Final Report

Malawi Prevalence Study

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UNIVERSITY OF MALAWI

CHANCELLOR COLLEGE

UNC
CAROLINA
POPULATION
CENTER

UNC
SCHOOL OF MEDICINE

UNC
PROJECT
Lilongwe, Malawi

Study Team:

University of North Carolina

Sharon Weir
Irving Hoffman
Adamson Muula
Lillian Brown
Elizabeth F. Jackson

Chancellor College

Tobias Chirwa

National Statistical Office

Derek Zanera

Johns Hopkins Project

Newton Kumwenda

Center for Social Research

John Kadzandira

London School of Hygiene and Public Health

Emma Slaymaker
Basia Zaba

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Executive Summary and Recommendations

The National AIDS Commission (NAC) observed that declines in HIV prevalence among ANC attendees in Lilongwe (from 30% in 1996 to 17% in 2003) might signal an important success in fighting the urban epidemic. This level of decline was not observed in Blantyre, where HIV prevalence among only declined from 34% in 1996 to 27% in 2003. The National AIDS Commission asked for proposals to:

"study the differences in infection levels and trends, and establish the possible causal factors in the apparent decline in HIV prevalence in Lilongwe and not seen in Blantyre including but not limited to differences or changes in demographics, differences or changes in social context, differences or changes in behaviors, and level, exposure and impact of HIV prevention interventions/programs "

Our team of researchers answered this challenge. First we assessed whether the difference in HIV prevalence is real or only an artifact of the surveillance population or protocol (Questions 1-3 below). We concluded there is a difference in prevalence between the two cities that is confirmed by other sources of HIV prevalence data and not easily explained away by clinic choice, by the age or parity of the clinic population, or protocol implementation. Next we reviewed available data to identify the most likely causes for the difference in prevalence (Questions 4-11 below).

Main Findings

Part I   Is HIV prevalence between the two cities really different?

1. Can the observed difference in HIV prevalence among ANC patients in Lilongwe compared to Blantyre be explained simply by differences in the age and gravidity of women?

   Answer: Age and gravidity do not explain the difference.

   Trend analysis of ANC surveillance data adjusting for age and gravidity supports arguments that HIV prevalence has fallen in Lilongwe but not Blantyre. Age and gravidity standardized prevalence was similar and high in the surveillance clinics in the two cities in 1999 (26.5% in Lilongwe and 28.5 in Blantyre). By 2003, however, adjusted HIV prevalence in Lilongwe had decreased to 16.8 while there was virtually no change in Blantyre (27.6%). In 2005, the difference remained although the gap narrowed.

2. Do other sources of data confirm the Lilongwe-Blantyre prevalence differentials?

   Answer: Other sources of data confirm the difference.

   The higher HIV prevalence in Blantyre was confirmed by two other sources of data—the 2004 DHS data and 2005 and 2006 screening data from ANC clinics. The DHS estimates showed a female HIV prevalence twice as high in Blantyre—22.5% for

Blantyre vs 10.9% for Lilongwe. The DHS Blantyre estimate was lower but similar to the ANC surveillance estimate; the DHS estimate for Lilongwe was much lower than the ANC surveillance estimate and was based on a re-do of the DHS survey in 2006.

Test data from large ANC screening programs in the two cities in 2005 and 2006 also showed a higher prevalence in Blantyre, although the absolute difference was much smaller. In 2005, the prevalence among over 20,000 women tested at 4 ANC clinics in Lilongwe was 15.1% compared to 19.7% among 8964 women tested at 6 clinics in Blantyre. In 2006, the prevalence was 14.5% in Lilongwe compared to 20.7% among 18,100 women tested in Blantyre.

3. Could the difference in prevalence in the ANC surveillance data in Lilongwe and Blantyre be an artifact of the choice of clinic selected to participate in the ANC surveillance program? Or an artifact of how the ANC protocol was implemented at each clinic?

Answer: It is unlikely that clinic choice is responsible for the difference.

