Sentinel Surveillance of HIV

& STDs in Kenya

REPORT

2006

National AIDS and STD Control Programme (NASCOP), Ministry of Health

With support from

Centers for Disease Control and Prevention (CDC)

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ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
ANC	Antenatal Clinic
CDC	Centres for Disease Control and Prevention
CO	Clinical Officer
DASCO	District Aids/STI Co-ordinator
DBS	Dried Blood Spots
ELISA	Enzyme Linked Immuno-sorbent Assay
HIV	Human Immunodeficiency Virus
HR&IO	Health Record and Information Officer
M&E	Monitoring and Evaluation
MOH	Ministry of Health
NASCOP	National AIDS and STI Control Programme
NPHL	National Public Health Laboratory
PMTCT	Prevention of Mother to Child Transmission
RH	Reproductive Health
RPR	Rapid Plasma Reagin
STI	Sexually Transmitted Infections
VCT	Voluntary Counselling and Testing
WHO	World Health Organization

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FOREWORD

Almost two decades after the first AIDS case was described in Kenya, HIV/AIDS still remains the biggest social, economic and development challenge. This is in spite of the fact that the Government together with NGOs and development partners have continued to provide resources to stymie the epidemic and reducing its impact on the Kenyan society.

To monitor the impact of the interventions, the Ministry of Health through the National AIDS and STIs Control Programme (NASCOP) established the HIV/AIDS/STI surveillance system in 1990. Its major objective is to determine the HIV/AIDS/STI trends in the country over time.
The data provided by the surveillance system has been very useful in understanding the magnitude of the epidemic. It is through the surveillance system that major decisions on how to control the epidemic are made. For example, in 1997 data from the surveillance system showed that the HIV infection rates had increased more than two fold in a period of about six years (from 6.1% in 1990 to 11% in 1996)
This worrying trend caused the Government to launch the first comprehensive policy paper on AIDS - "Sessional Paper No. 4 on AIDS in Kenya of 1997". The paper recognizes that AIDS is no longer only a health issue but a catastrophe which cuts across all the sectors of the economy. It provides a multi-sectoral guidance on policy development, institutional organization and service delivery to respond to the epidemic more effectively. One major outcome of the sessional paper is the establishment of the AIDS Control Council (NACC) to coordinate the response to contain the HIV spread and to mitigate the impact of AIDS. The declaration of AIDS as a national disaster in 1999 added an impetus to the control effort.

From the year 2000 several sentinel surveillance sites in Kenya where HIV surveillance is conducted have shown declining HIV rates in the age group 15-49 in both the rural and urban sites. More significantly, the HIV infection rates in the age group 15-24 have also declined. This age group is important in that it is a proxy indicator for measuring new infections. These are in no doubt very encouraging trends which are a result of over a decade of sustained effort in control and prevention activities by many individuals, communities and societies. However, it is not yet time to celebrate. HIV prevalence data provides only trends of the infection over time. The observed period is still too short and we may need to observe the trends for a little longer before meaningful conclusions are made.
Nevertheless, these trends should encourage and motivate all of us to strive even harder to ensure that the downward trends we have started observing in the sentinel sites are sustained and extended to the general population.

The National AIDS/STD Control Programme conducts other surveys to supplement the sentinel surveillance data. The implementation of the Second Generation Surveillance through the Behavioural Surveillance Survey (BSS) was conducted in 2002 and the results have provided further information on the behavioural dynamics that are driving the epidemic. A population based survey (Kenya Demographic and Health Survey (KDHS) to complement the surveillance data was also conducted in 2003. The KDHS, for the first time, included HIV testing in the households and the results provided useful information on the robustness of the surveillance system.
Implementing an HIV/AIDS surveillance system is quite costly and the resources required are enormous. The surveillance system has benefited immensely from the Centres for Disease Control and I sincerely thank them for their continued support.

Dr. I. Mohammed
Head, NASCOP

EXECUTIVE SUMMARY

HIV surveillance is the collection of complete epidemiological information regarding the distribution and spread of HIV infection for planning, implementation, monitoring and evaluation of HIV/AIDS prevention and control programme activities.

In order to monitor trends in HIV infection over time and place, sero surveys are conducted at repeated intervals using consistent methodology in the same population groups. This ensures that any changes in HIV prevalence are detected.

Kenya started HIV /AIDS surveillance system in 1990 and has been implemented by the National AIDS/STD Control Programme every year.
Two population sub groups are used mainly: - women aged 15-49 attending ante natal clinics (ANC) for the first time during the current pregnancy and men and women aged 15-49 seeking medical treatment for the current episode of sexually transmitted infection (STI). The ANC clinic attendees represent the healthy, sexually active and reproductive people in the population while the STI patients represent the high risk population.
Due to its low risk nature the ANC population data is used to estimate HIV infection rate.

Several sites have been used consistently since 1990 and the information derived from the surveillance system has been used to improve the programme planning, policy development and implementation of interventions and general monitoring and evaluation of the programmes.

For the last one decade the HIV infection rates have been rising steadily from a low of 6.1% in 1990 reaching its highest peak in 2000 (13.4%).
In the year 2002, ten out of hundred pregnant women who were surveyed tested positive for the HIV virus.
Among the rural sites and district towns the proportion of pregnant women who were HIV infected varied between 3% and 26.3%. Infection rates are high among ANC clients aged between 25 and 34 years, those who live in urban or peri-urban areas, those in polygamous marriages and those with only Primary school level of education.
Although in some sites there is an upward trend, in the past two to three years (1999-2002) encouraging results have been observed in several sentinel sites which have shown declining infection rates for several years in a row.
What is even more significant is that this decline has been observed in both rural and urban sites.
More strikingly, infection rates have also been declining in the age group 15-24. This is important in that the age group represents new infections in the population.

As a result of the decline of the rates in the sites the estimated national HIV prevalence rate also dropped from 13.4% to, 6.9% in 2000 and 2006 respectively.

In the year *2006 about 1900 STI patients seeking treatment in 42 clinics during the survey period were tested for HIV and syphilis. Approximately 20% were infected with HIV and 9% were infected with syphilis indicating that patients seeking STI treatment are three times as likely to be infected with HIV as women attending ANC clinics.*

The number of AIDS cases and deaths has been rising since Anti Retroviral (ARV) drugs are only accessible to a very small proportion of Kenyans. The major implication of this is that people dying from the disease are in the age bracket 15-49 years - people of reproductive age and economically most productive.

Kenya started implementing behavioural surveillance survey (BSS) as part of the second generation surveillance system in 2002. A population based survey (Kenya Demographic and Health Survey) was also conducted in 2003. Information from these other sources supplements the sentinel surveillance data and facilitate in explaining the behaviour changes influencing the spread of HIV/AIDS in Kenya.

1.0 Background

Kenya has a population of 32 million[1] in a country of great geographic diversity, from 400 km of Indian Ocean Coastline to Lake Victoria, with the Great Rift Valley bisecting fertile highland areas and mountain areas with glaciers on the Equator. Eighty percent of the land is arid or semi-arid, and the population contains at least 42 tribal or ethnic groups including traditional pastoralists, farmers and fishermen, and an increasing trend of urbanization with significant population mixing.

The first case of AIDS was diagnosed in 1984. In 1987 an HIV/AIDS programme was established in the Ministry of Health and AIDS case reporting began[2].
In 1990 sentinel surveillance in pregnant women and patients with sexually transmitted diseases began at 13 health facilities. Most of these sites were in urban areas, so in 1994 and 1995 sites were expanded to 22 in smaller district towns and rural areas, and to 38 in 2001 and 43 in 2005 to better represent regional diversity and rural populations.

The sites represent the diverse cultural, socio-economic and regional variations within the country. Sites are selected within each province, but representation is not restricted to within the province. Sites are characterized as urban if pregnant women report that at the beginning of the pregnancy, they resided in a location characterized as urban or peri-urban by the census and as rural if they report that at the beginning of the pregnancy, they resided in a location characterized as rural. Mixed sites are those with mixed rural and urban/peri-urban populations.

Unlinked anonymous testing has been performed at these sites on an annual basis using the protocol and recommendations of WHO and later UNAIDS for sentinel surveillance. Serial recruitment of pregnant women attending their first antenatal clinic (ANC) visit of that pregnancy is conducted at the selected sites for up to 3 months or until an agreed sample size was reached. Serial recruitment of men and women with sexually transmitted diseases was also carried out at the same sites. Laboratory testing using serum left over from the antenatal profile or syphilis testing was utilized for HIV testing, though the lab protocols and specific test kits used varied over time.

The current 43 sites provide a balanced, historically valuable, and representative national sample and will be maintained as long as sites demonstrate the ability to collect adequate sentinel surveillance data. This includes collection of an appropriate sample size within a 3-month period (at least 250-300 pregnant women) and the presence of adequate clinic, lab and data management staff. The overall sample size from all sites combined in 2005 was approximately 12,800 ANC and over 1,800 STI patients.
If a single rural site cannot achieve this sample size in the time period, pairing of two similar, lower volume sites in the same geographic area may be done, as in the pairing of Turbo and Sirikwa Health Centres in Nandi and Uasin-Gishu Districts and of Wesu District Hospital and Wundanyi Health Centre in Taita Taveta District. These pairs of facilities are considered a single site from the standpoint of data analysis. Appendix 2 shows the location of sites and the recommended sample size per site.

Kenya currently has over 80 districts. It is impractical to establish a sentinel site in each district, and this would still not achieve a balanced representation of various populations (rural/urban, occupational and ethnic groups) within a district. Therefore, urban and rural populations for each district are represented by the selected sentinel sites.

[1] Central Bureau of Statistics. Analytic Reports Volume VII: Population projections 1999-2008. Ministry of Planning and National Development: 2003.
[2] National AIDS/STD Control Programme. AIDS in Kenya: 6th edition. Ministry of Health: 2002.

The assignment of sites to district populations is based on similarities in urbanization, ethnic groups, economic activity and geographic proximity. One site is assigned to represent the prevalence of the urban population of each district and one site to represent the rural population. **Appendix 3 shows the sentinel sites and the districts and populations that they represent.**

Site information will be updated on an annual basis to detect changes in staffing, services, and organization that may affect whether the staff has the ability to carry out sentinel surveillance. In the past, the availability of STI drugs in government clinics fluctuated with time and it is important to note whether these drugs were available during the sentinel surveillance period. Changes in the catchment area of the sentinel clinic or in the population attending the clinic will also be monitored to ensure that this population remains representative of the larger population or patterns of district matching. This may include migration, division of districts and building of new facilities, which may cause increases, decreases or shifts in the population attending these clinics.

New sites may be considered if data from population surveys and/or PMCT data indicate that existing sites do not adequately or appropriately represent segments of the population. Population reassignments may also be made based on new information from complementary sources. Reassignment of populations or addition of sites will require the recommendation of the Surveillance Technical Committee of NASCOP and the approval of the Director, NASCOP. This Technical Committee is appointed by the Director NASCOP and should include representatives from NASCOP Surveillance, Lab, PMCT, and STI sections, National Public Health Laboratory Services, NACC, CDC, KEMRI and others as appropriate such as the Central Bureau of Statistics, Division of Reproductive Health, University of Nairobi.

Since 2001 national policies have been developed for Voluntary Testing and Counseling for HIV infection[3] and over 748 VCT sites in health facilities or in the community are currently registered with the Ministry of Health. In 2005, over 500,000 Kenyans used VCT services to learn their HIV status and receive counseling on prevention of HIV infection and care for those infected. Cumulatively over 1.2 million Kenyans have been counseled and tested to-date.

National Guidelines on the Prevention of Mother to Child Transmission were introduced in 2002[4] and comprehensive PMCT services have now been introduced in 40% of health facilities providing pregnancy care. These policies set standards for HIV testing and counseling as a routine part of antenatal care using an "opt-out" strategy of consent for testing. Close to one million pregnant women have so far received PMCT services, though there is a national strategy to provide training to reproductive health staff to deliver these services and reach the 1.2 million women who are pregnant each year in Kenya. In 2003, thirteen of the 42 sentinel surveillance sites provided PMCT services**; in 2006 over 40 of the sites provided these services.**

At PMCT sites, pregnant women who consent are routinely tested for HIV using the nationally approved serial test *algorithm* with Determine HIV1/2 and Bio-line. If tests are discrepant, a third tiebreaker test is conducted. Post-test counseling is provided according to the national PMCT guidelines. For quality control, the National Laboratory Committee recommends simultaneous collection of a filter paper specimen to be tested at a central laboratory on a sample of tests.

