A STUDY OF INDIVIDUAL PREDICTORS OF MATERNAL SELF-REPORTED UNKNOWN HIV STATUS IN KENYA 2008

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Reader

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Dedication

I dedicate this work to my lovely wife Veneranda Joseph and son Jesse Joseph who supported me throughout my training period despite all difficulties we have gone through recently. Your love, understanding and hard work has been my inspiration to accomplish this training.

Abstract

Objectives: To determine if maternal education and wealth status predicts maternal self-reported unknown HIV status among women in Kenya.

Methods: Kenya Demographic Health Survey (KDHS) 2008 – 2009 was used to examine the association between unknown HIV status and education and wealth, controlling for age, place of residence, place of delivery, history of intimate violence, knowledge of prevention of mother to child transmission (PMTCT), and health decision-making.

Results: 617 (21.8%) had unknown HIV status. Education was not associated with unknown HIV status. Only women in the richest wealth category reported less unknown HIV status. Home and private facility births, high PMTCT knowledge and antenatal care (ANC) visits significantly decreased likelihood of unknown HIV status in education and wealth status model. Rural residence significantly predicted unknown HIV status in education model.

Conclusion: There is a need to improve PMTCT knowledge and services in rural areas, and to maximize counseling and testing through antenatal care visits.

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CHAPTER I INTRODUCTION

1.1 Background information

Worldwide, HIV has infected almost 60 million people, and 25 million people have died of HIV/AIDS. (1) In 2008, 2.1 million children under the age of 15 years were living with HIV infection, while 430,000 infants were born with HIV infection. (1) Sub-Sahara Africa is the home for 67% of worldwide HIV infections and to 91% of all new infections among children. (1) Mother-to-child-transmission of HIV infection (MTCT) accounts for about 90% of childhood HIV infections (2). Without interventions the risk of vertical HIV transmission ranges from 20-50%, however, with adequate prenatal, natal and post-natal intervention, the risk can be lowered to less than 2%. (2) Prenatal HIV counseling and testing is an important entry point to receive prevention of mother-to-child-transmission of HIV (PMTCT) services. Although many efforts have been put in place to help reduce vertical HIV transmission, these efforts are hampered by low uptake of PMTCT services. Furthermore, to reflect on low PMTCT uptake, in year 2008, 43% of pregnant women in eastern and southern Africa had been tested for HIV, while only 58% of those infected with HIV received antiretroviral drugs. (3) The World Health Organization brief report on factors affecting the scaling of PMTCT uptake included limited human resources and infrastructure for scale-up; weak health care systems; lack of demonstrated government leadership and commitment in fulfilling the goal of universal access to PMTCT; limited functional linkages or integration of service delivery; lack of monitoring, follow-up or tracking of women and children post-delivery; weak supply management systems; lack of technologies for

early testing of infants; lack of sustainable funding for scaling-up national programs; and lack of coordination among partners. (4) Other individual and social factors include fear and distrust, difficulties in HIV status disclosure and discrimination and access to PMTCT services. (5) According to the 2008-2009 Kenya Demographic Health Survey (KDHS), 61% of pregnant women received HIV pretest counseling, while 56% of pregnant women received HIV test results following counseling and testing for HIV. (6) While prior knowledge of HIV status may play some part in this, it is still possible to acquire HIV infection or seroconvert after prior HIV tests through the conception and pregnancy period. It is not clear if these women attended antenatal care or not. These women may be captured during intra- and post-partum care, an effort hampered by a very low (43%) health facility delivery uptake in Kenya. (6) This situation poses a huge risk for MTCT of HIV. Furthermore, individuals with unknown HIV status not only deny themselves an opportunity to receive HIV treatment and care but also miss a chance to reinforce positive behavior characteristics that prevent or reduce the risk of HIV transmission/infections. Moreover, women with prenatal unknown HIV status have moderately increased risks for perinatal deaths.(7), (8), (9), (10), (11) To highlight inaccessibility to PMTCT services, a study conducted in Zimbabwe, found postnatal women who did not test for HIV in their previous pregnancy reported willingness to test for HIV if the PMTCT services would be made accessible even with an Opt-out strategy of HIV testing. (8) Different studies conducted in South Africa, Kenya and Botswana reported lack of confidentiality by health care providers, or lack of privacy during counseling as the reasons for not testing for HIV. (12), (13), (11). In this case, a systematic review found that a positive attitude of the counselor could significantly influence uptake of HIV testing. (14)

Moreover, the quality of PMTCT services has also been questioned, A study conducted in Dar es Salaam, Tanzania showed the PMTCT site to be a significant predictor for maternal HIV testing (15) as well as the time spent during counseling process.(10) Several studies reported poor testing and treatment rates were associated with time spent during pretest or post-test counseling. (10), (9), (11). In Uganda, clinics that operated for a prolonged duration of time had significantly higher HIV testing rates among pregnant women. (10) Also a study in rural Burkina Faso found a very poor quality of pre-test counseling such that 42% of pregnant women did not understand the counseling process. (9) It is possible that providers have inadequate PMTCT knowledge contributing to lower HIV testing in pregnancy. This may be suggested by a study conducted in Botswana that found the providers of HIV services had discomfort with their PMTCT knowledge and skills despite realizing the importance of HIV testing in pregnancy. (12)

In one study in South Africa, women reported delayed ANC attendance because of facility-related barriers. (16) Also to suggest poor quality in health education services, some women reported mistrust in reliability of the HIV test. (10)

Partner or family related factors associated with not testing for HIV include fear of stigma from the partner and a need to have consent from the partner. (8), (17), (18) A cross-sectional study conducted at a rural district hospital in Burkina Faso found that discussing HIV screening with the partner and wanting the partner tested were significant predictors for HIV testing during pregnancy. (17) HIV testing poses a huge stigmatization in the family. A study conducted in Nigeria reported that women who anticipated male partner stigma were more than twice as likely to refuse HIV testing, after adjusting for other individual-level predictors. (17) Similarly a

cross sectional study conducted in Kenya reported higher rates of HIV testing anticipated stigma: about 32% of pregnant women anticipated break-up of the relationship with their partners following HIV positive test. (18) Another study conducted in Nyanza province in Kenya, 80% of pregnant women did not turn up for post test HIV counseling irrespective of their HIV status (11), while 95% did not disclose positive HIV status to spouses/relatives for fear of stigma, discrimination and violence. (11) Lack of family support was associated with increased likelihood of not testing for HIV and vice versa in a study conducted in Dar es Salaam, Tanzania. (19)