Although there are no data prior to 2005 from other clinics to compare with the ANC data from the clinics selected for surveillance, there are data from other clinics for 2005 and 2006 for comparison. These clinics show a higher prevalence in Blantyre than in Lilongwe, suggesting that clinic choice alone is unlikely to explain the difference in prevalence.

The same ANC surveillance protocol was used in the surveillance clinics in Lilongwe and Blantyre. Although the ANC surveillance protocol may not have been perfectly administered in each clinic, there is no clear evidence that the difference in prevalence can be attributed to differences in administering the protocol.

Part II   What caused the difference in HIV prevalence?

4. Is there strong evidence that the difference in prevalence is caused by a real difference in HIV incidence rather than other factors such as differential mortality?

Answer: Although incidence studies among the general population have not been conducted, there is some evidence from available data that the difference is caused by a real difference in HIV incidence.

HIV prevalence can increase or decrease even when HIV incidence remains unchanged. Consequently it is naïve to conclude that a decrease in prevalence belies a true decrease in incidence. There are no HIV incidence studies among the general population in Lilongwe or Blantyre that provide sound epidemiologic confirmation that HIV incidence in Lilongwe is declining. In the one reported HIV incidence study conducted in Lilongwe and Blantyre between 1999 and 2001 among female post-natal and/or family planning patients, the incidence among study participants from Blantyre was higher than the incidence among women in Lilongwe (4.9 per 100 py compared to 4.3 per 100 py), but the difference was not statistically

significant. Incidence among women under 25, however, in this study was higher in Blantyre than in Lilongwe (6.1 per 100 py compared to 4.5 per 100 py).

HIV prevalence among young women attending ANC clinics is a reasonable proxy for HIV incidence. HIV prevalence among young women is more likely to reflect HIV incidence than the prevalence trends among older women attending ANC clinics or convenient samples of women, due to the reduced effect of mortality on prevalence among the young and the widespread use of ANC clinics by all strata of the population. Over the last four rounds of surveillance (1999-2005) young women in Blantyre have had a higher HIV prevalence than young women in Lilongwe. In 2005 the prevalence among women under age 25 in Blantyre was 21.4% compared to 16.4% among young women in Lilongwe.

5. Could in-migration into Lilongwe from rural areas where HIV prevalence is lower have "diluted" the HIV prevalence in Lilongwe, causing an apparent decline in prevalence when actually the prevalence among those who were lifelong residents did not decline?

    Answer: In-migration may have diluted prevalence, but data are inadequate to assess this issue.

    There is insufficient information about the HIV status of in-migrants into either city to assess whether they would have been more likely to dilute the prevalence in Lilongwe relative to any dilution in Blantyre. However, according to the 1992, 2000 and 2004 DHS surveys, men were consistently less likely to have moved into Lilongwe from rural areas and more likely to have moved into Blantyre from rural areas. In 2004, 16% of men in Blantyre had moved from rural areas compared with 6% of men in Lilongwe. There are not enough migrants in the DHS sub-sample to fully assess whether migrants had a lower HIV status, but on the face of it, the prevalence among migrants in Blantyre was lower than among non-migrants (24% vs 14%). Since more men moved into Blantyre than into Lilongwe from rural areas, this would tend to dilute prevalence in Blantyre more than Lilongwe. However, without a larger sample size and better information about where the people moving into Blantyre come from and the prevalence of infection in the area that they moved from, it is difficult to assess the effect of migration on HIV prevalence in urban areas.

    According to add-on ANC surveillance data in 2005, more than half of women in 2005 reported living in their current district less than five years. Prevalence was lower among women who had lived in the district less than a year, but a similar proportion of women in Blantyre (13.7%) as in Lilongwe (16.0%) reported living in the district less than a year. Data from the add-on survey do not indicate whether the person moved from a rural or urban area.

6. Could syphilis or lack of circumcision have contributed to a higher HIV prevalence in Blantyre?

    Answer: It is unlikely that either syphilis or circumcision is responsible for the difference in prevalence.

