DISCRIMINANT ANALYSIS OF FACTORS THAT HAVE LED TO SLOW DECLINE OF HIV/AIDS PREVALENCE: CASE STUDY OF MASENO

BY

LEONARD KING'ORA THUO

A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN APPLIED STATISTICS

DEPARTMENT OF ACTUARIAL SCIENCE AND APPLIED STATISTICS

MASENO UNIVERSITY

DECLARATION

I, **Leonard King'ora Thuo**, Adm No: **MSC/MAT/00119/2015,** declare that this research is my own original work. It is being submitted for the degree of Master of Science in Applied Statistics in the school of Mathematics, Actuarial science and Applied Statistics, Maseno University. It has not been submitted before for any degree or examination at this or any other university.

Signature: …….. Date: ……..

DECLARATION BY SUPERVISOR

This research project has been submitted for examination with my approval as the supervisor.

Prof. Fredrick Onyango,

Department of Applied Statistics and Actuarial Science,

Maseno University,

Private Bag,

MASENO.

Signature: …….. Date: ……..

ACKNOWLEDGEMENT

I would like to thank all my lecturers in the school of Mathematics, Actuarial and Applied Statistics, Maseno University. I would especially like to thank my supervisor, Professor Fredrick Onyango for providing me professional guidance throughout this process. I am also grateful for the amazing support of my parents during my studies.

DEDICATION

This dissertation is dedicated foremost to the Almighty God who gave me the physical strength and mental capacity to undertake this project. Special dedication is to my family for financial and moral support.

ABSTRACT

HIV/AIDS epidemic has endangered the development of countries in this new century, presenting one of the greatest challenges of this generation and threatening human development. To accomplish an efficient response requires many researches to find long term solutions. Though its prevalence has declined in the past years, it is still very high in particular regions due to various factors. This research analysed major factors associated with HIV/AIDS prevalence in Maseno Community. If no serious measures are taken to curb this epidemic, Maseno Community will lag behind economically. The study had six objectives namely; to analyse TB prevalence in relation to HIV/AIDS status, to determine if gender was associated with HIV/AIDS prevalence, to identify which age-group is highly HIV/AIDS infected, to test between the couples and single people, which group was at high risk of HIV infection, to test which group was the most HIV infected between the students, staff and the community residents and finally to examine which key independent variable predicted HIV/AIDS status. Secondary data from Maseno AIDS Control Unit (ACU) and Maseno ACK Hospital were used. The population of study entailed all clients who visited the ACU and hospital for testing. The study utilized stratified sampling across HIV status. Cronbach's alpha was used to test reliability of the result. Binary logistic regression analysis was also used to determine the association between factors mentioned above and HIV/AIDS. Odds ratio from the logistic regression analyses gave estimates of the risks of HIV/AIDS that was associated with each of these factors. Results from this study showed that TB, marital status, 'origin' (if one was a student, staff or Maseno community resident) and age had a significant association with HIV/AIDS. Odds ratio from logit model showed that, TB positive clients were 128.407 times more likely to be HIV positive than the TB negative clients. Female were 1.272 times more likely to be HIV positive than the male. Married people were 5.304 time more likely to be HIV positive than the single clients. Staffs were 7.496 times more likely to be HIV positive than the student while the Maseno community members were 69.662 times more likely to be HIV positive than the students. Age group 40-44 was at the highest risk of being HIV positive with an odds ratio of 34.000 than age group 15-19. Results from marginal effect showed that out of the five key independent variables, only marital status did not predict if the client was HIV positive. It was recommended that in-depth analyses of HIV epidemics to be carried out in other counties to know major factors associated with HIV/AIDS.

TABLE OF CONTENTS

LIST OF ACRONYMYS AND ABBREVIATIONS

ACU	AIDS Control Unit
AIDS	Acquired Immune Deficiency Syndrome
CDC	Center of Diseases Control
GDP	Gross Domestic Product
HIV	Human Immunodeficiency Virus
NGO	Non-governmental Organization
STD	Sexually Transmitted Disease
STI	Sexually Transmitted Infection
VCT	Voluntary Counseling and Testing
WHO	World Health Organization

OPERATIONAL DEFINITIONS

Logistic Regression - Is a type of regression equation that uses a categorical dependent variable. It allows you to include any type of independent variables (categorical or continuous) and any number of independent variables. In this sense, it is very similar to simple or multiple linear regression but instead of providing you with a slope it provides an odds ratio for each independent variable.

Odds -This is the probability of an event happening divided by the probability of the event not happening.

Odds Ratio - This is the odds of an event happening in one group divided by the odds of an event happening in another group. It is literally the ratio of two odds. It acts like effect size for a chi-square. The chi-square tells you if there is a difference and the odds ratio tells you how big/strong that difference is. If the chi-square is significant, the odds ratio is also statistically significant.

Probability- Likelihood of an event occurring.

Sensitivity- Probability that, if you truly have the disease, the diagnostic test will catch it.

Specificity- Probability that, if you truly do not have the disease, the test will register negative.

Wald test-It tests the effect of individual predictor while controlling other predictors.

Marginal effects - show the change in probability when the predictor or independent variable increases by one unit. For continuous variables this represents the instantaneous change given that the 'unit' may be very small. For binary variables, the change is from 0 to 1, so one 'unit'.

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER ONE

INTRODUCTION

This chapter presented the background to the study, statement of the problem, hypothesis, significance of the study and conceptual frame work.

1.1 BACKGROUND INFORMATION

This section covered HIV/AIDS definition and transmission, the global HIV/AIDS epidemic, HIV/AIDS in Kenya, HIV/AIDS consequences and impacts in different sectors

1.1.1 HIV/AIDS DEFINITION AND TRANSMISSION

Acquired Immune Deficiency Syndrome (AIDS) is a disease of the human immune system caused by the human immunodeficiency virus (HIV) (Weiss, 1993). This condition progressively reduces the effectiveness of the immune system and leaves individuals susceptible to opportunistic infections and tumors. There are two types of HIV, HIV-1 and HIV-2. In the United States, unless otherwise noted, the term “HIV” primarily refers to HIV-1 (CDC, 2001).

AIDS is a chronic life threatening condition caused by the human immunodeficiency virus (HIV) (Med, 2001). There's no cure for HIV/AIDS, but there are medications that can drastically slow the progression of the disease. These drugs have reduced AIDS deaths in many developed nations, but HIV continues to reduce population in Africa.

HIV is transmitted through direct contact via blood, semen, vaginal fluid, and breast milk. This transmission can involve anal, vaginal or oral sex, blood transfusion, contaminated hypodermic needles, vertical transmission (pregnancy), childbirth, breastfeeding or other exposure to one of the above bodily fluids (CDC, 2010)

1.1.2 THE GLOBAL HIV/AIDS EPIDEMIC

According to UNAIDS/WHO (2009), already, more than twenty-five million people around the world had died of AIDS related diseases. Further, in 2008, 2.7 million people were newly infected with HIV, and 2 million men, women and children lost their lives. At the end of 2008, women accounted for 50% of all adults living with HIV worldwide.

While every nation had in some way been affected by this pandemic, it was in Africa that the grip of HIV and AIDS had been, by far, the deadliest. Twenty-eight million people in Africa were living with HIV/AIDS when Southern Africa had the highest HIV adult prevalence in

the world (UNESCO, 2012). According to World Bank (2002), over two thirds of the HIV/AIDS related deaths (18 million, or 72%) were from Africa and almost one in every ten adults in sub-Saharan Africa were HIV positive although infection rates in individual countries such as South Africa, Botswana, Malawi, and Swaziland were much higher.

The magnitude of the problem became clear when one considered that well over one third (39 percent) of adults in Botswana, and one in every five (20 percent) adults in South Africa, were estimated to be HIV positive (NIC, 2010). At a human level, the financial burden of HIV/AIDS was at least 30% greater than deaths from other causes, because it affected the most productive age group (young adults), and because the costs of medication and caring for the sick were staggering and could be prolonged (Coombe, 2009).

HIV/AIDS leads to financial, resource and income impoverishment Barnett and Whiteside (2012), and puts severe strain on individuals and households. The psychological stress that was a direct consequence of the impact of HIV/AIDS on individuals and families compromised school and work performance, family relationships, and the capacity to take care of children, and also culminated in risk behavior such as alcohol and drug abuse and in unsafe sexual behavior (Coombe, 2009)

HIV/AIDS represented not only a tragedy at a human level but also heavily affected the economic development of countries, many of which were already severely strained for resources (UNAIDS & WHO, 2008). The weight on the health system was tremendous and the loss of productive workforce had implications for the economy. Cross country analyses conducted by the World Bank suggested that the region of Southern Africa was losing an estimated 0.7 to 1.0 percent per capita growth per year as a direct result of HIV and AIDS and that by the year 2020 it may had reduced the aggregate output by between 15 to 20 percent (World Bank, 2010). By 2008, some estimated between 50 and 80 percent of hospital beds in Southern Africa were occupied by people with HIV related infections (UNAIDS, 2008).

In 2009, the joint United Nations Program on HIV/AIDS estimated the number of people infected with HIV to be 33.3million, out of who 23.3 million lived in Sub- Sahara Africa representing three quarters of the total population infected. A decrease was seen as the estimated number of death due to AIDS in 2008 was 2millon (1.7-2.4 million) worldwide of

which 76% occurred in Sub Sahara Africa (UNAIDS, 2009). More than two out of three (68%) adults and nearly of children infected with HIV lived in this region.

1.1.3 HIV EPIDEMIC IN KENYA

Results of Kenya Aids Indicator Survey KAIS (2007), indicated that 7.4% of the adults aged between 15-64 years were infected with HIV. While 7.8% of adults aged between 15-49 years were infected with HIV, which translated to 1.4 million adults. Women continued to be disproportionately infected with HIV (8.7%) compared to men (5.6%). The overall prevalence among youth aged 15-24 years was 3.8% ranging from 3% in women 15 years old and 12% in women 24 years old, and among men aged 15-24 years ranged from 0.4%-2.6%. Thus young women aged between 15-24 years remained vulnerable to HIV infection.

Here is a brief overview of the HIV epidemic in the country as reported by the Ministry of Education in June 2014 (KNA and PSTIC, 2014)

- 101,560 Kenyans were infected with HIV in 2013.
- 12,940 children, 50,530 women, and 38,090 men were infected with HIV in 2013.
- 65% of new HIV infections occur in 9 out of 47 counties.
- 21% of new adult HIV infections occurred among young women aged 15–24 every year.
- 1.6 million Kenyans were living with HIV in 2013.
- 191,840 children were living with HIV in 2013.
- 63% of men and 80% of women knew their HIV status

Although HIV interventions and initiatives were underway, there were questions related to the nature and impact of the epidemic, as well as questions related to the effectiveness of the community response. A number of institutions were implementing HIV/AIDS prevention programs in Kenya. These programs involved schools, health clinics, and the media. The Government of Kenya created the National AIDS Control Council (NACC) in 2000 to coordinate all HIV/AIDS activities in the country. Voluntary Counseling and Testing (VCT) services were available in each district. A number of NGOs were implementing HIV/AIDS prevention programs in schools, in churches and for specific target groups. With all these initiatives ignorance was still a part of much society (NASCOP, 2014).

According to KAIS (2007) Government of Kenya recognized that HIV/AIDS epidemic possessed severe threat to Kenyan economy, with major social and economic impact on individuals, households and society as a whole. This narrowed down to Maseno town where the market was the source of revenue to most residents of the region and the supply of goods and services to the university students. HIV infection lowered the economy with the available income being used for treatment and burials.

A decline of 9% of new infections among adults was estimated to have occurred from 2007 (98,000) to 2012 (85,000) (UNAIDS, 2009). In addition, the number of people dying from AIDS-related causes had reduced by more than 50% from 2005 to 2011 (UNAIDS, 2012). According to the Kenya AIDS Indicator survey of 2012, there were approximately 1,192,000 people living with HIV and a prevalence of 5.6% among adults aged 15 to 64 years. A higher proportion of women aged 15 to 64 years (6.9%) than men (4.4%) were are also living with HIV (NASCOP, 2014)

Significant gender and age variations existed in the Kenyan epidemic with sharp rise in HIV prevalence among young girls and women raising from 2.1% among ages 15-24 to about 10.5% among those aged 25 to 35 a clear marker of increased incidence for these groups (NASCOP, 2014). The HIV situation in this group was further compounded by the fact that girls aged 15- 19 years were nearly four times more likely to be infected with HIV than males of the same age (2.7% to 0.7%) a clear marker of HIV incidence (Kenya National Bureau of Statistics, 2010). Overall, there were marked gender disparities which characterized the epidemic with higher prevalence amongst women at 6.9% compared to men at 4.4% (NASCOP, 2014).

