveries from the current 69.5%. This will be through increased sensitization of women about the importance hospital deliveries and increasing access to maternal hospital care. Traditional birth attendants, who attend to those opting for home deliveries, should be trained on providing proper post natal advice that includes hospital post natal visits at 6 weeks and screening for HIV.

Continued and sustained HIV sensitization in the community will help in overcoming information gaps, social fears and dispelling cultural beliefs and myths about HIV. The messages should also emphasize on the rights of people living with HIV. As well as being made aware of their rights, people living with HIV can be empowered in order to take action if these rights are violated. This will help reduce HIV-related stigma and embracing the concept of HIV testing and entry into care.

6.4.2 Health Worker Factors Associated with Delayed Infant HIV Diagnosis

Public health facilities should promote good inter-personal relationships between health workers through encouraging warm internal interactions (employee to employee and employee-supervisors) as they perform their daily duties. This can be further fostered through engagement of every staff in joint hospital activities and adopting a bottom to top leadership style where employees are given opportunity to design, execute and own deliverables to achieve broad targets.

6.4.3 Facility Organisation Factors Associated with Delayed Infant HIV Diagnosis

Human resources performance management cycle should be adopted by facilities as a collaborative team self-management practice. In this cycle, facilities will have clear roles for

health workers with aligned tasks. As they perform their daily responsibilities, objective performance evaluation and feedback is given from supervisors and colleagues. This can then be merged with reward and recognition systems that can influence motivation, commitment and ownership of roles.

Kisumu County should adopt point of care testing for HIV-DNA PCR as a long term solution. Virological testing facilities within these public health facilities will help address all the drawbacks related to specimen transport and results transmission. Specimen analysis and result delivery will be done at the point of care.

6.5 Areas of Further research

1. A similar but community based study involving households in Kisumu County can be undertaken. This will enable capturing of caregiver-infants who default hospital visits and those seeking care in other facilities other than tier III and IV public health facilities.
2. A more inclusive study capturing all workers involved in specimen collection, logistics and central laboratory testing can be undertaken to evaluate similar attributes that were assessed in this study.
3. A pilot study on cost benefit analysis of infant HIV point of care testing versus a centralized laboratory system can be undertaken in selected public health facilities. This would enable one to draw conclusions on the possible implementation of point of care infant HIV testing in Kisumu County as an attempt to eliminate delayed infant HIV diagnosis.

REFERENCES

- Ahmed, S. M., Tomson, G., Petzold, M., & Kabir, Z. N. (2005). Socioeconomic status overrides age and gender in determining health-seeking behaviour in rural Bangladesh. *Bulletin of the World Health Organization*, 83(2), 109–17.
- Ahoua, L., Ayikoru, H., Gnauck, K., Odaru, G., Odar, E., Ondo-Onama, C., Pinoges, L., *et al.* (2010). Evaluation of a 5-year programme to prevent mother-to-child transmission of HIV infection in Northern Uganda. *Journal of tropical pediatrics*, 56(1), 43–52.
- Arias, E. & Vos, S (1996). Using housing items to indicate socioeconomic status: Latin America. *Social Indicators Research*, 38 (1), 53.
- Awases, H., Magdalene & Bezuidenhout, C. Marthie & Roos, Janetta. (2013). Factors affecting the performance of professional nurses in Namibia. *Curationis*. 36. E1-E8.
- Cook, R. E., Ciampa, P. J., Sidat, M., Blevins, M., Burlison, J., Davidson, M. A., Arroz, J. A., *et al.* (2012). NIH Public Access, 56(4), 1–14.
- Douglas, G. P., Gadabu, O. J., Joukes, S., Mumba, S., McKay, M. V, Ben-Smith, A., Jahn, A., *et al.* (2010). Using touchscreen electronic medical record systems to support and monitor national scale-up of antiretroviral therapy in Malawi. *PLoS medicine*, 7(8).
- Dube, Q., Dow, A., Chirambo, C., Lebov, J., Tenthani, L., Moore, M., Heyderman, R. S., *et al.* (2012). Implementing early infant diagnosis of HIV infection at the primary care level: experiences and challenges in Malawi. *Bulletin of the World Health Organization*, 90(9), 699–704.
- Fatmi, Z., & Avan, B. I. (2002). Demographic, socio-economic and environmental determinants of utilisation of antenatal care in a rural setting of Sindh, Pakistan. *The Journal of the Pakistan Medical Association*, 52(4), 138–42.
- Ferlie, E. B., & Shortell, S. M. (2001). Improving the quality of health care in the United Kingdom and the United States: a framework for change. *The Milbank quarterly*, 79(2), 281–315.
- Ferguson, N., & Linda, M. (2013). Putting the ‘patient’ back into patient-centred care: An education perspective. *Nurse Education in Practice*, Volume 13, Issue 4, 283 - 287
- Finocchiaro-Kessler, S., Gautney, B. J., Khamadi, S., Okoth, V., Goggin, K., Spinler, J. K., Mwangi, A., *et al.* (2014). If you text them, they will come: using the HIV infant tracking system to improve early infant diagnosis quality and retention in Kenya. *AIDS (London, England)*, 28 Suppl 3, S313–21.

- Genberg, B. L., *et al* (2009). A comparison of HIV/AIDS-related stigma in four countries: negative attitudes and perceived acts of discrimination towards people living with HIV/AIDS. *Soc Sci Med*, 68(12), 2279-2287.
- Ghadrshenas, A., Ben Amor, Y., Chang, J., Dale, H., Sherman, G., Vojnov, L., Young, P., *et al.* (2013). Improved access to early infant diagnosis is a critical part of a child-centric prevention of mother-to-child transmission agenda. *AIDS (London, England)*, 27 Suppl 2, S197–205.
- Hanan Al-Ahmadi. (2009). Factors affecting performance of hospital nurses in Riyadh Region, Saudi Arabia. *International Journal Health Care Quality Assurance*, 22(1):40-54
- Hassan, A. S., Sakwa, E. M., Nabwera, H. M., Taegtmeier, M. M., Kimutai, R. M., Sanders, E. J., Awuondo, K. K., *et al.* (2012). Dynamics and constraints of early infant diagnosis of HIV infection in Rural Kenya. *AIDS and behavior*, 16(1), 5–12.
- Ioannidis, J. P., Taha, T. E., Kumwenda, N., Broadhead, R., Mtimavalye, L., Miotti, P., Yellin, F., *et al.* (1999). Predictors and impact of losses to follow-up in an HIV-1 perinatal transmission cohort in Malawi. *International journal of epidemiology*, 28(4), 769–75.
- Juma, Milka & Askew, Ian & Alaii, Jane & Kay Bartholomew, L & Borne, Bart. (2014). Cultural practices and sexual risk behaviour among adolescent orphans and non-orphans: a qualitative study on perceptions from a community in Western Kenya. *BMC Public Health*. 14. 84.
- Karema, C., & Binagwaho, A. (2012). Designing and Implementing an Innovative SMS-based alert system (RapidSMS-MCH) to monitor pregnancy and reduce maternal and child deaths in Rwanda, 8688, 1–15.
- Kenya AIDS Strategic Framework (KASF) 2014/15-2018/19. Published by Kenya National AIDS Control Council (NACC).
- Kenya Demographic and Health Survey (2014). Supported by Kenya National Bureau of Statistics, Ministry of Health, National AIDS Control Council, Kenya Medical Research Institute, National Council for Population and Development DHS Program & ICF International.
- Khamadi, S., Okoth, V., Lihana, J., Nabwera, R., Hungu, J., Okoth, F., Lubano, K., & Mwau, M. (2008). Rapid identification of infants for antiretroviral therapy in a resource poor setting: the kenya experience. *Journal of Tropical Pediatrics*, 54(6):370, 2008.
- Kenya Health Sector Strategic And Investment Plan – KHSSP July 2012 – June 2017. Published by Ministry of Medical Services and Ministry of Public Health and Sanitation.
- Kisumu County (2013), Kisumu County Fact Sheet - Vital Statistics.

