5-15-2015

The Use of Antenatal Care Services Among Women Living in Cote d'Ivoire: Focus on Prevention of Mother-To-Child Transmission of HIV

Constance Ogokeh

Follow this and additional works at: http://scholarworks.gsu.edu/iph_theses

The Use of Antenatal Care Services Among
Women Living in Cote d'Ivoire:
Focus on Prevention of Mother-To-Child Transmission of HIV

by

Constance Ekeoma Ogokeh

Bachelor of Science, Biology

Georgia State University

A Thesis submitted to the Graduate Faculty of Georgia State University in Partial
Fulfillment of the Requirements for the Degree

MASTER OF PUBLIC HEALTH

ATLANTA, GEORGIA

30303

THE USE OF ANTENATAL CARE SERVICES AMONG

WOMEN LIVING IN COTE D'IVOIRE:

FOCUS ON PREVENTION OF MOTHER-TO-CHILD TRANSMISSION OF HIV

by

Constance Ekeoma Ogokeh

Approved:

_Dr. Richard Rothenberg___
Committee Chair

_Dr. Betty Lai_____
Committee Member

_Dr. Ike Okosun_____
Committee Member

_04-30-2015_____
Date

CONSTANCE EKEOMA OGOKEH

The Use of Antenatal Care Services among Women Living in Cote d'Ivoire: Focus on Prevention of Mother-To-Child Transmission of HIV

(Under the direction of Dr. Richard Rothenberg, Committee Chair)

Abstract

Introduction: The use of antenatal care (ANC) services with programs for prevention of mother-to-child transmission (PMTCT) of HIV is vital in reducing maternal and infant mortality as well as reducing the rate of neonatal HIV infections. The objectives of this study were 1) to determine the knowledge that women have about HIV/AIDS as well as mother-to-child transmission (MTCT) of HIV, and 2) to identify factors that were associated with ANC attendance, timing of first ANC visit, HIV testing as part of an ANC visit, and place of delivery among women living in Cote D'Ivoire, a high HIV prevalent country in West Africa.

Methods: The 2011-2012 Demographic Health Surveys (DHS) for Cote D'Ivoire was used, with a focus on women who had a parity of at least 1 and/or are currently pregnant. The outcomes of interest were ANC attendance, timing of first ANC visit, being tested for HIV as part of ANC visit, and the place of delivery. The independent variables included age, education, marital status, wealth, type of residency, general knowledge of HIV/AIDS (transmission and prevention), attitudes towards people living with HIV/AIDS, general knowledge of mother-to-child transmission (MTCT) routes, and HIV pre-counseling during ANC visits. Chi-Square tests, univariate and multivariate logistic regression were conducted.

Results: There were a total of 7729 women who met the inclusion criteria, in which 4902 (90.9%) of them had at least one ANC visit, and 2340 (43.4%) had more than three ANC visits. More than half of the respondents went for their first ANC visit in their second trimester compared to 31.2% who went in their first trimester. Type of residence, wealth, attitudes towards people living with HIV/AIDS were associated with at least three of the outcomes. Women who did not receive counselling about testing for HIV during an ANC visit were more likely to not be tested for HIV (OR=24.65, 20.60 – 29.48; AOR= 22.21, 95% CI=16.82 – 29.31) compared to women who did receive counselling. Women less than 18 years were less likely to delivery in a health facility (OR= 1.76, 95% CI= 1.15 – 2.70) compared to women between the age of 25-29.

Conclusion: Even though approximately 91.0 % of the women in the study had at least one ANC visit, less than half of them met the World Health Organization (WHO) guidelines to have at least four ANC visits. The study shows that HIV pre-counseling is an effective intervention in engaging pregnant women in PMTCT programs. However, interventions need to take in consideration people living in rural areas as well as people with low income.

Keywords: Prevention of mother-to-child transmission, HIV counseling and testing, Antenatal care services, knowledge

Acknowledgements

I have so many people to be grateful for accomplishing this Master's program. Let me start first to give all glory and praise to my God because without Him I am nothing and surely would not have been able to achieve anything in my life. He has been my strength especially throughout those last weeks in my program (Psalms 118). I thank my parents for always being there for me and for always supporting me financially, spiritually, and emotionally. I also thank all my siblings, even though we are far from each other, they have always supported me in many ways especially morally; many thanks!

I extend my gratitude to my GRA mentor Dr. Lai for being patient with me in improving my research skills as well as my writing skills, and for always encouraging me to reach for higher goals. I am so grateful to Dr. Rothenberg for the guidance he provided me in writing my thesis, his patience (for every time I was thinking of modifying my topic), and also I thank him for believing that I could accomplish this work. I cannot forget to thank Dr. Okosun, who everyday (I mean *everyday*), will pass by our GRA office and say with a deep voice to me and my colleague "If you continue on working hard, one day you guys will go far". Thank you Dr. Okosun, and thank you for being my academic advisor, as well as one of my committee member. I am thankful also for all the faculty and staffs in the School of Public Health.

I also want to thank all my friends, they have been very supportive throughout these years. Many thanks go to my classmates, despite our moments of frustration due to school projects, assignments and more, we always encouraged each other.

I am also grateful for the Georgia State Catholic Association for always having Mass, as well as fellowship for students, faculty and staffs on campus. And this lead me to thank all my friends and family in my parish St. Andrew Catholic Church for all their support and prayers.

The list could surely go on, but I will stop here otherwise I will be writing a chapter on "Acknowledgement".

Thank you!

Author's Statement Page

In presenting this thesis as a partial fulfillment of the requirements for an advanced degree from Georgia State University, I agree that the Library of the University shall make it available for inspection and circulation in accordance with its regulations governing materials of this type. I agree that permission to quote from, to copy from, or to publish this thesis may be granted by the author or in his/her absence, by the professor under whose direction it was written, or in his/her absence, by the Associate Dean, School of Public Health. Such quoting, copying, or publishing must be solely for scholarly purposes and will not involve potential financial gain. It is understood that any copying from or publication of this thesis which involves potential financial gain will not be allowed without written permission of the author.

_____Constance E. Ogokeh_____
Signature of Author

Notice to Borrowers Page

All theses deposited in the Georgia University Library must be used in accordance with the stipulations prescribed by the author in the preceding statement.

The author of this thesis is:

Student's Name: Constance Ekeoma Ogokeh
City, State, and Zip Code: Atlanta, GA 30350

The chair committee for this thesis is:

Professor's Name: Richard Rothenberg
Department: Epidemiology & Biostatistics
College: School of Public Health

Georgia State University
School of Public Health
P.O. Box 3995
Atlanta, GA 30302-3995

Name of User	Address	Date	Type of Use (Examination only or copying

Constance Ekeoma Ogokeh

3505 Spring Creek Lane
Atlanta, GA 30350

cogokeh1@student.gsu.edu
404-979-0240

Education

Master of Public Health, Epidemiology **2015**
Georgia State University, Atlanta, GA

Bachelor of Science, Biology **2012**
Georgia State University, Atlanta, GA

Skills

Computing Skills:
Microsoft Office (Word, Excel, PowerPoint, Publisher), Prezi, Endnote, SPSS, SAS, Qualtrics, EpiInfo.

Languages:
English, French.

Research Experience

Graduate Research Assistant **08/13 – 05/15**
Georgia State University, Atlanta, GA
Focus: Stressors and youth mental and physical health (under *Betty S. Lai, Ph.D.*)

Assist professor in manuscripts' preparation by performing literature searches, writing study design and other sections, and reviewing the articles. Tailor manuscripts and gather required documents for online submission to journals of interest according to their guidelines. Additional research skills involve cleaning datasets.

Healthy Military Family Project **09/14 – Present**
Primary investigator: *Betty S. Lai, Ph.D.*
The objective of this research is to identify the factors that predict resilience in military families. Information will be collected from the adolescents and spouse of military affiliated parent.

Design questionnaires for collecting valuable information from participants in paper form and also using online survey software such as Qualtrics. Data management includes creating a detailed and well organized codebook for the questionnaires and using SAS and SPSS for data coding and analyses. Develop research protocol, and prepare and submit IRB documents.

Teaching Experience

Teaching Assistant **08/13 – 05/15**
Georgia State University, Atlanta, GA

Biostatistics I (Graduate level) with SAS under Betty S. Lai, Ph.D.
Class management involves grading class' assignments and exams. Compute Biostatistics and SAS related homework and other learning resources valuable for the class.

Structural Equation Models (Graduate level) under Betty S. Lai, Ph.D.
Assist in preparing and organizing class lectures. Compute SEM assignments and quizzes.

Guest Lecturer **2014**
Georgia State University, Atlanta, GA
Graduate level. Biostatistics I: Hypotheses for Categorical Data (Chi-Square test).

Published Work

1.   Lai, B.S., Beaulieu, B., **Ogokeh, C.**, Tiwari, A., Self-Brown, S. (2014). Posttraumatic Stress Symptom Trajectories after Disasters: Adult and Child Reactions. In V. Preedy (Ed.). *The Comprehensive Guide to Post-traumatic Stress Disorders.* London: Springer.

2.   Lai, B.S., Beaulieu, B., **Ogokeh, C.**, Self-Brown, S., & Kelley, M.L. (In press). Mother and Child Reports of Hurricane Related Stressors: Data from a Sample of Families Exposed to Hurricane Katrina. *Child and Youth Care Forum.*

Editorial Experience

Ad Hoc Reviewer, *Journal of Clinical Child and Adolescent Psychology*
Ad Hoc Reviewer, *Western Journal of Emergency Medicine*

Work Experience

Certified Pharmacy Technician   **05/14 – Present**
Walgreens Pharmacy, Atlanta, GA

Count and measure drugs given to patients. Reconstitute powdered medications. Customer services involve assisting customers at the in- and out-window stations, and calling them to ensure that they are doing well on their medications. Resolve Third Party rejections. Execute outside vendors medication check-ins and maintain the pharmacy drugs' inventory.

Intern   **08/14 – 12/14**
Department of Human Services (Division of Aging Services), Atlanta, GA

Assist the Livable Communities section staffs with reviewing their data, and organizing the different programs of the division. Convey data and other information using presentation tools such as Prezi. Assist staffs in implementing projects and evaluating them.

Certified Pharmacy Technician   **01/13 – 12/13**
CVS Pharmacy, Roswell, GA

Completed one year-technician training, which included assisting customers at Drop-off and Pick-up stations, counting and measuring drugs dispensed to patients, and resolving Third Party rejections and finalized any manual claims.

Student Assistant (Student Life Office)   **09/09 – 12/10**
Georgia Perimeter College, Dunwoody, GA

Wrote and edited official letters. Marketed school organizations and other activities by creating brochures, flyers, and signs. Organized documents concerning school organizations' budgets and policies.

Licenses and Certifications

Adult First Aid/CPR/AED Certification (American Red Cross)	**2014**
Pharmacy Technician Certification	**2013**
Pharmacy Technician License	**2013**

Memberships

American Public Health Association (APHA)	**2014 – Present**
Minority Association of Pre-Health Students (MAPS) at Georgia State University	**2014 – Present**
Georgia State University Public Health Student Association	**2013 – Present**
Georgia State Student Alumni Association	**2013 – Present**
Phi Theta Kappa (Honors' association for two-year colleges)	**2009 – Present**

Activities

VISA (Volunteer International Student Assistant) Leader   **12/11 – 05/12**
Georgia State University, Atlanta, GA

Guided international students in completing admission documents during orientation, and provided them with tips and advices in order to adapt to the USA.

Student Team for Advisement and Registration (STAR) Leader   **08/08 – 08/10**
Georgia Perimeter College, Dunwoody, GA

Conducted Campus Tours and emphasized the services and /or benefits of each department; participated in Leadership Conference and yearly training; and guided students and parents during New Student Orientation and Open House.

Community Services

Selfless4africa, non-profit organization   **2011 – Present**
Aim to promote education in West Africa by providing scholarships.
- Assist in their annual events such as Benefit dinner, and participate in their volunteering activities.

Sunrise Senior Assisted living   **2010 – 2011**
Sandy Springs, GA
- Taught French classes on Saturdays, and conducted the Saturday fitness class.
- Assisted seniors in activities such as art crafts, and games.