There are mixed reports with regards to intimate partner violence and HIV testing. Intimate partner violence predicted for not testing for HIV in pregnancy in Uganda and Tanzania. (20), (21) A focus group discussion and interviews in Uganda reported women fear of testing for HIV and disclosing HIV results, because of the fear of intimate partner violence. (20) Another study conducted in two cities of Tanzania found that partner violence was significantly associated with the partner being prevented or discouraged from antenatal care attendance. (21) Some studies however found fear of stigma and increased resistance from partners and previous history of domestic violence were not significantly associated with HIV testing (22)

Also, there are mixed reports with regards to personal or individual predictors for unknown maternal HIV status or not testing for HIV during pregnancy. While some studies have reported a positive association others have reported a negative association. Individual factors predicting unknown HIV status include fear of receiving HIV test results, lack of knowledge of partner's HIV status, lack of PMTCT knowledge (13) (22), and other socio-demographic factors such as, low maternal education status, rural residency, age, and less antenatal care visits. (7) (12) (8) (17)

In the individual socio-demographic characteristics, The KDHS 2008/9 report showed that pregnant women with low education and low income have lower rates of HIV testing compared to educated and higher income pregnant women. These results are different from Kenya national representative ANC sentinel surveillance data obtained from 43 clinics in 2005 which found that women were significantly less likely to accept HIV testing if they had secondary or post-secondary education compared to primary or no education; however, this association was lost after adjusting for PMTCT testing sites. It is possible that operation factors across the PMTCT sites were the major determinant of PMTCT testing in this population. (23) The results from the KDHS 2008/9 are supported by other studies conducted in Zimbabwe and Tanzania.(8) (15) A cross-sectional study of the women attending postnatal care clinics in Zimbabwe found that of 520 women sampled, 55% had been HIV tested during their last pregnancy. (8) In this study, primary education level or no education and having attended less than six ANC visits were associated with not having been tested for HIV. (8) Similarly a retrospective hospital based birth registry in Tanzania reported single motherhood; rural residence, low maternal education, and maternal farming to be associated with unknown HIV status.(7) Furthermore, these results correspond with a nationally representative survey of 4494 women in Botswana that reported younger age, more-educated women and those residing in towns to have a higher likelihood of being offered both HIV counseling and testing than older, less-educated, and rural women.(12) Compared to pregnant women from urban towns, rural residence has been found to be associated with maternal unknown HIV status or not testing for HIV in both cross section and retrospective studies in Kenya, Botswana and Tanzania.(7) (23) (12)

Older pregnant women were found to have a lower likelihood of HIV testing. Studies conducted in Tanzania and Botswana, (15) (12) found that women aged 35–39 years were 18% less likely to accept testing than women <20 years of age. (15)

Pregnant women with fewer ANC visit are significantly less likely to test for HIV. (8) (17) One study conducted in Zimbabwe found that having less than 6 ANC visits increases likelihood of unknown HIV. (8)

1.2 Limitations of previous studies

Although previous studies differed with regards to socio-economic and demographic correlates for unknown prenatal HIV status or HIV testing, they all used similar methodological approaches in study design, methods and data analysis. Most of these studies instituted cross-sectional surveys, qualitative interviews, and retrospective data review, or longitudinal surveys. All studies were conducted in hospital/health facility settings and accounted for confounders by adjusting for them in multivariate analysis. None of the studies were a community-based survey that included women who may have not turned up for antenatal care in clinics or delivery in the health facilities. This approach may have affected external validity since they only recruited women from hospital/health care facilities, therefore excluding information from women who did not use health care facility services. These studies may have underestimated the prevalence of unknown HIV status and its predictors. Women who do not turn up regularly for antenatal care and hospital deliveries may have specific socio-demographic characteristics that may have been missed in previous studies. One study only recruited a sample of women

coming back for post natal care service to determine the correlates of prenatal HIV testing but did not indicate how many women attended prenatal care services and what proportion of those turned up for post partum follow up. (8)This approach may have excluded a large proportion of women who did not turn up for post natal care given the fact that in developing countries some women do not come back for post natal care follow up. Furthermore, there are limited study reports that assessed the relationship between maternal income and HIV testing in pregnancy. There is a need to conduct a study with data from a population-based representative sample that may help to identify individual maternal predictors of unknown HIV status in pregnant women. Such analysis will provide the programs and clinicians very important information needed to increase the coverage for PMTCT services.

1.3 Study rationale

To my knowledge, there are limited and conflicting reports on how individual maternal predictors are associated with unknown HIV status. Furthermore, none of the literature reports on how maternal income associates with HIV testing in pregnancy.

Most previous studies used health facility based samples that do not represent the targeted population leading to poor internal and external validity. This study includes all women, ages 15-49, who reported a pregnancy in the past three years, received ANC during their most recent pregnancy, and who were offered an HIV test as part of their ANC and therefore representing most of antenatal care users in Kenya.

The study will analyze how maternal education and wealth are associated with testing for HIV in pregnancy, while accounting for other individual characteristics.