Kisumu County (2013), Kisumu County Integrated Development Plan (CIDP) 2013 - 2017

Lambert, J. S., Harris, D. R., Stiehm, E. R., Moye, J., Fowler, M. G., Meyer, W. A., Bethel, J., *et al.* (2003). Performance characteristics of HIV-1 culture and HIV-1 DNA and RNA amplification assays for early diagnosis of perinatal HIV-1 infection. *Journal of acquired immune deficiency syndromes*, 34(5), 512–9.

Lofgren, S. M., Morrissey, A. B., Chevallier, C. C., Malabeja, A. I., Edmonds, S., Amos, B., Sifuna, D. J., *et al.* (2009). Evaluation of a dried blood spot HIV-1 RNA program for early infant diagnosis and viral load monitoring at rural and remote healthcare facilities. *AIDS (London, England)*, 23(18), 2459–66.

MapXL (2017). Kenya Latitude and Longitude Map. Retrieved from <https://www.mapsofworld.com>

Mawoli, M. A. (2011). An evaluation of staff motivation , dissatisfaction and job performance in an academic setting, *I(9)*, 1–13.

Ministry of Health (2013). Integrated Payroll and Personnel Database

Ministry of Health (2016). Kenya AIDS Response Progress Report, 2016.

Mugenda, A. and Mugenda, O. (2003). Mugenda, A. and Mugenda, O.

NASCOP. (2012). Guidelines For Prevention of Mother To Child Transmission (PMTCT) of HIV/AIDS In Kenya.

NASCOP & Ministry of Public Health & Sanitation, K. (2012). Achieving Universal Access to knowledge of HIV status. The Kenya HTC report 2011.

National AIDS and STI Control Programme (NASCOP). (2013). Kenya County HIV Service Delivery Profiles.

National AIDS and STI Control Programme (NASCOP). (2014). Kenya AIDS Indicator Survey 2012.

NASCOP-EID (2016). PCR Testing Trends Jan-Dec, 2016. <https://eid.nascop.org/>

NASCOP (2016). Kenya Country Operational Plan (COP) 2016

National Health Sector Strategic Plan of Kenya – NHSSP II – 2005–2010. Published by Ministry of Medical services.

Nelson, A. (2013). Clinical Microsystems “The Place Where Patients, Families and Clinical Teams Meet”. *Institute for Healthcare Improvement*, (1).

- Newell, M.-L., Coovadia, H., Cortina-Borja, M., Rollins, N., Gaillard, P., & Dabis, F. (2013). Mortality of infected and uninfected infants born to HIV-infected mothers in Africa: a pooled analysis. *Lancet*, *364*(9441), 1236–43.
- Noor, A. M., Zurovac, D., Hay, S. I., Ochola, S. A., & Snow, R. W. (2003). Defining equity in physical access to clinical services using geographical information systems as part of malaria planning and monitoring in Kenya. *Tropical medicine & international health : TM & IH*, *8*(10), 917–26.
- Nuwagaba-Biribonwoha, H., Werq-Semo, B., Abdallah, A., Cunningham, A., Gamaliel, J. G., Mtunga, S., & Nankabirwa, V. (2010). Introducing a multi-site program for early diagnosis of HIV infection among HIV-exposed infants in Tanzania. *BMC pediatrics*, *10*, 44.
- Odundo, P., & Owino, W. (2004). *HIV/AIDS scourge in Nyanza Province: Culture, poverty, and behaviour change*. Nairobi, Kenya: Institute of Policy Analysis and Research.
- Read, J. S. (2007). Diagnosis of HIV-1 infection in children younger than 18 months in the United States. *Pediatrics*, *120*(6), e1547–62.
- Rivka, R, L., Kalk, E., Technau, Karl-Gunter, Sherman & Gayle, G. (2013). Birth Diagnosis of HIV Infection in Infants to Reduce Infant Mortality and Monitor for Elimination of Mother-to-child Transmission. *The Pediatric Infectious Disease Journal.*, *32*(10), 1080–1085.
- San Francisco Businesswire (2015). *Health Workers' Performance Improving*.
- Sherman, G. G., Stevens, G., Jones, S. A., Horsfield, P., & Stevens, W. S. (2005). Dried blood spots improve access to HIV diagnosis and care for infants in low-resource settings. *Journal of acquired immune deficiency syndromes*, *38*(5), 615–7.
- Song, R., Jelagat, J., Dzombo, D., Mwalimu, M., Mandaliya, K., Shikely, K., & Essajee, S. (2007). Efficacy of highly active antiretroviral therapy in HIV-1 infected children in Kenya. *Pediatrics*, *120*(4), e856–61.
- Sprague, C., Chersich, M. F., & Black, V. (2011). Health system weaknesses constrain access to PMTCT and maternal HIV services in South Africa: a qualitative enquiry. *AIDS research and therapy*, *8*, 10.
- Sutcliffe, C. G., Van Dijk, J. H., Hamangaba, F., Mayani, F., & Moss, W. J. (2014). Turnaround time for early infant HIV diagnosis in rural Zambia: a chart review. (H. B. Jaspan, Ed.) *PloS one*, *9*(1).
- Tejiokem, M. C., Faye, A., Penda, I. C., Guemkam, G., Ateba Ndong, F., Chewa, G., Rekacewicz, C., *et al.* (2011). Feasibility of early infant diagnosis of HIV in resource-limited settings: the ANRS 12140-PEDIACAM study in Cameroon. *PloS one*, *6*(7), e21840.