Table of Contents

CHAPTER I: BRIEF INTRODUCTION

1. Antenatal Care Services

1.1. Pattern of Distribution in the World

Improving maternal health is the fifth of eight Millennium Development Goals (MDGs) established by the United Nations (UN) members in 2000 to be achieved by the end of the year 2015. The MDG 5 consists of two targets: reduce by three quarters the maternal mortality ratio between 1990 and 2015, and achieve universal access to reproductive health by 2015 (United Nations, 2008). It is estimated that 71% of women across the globe have received some types of antenatal care (ANC) services. According to the World Health Organization (WHO), pregnant women should have at least four antenatal care visits, or more if medical complications have been diagnosed in order to treat or monitor their condition (The Partnership for Maternal Newborn and Child Health, 2006). In addition, the WHO encourages pregnant women to have their first ANC visit during their first trimester and to deliver in an ANC healthcare facility with the assistance of a skilled health professional (The Partnership for Maternal Newborn and Child Health, 2006). On a global scale, 83% of pregnant women had at least one ANC visit with a skilled health professional in 2012; however, only half of those women met the minimum number of visits recommended by the WHO (United Nations Children's Fund, 2014). The pattern of distribution of ANC services' use varies between regions. For instance in the developing countries, 74% of pregnant women stated that they attended at least one ANC visit, and only 37% attended at least four visits (United Nations Children's Fund, 2014). The pattern of distribution of ANC services' use varies also within countries due mainly to socioeconomic factors. Approximately 25% of women living in

rural areas were assisted with skilled attendance during childbirth compare to 81% of women living in the urban areas (The Partnership for Maternal Newborn and Child Health, 2006).

According to the WHO, a number of 800 women die from preventable conditions during pregnancy and childbirth, and almost 99% of all these deaths occur in developing countries, where access to ANC services may be challenging (World Health Organization, 2014c). Furthermore, though infant mortality has declined worldwide, it still remains a major problem in some parts of Africa, particularly sub-Saharan Africa (World Health Organization, 2014b).

1.2. The Components of Antenatal Care Services

A package for antenatal check-ups should consist of at least screenings for maternal illnesses and infections (urine and blood tests), hypertensive disorders (blood pressure assessment) and anaemia (blood test) (United Nations Children's Fund, 2014). ANC healthcare facility should encourage pregnant women in taking iron and folic acid to reduce the risk of maternal anaemia and serious birth defects respectively; provide counselling on family planning, birth and emergency preparedness; encourage smoking cessation; provide prevention of mother-to-child transmission (PMTCT) of HIV programs, necessary immunizations (e.g., tetanus); and promote the use of skilled attendance during delivery, postnatal care and more (The Partnership for Maternal Newborn and Child Health, 2006; United Nations Children's Fund, 2014).

Though the number of ANC services use increases worldwide, developing countries continue to face challenges such as lack of infrastructure; general health system weaknesses; and social, economic, and cultural barriers. According to a study done in Kenya by Ochako, Fotso, Ikamari, and Khasakhala (2011), the place of residence, the household wealth, education, ethnicity, parity, marital status and the age at birth of the last child were associated with the timing of the

first ANC visit by pregnant women and the type of delivery assistance they received. Even though some countries have made progress on the MDG 5, much more work is needed to achieve the targets by 2015.

2. HIV/AIDS Pandemic and the Prevention of Mother-to-Child Transmission of HIV

2.1. Statistics on HIV/AIDS Worldwide

Since its discovery in the 1980's, the Human Immunodeficiency Virus (HIV) and the disease resulting from acquiring the virus, Acquired Immunodeficiency Syndrome (AIDS), continue to be a global burden of disease. Approximately 78 million people have been infected with HIV, and about 39 million AIDS-related deaths have been reported globally since the beginning of the HIV/AIDS epidemic (World Health Organization, 2014a). The World Health Organization stated that 35 million people worldwide were living with HIV/AIDS in 2013 (World Health Organization, 2014a). Of these, 3.2 million were children, and most of them were infected by their mothers who were HIV positive during pregnancy, childbirth or breastfeeding (World Health Organization, 2014a).

Even though the disease is spread worldwide, the distribution varies between and within countries in different magnitude. Sub-Saharan Africa remains the region with the most burden of HIV/AIDS, affecting 1 in every 20 adults, and accounted for almost 71% of the people living with HIV/AIDS globally in 2013 (World Health Organization, 2014a).

2.2. Antiretroviral Therapy and other HIV Interventions

The first HIV treatment, zidovudine or AZT, was discovered in 1987, and since then more than 20 drugs have been approved to treat individuals living with HIV/AIDS (AIDS.gov, 2009b).

Numerous studies have shown that antiretroviral (ARV) drugs, taken in combination of at least three, were more effective than taking just one HIV medication (AIDS.gov, 2009b); this combination is also referred as antiretroviral therapy (ART). There have been many health benefits associated with being compliant to ART such as decrease in HIV/AIDS related deaths, reduction in the risk of acquiring opportunistic illness, decrease in transmitting the virus to others, and protection against HIV drug resistance (AIDS.gov, 2009b). Since each individual is unique in terms of genetic components, people infected with HIV react differently to certain HIV drugs, thus a health provider needs to take in consideration many characteristics of his or her patients before prescribing the right combination of ARV drugs (e.g., CD4 counts levels, viral load test, complete blood count, tests for other infections) (AIDS.gov, 2009a). There is still no cure or vaccines for HIV/AIDS; however, treatments are available for many populations such as discordant couples, men who have sex with (MSM), pregnant women, young children and other key populations at great risk of contracting the infection.

Tremendous progress has been made in order to end this epidemic globally. On a global scale, there have been a 33% decrease in new HIV infection since 2001, 29% decrease in AIDS-related deaths (both adults and children) since 2005, 52% reduction in new HIV infections in children since 2001 (UN Joint Programme on HIV/AIDS, 2013b). By the end of 2012, about 9.7 million people in low and middle income nations had access to antiretroviral therapy (ART) drugs (UN Joint Programme on HIV/AIDS, 2013b). Nevertheless, many barriers that slow the progress have been identified. For instance, more effort or interventions are still needed in providing education and continuous access to treatment, eliminating punitive laws and practice, eliminating HIV-related stigma and discrimination, reducing new cases of HIV/AIDS transmitted sexually, and preventing mother-to-child transmission of HIV and decreasing maternal deaths (UN Joint

Programme on HIV/AIDS, 2013a).The latter challenge is a major concern identified mostly in sub-Sahara Africa, which will be covered in the following paragraph.

2.3. Prevention of Mother-To-Child Transmission of HIV

As mentioned above, mother-to-child transmission (MTCT) of HIV, maternal deaths and infant mortality continue to affect many countries in Africa, particularly the sub-Saharan region. According to WHO, more than half a million of newborns are infected with HIV every year in sub-Saharan Africa through the MTCT route (World Health Organization, 2014a). Approximately 90% of newly HIV infected cases in infants and children in sub-Saharan Africa is attributable to the transmission of HIV from a woman with HIV to her child during pregnancy, labor, delivery or breastfeeding (United Nations Children's Fund, 2015b). Without any treatments or interventions offered to the mother and the newborn, the risk of MTCT is 20% to 45% compared to less than 2% if appropriate interventions and treatments are available and accessible in a timely manner (United Nations Children's Fund, 2015a).

In 1998, due to the high burden caused by the mother-to-child transmission of HIV, steps towards PMTCT programs have been initiated in order to create and AIDS free generation. In order to be effective, PMTCT programs must enable women and their children to have access to numerous interventions such as access to ANC services, HIV testing during pregnancy, use of ART by pregnant women living with HIV, safe childbirth practices, safe infant feeding, and other postnatal healthcare services (Avert.gov, n.d.). The WHO strategic vision towards PMTCT programs include: 1) preventing newly HIV infections among women of childbearing age, 2) preventing unintended pregnancies among women living with HIV, 3) preventing HIV

transmission from a woman living with HIV to her baby, and 4) providing appropriate treatment, care and support to mothers living with HIV and their children (World Health Organization, 2010).

Many progress have been made globally in programs related to PMTCT. In 2012, about 62% of pregnant women living with HIV globally had access to PMTCT services. The incidence rate of HIV infections among children fell by 52% between 2001 and 2012 (Avert.gov, n.d.). Despite those accomplishments, the target set in the health-related Millennium Development Goals (MDGs 4, 5 & 6) will not be achieved by the end of 2015 in many parts of the world. More work needs to be done in other to address barriers that prevent PMTCT uptake such as knowledge about HIV, MTCT, and PMTCT; fear of knowing HIV status; HIV stigma and discrimination; stigma in healthcare settings; culture beliefs; and infant feeding.

3. Objective of This Study

Attending ANC facilities during the first trimester of the pregnancy is very important in reducing maternal and infant mortality. Implementing interventions for preventing mother-to-child transmission of HIV to those facilities can reduce the rate of new infections by providing HIV pre- and post-counseling and testing, ART, postnatal care, infant feeding options, and other information that are necessary. The objectives of this study are to determine the knowledge that women have about HIV/AIDS as well as mother-to-child transmission (MTCT) of HIV; and to identify factors that were associated with ANC attendance, timing of first ANC visit, HIV testing as part of an ANC visit, and place of delivery among women living in Cote D'Ivoire, a high HIV prevalent country in West Africa.

CHAPTER II: LITERATURE REVIEW

1.   The Components of PMTCT of HIV Programs

PMTCT of HIV is an intervention with the goal of ensuring an AIDS free generation by making sure that no child is born with HIV. The program should offer drugs, counseling and psychological support to assist mothers in reducing the risk of MTCT (United Nations Children's Fund, 2015a). Many studies have shown that taking ARV drugs during pregnancy, during labor and delivery, as well as during breastfeeding period have been beneficial in reducing the risk of MTCT of HIV (Chigwedere, Seage III, Lee, & Essex, 2008; Coovadia et al., 2012; Hoffman et al., 2010; Kesho Bora Study Group, 2011; Kilewo et al., 2009). Msellati (2009) gives a detailed description of the steps involve in PMTCT programs. First, a pregnant woman must attend an antenatal healthcare facility during pregnancy (first trimester as recommended by the WHO); second, she must be offered with an HIV counseling at that clinic and agree to take a blood test for HIV; third, if her HIV test comes out positive, she then receives post-test HIV counseling, both around her own HIV status and learning about PMTCT intervention (including infant feeding options). Fourth, she must come back to receive the prophylactic ''intervention'' to reduce viral load in her body as well as her newborn child; fifth, she is encouraged to deliver in a health structure with intervention for her and her baby. Sixth, she must apply the infant feeding option she has chosen and undergo follow-up with her baby until the health system can provide the HIV test for the baby. Then, the health system must offer the HIV-positive woman and her child access to continuous treatment if needed. As mentioned by Uneke, Duhlinska, and Igbinedion (2007), ANC healthcare facility is the entry point for HIV counseling and testing for pregnant women. All these steps are vital for a successful result in the PMTCT program. However, many challenges that can compromise the effectiveness of this program have been identified, mostly in developing

countries: lack of education, fear of knowing HIV status, the result time (e.g., two weeks before you get HIV test result, thus of loss of follow up), discrimination and stigma, long distance to ANC facility, socioeconomic status, infant feeding options (Buesseler, Kone, Robinson, Bakor, & Senturia, 2014; e.g., no access to infant formula or no means of boiling water), gender inequality, and more (Kilewo et al., 2001; Kwapong, Boateng, Agyei-Baffour, & Addy, 2014; Matovu & Makumbi, 2007; Perez, Zvandaziva, Engelsmann, & Dabis, 2006; Turan, Miller, Bukusi, Sande, & Cohen, 2008; Turan & Nyblade, 2013; Van Eijk et al., 2006).

2.   Cote D'Ivoire

Cote D'Ivoire, also known as Ivory Coast in English, is a francophone nation located in West Africa across the border of the North Atlantic Ocean, between Ghana and Liberia. Cote D'Ivoire has a huge population of 20.3 million people (African Development Bank Group, 2013), shares about 60 native dialects (Central Intelligence Agency, 2015), and has a high percentage of Muslims (38.6%) followed by Christians (32.8%). The country has a slightly higher urban population, with about 52.76 % of the total inhabitants living in urban settings (African Development Bank Group, 2013). Although Yamoussoukro is the official capital of Cote D'Ivoire, the seat of government is located in Abidjan.