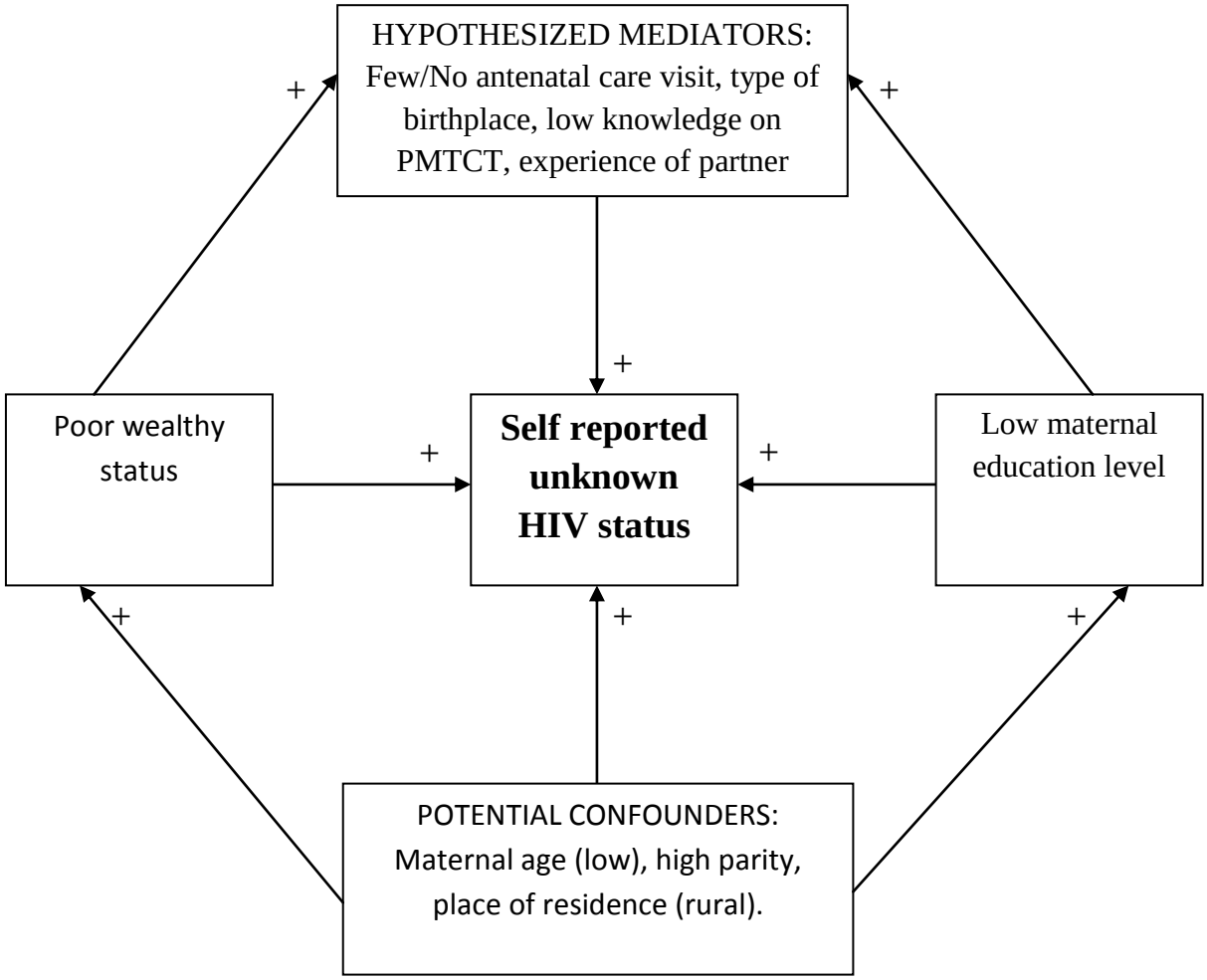
1.4 Hypothesis

Low maternal education and low wealth status would lead to increased rate of unknown HIV status while mediated by less knowledge on HIV disease, fewer ANC visits, and less access to PMTCT services, while, residential place of the woman, age, marital status and parity confound this association.

1.5 Research question

Is maternal low education and poor wealth status associated with increased unknown HIV status among pregnant women in Kenya?

1.6 Conceptual Framework of the association between maternal Socio-economic status and self reported unknown HIV status



CHAPTER II METHODS

2.1 Study Population

This is a secondary analysis using cross section demographic health survey data from Kenya (2008/2009), East Africa. The survey includes information from all individual women (N=2829) who attended ANC in the last three years prior to the survey for their pregnancy

2.1.1 Inclusion criteria

1. Women in the Kenya DHS survey data within individual women survey category aged 15 to 49 years old.
2. Women who attended ANC in within last three years.
3. Women who were offered HIV testing in their most recent pregnancy as part of ANC services.

2.1.2 Exclusion criteria

1. Pregnant women who did not attend ANC services in their most recent pregnancy three years prior to the survey.

2. Women with missing data pertaining to HIV testing during pregnancy.

2.2 Study variables

2.2.1 Dependent Variable

1. Unknown maternal HIV status at most recent pregnancy

To obtain a group of women with unknown HIV status, I merged women who declined HIV testing at their most recent pregnancy and those who tested but did not get their test results (post test results). These responses are based on two questions: i) I don't want to know the

results, but were you tested for HIV/AIDS as part of your ANC? Yes/No ii) I don't want to know the results, but did you receive the results of the test? Yes/No.

2.2.2 Independent variables

1. Maternal education status grouped into; i) no education (0 years of education), ii) primary school (8 years of formal education), iii) secondary school (4 years of post primary school education, iv) high education (college or any post secondary education.
2. Wealth status; derived from the pre-existing Kenya DHS data wealth index score built based on questions asking for household's ownership of consumer goods; dwelling characteristics; presence and type of toilet facilities, type of drinking water and other things/items that provide a proxy estimates of socio-economic status. . The obtained score was summed up for each household and thereafter individuals were divided into quintiles with a ranked scale of five categories; i) very poor, ii) poorer, iii) middle, iv) richer, and v) richest.

2.2.3 Other independent variables

i. Number of antenatal care visits (1 to 3 visits, 4 to 6 visits, 7 to 18 visits) place of residency (urban vs. rural),

ii. PMTCT knowledge score was composed following either Yes (1 point) or No (0 point) responses to the following four questions; i) Do you know if AIDS is transmitted during pregnancy? Ii) Do you know if AIDS is transmitted during delivery? Iii) Do you know if AIDS is transmitted during breast-feeding? iv) Do you know there are drugs to prevent HIV/AIDS transmission to babies during pregnancy?