1.1.4 HIV/AIDS CONSEQUENCES

Economic performance in most countries in Sub-Saharan Africa had been continuously recorded in most official reports as very poor. As such, the incomes were very low and poverty levels at household level were unfortunately very high (UNAIDS, 2012). A significant number of populations living in Kenya, Tanzania and Uganda lived below the poverty lines or were simply poor. Poverty, had been defined by Human Rights groups as “a human condition characterized by the sustained or chronic deprivation of resources, capacities, choices, security and power necessary for the enjoyment of an adequate standard

of living and other fundamental civil, economic and social rights" (World Population Foundation, 2004).

The pandemic was not only causing so many deaths, but was also rendering very many children parentless. For example, in 2012 the scourge rendered some 11,035,000 children parentless in Sub-Saharan Africa. During this period there were some 892,000 children in Kenya, 884,000 children in Uganda and 815, 000 children in Tanzania orphaned due to AIDS (UNAIDS, 2012).While, the impact of loss of life varied from group to another, one thing was truly clear; a child's life falls apart when a child lost a parent. The huge numbers involved called for urgent attention.

HIV/AIDS was the leading cause of death in Africa and the fourth leading cause of death worldwide (UNAIDS/WHO, 2008). In some African countries, life expectancies had fallen below 40 years, whereas they would have been above 60 without AIDS (UNAIDS/WHO, 2008). In Kenya, because of AIDS, life expectancy had also been reduced. In families, loss of one or both parents to HIV led to loss of income, cessation of children's education, increased child labor, and disruption of family and social support systems.

As a sexually transmitted disease, HIV/AIDS particularly affects adolescents and young adults. Deaths of young adults have negative impact on families, communities, social systems, national growth and development. Also, the number of orphans had increased, there were around15 million living children who had lost a parent to AIDS (UNAIDS/WHO, 2008). Young adults who contribute substantially to countries' gross domestic product were most commonly affected.

AIDS is currently killing young economically productive people, bringing hardships to families, increasing expenditure on health care and adversely affecting the country's development, depriving the economy of qualified and productive labour force, restricting the tax base and raising demands for social services due to increased number of orphaned children and widows (NASCOP, KENYA HIV ESTIMATES, 2014). The large number of orphaned children and with the current high levels of unemployment, poverty and lack of extended family support led to unprecedented social disintegration. The loss of skilled uniformed officers had security implications too.

1.1.5 IMPACT OF HIV/AIDS IN KENYA

1.1.51 EDUCATION SECTOR

AIDS affects education demand by lowering school enrolment as AIDS orphans increase and as more children get infected with AIDS. The rise in child labor and child-headed households following the death or incapacitation of the breadwinner prevents such children from attending school (Government of Kenya, 2001).

Second, it affects education supply through loss of teaching staff and increasing teacher absenteeism. Third, it affects the quality of teaching and disrupts the organizational stability of schools with the loss of key education officials and head-teachers.

1.1.52 AGRICULTURE

Agriculture employs a large segment (80%) of the labor force and accounts for 70% of Kenya's export earnings; it is a major portion of the GDP. As the epidemic progressed, the agricultural sector was forced to adjust to the decrease in adult labor on farms (Rugalema,Weigang & Mbwika, 1998).This meant that productivity would decline and knowledge about indigenous farming methods would be lost. The consequences on food security are obvious.

HIV/AIDS diminished farming production of both cash and food crops and also crop variety due to labor loss. In 2000, agricultural labor losses were 9.6% and would reach to 22.7 % in 2020 according to the (Organisation for Economic Co-operation , 2000). For commercial and business firms, HIV may cause losses in experienced and skilled labor resulting in low productivity due to shortage of labor during crucial periods of planting and harvesting. The employer also incurred other employment related costs such as, rising costs of staff welfare, training, recruitment, and funerals. The individual farm worker families, were experiencing shortage of labor, reduction of labor supply, lack of essential inputs, experienced and skilled labor loss, revenue and output losses, accumulation of knowledge and land losses and eventually switch to less-labor-intensive crops. The switch to less-labor-intensive crops implied shifting from export crops to food crops which would reduce over the long term, national export earnings and needed foreign exchange.

1.1.53 HEALTH SECTOR

HIV/AIDS affected the health system by undermining its capacity to perform, and by eroding the quality of care and the state of health facilities. AIDS also significantly affected health-related expenditures of households, private organizations and public health providers (Lonwenson R. & Whiteside, 2001). The HIV/AIDS epidemic had posed tremendous challenges to the health systems of the developing countries, especially in the most severely affected countries. HIV/AIDS increased overall health expenditures for both medical care and social support at the same time that claimed the lives of doctors and nurses in the developing countries.

Another problem that affected the health sector, especially the public healthcare system, was distortion of the health referral system. Also, AIDS led to overcrowding in public health facilities with patients with AIDS-related illness occupying most beds. In 1992, 15% of hospital beds were occupied by AIDS patients; this rose to about 50% by 2000 (Institute of Economic Affairs & SID Society for International Development, 2001). The growing number of AIDS cases aggravated this problem. The World Bank estimated that a country with a stable 5 per cent adult HIV prevalence rate could expect that each year between 0.5 and 1 percent of its health-care providers was dying from AIDS. In contrast, a country with 30 per cent prevalence would lose 3-7 per cent of its health workers to the HIV/AIDS epidemic (World Bank, 2002). Absenteeism and illness among health workers was a major issue. The quality of care of AIDS patients would also suffer because caregivers fear contracting the disease.

Many countries in the developing world were faced with a high demand for treatment of AIDS related diseases, making it difficult to satisfy the demand for treatment of other diseases. Information on bed usage by AIDS patients was available for major hospitals in a number of countries. For many of the most affected countries, the loss of hospital capacity was on the order of 50 percent.

Calculations by the World Bank (2002) suggested that the effect of HIV/AIDS on total health care costs was likely quite large, even in countries that were spared the most serious epidemics. As HIV/AIDS increased the demand for health care, was tending to drive up the effective price of health care as well, amplifying the impact on total health-care spending. Higher prices led some people to forego care they would have sought at the lower

price, with the poor likely to feel the greatest effect. However, the price responsiveness or elasticity of demand for adult health care was usually small, since people who were sick and who had ability to pay would often pay whatever was needed to get well (World Bank, 1999).

In many affected countries, the health budget allocated to the HIV/AIDS epidemic had increased, leading to the compression of the non-AIDS health budget (Fleming & Wasserheit, 2012). One of the reasons for a higher allocation to AIDS in the health budget was that AIDS was far more costly to treat than other conditions. A study in Zimbabwe showed, for instance, that hospital care for HIV/AIDS patients was twice as expensive as that for the non-HIV/AIDS patients.

1.2 STATEMENT OF THE PROBLEM

HIV/AIDS is still a major problem in Maseno community. Every month there are many reported cases of patients who die of HIV/AIDS. This has led to increase of number of orphans in the community and thus increase in number of street children child labor. Further, HIV/AIDS has led to slow development rate within Maseno region. More and more money which could have been for development purposes are being used for hospital bills and treatments.

Focus on HIV prevalence among university students has been an alarming case study in years (Chiboola, 2009). Studies have indicated a rampant growth of HIV infections among students whose sexual behavior is quite permissive. On the other hand staff members are highly infected and more deaths have transpired. It is being assumed that the people at risk are majorly students yet non students are also vulnerable. Currently the rates of HIV infection among students have reduced yet the prevalence of HIV has not proportionately reduced (Nzioka, 2010).

This study was to determine and analyse major factors associated with HIV/AIDS prevalence and ultimately to examine which key independent variable predicted HIV/AIDS status. By so doing, the study could help health policy makers develop an effective intervention in Maseno region by showing where and towards which group HIV resources should be allocated.

1.3 OBJECTIVES OF THE STUDY

General objective

The general objective of this study was to test the major factors that have led to slow decline of HIV/AIDS in Maseno community.

Specific objectives;

1. To analyse TB prevalence in relation to HIV/AIDS.
2. To test if gender is associated to HIV/AIDS prevalence.
3. To determine which age-group is highly HIV/AIDS infected.
4. To test if marital status is an associated with HIV/AIDS
5. To test which group is HIV affected most between the students and Maseno residents.
6. To examine which key independent variable predicts HIV/AIDS status.

1.4 HYPOTHESIS OF THE STUDY

The hypotheses for this study were;

H_0: TB prevalence is the same across HIV/AIDS status.

H_0: HIV/AIDS prevalence is the same in both genders.

H_0: Marital status is not associated with HIV/AIDS prevalence.

H_0: Prevalence of HIV/AIDS is equal between students and Maseno residents.

H_0: Prevalence of HIV/AIDS is equal in all age groups.

H_0: There is an equal chance of HIV/AIDS status for all predictor variables.

1.5 SIGNIFICANCE OF THE STUDY

Maseno University is a fountain of academic excellence, which has contributed immensely to national development. All this will seriously be affected if we continue losing student and staffs who are the cream of the society through HIV/AIDS infection. The impact of HIV/AIDS is causing uncertainty in human resources planning and development. This research aimed at bringing out clearly the current prevalence of HIV/AIDS in Maseno

community and the major factors that have led to slow decline of this epidemic. The understanding of the current situation for HIV/AIDS would help in the establishment of a baseline for assessing whether to consider other options that would reduce HIV prevalence.

HIV/AIDS, among other factors, has caused a development crisis in Maseno community. Even if exceptionally effective prevention and treatment are put into place today, the size of the crisis is so enormous that the socio-economic toll will remain significant for several generations to come. AIDS will not only reverse the efforts to eradicate poverty but will also increase the proportion of people living in extreme poverty. Loss of income, reduced ability of caregivers, mounting medical bills and funeral expenses help push households further into poverty. Results from this study will be very important to Maseno community. If each person takes great care, Maseno community will raise economically.

Also, the study aimed at creating awareness on HIV/AIDS which would prevent further HIV infection among students, staff and community members. In addition, they will take care on issues such as; sexual negotiation, gender norms, and cultural behaviors which lead to spread of HIV/AIDS.

CHAPTER TWO
LITERATURE REVIEW

According to the 2012 UNAIDS report on the global AIDS epidemic approximately 34.0 million people were living with HIV. Sub-Sahara Africa continued to be severely affected with 69% of all global HIV cases reported (UNAIDS, 2012). HIV/AIDS affects people in the most productive phases of their lives contributing to high medical costs and psychological problems resulting from stigma and discrimination increasing burden on the local and global economy. WHO defined burden of disease as the effects of a disease on premature death and disability which could be further extended to describe the effects of disease not only on households but also on the society.

The global pandemic of HIV/AIDS rages on with no region immune from the perspectives of personal, social and economic ravages of HIV/AIDS. Sub-Saharan Africa continued to lead the grim statistics with more than 15 million deaths, more than 12 million orphans, and HIV prevalence rates greater than15% in much of East Africa, more than 30% in some countries in South Africa, and approached double the digits in a number of West Africa countries (WHO/UNAIDS/UNICEF, 2011). Thailand had HIV/AIDS map for a number of years already with prevalence rates of about 2%. In China, if current infection rates hold steady, 10 million people will be HIV positive in 2020 (UNAIDS, 2012).

HIV/AIDS was declared a national disaster in Kenya in December 1999 and therefore a public health emergency. Cumulatively 2.6 million had been infected and half of these were already dead. Over 1.3 million children had been orphaned as a result of HIV/AIDS. In 2013, the estimated national prevalence was 13% and five hundred to seven hundred people died daily due to AIDS related illnesses (KNA and PSTIC, 2014).

According to (NASCOP, 1999) estimate on adult prevalence in HIV was 13.5%, which meant that Kenya had one of the most serious HIV/AIDS epidemics in the world when compared with figures available from other countries. In some cases in urban and rural areas some of the women did not attend antenatal clinics and therefore the results would not give a true picture of the realities within the selected sites. Results from the report indicated that of all the pregnant women tested in the high prevalence districts of Busia, Kisumu and Thika, 20-35% of them were HIV/AIDS infected. Kakamega, Nairobi, Meru, Nyeri, and Mombasa had

a rating of 10-25%, while Garissa, Kitui, Mosoriot, Kaplong, and Njabini showed a rating of 3-10%.

Prevalence estimates by county (table 2.10) shows the geographical variability of the HIV burden across the country. It was estimated that HIV prevalence ranged from a high 27.1% in Homa Bay County to below 0.2% in Wajir County. Ten counties had an estimated prevalence higher than the national average, while 7 counties had prevalence of less than 2%. This variability showed the need to design programmes that addressed the specific underlying issues in the counties.