The country has always been known for its abundant cocoa production and its hospitality to foreign investments since its independence in 1960 until a civil war broke out in 2002, which divided the nation in two parts: North (Rebels area) and south (Central Intelligence Agency, 2015). Even though the conflict ended in 2003, the nation was still living in discordance and fear. A second civil war broke out in 2011, when the former president, Laurent Gbagbo, refused to step down to its opponent Alassane Ouattara, after losing the presidential election. The chaos ended

few weeks later when France's Army and the United Nations (UN) arrested Gbagbo and his allies (Central Intelligence Agency, 2015). The conflicts that occurred in Cote D'Ivoire these past years have hurt the country's economic, political, educational, and health sector. According to a study funded by the Global Fund to Fight AIDS, Tuberculosis and Malaria, the health facilities and human resources in both the public and private health sector has dramatically decreased due to the war (Betsi et al., 2006). The number of medical doctors and qualified midwifes in Central Cote D'Ivoire have dropped from 127 to 3 (98 % reduction), and from 184 to 26 (86 % reduction), respectively, from 2001 to 2004 (Betsi et al., 2006). About 80% of health facilities in the north (rebel territory) were locked down or destroyed. Though during this conflict period the number of non-governmental organizations (NGOs) doubled, those organizations were mainly local, thus lacked the appropriate means and equipment to continue the implementation for HIV/AIDS care and prevention (Betsi et al., 2006).

Compared to other nations in West Africa, Cote D'Ivoire is the country with most HIV/AIDS prevalence. In 2013, about 370,000 of people were living with HIV, including 72,000 children aged 0 to 14 years. Approximately 28,000 people have died of AIDS and 400,000 children and adolescents aged 0 to 17, were left orphans due to AIDS in 2013 (UN Joint Programme on HIV/AIDS, 2014). Though the civil war may have harmed the HIV/AIDS care and prevention interventions, the country is still on the journey to reduce new HIV infections, ensure that newborn are HIV-free, preserve the health of women during pregnancy, delivery and after labor.

CHAPTER III: MANUSCRIPT IN STYLE OF JOURNAL

The Use of Antenatal Care Services among Women Living in Cote d'Ivoire: Focus on Prevention of Mother-To-Child Transmission of HIV

Constance E. Ogokeh

Abstract

Introduction: The use of antenatal care (ANC) services with programs for prevention of mother-to-child transmission (PMTCT) of HIV is vital in reducing maternal and infant mortality as well as reducing the rate of neonatal HIV infections. The objectives of this study were 1) to determine the knowledge that women have about HIV/AIDS as well as mother-to-child transmission (MTCT) of HIV, and 2) to identify factors that were associated with ANC attendance, timing of first ANC visit, HIV testing as part of an ANC visit, and place of delivery among women living in Cote D'Ivoire, a high HIV prevalent country in West Africa.

Methods: The 2011-2012 Demographic Health Surveys (DHS) for Cote D'Ivoire was used, with a focus on women who had a parity of at least 1 and/or are currently pregnant. The outcomes of interest were ANC attendance, timing of first ANC visit, being tested for HIV as part of ANC visit, and the place of delivery. The independent variables included age, education, marital status, wealth, type of residency, general knowledge of HIV/AIDS (transmission and prevention), attitudes towards people living with HIV/AIDS, general knowledge of mother-to-child transmission (MTCT) routes, and HIV pre-counseling during ANC visits. Chi-Square tests, univariate and multivariate logistic regression were conducted.

Results: There were a total of 7729 women who met the inclusion criteria, in which 4902 (90.9%) of them had at least one ANC visit, and 2340 (43.4%) had more than three ANC visits. More than half of the respondents went for their first ANC visit in their second trimester compared to 31.2% who went in their first trimester. Type of residence, wealth, attitudes towards people living with HIV/AIDS were associated with at least three of the outcomes. Women who did not receive counselling about testing for HIV during an ANC visit were more likely to not be tested for HIV (OR=24.65, 20.60 – 29.48; AOR= 22.21, 95% CI=16.82 – 29.31) compared to women who did receive counselling. Women less than 18 years were less likely to delivery in a health facility (OR= 1.76, 95% CI= 1.15 – 2.70) compared to women between the age of 25-29.

Conclusion: Even though approximately 91.0 % of the women in the study had at least one ANC visit, less than half of them met the World Health Organization (WHO) guidelines to have at least four ANC visits. The study shows that HIV pre-counseling is an effective intervention in engaging pregnant women in PMTCT programs. However, interventions need to take in consideration people living in rural areas as well as people with low income.

I. <u>Introduction</u>

A number of 800 women die from preventable conditions during pregnancy and childbirth, and almost 99% of all these deaths occur in developing countries, where access to antenatal care (ANC) services may be challenging (World Health Organization, 2014c). According to the World Health Organization (WHO), pregnant women should have at least four antenatal care visits, or more if medical complications have been diagnosed in order to treat or monitor their condition (The Partnership for Maternal Newborn and Child Health, 2006). In addition, the WHO encourages pregnant women to visit an ANC healthcare facility during the first trimester and to deliver in an ANC healthcare facility with the assistance of a skilled health professional (The Partnership for Maternal Newborn and Child Health, 2006). On a global scale, 83% of pregnant women had at least one ANC visit with a skilled health professional in 2012; however, only half of those women met the minimum number of visits recommended by the WHO (United Nations Children's Fund, 2014).

The pattern of distribution of ANC services' use varies between regions. For instance in the developing countries, 74% of pregnant women stated that they have attended at least one ANC visit, and only 37% have attended at least four visits (United Nations Children's Fund, 2014). The pattern of distribution of ANC services' use varies also within countries due mainly to socioeconomic factors. Approximately 25% of women living in rural areas were assisted with skilled attendance during childbirth compare to 81% of women living in the urban areas (The Partnership for Maternal Newborn and Child Health, 2006).
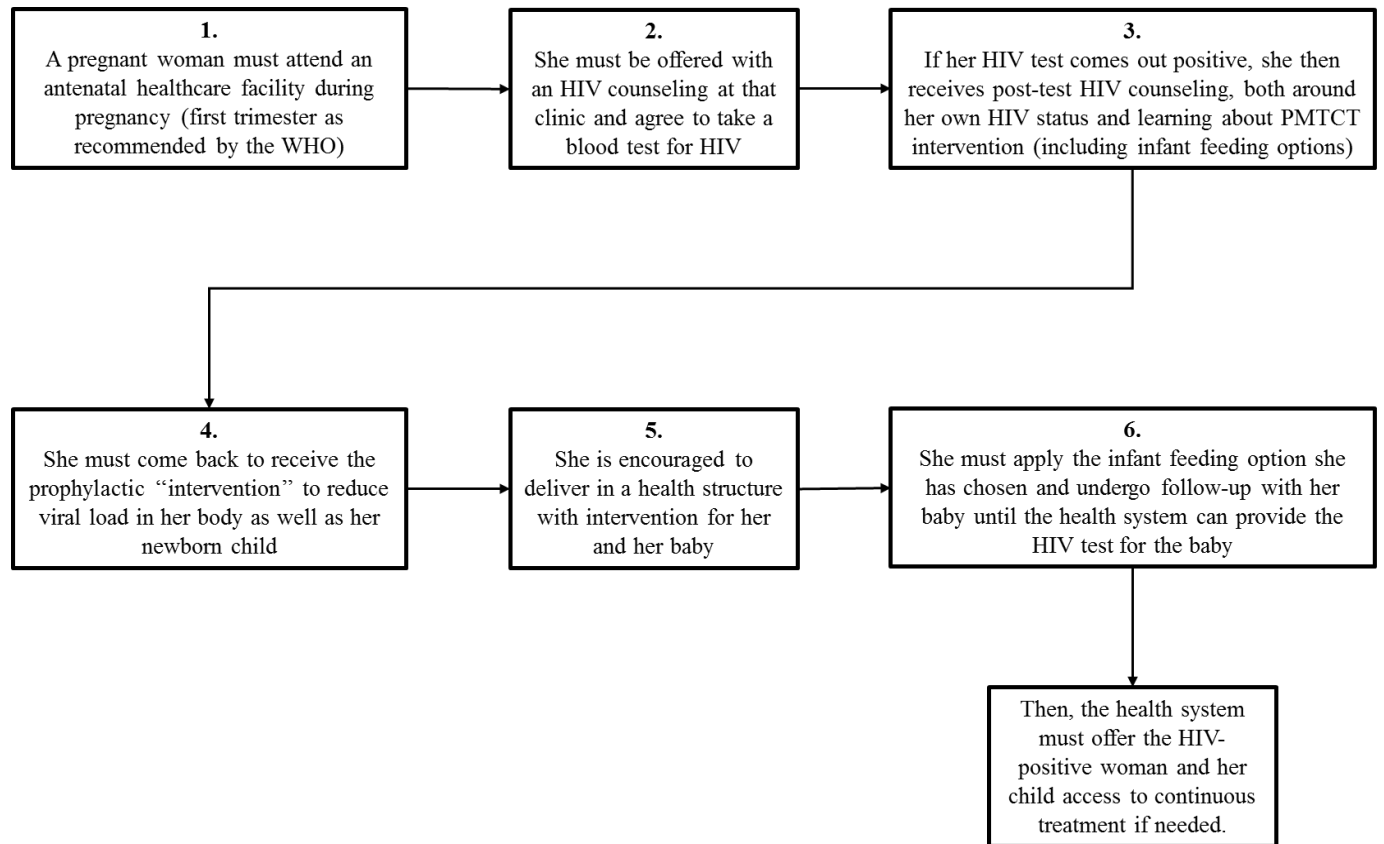
Antenatal check-ups offer many services including programs for the prevention of mother-to-child transmission (PMTCT) of HIV. Mother-to-child transmission (MTCT) of HIV, maternal deaths and infant mortality continue to affect many countries in Africa, particularly the sub-

Saharan region. According to WHO, more than half a million of newborns are infected with HIV every year in sub-Saharan Africa through the MTCT route (World Health Organization, 2014a). Approximately 90% of newly HIV infected cases in infants and children in sub-Saharan Africa is attributable to the transmission of HIV from a woman with HIV to her child during pregnancy, labor, delivery or breastfeeding (United Nations Children's Fund, 2015b). Without any treatments or interventions offered to the mother and the newborn, the risk of MTCT is 20% to 45% compared to less than 2% if appropriate interventions and treatments are available and accessible in a timely manner (United Nations Children's Fund, 2015a).

In 1998, due to the high burden caused by MTCT of HIV, steps towards PMTCT programs have been initiated in order to create an AIDS free generation, where no child is born with HIV. In order to be effective, PMTCT programs must enable women and their children to have access to numerous interventions such as access to ANC services, HIV testing during pregnancy, use of ART by pregnant women living with HIV, safe childbirth practices, safe infant feeding, and other postnatal healthcare services (Avert.gov, n.d.). Many studies have shown that taking ARV drugs during pregnancy, during labor and delivery, as well as during breastfeeding period have been beneficial in reducing the risk of MTCT of HIV (Chigwedere et al., 2008; Coovadia et al., 2012; Hoffman et al., 2010; Kesho Bora Study Group, 2011; Kilewo et al., 2009). The WHO strategic vision towards PMTCT programs include: 1) preventing newly HIV infections among women of childbearing age, 2) preventing unintended pregnancies among women living with HIV, 3) preventing HIV transmission from a woman living with HIV to her baby, and 4) providing appropriate treatment, care and support to mothers living with HIV and their children (World Health Organization, 2010).

Msellati (2009) gives a detailed description of the steps involve in PMTCT programs, which is described in Figure 1.

| 1.
A pregnant woman must attend an antenatal healthcare facility during pregnancy (first trimester as recommended by the WHO) | → | 2.
She must be offered with an HIV counseling at that clinic and agree to take a blood test for HIV | → | 3.
If her HIV test comes out positive, she then receives post-test HIV counseling, both around her own HIV status and learning about PMTCT intervention (including infant feeding options) |

| 4.
She must come back to receive the prophylactic "intervention" to reduce viral load in her body as well as her newborn child | → | 5.
She is encouraged to deliver in a health structure with intervention for her and her baby | → | 6.
She must apply the infant feeding option she has chosen and undergo follow-up with her baby until the health system can provide the HIV test for the baby |

Then, the health system must offer the HIV-positive woman and her child access to continuous treatment if needed.

Figure 1. Detailed steps of the components of a prevention of mother-to-child transmission (PMTCT) of HIV program. Based on Msellati, P. (2009). Improving mothers' access to PMTCT programs in West Africa: A public health perspective. *Social science & medicine*, 69(6), 807-812.