To each respondent the point scored were summed up into a point scale ranging from 0 – 4 such that (0 - 1=no knowledge), (2=minimal knowledge), (3=moderate knowledge) and (4=high knowledge)

iii. Number of children ever born grouped into four categories of: (1), (2 – 5), (6 – 10), (11 -13),

iv. Maternal years of age grouped into: (15 – 20), (21 – 30), (31 – 40) and (41 – 49),

v. Who makes decision for your health categorized into: (self made), (self and partner/husband), and (Partner/husband only).

vi. Place of birth with 3 categories of: (public health facility), (private/maternity home) and (home birth/birth before arrival)

vii. Intimate based violence variable had two options of Yes or No. This based on picking any 'Yes' response that resulted from any of the following questions; Does/Did your (last) husband/partner ever: (a) Push you, shake you, or throw something at you? (b) Slap you? (c) Twist your arm or pull your hair? (d) Punch you with his fist or with something that could hurt you? (e) Kick you or drag you or beat you up? (f) Try to choke you or burn you on purpose? (g) Threaten or attack you with a knife, gun, or any other weapon? (h) Physically force you to have sexual intercourse even when you did not want to? (i) Force you to perform any sexual acts you did not want to? In this case this variable measures both sexual and physical violence.

2.3 Sample size and design

Kenya DHS data was collected after a probability sampling method, based on the stratified two-stage cluster design. The first step involved selecting clusters from a nationally representative sampling frame leading into 133 urban and 267 rural clusters. The second stage-involved selection of 10,000 households from a list of household made from all selected clusters. From the households interviewed, 8,767 women were found to be eligible and 8,444 were interviewed, giving a response rate of 96%. However, for the purpose of this study, only individual women in their reproductive age (15-49) who attended ANC services and gave birth during the three years prior to the survey are included. Based on the KDHS report the total number was 2829.

2.4 Data collection method

Kenya DHS used standardized face-to-face interview to collect information pertaining to their reproductive life, maternal and ANC experiences. The questionnaires were adapted from Measure DHS model and adjusted by translating them from English into Kiswahili and other ten Kenyan local languages. These were further formatted following a feedback from the pretest survey and training of the field staff.

2.5 Data analysis plan

Data abstraction was completed from the individual women survey in Kenya DHS 2008/2009. The needed study variables will be kept while others dropped. Data cleaning was done, followed by variable recoding and labeling to obtain a functional dataset. Using a weighted sample, data analysis was conducted using STATA SE version 11 statistical packages. The Stata

survey (svy) command, which accounts for weighting and the cluster sampling, was used in all analyses.

Frequency distributions and descriptive statistics for all study variables were generated. For continuous variables such as age, parity, and number of antenatal visits, the mean, standard deviations and range were calculated. Bivariate analysis was calculated by logistic regression to determine the relationships between categorical predictor variables: Education and wealth status versus dependent categorical variable of unknown maternal HIV status. Again, bivariate logistic regression analysis was used to find relationships between other categorical predictor variables such as maternal age, antenatal care visits, number of children, place of residence, place of birth, any intimate based violence, who makes decision on your health and unknown maternal HIV status. In this case the odds of an event occurring was captured within a 95% confidence limit.

To look for effect modification, the odds of unknown HIV status in different categories of wealth and education status were determined by stratifying the models into categories of place of residence, ANC visits, birth place and PMTCT knowledge score using bivariate logistic regression.

Multivariate Logistic regression model was used to estimate the association between maternal levels of education; maternal wealth and self report unknown HIV status while adjusting for other potential mediating and confounding categorical variables. In this case the odds of event occurring was captured within 95% confidence limits for precision.

CHAPTER III RESULTS

3.1 Descriptive statistics

A total of 2829 individual women were included in this analysis. The mean age +/- (SD) was 27.5 +/- (6.5) years and range was 15 – 49 years old. Most of them were from rural areas (79.3). The reported mean +/- (SD) number of ANC visits in the most recent pregnancy was 3.9 +/- (1.8) with a range of 1 – 18 visits. (Table 1) The mean number of years spent in formal school was 7.5+/- (3.6) years, and range of 0 – 23 years. Women from urban residence had higher mean years of education than with rural women (2.7 years, 95% CI: 2.38 – 3.03). (Not reported in Table 1) The mean number of children ever born was 3 +/- (2). The majority (64.9%) of women had a primary school level of education, while only (5.2%) had the highest level of education. Only (21.3%) and (20.6%) women were poor and very poor, respectively similarly to (20.8%) and (17.7%) who reported being very wealthy and wealthy respectively, (19.5%) women were in the moderate wealth group between richer and poor. There was unequal distribution of wealth status among rural and urban residence. In urban, 73.5% of women were categorized as richest compared to only 0.8% in rural areas. Furthermore, 32% of women in rural residence were categorized as poorest compared to only 5.5% in urban women. Most (58.1%) women were between 21 – 30 years, and only (3.7%) were between 41 – 49 years old. Over a third of women (37.9%) had high PMTCT knowledge scores while (5.5%) completely had no PMTCT knowledge. Over a-third (34.7%) of women had experienced any form of intimate based violence in the past year. For antenatal care visits, (49.9%) women attended 1 – 3 times, and (6.6%) attended 7 – 18 times. Nearly half (46.5%) of the women made their health decisions together with their partners/husbands, while (28.3%) had their health decision made only by

their partners/husbands. Most (60%) women had given birth 2 – 5 times, (16.8%) had delivered 6 – 10 times, (22.5%) gave birth only once, while (0.7%) had given birth 11 – 13 times. (Table 2) Among 2829 women, 617 (21.8%) had unknown HIV status on self-report (Not included in table 2).