Table 2.10: HIV Prevalence by County, 2013

County	Adult Prevalence (%)	County	Adult Prevalence (%)	County	Adult Prevalence (%)	County	Adult Prevalence (%)
Homa Bay	25.7	Bomet	5.8	Uasin Gishu	4.3	Bungoma	3.2
Siaya	23.7	Kwale	5.7	Kitui	4.3	Baringo	3
Kisumu	19.3	Makueni	5.6	Nyeri	4.3	Meru	3
Migori	14.7	Nakuru	5.3	Isiolo	4.2	West Pokot	2.8
Kisii	8	Muranga	5.2	Vihiga	3.8	Elgeyo	2.5
Turkana	7.6	Trans Nzoia	5.1	Kiambu	3.8	Lamu	2.3
Mombasa	7.4	Samburu	5	Nyandarua	3.8	Garissa	2.1
Nairobi	6.8	Narok	5	Nandi	3.7	Mandera	1.7
Busia	6.8	Machakos	5	Laikipia	3.7	Marsabit	1.2
Nyamira	6.4	Kajiado	4.4	Embu	3.7	Tana River	1
Taita-Taveta	6.1	Kilifi	4.4	Kericho	3.4	Wajir	0.2
Kakamega	5.9	Tharaka-Nithi	4.3	Kirinyaga	3.3		

Source: *Kenya HIV and AIDS Profile, 2014*

Kenya National HIV and AIDS Strategic Plan, estimated number of people living with HIV by the 2013 as show in table 2.11. The number of people living with HIV was estimated to have increased from about 1.4 million in 2009 to 1.6 million in 2013. Women constituted

about 57% of the people living with HIV, while men account for 43%. About 80% to 90% of the people living with HIV were adults.

Table 2.11: Number of People Living with HIV

	2009	2010	2011	2012	2013
All Ages					
Male	632,250	645,127	658,263	672,423	685,394
Female	830,379	848,038	867,588	888,023	906,948
Total	1,462,629	1,493,165	1,525,851	1,560,446	1,592,342
Adults (15 yrs and above)					
Male	510,059	528,730	549,616	569,727	589,651
Female	710,052	733,386	760,531	786,813	812,561
Total	1,220,112	1,262,116	1,310,147	1,356,540	1,402,212
Percentage	80	80	90	90	90
Children (0-14 yrs)					
Male	122,191	116,397	108,647	102,696	95,743
Female	120,326	114,652	107,057	101,210	94,388
Total	242,517	231,049	215,704	203,906	190,131
Percentage	20	20	10	10	10

Source: *Kenya National HIV and AIDS Strategic Plan (KNASP). Kenya AIDS Response Progress Report 2013 Progress towards Zero*

According to Kenya National HIV and AIDS Strategic Plan 2013, HIV prevalence rate had been on the decline in the last few years, but number of people living with HIV and AIDS had been on the increase, and was estimated at 1.6 million. This number was projected to increase due to improved survival (reduced mortality due to HIV) attributed to ART program.

According to Kenya National HIV and AIDS Strategic Plan 2013, new infections among adults contributed over 80% of the total new infections. The new infections among adults stabilized at an average of 93,000 annually over the last five years. Among children, new infections declined from about 20,000 to 11,000 annually over the same period. An estimate of new infections among men and women and children is shown in table 2.12.

Table 2.12: Estimated New HIV Infections

	2009	2010	2011	2012	2013
All Ages					
Male	51,604	49,753	47,137	44,892	43,193
Female	64,746	63,047	60,577	57,057	55,309
Total	116,349	112,800	107,714	101,949	100,501
Adults (15 yrs and above)					
Male	41,068	41,324	41,549	37,780	37,514
Female	54,480	54,833	55,132	50,127	49,778
Total	95,548	96,157	96,681	87,907	87,291
Percentage	82	85	90	86	89
Children (0-14yrs)					
Male	10,536	8,429	5,588	7,113	5,679
Female	10,266	8,214	5,445	6,930	5,531
Total	20,802	16,643	11,033	14,042	11,210
Percentage	18	15	10	14	11

Source: *Kenya National HIV and AIDS Strategic Plan (KNASP). Kenya AIDS Response Progress Report 2013Progress towards Zero*

2.1 AGE

In many developing countries, the majority HIV infections occurred among individuals' aged 15-24 (Weiss, Whelan & Gupta, 2009). Having an STD put someone at risk for contracting HIV. Since youth are usually sexually active and unmarried, they were at high risk. These risks included psychological and behavioral reasons. Biological and social reasons were also explaining these risks. Psychological factors allowed many adolescents and young adults at increased risk for STIs because of their general sense of invulnerability, the desire to try new experiences, to impress their friends or relatives and the willingness to take risks, including changing sexual partners often or having a partner who had multiple partners

About half of all new HIV infections worldwide, or approximately 6,000 per day, occurred among young people aged 15–24, the majority of them young women (United Nation Chilldren's Fund, 2008). In the United States, for men who had sex with men, younger age was strongly correlated with increased high risk sexual behaviors (e.g. unprotected anal sex) (Kamali, Carpenter, Whitworth, Pool, Ruberantwari & Ojiywa, 2009). Despite high levels of

sexual activity, young people often did not know the basic HIV/AIDS statistics and facts, which put them at risk (Fleming & Wasserheit, 2012).

2.2 MARITAL STATUS

Marriage does not always protect young women against HIV infection. Since a much higher percentage of young men than young women become sexually active early, young women were likely to marry an already sexually experienced man. In Pune, India, a study in an STI clinic found that 25% of the 4000 women attending the clinic were infected with an STI and 14 % were HIV positive. Among the 93% who were married, 91% had only one partner, their husbands (Donegan et al., 1994)

The HIV/AIDS pandemic disproportionately affects women who already carry a very hard burden in many African countries. From a physiological and medical perspective, women were at a great risk of getting infected. In addition, they were often solely responsible for household and the children, and had less financial and material reserves to fall back on. Women also faced the risk of abandonment or abuse at the hands of their partners when HIV/AIDS strikes. When family members fall sick as a result of HIV, it is most often the girls who will be removed from school to take care of those who are sick (Barnett & Whiteside, 2012). This increased their susceptibility to poverty and to the diseases because they would probably marry younger and would not have the benefits of education.

A study in Kisumu, Kenya, found that as many as half of the married women whose husbands were 10 or more years older, were infected with HIV, compared to none of the women whose husbands were only up to three years older (UNAIDS & WHO, 2008).

Kenya Demographic Health Survey conducted a HIV test for both partners in over 1000 cohabiting couples in 2013. Test results of these couples were linked to each other, but before HIV test results were merged with data from the questionnaires, personal identifiers such as household and cluster numbers were removed. Therefore, no individual or couple's HIV status could be traced. Results shown in table 2.13 indicate that in 89% of cohabiting couples both partners were HIV free of HIV infection; in 4% both partners are HIV infected; and 7% of couples were discordant, with one partner infected and the other uninfected. These discordant couples were at high risk for HIV transmission, especially if they did not mutually know their HIV status or did not use condoms consistently.

Table 2.13*:* HIV prevalence among couples (%)

Characteristic	Both infected	Male infected, female not	Female infected, male not	Neither infected	Number sampled
Marital status					
Married	3.3	3.1	4.4	89.2	948
Living together	7.7	0.5	6.0	85.8	92
Type of union					
Monogamous	3.1	3.1	3.9	89.9	913
Polygynous	7.5	1.4	9.0	82.1	128
Total	3.7	2.8	4.6	88.9	1041

Sources: *Central Bureau of Statistics, Kenya demographic and health survey 2013; population projections, CBS and NASCOP.*

Among married couples both partners were infected in 3%, the man only in another 3%, and the woman only in 4%. Among those not married but living together, the proportion was higher of couples in which both partners were infected (8%), but the proportion that were discordant is similar (7%). In polygamous marriages, 8% of couples were both infected, in 1% the man only was infected, and in 9% the woman only.

Based on this information, between 400,000 and 500,000 couples in Kenya were discordant for HIV infection. The vast majority did not know their own or their partner's HIV infection status.

2.3 TB

Globally, the HIV epidemic has intersected with other diseases, especially tuberculosis (TB). TB remains the principal cause of death in persons with HIV infection worldwide (University of California, 2013). National TB rates had escalated over the past decade in many countries especially Sub Saharan Africa.

The co-epidemic of tuberculosis (TB) and human immunodeficiency virus (HIV) is one of the major global health challenges in the present time. The World Health Organization (WHO) reported 9.2 million new cases of TB in 2012 of whom 7.7% were HIV-infected (World Health Organisations, 2012). Tuberculosis was the most common contagious infection in HIV patients, leading to death. These both diseases become dreadful in

combination as HIV declines the human immunity while tuberculosis becomes progressive due to defective immune system. This condition becomes more severe in case of multi-drug (MDRTB) and extensively drug resistant TB (XDRTB), which are difficult to treat and contribute to increased mortality. A study on gold miners of South Africa revealed that the risk of TB was doubled during the first year after HIV sero-conversion (University of California, 2013).

Since the mid-1980s, in many African countries with well-organized programs, annual TB notification rates have increased, reaching peaks of more than 400 cases per 100,000 individuals (Center of Diseases Control, 2001). In some countries, up to 70% of patients with sputum smear positive pulmonary TB is HIV infected.

2.4 STUDENTS, STAFF AND COMMUNITY RESIDENTS

University students are mostly sexually-active young people in the 18-30 year old category (Chiboola, 2009). Certain aspects of social life place members of tertiary and higher education institutions at risk of contracting HIV. Global data showed that more than a third of all people living with HIV were under the age of 25 (UNAIDS, 2004). Instances of offering sex in return of favors like good grades and academic advancements existed in some of these institutions. Such studies led to measures being carried out and departments like Aids Control Unit being established. This caused an overlook of the neighborhoods of the universities

A study by Chiboola (2009) carried among 120 students of the University of Zambia showed that most students were aged between 19-26 years, the age group which was highly vulnerable to HIV infection. It further revealed that knowledge regarding HIV transmission was only moderately good considering that the students were among the most highly educated group in the country. Most students knew that HIV infection was spread through blood, semen and vaginal fluids, nearly 50% also thought that HIV could be transmitted through saliva and mosquitoes – popular beliefs among different study groups. The study also noted that despite the fact that the majority of students knew someone with HIV/AIDS, they still held very negative attitudes to those with the disease. For instance, 8% felt that people with HIV/AIDS had led immoral lives, 14% felt that people with HIV/AIDS should be isolated, and 15% did not like the idea of working with people who have HIV/AIDS. Such negative attitude seemed predominant in the general population and greatly contributed to the mystification, stigmatization and perpetuation of inappropriate fears regarding HIV/AIDS.

More specifically, the report revealed that estimates of percentages of staff infected range from 12% to over 50% of staff members between the ages of 30 and 39 and 35% of those over 40 years. Statistics were more easily available for infection and death rates among staff than they were for students, since staff members tended to remain attached to the university after the onset of illness whereas students disappeared. Many institutions reported an average death rate of about 2 staff members per week (Nzioka, 2010).

The above observations indicated that non students tended to be highly infected in relation to the students. A significant proportion of students and staff reported to have not tested for HIV. Reasons given by both students and staff for not going for an HIV test in descending order were: I am afraid of the results (90.5%); I do not have time to go for testing (39.3%); it costs too much (12.2%); I do not know where to go for testing (12.2%); I trust myself to be ok (10.8%) and no need to (9.4%). Increases of HIV awareness and campaigns motivated testing for HIV.

A health report compiled in Maseno University showed that the male/female ratio was 2:1 and the ages affected most were the 0 – 39.9 years at 51.5% and above 40 years followed at 35.4%. The staff category most affected was at 59.6%, while the senior and middle were 20.2% each respectively. Further categorization showed that support staff suffered most (73.8%), followed by academic (17.2%) then administrative staff at 9.1% (Sigot, 2008).

The lack of proper awareness and knowledge regarding HIV/AIDS may leave a large section of the population vulnerable to contract the disease. Correct knowledge and awareness regarding the disease was a general prerequisite for the prevention and control of HIV/AIDS. Case studies undertaken before enabled the tackling of the problem statement at hand easy to solve.

2.5 GENDER

Gender was another factor that also influences HIV/AIDS epidemiology. For example, men were less likely to acquire HIV from heterosexual sex than women were because of the anatomy of the penis (Fleming & Wasserheit, 2012). However, cultural norms in many parts of the world encouraged men to demonstrate their masculinity by having multiple sex partners and coercing women into having sex, which increase HIV risk.

Men are also much more likely than women to abuse alcohol and drugs, which increased the likelihood that they would engage in unprotected sex. Men were also more likely than women

to inject drugs, exposing them to the risk of HIV from infected needles and syringes (Donegan et al., 1994).

Women, in contrast, were at greater risk of HIV infection from heterosexual sex than men were because of the anatomy of the vagina. In addition, although cultural norms in many parts of the world dictated that women should remain virgins until married (a factor that can reduce HIV risk), the denial of access to HIV education and the belief that women should be sexually passive decrease the likelihood that women would take steps to protect themselves from HIV in sexual relationships.

Limited access to education and employment made women dependent on male partners, or forces them to exchange sex for food or money, thus limiting their control of sex. Women were also far more likely than men to experience gender based violence, including physical and sexual abuse, in which they did not have control over the safety of sexual intercourse.