- Uchudi, J. M. (2001). Covariates of child mortality in Mali: does the health-seeking behaviour of the mother matter? *Journal of biosocial science*, 33(1), 33–54.
- UNAIDS. (2017). UNAIDS 2016 HIV and AIDS Estimates.
- Violari, A., Cotton, M. F., Gibb, D. M., Babiker, A. G., Steyn, J., Madhi, S. A., Jean-Philippe, P., *et al.* (2008). Early antiretroviral therapy and mortality among HIV-infected infants. *The New England journal of medicine*, 359(21), 2233–44.
- WHO (2006). Global Health Observatory (GHO) data.
- WHO. (2008). WHO recommendations on the diagnosis of HIV infection in infants and children.
- WHO. (2010). WHO Guidelines for PMTCT & Breastfeeding.
- WHO. (2012). WHO Guidelines for PMTCT & Breastfeeding.
- WHO (2016). The Health Workforce in India. *Human Resources for Health Observer Series* No. 16.
- WHO (2017). HIV surveillance, estimates, monitoring and evaluation
- Woldesenbet, S. A., Jackson, D., Goga, A. E., Crowley, S., Bs, M. B., Doherty, T., Mogashoa, M. M., *et al.* (2015). Missed Opportunities for Early Infant HIV Diagnosis : Results of A National Study in South Africa, 68(3), 26–32.
- World Bank. (2002). Poverty in Pakistan: vulnerabilities, social gaps, and rural dynamics.

APPENDIX II: Work plan

Activity/Date	Oct(14) to Apr(15)	Jul(15) to Aug (15)	Sep (15) to Dec (15)	Jan(16) to Feb (16)	Mar(16) to Feb (17)	Nov (17) to Jan (18)
Proposal Dev & Defence						
Ethical Approval						
Data Collection						
Data Analysis						
Thesis Dev & Submission						
Thesis Defense & Resubmission						

APPENDIX III: Expenditure

EXPENSES	AMOUNT (Kshs)	SUB-TOTAL(Kshs)
PROPOSAL DEVELOPMENT		
Printing	2,000	
Internet access	3,000	
Translation/Questionnaire printing	10,000	15,000
DATA COLLECTION		
JOOTRH	10,000	
Kisumu County Referral	8,000	
Chulaimbo Sub County Referral Hospital	4,000	
Kombewa Sub County Referral Hospital	4,000	
Ahero Sub County Referral Hospital	4,000	
Muhoroni Sub County Referral Hospital	4,000	
Nyakach Sub County Referral Hospital	4,000	
Printing of questionnaires	3,000	
Communication(Airtime) 500 per station	3,500	
Principal Investigator Transport	5,000	
Data analysis (Consultancy)	18,000	67,500
THESIS DEVELOPMENT	5,000	
Printing	1,000	6,000
Internet		
CONTINGENCY	6,000	6,000
TOTAL		94,500

APPENDIX IV: ETHICAL APPROVALS & CONSENT FORMS

Ethical Approvals



MASENO UNIVERSITY
SCHOOL OF GRADUATE STUDIES

Office of the Dean

Our Ref: PG/MPH/00019/2013

Private Bag, MASENO, KENYA
Tel:(057)351 22/351008/351011
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Email: sgs@maseno.ac.ke

Date: 24th July, 2015

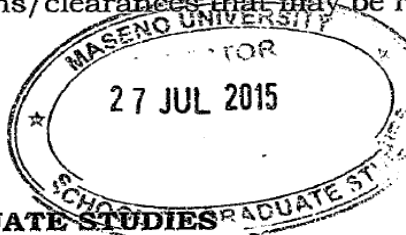
TO WHOM IT MAY CONCERN

**RE: PROPOSAL APPROVAL FOR WANGULU COLLINS —
PG/MPH/00019/2013**

The above named is registered in the Master of Public Health in the School of Public Health and Community Development, Maseno University. This is to confirm that his research proposal titled “Factors Associated with Delayed HIV Diagnosis in Infants in their Three and Four Public Health Facilities in Kisumu County, Kenya” has been approved for conduct of research subject to obtaining all other permissions/clearances that may be required beforehand.

A handwritten signature in black ink, appearing to be 'P.O. Owuor'.

Prof. P.O. Owuor
DEAN, SCHOOL OF GRADUATE STUDIES





MASENO UNIVERSITY ETHICS REVIEW COMMITTEE

Tel: +254 057 351 622 Ext: 3050
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Private Bag – 40105, Maseno, Kenya
Email: muerc-secretariate@maseno.ac.ke

FROM: Secretary - MUERC

DATE: 24th August, 2015

TO: Collins Wangulu
PG/MPH/00019/2013
Department of Public health
School of Public Health and Community Development
P. O. Box, Private Bag, Maseno, Kenya

REF: MSU/DRPI/MUERC/00216/15

RE: Factors Associated with Delayed HIV Diagnosis in Infants in Tier Three and Four Public Health Facilities in Kisumu County, Kenya. Proposal Reference Number MSU/DRPI/MUERC/00216/15

This is to inform you that the Maseno University Ethics Review Committee (MUERC) determined that the ethics issues were adequately addressed in the proposal presented for review. Consequently, the study is granted approval for implementation effective this 24th day of August, 2015 for a period of one (1) year.

Please note that authorization to conduct this study will automatically expire on 23rd August, 2016. If you plan to continue with the study beyond this date, please submit an application for continuation approval to the MUERC Secretariat by 14th July, 2016.

Approval for continuation of the study will be subject to successful submission of an annual progress report that is to reach the MUERC Secretariat by 14th July, 2016.

Please note that any unanticipated problems resulting from the conduct of this study must be reported to MUERC. You are required to submit any proposed changes to this study to MUERC for review and approval prior to initiation. Please advise MUERC when the study is completed or discontinued.

Thank you.

Yours faithfully,

Dr. Bonuke Anyona,
Secretary,
Maseno University Ethics Review Committee.



Cc: Chairman,
Maseno University Ethics Review Committee.

MASENO UNIVERSITY IS ISO 9001:2008 CERTIFIED



COUNTY GOVERNMENT OF KISUMU

Telegrams: "PRO.(MED)"
Tel: 254-057-2020105
Fax: 254-057-2023176
E-mail: kisumucdh@gmail.com



County Director of Health,
Kisumu.
P.O. Box 721-40100,
KISUMU.