Table 1. Characteristics of the study population, Kenya DHS, 2008-9 (N= 2829)

VARIABLE	MEAN	SD	RANGE
Age	27.5	6.5	15-49
PARITY	3	2	(1 - 13)
ANC VISITS	4	2	(1 - 18)
	HIV STATUS UNKNOWN		
	No n (%)	Yes n (%)	Total n (%)
EDUCATION LEVEL			
No education	148 (6.7)	109 (17.7)	257 (9.1)
Primary school	1404 (63.5)	433 (70.2)	1837 (64.9)
Secondary school	517 (23.4)	70 (11.3)	587 (20.7)
Higher education	143 (6.5)	5 (0.8)	148 (5.2)
WEALTH STATUS			
poorest	392 (17.7)	211 (34.3)	603 (21.3)
poorer	409 (18.5)	174 (28.2)	583 920.6)
middle	430 (19.4)	122 (19.8)	552 (19.5)
richer	427(19.3)	73(11.9)	500(17.7)
richest	554(25.0)	36(5.8)	590(20.9)
PLACE OF RESIDENCE			
Urban	536 (24.2)	50 (8.1)	586(20.7)
Rural	1676 (75.8)	568 (91.9)	2244(79.3)
AGE CATEGORIES			
15 - 20	290 (13.1)	80 (13.0)	370 (13.1)
21 - 30	1287(58.2)	358(58.0)	1645(58.1)
31 - 40	557 (25.2)	153(24.8)	710 (25.1)
41 - 49	79 (3.6)	26 (4.2)	105 (93.7)

KNOWLEDGE OF PMTCT			
None	85 (4.0)	63 (11.5)	148 (5.5)
Minimal	397(18.6)	141(25.6)	538(20.1)
Moderate	788 (37.0)	189 (34.4)	977 (36.5)
Higher	859 (40.3)	157 (28.5)	1016 (37.9)
FINAL SAY ON MATERNAL HEALTH DECISION			
Respondent alone	460 (25.2)	132 (25.2)	592 (25.2)
Respondent & husband/partner	901 (49.3)	191 (36.5)	1092 (46.5)
Husband or partner alone	466 (25.5)	200 (38.2)	666 (28.3)
NUMBER OF ANTENAL VISITS			
1 to 3	1009 (46.3)	385 (62.8)	1394 (49.9)
4 to 6	997 (45.8)	217 (35.4)	1214 (43.5)
7 to 18	172 (7.9)	11 (1.8)	183 (6.6)
INTIMACY VIOLENCE			
No	1151 (65.2)	306 (62.1)	1457 (65.3)
Yes	588 (33.8)	187 (37.9)	775 (34.7)
PLACE OF DELIVERY			
Public facilities	981 (44.4)	476 (77.1)	1457 (51.6)
Private facilities	920 (41.6)	104 (16.9)	1024 (36.2)
Home/before arrival to health facility	308 (13.9)	37 (6.0)	345 (12.2)
TOTAL CHILDREN EVER BORN			
1	528 (23.9)	108 (17.5)	636 (22.5)
2 to 5	1347 (60.9)	352 (57.1)	1699 (60.0)
6 to 10	321 (14.5)	154 (25.0)	475 (16.8)
11 to 13	17 (0.8)	3 (0.5)	20 (0.7)

Key; SD = Standard deviation

3.2 Association between maternal education and unknown maternal HIV status on self-report

For the bivariate logistic regression analysis comparing with pregnant women with no education, the crude odds for unknown maternal HIV status in women with primary, secondary

and higher education was (OR 0.42, 95% CI: 0.30 – 0.58), (OR 0.19, 95% CI: 0.12 – 0.29) and (OR 0.05, 95% CI: 0.02 – 0.13) respectively (Table 2, Column 1). This suggests that a significant association exists between low maternal education and unknown HIV status. Women from rural residence were three times as likely to have unknown HIV status (OR 3.66, 95% CI: 2.46 – 5.43), while women with a higher PMTCT knowledge score were significantly less likely to report unknown HIV status (OR 0.24, 95% CI: 0.15 – 0.42). Women whose health decisions are made by husband/partners alone were 1.5 times as likely to report unknown maternal HIV status. Increased frequency of maternal antenatal care visits significantly decreased the odds of unknown HIV status on self-report. Compared to delivery at a public health facility, women who reported giving birth at home or before arrival to the health facility (OR 0.24, 95% CI: 0.17 – 0.32) and those who delivered at the private health care facilities (OR 0.23, 95% CI: 0.15 – 0.39) had reduced odds of unknown maternal HIV status on self-report. Women who gave birth 6 – 10 times had increased odds of unknown HIV status on self-report. (Table 2)

In multivariate logistic regression while adjusting for all other predictor variables, maternal education was no longer associated with self-reported unknown HIV status. Women who reported rural residence had a significant increase in odds of unknown HIV status while a higher PMTCT knowledge scores, home birth, private facility birth and antenatal care of 7 – 18 visits reduced the likelihood of unknown HIV status. (Table 2)

Table 2. Multivariate logistic regression indicating the association of maternal education and unknown maternal HIV status on self-report

VARIABLE	HIV STATUS UNKNOWN			
	COR	(95% CI)	AOR	(95% CI)
EDUCATION LEVEL				
No education	1		1	
Primary school	0.42	0.30 - 0.58	0.68	0.43 - 1.07
Secondary school	0.19	0.12 - 0.29	0.61	0.32 - 1.16
Higher education	0.05	0.02 - 0.13	0.48	0.15 - 1.57
PLACE OF RESIDENCE				
Urban	1		1	
Rural	3.66	2.46 - 5.43	1.85	1.07 - 3.17
AGE CATEGORIES				
15 - 20	1		1	
21 - 30	1	0.69 - 1.46	0.83	0.45 - 1.54
31 - 40	0.99	0.65 - 1.50	0.6	0.30 - 1.23
41 - 49	1.2	0.59 - 2.39	0.65	0.21 - 2.00
KNOWLEDGE OF PMTCT				
None	1		1	
Minimal	0.48	0.27 - 0.83	0.72	0.38 - 1.38
Moderate	0.32	0.19 - 0.54	0.55	0.31 - 1.01
Higher	0.24	0.15 - 0.42	0.53	0.30 - 0.96
INTIMACY VIOLENCE				
No	1		1	
Yes	1.27	0.96 - 1.68	1.07	0.76 - 1.54
FINAL SAY ON MATERNAL HEALTH DECISION				
Respondent alone	1		1	
Respondent & husband/partner	0.74	0.51 - 1.05	0.84	0.56 - 1.27
Husband or partner alone	1.49	1.03 - 2.1	1.37	0.90 - 2.01
NUMBER OF ANTENAL VISITS				
1 to 3	1		1	
4 to 6	0.57	0.44 - 0.74	0.71	0.51 - 1.00
7 to 18	0.16	0.08 - 0.34	0.26	0.12 - 0.58