Syphilis may have had a role in the past in the HIV epidemic. The HIVNET 024 trial in 2001-2003 showed a higher prevalence of syphilis in Blantyre than in Lilongwe (6.3% in Blantyre and 5.1% in Lilongwe). In that study, there was a strong association between HIV infection and syphilis. ANC data from 2005 estimate the prevalence of syphilis under 2% in both Lilongwe and Blantyre. As the prevalence of syphilis has declined in both cities, differences in HIV prevalence have remained, suggesting that syphilis is unlikely to be the sole factor in maintaining difference levels of prevalence

There is no evidence to support that circumcision status is a strong contributor to the difference in prevalence. Most men in both cities are uncircumcised, although circumcision is more common in Blantyre than in Lilongwe (22% versus 15%). It is unknown whether the incidence of HIV infection is higher among uncircumcised males in either city.

7. Could a younger age of sexual debut have contributed to a higher HIV prevalence in Blantyre?

   Answer: Yes, a younger age of sexual debut could have contributed to the difference in prevalence.

   The most recent DHS does not show a significant difference in age at first sex for women in Lilongwe vs Blantyre. However, pooled data from all DHS surveys show that there appears to have been an increase in the median age at first sex for women in Lilongwe whereas in Blantyre the age at first sex has decreased.

   The most recent DHS show that men in Blantyre begin sex at a younger age than men in Lilongwe. In addition, pooled data over time from all DHS surveys show that age at first sex is consistently lower in Blantyre than in Lilongwe for men and there has been no real change in the age at first sex for men over time.

8. Could a longer gap between first sex and first marriage have contributed to a higher HIV prevalence in Blantyre?

   Answer: Yes, the gap between first sex and marriage is longer in Blantyre for men.

   Young people may be more at risk in the period between first sex and first marriage. The gap between age at first sex and age at first marriage was longer among men in Blantyre (a median of 7 years in Blantyre compared to 6 years in Lilongwe). The gap for women was approximately three years in both cities.

9. Could having sex with a non-cohabitating partner have contributed to a higher HIV prevalence in Blantyre?

   Answer: Yes, sex with a non-cohabitating partner was more common in Blantyre.

   Sexual relationships among non-marital and non-cohabitating partners may be of shorter duration than marital or live-in relationships and more likely to involve partners engaged in other concurrent relationships. According to DHS surveys in 1996, 2000, and 2004, more women in Blantyre than in Lilongwe reported sex with a

non-cohabitating partner in the past year (1996:14.5% vs. 4.4%; 2000: 15.2% vs. 5.9%; 2004: 13.6% vs 7.2%). Data from the add-on survey from the ANC surveillance in 2005 confirm this. Women at Limbe Health Center in Blantyre were more likely than women in Lilongwe to report having sex with a man other than her husband in the past year (16.6% vs 8.8%). Among women at the Limbe Health Center who reported sex with a man other than their husband in the past year, 32% were HIV infected compared with 24% who did not report sex with another man.

More men in Blantyre reported sex with a non-cohabitating partner in 1996 and 2000 but the difference disappeared in 2004.

10. Are short-lived marriages in Blantyre a possible cause for higher HIV prevalence in Blantyre?

Answer: Yes

Marital stability may be protective for women. More ANC clients at Limbe Health Center,in Blantyre (21.1%) reported not being in a first marriage compared with 16.6% at Bottom Hospital. Among these women, the odds of infection was 1.9 in Blantyre and 1.6 in Lilongwe.

11. Were HIV prevention programs more effective in Lilongwe than in Blantyre?

Answer: Unknown due to insufficient information.

According to DHS data in 2000 and 2004, over 90% of men in both cities reported being exposed to health or family planning message. Women in Lilongwe were significantly less likely to report exposure to these messages than women in Blantyre. The number of condoms distributed by PSI was higher in Blantyre than in Lilongwe. According to BSS surveys, having an HIV/AIDS program at work or attending an HIV/AIDS workshop was less common in Blantyre than in Lilongwe for all groups and in both 2004 and 2006 (except for female secondary school teachers.) According to the PLACE data, almost all patrons from PLACE venues in Lilongwe and Blantyre were exposed to prevention programs, with slightly higher proportions exposed in Lilongwe.