[3] National AIDS/STD Control Programme. National Guidelines for Voluntary Counseling and Testing (VCT). Ministry of Health: 2001.
[4] Ministry of Health. National Guidelines for Prevention of Mother to Child HIV Transmission (PMCT). Ministry of Health: 2002.

The Kenya Demographic and Health Survey 2003(KDHS) included an HIV sero-survey in all women 15-49 and men 15-54 in half of the surveyed household[5]. The overall prevalence of HIV infection in women was 8.7%, and 4.6% in men. Socio-demographic, behavioural and HIV serological data were analyzed after identifiers were removed from the dataset. This has enabled a calibration of HIV sentinel surveillance in pregnant women with this general population estimate.

OBJECTIVES

The specific objectives of sentinel surveillance in Kenya are to:

1. Monitor the trends of HIV and syphilis infection in pregnant women at sentinel sites.
2. Estimate the burden of HIV infection in the general population nationally and the distribution by district and province, in rural and urban populations, by age group and by educational and marital status.
3. Measure the prevalence of HIV infection in men and women with sexually transmitted infections on a national level.
4. Compare and validate program data with sentinel surveillance at sites offering prevention of mother to child transmission services.
5. Disseminate and utilize the information provided by sentinel surveillance to advocate and plan for more effective services to prevent HIV infection and to care for those infected and to measure progress in achieving targets of the National HIV/AIDS Strategic Plan.

2.0 METHODOLOGY

2.1.1 Selection of sentinel populations

Sentinel surveillance was conducted in two populations in Kenya:

1. pregnant women all ages attending ANC for the first visit for that pregnant
2. men and women over age 15 with STD syndromes

Pregnant women are selected as a proxy for the general population and were used to report on indicators for the National Strategic Plan and for UNGASS. The STI clinic population is a group that has current and historic value to identify trends of HIV prevalence in higher risk men and women and to identify the associations of various STI syndromes with HIV and syphilis serologic reaction (RPR).

2.1.2 Selection of Sentinel Sites

Sites in Kenya have been selected in the expansion of sentinel surveillance described in the Background section. They represent the diverse cultural, socio-economic and regional variations within the country. Sites are selected within each province, but representation is not restricted to within the province. Sites are characterized as urban if $\geq$ 85% of the pregnant women report that at the beginning of the pregnancy, they resided in a location characterized as urban or peri-urban by the census and as rural if $\geq$ 85% of the pregnant women report that at the beginning of the pregnancy, they resided in a location characterized as rural. Mixed sites are those with mixed rural and urban/peri-urban populations (15-85% rural).

The current 44 sites provide a balanced, historically valuable, and representative national sample and will be maintained as long as sites demonstrate the ability to collect adequate sentinel surveillance data. This includes collection of an appropriate sample size within a 3-month period (at least 300-400 pregnant women) and the presence of adequate clinic, lab and data management staff. The overall sample size from all sites combined is approximately 12,800 ANC and over 1,800 STI patients.

If a single rural site cannot achieve this sample size in the time period, pairing of two similar, lower volume sites in the same geographic area may be done, as in the pairing of Turbo and Sirikwa Health

[5] Central Bureau of Statistics, Ministry of Health, Centers for Disease Control and Prevention, ORC-MACRO. Kenya Demographic and Health Survey 2003: Preliminary Report. CBS: 2003.

Centres in Nandi and Uasin-Gishu Districts and of Wesu District Hospital and Wundanyi Health Centre in Taita Taveta District. These pairs of facilities are considered a single site from the standpoint of data analysis. Appendix 2 shows the location of sites and the recommended sample size per site.

Kenya currently has over 80 districts. It is impractical to establish a sentinel site in each district, and this would still not achieve a balanced representation of various populations (rural/urban, occupational and ethnic groups) within a district. Therefore, urban and rural populations for each district are represented by the selected sentinel sites.

The assignment of sites to district populations is based on similarities in urbanization, ethnic groups, economic activity and geographic proximity. One site is assigned to represent the prevalence of the urban population of each district and one site to represent the rural population.

Site information is updated on an annual basis to detect changes in staffing, services, and organization that may affect whether the staffs have the ability to carry out sentinel surveillance. In the past, the availability of STI drugs in government clinics fluctuated with time and it is important to note whether these drugs were available during the sentinel surveillance period. Changes in the catchment area of the sentinel clinic or in the population attending the clinic will also be monitored to ensure that this population remains representative of the larger population or patterns of district matching. This may include migration, division of districts and building of new facilities, which may cause increases, decreases or shifts in the population attending these clinics.

New sites may be considered if data from population surveys and/or PMCT data indicate that existing sites do not adequately or appropriately represent segments of the population. Population reassignments may also be made based on new information from complementary sources. Reassignment of populations or addition of sites will require the recommendation of the Surveillance Technical Committee of NASCOP and the approval of the Director, NASCOP. This Technical Committee is appointed by the Director NASCOP and should include representatives from NASCOP Surveillance, Lab, PMCT, and STI sections, National Public Health Laboratory Services, NACC, CDC, KEMRI and others as appropriate (such as Central Bureau of Statistics, Division of Reproductive Health, University of Nairobi, The Futures Group). The proposed membership of this committee is included in Appendix 3.

2.1.3 Sampling methods

Sampling is done annually for three months at a time period set by NASCOP.

2.1.3.1 Duration of Sampling per Sampling Period

The maximum sampling duration is three months. If a site achieves the site-specific maximum sample size in a period less than three months, sampling will stop at that site. If a site has not achieved a minimum sample size within the three-month period for reasons beyond their control, it may be extended to ensure a minimum sample size.

2.1.3.2 Minimum Sample size per site

The minimum sample size depends on the prevalence of the area and will be determined for each site using the prevailing Epidemiological factors and the population. The standard formula for calculation of sample size for proportions is used. In smaller sites 300 is the standard, desired sample size for ANC patients; in larger sites, 400 will be the standard sample size.

2.1.3.3 Client eligibility criteria

Inclusion criteria for pregnant women attending sentinel ANC sites:

1. Pregnant women of all ages.
2. First ANC visit to the sentinel clinic for that pregnancy (or, in clinics where blood testing is done routinely on a first follow-up visit, the visit when blood testing for the antenatal profile is routinely performed).
3. During the sentinel surveillance period.
4. Residence within the catchments area of the site.

Inclusion criteria for STI patients attending sentinel STD clinics:

1. All patients with a selected STD syndrome (Urethral discharge and Genital ulcer disease) visiting the sentinel site for the first time for that episode.
2. Age 15 years and above.
3. During the sentinel surveillance period.
4. Residence within the catchments area of the site.

2.2 Data Collection

The following procedures are used for data collection for sentinel surveillance:

1. Clinic staff (antenatal nurse-midwives and STD clinicians) will collect routine demographic data on a standard "Pathological Request Form" (yellow lab request form). This form includes personal identifiers (name and health facility out-patient number) since it is the form that is returned to the clinic with laboratory results of the ANC profile (haemoglobin, RPR, malaria smear results and other tests) or STD clinic profile (RPR) to be included in the patient's confidential medical record. Data captured on this form includes: sex, year of birth, gravidity and parity (pregnant women only), rural or peri-urban/urban residence, marital status, education level, STD syndrome (STD patients only), acceptance of HIV testing and counseling (for ANC women at PMCT sites only), and the reason for the laboratory request. Since this form is used for other hospital laboratory requisitions, patients who meet the inclusion criteria for sentinel surveillance will be identified only by the statement "ANC profile" or "STD" in the reason for laboratory test.

2. In the laboratory, for patients eligible for sentinel surveillance, blood will be collected for the routine tests ordered. The ANC profile or STD laboratory tests are performed and the results recorded by the lab tech on the "Pathological Request Form". A trained laboratory technologist/technician will then transfer the demographic information (without any personal identifiers) and the syphilis laboratory test results from the "Pathological Request Form" to the sentinel surveillance "Form X" and assign a serially created sentinel surveillance identification number. This number is not placed anywhere in the patients record including on the "Pathological Request Form". This Sentinel Surveillance ID number includes: a 2-digit year code, a letter ("A" for ANC and "S" for STD, a 2-digit site code and a 3-digit serially assigned number that starts with 001 for ANC patients and 601 for STD patients. "Form X" is packaged in bound, single copy pads of 200 forms. Separate pads are used for ANC and STD patients to serve a check that numbers are correctly assigned. The "Pathological Request Form" (with the lab results of the ANC profile or RPR testing for STD patients) is promptly returned to the clinic for provision of care.

3. Leftover blood from the routine tests ordered is placed on a filter paper that will be dried and processed according to the laboratory protocol below. The sentinel surveillance ID number is placed on the filter paper. No identifying information is placed on the filter paper. No HIV

testing will be done at the site for the purpose of sentinel surveillance in order to ensure anonymity of results.

4. At PMCT clinics, routine data are collected from pregnant women for program purposes. This includes the same demographic information that is collected for sentinel surveillance, but also includes specific information relevant to PMCT issues, including information on the partner. For PMCT, pregnant women consent for HIV testing and counseling as part of their routine care. A nationally approved laboratory algorithm for HIV testing is performed, usually two HIV simple, rapid HIV tests (Determine and UniGold) performed in parallel (simultaneously) with a tie-breaker test (InstaScreen) for discrepant results. Trained nurse-midwives or counselors provide HIV test results counseling and in some cases perform the simple rapid HIV tests in the ANC. HIV test results are part of the patient's confidential medical record, with special safeguards for confidentiality. Sentinel sites that are also PMCT sites will use a modified "Form X" that will include the field site performed HIV test results from those that consent for HIV testing.

2.3 Blood Sample Collection and Laboratory Testing

Past methods for laboratory testing for HIV for sentinel surveillance have changed as new technologies have been developed. Initial testing in the early- and mid-1990s involved storage of serum at sites, transport by NASCOP officers to the NPHLS, and testing using available machine-read ELISA tests. From 1997 through 2003 a single rapid test was performed in the field by lab techs at the sites. In 1997 through 2000 the Immunocomb HIV1/2 test without central lab validation. Immunocomb is subject to both false positive (2-4%) and false negative (~1%) results and is relatively rapid but not simple, with 9 steps taking approximately 2 hours. In 2001 the UniGold HIV1 test, a simple rapid with high specificity and sensitivity was used. In 2002 and 2003 a single rapid test was performed on site and results reported on "Form X". Validation of 10% of field-negative and all field HIV-positive tests was performed on stored serum samples using Vironistika 4th generation ELISA and a battery of other tests (Enzygnost 3rd generation machine-read ELISA, Determine HIV1/2, UniGold HIV1, and Capillus HIV1/2 for discrepant results. In 2004 and 2005 testing was performed centrally using the same methodology as was used for validation previously.

Results of this validation have been mixed, with some sites performing very well and others having discrepant results at unacceptable levels. A high proportion of specimens (one-fourth or higher) have been grossly haemolysed. Some sites have intermittent electricity, poorly functioning refrigerators, or inadequate freezer space. As a result, serum storage at sites has been inconsistent; resulting in extended and/or repeated thaws and validation test results may be compromised by specimen quality issues.

Many facilities, especially the rural health centers, may have only one or two lab techs to perform all lab tests. In the past these same lab techs performed both the routine lab work and the on-site HIV testing for sentinel surveillance. Usually this is done in a batch with a refrigerated or frozen serum specimen a day or two after collection in order that the linkage with the identity of the person tested is reduced. This is, however, a potential ethical problem. For this reason, and because of the specimen quality issues when stored serum is used, this proposal will do no sentinel surveillance testing on site and will use dried blood spots. Dried blood spots have improved specimen quality and therefore test results, since they tolerate room temperature for up to 30 days in most Kenyan environments or refrigerated storage for up to six months. This also ensures the ethical requirement that a separate person conduct the routine laboratory testing and HIV results testing in unlinked anonymous testing. This is not a

problem for HIV testing for PMCT, since it is done with consent and is confidential rather than anonymous.

Dried blood spots (DBS) have already been used successfully for HIV testing in Kenya. DBS are collected from every tenth VCT client (previously every fifth) and no errors have been detected in the first 3000 validation tests comparing the results of parallel rapid tests at VCT Centres with central lab DBS testing. PMCT also has initiated this quality assurance testing. In over 6300 dried blood spots collected in the KDHS, less than 10 specimens were spoiled and could not be tested, and only 2 results were indeterminate.