PLACE OF DELIVERY					
Public facilities		1		1	
Private facilities		0.23	o.17 - 0.32	0.29	0.19 - 0.42
Home/before arrival to health facility		0.24	0.15 - 0.39	0.41	0.23 - 0.74
TOTAL CHILDREN EVER BORN					
	1	1		1	
2 to 5		1.28	0.9 - 1.81	0.98	0.55 - 1.72
6 to 10		2.34	1.5 - 3.5	1.52	0.74 - 3.10
11 to 13		0.97	0.27 - 3.5	0.4	0.05 - 3.00

Key; COR=crude odds ratio, AOR=adjusted odds ratio, 95% CI=95% Confidence interval

3.3 Association between maternal education and unknown maternal HIV status stratifying into place of residence, ANC visits, birthplace & PMTCT knowledge.

Despite the odds on unknown HIV status being attenuated, the increased maternal education level was significantly and inversely associated with unknown HIV status only in rural women. Increased education level significantly reduced the odds of unknown maternal HIV status across the strata for place of birth, number of ANC visits and PMTCT knowledge score. (Table 3)

Table 3. Logistic regression of education and unknown maternal HIV status stratifying into place of residence, ANC visits, birthplace & PMTCT knowledge.

	Urban		Rural	
VARIABLE	OR	(95% CI)	OR	(95% CI)
EDUCATION LEVEL				
Primary	1.25	0.37 - 4.1	0.36	0.26 - 0.51
Secondary	0.91	0.22 - 3.74	0.17	0.11 - 0.29
Higher	0.41	0.10 - 1.67	0.04	0.01 - 0.17

	Place of birth					
	Public facility		Private/maternity home		Home /before arrival	
EDUCATION LEVEL	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Primary	0.55	0.38 - 0.80	0.33	0.16 - 0.71	0.23	0.04 - 1.33
Secondary	0.31	0.17 - 0.59	0.23	0.09 - 0.61	0.13	0.02 - 0.83
Higher	0.05	0.02 - 0.12	0.14	0.03 - 0.62	0.05	0.01 - 0.37

	ANC visits					
	(1 - 3)		(4- 6)		(7 - 18)	
EDUCATION LEVEL	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Primary	0.46	0.29 - 0.71	0.41	0.24 - 0.68	0.24	0.05 - 1.16
Secondary	0.28	0.16 - 0.51	0.18	0.09 - 0.40	0.01	0.0.00 - 0.1
Higher	0.17	0.04 - 0.83	0.05	0.02 - 0.13	0.01	0.00 -0.11

	PMTCT knowledge							
	None		Minimal		Moderate		High	
EDUCATION LEVEL	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Primary	0.47	0.17 - 1.26	0.63	0.31 - 1.30	0.54	0.29 -1.02	0.92	0.37 - 2.31
Secondary	0.74	0.16 - 3.42	0.36	0.12 - 1.08	0.19	0.08 - 0.42	0.39	0.14 - 1.10
Higher	0.08	0.01 - 0.76	0.03	0.00 - 0.26	0.1	0.02 - 0.40	0.06	0.01 - 0.26

3.4 Association between maternal wealth status and unknown HIV status on self-report

In bivariate logistic regression analysis of wealth status model, improved wealth status was associated with decreased odds of unknown maternal HIV status. When compared with the poorest pregnant women, the crude odds for unknown maternal HIV status was (0.53, 95% CI: 0.37 – 0.76) for the moderate group, (0.32, 95% CI: 0.21 – 0.48) for the richer group, and (0.12, 95% CI: 0.08 – 0.18) for the richest women. Women from rural residence were three times likely to have unknown HIV status (OR 3.66, 95% CI: 2.46 – 5.43), while women with a higher PMTCT knowledge score were significantly less likely to report unknown HIV status (OR 0.24, 95% CI: 0.15 – 0.42). Women whose health decisions are made by husband/partners alone were 1.5 times as likely to report unknown maternal HIV status. Increased frequency of maternal antenatal care visits significantly decreased the odds of unknown HIV status on self-report. Compared to delivery at a public health facility, women who reported giving birth at home or before arrival to the health facility (OR 0.24, 95% CI:0. 17 – 0.32) and those who delivered at the private health care facilities (OR 0.23, 95% CI:0. 15 – 0.39) had reduced odds of unknown maternal HIV status on self-report. Women who gave birth 6 – 10 times had increased odds of unknown HIV status on self-report. (Table 4)

In multivariate logistic regression adjusted for all other predictor variables, the richest women were significantly (AOR 0.25, 95% CI: 0.09 – 0.67) less likely to report unknown HIV status. Place of delivery: (AOR 0.3, 95% CI: 0.2 – 0.45) for private facility, (AOR 0.48, CI: 0.27 – 0.86) for home birth/before arrival, higher PMTCT knowledge score (AOR 0.52, 95% CI: 0.28 – 0.94) and over

seven antenatal care visits (AOR 0.3, 95% CI: 0.14 – 0.67) significantly reduced the likelihood for maternal unknown HIV status. (Table 4)

Table 4. Multivariate logistic regression of maternal wealth status and unknown maternal HIV status on self-report