All these steps are vital for a successful result in the PMTCT program. However, many challenges that can compromise the effectiveness of this program have been identified, mostly in developing countries: lack of education, fear of knowing HIV status, the result time (e.g., two weeks before you get HIV test result, thus of loss of follow up), discrimination and stigma, long distance to ANC facility, socioeconomic status, infant feeding options (Buesseler et al., 2014; e.g., no access to infant formula or no means of boiling water), gender inequality, and more (Kilewo et al., 2001; Kwapong et al., 2014; Matovu & Makumbi, 2007; Perez et al., 2006; Turan et al., 2008; Turan & Nyblade, 2013; Van Eijk et al., 2006).

Numerous progress have been made globally in programs related to PMTCT. In 2012, about 62% of pregnant women living with HIV globally had access to PMTCT services. The incidence rate of HIV infections among children fell by 52% between 2001 and 2012 (Avert.gov, n.d.). Despite those accomplishments, the target set in the health-related Millennium Development Goals (MDGs 4, 5 & 6) will not be achieved by the end of 2015 in many parts of the world. More work needs to be done in other to address barriers that prevent PMTCT uptake such as knowledge about HIV, MTCT, and PMTCT; fear of knowing HIV status; HIV stigma and discrimination; stigma in healthcare settings; culture beliefs; and infant feeding.

The objectives of this study were 1) to determine the knowledge that women have about HIV/AIDS as well as MTCT of HIV, and 2) to identify factors that are associated with ANC attendance, timing of first ANC visit, HIV testing as part of an ANC visit, and place of delivery among women living in Cote D'Ivoire, a high HIV prevalent country in West Africa.

II.   Methods

The objective of this study was to identify the factors influencing ANC attendance, timing of first ANC visit, HIV testing as part of ANC visit, and the place of delivery among women living in Cote D'Ivoire, a high HIV prevalent country in West Africa. The data used in this research is a secondary data from the Demographic and Health Survey (DHS): 2011-2012 Cote D'Ivoire DHS.

1. Survey Designs and Ethical Review

1.1. Demographic Health Survey

The Demographic Health Survey program was launched in 1984 by the United States Agency for International Development (USAID). The program has been implemented in overlapping five-year phase (e.g., DHS-I, DHS-II), and as of this date, the most updated phase is DHS-6, which was used in this research (United States Agency for International Development, 2013). The Standard DHS is a nationally population based survey with a very large sample size varying from 5,000 to 30,000 households, including women aged 15 to 49, and men aged 15 to 59. The survey constitutes of three core questionnaires: household's questionnaire, women's questionnaire, and men's questionnaire; however, topics such as antenatal care services; HIV-related knowledge, attitudes, and beliefs; malaria, domestic violence, and infant mortality are included (United States Agency for International Development, 2013).

The purpose of implementing the DHS is to give decision makers in participating countries with appropriate information and analysis useful for informed policy choices, furnish in participating nations the techniques and resources beneficial to perform high quality demographic and health surveys, and collect data that are comparable across nations and more.

1.2. Sample Design

The 2011-2012 Cote D'Ivoire DHS is a national representative of women and men living in Cote d'Ivoire, which was collected from December 2011 to May 2012. The sample was stratified into two stages of clusters. In the first stage, the clusters were derived from the 1998 General Census of Population and Housing. Based on a systematic probability proportional to size, a total of 352 clusters were selected (rural: 191, urban: 161). In the second stage and based on the place of residency, a fixed number of households were drawn from each cluster by systematic random sampling. The average number of households drawn from each cluster was 32 in the rural area and 27 in the urban area.

A total of 10,413 households were selected in this survey. Among them 9,873 households were eligible, but 9,686 were successfully interviewed with a 98% response rate (rural: 99%, urban: 97%). Thus 10,848 women were identified, but 10,060 women were successfully interviewed (93% response rate). According to the ICF international, women were measured and tested for HIV and anemia, and anthropometric measurements were taken. Pregnant women and their children were tested for malaria. In addition, children were also tested for anemia and took some anthropometric measurements as well.

1.3. Inclusion criteria

Based on the aim of the current study, the women's file also known as individual recode in the dataset was used and constituted of 10,060 respondents. The women included in the analysis 1) had to have given birth to at least 1 child and/or 2) be currently pregnant at the time of the data collection. The participants (N=7,729) ranged in age from 15-49 (*M*=31.06, *SD*=8.60). Among

those women, 1593 had given birth to at least a child, and 1016 were currently pregnant at the time of the interview.

2. Data variables and definitions

2.1. Independent variables (Socio-demographic characteristics)

Age

In order to determine the age, the women were asked two questions: "In what month and year were you born" and "How old were you at your last birthday". These questions were compared and corrected if inconsistent. For the purpose of this study, the age were reclassified into 5 categories: 'less than 18 years old,' '18-24,' '25-29,' '30-34,' and '35 and above'.

Educational level

The educational level was classified into 4 groups: 'No education,' 'Primary,' 'Secondary,' and 'Higher'.

Wealth index

In order to provide an estimation of the participants economic status, different characteristics such as household ownership (e.g., vehicles, bicycles, televisions), types of water access and sanitation facilities were taken into consideration. Based on this criteria, the women were classified into 5 categories in the DHS as 'Poorest,' 'Poor,' 'Middle,' 'Rich,' and 'Richest'.

Marital status

The marital status was grouped into 6 categories: 'Never in union,' 'Married,' 'Living with partner,' 'Widowed,' 'Divorced,' and 'No longer living together/separated'. However, for the

purpose of this study the categories were regrouped into 4 groups: 'Never in union,' 'Married/Living with partner', 'Divorced/No longer living together/separated,' and 'Widowed'.

Type of residence

The type of residence was classified as 'urban,' and 'rural'.

2.2. Independent variables (General knowledge, attitudes of HIV/AIDS)

For this section, the women were first asked if they have ever heard about AIDS. If the women responded 'No', they were coded as missing values, thus they did not answer any of the following questions about HIV/AIDS.

General knowledge of HIV/AIDS (transmission)

Three questions were used to create this variable: 'Can you get HIV by witchcraft or supernatural means,' 'Can you get HIV by mosquito bites,' and 'Can you get HIV by sharing food with a person who has AIDS'. Women who answered 'Don't know' and 'Yes' to any of these questions were put together. A summary score was given (0 to 3). A score of 0 stands for 'Knowledgeable', a score of 1 stands for 'Somewhat Knowledgeable', a score of 2 stands for 'Not quite Knowledgeable', and a score of 3 stands for 'Not at all knowledgeable'.

General knowledge of HIV/AIDS (prevention)

Two questions were used to create this variable: 'Can you reduce the risk of getting HIV by always using condoms during sex,' and 'Can you reduce the risk of getting HIV by having only 1 sex partner, who has no other partners'. Women who answered 'Don't know' and 'No' to any of these questions were put together. A summary score was given (0 to 2). A score of 0 stands for 'Not at all Knowledgeable', a score of 1 stands for 'Somewhat Knowledgeable', and a score of 2 stands for 'Knowledgeable'.

Attitudes towards people living with HIV/AIDS

Four variables were used to describe HIV-related attitudes, and were mainly focused on stigma and discrimination towards people infected with HIV/AIDS. The variables included: 'Keeping HIV as a secret,' 'Caring for someone living with HIV/AIDS,' 'Allowing a teacher, who is infected with HIV to teach,' and 'Purchasing fresh vegetables from someone infected with HIV/AIDS'. Women who answered 'Don't Know' were coded as missing values. A summary score was given (0 to 4). However, three categories were created: 'Positive attitude' (based on a score of 3, and 4), 'In between' (based on a score of 2), and 'Negative attitude' (based on a score 0, and 1).

2.3. Independent variables (Knowledge of MTCT of HIV/AIDS)

For this section, the women were first asked if they have ever heard about AIDS. If the women responded 'No', they were coded as missing values, thus they did not answer any of the following questions about HIV/AIDS. Three questions were used to identify women's knowledge on MTCT of HIV/AIDS. The questions were asked as follow: 'Can the virus that causes AIDS be transmitted from a mother to her baby during pregnancy,' 'Can the virus that causes AIDS be transmitted from a mother to her baby during delivery,' and 'Can the virus that causes AIDS be transmitted from a mother to her baby by breastfeeding'. Women who answered 'Don't know' and 'No' to any of these questions were put together.

2.4. Independent variables (During ANC visit…HIV pre-counseling)

For this section, the women were first asked if they have ever heard about AIDS. If the women responded 'No', they were coded as missing values, thus they did not answer any of the following questions about HIV/AIDS. Women, who did not have any child in the last five years as well as

women who did not have an ANC visit, were excluded from the following questions during the interview. All the respondents who answered 'Don't Know' were coded as missing in this study.

Mother-to-child transmission

The question for this variable was: 'During an ANC visit, did you talk about MTCT'.

Things to do to prevent HIV

The question for this variable was: 'During an ANC visit, did you talk about things to do to prevent getting HIV'.

Getting an HIV test

The question for this variable was: 'During an ANC visit, did you talk about getting an HIV test'.

2.5. Dependent variables

Outcome 1: ANC attendance according to WHO

Information about attending ANC visits were collected from the women in this study. Women were asked the number of ANC visits they had have for each of their children. Due to the huge number of missing values for each child and in order to reduce the recall bias in this study, only the information on the last child was taken into consideration. According to the WHO, pregnant women are recommended to have at least four ANC visits. Thus this variable was classified into two categories: Attended (at least 4 ANC visits), and not attended (Less than 4 ANC visits).

Outcome 2: Timing of first ANC visit

Information about the first ANC visit was collected from the women in the study. Women were asked at what months they went for their first ANC visit for each of their children. Due to the huge number of missing values for each child and in order to reduce the recall bias in this study, only the information on the last child was taken into consideration. According to the WHO, pregnant women are recommended to have their first ANC visit during their first trimester. Thus this variable was grouped into two categories: Early (First trimester), Late (Second and Third trimester).

Outcome 3: ANC service (HIV test as part of ANC visit)

Information about PMTCT interventions during ANC visits were collected from the participants. Women who answered 'Don't Know', were identified as missing value.

Outcome 4: Place of delivery

Information about the place of delivery for each of the respondents' children were collected from the women. Due to the huge number of missing values for each child and in order to reduce the recall bias in this study, only the information on the last child was taken into consideration.

According the WHO, pregnant women, particularly pregnant women with HIV-positive, are advised to deliver in a healthcare facility in order for the mother to be provided with immediate care as well as the newborn. This recommendation reduces the risk of maternal mortality as well as child mortality. There were different categories for place of delivery. However, for the purpose this study, all government health facilities (e.g., public sector), private clinics and hospitals, and other private sectors were classified as 'healthcare facility'. The remaining answers, which

included delivering in the respondent's home, other homes, and other were classified as 'home and others'.

3. Statistical Analysis

In this study, the analyses were executed with IBM SPSS Statistics Software version 20 statistical analysis (IBM Corporation, 2011). A Chi-Square test to examine the difference between the selected independent variables and dependent variables was conducted. Univariate logistic regression and multivariate logistic regression were run to determine the association between the selected independent variables and the dependent variables.

III. <u>Results</u>

The 2011-2012 DHS for Cote D'Ivoire contained 10,060 women who were interviewed, but only 7729 of them met the inclusion criteria for this study, which was to have a parity of at least 1 and/or being currently pregnant.

1. Socio-demographic characteristics

The age ranged from 15 to 49, and the mean age was 31.06 (*SD*=8.60). Almost 80% of the women were currently married or living with a partner (see Table 1). The number of women with no education was 4948, which represent 64% of the respondents. Only 105 (1.4%) women had a higher education. To add to this statistic, 5577 (72.2%) women could not read at all the sentence that was presented to them during the interview (see Table 1). Muslims represented the majority in the sample (45.6%), followed by Christians (42.9%). The percentage of women falling in each wealth index category ranged from 21.1% (poorer) to 17.4% (richest). About 75.9% of the women had an occupation (see Table 1).