2.3.0 Procedures used for DBS specimen collection and storage:

1. On leftover blood from routine testing (antenatal profile or RPR testing), approximately 2 drops of blood was placed on each of the 5 spots on a standard filter paper.
2. The Sentinel Surveillance ID number was placed on the filter paper and on the Form X.
3. DBS was placed in a drying rack in a ventilated storage box, and was dried overnight in a dry warm place.
4. When the specimen is sufficiently dried, the filter paper DBS was placed in an individual, non-permeable plastic bag with desiccant and humidity indicator strip. These individual bags were at placed in a larger zip lock bag. This was stored in a secure location and may be at room temperature for up to 3 weeks (if temperature is under 35^{o} C), or either at 4^{o} to 8^{o} C or at -20^{o} C if duration of these conditions cannot be made for on-site storage.
5. Specimens was transported to NASCOP by supervisory staff

Laboratory testing was conducted in the National Public Health Laboratory Services according to the standard protocol for DBS analysis.

1. After placing a 6mm DBS in a cryovial and eluting overnight, Vironistika HIV1/2 ELISA was run.
2. All positive results and 10% of HIV negative results were tested with Murex HIV1/2 using the appropriate methods.
3. All discrepant results were considered to be negative.
4. Remaining DBS will be stored at -70^{o} C for possible testing with incidence assays or future studies.

2.4 Data Entry, Storage and Analysis

The following procedure was used for data entry, storage and analysis:

1 A trained medical records officer or lab tech (in sites without a separate records officer) maintains completed "Form X" pads in a secure location. Data is transferred to a "Summary Form X" for central data entry and processing.

2 Data entry was performed centrally at NASCOP by single entry with manual data checks.

3 HIV laboratory data was entered at National Reference Laboratory and at NASCOP. Sentinel Surveillance ID number (from filter paper); date run, optical density, cut-off and result for each ELISA test; and final HIV result (positive, negative, indeterminate, or missing).

4 Data was cleaned and merged and preliminary analysis performed by NASCOP.

5 Reporting of preliminary results will first be to the Sentinel Surveillance Technical Working Group for initial interpretation of results and for preparation of a national projection. A report of this analysis was then made to the annual meeting of the Surveillance Advisory Group, which includes national and international experts, to reach consensus on interpretation of results.

2.5 Measures to Protect Anonymity

Anonymity of sentinel surveillance clients was essential. Since no testing for sentinel surveillance was performed on site and no personal identifiers are included either the lab or demographic database, the clinical and laboratory staff at facilities will not be able to identify any patient's results. Data security measures were added to this protection.

2.6 Training of Sentinel Surveillance Staff

Sentinel staff, including one nurse-midwife, one STI clinical officer, one lab tech, and one medical records staff from each of the 43 sites have been trained each year for sentinel surveillance. Approximately one-third of these staff has taken this training more than once, but the result is that over 400 health facility staff has been trained in sentinel surveillance. For the last four years, the DASCO from each district with one or more sentinel sites have also been trained in this integrated 5 day training. Eight PASCOs have also been trained in sentinel surveillance. Training has utilized both didactic and skill-based training techniques.

The change to using DBS required additional training for more than one lab tech per site.

2.6.0 Training activities:

1. NASCOP staff developed a training schedule and identified individuals at each site to be trained. Special attention was made for training all of the lab staff and regarding proper handling of the dried blood spots (at least 2 per sentinel site).
2. NASCOP staff and PASCOs, participated in a 4-day training of trainers to standardize training methods and materials.
3. Training was conducted for an estimated 360 health workers in a 4 or 5 day course.

2.7 Supervision:

1. Primary facility supervision was conducted by DASCOs through at least 2 preparatory visits and twice monthly supervisory visits to all sites.
2. NASCOP staff and PASCOs provided at least monthly technical supervision to collect data forms and DBS from each site, identify and find solutions for any problems at the sites.
3. An on-site orientation was given at each site, including a continuing education session on sentinel surveillance for all facility staff. Feedback on prior year site performance and final results was provided in one supervisory visit. One laboratory staff person and a surveillance programme officer participated in the supervisory visits.

CHAPTER THREE

3.0 RESULTS OF THE SENTINEL SERO-SURVEILLANCE SURVEY 2006

3.1 Background Characteristics of the ANC respondents

A total of 12,801 pregnant women attending antenatal care (ANC attendees) at selected 43 health facilities in the country were recruited into the sentinel sample.

3.2 Place of residence

The sentinel sites were selected from both urban and rural areas in the country. There were 12,801 pregnant women that were recruited, and out of those 5364 (41.9%) and 7,397 (57.8%) were residing in the urban and rural areas respectively, 40 (0.3%) did not record residence. These proportions when compared with the previous years were found to be slightly different.

3.3 Age distribution

Age is an important background characteristic of respondents because it is central to most of the analysis and is crucial in the design of HIV/AIDS strategy and interventions. Twelve thousand seven hundred fifty four (99.7%) respondents had their ages recorded; age was missing for forty one (0.3%) pregnant women. Table 1: gives an age distribution of the respondents in 2006. About 55% of the respondents were young women aged 15-24 years.

Table 1: Distribution of ANC respondents by age group 2006

AGE GROUP	FREQUENCY	PERCENTAGE
10-14	70	0.5
15-19	2,447	19.2
20-24	4,588	36.0
25-29	3,108	24.4
30-34	1,659	13.0
35-39	693	5.4
40-44	178	1.4
45+	17	0.1
Missing	41	0.3
Total	12801	100

3.4 Educational status

The ANC respondents were asked whether they had been to school or not. In the survey, five categories were envisaged: no formal education, primary, secondary, and collage. The responses to this question are summarized in table 2. The majority of the respondents (90.2%) reported to have received formal education and only 9.7% had not, while 8 (0.1%) had not recorded their education status. The educational level categories below indicate that most ANC respondents had attained primary level of education 7,253 (56.7%) secondary and college education recorded 3,657 (28.6%), 775 (6.1%) respectively while the no formal education had 1,108 (9.7%).

Table 2: Distribution of ANC respondents by educational level, 2006

Education	Frequency	Percent
None	1,108	9.7%
Primary	7,253	56.7%
Secondary	3,657	28.6%
College	775	6.1%
Missing	8	0.1%
Total	12801	100.0%

3.5Marital status

In 2005 sentinel surveillance survey, five categories were used; divorced/separated, monogamous, polygamous single and widowed. Of the 12801 pregnant women recruited into the 2006 HIV sentinel surveillance survey, monogamous accounted for 10,147 (79.3%), followed by single 1,461 (11.4%), while polygamous, divorced/separated, and widowed recorded 1,076(8.4%), 66 (0.5%) and 30 (0.2%) respectively. 21 clients did not their marital status as shown in table 6.

Table 3: Distribution of ANC respondents by marital status -2006

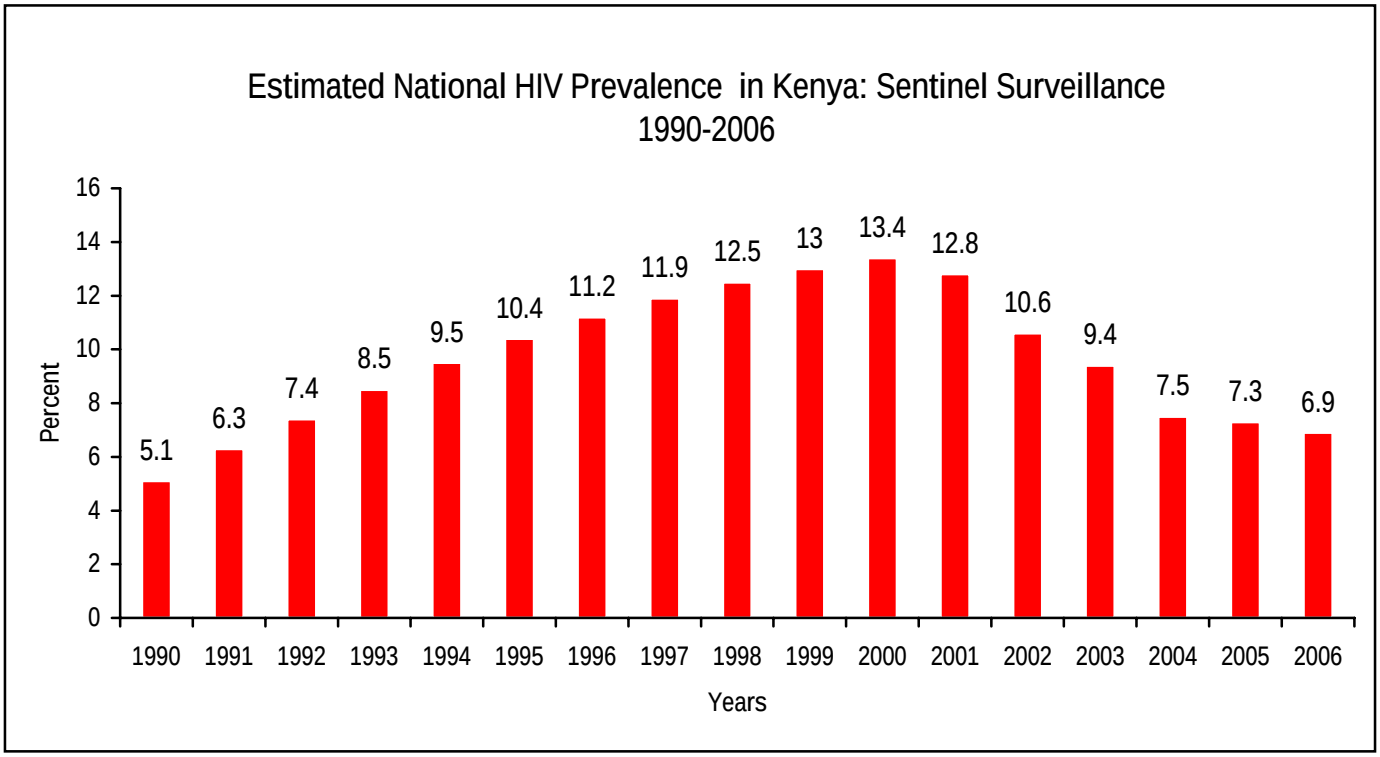
MARITALSTATUS	FREQUENCY	PERCENT
Single	1461	11.4%
Monogamous	10,147	79.3%
Polygamous	1,076	8.4%
Divorced/Separated	66	0.5%
Widowed	30	0.2%
Missing	21	0.2%
Total	12801	100.0%

3.6 HIV PREVALENCE AND TRENDS

This section describes the current HIV sero-prevalence as well as the demographic variations in HIV infection rates among pregnant women attending antenatal care clinics (ANC respondents).