		HIV STATUS UNKNOWN		
VARIABLE	**COR**	**(95% CI)**	**AOR**	**(95% CI)**
WEALTH STATUS				
poorest	1		1	
poorer	0.79	0.52 - 1.11	1.02	0.67 - 1.55
middle	0.53	0.37 - 0.76	0.8	0.50 - 1.31
richer	0.32	0.21 - 0.48	0.63	0.36 - 1.08
richest	0.12	0.08 - 0.18	0.25	0.09 - 0.67
PLACE OF RESIDENCE				
Urban	1		1	
Rural	3.66	2.46 - 5.43	0.8	0.34 - 1.88
AGE CATEGORIES				
15 - 20	1		1	
21 - 30	1	0.69 - 1.46	0.85	0.47 - 1.53
31 - 40	0.99	0.65 - 1.50	0.63	0.31 - 1.23
41 - 49	1.2	0.59 - 2.39	0.73	0.24 - 2.23
NUMBER OF ANTENAL VISITS				
1 to 3	1		1	
4 to 6	0.57	0.44 - 0.74	0.74	0.53 - 1.04
7 to 18	0.16	0.08 - 0.34	0.3	0.14 - 0.67
INTIMATE VIOLENCE				
No	1		1	
Yes	1.27	0.96 - 1.68	1.09	0.76 - 1.54
PLACE OF DELIVERY				
Public facilities	1		1	
Private facilities	0.23	0.17 - 0.32	0.3	0.20 - 0.45
Home/before arrival to health	0.24	0.15 - 0.39	0.48	0.27 - 0.86

facility

TOTAL CHILDREN EVER BORN				
1	1		1	
2 to 5	1.28	0.9 - 1.81	0.94	0.53 - 1.67
6 to 10	2.34	1.5 - 3.5	1.4	0.68 - 2.90
11 to 13	0.97	0.27 - 3.5	0.42	0.06 - 3.00
FINAL SAY ON MATERNAL HEALTH DECISION				
Respondent alone	1		1	
Respondent & husband/partner	0.74	0.51 - 1.05	0.85	0.56 - 1.28
Husband or partner alone	1.49	1.03 - 2.1	1.4	0.91 - 2.13
KNOWLEDGE OF PMTCT				
None	1		1	
Minimal	0.48	0.27 - 0.83	0.7	0.37 - 1.33
Moderate	0.32	0.19 - 0.54	0.55	0.31 - 1.00
Higher	0.24	0.15 - 0.42	0.52	0.28 - 0.94

Key; COR=crude odds ratio, AOR=adjusted odds ratio, 95% CI=95% Confidence interval

3.5 Association between maternal wealth status and unknown maternal HIV status stratifying into place of residence, ANC visits, birthplace & PMTCT knowledge.

While the odds of unknown HIV status was attenuated compared with crude odds, the increased maternal wealth level was significantly and inversely associated with unknown HIV status in all variables with exception of richest women in urban who did not have any significant results. (Table 5)

Table 5. Logistic regression of wealth status and unknown maternal HIV status stratifying into place of residence, ANC visits, birthplace & PMTCT knowledge.

	Urban		Rural	
VARIABLE WEALTH STATUS	OR	(95% CI)	OR	(95% CI)
Poorer	0.43	0.05 - 3.71	0.8	0.57 - 1.13
Middle	0.78	0.09 - 6.37	0.53	0.36 - 0.76
Richer	0.6	0.08 - 0.77	0.29	0.19 - 0.45
Richest	0.16	0.02 - 1.05	0.16	0.07 - 0.327

	Place of birth					
	public facility		private/maternity home		home /before arrival	
WEALTH STATUS	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Poorer	1.02	0.69 - 1.51	0.35	0.15 - 0.80	0.67	0.11 - 4.20
Middle	0.61	0.39 - 0.95	0.54	0.25 - 1.20	0.72	0.12 - 4.37
Richer	0.48	0.29 - 0.80	0.35	0.14 - 0.86	0.19	0.03 - 1.10
Richest	0.27	0.13 - 0.53	0.11	0.05 - 0.25	0.17	0.03 - 0.91

	ANC visits					
	(1 - 3)		(4- 6)		(7 - 18)	
WEALTH STATUS	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Poorer	0.79	0.51 - 1.23	0.75	0.42 - 1.34	1.61	0.24 - 10.61
Middle	0.63	0.39 - 1.02	0.45	0.26 - 0.79	0.07	0.01 - 0.71
Richer	0.36	0.21 - 0.61	0.33	0.18 - 0.62	0.03	0.00 - 0.28
Richest	0.24	0.14 - 0.42	0.08	0.04 - 0.16	0.06	0.01 - 0.33

	PMTCT knowledge							
	None		Minimal		Moderate		High	
WEALTH STATUS	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Poorer	1.01	0.30 - 3.38	1.3	0.61 - 2.75	0.43	0.22 - 0.82	1.38	0.74 - 2.56
Middle	0.98	0.28 - 3.60	0.61	0.27 - 1.38	0.73	0.39 - 1.38	0.53	0.26 - 1.08
Richer	0.12	0.01 - 1.09	0.65	0.26 - 1.64	0.41	0.21 - 0.77	0.29	0.14 - 0.61
Richest	0.11	0.2 - 0.47	0.14	0.05 - 0.44	0.18	0.09 - 0.38	0.13	0.06 - 0.29

CHAPTER IV DISCUSSIONS AND CONCLUSIONS

4.1 Discussion

In this study, as many as 21.8% of women did not know their HIV status during their most recent pregnancy. This is similar to studies conducted in the neighboring country of Tanzania where unknown HIV status in pregnant women was found to be 22% and 22.8% in cities of Moshi and Dar es Salaam respectively.(7) (8) This trend seems to be the same with countries in West Africa where, 22.8% of pregnant women in suburban and rural primary care facilities refused HIV testing, reflecting their rates of maternal unknown HIV status.(24)

In this study population, the crude analysis demonstrated that maternal education and wealth status were associated with maternal unknown HIV status on self-report. Increased maternal education was inversely and significantly associated with unknown HIV status. Furthermore, increased number of antenatal care visits, high PMTCT knowledge score, and maternal birth in public or home birth were significantly and inversely associated with unknown HIV status on self-report unlike rural residence which significantly increased the likelihood of unknown HIV status. Looking into the association between maternal education and unknown HIV status while stratifying the analysis into various variable categories of ANC visits, birthplace and PMTCT knowledge revealed similar significant results across all variables. However, when stratified in rural and urban residence, low maternal education significantly predicted unknown HIV status in rural only. This suggests that place of residence modifies the maternal education effect on unknown HIV status.