2. General knowledge of HIV/AIDS, attitudes towards people living with HIV/AIDS, and knowledge of MTCT of HIV/AIDS

In the sample, 94.8% and 93.9% of the women have heard of an STI and AIDS before, respectively (Table 2). Only the women who have heard of AIDS were asked further questions. Less than 45% of the women have taken an HIV test before, and about 2919 (94.1%) were aware of their status. Approximately 22.0% and 53.3% of the women were knowledgeable of HIV/AIDS (transmission and prevention, respectively). A total of 4208 (58.0%) had a positive attitude towards people living with HIV/AIDS. Thus for instance, they would buy vegetables from somebody who has HIV/AIDS, and will allow a teacher with HIV/AIDS to still teach (Table 2). More than 68% of the women were knowledgeable about the different ways of MTCT of

Table 1. Socio-demographic characteristics of women who met the inclusion criteria.

Demographic variables	Number of Ivoirian women N (%)
Age	
Less than 18	180 (2.3)
18-24 years	1854 (24.0)
25-29 years	1652 (21.4)
30-34 years	1398 (18.1)
35 and above	2645 (34.2)
Current marital status	
Never in union	979 (12.7)
Married or Living with partner	6142 (79.5)
Divorced or no longer living together/separated	390 (5.0)
Widowed	218 (2.8)
Educational Level	
No education	4948 (64.0)
Primary	1816 (23.5)
Secondary	860 (11.1)
Higher	105 (1.4)
Literacy[a]	
Cannot read at all	5577 (72.2)
Able to read only parts of sentence	256 (3.3)
Able to read whole sentence	1869 (24.2)
Religion	
No religion	843 (11.5)
Christians	3157 (42.9)
Muslims	3351 (45.6)
Wealth Index	
Poorest	1580 (20.4)
Poorer	1634 (21.1)
Middle	1691 (21.9)
Richer	1482 (19.2)
Richest	1342 (17.4)
Type of residence	
Rural	4713 (61.0)
Urban	3016 (39.0)
Women's occupation	
Not working	1855 (24.1)
Sales	2528 (32.8)
Agricultural - self employed	2361 (30.6)
Services	341 (4.4)
Skilled manual	253 (3.3)
Clerical	99 (1.3)
Household and domestic	99 (1.3)
Professional/technical/managerial	85 (1.1)
Unskilled manual	86 (1.1)
Total	7729 (100)

[a] The number of women who were blind/visually impaired or had no card with required language were excluded from the total percentage (20 women, 0.3%).

HIV/AIDS (see Table 3). However, more women (73.9%) were familiar with MTCT via breastfeeding.

Table 2. General knowledge, attitudes of HIV/AIDS.

Variables	Number of Ivoirian women n (%)
Ever heard of an STI	
Yes	7328 (94.8)
No	401 (5.2)
Ever heard of AIDS	
Yes	7256 (93.9)
No	473 (6.1)
Ever been tested for HIV	
Yes	3160 (41.5)
No	4451 (58.5)
Received HIV test results (Aware of HIV status)	
Yes	2919 (94.1)
No	182 (5.9)
General Knowledge of HIV (Transmission)	
Knowledgeable	1558 (21.5)
Somewhat Knowledgeable	2197 (30.3)
Not quite knowledgeable	1995 (27.5)
Not at all Knowledgeable	1505 (20.7)
General Knowledge of HIV (Prevention)	
Knowledgeable	3865 (53.3)
Somewhat Knowledgeable	1963 (27.1)
Not at all Knowledgeable	1427 (19.7)
Attitude about HIV	
Positive attitude	4208 (58.0)
In between	1569 (21.6)
Negative attitude	1475 (20.3)

3. Antenatal care attendance and services (HIV pre-counseling and testing), and place of delivery

A total of 4902 (90.9%) women had at least one ANC visit, and a total of 2340 (43.4%) had more than three ANC visits (see Table 3). More than half of the respondents (55.4%) had their first ANC visit during their second trimester, and about 13.4% had theirs in their third trimester. During an ANC visit, women did not talk with their health provider about MTCT (44.7%), things to do to prevent MTCT (46.9%), and getting tested for HIV (44.7%). Only 48.5% of the women, who were offered an HIV test as part of an ANC visit, were actually tested, and 93.5% of those women received their results (aware of HIV status). A total of 3108 (57.4%) women delivered in a health

facility compared to their counterparts who gave birth in their own home, other homes, or other

places (Table 3).

Table 3. Antenatal care (ANC) attendance, timing of first ANC visit, HIV counseling and testing as part of ANC visits, and knowledge of the route of mother-to-child transmission of HIV/AIDS.

	Number of Ivorian women n (%)	
	No	Yes
Had at least one ANC visit	490 (9.1)	4902 (90.9)
Had at least 4 ANC visits	3052 (56.6)	2340 (43.4)
Timing of first ANC visit		
Early (0-3 months)	N/A	1535 (31.2)
Late (4-6 months)	N/A	2720 (55.4)
Very Late (7 or plus months)	N/A	659 (13.4)
Knowledge of MTCT of HIV/AIDS:		
HIV transmitted during pregnancy	2115 (29.1)	5141 (70.9)
HIV transmitted during delivery	2254 (31.1)	5000 (68.9)
HIV transmitted by breastfeeding	1890 (26.1)	5365 (73.9)
During ANC, talked about:		
HIV transmitted mother to child	1648 (44.7)	2036 (55.3)
things to do to prevent getting HIV	1723 (46.9)	1954 (53.1)
getting tested for HIV	1645 (44.7)	2032 (55.3)
Offered HIV test as part of ANC	1625 (43.6)	2100 (56.4)
Tested as part of ANC	1922 (51.5)	1811 (48.5)
Got result as part of ANC	118 (6.5)	1690 (93.5)
Place of delivery		
Home, other home, and other places	N/A	2307 (42.6)
Health facility (Gov., public, and private)	N/A	3108 (57.4)

4. Dependent Variables

A Chi-Square test was done between each independent variable and its dependent variable. Then, a univariate and multivariate logistic regression were executed.

4.1. Outcome 1: Not meeting ANC visit according WHO guidelines

All the results from the bivariate analysis were statistically significant with the Chi-Square test (*p*-value <0.001), except for the age variable (see Table 4). Of the women who met the WHO guidelines by attending at least 4 ANC visits, 80.0% were married or living with a partner. About 76.1% and 76.9% of the women who did not meet the WHO guidelines had no education, and were living in a rural setting, respectively. When looking at wealth, the percentage of women who met the WHO guidelines increased as the wealth index increased. About 60% of the women who

Table 4. Associations between factors and Not meeting the number of ANC visits according to WHO (Outcome 1).

Demographic variables	n (%[a]) followed ANC*WHO (N=2340)	n (%[a]) did not followed ANC*WHO (N=3052)	Univariate analysis OR (95% CI)	Multivariate analysis AOR (95% CI)
Age of respondent				
Less than 18	52 (2.2)	74 (2.4)	1.15 (0.80 – 1.67)	0.98 (0.64 – 1.52)
18-24 years	690 (29.5)	906 (29.7)	1.06 (0.92 – 1.23)	1.01 (0.85 – 1.19)
25-29 years	620 (26.5)	766 (25.1)	Reference	Reference
30-34 years	456 (19.5)	593 (19.4)	1.05 (0.90 – 1.24)	0.98 (0.82 – 1.18)
35 and above	522 (22.3)	713 (23.4)	1.11 (0.95 – 1.30)	0.91 (0.77 – 1.09)
Current marital status[**]				
Never in union	336 (14.4)	340 (11.1)	**0.73 (0.62 – 0.86)**	1.11 (0.91 – 1.36)
Married or Living with partner	1873 (80.0)	2601 (85.2)	Reference	Reference
Divorced or no longer living together/separated	96 (4.1)	83 (2.7)	**0.62 (0.46 – 0.84)**	0.83 (0.59 – 1.16)
Widowed	35 (1.5)	28 (0.9)	**0.58 (0.35 – 0.95)**	**0.50 (0.28 – 0.87)**
Educational Level[**]				
No education	1221 (52.2)	2323 (76.1)	**39.32 (12.32 – 125.51)**	**12.66 (3.91 – 41.02)**
Primary	686 (29.3)	574 (18.8)	**17.30 (5.40 – 55.38)**	**6.66 (2.05 – 21.61)**
Secondary	371 (15.9)	152 (5.0)	**8.47 (2.62 – 27.39)**	**5.17 (1.58 – 16.88)**
Higher	62 (2.6)	3 (0.1)[b]	Reference	Reference
Wealth Index[**]				
Poorest	307 (13.1)	888 (29.1)	**7.84 (6.41 – 9.60)**	**3.04 (2.30 – 4.02)**
Poorer	442 (18.9)	741 (24.3)	**4.55 (3.74 – 5.52)**	**2.00 (1.53 – 2.61)**
Middle	457 (19.5)	787 (25.8)	**4.67 (3.85 – 5.67)**	**2.22 (1.76 – 2.80)**
Richer	543 (23.2)	418 (13.7)	**2.09 (1.71 – 2.55)**	**1.38 (1.10 – 1.72)**
Richest	591 (25.3)	218 (7.1)	Reference	Reference
Type of residence[**]				
Rural	1141 (48.8)	2348 (76.9)	**3.51 (3.12 – 3.94)**	**1.63 (1.36 – 1.96)**
Urban	1199 (51.2)	704 (23.1)	Reference	Reference
General Knowledge of HIV[**] **(Transmission)**				
Knowledgeable	588 (26.1)	476 (17.1)	Reference	Reference
Somewhat Knowledgeable	718 (31.8)	787 (28.2)	**1.35 (1.16 – 1.59)**	1.03 (0.87 – 1.23)
Not quite knowledgeable	586 (26.0)	812 (29.1)	**1.71 (1.46 – 2.01)**	1.04 (0.87 – 1.25)
Not at all Knowledgeable	364 (16.1)	716 (25.7)	**2.43 (2.04 – 2.89)**	1.10 (0.90 – 1.34)
General Knowledge of HIV[**] **(Prevention)**				
Knowledgeable	1351 (59.9)	1377 (49.3)	Reference	Reference
Somewhat Knowledgeable	553 (24.5)	768 (27.5)	**1.37 (1.19 – 1.56)**	1.13 (0.98 – 1.31)
Not at all Knowledgeable	351 (15.6)	646 (23.1)	**1.81 (1.55 – 2.10)**	**1.23 (1.04 – 1.45)**
Knowledge of MTCT of HIV/AIDS[**]**:**				
1 correct answer	516 (22.9)	898 (32.2)	**1.65 (1.45 – 1.88)**	**1.25 (1.08 – 1.44)**
2 correct answers	379 (16.8)	456 (16.3)	1.14 (0.98 – 1.33)	1.11 (0.94 – 1.32)
All correct answers	1361 (60.3)	1437 (51.5)	Reference	Reference
Attitude about HIV[**]				
Positive attitude	1516 (67.3)	1316 (47.2)	Reference	Reference
In between	386 (17.1)	739 (26.5)	**2.21 (1.91 – 2.55)**	**1.44 (1.23 – 1.68)**
Negative attitude	352 (15.6)	735 (26.3)	**2.41 (2.08 – 2.79)**	**1.43 (1.21 – 1.69)**

[a] Column percentages
[b] Fischer-exact test
[**] Chi-Square test significant (p-value <0.001)

met the WHO guidelines were knowledgeable of MTCT of HIV/AIDS; however, 51.5% of the women who did not meet the WHO guidelines were also knowledgeable of MTCT of HIV/AIDS. After a univariate logistic regression has been done, the results were found to be statistically significant based on their confidence interval (CI), except for the association between age and not meeting the WHO guidelines (Table 4). When looking at marital status, women in each category were less likely to not meet the number of ANC visits when compared to women who were married or living with a partner. When considering educational level, all women were more likely to not meet the WHO guidelines when compared to women who had a higher education. However, women with no education were 39.32 more times likely to not meet the minimum number of ANC visit (95% CI=12.32 – 125.51). Women who had no general knowledge of HIV (transmission and prevention) were more likely to not meet the WHO guidelines on ANC visits compared to women who were knowledgeable (see Table 4).

After completing a multivariate logistic regression analysis, marital status, educational level, wealth index, type of residence, general knowledge of HIV/AIDS (transmission and prevention), knowledge of MTCT of HIV/AIDS, and attitude towards people living with HIV/AIDS were statistically significant when looking at ANC attendance. Women who knew at most one way of MTCT were more likely to not meet the minimum number of ANC visit (AOR=1.25; 95% CI= 1.08 – 1.44) compared to women who knew all the MTCT routes (Table 4).