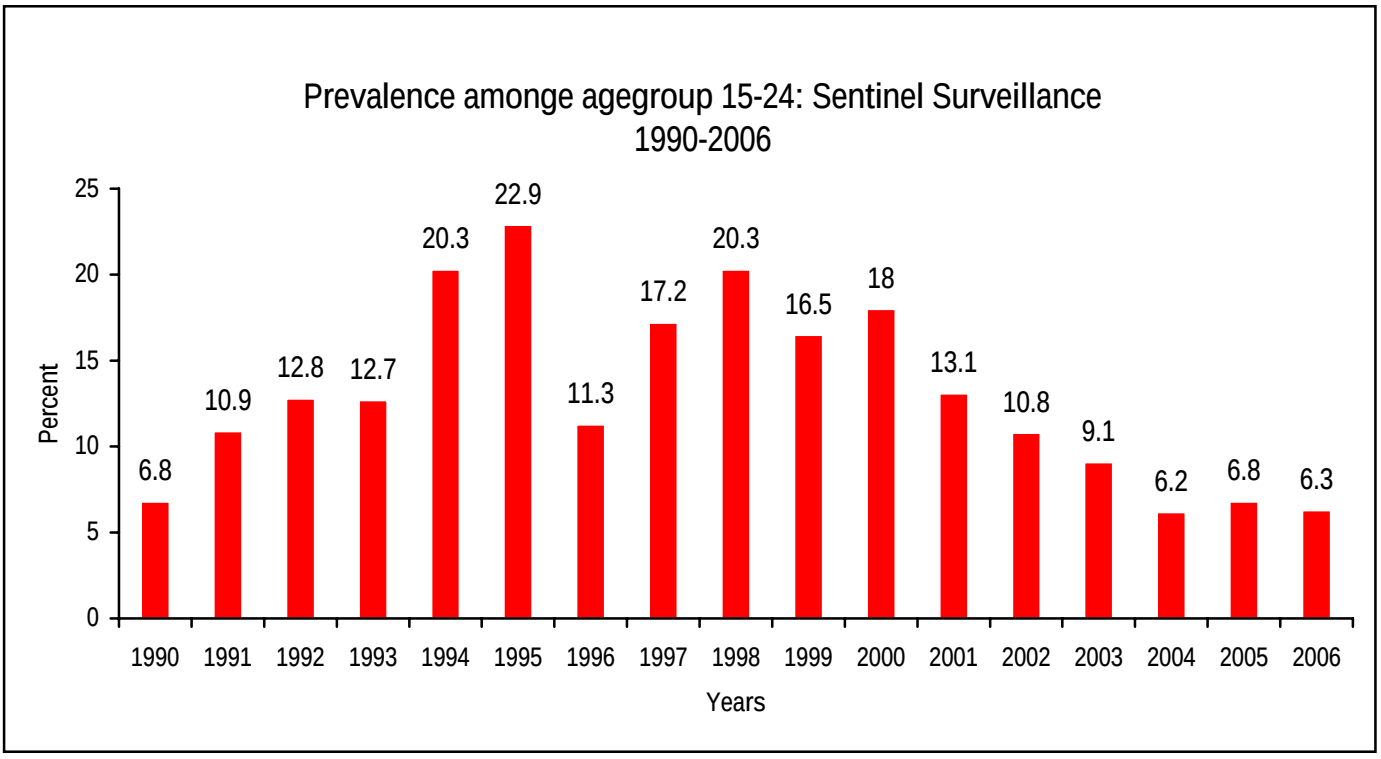
3.6.0 National HIV Prevalence

Figure 1: HIV infection trends among ANC respondents in Kenya 1990-2006



The graph indicates a steady increase in HIV prevalence since 1990(5%) to 2000 when the epidemic reached its peak (13.4%). Prevalence has since declined to 6.9% in the year 2006 and the 95% confidence limit for this was between 6.9%- 7.8%.

Figure 2:Prevalence amonge agegroup 15-24: Sentinel Surveillance 1990-2006



The age group 15 to 24 years is used as an impact assessment indicator for establishing infection rate amongst the young population and monitoring achievements towards United Nations General Assembly Special Session on HIV/AIDS (UNGASS) targets. The HIV prevalence amongst this group was 6.3% (2006).

Table 4: HIV Prevalence by Residence

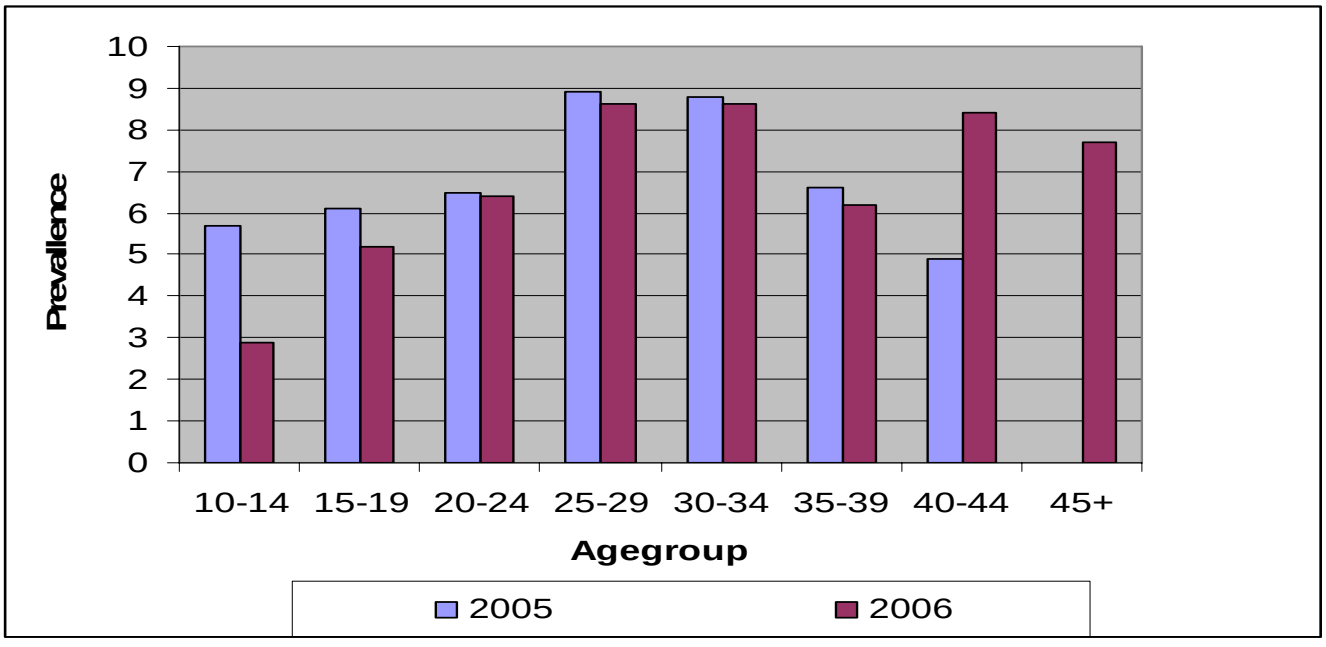
Residence	Frequency HIV+(2006)	Percent HIV+ 2005 (2005)
Rural	412/7397	5.9% (6.3%)
Urban/peri-urban	458/5364	9.3% (8.7%)
Missing	2/40	5.3% (12.2%)

The HIV prevalence rates for urban is higher compared rural as indicated in table. There was reduction of 0.6% in urban while rural reduced by 0.6%.

3.6.2 HIV Prevalence by age and residence

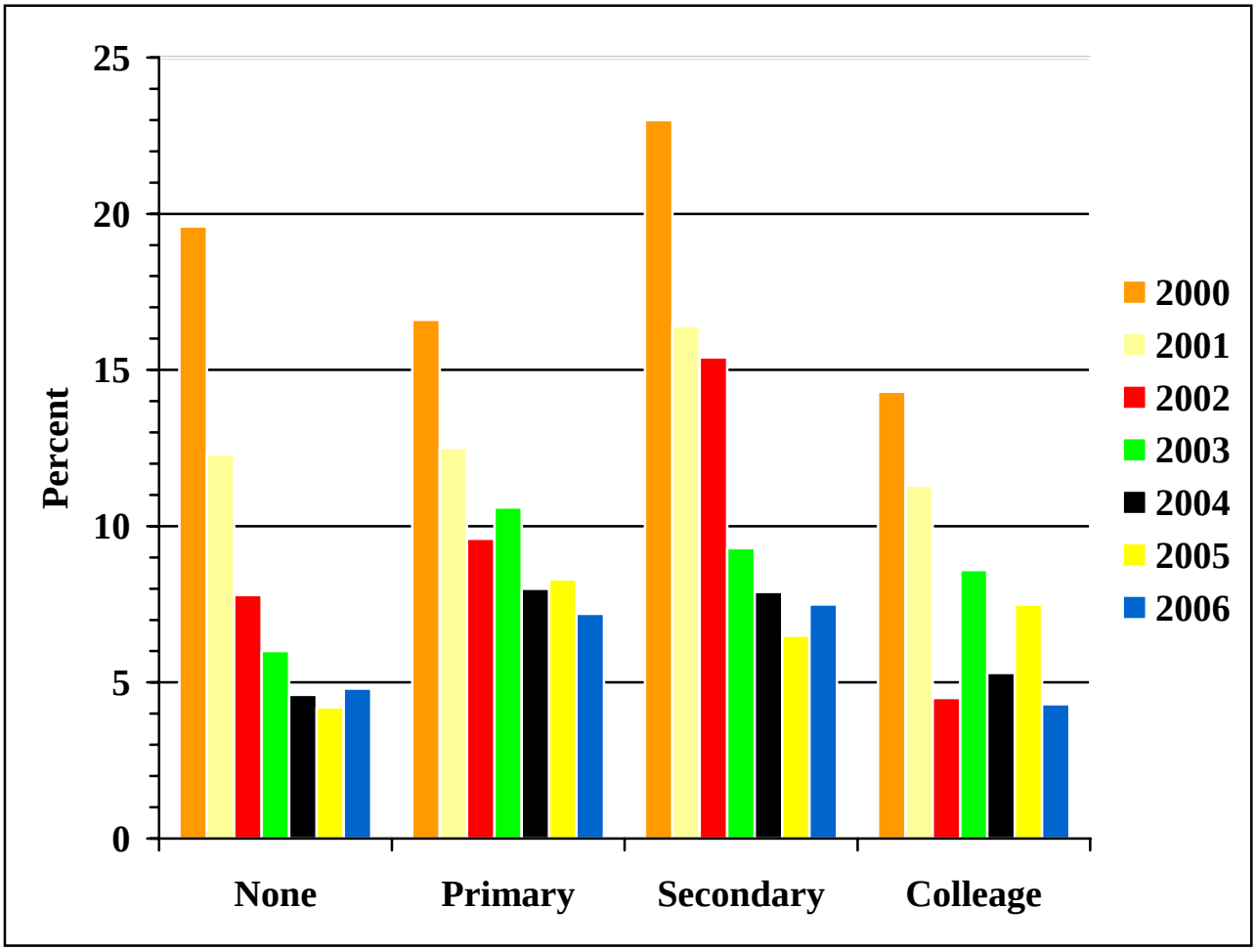
The age specific HIV prevalence rates for 2005 and 2006 among ANC respondents were analyzed and are indicated in **figure 2** below.

Figure 3: HIV prevalence among ANC client by age group and year



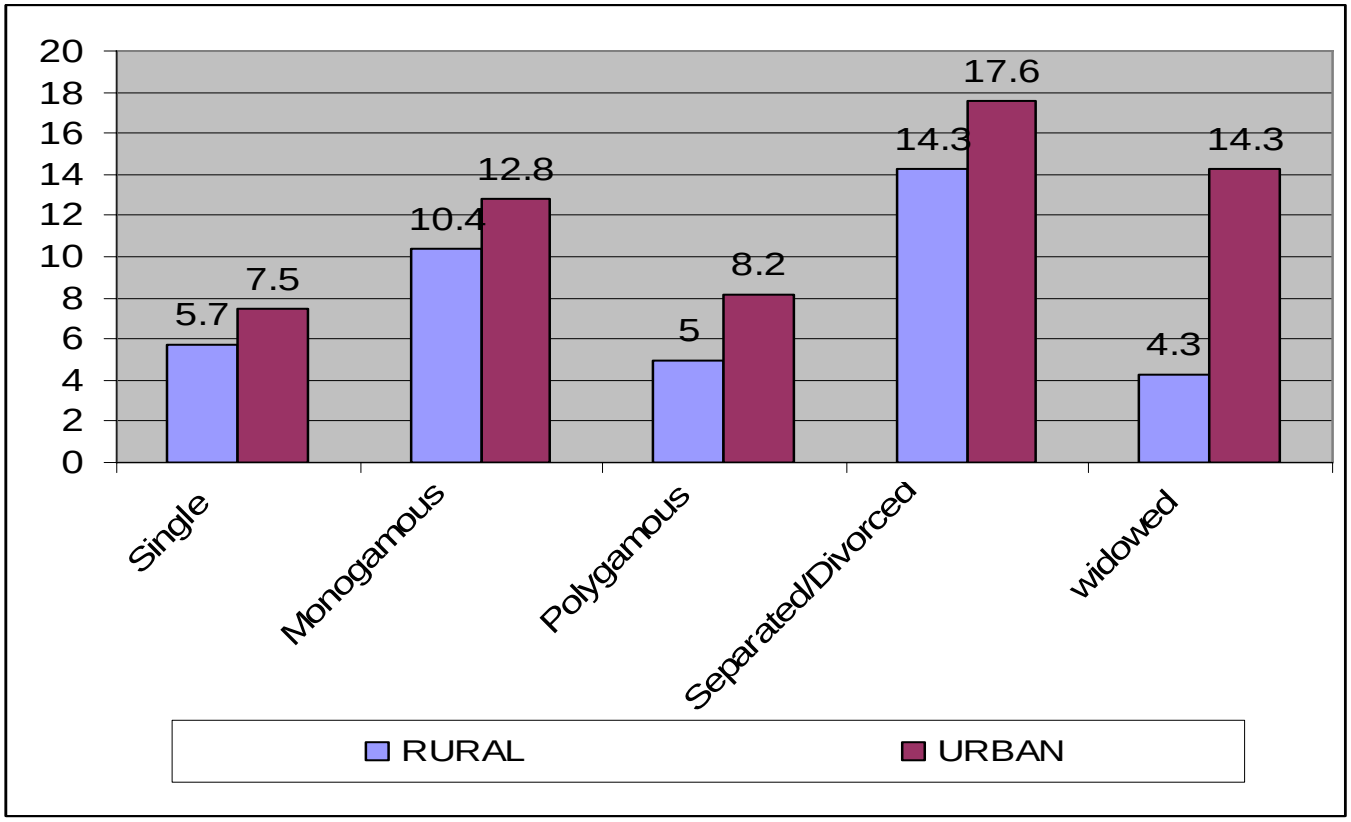
3.6.3 HIV Prevalence by Level of Education

Figure 4: HIV prevalence by of education status, 2000 - 2006



Based on 2006 SS data, women with College level of education are least infected with HIV as compared to women with Primary, Secondary or no education.