Results from the 2013 Kenya Demographic Health Survey (KDHS) indicated that 6.7% of Kenyan adults were infected with HIV (table 2.14). HIV prevalence in women age 15–49 was 8.7%, while for men 15–49, it was 4.6%. This female-to-male ratio of 1.9 to 1 was higher than that found in other population-based studies in Africa. Young women were particularly vulnerable to HIV infection compared with young men. For example, 3% of women age 15–19 were HIV infected, compared with less than 0.5% of men 15–19, while HIV prevalence among women 20–24 was over 4 times that of men in the same age group (9% vs. 2% table 2.14). The peak prevalence among women was at age 25–29 (13%), while prevalence rose gradually with age among men to peak at age 40–44 (9%). Only in the 45–49-year age group was HIV prevalence among men (5%) higher than that among women (4%).

Since few HIV-infected children survived into their teenage years, infected youth represented more recent cases of HIV infection and serve as an important indicator for detecting trends in both prevalence and incidence. Overall, prevalence among women age 15–24 was 6%, compared with slightly over 1% among men the same age, for an overall prevalence in youth of under 4%.

Urban residents had a significantly higher risk of HIV infection (10%) than rural residents (6%). Prevalence in urban women was 12% compared with less than 8% for rural women, which was a 1.6 urban–rural relative risk. For men, the risk of urban residents was double (8% vs. 4%). Since 75% of Kenya's population was categorized as rural, however, the greatest burden of HIV infection was in the rural population.

Table 2.14: HIV Prevalence Among Adults Tested, Age 15–49 (%)

	Women	Men	Total
Total	8.7	4.6	6.7
Age			
15–49	3.0	0.4	1.6
20–24	9.0	2.4	6.0
25–29	12.9	7.3	10.4
30–34	11.7	6.6	9.4
35–39	11.8	8.4	10.1
40–44	9.5	8.8	9.1
45–49	3.9	5.2	4.4
50–54	n.a.	5.7	n.a.
Residence			
Urban	12.3	7.5	10.0
Rural	7.5	3.6	5.6
Province			
Nairobi	11.9	7.8	9.9
Central	7.6	2.0	4.9
Coast	6.6	4.8	5.6
Eastern	6.1	1.5	4.0
North Eastern	< 1.0	< 1.0	< 1.0
Nyanza	18.3	11.6	15.1
Rift Valley	6.9	3.6	5.3
Western	5.8	3.8	4.9

Sources: *Central Bureau of Statistics, Kenya demographic and health survey 2013; population projections, CBS and NASCOP.*

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 RESEARCH DESIGN

The way in which knowledge is going to be developed determines the way in which research is done (Saunders, Phillip & Thornhil, 2003). Based on the objectives in the study, emphases were placed on structured methodology to facilitate replication and quantifiable observations that would to lead to correct statistical analysis.

Longitudinal study was done by collecting data recorded in Maseno ACK hospital and Maseno AIDS Control Unit. Exploratory, descriptive and explanatory techniques were employed in this study.

3.2 AREA OF STUDY

Maseno community was the study area of research. Maseno community is a town in Kisumu County, Kenya. It is located along Kisumu-Busia highway 25 kilometers northwest of Kisumu town. Another road connects Maseno to Vihiga town, located 15 kilometers east of Maseno. The altitude of Maseno is 1,503 meters or 4,934 feet above sea level. Maseno is the headquarters of Maseno division. Maseno has a population of 65,304, of whom 2,199 are classified as urban (International Livestock Research Institute, 1999). Maseno is part of Kisumu county council and Kisumu Rural Constituency (Government of Kenya, 2001).

Maseno University has its main campus located in Maseno town. This university is the largest contributor to the economy of Maseno town.

3.3 DATA TYPE AND DATA COLLECTION

This was a sensitive study and required special permission which was granted by the relevant authorities. Secondary data was obtained from Maseno AIDS Control Unit and Maseno ACK mission Hospital. These were the main hospitals that were attended by Maseno community. The study also utilized secondary sources of information mainly books, journals, reports, institutional records and government policy documents. These documents were reviewed and analyzed to establish trends, examine past interventions and identify gaps. The information gathered using this technique was used for comparative purpose.

3.4 SAMPLE UNIT

Data comprised of all clients tested for HIV and TB. This included all observations from January 2015 to December 2016. This was the most recent data that would give the current HIV prevalence in association to the factors of study (TB, age, gender origin marital status and age groups).

3.5 DEFINITION OF VARIABLES

This study's objective was to find out the association between HIV status and factors that have led to the slow decline of HIV prevalence. In order to assess the association of HIV status and these factors, variables that were used were be defined.

a) Age

This variable referred to individuals' number of living years. For this study, the variable age, was categorized in nine age groups: 0-14, 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49 and 50+.

b) Marital status

Marital status included married and unmarried individuals.

c) Gender

Gender referred to an individual sex, whether a client was a male or female. Analysis was done to check if gender would probably make a difference among people infected with HIV.

d) HIV status

Clients were classified whether they were HIV positive (have the diseases) or negative (do not have the diseases).

e) Origin

This variable was used to classify if a client was a student, Maseno University staff or Maseno community resident.

f) TB

This variable included all TB patients. This included both type of TB that is, pulmonary TB and Extra-pulmonary TB.

3.6 STATISTICAL ANALYSIS

The prevalence of HIV/AIDS was determined across the above mentioned variables. All analyses were stratified across HIV status. Test of hypothesis was carried out using parametric method after pass of normality test.

Binary logistic regression analysis was also used to determine the association between these factors and HIV/AIDS. Odds ratio from the logistic regression analyses were used to estimate the risks of HIV/AIDS that are associated with these factors. Marginal effects was used to check how the outcome variable changed when an explanatory variable changes.

Model

Logistic regression model is given as;

$$logit(y) = \ln(\text{odds}) = \ln(\frac{p}{1-p}) = \alpha + \beta_i x_i \ldots . \beta_n x_n$$

$$= \frac{e^{\alpha + \beta_i x_i \ldots \beta_n x_n}}{1 + e^{\alpha + \beta_i x_i \ldots \beta_n x_n}}$$

Where:

- Y- is a binary dependent variable (HIV positive = 1, HIV negative = 0)
- $(\frac{p}{1-p})$-odds
- p - is the probability of having a HIV positive client.
- x_i -independent variables.
- β_i - The regression coefficients estimated using maximum likelihood.
- α - constant
- n- number of predictors

That is;

Log odds of being a HIV positive (outcome) = Intercept + Age group (predictor) + Gender (predictor) + Origin (predictor) + TB status (predictor) + Marital status (predictor)

Table 3.10: Variable Description for Logit Model

Variable name	Type	Description
Dependent variable		
HIV/AIDS status	Categorical	HIV status of the client.
Independent variable		
Age group	Categorical	Age of the client.
Gender	Categorical	Gender of the client. If male or female.
Origin	Categorical	If the client is a student, staff or Maseno community resident
TB Status	Categorical	TB status of the client. If TB positive or Negative
Marital status	Categorical	Marital status of the client, single or married.

3.61 ASSUMPTIONS OF LOGISTIC REGRESSION

Logistic regression does not require many of the principle assumptions of linear regression models that are based on ordinary least squares method–particularly regarding linearity of relationship between the dependent and independent variables, normality of the error distribution, homoscedasticity of the errors, and measurement level of the independent variables. Logistic regression can handle non-linear relationships between the dependent and independent variables, because it applies a non-linear log transformation of the linear regression. However the following assumptions were made:

- The outcome must be discrete, otherwise explained as; the dependent variable should be dichotomous in nature (e.g., presence vs. absent).
- There should be no outliers in the data, which can be assessed by converting the continuous predictors to standardized, or *z* scores, and remove values below -3.29 or greater than 3.29.
- There should be no high inter-correlations (multi-co linearity) among the predictors. This can be assessed by a correlation matrix among the predictors. Fidell and Tabachnick (2012) suggested that as long correlation coefficients among independent variables are less than 0.90 the assumption is met.
- There should be a linear relationship between the odds ratio, or EXP (B) and each independent variable. Linearity with an ordinal or interval independent variable and the odds ratio can be checked by creating a new variable that divides the existing independent variable into categories of equal intervals and running the same regression on these newly categorized versions as categorical variables. Linearity is demonstrated if the beta coefficients increase or decrease in linear steps (Garson, 2009).

3.62 EVALUATION OF A LOGISTIC REGRESSION MODEL

There are several parts involved in the evaluation of the logistic regression model. First, the overall model (relationship between all of the independent variables and dependent variable) needs to be assessed. Second, the importance of each of the independent variables needs to be assessed. Third, predictive accuracy or discriminating ability of the model needs to be evaluated. Finally, the model needs to be validated.

1. Overall model evaluation

The likelihood ratio test

Overall fit of a model shows how strong a relationship between all of the independent variables, taken together, and dependent variable is. It can be assessed by comparing the fit of the two models with and without the independent variables. A logistic regression model with the *k* independent variables (the given model) is said to provide a better fit to the data if it demonstrates an improvement over the model with no independent variables (the null model). The overall fit of the model with *k* coefficients can be examined via a likelihood ratio test which tests the null hypothesis

H_0: $\beta_1 = \beta_2 = \ldots = \beta_k = 0$.

To do this, the deviance with just the intercept (-2 log likelihood of the null model) is compared to the deviance when the *k* independent variables have been added (-2 log likelihood of the given model). Likelihood of the null model is the likelihood of obtaining the observation if the independent variables had no effect on the outcome. Likelihood of the given model is the likelihood of obtaining the observations with all independent variables incorporated in the model. The difference of these two yields a goodness of fit index G, $\chi 2$ statistic with *k* degrees of freedom (Bewick, 2005). This is a measure of how well all of the independent variables affect the outcome or dependent variable. If the *p*-value for the overall model fit statistic is less than the conventional 0.05, then reject H_0 with the conclusion that there is evidence that at least one of the independent variables contributes to the prediction of the outcome.

2. Statistical significance of individual regression coefficients

If the overall model works well, the next question is how important each of the independent variables is. The logistic regression coefficient for the *i*th independent variable shows the change in the predicted log odds of having an outcome for one unit change in the *i*th independent variable, all other things being equal. That is, if the *i*th independent variable is changed one unit while all of the other predictors are held constant, log odds of outcome is expected to change by *i* units. There are a couple of different tests designed to assess the significance of an independent variable in logistic regression, the likelihood ratio test and the Wald statistic (Menard, 2001).

Wald statistics

The Wald statistic can be used to assess the contribution of individual predictors or the significance of individual coefficients in a given model (Bewick, 2005). The Wald statistic is the ratio of the square of the regression coefficient to the square of the standard error of the coefficient. Each Wald statistic is compared with a Chi-square with 1 degree of freedom.

Odds ratio

The odds ratio (OR) is a comparative measure of two odds relative to different events. For two events A and B, the corresponding odds of A occurring relative to B occurring is odds ratio. An OR is a measure of association between an exposure and an outcome. The OR represents the odds that an outcome will occur given a particular exposure, compared to the

odds of the outcome occurring in the absence of that exposure. When a logistic regression is calculated, the regression coefficient (b_1) is the estimated increase in the logged odds of the outcome per unit increase in the value of the independent variable. In other words, the exponential function of the regression coefficient ($exp\ (b_1)$) is the OR associated with a one unit increase in the independent variable.

The OR can also be used to determine whether a particular exposure is a risk factor for a particular outcome, and to compare the magnitude of various risk factors for that outcome. OR=1 indicates exposure does not affect odds of outcome. OR>1 indicates exposure associated with higher odds of outcome. OR<1 indicates exposure associated with lower odds of outcome.

3. Predictive accuracy.

The classification table is a method to evaluate the predictive accuracy of the logistic regression model (Peng, 2002). In this table the observed values for the dependent outcome and the predicted values (at a user defined cut-off value) are cross-classified. For example, if a cutoff value is 0.5; all predicted values above 0.5 can be classified as predicting an event, and all below 0.5 as not predicting the event. Then a two-by two table of data can be constructed with dichotomous observed outcomes, and dichotomous predicted outcomes. The table has following form.

Table 3.11: Sample Classification Table

Observed	**Predicted**	
	1	0
1	A	B
0	C	D

Where a, b, c and d are number of observations in the corresponding cells. If the logistic regression model has a good fit, we expect to see many counts in the *a* and *d* cells, and few in the *b* and *c* cells. In this case we consider sensitivity = $a/(a+b)$ and specificity = $d/(c+d)$. Higher sensitivity and specificity indicate a better fit of the model.

3.63 MARGINAL EFFECT

Logit models assume the probabilities are given by the following formula:

$$P = \frac{e^{x\beta}}{1 + e^{x\beta}} = \alpha(x\beta) \quad \dots\dots \quad (1)$$

Where $x\beta = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_N X_N$

In this case, the marginal effect of X_k is given by

$$\frac{\partial \Pr(y=1)}{\partial X_k} = \frac{e^{x\beta}}{\{\frac{e^{x\beta}}{1 + e^{x\beta}}\}^2} \frac{\partial x\beta}{\partial X_k} \quad \dots\dots \quad (2)$$

$$= \frac{e^{x\beta}}{\{\frac{e^{x\beta}}{1 + e^{x\beta}}\}^2} \beta_k \quad \dots\dots \quad (3)$$

$$= \alpha(x\beta)(1 - \alpha(x\beta))\, \beta_k \quad \dots\dots \quad (4)$$

$$= \Pr(y = 1) \times \Pr(y = 0) \times \beta_k \quad \dots\dots \quad (5)$$

Coding of variables

For dependent variable, 1 as HIV positive was used and 0 as HIV negative. For the independent variables cases coded as 1 referred to response group, comparison group, or target group. Cases coded as 0 referred to reference group, base group, or control group.