4.2. Outcome 2: Not meeting the timing of ANC visit according to WHO guidelines

All the results from the bivariate analysis were statistically significant with Chi-Square test (p-value < 0.05, and p-value < 0.001), except for the current marital status variable (see Table 5). About 28.7 % of women who were between the age of 25 and 29 had their first ANC visit during the first trimester (Early) (p-value < 0.05). Approximately 67% and 69% of the women had their

Table 5. Associations between factors and Not meeting the timing of the first ANC visit according to WHO (Outcome 2).

Demographic variables	n (%[a]) Early (N=1535)	n (%[a]) Late (N=3379)	Univariate analysis OR (95% CI)	Multivariate analysis AOR (95% CI)
Age of respondent[*]				
Less than 18	30 (2.0)	81 (2.4)	1.42 (0.92 – 2.19)	1.02 (0.63 – 1.65)
18-24 years	426 (27.8)	1034 (30.6)	**1.27 (1.08 – 1.50)**	1.17 (0.98 – 1.40)
25-29 years	441 (28.7)	840 (24.9)	Reference	Reference
30-34 years	304 (19.8)	650 (19.2)	1.12 (0.94 – 1.34)	1.12 (0.92 – 1.36)
35 and above	334 (21.8)	774 (22.9)	**1.22 (1.02 – 1.45)**	1.18 (0.98 – 1.43)
Current marital status				
Never in union	177 (11.5)	465 (13.8)	**1.22 (1.01 – 1.46)**	**1.50 (1.21 – 1.87)**
Married or Living with partner	1281 (83.5)	2768 (81.9)	Reference	Reference
Divorced or no longer living together/separated	57 (3.7)	109 (3.2)	0.89 (0.64 – 1.23)	1.11 (0.79 – 1.58)
Widowed	20 (1.3)	37 (1.1)	0.86 (0.50 – 1.48)	0.86 (0.47 – 1.56)
Educational Level[**]				
No education	860 (56.0)	2267 (67.1)	**12.94 (6.74 – 24.87)**	**5.77 (2.91 – 11.44)**
Primary	389 (25.3)	822 (24.3)	**10.38 (5.36 – 20.06)**	**5.04 (2.54 – 10.00)**
Secondary	232 (15.1)	279 (8.3)	**5.90 (3.02 – 11.55)**	**4.02 (2.02 – 8.03)**
Higher	54 (3.5)	11 (0.3)	Reference	Reference
Wealth Index[**]				
Poorest	221 (14.4)	780 (23.1)	**4.12 (3.36 – 5.06)**	**2.44 (1.82 – 3.25)**
Poorer	244 (15.9)	850 (25.2)	**4.07 (3.34 – 4.97)**	**2.51 (1.90 – 3.31)**
Middle	288 (18.8)	811 (24.0)	**3.29 (2.71 – 3.99)**	**2.27 (1.80 – 2.87)**
Richer	352 (22.9)	570 (16.9)	**1.89 (1.56 – 2.29)**	**1.48 (1.20 – 1.82)**
Richest	430 (28.0)	368 (10.9)	Reference	Reference
Type of residence[**]				
Rural	727 (47.4)	2328 (68.9)	**2.46 (2.18 – 2.79)**	**1.29 (1.06 – 1.57)**
Urban	808 (52.6)	1051 (31.1)	Reference	Reference
General Knowledge of HIV[**] (Transmission)				
Knowledgeable	395 (26.9)	599 (18.9)	Reference	Reference
Somewhat Knowledgeable	468 (31.8)	935 (29.5)	**1.32 (1.11 – 1.56)**	1.08 (0.90 – 1.29)
Not quite knowledgeable	352 (23.9)	933 (29.5)	**1.75 (1.47 – 2.09)**	1.21 (1.00 – 1.47)
Not at all Knowledgeable	256 (17.4)	699 (22.1)	**1.80 (1.49 – 2.18)**	1.07 (0.86 – 1.33)
General Knowledge of HIV[**] (Prevention)				
Knowledgeable	900 (61.2)	1649 (52.1)	Reference	Reference
Somewhat Knowledgeable	378 (25.7)	835 (26.4)	**1.21 (1.04 – 1.40)**	1.05 (0.90 – 1.22)
Not at all Knowledgeable	192 (13.1)	682 (21.5)	**1.94 (1.62 – 2.32)**	**1.54 (1.27 – 1.86)**
Knowledge of MTCT of HIV/AIDS[**]:				
1 correct answer	318 (21.6)	923 (29.2)	**1.53 (1.31 – 1.77)**	**1.23 (1.05 – 1.44)**
2 correct answers	250 (17.0)	524 (16.6)	1.10 (0.93 – 1.31)	1.08 (0.90 – 1.30)
All correct answers	903 (61.4)	1719 (54.3)	Reference	Reference
Attitude about HIV[**]				
Positive attitude	965 (65.7)	1735 (54.8)	Reference	Reference
In between	258 (17.6)	728 (23.0)	**1.57 (1.33 – 1.85)**	1.10 (0.92 – 1.31)
Negative attitude	246 (16.7)	702 (22.2)	**1.59 (1.35 – 1.87)**	1.05 (0.87 – 1.26)

[a] Column percentages
[*] Chi-Square test significant (*p*-value <0.05)
[**] Chi-Square test significant (*p*-value <0.001)

first ANC visit during their second or third trimester (Late) had no education and were living in a rural area, respectively, (*p*-value <0.001).

More than 58% of the women, who met the WHO guidelines to visit an ANC facility early, were somewhat knowledgeable to knowledgeable about the general knowledge of HIV/AIDS (transmission), as well as having a positive attitude towards people living with HIV/AIDS (65.7%) (see Table 5).

There was an association between each independent variable and the outcome when analyzing the relation individually for all the independent variables. Women, who were between the age of 18 to 24, and more than 34 years, were more likely to go late for their first ANC visit (OR=1.27, 95% CI= 1.08 – 1.50; OR=1.22, 95% CI= 1.02 – 1.45, respectively) compared to women between the age of 25 to 29 years. Again, women with no education, who were poor, and lived in a rural area were more likely to go late for their first ANC visit compared to the reference group (see Table 5). Women with no general knowledge of HIV/AIDS (transmission and prevention), and women who knew at most 1 MTCT route were more likely to go late for their first ANC visit compared to the reference group.

In the multivariate logistic regression analysis, only current marital status, educational level, wealth index, type of residence, general knowledge of HIV/AIDS (prevention), and knowledge of MTCT of HIV/AIDS had a statistically significant impact on the timing of the first ANC visit. Even though women who were "richer" went late for their first ANC visit (AOR=1.48, 95% CI= 1.20 – 1.82) compared to women who were classified as "richest", women who were "poorer" had a higher odds ratio (AOR=2.51, 95% CI= 1.90 – 3.31) (see Table 5).

Table 6. Associations between factors and Not being tested for HIV as part of ANC visit (Outcome 3).

Demographic variables	n (%[a]) Yes[b] (N=1811)	n (%[a]) No[b] (N=1922)	Univariate analysis OR (95% CI)	Multivariate analysis AOR (95% CI)
Age of respondent[*]				
Less than 18	37 (2.0)	61 (3.2)	**1.76 (1.15 – 2.70)**	1.76 (0.99 – 3.12)
18-24 years	576 (31.8)	612 (31.8)	1.14 (0.96 – 1.34)	1.18 (0.93 – 1.49)
25-29 years	518 (28.6)	485 (25.2)	Reference	Reference
30-34 years	342 (18.9)	354 (18.4)	1.11 (0.911 – 1.34)	1.01 (0.77 – 1.32)
35 and above	338 (18.7)	410 (21.3)	**1.30 (1.07 – 1.57)**	0.97 (0.75 – 1.27)
Current marital status[*]				
Never in union	273 (15.1)	225 (11.7)	**0.74 (0.61 – 0.90)**	1.11 (0.83 – 1.48)
Married or Living with partner	1469 (81.1)	1635 (85.1)	Reference	Reference
Divorced or no longer living together/separated	55 (3.0)	43 (2.2)	0.70 (0.47 – 1.05)	0.69 (0.39 – 1.20)
Widowed	14 (0.8)	19 (1.0)	1.22 (0.61 – 2.44)	2.31 (0.94 – 5.65)
Educational Level[**]				
No education	965 (53.3)	1403 (73.0)	**8.52 (3.80 – 19.06)**	1.63 (0.63 – 4.20)
Primary	504 (27.8)	422 (22.0)	**4.90 (2.18 – 11.05)**	1.33 (0.52 – 3.46)
Secondary	301 (16.6)	90 (4.7)	1.75 (0.76 – 4.04)	0.87 (0.33 – 2.31)
Higher	41 (2.3)	7 (0.4)	Reference	Reference
Wealth Index[**]				
Poorest	240 (13.3)	525 (27.3)	**6.59 (5.18 – 8.40)**	**1.54 (1.03 – 2.33)**
Poorer	336 (18.6)	505 (26.3)	**4.53 (3.59 – 5.72)**	1.27 (0.85 – 1.88)
Middle	396 (21.9)	458 (23.8)	**3.49 (2.77 – 4.39)**	1.08 (0.76 – 1.52)
Richer	402 (22.2)	289 (15.0)	**2.17 (1.70 – 2.76)**	1.20 (0.87 – 1.67)
Richest	437 (24.1)	145 (7.5)	Reference	Reference
Type of residence[**]				
Rural	856 (47.3)	1499 (78.0)	**3.95 (3.43 – 4.56)**	**1.54 (1.18 – 2.02)**
Urban	955 (52.7)	423 (22.0)	Reference	Reference
General Knowledge of HIV[**] (Transmission)				
Knowledgeable	474 (26.2)	303 (15.8)	Reference	Reference
Somewhat Knowledgeable	590 (32.6)	532 (27.7)	**1.41 (1.17 – 1.70)**	1.23 (0.96 – 1.59)
Not quite knowledgeable	478 (26.4)	559 (29.1)	**1.83 (1.52 – 2.21)**	1.08 (0.83 – 1.41)
Not at all Knowledgeable	269 (14.9)	528 (27.5)	**3.07 (2.50 – 3.77)**	1.35 (1.00 – 1.81)
General Knowledge of HIV[**] (Prevention)				
Knowledgeable	1049 (58.0)	992 (51.6)	Reference	Reference
Somewhat Knowledgeable	489 (27.0)	495 (25.8)	1.07 (0.92 – 1.25)	0.89 (0.72 – 1.10)
Not at all Knowledgeable	272 (15.0)	435 (22.6)	**1.69 (1.42 – 2.01)**	1.17 (0.92 – 1.49)
During ANC, talked about:				
HIV transmitted mother to child[**]				
Yes	1424 (79.4)	612 (32.4)	Reference	Reference
No	370 (20.6)	1278 (67.6)	**8.04 (6.92 – 9.33)**	1.09 (0.79 – 1.51)
Things to do to prevent getting HIV[**]				
Yes	1387 (77.4)	567 (30.1)	Reference	Reference
No	406 (22.6)	1317 (69.9)	**7.94 (6.84 – 9.20)**	0.79 (0.56 – 1.11)
Getting tested for HIV[**]				
Yes	1589 (88.4)	443 (23.6)	Reference	Reference
No	209 (11.6)	1436 (76.4)	**24.65 (20.60 – 29.48)**	**22.21 (16.82 – 29.31)**
Attitude about HIV[**]				
Positive attitude	1257 (69.5)	883 (45.9)	Reference	Reference
In between	291 (16.1)	515 (26.8)	**2.52 (2.13 – 2.98)**	**1.66 (1.32 – 2.09)**
Negative attitude	260 (14.4)	524 (27.3)	**2.87 (2.42 – 3.41)**	**1.59 (1.25 – 2.02)**

[a] Column percentages; [b] Yes: Tested; No: Not tested
[*] Chi-Square test significant (*p*-value <0.05); [**] Chi-Square test significant (*p*-value <0.001)

4.3. Outcome 3: Not being tested for HIV as part of ANC visit

All the results from the bivariate analysis were statistically significant with the Chi-Square test (*p*-value <0.05, *p*-value <0.001). A total of 1469 (81.1%) of women, who tested for HIV as part of an ANC visit, were married (*p*-value <0.05) (see Table 6). About 73.0% of the women, who did not take an HIV test as part of an ANC visit, had no education (*p*-value <0.001). Among women who did not take an HIV test as part of an ANC visit, 67.6%, 69.9%, and 76.4% of them did not discuss with their health provider during an ANC visit about MTCT, things to prevent MTCT, and getting tested for HIV did not get tested for HIV, respectively.