MINISTRY OF HEALTH

When replying please quote:

Our Ref: GN 62B VOL.III/78

Date: 2ND September, 2015

The Health Facility Administrators
Jaramogi Oginga Odinga Teaching and Referral Hospital
Kisumu County Referral Hospital
Chulaimbo County Hospital
Kombewa County Hospital
Ahero County Hospital
Nyakach County Hospital
Lumumba Sub County Hospital

RE: APPROVAL FOR DR. COLLINS WANGULU TO COLLECT DATA IN YOUR FACILITY

I refer to above subject matter. Dr. Collins Wangulu is an MPH student at Maseno University. He has been granted permission to collect data for the study titled "*Factors associated with delayed HIV diagnosis in infants in tier three and four public health facilities Kisumu County, Kenya*".

Since Kisumu County still has a high prevalence of HIV infection, this study is relevant in that it will inform the county on any health related factors that contribute to delays in early infant diagnosis and the attendant challenges. He is expected to share his findings with the County Health Management Team and with the facility. You are requested to accord him the necessary participation.

Yours Faithfully


**COUNTY DIRECTOR
OF HEALTH
KISUMU**

Dr. Onyango D.O
Director of Health
KISUMU COUNTY



MINISTRY OF HEALTH

Telegrams: "MEDICAL", Kisumu
Telephone: 057-2020801/2020803/2020321
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When replying please quote

JARAMOGI OGINGA ODINGA TEACHING &
REFERRAL HOSPITAL
P.O. BOX 849
KISUMU

11th November, 2015

ERC.1B/VOL.I/226

Date

Ref:

Collins Wangulu,
Reg. PG/MPH/00019/2013,
MASENO UNIVERSITY.

Dear Collins,

RE: FORMAL APPROVAL TO CONDUCT RESEARCH ENTITLED: "FACTORS ASSOCIATED WITH DELAYED HIV DIAGNOSIS IN INFANTS IN TIER THREE AND FOUR PUBLIC HEALTH FACILITIES IN KISUMU COUNTY, KENYA"

The JOOTRH ERC (ACCREDITATION NO. 01713) reviewed your protocol in a meeting held on 5th November, 2015 and found it ethically satisfactory. You are therefore, permitted to commence your study immediately. Note that this approval is granted for a period of one year (11th November, 2015 to 12th November, 2016). If it is necessary to proceed with this research beyond the approved period, you will be required to apply for further extension to the committee.

Also note that you will be required to notify the committee of any protocol amendment(s), serious or unexpected outcomes related to the conduct of the study or termination for any reason.

Finally, note that you will also be required to share the findings of the study in both hard and soft copies upon completion.

The JOOTRH ERC takes this opportunity to thank you for choosing the institution and wishes you the best in your endeavours.

Yours sincerely,

WILBRODA N. MAKUNDA,
For: **SECRETARY –ERC,**
JOOTRH – KISUMU.

Infant Caregiver Consent Form

MASENO UNIVERSITY CONSENT FORM FOR INTERVIEWS (CAREGIVERS)

(To be translated into Dholuo (local language of the people); to be administered verbally to those not able to read)

Study Title: Factors associated with delayed HIV diagnosis in infants in tier three and four public health facilities in Kisumu County, Kenya

Statement of the Researcher

We are requesting you to participate in a research study. The purpose of the form is to give you information which you will need to help you to decide whether to take part in the study or not. Please, listen carefully as I read this form. You are free to ask questions about what we will ask you to do, the risks involved, the benefits, your rights as a volunteer or anything in this form that may not be clear to you. In a process known as informed consent you decide whether or not you would like to participate in the study. If you agree to take part in the study after we have described it to you and having answered any questions you have to your satisfaction, we will give you a signed copy of this form for your records.

Purpose of the Study

The purpose of this study is to determine factors that delay diagnosis of HIV among infants that are borne of HIV positive mothers. This information is useful in determining whether there are particular issues in caregivers of such infants that have an influence on the timing of HIV testing. It will be useful in re-developing practical and programmatic strategies that will help in addressing caregiver or infant related issues that will aid in early identification of HIV infected infants in order to link them into care at an early age. This has been shown to reduce illness and the number of deaths in HIV infected children.

Study Procedure

The study will be carried out in selected health facilities in Kisumu County. We shall engage trained research assistants to help collect the information from you. If you agree to participate in the study, you will be interviewed for about 20 to 30mins with some questions requiring verification from the infant's clinic records.

Potential Risks of Participating in the study

There may be some other risks, stress or discomforts of joining the study. There might be emotional discomfort and or depression when unrevealing some of the hurting life events that

Infant Caregiver Consent Form (Dholuo translation)

Andike mar Yie

Andike mar Yie mar Jarit Nyathi

TAT SOMO MAR MASENO

ANDIKE MAR YIE MAR JARIT NYATHI

*(Mondo oloki e Dholuo (Dhok mar jokanyo); Mondo ochiwe e yor woyo ne jogo maok nyal
somo)*

Nying Nonro: Gik ma otenre kod fwenyo kute mag ayaki kind nyithindo matindo e aluora mar
Kisumo

Wach mar ja tim nonro

Wakwayi ni mondo iyi idonjie e nonri ni. Andike ni oting'o weche mathoth manyalo miyo iyier
donjo e nonro ni, kata itamri. Yie ichik iti maber ka asomo oboke ni. In thuolo mondo ipenj gino
ma ibodwar ni itim, rach madibedi, ber mar nonro, haki mari kaka jachiwre kata gino maok
oyangore ni maler e andike ni. Seche ma iyie ka in gi ng'eyo to nyiso ni iyie kata itamori donjo e
nonro. ka iyie mar bedo e nonro ni bang' ka wasenyisi kaka en aito iyudo dwoko mag penjo
main go kaka idwaro, wabiro miyi mar andike modo mi iket seyi.

Gima omiyo itimo nonro

Itimo nonro ni mondo wang'e gik ma thiro fwenyo kute mag ayaki kuom nyithindo maonyuol
kod mine man kod kute mag ayaki.

Weche gi long'o kuom ng'eyo kadipo ni jorit nyithindo ni kod gigo ma
miyo ipimo nyithindo kute mag ayaki. Gini biro bido maber kuom loso chenro mabiro konyo
kaka di ber weche maotudore kaka jorit nyithindo nyalo fwenyo mapiyo kadipo ni nyindgi ni kod
kute mag ayaki mondo mi chak ket gi e thieth chon. Timo kamae osanyiso ni nyalo duoko chien
tuoche ka achiel kod tho e kind nyithindo man kod kute mag ayaki.

Chenro mar timo Nonro

Nonro ni ibiro tim kind kuonde thieth moyier e kaunti ma Kisumo. Wabiro keto jokony jotim nonro mosetiagi mondo okony choko weche maa kuomu. Kiyie donje nonro to ibiro twak kodi kind dakika pierario kod piero adek ewi penjo madworo weche mag clinic mag nyithindo.