3.7 RESEARCH ETHICS

Kothari (2014) defines ethics as a code of behavior appropriate to academics and the conduct of research. Thus the appropriateness of the behavior of the researcher and those who became the subject of this work was observed. Ethical issues arise during design and initial access, data collection, and during analysis and reporting. Exercising subjective selectivity in what was recorded was avoided. During data analysis and reporting, great effort was made to avoid selective report and mis-interpreting statistical accuracy of data. Data clearly attributable to specific individuals was not to be openly reported, instead it was held private.

3.8 DATA VALIDATION

Preliminary analysis using pilot study data was done to ensure data would enable the hypotheses to be answered. The supervisor re-examined the suitability of the prior sample data with room for addition of other relevant variables that would help establish content validity. After the pilot study, variables that were irrelevant were eliminated.

3.9 DATA RELIABILITY

A scale or test is reliable if measurements made under constant conditions are likely to give the same results, assuming that no changes in the basic characteristics being measured occur (Moser, 1979). However, in the research situation, measurement scores normally constitute the true component and the error component. In this way, the reliability is higher when the degree of error in an instrument is lower. The analysis of reliability is specifically important when there are several items that measure the same concept or phenomenon (before constructing an index or scale) so as to minimize errors of single items (Kerlinger, 1986). Reliability may be measured in terms of stability or consistency. The stability aspect of reliability refers to a comparison of the same measure for the same sample at two or several points in time, i.e., test-retest whereas internal consistency reflects homogeneity of the several items comprising a scale (Cronbach, 1951).

According to Mitchel (1996), reliability means consistence in responses to the questions. Consistency method was used whereby comparison of similar variables across the sample dataset was done. Cronbach’s alpha was used to test reliability result.

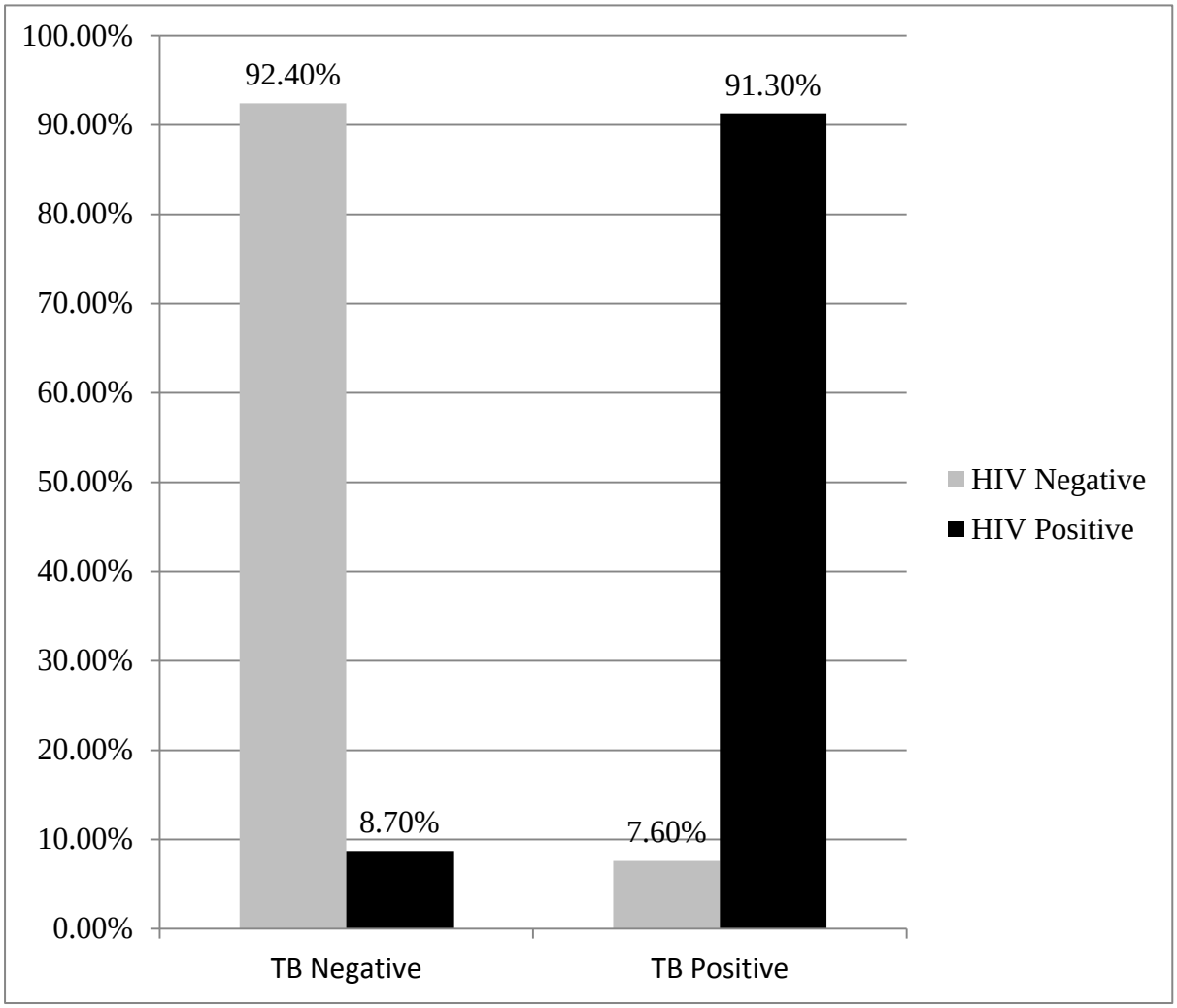
CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 EXPLANATORY ANALYSIS

This subsection shows the frequency distribution in percent of all the variables used in analysis plotted vis-a-vis HIV status.

Figure 4.10: Bar Chart of HIV Status Versus TB Status



As shown in figure 4.10, 91.3% of all HIV positive clients were TB positive. Although there was no high difference of HIV/AIDS status among male and female, the females had a higher percentage (52.9%) of HIV positive clients than the males (47.1%). This is displayed in figure 4.11

Figure 4.11: Bar Chart of HIV Status Versus Gender

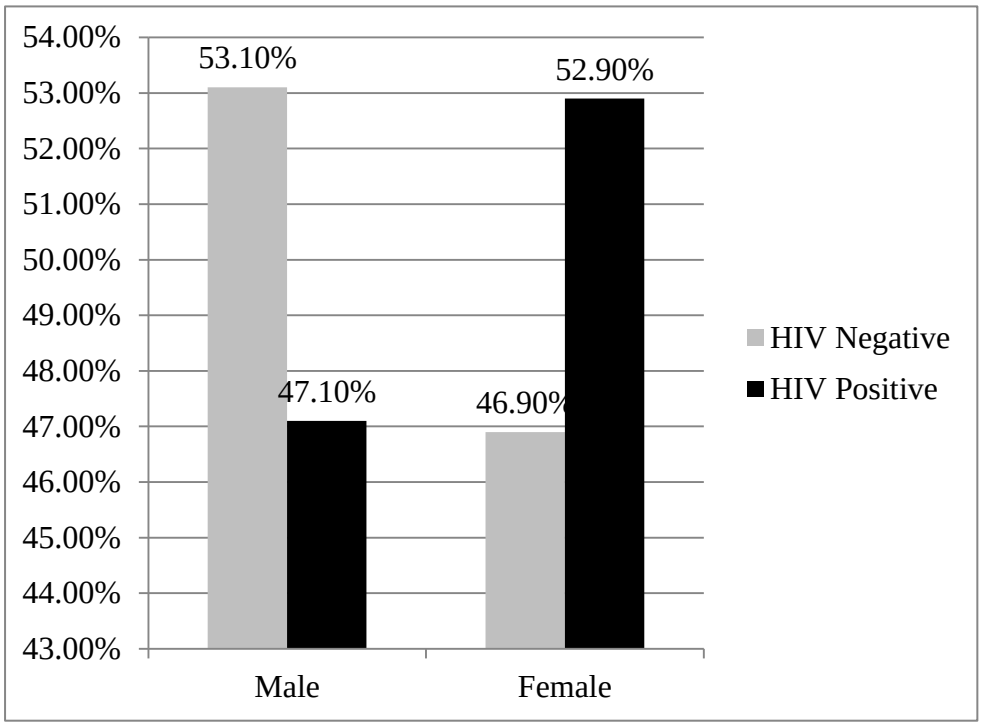
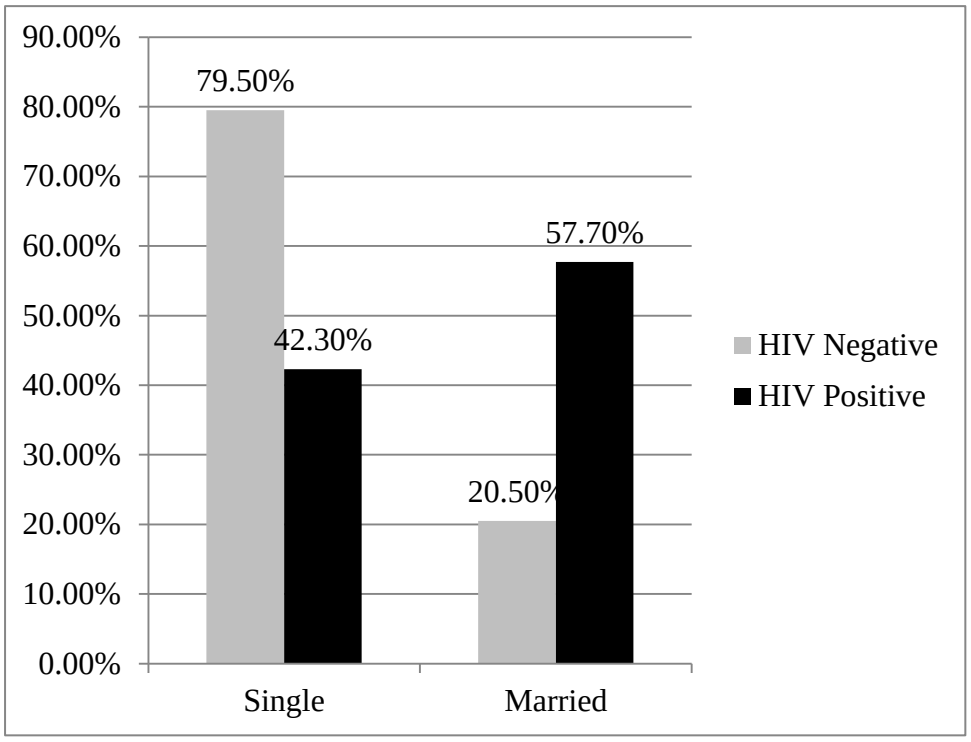
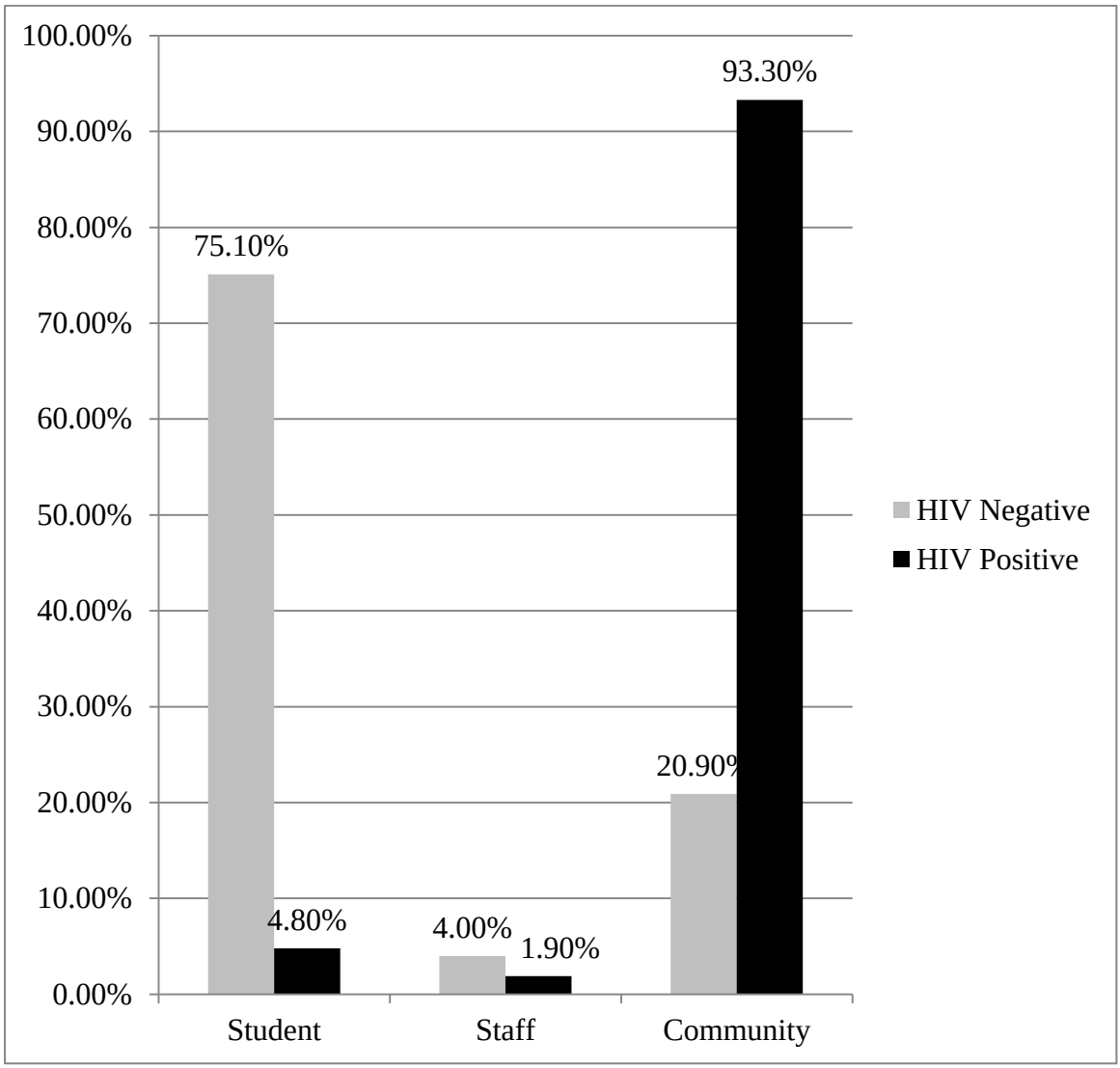