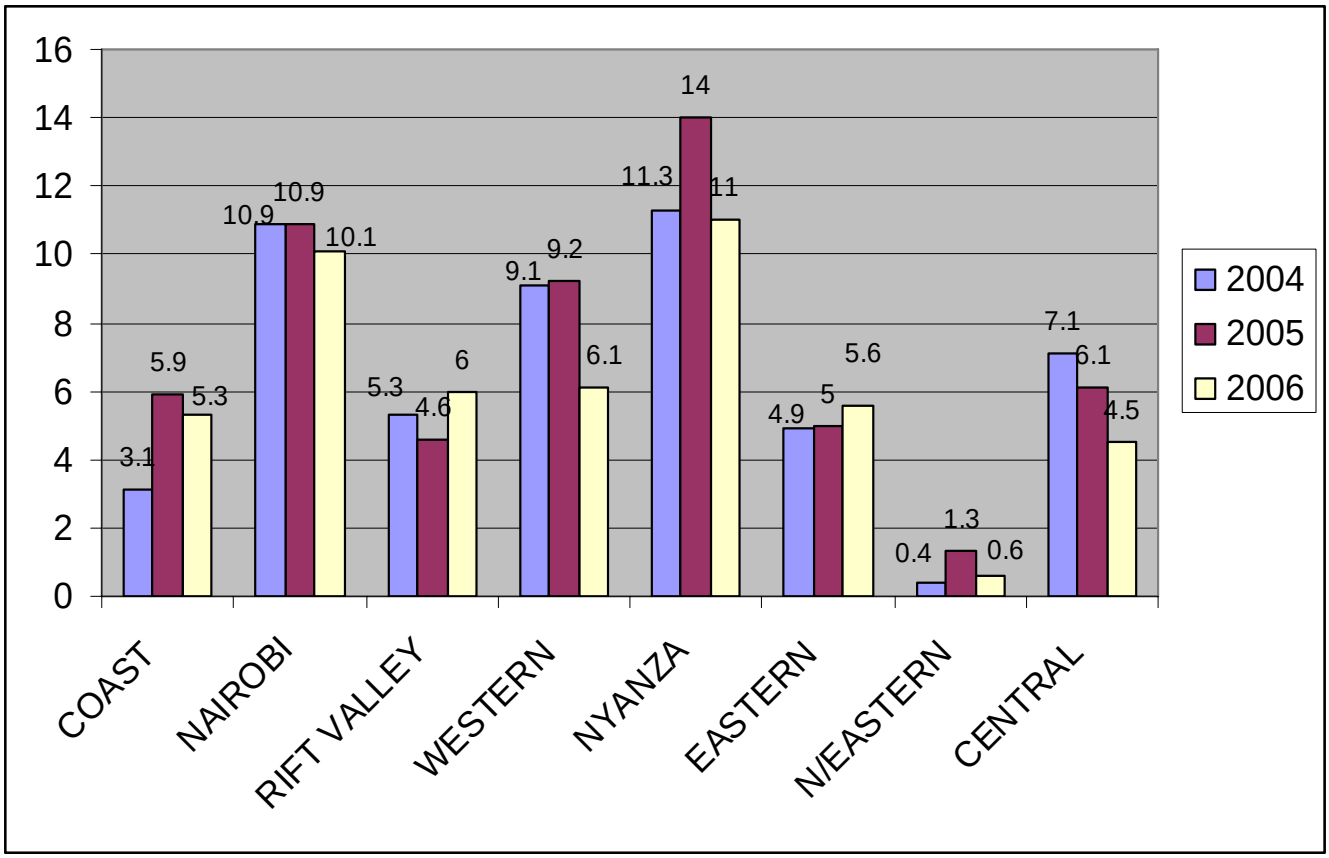
Figure 5: HIV Prevalence among ANC clients by marital status and residence-2006



Women in a single or monogamous relationship and are in urban areas are more likely to be HIV infected as compared to those in the rural areas. Separated/Divorced and widowed had higher prevalence However; this could be due to small sample sizes.

3.6.5 Provincial HIV Prevalence

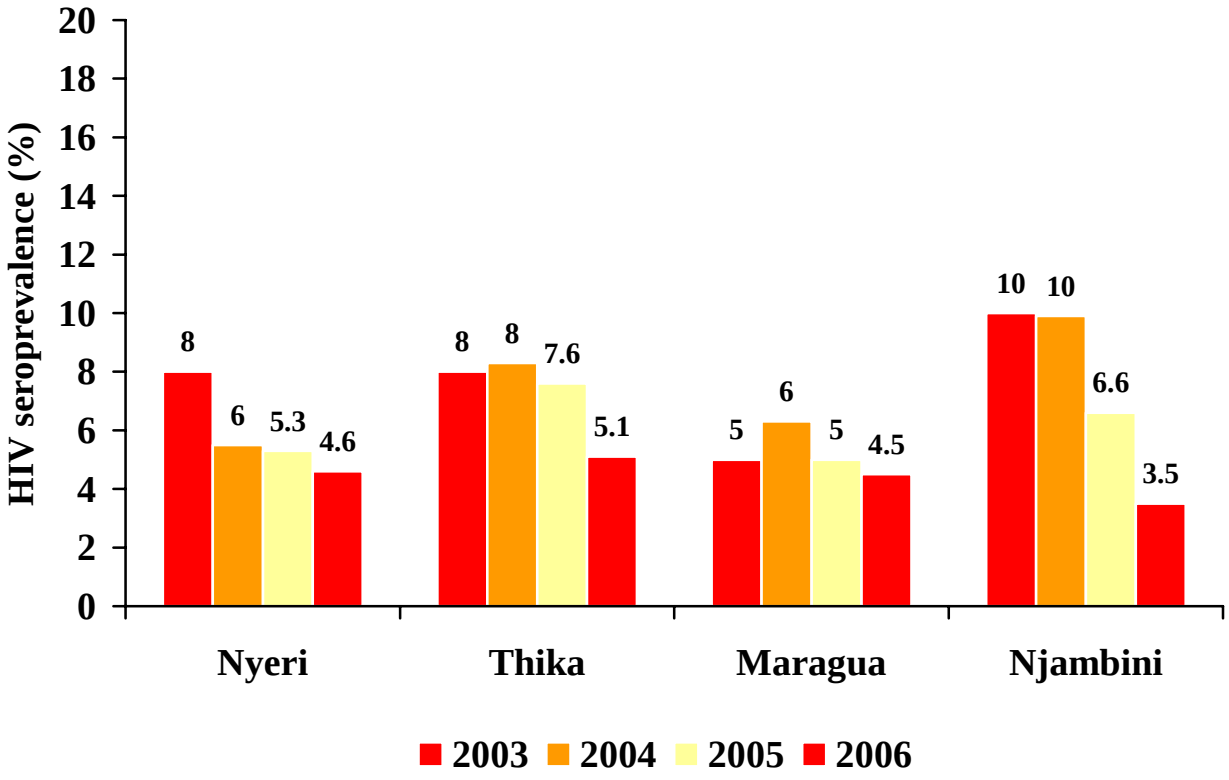
Figure 6: HIV Prevalence by Province. 2004-2005-2006



Six Province had decline in prevalence except Rift valley and Eastern which an increase. In 2006 Nyanza Province recorded the highest with 11% followed by Nairobi, Western and Central with 10.1%, 6.1% and 4.5% respectively while North Eastern had the lowest with 0.6%.

3.6.6 HIV Prevalence of sites in Central Province

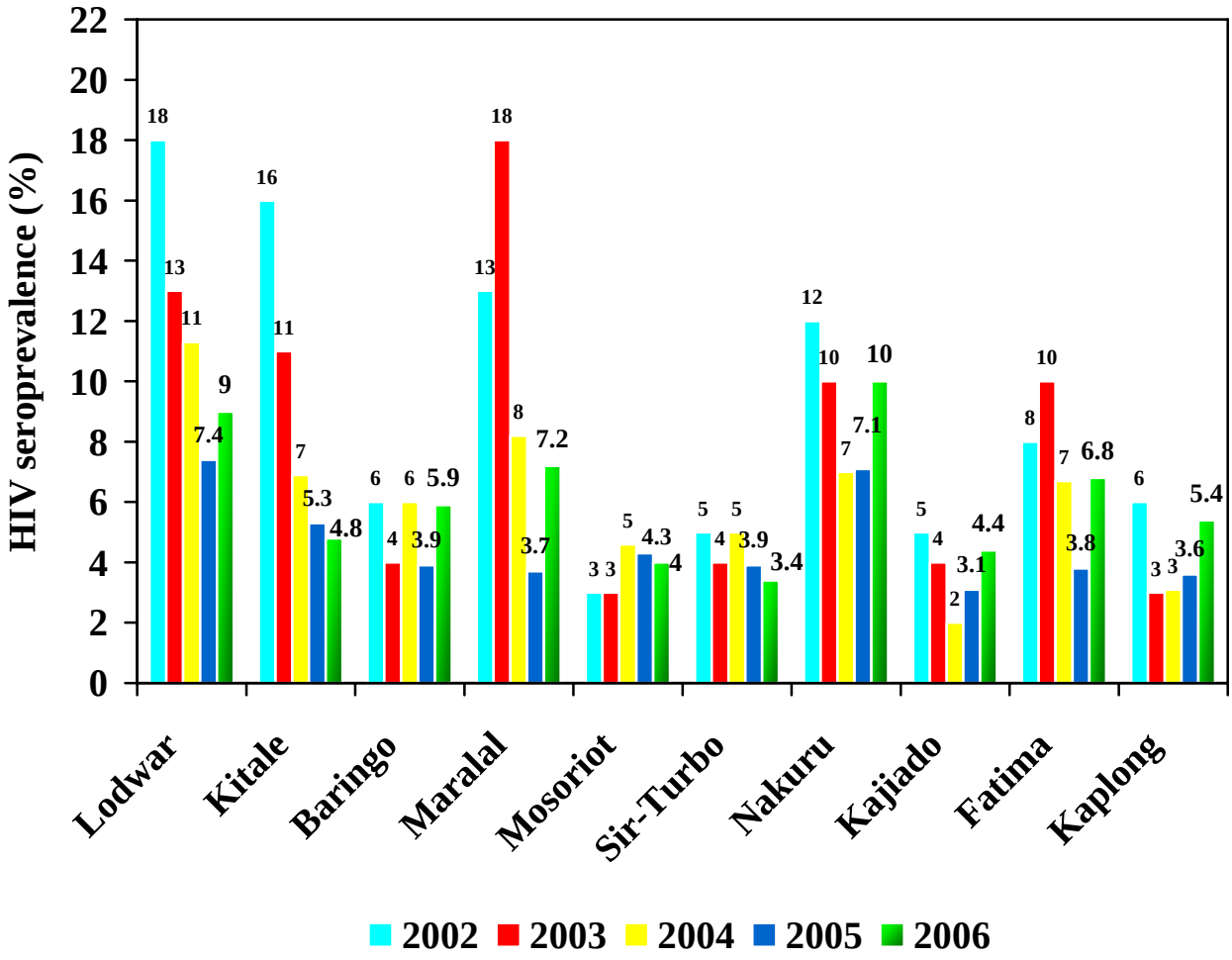
Figure 7: HIV Prevalence by sites in Central Province 2003 - 2006



The figure shows that site in this province are showing a decline in prevalence. In the year 2005 Thika had the highest prevalence (5.1%) followed by Nyeri i with 4.6%. Maragua and Njabin with 4.5% and 3.5% respectively.