Rach madibed ka idonjo e nonro

Ka idonje nonro, inyalo neno rach, inyalo beo kod chuny malit kata inyalo winjo marach. Inyalo bedo kod chuny malit kaitemo golo wech moko maok mori kendo ok digomb mondo mi ipar gi. Hocho malong'o ibiro tim kapok twak ochakore, ka twak dhi mbele kendo tok tieko twak modo mi iyud jip makende kendo ibed motegno. Ka pek dibedi, ibiro ori ir jalony e weche mag thieth mond mi okonyi kaka nyalore. Kendo ng'at machielo maok onego ng'e weche michiwo kae nyalore po ka ong'eyo weche gi. Mae okonego miyi parruok. Katakamano, en ewiwa mondo mi wakan weche gi maling' ling'.

Ber mar donje nonro

Ibiro mi puonj e yo makare mar pim mar ayaki, kaka onego iduog e clinic kod ber donjo e thieth chon kuom nyithindo man kod yot mar gamo kute mag ayaki. Ka dibed kod ranyisi mar lokruok e dendi kaotudore kod thith kata yor paro moro amora, ibiro ter ir jalony mag weche mag thieth mondo omi kony manyalore. Magi oting'o tend loch nanga, lakteche, johochoko kod jotij oganda.

Chiwruok kod weche mamoko

Nonro ni idonjo tok chiwore ayanga to inyalo wuoke nonro kapok twak ochakore kata ka twak dhi nyime maonge chudo moro amora. pod yot mondo iwuoge e nonoro kata ka iseketo koki e andike mar yie. weche mabiro wuok e nonro ni ibiro tigo kaka oyange e andike ni. Dwaher mondo walerni ni weche kod ndiko madiwuog kuom nonro ni ok biyango nyingi kaka chachiwre. En mana jatend jotim nonro kod jotim nonro ema biro yudo thuolo mar somo weche gi kotudore kod nying ma ikete andike mar yie kod kwandi e nonro. Wabiro kano weche mainyiso wa e yo maling'ling. Ka dibed kod penjo ewi nonro ni, bed thuolo mondo itudri kod

COLLINS WANGULU 0723 99 55 96

Nying jatim nonro

Seyi

Tarik

Weche mag Jachiwre

Osekona gimaomiyo itimo nonro maler. Achiwora mondo adonjie twagni. Ayayudo thuolo mar penjo penjo. Angeyo ni ka dabed kod weche mamoko kata penjo mamoko, abiro tudora kod,

Collins Wangulu, ma en jatiegruok mar somo mar Master of Public Health (MPH), School of Public Health and Community Development, Tat Somo Mar Maseno, Kenya, e yor ni:

Maseno University

School of Public Health and Community Development

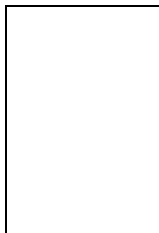
Private Bag, Maseno.

Nying Jachiwre

Seyi

Tarik

Kata (Jogo maok nyal go seyi)



Alama lwedo mathuon (kor
achich)

Tarik _____
(Indiko kod ng'at ma keto ji e
nonro)

Nying Janeno

Seyi

Tarik

Health Worker Consent Form

MASENO UNIVERSITY

CONSENT FORM FOR INTERVIEWS (HEALTH WORKERS)

(To be translated into Dholuo (local language of the people); to be administered verbally to those not able to read)

Study Title: Factors associated with delayed HIV diagnosis in infants in tier three and four public health facilities in Kisumu County, Kenya

Statement of the Researcher

We are requesting you to participate in a research study. The purpose of the form is to give you information which you will need to help you to decide whether to take part in the study or not. Please, listen carefully as I read this form. You are free to ask questions about what we will ask you to do, the risks involved, the benefits, your rights as a volunteer or anything in this form that may not be clear to you. In a process known as informed consent you decide whether or not you would like to participate in the study. If you agree to take part in the study after we have described it to you and having answered any questions you have to your satisfaction, we will give you a signed copy of this form for your records.

Purpose of the Study

The purpose of this study is to determine factors that delay diagnosis of HIV among infants that are borne of HIV positive mothers. This information is useful in determining whether there are particular factors among health workers that have an influence on the timing of diagnosis of HIV among infants borne of HIV positive mothers. It will be useful in re-developing practical and programmatic strategies that will help in addressing health worker related issues that will aid in early identification of HIV infected infants in order to link them into care at an early age. This has been shown to reduce illness and the number of deaths in HIV infected children.

Study Procedure

The study will be carried out in selected health facilities in Kisumu County. We shall engage trained research assistants to help collect the information from you. If you agree to participate in the study, you will be interviewed for about 20 to 30mins by use of a questionnaire.

Potential Risks of Participating in the study

Facility In charge Consent Form

MASENO UNIVERSITY CONSENT FORM FOR INTERVIEWS (FACILITY INCHARGE)

(To be translated into Dholuo (local language of the people); to be administered verbally to those not able to read)

Study Title: Factors associated with delayed HIV diagnosis in infants in tier three and four public health facilities in Kisumu County, Kenya

Statement of the Researcher

We are requesting you to participate in a research study. The purpose of the form is to give you information which you will need to help you to decide whether to take part in the study or not. Please, listen carefully as I read this form. You are free to ask questions about what we will ask you to do, the risks involved, the benefits, your rights as a volunteer or anything in this form that may not be clear to you. In a process known as informed consent you decide whether or not you would like to participate in the study. If you agree to take part in the study after we have described it to you and having answered any questions you have to your satisfaction, we will give you a signed copy of this form for your records.

Purpose of the Study

The purpose of this study is to determine factors that delay diagnosis of HIV among infants that are borne of HIV positive mothers. This information is useful in determining whether there are particular organizational factors in health facilities that have influence on the timing of diagnosis of HIV among infants borne of HIV positive mothers. It will be useful in re-developing practical and programmatic strategies that will help in addressing facility organization related issues that will aid in early identification of HIV infected infants in order to link them into care at an early age. This has been shown to reduce illness and the number of deaths in HIV infected children.

Study Procedure

The study will be carried out in selected health facilities in Kisumu County. We shall engage trained research assistants to help collect the information from you. If you agree to participate in the study, you will be interviewed for about 20 to 30 minutes by use of a questionnaire. Some of the questions may require verification from available records at your facility. In areas where you may not have accurate information about, you can nominate person(s) familiar with the area(s) to respond to the question(s).