Figure 4.12: Bar Chart of HIV Status Versus Marital Status



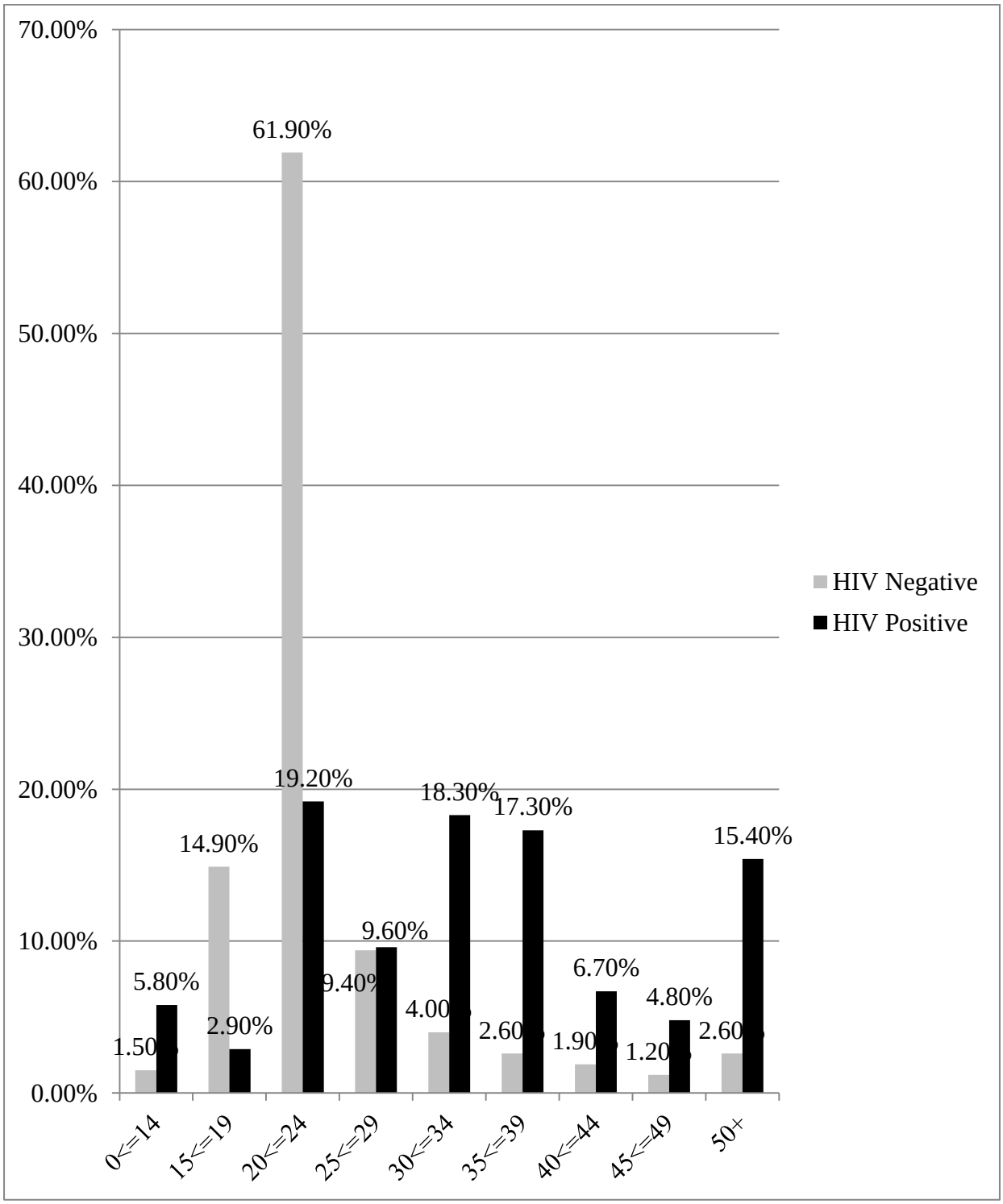
For Marital status (figure 4.12), 57.7% of all the HIV positive clients were the married people while 42.3% were the singles.

Figure 4.13: Bar Chart of HIV Status Versus 'Origin'



As shown in figure 4.13, out of all the HIV positive clients, 93.3% were the community members. Age group 20 - 24 had the highest percentage (19.2%) of HIV positive clients as shown in figure 4.14.

Figure 4.14: Bar Chart of HIV Status Versus Age Group



4.2 TEST OF HYPOTHESIS

From table 4.10, only gender was insignificant at 5% significant level. This implied that TB, marital status and origin had significant association with HIV/AIDS.

Results from the output indicated that there was strong association between TB and HIV/AIDS, therefore null hypothesis was rejected, testing at 5% significance level. HIV appeared to be the most potent known risk factor for reactivation of latent TB. In addition, TB is the most common opportunistic infection (OI) among HIV-infected individuals, and co-infected individuals are at high risk of death. TB may occur at any stage of HIV disease and is frequently the first recognized presentation of underlying HIV infection.

HIV/AIDS prevalence was the same in both gender, therefore the null hypothesis was not rejected at 5% significance level. There was no statistical significant difference between the frequencies of HIV positive clients in gender. This could be explained by equal access to education and employment which make women less dependent on male partners.

Marital status had a p-value less than 0.05 testing at 5% significance level, therefore the null hypothesis was rejected. Married people may contract HIV through committing unsafe sexual intercourse.

“Origin” had a p-value of 0.000 which was less than 0.05 testing at 5% significance level. From these results the null hypothesis was rejected. In line with these findings, out of all HIV positive clients 93.3% were the community members while only 1.9% and 4.8% were the staff and students respectively. Students have sufficient information concerning HIV/AIDS and hence they are able to protect themselves from the epidemic. Further, students and their teachers have considerable knowledge about HIV/AIDS, presumably derived from many different information sources. They have high level of understanding of the consequences of HIV/AIDS, practices seeming to be more risky, mode of transmission and prevention, and the provision of primary care of individuals with HIV/AIDS.

Table 4.10: Test of Hypothesis using Chi-square

			HIV status of the client		Total	p-value
			Negative	Positive		
TB	Negative	Count	2214	9	2223	
		Expected Count	2130.5	92.5	2223.0	
	Positive	Count	182	95	277	.000
		Expected Count	265.5	11.5	277.0	
Gender	Male	Count	1273	49	1322	
		Expected Count	1267.0	55.0	1322.0	
	Female	Count	1123	55	1178	.229
		Expected Count	1129.0	49.0	1178.0	
Marital Status	Single	Count	1906	44	1950	
		Expected Count	1868.9	81.1	1950.0	
	Couple	Count	490	60	550	.000
		Expected Count	527.1	22.9	550.0	
Origin	Student	Count	1799	5	1804	
		Expected Count	1729.0	75.0	1804.0	
	Staff	Count	96	2	98	
		Expected Count	93.9	4.1	98.0	.000
	Community	Count	501	97	598	
		Expected Count	573.1	24.9	598.0	

As shown in table 4.11, it was evident that there was strong association between age and HIV/AIDS prevalence. From appendix 4, age group 20-24 had the highest percentage (19.2%) of HIV positive clients. The study by Fontanet (1998) and Weiss, Whelan and Gupta (2009) affirmed that highest prevalence of HIV was observed in the young age group 15-24. Since youth are usually sexually active and unmarried, they are at high risk. These risks include psychological and behavioral reasons. Biological and social reasons could also explain these risks.

Table 4.11*:* Test of Association Between Age Group and HIV/AIDS

			HIV status of the client		Total	p-value
			Negative	Positive		
Age Group	0<=14	Count	36	6	42	.000
		Expected Count	40.3	1.7	42.0	
	15<=19	Count	357	3	360	
		Expected Count	345.0	15.0	360.0	
	20<=24	Count	1482	20	1502	
		Expected Count	1439.5	62.5	1502.0	
	25<=29	Count	225	10	235	
		Expected Count	225.2	9.8	235.0	
	30<=34	Count	97	19	116	
		Expected Count	111.2	4.8	116.0	
	35<=39	Count	63	18	81	
		Expected Count	77.6	3.4	81.0	
	40<=44	Count	45	7	52	
		Expected Count	49.8	2.2	52.0	
	45<=49	Count	29	5	34	
		Expected Count	32.6	1.4	34.0	
	50+	Count	62	16	78	
		Expected Count	74.8	3.2	78.0	

4.3 ODD RATIO TEST

In this subsection, the output of the odds ratio was employed to determine whether a particular variable was a risk factor for being HIV positive, and to compare their magnitude. Study of key independent variables was done at 5% level of significance where the wald test confirmed only gender and age group 25 – 29 were insignificant.

As confirmed earlier from table 4.10, there was strong association between TB and HIV status. Further interest was to find out the magnitude of the association. From odds ratio table (table 4.12), TB positive clients were 128.407 times more likely to be HIV positive than the TB negative clients. Females were 1.272 times more likely to be HIV positive than the males but the wald test was not statistically significant at 5% significance level.

Married people were 5.304 time more likely to be HIV positive than the single clients. This value was statistically significance with a p-value of 0.000. In line with the descriptive table (appendix 4), of all HIV positive clients, 57.7% were the married people while 42.3% were the singles.

Staffs were 7.496 times more likely to be HIV positive than the students while the Maseno community members were 69.662 times more likely to be HIV positive than the students. Setting staff to be the reference group, students were 0.133 times less likely to be HIV positive than the staff while the Maseno community members were 9.293 more likely to be HIV positive than the staff.

Setting age group 15-19 as the reference group, age group 40 – 44 was at the highest risk of being HIV positive with an odds ratio of 34.000. Age group 20 -24 was 30.710 times more likely to be HIV positive than age group 15 -19. From descriptive statistics table (appendix 4) age group 20-24 had the highest frequency of HIV positive clients. These results confirmed that the young age (20-24) was at high risk of contracting HIV/AIDS.