After a univariate logistic regression has been done, all the independent variables were statistically significant. Women who were less than 18 years old, and more than 34 years old, were more likely to not be tested as part of an ANC visit compared to women in the age of 25 to 29 (OR= 1.76 , 95% CI= 1.15 – 2.70; OR= 1.30, 95% CI= 1.07 – 1.57).

After completing a multivariate logistic regression, the following variables were still statistically significant: wealth index, type of residence, talking about getting tested during ANC visit and attitudes towards people with HIV/AIDS (see Table 6). Women, who did not talk about getting tested for HIV with their health provider were more likely to not get an HIV test compared to women who did discuss with their health provider (AOR= 22.21, 95% CI=16.82 – 29.31) (see Table 6).

4.4. Outcome 4: Delivering in a health care facility

Based on the bivariate analysis, all the results from the Chi-Square test were statistically significant (*p*-value < 0.05, *p*-value <0.001). About 30.5% of women, who delivered in a healthcare facility, were between the ages of 18 to 24; and 23.2 % of women, who delivered in a

healthcare facility, were in the "richest" wealth category (see table 7). The percentage of women who delivered in a healthcare facility were almost the same between women living in rural and urban area (49.8%; 50.2%, respectively, p-value<0.001). However, 84.7% of women who gave birth at home and other places were living in rural areas. More than 55% of women who gave birth at home and other places did not discuss with their health provider about MTCT of HIV, thing to do to prevent MTCT, and getting tested for HIV. Women who delivered in a healthcare facility had a positive attitude towards people living with HIV/AIDS (66.2%, p-value <0.001).

After doing a univariate logistic regression analysis, all the independent variables had an association with the place of delivery (see Table 7). Women who were less than 18 years old were more likely to deliver at home or other places (OR=1.81, 95% CI= 1.26 – 2.62) than women who were between the ages of 25 and 29. Women who were classified as "poorer" in the wealth category were 15.38 times more likely to give birth at home or other places than women who were classified as "richest" (OR=15.38, 95% CI=11.99 – 19.72) (see table 7). In addition, women who did not talk with their health provider during an ANC visit about things to do to prevent MTCT were 2.55 times more likely to give birth at home or other places compared to women who did discuss it with their health provider (OR=2.55, 95% CI= 2.22 – 2.92).

Based on the results of the multivariate logistic regression analysis, the independent variables that still show an association with the outcome were age, wealth index, type of residence, during ANC talked to health provider about things to do to prevent MTCT and getting tested for HIV, and attitudes towards people living with HIV/AIDS (see Table 7). Women who were living in rural areas were more likely to deliver at home or other place compared to women who were living in an urban setting (AOR=1.92, 95% CI= 1.53 – 2.42).

Table 7. Associations between factors and delivering in a healthcare facility (Outcome 4).

Demographic variables	n (%[a]) Facility (N=3108)	n (%[a]) Home & others (N=2307)	Univariate analysis OR (95% CI)	Multivariate analysis AOR (95% CI)
Age of respondent[*]				
Less than 18	55 (1.8)	71 (3.1)	**1.81 (1.26 – 2.62)**	**1.68 (1.04 – 2.71)**
18-24 years	948 (30.5)	656 (28.4)	0.97 (0.84 – 1.12)	0.85 (0.69 – 1.03)
25-29 years	813 (26.2)	579 (25.1)	Reference	Reference
30-34 years	610 (19.6)	442 (19.2)	1.02 (0.87 – 1.20)	0.87 (0.69 – 1.08)
35 and above	682 (21.9)	559 (24.2)	1.15 (0.99 – 1.34)	0.90 (0.72 – 1.11)
Current marital status[**]				
Never in union	452 (14.5)	226 (9.8)	**0.63 (0.55 – 0.75)**	0.94 (0.73 – 1.20)
Married or Living with partner	2510 (80.8)	1988 (86.2)	Reference	Reference
Divorced or no longer living together/separated	110 (3.5)	67 (2.9)	0.77 (0.56 – 1.05)	0.97 (0.61 – 1.54)
Widowed	36 (1.2)	26 (1.1)	0.91 (0.55 – 1.52)	0.79 (0.36 – 1.74)
Educational Level[**]				
No education	1778 (57.2)	1781 (77.2)	**20.70 (6.49 – 66.07)**	3.55 (0.83 – 15.08)
Primary	833 (26.8)	433 (18.8)	**10.74 (3.35 – 34.42)**	2.75 (0.64 – 11.70)
Secondary	435 (14.0)	90 (3.9)	**4.28 (1.31 – 13.92)**	2.36 (0.55 – 10.19)
Higher	62 (2.0)	3 (0.1)[b]	Reference	Reference
Wealth Index[**]				
Poorest	408 (13.1)	793 (34.4)	**15.38 (11.99 – 19.72)**	**4.63 (3.14 – 6.81)**
Poorer	608 (19.6)	585 (25.4)	**7.61 (5.95 – 9.73)**	**2.65 (1.82 – 3.87)**
Middle	647 (20.8)	597 (25.9)	**7.30 (5.72 – 9.33)**	**3.07 (2.17 – 4.34)**
Richer	725 (23.3)	241 (10.4)	**2.63 (2.02 – 3.42)**	**1.64 (1.16 – 2.32)**
Richest	720 (23.2)	91 (3.9)	Reference	Reference
Type of residence[**]				
Rural	1548 (49.8)	1954 (84.7)	**5.58 (4.88 – 6.37)**	**1.92 (1.53 – 2.42)**
Urban	1560 (50.2)	353 (15.3)	Reference	Reference
General Knowledge of HIV[**] (Transmission)				
Knowledgeable	730 (24.7)	336 (15.9)	Reference	Reference
Somewhat Knowledgeable	945 (32.0)	563 (26.7)	**1.29 (1.10 – 1.53)**	1.19 (0.95 – 1.48)
Not quite knowledgeable	784 (26.5)	617 (29.3)	**1.71 (1.45 – 2.02)**	1.06 (0.84 – 1.33)
Not at all Knowledgeable	496 (16.8)	591 (28.0)	**2.59 (2.17 – 3.09)**	1.16 (0.91 – 1.49)
General Knowledge of HIV[**] (Prevention)				
Knowledgeable	1686 (57.1)	1046 (49.6)	Reference	Reference
Somewhat Knowledgeable	759 (25.7)	565 (26.8)	**1.20 (1.05 – 1.37)**	1.04 (0.87 – 1.24)
Not at all Knowledgeable	509 (17.2)	496 (23.5)	**1.57 (1.36 – 1.82)**	1.02 (0.84 – 1.24)
During ANC, talked about:				
HIV transmitted mother to child[**]				
Yes	1440 (63.5)	593 (42.0)	Reference	Reference
No	828 (36.5)	819 (58.0)	**2.40 (2.10 – 2.75)**	0.96 (0.73 – 1.25)
Things to do to prevent getting HIV[**]				
Yes	1400 (61.9)	551 (39.0)	Reference	Reference
No	860 (38.1)	862 (61.0)	**2.55 (2.22 – 2.92)**	**1.44 (1.09 – 1.91)**
Getting tested for HIV[**]				
Yes	1465 (64.8)	564 (40.0)	Reference	Reference
No	797 (35.2)	847 (60.0)	**2.76 (2.41 – 3.17)**	**1.33 (1.06 – 1.66)**
Attitude about HIV[**]				
Positive attitude	1953 (66.2)	887 (42.1)	Reference	Reference
In between	527 (17.9)	600 (28.5)	**2.51 (2.18 – 2.89)**	**1.58 (1.31 – 1.90)**
Negative attitude	472 (16.0)	620 (29.4)	**2.89 (2.51 – 3.34)**	**1.53 (1.26 – 1.85)**

[a] Column percentages; [b] Only Pearson Chi-Square was provided; [*] Chi-Square test significant (*p*-value <0.05); [**] Chi-Square test significant (*p*-value <0.001)

Women who had a negative attitude towards people living with HIV/AIDS were more likely to deliver at home or other places than women who had a positive attitude towards people living with HIV/AIDS (AOR=1.58, 95% CI=1.31 – 1.90) (see Table 7).

IV.   <u>Discussion</u>

The objective of the current study was to determine the factors that were associated with antenatal care (ANC) attendance, timing of the first ANC visit, taking an HIV test as part of an ANC visit, and the place of delivery among women living in Cote D'Ivoire, who had a parity of 1 or greater, and/or were currently pregnant. As discussed in previous paragraphs, attending ANC facilities during pregnancy is beneficial both for the mother and the child. In addition, going early (first trimester) is recommended by the World Health Organization (WHO), as it gives room for health providers to detect and take immediate actions to reduce any complications that may affect the mother as well as the baby. Uneke, Duhlinska, and Igbinedion (2007) stated that ANC healthcare facilities are the points of entry for HIV counseling and testing for pregnant women.

In this study, about 91% of the women had at least one ANC visit, and more than 55% of the women failed to meet the WHO recommendation to attend at least four ANC. The number of women who did not meet the recommendation was more than the estimation given for Africa alone (The Partnership for Maternal Newborn and Child Health, 2006). Factors that were associated with at least three of the four outcomes included: wealth, type of residence, knowledge of MTCT of HIV/AIDS (outcome 1 and 2), talking about getting an HIV test as part of an ANC visit (outcome 3 and 4), and attitudes towards people living with HIV/AIDS. The findings were similar to a study, which was using the Kenya DHS (Ochako et al., 2011). Ivorian women living in a rural setting were more likely to go late for their first ANC visit, which was the same for women living in Kenya (Ochako et al., 2011). In a study conducted in South Africa by Horwood et al. (2010), nearly 61% in the study attended their first ANC visit in their third trimester, which is very late, and thus give less time for health providers to provide treatment in a timely manner if needed. Even though in reference to women who were in the "richest" category, "richer" women were more likely to go

late for their first ANC visit ; however, "poorer" women were 2.51 times more likely to go late than the "richest" women (Ochako et al., 2011). One contrast with Ochako et al. (2011) is that the authors found that women with no education sought ANC early compared to women with a primary education. Our findings show that people with no education were more likely to go late in reference to women with higher education; however the confidence intervals in our study were large. This might due to the fact that women with higher education were very small in sample size.

In the current study, more than 55% of the women were offered an HIV test as part of ANC visit, and 48.5% of the women took an HIV test as part of an ANC visit. This result is low compared to other studies (Dahl, Mellhammar, Bajunirwe, & Björkman, 2008; Etiebet, Fransman, Forsyth, Coetzee, & Hussey, 2004; Horwood et al., 2010; Kilewo et al., 2001; Peltzer, Mosala, Dana, & Fomundam, 2008; Perez et al., 2004; Welty et al., 2005). Approximately 94% of the women who tested for HIV as part of an ANC, received their test results. The rate for receiving the test results was higher in our study compared to Kilewo and colleagues (2001) and Perez et al. (2004), which were 68% and 74.3%, respectively. It is very crucial for pregnant women who have tested for HIV to return and collect their results, where HIV post-counseling can be provided as well ARV prophylaxis is required.

Our findings support the importance of HIV pre-counseling as a tool to encourage women in engaging in taking an HIV test as part of an ANC service. Ivorian women who did not talk with their health providers about getting an HIV test during an ANC visit were more likely to not take an HIV test as part of an ANC visit (OR=24.65, 95% CI: 20.60 – 29.48; AOR=22.21, 95% CI: 16.82 – 29.31). Perez et al. (2006) identified three main reasons pregnant women did not accept taking an HIV test as part of ANC: 'It was never mentioned to them, they needed to speak to their partner first, and they were not prepare to go through pre-counseling' (Kwapong et al., 2014).

Etiebet and colleagues (2004) found that women, who refused to take an HIV test as part of an ANC visit, were four times more likely to believe that the community and families will reject women who were HIV positive. Women who were less than 18 years were more likely to delivery in their home, other homes or other. As policy makers are implementing rules and regulations, they should take in consideration this young generation as well as people with low income, and those living in rural settings.