Master of Public Health (MPH) candidate, School of Public Health and Community Development, Maseno University, Kenya, at the following address:

Maseno University

School of Public Health and Community Development

Private Bag, Maseno.

Name of Participant	Signature	Date
Or (for those unable to sign)		
<div style="border: 1px solid black; width: 80px; height: 60px; display: inline-block;"></div>		Date_____ (To be filled by the recruiting staff)
<div style="border: 1px solid black; width: 200px; height: 20px; display: inline-block; vertical-align: middle;">Thumbprint (right hand)</div>		

Name of witness	Signature	Date

APPENDIX V: QUESTIONNAIRES

Infant Caregiver Questionnaire (English)

STUDY SITE CODE Site Name Participant
Name..... ID No. Mobile
No..... Date /...../.....

A. CAREGIVER SOCIO-DEMOGRAPHIC INFORMATION

1. Indicate the following concerning the caregiver:

- a) Gender Male Female
b) Age ___ (years)
c) Religion Christian Muslim Others Specify
d) Ethnicity _____
e) Location _____

2. a) What is the caregiver's relationship to the Infant?

- Mother Father Sibling
 Other relative Special group Others
specify.....

3. a) What is the caregiver's last level of schooling?

- None Primary Secondary Tertiary

b) How many years of school did the caregiver complete?__ years(**Do not count repeat levels**)

B. KNOWLEDGE AND AWARENESS ABOUT INFANT HIV DIAGNOSIS

1. a) Can HIV be transmitted from an infected mother to her child?

- Yes No Don't know

b) If yes in (a) above, when is transmitted?

- Pregnancy Delivery Breastfeeding others specify

2. At what age is the baby born of a HIV positive mother supposed to be presented for HIV testing at the facility? _____ (**indicate whether weeks/months/years**)

INFANT INFORMATION

1. Does the child have parents? (**Indicate parental status**)

All alive single parent orphaned Others
specify.....

2. What was the date of birth of the infant?/...../.....(format: DD/MM/YYYY)
(Calculate the Age of the Infant ___ Months ___ Weeks)

3. What is the infant's place of Birth?
 Hospital Home

4. Was the infant Immunized at the following ages? (**corroborate with the MCH card**)

- b) 6 weeks? Yes Missed Has not attained the age Don't Know
c) 10 weeks? Yes Missed Has not attained the age Don't Know
d) 14 weeks? Yes Missed Has not attained the age Don't Know
e) 6 Months? Yes Missed Has not attained the age Don't Know
f) 9 Months? Yes Missed Has not attained the age Don't Know

5. (a) Has the child ever been tested for HIV? (**Corroborate with available Clinic records**)
 Yes No Don't know

(b) If yes, how old was the child on first testing? _____ (**indicate whether months or weeks**)

(c) What was the test result? (**If Yes, proceed to question 7**)

Positive Negative

6. (a) If negative, was there any test done after the initial testing of the child?

Yes No Don't know

(b) If yes, how old was the child on the last testing? _____ (**indicate whether months or weeks**)

(c) What was the test result?

Positive Negative

7. (a) Since the birth of the child, have there been any hospitalizations?

Yes No Don't know

(b) If yes, indicate the age of the child in months at that time and reason for admission
e.g. fever, difficulty in breathing, diarrhea, not feeding, vomiting, poor weight gain

	Age of the Child in months	REASON (write the probable diagnosis)
1		
2		
3		
4		
5		

C. PHYSICAL & FINANCIAL ACCESS

1. How far the caregiver's home to the facility? _____ (**Indicate approx. distance in Kms**)

2. (a) Did the participant incur any costs?

Yes No

(b) If yes, indicate the cost (to and from the facility) in Kshs. _____

3. What has been the participant's average monthly income for the past 3 months? _____
(Indicate the average amount in Kshs.)

4. Describe the caregiver's house in the following manner;

(a) What material is the wall made of?

Blocks/bricks Mud or cow dung Timber Others specify...

(b) What material is the roof made of?

Grass Mabati/iron sheets Tiles Others specify...

(c) What material is the floor made of?

Cement Mud or cow dung Tiles Others specify...

(d) Does the house have electricity?

Yes No

5. What is the participant's source of water at home?

Tap water Well River Rain water

Others specify.....

CULTURAL ACCESS

1. (a) Do you know of any myths/taboo/beliefs in your community about HIV testing?

Yes No

(b) If yes, state them

(c) Do you believe in any of the above?

Yes No

(d) If yes, state

2. (a) Do you know of any myths/taboo/beliefs in your community about HIV treatment?

Yes *No*

(b) If yes, state them

(c) Do you believe in any of the above?

Yes *No*

(d) If yes, state

3. When the child is sick, where do you seek help?

Hospital *Chemist/over the counter* *Herbali*

Witchdoctor

Others specify...

E. MATERNAL CHARACTERISTICS

1. (a) Did the mother attend Antenatal care?

Yes *No* *Don't Know*

(b) If yes, how many visits? ____ (**Indicate the number of visits**)

2. When did the mother discover her positive status?

Before pregnancy *During pregnancy* *After Delivery*

3. Was the mother put on any Antiretroviral medication;

(a) During her pregnancy?

Yes *No* *Don't Know*

(b) During labour?

Yes *No* *Don't Know*

D. DISCLOSURE STATUS , FAMILY AND SOCIAL SUPPORT

1. Have you revealed the exposure status of the child to your life partner?
 Yes *No* *Don't Know*
2. Have you revealed the exposure status of the child to other mature members of the nuclear family?
 Yes *No* *Don't Know*
3. Have you revealed the exposure status of the child to any other relatives?
 Yes *No* *Don't Know*
4. Have you revealed the exposure status of the child to any persons who are not your own relatives?
 Yes *No* *Don't Know*
5. How do rate the support given to the infant whether materialistic or non-materialistic by family members?
 Not helpful at all *Slightly helpful* *Somewhat helpful*
 Very helpful *Extremely helpful*
6. Do you belong to any HIV social support group?
 Yes *No* *Don't know*
7. If yes, how beneficial has the group been to the infant?
 Not helpful at all *Slightly helpful* *Somewhat helpful*
 Very helpful *Extremely helpful*

Infant-Caregiver Questionnaire (Dholuo Translation)

Oboke mag Tuak

Oboke mar Jachiw rit ne nyithindo mapod tin

STUDYSITE CODE Namba Jachiwre Tarik/...../.....

B. CAREGIVER SOCIO-DEMOGRAPHIC INFORMATION

Gender [M][F] Age __ years __ Months

Ethnicity _____ Location _____

1. a) Ere tudro mantie kuom Jachiwre gi Nyathi?
[Min gi] [Wuon gi] [Nyathigi] [Wat mamoko] [Grup makende] [Mamoko wachi.....]