3.6.7 HIV Prevalence of sites in Rift valley Province

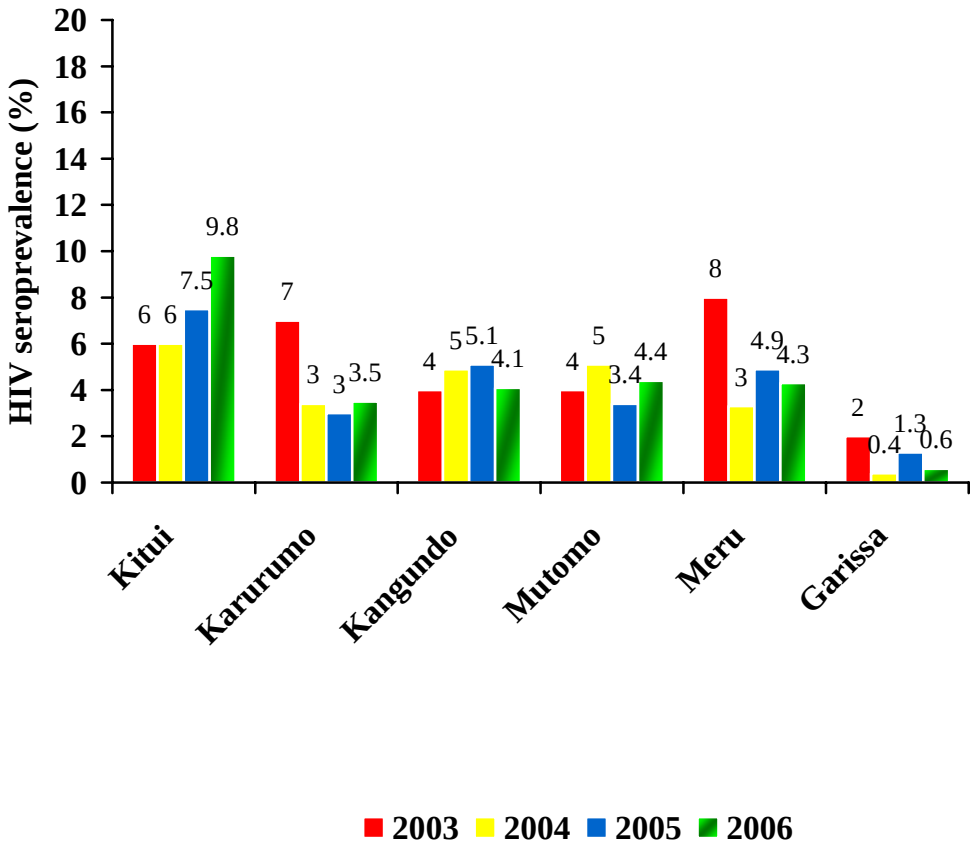
Figure 8: HIV Prevalence by sites in Rift valley Province 2002 - 2006



Rift valley is the largest province in the country and has the highest number of sentinel sites in this survey. Most the sites in this province recorded a increase in 2006 except Kitale, Mosoriot and Sirikwa/Turbo with decline prevalence in 2006.

3.6.8 HIV Prevalence of sites in Eastern and North Eastern Province

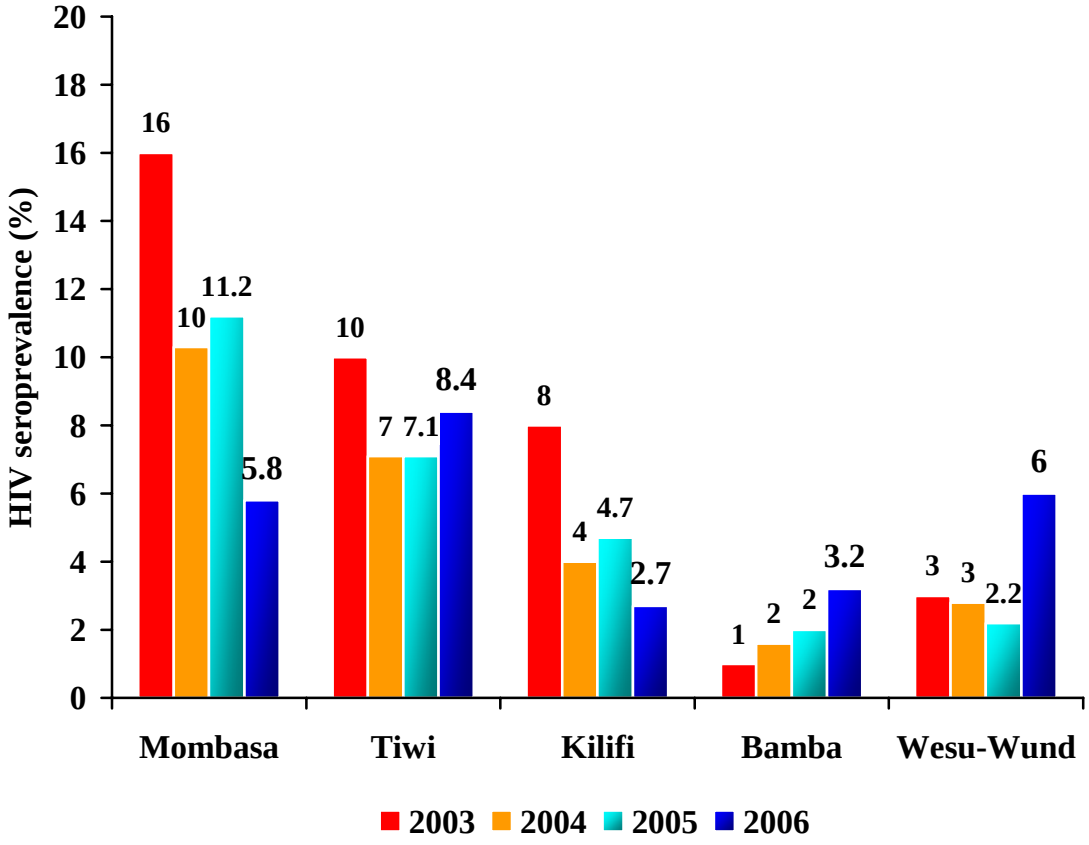
Figure 9: HIV Prevalence by sites in Eastern and North Eastern Province 2002 - 2006



Eastern province is the second largest province with five sites while North Eastern province is the third with one site which Garissa with a prevalence of 0.6% (2006). Kitui and Mutomo recorded an increase 9.8% and 4.4 (2006) respectively.

3.6.9 HIV Prevalence of sites in Coast Province

Figure 10: HIV Prevalence by sites in Coast Province 2003 - 2006



In coast province Tiwi which is rural site had the highest prevalence with 8.4% (2006). The least was recorded by Kilifi 2.7% for 2006. The sites with an increase in prevalence are Tiwi, Bamba and Wesu-Wundanyi.

3.6.10 HIV Prevalence of sites in Western Province

Figure 11: HIV Prevalence by sites in Western Province 2002 - 2006

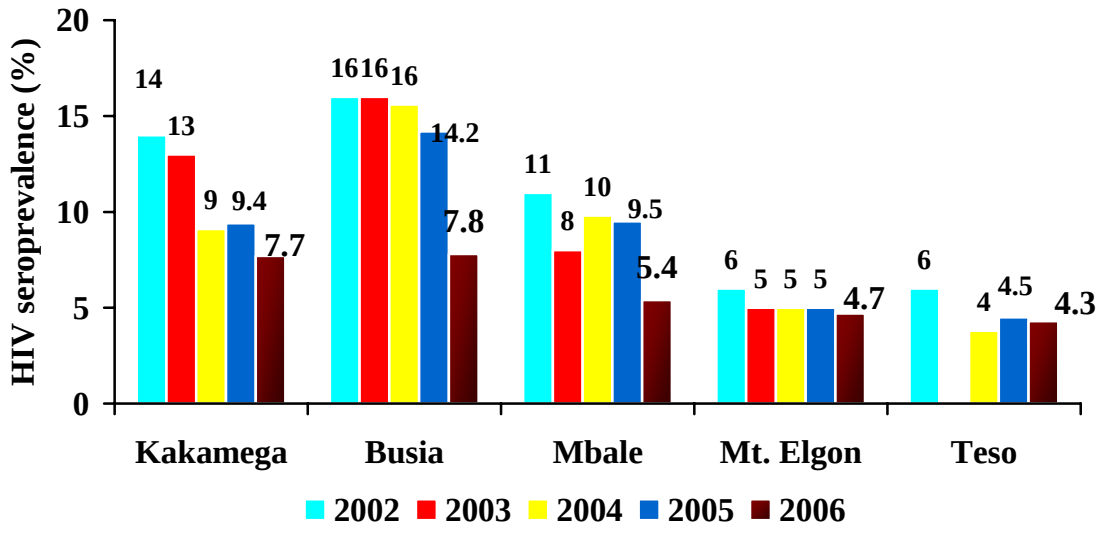
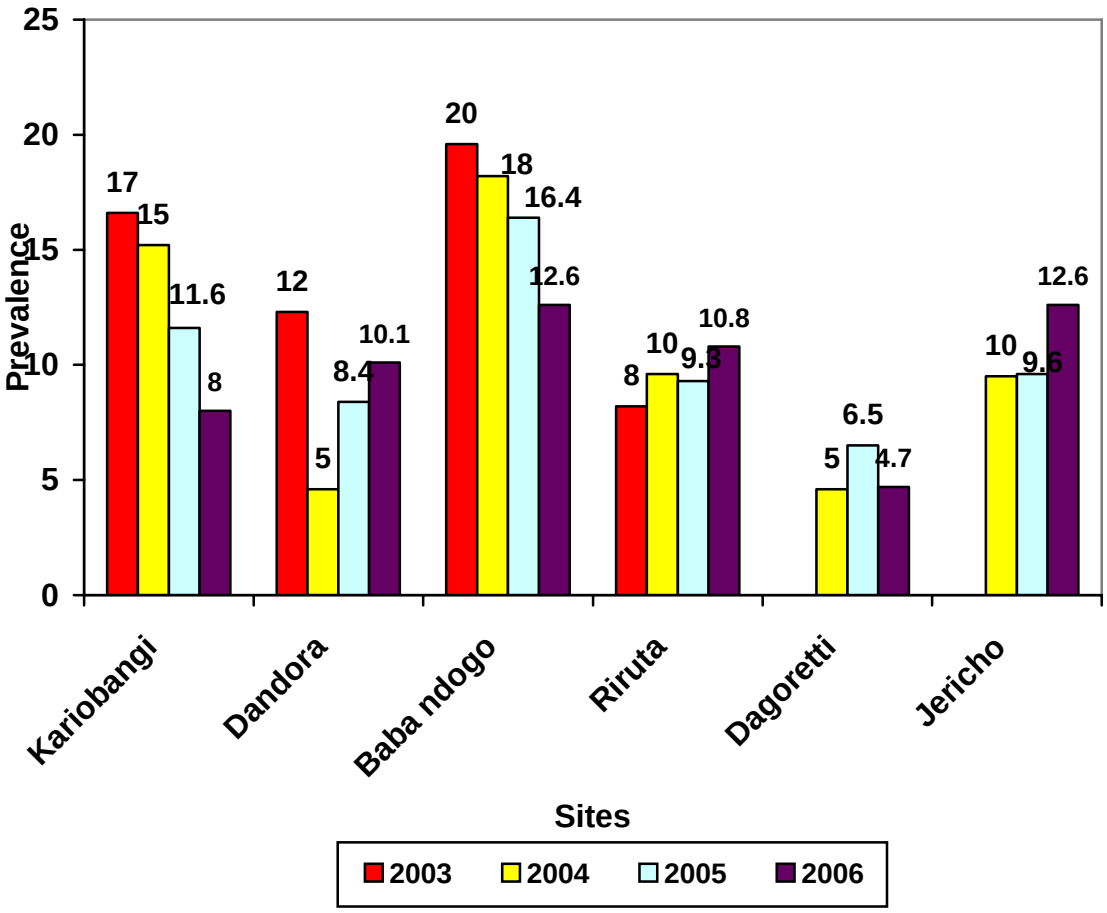


Figure 12 indicates the sites in Western province. After stabilizing for three years Busia is finally showing a decline. Mt. Elgon recorded stabilizing trend while Kakamega and Teso registered a decline trend.