Furthermore, the significant association between maternal education and HIV status was eliminated after adjusting for place of residence, number of antenatal care visits, and PMTCT knowledge. Also, women who had 7 – 18 ANC visits, birth in private facility and home birth although high PMTCT knowledge score still were significantly less likely to report unknown HIV status. The odds for unknown HIV status in rural residence were slightly reduced but still significant. This suggests that place of residence, number of antenatal care visits, PMTCT knowledge, and maternal birthplace mediate the association between low maternal education and unknown HIV status on self-report. These results are similar with previous studies conducted in Africa that found low maternal education predicted unknown maternal HIV status. (7), (8), (15), (12)

Similar with education status, maternal wealth status was significantly and inversely associated with unknown maternal HIV status in crude analysis. Improved wealth status was inversely associated with unknown maternal HIV status. Also, 7-18 ANC visits, birth in private and home birth and high PMTCT knowledge score were significantly less likely associated with unknown HIV status. Rural residence had a threefold significant increase in the odds of unknown HIV status.

Stratifying the association between wealth status and unknown HIV status into categories of ANC visits, birthplace and PMTCT knowledge led to similar significant results across all variables. Logistic regression adjusting for all variables with significant results revealed the effect of richest, private and home birth, 7-18 ANC visits and high PMTCT knowledge score on

unknown HIV status was attenuated however still significant. In this model place of residence was not associated with unknown HIV status.

In models that separately adjusted for education and wealth, women with 7 – 18 ANC visits were significantly less likely to have unknown HIV status. This finding resembles results from a study conducted in Zimbabwe that found that having less than 6 ANC visits increases likelihood of unknown HIV. (8) A study in Burkina Faso a found increased ANC visits was positively associated with maternal HIV testing. (9)It is possible that increased number of visits is associated with increased opportunities for counseling and testing and make up for days of missed test or it could be due to other medical conditions in pregnancy that require frequent visits, such as being HIV positive and other pregnancy complications.

In both models, high PMTCT knowledge score decreased the likelihood of unknown maternal HIV status. These results correlates with other previous studies conducted in Africa, which reported a higher PMTCT knowledge score was positively associated with HIV testing. (17), (22)

In both models delivery in private facility and home delivery/ birth before arrival to the health facility were significantly associated with decreased unknown maternal HIV status when compared to women who deliver in public health facilities. Women who delivered at home accounted for 12.2% of study population, while making 6% of women with unknown HIV status.

This is a paradoxical results as it is very difficult to explain why women with home/birth before arrival have lower likelihood for unknown HIV status however, It is possible that these are women who either consider themselves to have no risk pregnancy and therefore do not entertain facility based delivery or are just part of pregnant women who are not satisfied by

intrapartum services in most of developing countries. It should be remembered that, only 43% of pregnant women in Kenya delivers in health facilities while 56% delivers at home. (4) This is contrary to a very high (92%) uptake in ANC attendance. (4) It is also possible that birth place has no influence on HIV testing but mainly the fact that previous studies did not include birth place as one of study variable since most of these studies recruited women during pre-partum period when most of HIV test in pregnancy are conducted.

In education model, rural residence was significantly associated with unknown HIV status on self-report. The results are similar with other studies conducted in Tanzania (7) and Botswana. (12) This could relate to the fact that most rural residencies have limited health care services to meet the demands of its people in most of African countries. Living in urban residency was found to predict the likelihood of being offered HIV test in pregnant women living in Botswana. (12) It is unknown to me why rural residence was not a significant predictor for unknown HIV status in the wealth model. This could be due to a huge difference in wealth status among women of rural residence compared to urban residence. In urban, 73.5% of women were in the richest category compared to only 0.8% in rural areas. Furthermore, 32% of women in rural residence were categorized as poorest compared to only 5.5% in urban women. This un-equal distribution of wealth status might have contributed to lack of significant effect of rural residence in wealth model. Also the difference in levels of education may have accounted for much of the difference seen on unknown HIV status compared to the effect of wealth status. In this study population women in urban had a higher mean [9.1 (4.5)] years of education compared to women from rural areas [6.4 (3.8)] with the mean difference of (2.7years, 95% CI: 2.38 – 3.03).

4.2 Study strength.

This is probably the first study of its kind to evaluate the predictors to evaluate the predictors of maternal unknown HIV status using a community survey representative of the population of women who received antenatal care. Previous studies are based mostly on health facility samples and therefore had poor representation and generalizability.

Also, this study included women with history of home birth or birth before arrival who have systematically been omitted from previous research. This approach has increased both internal and external validity for this study.

4.3 Study limitations.

The primary outcome measure for this study is unknown HIV status based on self-report, which may have been reported incorrectly because there was no way to validate the individual woman's response. It is assumed that the problem of incorrect status this may have been distributed in all sets of women, educated and non-educated, wealth and poorer. In this case antenatal records were not used to confirm if someone had received a test result.

4.4 Conclusion and recommendation

Increased number of antenatal care visits, birth at home or in private facilities, higher PMTCT knowledge scores independently decreases the likelihood of unknown maternal HIV status in this population. Rural residence independently predicted unknown HIV status in the education model. The findings indicate that PMTCT knowledge, accessibility of PMTCT services in rural

areas, and maximizing maternal contact opportunities available for counseling and testing during antenatal care visits will reduce the proportion of women with unknown HIV status.

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