Table 4.12: Odd Ratio Test

		B	S.E.	Wald	df	Sig.	Exp(B)
TB	Negative	-	-	-	-	-	-
	Positive	4.855	.357	184.765	1	.000*	128.407
Gender	Male	-	-	-	-	-	-
	Female	.241	.201	1.441	1	.230	1.272
Marital Status	Single	-	-	-	-	-	-
	Couple	1.669	.205	66.348	1	.000*	5.304
	Student	-	-	-	-	-	-
Origin	Staff	2.014	.843	5.707	1	.017*	7.496
	Community	4.244	.461	84.603	1	.000*	69.662
	Staff	-	-	-	-	-	-
Origin	Student	0.032	.161	3.7541	1	.002*	.133
	Community	2.229	.723	9.508	1	.000*	9.293
	0<=14	2.987	.728	16.820	1	.000*	19.833
	15<=19	-	-	-	-	-	-
	20<=24	3.425	.644	28.276	1	.000*	30.710
Age-Group	25<=29	.474	.622	.580	1	.446	1.606
	30<=34	1.666	.664	6.297	1	.012*	5.289
	35<=39	3.149	.632	24.846	1	.000*	23.309
	40<=44	3.526	.638	30.511	1	.000*	34.000
	45<=49	2.918	.708	16.993	1	.000*	18.511
	50+	3.021	.755	15.997	1	.000*	20.517

*Number of Obs =2502, - = Reference group, Exp (B) computed from Step Wise logistic regression analysis. * Significant association at p <.05. Exp (B) :< 1=negative association. Exp (B) :> 1=positive association.*

4.4 LOGISTIC REGRESSION

4.4.10 Diagnostic Tests for Multinomial Logit

4.4.11 Pairwise Correlation

Potential multicollinearity among explanatory variables was tested in a preliminary analysis where it was found not to have any influence on estimates from the model. The highest pair-wise correlation was 0.6056 between TB status and origin (student, staff and community resident). There was a negative correlation between age group and gender with a coefficient value of -0.0737. TB and gender also had a negative correlation with a coefficient value of -0.0114. Multicollinearity is a serious problem if pair-wise correlation among regressors is in excess of 0.7 (Gujarati, 2004).

Table 4.13: Pairwise Correlation at 5% Significance Level

		TB_STATUS	GENDER	MARITAL STATUS	ORIGIN	AGE_GP
TB_STATUS		1.0000				
GENDER		-0.0114	1.0000			
	p-value	**0.5696**				
MARITAL STATUS		0.2928	0.0084	1.0000		
	p-value	**0.0000**	**0.6739**			
ORIGIN		0.6056	0.0069	0.2181	1.0000	
	p-value	**0.0000**	**0.7304**	**0.0000**		
AGE_GP		0.3713	-0.0737	0.2798	0.4868	1.0000
	p-value	**0.0000**	**0.0002**	**0.0000**	**0.0000**	

4.4.12: Analysis of Variance Inflation Factor

Analysis of variance inflation factor (VIF) did not show any problem since none of the VIF of a variable exceeded 8 (Greene, 2002). In addition a Bruesch-Pagan/ Cook-Weisberge test for heteroscedasticity indicated a chi-square of 64.09 and P-value 0.8633 indicating that heteroscedasticity was not a problem.

Table 4.14: Analysis of variance inflation factor (VIF**)**

Model	**Collinearity Statistics**
	VIF
TB status of the client	1.654
Gender of the client	1.009
married or single	1.136
Student, Staff or a community member	1.807
Age Group of the client	1.383

4.4.13: Measures of Variability

Nagelkerke's R^2 measures how much variability in the dependent variable the predictors account for. Of the 5 independent variables entered into the model, 3 of them were found to be significant predictors at 10% significance level while the 2 were not. The *Nagelkerke's* R^2 in this model was found to be 0.542, which meant that the 5 predictors could explain about 54% of the variation in HIV status of the client. Since *Nagelkerke's* R^2 values above 40% are considered high, this model could therefore explain a lot of the variation in the dependent variable. In other words, we can predict, to a great degree, HIV status of the clients using the 5 independent variables. The remaining unexplained variation in HIV status could be attributed to the error term in the regression equation.

Table 4.15: Measures of Variability

Step1	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
	433.394	.159	.542

4.4.14: Specificity test

The model had specificity value of 98.7% and sensitivity value of 30.8 %. In general the model had 95.9% of correctly classified observation which indicated a better fit of the model.

Table 4.16: Classification Table

Observed		Predicted		
		HIV status of the client		Percentage Correct
		Negative	Positive	
HIV status of the client	Negative	2365	31	98.7
	Positive	72	32	30.8
Overall Percentage				95.9

4.4.15: Reliability Test

In this study, Cronbach's alpha coefficient which is a measure of internal consistency was used to assess reliability. Although there is no set interpretation as to what is an acceptable alpha value, Robinson (1991) assert that, an alpha coefficient above 0.80 is "exemplary", in the range between 0.70 and 0.79 is "extensive", whereas coefficients in the range between 0.60 and 0.69 indicate a "moderate" level of internal consistency. However, Cronbach's alpha values are quite sensitive to the number of items in the scale. In particular, it is common to find quite low Cronbach's values when the number of items is less than ten (Pallant, 2005). Despite this, this study had reliability index of 0.62 and so it suggested acceptable levels of internal consistency

Table 4.17: Reliability Statistics

Cronbach's Alpha	N of Items
.620	6

4.5 RESULT FROM LOGISTIC REGRESSION

The full model being tested was:

Log odds of being a HIV positive (outcome) = -6.2527 + 3.95519(TB status) + 0.4645459(Gender) – 0.0473782(Marital status) + 0.5509246(Origin) + 0.087797 (Age)

From this logit model, TB status had a statistical significant coefficient testing it at 5% significance level. It had the highest coefficient of 3.95519 in comparison to the other variables. One unit increase in the number of TB positive client would result to the highest increase in the log odd of being HIV positive. Marital status had the least coefficient that would result to a very small change in the log odd of being HIV positive, it was not significant at 5% significance level.

Table 4.18: Logistic Regression STATA Output

```
Logistic regression                               Number of obs   =       2500
                                                  LR chi2(5)      =     401.17
                                                  Prob > chi2     =     0.0000
Log likelihood =  -231.9066                       Pseudo R2       =     0.4638
```

HIV_STAT	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
TB_STATU	3.95519	.545473	7.25	0.000	2.886083	5.024297
GENDER	.4645459	.2414242	1.92	0.054	-.0086369	.9377287
MARITAL_	-.0473782	.3682782	-0.13	0.898	-.7691901	.6744337
ORIGIN	.5509246	.332548	1.66	0.098	-.1008576	1.202707
AGE_GP	.0877977	.0674512	1.30	0.193	-.0444041	.2199995
_cons	-6.252788	.4610287	-13.56	0.000	-7.156388	-5.349188

4.6 MARGINAL EFFECT

Marginal effect proved that not all the independent variables predicted if the client was HIV positive. Clearly, marital status did not predict if the client was HIV positive. The null hypothesis (H_0: There is an equal chance of HIV/AIDS status for all predictor variables), was rejected.

The results found a positive and statistically significant relationship between TB status of the client and HIV/AIDS status at 5 percent significance level. A unit increase in the number of clients TB positive clients, increased the probability of being HIV/AIDS positive by 11 percent. Clearly, TB predicted client being HIV/AIDS positive. It was clear that HIV epidemic had intersected with tuberculosis (TB). Further, TB remains the principal cause of death in persons with HIV infection worldwide. Also according to Center of Diseases Control (2001), up to 70% of patients with sputum smear positive pulmonary TB were HIV infected.

There was a positive relationship between gender of the client and HIV/AIDS status at 5 percent significance level. A unit change from male to female increased the probability of being HIV/AIDS positive by 1.3 percent. This could be because cultural norms in many parts of the world encouraged men to demonstrate their masculinity by having multiple sex partners and coercing women into having sex, which increased HIV risk.

Marital status insignificantly influenced the probability of a client being HIV/AIDS positive. There was a negative relationship between marital status of the client and HIV/AIDS status at 5 percent significance level. A unit change from single to married reduced the probability of being HIV/AIDS positive by 0.132 percent. HIV/AIDS affects married people than the singles. This could be due to unfaithful marriages and failure to use protection since they consider themselves safe.

A unit increase in age of the client increased the probability of being HIV/AIDS positive by 0.25 percent. The results found a positive and statistically significant relationship between age of the client and HIV/AIDS status at 5 percent significance level. According to Weiss, Whelan and Gupta (2009), in many developing countries, the majority HIV infections occurred among individuals' aged 15-24. Also according to United Nation Chilldren's Fund (2008), about half of all new HIV infections worldwide, or approximately 6,000 per day, occurred among young people aged 15–24.

The results found a positive and statistically significant relationship between “origin” (If the client was a student, staff or community member) and HIV/AIDS status at 5 percent significance level. A unit increase in the number of clients from students to staff or community resident increased the probability of being HIV/AIDS positive by 1.5 percent. On the contrary, Ebot (2009) reported that students were at high risk HIV, considering that their bodily pleasures being strong, with a high affinity for sex since they were in the middle stage of sexual behavior, and possibly changing partners frequently.

Table 4.19: Marginal Effect STATA Output

```
. margins,dydx(*)

Average marginal effects                        Number of obs   =       2500
Model VCE    : OIM

Expression   : Pr(HIV_STAT), predict()
dy/dx w.r.t. : TB_STATU GENDER MARITAL_ ORIGIN AGE_GP
```

	dy/dx	Delta-method Std. Err.	z	P>|z|	[95% Conf.	Interval]
TB_STATU	.1106924	.0146423	7.56	0.000	.081994	.1393908
GENDER	.0130011	.0066527	1.95	0.051	-.0000379	.0260401
MARITAL_	-.001326	.0103075	-0.13	0.898	-.0215283	.0188764
ORIGIN	.0154185	.0093411	1.65	0.099	-.0028897	.0337267
AGE_GP	.0024572	.0018753	1.31	0.190	-.0012183	.0061326

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 CONCLUSION

Based on the hypothesis of this study, several conclusions were made. First, TB was significantly associated with HIV/AIDS where most HIV positive clients ended up contracting TB. TB was the most common opportunistic infection among HIV-infected individuals, and co-infected individuals were at high risk of death.

Results from this study showed that there was no statistical significant difference between the frequencies of HIV positive clients in gender. Being female or male did not necessarily keep one safe from contracting HIV/AIDS; both male and female stood at an equal chance of contracting HIV.

Marital status was associated with HIV/AIDS prevalence. The married clients had a frequency of 57.7% being HIV positive clients while the singles had 42.3% being HIV positive.

Maseno region is highly dominated by students, for this reason it was assumed that they were the most HIV infected. From this study, out of all the HIV positive clients 93.3% were community members while only 1.9% and 4.8% were staff and students respectively. This clearly showed that community members were the most HIV infected.

It was evident that there was strong association between age group and HIV/AIDS prevalence. Age group 20-24 had the highest frequency (19.2%) of HIV positive clients. Youth re usually sexually active and unmarried, they are at high risk. These risks include psychological and behavioral reasons.

5.2 RECOMMENDATIONS

Indeed, the reduction of the number of new HIV infections implied the need for a greater understanding of ‘where’ and ‘towards which populations’ efforts should be concentrated, in terms of primary and secondary prevention activities such as counseling, availability and accessibility of condoms, HIV testing, linkage to care, early antiretroviral treatment, and support. For instance in Maseno region, our findings suggested that HIV activities should be especially reinforced to TB positive clients. In addition, greater efforts should be focused on

higher risk groups such as women and people who are older than 35 years .Furthermore, young people still need more opportunities for meaningful engagement in advocacy and decision making.

To be effective, youth-led organizations and networks should be involved in all stages of development, implementation and evaluation of policies and programmes at the national, regional and global level. This includes the participation of youth representatives at the board of the global fund to fight AIDS and Tuberculosis well as the UNAIDS Programmes Coordinating Board, as well as in other relevant national, regional and global institutional mechanisms. It is essential to ensure an HIV free new generation through successful implementation of the following evidence-informed prevention strategies: youth-specific HIV and sexuality education; mass media interventions; youth-friendly rights-based sexual and reproductive health services, including use of condoms, and male circumcision.

The findings of the present study are useful in the designing of a VCT intervention programme. Given that HIV/AIDS is a stigmatized health problem due to its mode of transmission as well as its chronic, lethal and terminal characters, it is very important to design VCT related messages that would mitigate subjective feelings of HIV/AIDS-related stigma so as to decrease clients' resistance to seeking VCT services. The fact that HIV/AIDS is psychologically and physically incapacitating, requires the government to establish appropriate long term counseling mechanisms to provide continuous psychological support and care among clients who are tested for HIV and get positive results.

5.3 AREA OF FUTURE STUDY

Findings from this study support the need for in-depth analyses of HIV epidemics in every county to tailor national prevention responses. This should encourage program managers in other regions to perform such studies in their own settings.

REFERENCES

Bagley, W. (2001). Logistic regression in the medical literature: Standards for use and reporting, with particular attention to one medical domain.*Journal of Clinical Epidemiology,* 54(10), 979-985.

Barnett & Whiteside. (2012). Impact of HIV in Africa.

Bewick, C. (2005). Statistics review 14: Logistic regression. London, England: Critical Care.

Center of Diseases Control. HIV Transmission & Prevention.

Center of Diseases Control. (2001). The Global HIV and AIDS Epidemic.

Chiboola, H. (2009). HIV/AIDS in Higher Education Establishments: The University of Zambia Experience. Presentation to the ACU/University of Zambia, Africa sub-regional workshop, Lusaka.

Clark, S. (2004). Early Marriage and HIV Risks in Sub-Saharan Africa. Studies in Family Planning,35(3), pp. 149-160.

Coombe. (2009). HIV survey Report in Africa.

Cronbach, L. (1951). Coefficient alpha and internal structure of tests. *Psychometrika,*, 16,297-334.