3.6.11 HIV Prevalence of sites in Nairobi Province

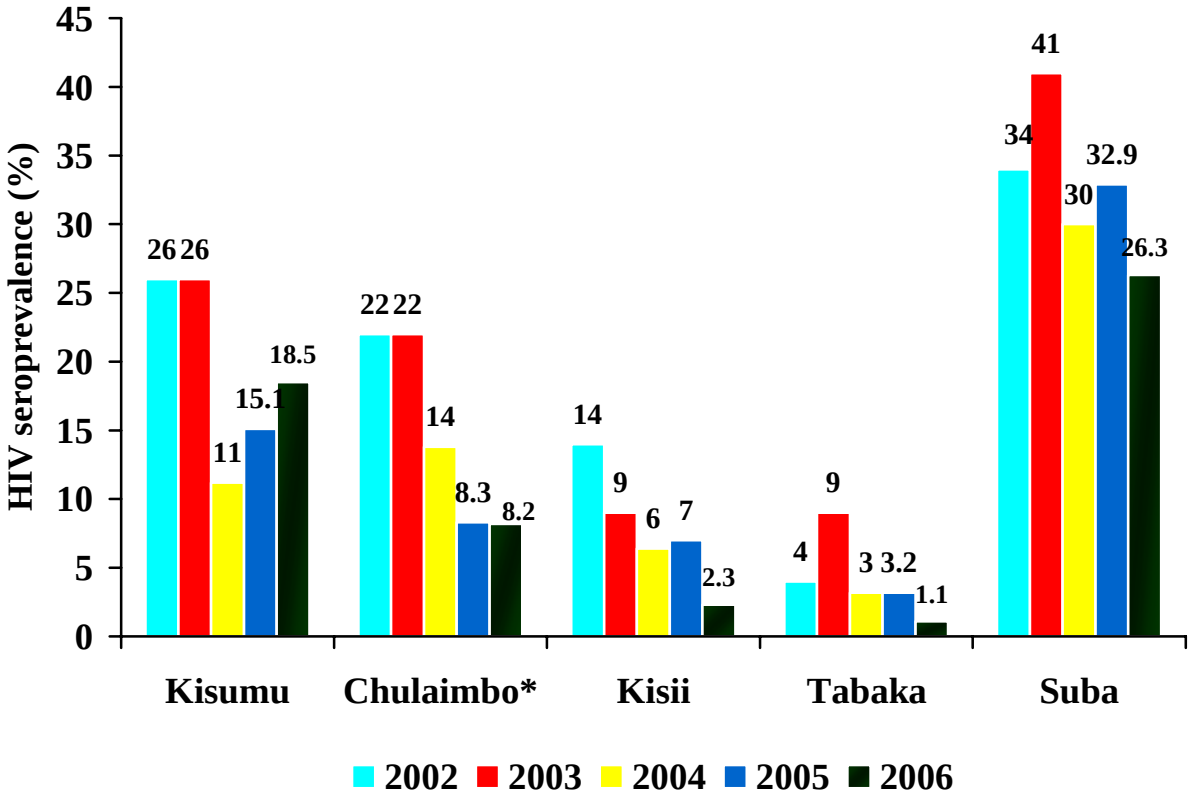
Figure 12: HIV Prevalence by sites in Nairobi Province 2003 - 2006



Nairobi province is the only province where all sites are urban. Kariobangi and Baba Dogo registered decline for the last three year while Dandora, Riruta and Jericho recorded an increase in 2006.

3.6.12 HIV Prevalence of sites in Nyanza Province

Figure 13: HIV Prevalence by sites in Nyanza Province 2002 - 2006



Nyanza province is the most affected province by HIV/AIDS with an estimated 30% of the national burden. Suba remains the highest prevalence site with HIV prevalence of 26.3% (2006) followed by Kisumu with 18.5% (2006) and is the only site with an increase in prevalence. The rest of the site recorded a decline.

3.7.0 Background Characteristics of the STD respondents

The total number of patients attending STI Clinic recruited into the sentinel sample at selected 43 health facilities in the country was 1,840.

3.7.1 Place of Residence

All sites selected in this survey were from both urban and rural areas in the country. 1,840 STD patient were recruited in this exercise and out of those 609 (33.1%) and 1,199 (65.2%) were residing in the urban and rural areas respectively. 32 (1.7%) did not record residence.

3.7.2 Age distribution

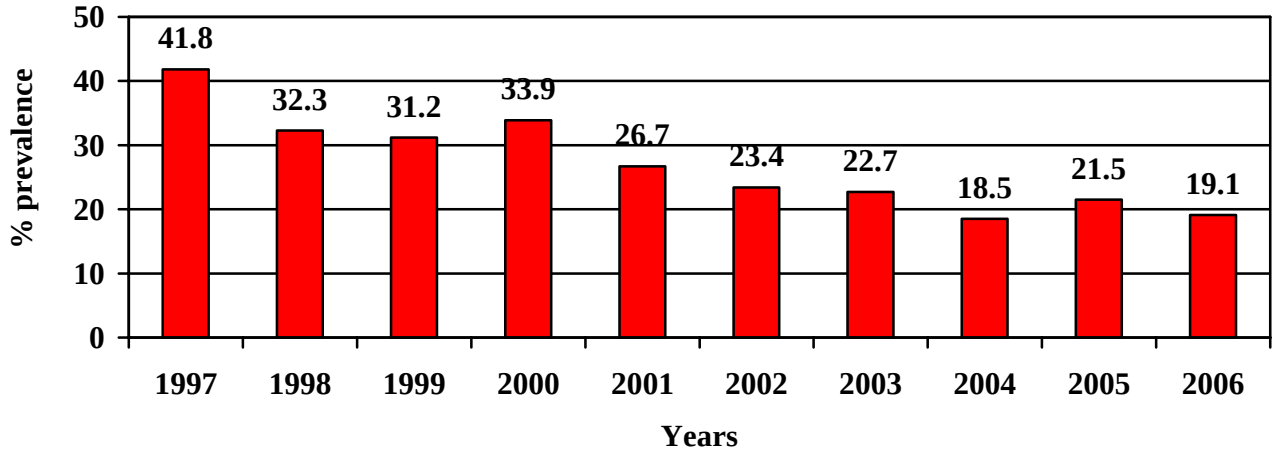
Age is an important background characteristic of respondents. One thousand eight hundred and ten patients had their age recorded and age was missing for thirty (1.6%) STD patients.

Table 5: Distribution of STD respondents by age group 2006

Age Group	Frequency	Percentage
Missing	30	1.6
10-14	0	0.0
15-19	198	10.8
20-24	450	24.5
25-29	457	24.8
30-34	305	16.6
35-39	190	10.3
40-44	107	5.8
45-70	103	5.6
Total	1,840	100.0

3.7.3 PREVALENCE OF HIV AMONG STD PATIENTS BETWEEN 1997-2006

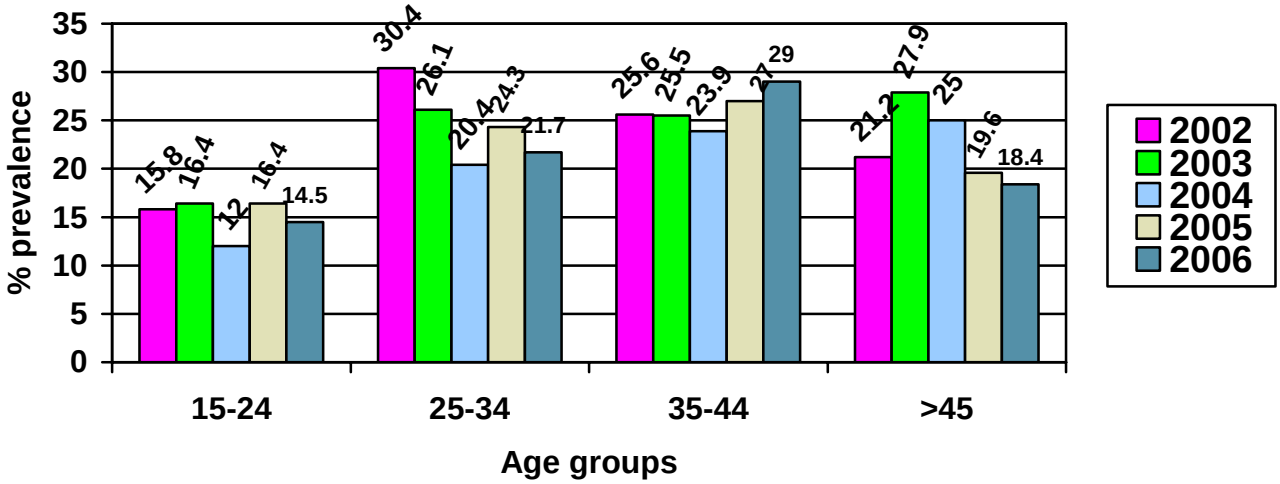
Fig 14 PREVALENCE OF HIV AMONG STD PATIENTS BETWEEN 1997-2006



From 2000 to 2004, there was a declining trend of HIV infection among STD clients. In 2006 the prevalence had decreased to 19.1%.

3.7.4 HIV PREVALENCE AMONG STD PATIENTS BY AGE GROUP

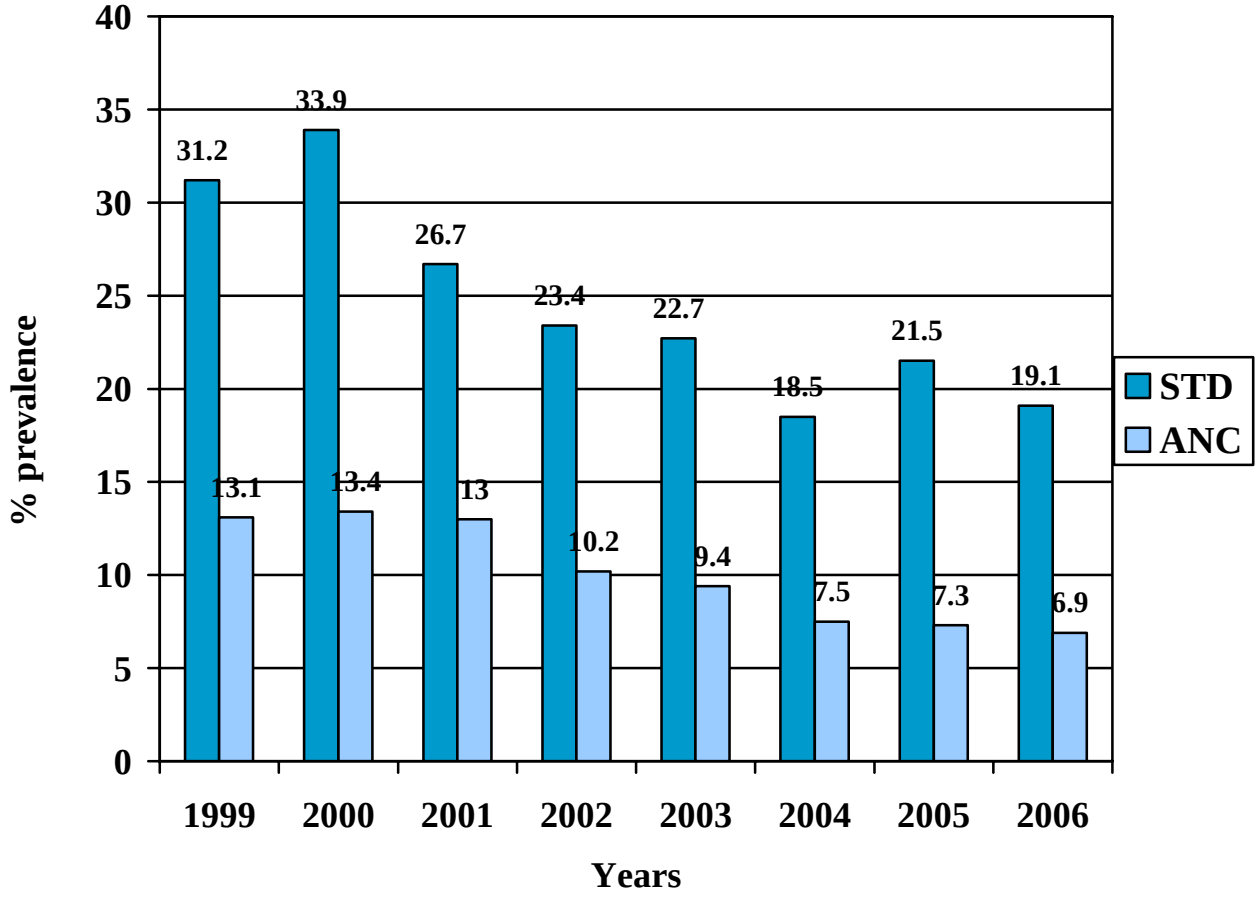
FIG 15 HIV PREVALENCE AMONG STD PATIENTS BY AGE GROUP



There was an decline in HIV prevalence over all the age groups in the year 2006 except for the age group 35-44.