2. a) Jachiwre ochopo kanye mogik e skol?
[Onge] [Primary] [Sekondary] [Tertiary]
b) Jachiwre otieko igni adi e skol? __ (Kik ikwan nuoruok)

3. Dini mar Jachiwre en mane?
[Katholik] [Protestant] [Islam] [Mamoko wachi.....]

E. BEDO GI WACH GI NGE'YO KUOM FWENYO KUTE MAG AYAKI MANTIE KUOM NYITHINDO MA POD TIN

3. Bende kute mag ayaki inyalo landi ka owuok kuom mama mantie kode momiye nyathine? [Ee] [Oyo] [Ok ange'yo]
4. Ka Ee, olandore seche mage? [Sama mine pek kata gimako ich] [Seche Nyuol] [Seche mimiyo nyathi thuno] [mamoko wachi]
5. Nyathi monyuol gi mama mantie gi kute mag ayaki onego ter pim mar kute mag ayaki mantie kar thieth ka en gi igni adi? _ _ _

F. WECHE MAG NYATHI MAPOD TIN

8. Bende nyathi nigi jonyuol mage? [Gi ngima te] [Janyuol achiel] [En kich][Mamoko wach.....]
9. Tarik mane onyuol nyathi en mane?/...../.....(format: DD/MM/YYYY)
(Go kwano mar ikni mar nyathi ___ Dweche ___ Wige)
10. Nyathi onyuol kanye? [Ospital] [Dala kata ei ot]
11. Bende ne ochuo nyathi sandan kata nomiye yath mar gen'go tuoche e ikni mantie piny kae? (corroborate with the MCH card)
 - g) Wik mar 6 ?[Ee] [Oyoo] [Ok ange'yo]
 - h) Wik mar 10 ?[Ee] [Oyoo] [Ok ange'yo]

- i) Wik mar 14 ?[Ee] [Oyoo] [Ok ange'yo]
- j) Dwe mar 6 ?[Ee] [Oyoo] [Ok ange'yo]
- k) Dwe mar 9? [Ee] [Oyoo] [Ok ange'yo]

12. (a) Bende nyathi osepim ka entie gi kute mag ayaki? [Ee] [Oyoo] [Ok ange'yo]
 (b) Ka Ee, ne entie gi igni adi e pim mokwon'go? _____Dweche ____Wige
 (c) Chal mare ne owuok nade? [Entie godo] [Oonge godo] (Ka ne oonge god to thi 6)

13. (a)Ka ne onge, bende ne ntie pim moro mane otim ne nyathi bang pim mokwongo?
 [Ee] [Oyoo] [Ok ange'yo]
 (b) Ka Ee, nyathi ne ntie gi igni adi e pim motim mogik? _____Dweche ____Wige
 (c) Duoko mar pim ne owuok nade? [Entie godo] [Oonge godo]

14. (a) Chakre onyuol nyathi, bende ose rwaka ei ospital?
 [Ee] [Oyoo] [Ok ange'yo]
 (b) Ka Ee, ket tarik gi gima ne omiyo orwake ei ospital e.g. Dend maliet, pek e yweyo, ne odieo,
 Ok ne ochiem, ng'ok, ne ok omed kilo maber

	TARIK	GIMA NE OMIYOREASON (Ndik kaka ne pim nyalo golo duoko)
1		
2		
3		
4		
5		

G. PHYSICAL & FINANCIAL ACCESS

6. Od jachiwre bor manade gi kar thieth? _ _ _ _ (ndik bor e Kms)
7. (a)Bende ne otio gi pesa mora mora? [Ee] [Oyoo]
 (b)Ka Ee, ndik pesa mane otio godo (dhi kod duogo kar thieth) e Kshs. _ _ _ _ _
8. Jachiwre ose bedo ka yudo pesa marom nade e dwe achiel kuom dweche adek mosekalo?
 _ _ _ _ _ (ndik yuto ma dwe ka dwe e Kshs.)
9. Wach kuom od jachiwre kaluore gi weche mantie piny kae;
 (e) Korot olosi gi gig mage?
 [Kite madongo/motafari] [Chuodho kata chieth thiang] [Mbao] [Mamoko wachi.....]
 (f) Tado olosi gi gig mage?
 [Lum] [Mabati/iron sheets] [Tiles] [Mamoko wachi.....]
 (g) Dier ot olosi gi gig mage?
 [Simiti] [Chuodho kata chieth thiang] [Tiles] [Mamoko wachi.....]
 (h) Bende ot ntie gi stima? [Ee] [Oyoo]
10. Jachiwre yudo pi kanya e dala kata e ot?
 [Pi mfereji] [Kisima] [ahora] [Pi koth] [Mamoko wachi.....]

H. NGE'YO KIDO (CULTURAL ACCESS)

4. (a) Bendeinge'yogimoramora ma oyiegodo(myths/taboo/beliefs)eigwengmaru/dini kuom kute mag ayaki? [Ee] [Oyoo]

(b) Ka Ee, Wachgi

(c) Bende kuomgi ntie ma iyegodo? [Ee] [Oyoo]

(d) Ka Ee, wache

5. (a) Bende inge'yo of any myths/taboo/beliefs ei gweng maru/dini kuom thieth mar kute mag ayaki?

[Ee] [Oyoo]

(b) Ka Ee, wachgi

(c) Bende iyegi mora mora kuom mantie malo ka? [Ee] [Oyoo]

(d) Ka Ee, Wachi

6. Kaponi nyathi tuo, ere kama imanyo konyruok?

[Ospital] [Kemist/over the counter] [Ja Yedhe kienyeji] [Jajuok] [Mamoko wachi]

E. TIMBE MINE KALUORE GI THIE KAR THIETH KA NE GIYACH(MATERNAL CHARACTERISTICS)

4. (a) Bende min nyathi ne othie rit mantie kar thieth kapok ne onyuol? *[Ee] [Oyoo][Ok ang'eyo]*
(b) Ka Ee, ne othie limbe didi? (Ndik namba mag limbe) _ _
5. En kara ang'o mane min nyathi ofwenyo chal mare mar bedo gi kute mag ayaki?
[Kapok omako ich] [Ka ne oyach] [Bang nyuol]
6. Bende ne oket min nyathi e yath mora mora mar kute mag ayaki;
(c) Ka ne oyach? *[Ee] [Oyoo][Ok ang'eyo]*
(d) Ka ne ochiegni nyuol? *[Ee] [Oyoo][Ok ang'eyo]*