Donegan et al. (1994). Transfusion transmission of retroviruses: Human lymphotropic virus types I and II compared with human immunodeficiency virus type 1.

Eac/Amref Lake Victoria Partnership Programme. (2010). HIV Sero-Behavioural Study in Six Universities in Kenya. East African Community.

Eberhardt, B.(2012). ISRN Ecology. Retrieved from http://dx.doi.org/doi:10.5402/2012/815016

Ebot, M. (2009). Perception of HIV/AIDS among Students at the University of Joensuu.

Fleming & Wasserheit. (2012). The contribution of other sexually transmitted diseases to sexual transmission of HIV infection. (Sexually Transmitted Infections).

Fontanet, A. L. (1998). Age- and sex-specific HIV-1 prevalence in the urban community setting of Addis Ababa, Ethiopia. AIDS: . *Official Journal of the International AIDS Society,* , 12(3), pp. 315-322.

Foundation, W. P. (2004). HIV Epidemic in Kenya.

Fylkesnes et al. (2001). Declining HIV prevalence and risk behaviours in Zambia: evidence from surveillance and population-based surveys. 15(7), 907-916.

Gardner, M. (1988). Calculating confdence intervals for relative risks (odds ratios) and standardised ratios and rates. . *British Medical Journal (Clinical Research Ed.)*, 296(6632), 1313-1316.

Garson, G. D. (2009). *http://faculty.chass.ncsu.edu/garson/PA765/logistic.htm.*

Georges. (2011). "HIV/AIDS in Haiti. An Analysis of Demographics, Lifestyle, STD Awareness, HIV Knowledge and Perception that Influence HIV Infection among Haitians..". Georgia State.

Gerald, D. F. (1999). Tuberculosis: 8. The disease in association with HIV infection. *Canadian Medical Association*, 161:47-51.

Government of Kenya. (2001). Economic Survey,. NAIROBI: Government Printer.

Greene. (2012). Econometric Analysis 7Th Edition. Pearson Education. NewYork.

Greene, W. (2002). . Econometric analysis. 4th Edn, Upper Saddle River, USA: Prentice Hall International.

Gujarati, N.(2004). Basic econometrics. 3rd Edn., New York:: McGraw-Hill Book Company.

Havlir DV, G. H. (2008). Opportunities and challenges for HIV care in overlapping HIV and TB epidemics. JAMA, 300 : 423-30.

Institute of Economic Affairs & SID Society for International Development. (2001). Kenya at the crossroads: scenarios for our future.

International Livestock Research Institute. (2003). Urban Poverty Estimates For Kenya's Provinces, Districts, Divisions and Locations.

KAIS. (2007). National AIDS/STI Control Programme. Final Report, Nairobi, NASCOP Septmber 2009. Nairobi.

Kamali, Carpenter, Whitworth, Pool, Ruberantwari, & Ojiywa. (2009). Seven year trends in HIV-1 infection rates, and changes in sexual behavior.

Katz, M. H. (1999). Multivariable analysis: A practical guide for clinicians.

Kenya National Bureau of Statistics. (2010). Kenya Demographic and Health Survey.

KNA & PSTIC (2014). 'Kenya AIDS Response Progress Report .

Kerlinger, F. N. (1986). Foundations of Behavioural Research. .New York: CBS Publishing.

Koskela, & Tikkanen. (1992). A five year follow-up study of attitudes to HIV infection among Finns.

Kothari. (2004). Research Methology-Methods and Techniques 2nd Edition.

Lonwenson R. & Whiteside. (2001). HIV/AIDS: implications for poverty reduction.

Med. (2001). AIDS--the first 20 years.

Menard. (2001). Applied logistic regression analysis (quantitative applications in the social sciences). CA: Sage Publications.

Mitchel. (1996). Assesing The Reliability and Validity Of Questionnaires.An Empirical.

Moser, C. A. (1979). Survey methods in social investigation (second ed.) New York: Basic Books.

(NACC), (2014). Kenya HIV Prevention Roadmap.

NASCOP. (1998). AIDS in Kenya: background projections, impact interventions, policy.

NASCOP.(1999). Aids in Kenya: Background, projections, impact and interventions. Nairobi.

NASCOP. (2014). KENYA HIV ESTIMATES.

NIC. (2010). Global Estimation and projection of HIV/AIDS.

Nzioka, C. (2010). The Impact of HIV/AIDS on the University of Nairobi, ADEA.

Organisations, W. H. (2012). Global Tuberculosis Report.

Organisation for Economic Co-operation . (2000). Economic Progress Report.

Pallant, J. (2005). SPSS survival manual: a step by step guide to data analysis using SPSS version 12 (2nd edition ed.). New York: Open University Press.

Peng. (2002). Logistic regression analysis and reporting. In Peng, *Understanding Statistics,* (pp. 1(1), 31-70).

Peng, L. (2002). An introduction to logistic regression analysis and reporting. *The Journal of Educational Research*, 96(1), 3-14.

Robinson, J. P. (1991). Criteria for scale selection and evaluation. New York: Academic Press.

Rugalema,Weigang and Mbwika. (1998). HIV/AIDS and the commercial agricultural sector of Kenya: impact, vulnerability, susceptibility and coping strategies.

Saunders, Phillip & Thornhil. (2003). Research Methods For Business Students.

Serlo, L. K. (1999). Attitudes of University Students towards HIV/AIDS. *J. Adv Nurs;*, 29: 463-70.

Sigot, J. A. (2008). Maseno University's Response and Current Activities on HIV/AIDS. Workshop on women in higher education and science: african universities responding to HIV/AIDS International Centre for Research in Agroforestry(ICRAF). Nairobi,Kenya.

Sonnenberg P, G. J. (2007). How soon after infection with HIV oes the risk of tuberculosis start to increase? A retrospective cohort study in South African gold miners. . 191 : 150-8.

Tabachnick, B. G. & Fidell, L. S. (2012). Using multivariate statistics (6th ed.) BOSTON.

Theodore, K. (2001). HIV/AIDS in the Caribbean: economic issues—impact and investment response.

UNAIDS. (2004). Global HIV report.

UNAIDS. (2008). Press Release.

UNAIDS. (2009). HIV EPIDEMIC REPORT.

UNAIDS. (2009). HIV/AIDS in Eastern and Southern Africa region.

UNAIDS. (2012). Global UNAIDS Report On the global AIDS epidemic.

UNAIDS/WHO. (2007). AIDS epidemic update: .

UNAIDS/WHO. (2008). Report on the Global AIDS Epidemic.

UNAIDS/WHO. (2008). AIDS epidemic update Regional Summary.

UNAIDS/WHO. (2009). AIDS Epidemic Update December 2009.

UNESCO. (2012). Yearly Report on HIV?AIDS in Africa.

United Nation Chilldren's Fund. (2008). The progress of nations. New York.

University of California. (2013). Tuberculosis and HIV.

Weiss. (1993). How does HIV cause AIDS.

Weiss, Whelan & Gupta. (2009). Vulnerability and Opportunity: Adolescents and HIV/AIDS.

WHO/UNAIDS/UNICEF. (2011). Global HIV/AIDS response: epidemic update and health.

World Bank. (1999). Effect of HIV/AIDS in Sub Sahara Africa.

World Bank. (2002). HIV/Aids Epidemic in Africa.

World Bank. (2010). Deterministic factors associted with HIV/AIDS Prevelence in Africa.

World Health Organisations, (2012). Global Tuberculosis Report.

APPENDIX

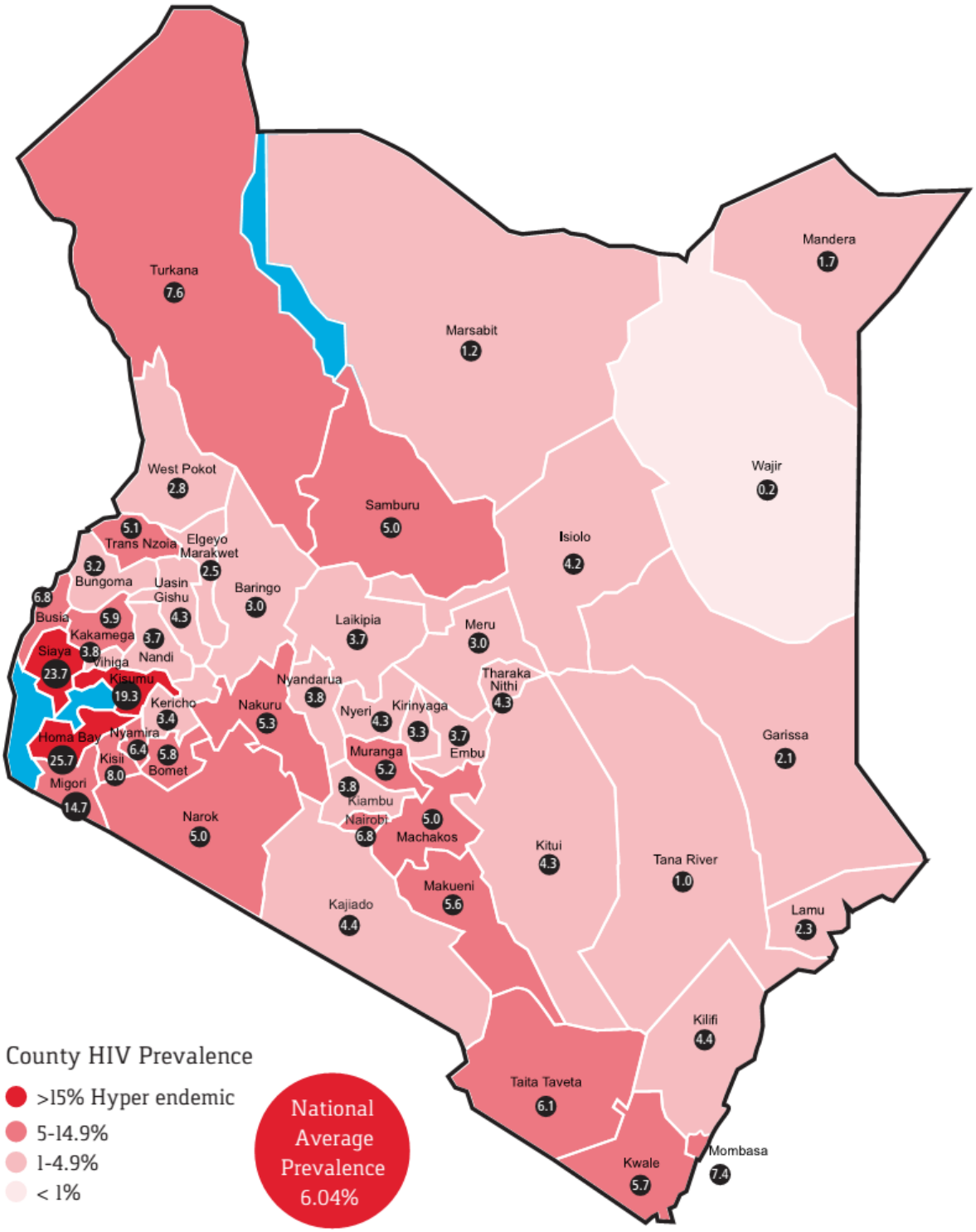
Appendix 1: Budget

	RESOURCES			
	Items	**Quantity**	**Unit Price Ksh.**	**Total Cost Ksh.**
Proposal development	Proposals	10	1,500	15,000
Proposal presentation	Sessions	1	3,000	3,000
Recruitment and training of enumerators	Enumerators	5	2,000	10,000
Field data collection	Days	10	4,000	40,000
Online articles	Journal papers	10	3,000	30,000
Report writing and printing	Report	10	2,000	20,000
Paper publication	Publication	1	40,000	40,000
Graduation	sessions	1	10,000	10,000
GRAND TOTAL COST KSH.				**168,000**

Appendix 2: Work plan

ACTIVITY	**Month**									
	1	2	3	4	5	6	7	8	9	10
Consultative Meetings										
Field data collection										
Data Entry and Cleaning										
Data analysis										
Report writing										
Report submission										
Paper publication										
Report defence										
Graduation										

Appendix 3: HIV Prevalence by County, 2013



Appendix 4: Frequency Distribution of HIV Status Across all Variables

Variable		**HIV status of the client**	
		Negative	Positive
TB status of the client	Negative	92.4%	8.7%
	Positive	7.6%	91.3%
Gender status of the client	Male	53.1%	47.1%
	Female	46.9%	52.9%
Marital status of the client	Single	79.5%	42.3%
	Married	20.5%	57.7%
Origin of the client	Student	75.1%	4.8%
	Staff	4.0%	1.9%
	Community	20.9%	93.3%
Age Group of the client	0<=14	1.5%	5.8%
	15<=19	14.9%	2.9%
	20<=24	61.9%	19.2%
	25<=29	9.4%	9.6%
	30<=34	4.0%	18.3%
	35<=39	2.6%	17.3%
	40<=44	1.9%	6.7%
	45<=49	1.2%	4.8%
	50+	2.6%	15.4%