3.7.5 HIV PREVALENCE BETWEEN STD AND ANTENATAL PATIENTS (1999-2006)

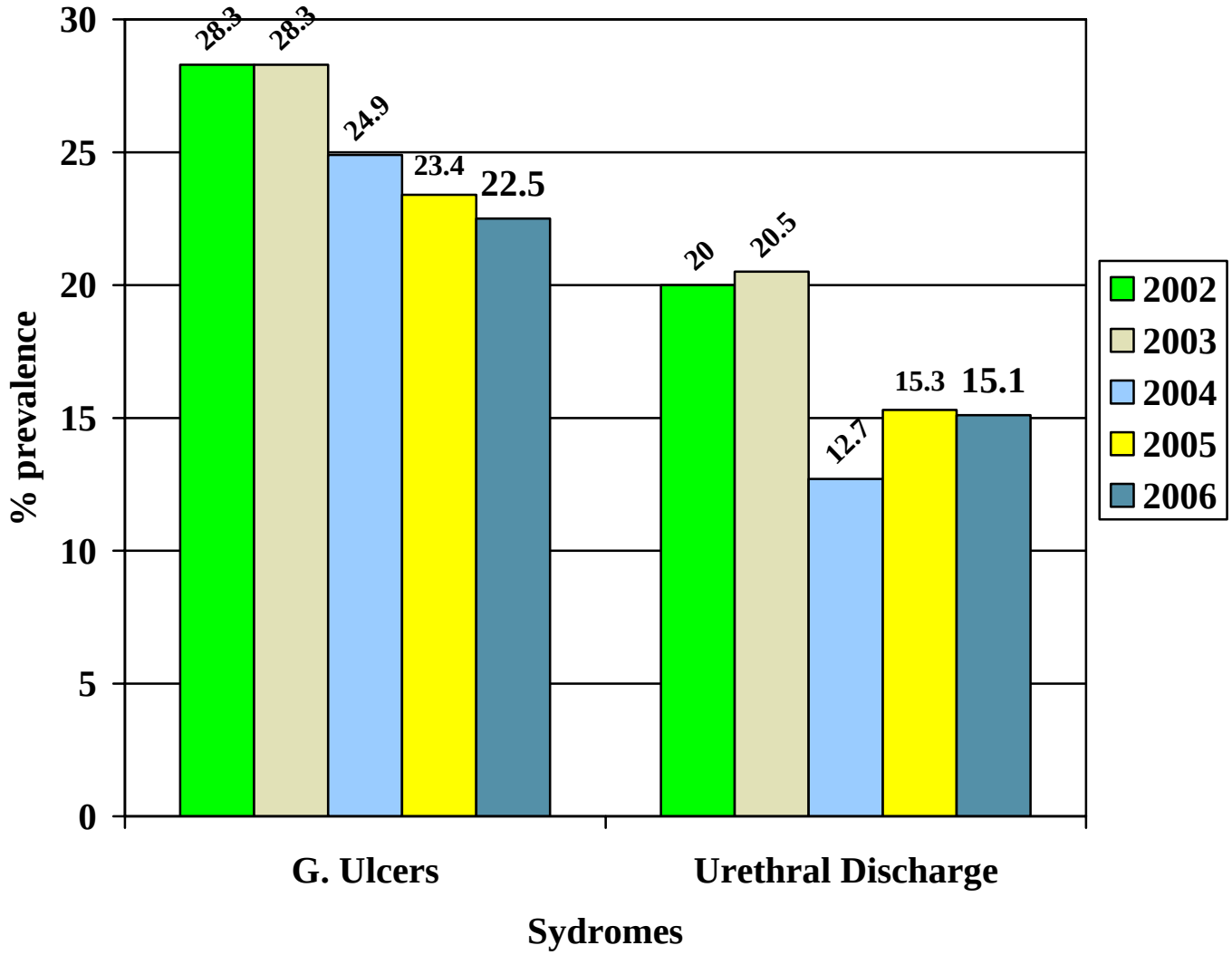
FIG 16 HIV PREVALENCE BETWEEN STD AND ANTENATAL PATIENTS (1999-2006)



HIV prevalence in both STD and ANC patients has significantly declined over the years with an exception of 2005 STD. The data also reveals that people with STDs have twice the risk of infection to other sexually active groups of the population.

3.7.6 HIV RATES BY STD SYNDROMES (2002/2006)

FIG 17 HIV RATES BY STD SYNDROMES (2002/2006)



There is a decline in the HIV prevalence for patients with genital ulcer disease while those with urethral discharge in the year 2006 recorded a point two drop. Genital ulcers have the highest infection of HIV for these years. Hence, Genital ulcer disease increases the likelihood of HIV infection. In general therefore, presence of STDs shows that there is a higher likelihood of HIV infection.

Appendix 1

PREVALENCE RATES OF WOMEN IN THE SENTINEL SITES 1990 - 2006

	Clients	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Bamba	**Rural**							**1%**					**9%**	**5%**	**1%**	**1.6%**	**2.%**	**3.2**
Baringo	**Mixed**												**10%**	**6%**	**4%**	**6.0%**	**3.9%**	**5.9**
Busia	**Urban**	**16%**	**9%**	**29%**	**21%**	**22%**	**21%**	**27%**	**28%**	**28%**	**32%**	**20%**	**15%**	**16%**	**16%**	**15.6%**	**14.2 %**	**7.8**
Chulaimbo	**Rural**						**20%**	**26%**		**35%**	**24%**	**29%**	**25%**	**22%**	**22%**	**13.8%**	**8.3%**	**8.2**
Fatima	**Rural**												**22%**	**8%**	**10%**	**6.7%**	**3.8%**	**6.8**
Garissa	**Mixed**	**4%**		**4%**	**3%**	**14%**	**5%**	**4%**	**7%**	**4%**	**4%**		**9%**	**4%**	**2%**	**0.4%**	**1.3%**	**0.6**
Kajiado	**Mixed**						**5%**	**6%**	**9%**	**6%**			**8%**	**5%**	**4%**	**2.0%**	**3.1%**	**4.4**
Kakamega	**Mixed**	**4%**	**12%**	**14%**	**8%**	**13%**	**11%**	**9%**	**9%**	**14%**	**10%**	**10%**	**11%**	**14%**	**13%**	**9.1%**	**9.4%**	**7.7**
Kangundo	**Mixed**												**14%**	**7%**	**4%**	**4.9%**	**5.1%**	**4.1**
Kaplong	**Rural**							**3%**	**5%**	**4%**	**4%**	**2%**	**9%**	**6%**	**3%**	**3.1%**	**3.6%**	**5.4**
Karurumo	**Rural**					**1%**	**9%**		**26%**	**10%**			**6%**	**4%**	**7%**	**3.4%**	**3.0%**	**3.5**
Kilifi	**Mixed**												**10%**	**5%**	**8%**	**4.0%**	**4.7%**	**2.7**
Kisii	**Urban**	**1%**	**3%**	**0%**	**2%**	**8%**	**3%**	**15%**	**15%**	**13%**	**11%**	**14%**	**17%**	**14%**	**9%**	**6.4%**	**7.0**	**2.3**
Kisumu	**Urban**	**18%**	**18%**	**19%**	**19%**	**29%**	**24%**	**26%**	**32%**	**27%**	**25%**	**33%**	**29%**	**26%**	**26%**	**11.2%**	**15.1 %**	**18.5**
Kitale	**Mixed**	**2%**	**5%**	**20%**	**7%**	**10%**	**9%**	**11%**	**12%**	**8%**	**16%**	**15%**	**13%**	**16%**	**11%**	**6.9%**	**5.3%**	**4.8**
Kitui	**Mixed**	**0%**	**4%**	**1%**	**7%**	**19%**	**3%**	**3%**	**5%**	**8%**	**7%**	**12%**	**17%**	**6%**	**6%**	**6.0%**	**7.5%**	**9.8**
Lodwar	**Urban**												**16%**	**18%**	**13%**	**11.3%**	**7.4%**	**9.0**
Maragua	**Rural**								**10%**	**5%**		**8%**	**8%**	**8%**	**5%**	**6.3%**	**5.0%**	**4.5**
Maralal	**Mixed**												**15%**	**13%**	**18%**	**8.2%**	**3.7%**	**7.2**
Mbale	**Rural**					**11%**	**10%**		**15%**	**10%**	**11%**	**23%**	**11%**	**11%**	**8%**	**9.8%**	**9.5%**	**5.4**
Meru	**Mixed**	**2%**			**1%**	**10%**	**8%**	**15%**	**13%**	**21%**	**28%**	**23%**	**10%**	**5%**	**8%**	**3.3%**	**4.9%**	**4.3**
Mombasa	**Urban**	**9%**	**16%**	**10%**	**16%**	**10%**	**15%**	**11%**	**16%**	**14%**		**10%**	**14%**	**15%**	**16%**	**10.3%**	**11.2 %**	**5.8**
Mosoriot	**Rural**					**1%**	**12%**		**8%**	**1%**	**1%**	**5%**	**4%**	**3%**	**3%**	**4.6%**	**4.3%**	**4.0**
Mt. Elgon	**Mixed**												**21%**	**6%**	**5%**	**5.0%**	**5.0%**	**4.7**
Mutomo	**Rural**												**2%**	**5%**	**4%**	**5.1%**	**3.4%**	**4.4**
Sirikwa-Turbo	**Rural**												**5%**	**5%**	**4%**	**5.0%**	**3.6%**	**3.5**
Suba	**Rural**												**31%**	**34%**	**41%**	**30.0%**	**32.9 %**	**26.3**
Tabaka	**Rural**												**11%**	**4%**	**9%**	**3.2%**	**3.2%**	**1.1**
Teso	**Rural**													**6%**		**3.8%**	**4.5%**	**4.3**
Thika	**Mixed**	**2%**	**9%**	**2%**	**27%**	**39%**		**12%**	**18%**	**31%**	**16%**	**19%**	**11%**	**7%**	**8%**	**8.3%**	**7.6%**	**5.1**
Tiwi	**Mixed**					**16%**	**23%**			**31%**	**21%**	**12%**	**10%**	**7%**	**10%**	**7.1%**	**7.1%**	**8.4**
Wesu-Wundanyi	**Rural**												**7%**	**5%**	**3%**	**2.8%**	**2.3%**	**6.4**
Nairobi	**Urban**	**5%**	**12%**	**13%**	**17%**	**15%**	**16%**	**16%**			**17%**	**!7%**	**14%**	**13%**	**11%**	**10.9%**	**10.9 %**	**10.1**
Nakuru	**Urban**	**9%**	**12%**	**12%**	**22%**		**26%**	**10%**	**24%**	**23%**	**25%**	**9%**	**12%**	**12%**	**10%**	**7.0%**	**7.15**	**10.8**

Njambi ni	**Rural**								**4%**	**2%**		**7%**	**6%**	**6%**	**10%**	**9.9%**	**6.6%**	**3.5**
Nyeri	**Urban**	**2%**	**3%**	**8%**	**2%**	**5%**	**20%**	**8%**	**6%**	**15%**		**12%**	**11%**	**8%**	**8%**	**5.5%**	**5.3%**	**4.6**
TOTAL		5.1	6.3	7.4	8.5	9.5	10.4	11.2	11.9	12.5	13	13.4	12.8	10.6	9.4	7.5%	7.3%	6.9