This study has some strengths as the data was taken from a nationally representative dataset. The results supports the literature showing that type of residence, education, and wealth were associated with ANC attendance, and the first timing of ANC. In addition, compared to other studies, attitudes towards people living with HIV/AIDS was also added as part of a factor which was really scarce in many studies. Though the study has some strength, it also comes with its weaknesses. The DHS data collection follow a cross sectional design thus leaving room for recall bias as women had to remember the timing of their first ANC visit. Even though the women were asked specific information about each child, there was a huge amount of missing information for most of the variables, thus the study focused only on the last child information. Another limitation includes interviewer bias. The questionnaire contained a lot of skip-pattern which accounted for a reduced sample size.

As many countries like Cote D'Ivoire are fighting each day to meet the health-related MDGs (MDG 4, 5, and 6), more effort need to be done in education women about the importance of ANC services as well as PMTCT programs which can result in them having a safe delivery as well reducing the risk of MTCT.

References

African Development Bank Group. (2013). Cote D'Ivoire.

      http://www.afdb.org/en/countries/west-africa/cote-d%E2%80%99ivoire/

AIDS.gov. (2009a). First steps to treatment.   https://www.aids.gov/hiv-aids-basics/just-

      diagnosed-with-hiv-aids/treatment-options/first-steps-to-treatment/index.html

AIDS.gov. (2009b). Overview of HIV treatments.   https://www.aids.gov/hiv-aids-basics/just-

      diagnosed-with-hiv-aids/treatment-options/overview-of-hiv-treatments/

Avert.gov. (n.d.). Prevention of mother-child transmission (PMTCT) of HIV.

      http://www.avert.org/prevention-mother-child-transmission-pmtct-

      hiv.htm#footnote1_36aqrea

Betsi, N. A., Koudou, B., Cissé, G., Tschannen, A., Pignol, A., Ouattara, Y., . . . Utzinger, J.

      (2006). Effect of an armed conflict on human resources and health systems in Côte

      d'Ivoire: Prevention of and care for people with HIV/AIDS. *AIDS care, 18*(4), 356-365.

      doi: 10.1080/09540120500200856.

Buesseler, H. M., Kone, A., Robinson, J., Bakor, A., & Senturia, K. (2014). Breastfeeding: The

      hidden barrier in Côte d'Ivoire's quest to eliminate mother-to-child transmission of HIV.

      Journal of the International AIDS Society, 17(1). doi: 10.7448/IAS.17.1.18853.

Central Intelligence Agency. (2015). Cote D'Ivoire. In The World Factbook.

      https://www.cia.gov/library/publications/the-world-factbook/geos/iv.html

Chigwedere, P., Seage III, G. R., Lee, T.-H., & Essex, M. (2008). Efficacy of antiretroviral drugs

      in reducing mother-to-child transmission of HIV in Africa: A meta-analysis of published

      clinical trials. *AIDS research and human retroviruses, 24*(6), 827-837. doi:

      10.1089/aid.2007.0291.

Coovadia, H. M., Brown, E. R., Fowler, M. G., Chipato, T., Moodley, D., Manji, K., . . . Fawzi,

    W. (2012). Efficacy and safety of an extended nevirapine regimen in infant children of

    breastfeeding mothers with HIV-1 infection for prevention of postnatal HIV-1

    transmission (HPTN 046): a randomised, double-blind, placebo-controlled trial. *The*

    Lancet, 379(9812), 221-228. doi: 10.1016/S0140-6736(11)61653-X.

Dahl, V., Mellhammar, L., Bajunirwe, F., & Björkman, P. (2008). Acceptance of HIV testing

    among women attending antenatal care in south-western Uganda: risk factors and reasons

    for test refusal. *AIDS care, 20*(6), 746-752. doi: 10.1080/09540120701693990.

Etiebet, M., Fransman, D., Forsyth, B., Coetzee, N., & Hussey, G. (2004). Integrating prevention

    of mother-to-child HIV transmission into antenatal care: Learning from the experiences

    of women in South Africa. *AIDS care, 16*(1), 37-46. doi:

    10.1080/09540120310001633958.

Hoffman, R., Black, V., Technau, K., van der Merwe, K. J., Currier, J., Coovadia, A., &

    Chersich, M. (2010). Effects of highly active antiretroviral therapy duration and regimen

    on risk for mother-to-child transmission of HIV in Johannesburg, South Africa. *Journal*

    of acquired immune deficiency syndromes (1999), 54(1), 35. doi:

    10.1097/QAI.0b013e3181cf9979.

Horwood, C., Haskins, L., Vermaak, K., Phakathi, S., Subbaye, R., & Doherty, T. (2010).

    Prevention of mother to child transmission of HIV (PMTCT) programme in KwaZulu-

    Natal, South Africa: An evaluation of PMTCT implementation and integration into

    routine maternal, child and women's health services. *Tropical Medicine & International*

    Health, 15(9), 992-999. doi: 10.1111/j.1365-3156.2010.02576.x.

IBM Corporation. (2011). IBM SPSS Statistics for Windows (Version 20.0). Armonk, NY: IBM

    Corp.

Kesho Bora Study Group. (2011). Triple antiretroviral compared with zidovudine and single-

    dose nevirapine prophylaxis during pregnancy and breastfeeding for prevention of

    mother-to-child transmission of HIV-1 (Kesho Bora study): A randomised controlled

    trial. *The Lancet infectious diseases, 11*(3), 171-180. doi: 10.1016/S1473-

    3099(10)70288-7.

Kilewo, C., Karlsson, K., Ngarina, M., Massawe, A., Lyamuya, E., Swai, A., . . . Team, M. P. S.

    (2009). Prevention of mother-to-child transmission of HIV-1 through breastfeeding by

    treating mothers with triple antiretroviral therapy in Dar es Salaam, Tanzania: The Mitra

    Plus study. *JAIDS Journal of Acquired Immune Deficiency Syndromes, 52*(3), 406-416.

    doi: 10.1097/QAI.0b013e3181b323ff.

Kilewo, C., Massawe, A., Lyamuya, E., Semali, I., Kalokola, F., Urassa, E., . . . Mhalu, F.

    (2001). HIV counseling and testing of pregnant women in sub-Saharan Africa:

    Experiences from a study on prevention of mother-to-child HIV-1 transmission in Dar es

    Salaam, Tanzania. *JAIDS Journal of Acquired Immune Deficiency Syndromes, 28*(5),

    458-462.

Kwapong, G. D., Boateng, D., Agyei-Baffour, P., & Addy, E. A. (2014). Health service barriers

    to HIV testing and counseling among pregnant women attending ANC; a cross-sectional

    study. *BMC health services research, 14*(1), 267. doi: 10.1186/1472-6963-14-267.

Matovu, J. K. B., & Makumbi, F. E. (2007). Expanding access to voluntary HIV counselling and

    testing in sub-Saharan Africa: Alternative approaches for improving uptake, 2001–2007.

Tropical Medicine & International Health, 12(11), 1315-1322. doi: 10.1111/j.1365-3156.2007.01923.x.

Msellati, P. (2009). Improving mothers' access to PMTCT programs in West Africa: A public health perspective. *Social science & medicine, 69*(6), 807-812. doi: 10.1016/j.socscimed.2009.05.034.

Ochako, R., Fotso, J.-C., Ikamari, L., & Khasakhala, A. (2011). Utilization of maternal health services among young women in Kenya: Insights from the Kenya Demographic and Health Survey, 2003. *BMC Pregnancy and Childbirth, 11*(1), 1. doi: 10.1186/1471-2393-11-1.

Peltzer, K., Mosala, T., Dana, P., & Fomundam, H. (2008). Follow-up survey of women who have undergone a prevention of mother-to-child transmission program in a resource-poor setting in South Africa. *Journal of the Association of Nurses in AIDS Care, 19*(6), 450-460. doi: 10.1016/j.jana.2008.05.006.

Perez, F., Mukotekwa, T., Miller, A., Orne-Gliemann, J., Glenshaw, M., Chitsike, I., & Dabis, F. (2004). Implementing a rural programme of prevention of mother-to-child transmission of HIV in Zimbabwe: First 18 months of experience. *Tropical Medicine & International Health, 9*(7), 774-783. doi: 10.1111/j.1365-3156.2004.01264.x.

Perez, F., Zvandaziva, C., Engelsmann, B., & Dabis, F. (2006). Acceptability of routine HIV testing (" opt-out") in antenatal services in two rural districts of Zimbabwe. *JAIDS Journal of Acquired Immune Deficiency Syndromes, 41*(4), 514-520. doi: 10.1097/01.qai.0000191285.70331.a0.

The Partnership for Maternal Newborn and Child Health. (2006). Opportunities for Africa's

   newborns: Practical data, policy and programmatic support for newborn care in Africa

   (WHO on behalf of The Partnership for Maternal Newborn and Child Health, Trans.).

Turan, J. M., Miller, S., Bukusi, E., Sande, J., & Cohen, C. (2008). HIV/AIDS and maternity

   care in Kenya: how fears of stigma and discrimination affect uptake and provision of

   labor and delivery services. *AIDS care, 20*(8), 938-945. doi:

   10.1080/09540120701767224.

Turan, J. M., & Nyblade, L. (2013). HIV-related stigma as a barrier to achievement of global

   PMTCT and maternal health goals: A review of the evidence. *AIDS and Behavior, 17*(7),

   2528-2539. doi: 10.1007/s10461-013-0446-8.

UN Joint Programme on HIV/AIDS. (2013a). Global Report: UNAIDS Report on the Global

   AIDS Epidemic: 2013.

   http://www.unaids.org/sites/default/files/en/media/unaids/contentassets/documents/epide

   miology/2013/gr2013/UNAIDS_Global_Report_2013_en.pdf

UN Joint Programme on HIV/AIDS. (2013b). UNAIDS 2013. AIDS by the numbers.

   http://www.unaids.org/sites/default/files/media_asset/JC2571_AIDS_by_the_numbers_e

   n_1.pdf

UN Joint Programme on HIV/AIDS. (2014). HIV and AIDS estimates (2013).

   http://www.unaids.org/en/regionscountries/countries/ctedivoire

Uneke, C., Duhlinska, D., & Igbinedion, E. (2007). Prevalence and public-health significance of

   HIV infection and anaemia among pregnant women attending antenatal clinics in south-

   eastern Nigeria. *Journal of health, population, and nutrition, 25*(3), 328.

United Nations. (2008). Official list of MDG indicators.

      http://mdgs.un.org/unsd/mdg/Host.aspx?Content=indicators/officiallist.htm

United Nations Children's Fund. (2014). Committing to child survival: A promise renewed –

      Progress report 2014.

      http://files.unicef.org/publications/files/APR_2014_web_15Sept14.pdf

United Nations Children's Fund. (2015a). Prevention of Mother to Child Transmission

      (PMTCT). http://www.unicef.org/supply/index_42855.html

United Nations Children's Fund. (2015b). Wide political support for eliminating 90 per cent of

      new HIV infections in children is yielding impressive results. http://data.unicef.org/hiv-

      aids/emtct

United States Agency for International Development. (2013). Standard recode manual for DHS

      6.

      http://www.dhsprogram.com/pubs/pdf/DHSG4/Recode6_DHS_22March2013_DHSG4.p

      df

Van Eijk, A. M., Bles, H. M., Odhiambo, F., Ayisi, J. G., Blokland, I. E., Rosen, D. H., . . .

      Lindblade, K. A. (2006). Use of antenatal services and delivery care among women in

      rural western Kenya: A community based survey. *Reproductive health, 3*(1), 2. doi:

      10.1186/1742-4755-3-2.

Welty, T. K., Bulterys, M., Welty, E. R., Tih, P. M., Ndikintum, G., Nkuoh, G., . . . Wilfert, C.

      M. (2005). Integrating prevention of mother-to-child HIV transmission into routine

      antenatal care: The key to program expansion in Cameroon. *JAIDS Journal of Acquired*

      Immune Deficiency Syndromes, 40(4), 486-493.

World Health Organization. (2010). PMTCT Strategic Vision 2010–2015: Preventing mother-to-

child transmission of HIV to reach the UNGASS and Millennium Development Goals.

http://www.who.int/hiv/pub/mtct/strategic_vision.pdf

World Health Organization. (2014a). Global Health Observatory data: HIV/AIDS.

http://www.who.int/gho/hiv/en/

World Health Organization. (2014b). Infant mortality: Situation and trends.

http://www.who.int/gho/child_health/mortality/neonatal_infant_text/en/

World Health Organization. (2014c). Maternal mortality.

http://www.who.int/mediacentre/factsheets/fs348/en/