Recommendations

The HIV epidemic in Malawi has been devastating in both of the urban areas, Lilongwe and Blantyre, that are the focus of this report. Although the high prevalence levels evident in previous decades have abated, both cities suffer from an ongoing epidemic.

We have the following recommendations:

- Ground HIV prevention strategies in epidemiologic models of sexual transmission of HIV
- Develop an HIV prevention strategy that links interventions with the proximate determinants of HIV transmission
- Focus on areas identified by PLACE that are most likely to contain populations with high rates of new partner acquisition
- Use the add-on survey questions in all ANC clinics
- Conduct additional research to understand the underlying cause of the HIV epidemic, particularly the role of migration from rural to urban areas

Encourage prevention programs to:

- Increase the proportion of sexually active men and women who know their own HIV status and increase condom use among those who are HIV infected
- If HIV testing is not available or acceptable, increase the proportion of all sexual contacts protected by condoms.
- Reduce the number of lifetime sexual partnerships engaged in by men and women.
- Reduce the number of over-lapping sexual partnerships in favor of sequential monogamous relationships.
- Reduce the prevalence of other sexually transmitted infections that may increase susceptibility to HIV infection or increase infectiousness among persons with co-infection.
- Increase the prevalence of circumcision among men.
- Increase condom use in all sexual contacts of persons most likely to be engaged in more than one sexual partnership per year.
- Delay sexual debut among young people and decrease the numbers of years between age at first sex and age at first marriage.
- Reduce the age difference in non-marital sexual partnerships to decrease the likelihood of HIV discordant contacts among the young.

Chapter 1: Background and Objectives

Background

The National AIDS Commission (NAC) called attention to the importance of understanding the determinants of the HIV epidemic in urban Malawi. The HIV/AIDS epidemic initially gained ground in urban areas of Malawi and HIV prevalence remains higher in urban and semi-urban areas than in rural areas. HIV prevalence rose above 25% in urban areas of Malawi between 1995 and 1999, and even semi-urban clinics recorded an overall prevalence above 25% in 1999. Since then, there have been signs of a decline in prevalence, at least in the urban and semi-urban populations, where prevalence fell to around 22% during the 2001 and 2003 surveillance rounds. Within the urban sites, the overall decline has been most consistent in Lilongwe, where it had fallen to 17% by 2003, although age-specific trends are not quite so clear-cut. Some confirmatory evidence of this decline in the capital city is available from blood donor data. Recent declines in HIV prevalence among ANC attendees in Lilongwe (from a high of 30% in 1996 to 17% in 2003) may signal an important success in fighting the urban epidemic.   However this rate of decline has not been observed in other urban areas including Blantyre, where the estimated HIV prevalence among ANC attendees declined from 34% in 1996 to 27% in 2003.

In order to better understand the epidemic in Malawi, the National AIDS Commission asked for research proposals to:

"study the differences in infection levels and trends, and establish the possible causal factors in the apparent decline in HIV prevalence in Lilongwe and not seen in Blantyre including but not limited to differences or changes in demographics, differences or changes in social context, differences or changes in behaviors, and level, exposure and impact of HIV prevention interventions/programs (Concept Brief, August 2004)."

Goals and Objectives

The overall goal of the study is a rigorous assessment of the HIV prevalence decline in Lilongwe and Blantyre and identification of factors associated with this decline. The specific objectives are:

To assess whether the HIV prevalence trends in Lilongwe and Blantyre from ANC surveillance, particularly among young people, remain after adjustment for age and parity and whether the difference is confirmed by other sources of prevalence data and whether the trends could be an artifact of changes in surveillance procedures.

To assess whether HIV prevalence differentials could be attributed to changes in the composition of the ANC patient population included in the surveillance program.

To assess the potential causal factors for change including the relative size of HIV-related mortality and incidence of new infections; the role of behavior change (e.g. partner reduction, condom use, delay in sexual activity); and programmatic success in control of sexually transmitted infections that increase susceptibility or transmission of HIV.

Based on this analysis, to identify specific recommendations for accelerating HIV decline in urban areas and ensuring its spread to other parts of Malawi.