I. FULO CHAL , KONY MAR JO FAMILI KOD OGANDA

8. Bende ise fulo chal mar nyathi ne jaherani mar dak? *[Yes] [No][Ok ang'eyo]*
9. Bende ise fulo chal mar nyathi ne jomamoko madongo mar famili ma oko? *[Ee] [Oyoo][Ok ang'eyo]*
10. Bende ise fulo chal mar nyathi ne wete mamoko? *[Yes] [No][Ok ang'eyo]*
11. Bende ise fulo chal mar nyathi ne nga'ta nga'ta ma ok gin owetegi?
12. Inyalo pimo nade konyruok ma imiyo nyathi obed gig moko kata ma ok en gig moko gi jo famili? *[Ok kony kata matin][Konyo matin ahinya] [Temo konyo] [Konyo maber] [Konyo maber ahinya]*
13. Bende intie chokruok mar kony mora mora mar jogo mantie gi kute mag ayaki? *[Ee] [Oyoo] [Ok ang'eyo]*
14. Ka Ee, chokruokni ose konyo nyathi nade? *[Ok okonye kata matin][Okonye matin ahinya] [Otemo konye] [Okonye maber] [Okonye maber ahinya]*

Health Worker Questionnaire

STUDY SITE CODE **Site Name** **Participant Name**..... **ID No.** **Mobile No.**..... **Date**/...../.....

A. STAFF INFORMATION

- 1. Staff cadre
 Medical specialist *Medical officer* *Clinical officer* *Nurse* *Nurse*
 Aid Others Specify....
 - 2. Terms of Employment
 Permanent *Temporary* *Others Specify*.....
 - 3. How many years have you worked in the MCH department? _____
 - 4. Within the last one year, how many work related trainings have you attended? _____
-

B. PERFORMANCE EVALUATION

- 1. Are there specific targets set to you by your supervisor that are supposed to be achieved by the end of a certain period?
 Yes *No* **(If yes proceed to No. 2 and 3, if No proceed to section C)**
 - 2. If yes, have you ever been evaluated on the specific targets set?
 Yes *No*
 - 3. Do you get a feedback from your supervisor after the evaluation?
 Yes *No*
-

C. JOB MOTIVATION

- 1. My achievement on the current job is satisfactory
 Strongly Diasagree *Disa* *ee* *Neither Agree or Di* *agree* *Agree*
Strongly Agree
- 2. I am given due recognition at work
 Strongly Diasagree *Disag* *ee* *Neither Agree or Di* *agree* *Agree*
Strongly Agree
- 3. The work itself is interesting and challenging
 Strongly Diasagree *Disag* *ee* *Neither Agree or Di* *agree* *Agree*
Strongly Agree
- 4. I am given due responsibilities at work to execute

Strongly Disagree *Disagree* *Neither Agree or Disagree* *Agree*
Strongly Agree

5. My advancement (promotion) on the current job is satisfactory

Strongly Disagree *Disagree* *Neither Agree or Disagree* *Agree*
Strongly Agree

6. Personal growth (i.e skills acquired through training and development) on the current job is satisfactory

Strongly Disagree *Disagree* *Neither Agree or Disagree* *Agree*
Strongly Agree

D. Rate your level of satisfaction with the following aspects of your job.

(i) General Working Conditions

1. Hours worked each week

Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

2. Flexibility in scheduling

Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

3. Location of work

Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

4. Annual leave/sick leave offered

Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

(ii) Pay and Incentives

1. Salary

Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

2. Opportunities for Promotion

Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

3. Benefits (Pension, Health insurance, life insurance, etc.)

Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

4. Job Security
 Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

5. Recognition for work accomplished
 Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

(iii) Work Relationships

1. Relationships with your co-workers
 Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

2. Relationship(s) with your supervisor(s)
 Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

3. Relationships with your subordinates (if applicable)
 Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

(iv) Organizational Support

1. Opportunity to utilize your skills and talents
 Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

2. Opportunity to learn new skills
 Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

3. Support for additional training and education
 Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

4. Recognition for work accomplished
 Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

(v) Work Activities

1. Variety of job responsibilities

Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

2. Degree of independence associated with your work roles

Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

3. Adequate opportunity for periodic changes in duties

Very Dissatisfied *Dissatisfied* *Neutral* *Satisfied*
Very Satisfied

(b) What is the monthly average number of patients (including HIV exposed infants) seen in the department mentioned above in the past three months by the staff?

Month	June 2015	July 2015	August 2015
Monthly Average			

2. Who makes the decision for HIV exposed infants to be tested? (Choose more than one option where applicable).
- Nurse Aid Nursery Clinical Officer Medical Officer Laboratory staff
 Medical specialist others specify
3. Who does rapid testing for HIV exposed infants?
- Nurse Aid Nursery Clinical Officer Medical Officer Laboratory staff
 Medical specialist others specify
4. Who collects the Dried Blot sample for HIV exposed infants?
- Nurse Aid Nursery Clinical Officer Medical Officer Laboratory staff
 Medical specialist others specify

SAMPLE COLLECTION, TESTING AND RESULT TRANSMISSION

1. Where does the facility source the HIV testing (this includes Dried blot and Rapid testing) materials from?
- MoH County Partner/Sponsor Private supplier Others specify
2. (a) Have there been any shortages of Kits in the last 6 months?
- Yes No
- (b) If yes, How often?
- Once Twice Thrice Four times Five or more
3. Do caregivers of HIV exposed infants pay for HIV testing;
- (a) HIV DNA PCR
- Yes No (If yes, indicate the cost in Kshs. _____)
- (b) HIV Rapid testing?
- Yes No (If yes, indicate the cost in Kshs. _____)
4. (a) Where do you take your Dried Blot Samples (DBS) for DNA PCR?
- Within the facility Outside the facility
- (b) If outside the facility, indicate the name of the station place and give approximate distance in Kms away)
- Name of station _____ Distance _____ Kms

(c) Are there any costs charged against your facility for HIV testing at the DNA PCR testing station?

Yes No (If yes, indicate the cost per test in Kshs. _____)

(d) How does the facility send the dried blot sample to the outside station?

Courier services Hospital Vehicle Tax Others specify.....

(e) Does the facility incur any direct costs when sending the dried blot sample?

Yes No

(f) If yes, how much on average has the facility incurred as direct costs for the past three months?

Month	May 2015	June 2015	July 2015
Cost in Kshs.			

(Indicate the monthly average amount in Kshs.) Kshs. _____

(g) Averagely for the past three months, how long does it take to have results back?

Month	May 2015	June 2015	July 2015
Turnaround Time			

(Indicate the average Turnaround Time) _____ Months _____ week

(h) How are results sent from central laboratories?

By post office address Electronic Physical address Others Specify

(i) How are the caregivers notified for HIV DNA PCR result collection?

SMS Cell phone calls Scheduled patient visits Others Specify