Table 1   Main data sources analyzed

Data Source	Description	Year
DHS	Malawi Demographic and Health Survey; only data from the Lilongwe and Blantyre population is used in this report. HIV prevalence data was first included in the Malawi DHS in 2004. A 2006 re-survey of HIV prevalence took place in Lilongwe to address low response rates there in 2004.	1992[1] 1996[2] 2000[3] 2004[4]
ANC HIV and Syphilis Surveillance Data	Surveillance to track trends in HIV prevalence over time; no test results provided to individuals; tests performed at a specific time each year, at a centrally located ANC in each city (Bottom Hospital in Lilongwe and Limbe Health Center in Blantyre)	1999[5] 2001[6] 2003[7] 2005[8]
ANC Surveillance Add-On	Behavioral data collected for this study through a questionnaire add-on at Lilongwe and Blantyre ANC HIV surveillance sites	2005
ANC Screening	Screening of every woman at her first ante-natal care visit, unless she chooses to 'opt-out'; opt-out rates are extremely low	2005 2006
PLACE	Priorities for Local AIDS Control (PLACE) assessment to identify areas likely to have high rates of new sexual partnership formation in urban areas of Blantyre and Lilongwe	2006
BSS	National Behavioral Surveillance Survey (BSS) of risk groups; only data from the Lilongwe and Blantyre population is used in this report. Includes HIV testing in 2006.	2004[9] 2006
Other Research Study Data Analyzed	HIVNET/HPTN 016A Condom Promotion & Counseling Study	1999-2001[10]
	Syphillis prevalence among pregnant women in Blantyre and Lilongwe between July 2001 and February 2003, from the HIVNET 024 Trial in Malawi, Tanzania, and Zambia	2001-2003[11]

[1] National Statistical Office (NSO) and ORC Macro. 1994. *Malawi Demographic and Health Survey 1992.*

[2] NSO [Malawi] and ORC Macro. 1997. *Malawi Knowledge, Attitudes and Practices in Health Survey 1996.*

[3] NSO [Malawi] and ORC Macro. 2001. *Malawi Demographic and Health Survey 2000.*

[4] NSO [Malawi], and ORC Macro. 2005. *Malawi Demographic and Health Survey 2004.*

[5] National AIDS Control Programme Malawi. *Sentinel Surveillance Report 1999: HIV/Syphilis Seroprevalence in Antenatal Clinic Attendees.*

[6] National AIDS Control Commission Malawi. *Sentinel Surveillance Report 2001: HIV/Syphilis Seroprevalence in Antenatal Clinic Attendees.*

[7] National AIDS Commission Malawi. *HIV Sentinel Surveillance Report 2003.*

[8] National AIDS Commission Malawi. 2005. *HIV and Syphilis Sero-Survey and National HIV Prevalence Estimates Report 2005.*

[9] National AIDS Commission (NAC) Malawi. *Behavioural Surveillance Survey (BSS) Report Malawi 2004.*

[10] Potter et al. 2006. *Correlates of syphilis seroreactivity among pregnant women: the HIVNET 024 Trial in Malawi, Tanzania, and Zambia.* Sex Transm Dis 33(10):604-9.

[11] Kumwenda et al. 2006. *HIV incidence among women of reproductive age in Malawi and Zimbabwe.* Sex Transm Dis 33(11):646-651.

Data Sources

This report utilizes data from a variety of sources to assess possible reasons for the decline in HIV prevalence in Lilongwe relative to Blantyre. Data sources are summarized in Table 1 and described at the point in the text when they are first utilized in analyses.

Organization of Report

Chapter 2 reviews HIV prevalence data in Lilongwe and Blantyre from ANC surveillance to assess whether there is a difference in prevalence, after appropriate adjustment of age and parity. It also reviews other sources of estimates of HIV incidence and prevalence to determine whether other sources confirm the differentials measured in the ANC surveillance data.
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Chapter 3 explores whether the HIV differentials in Lilongwe and Blantyre ANC surveillance could be the result of the surveillance protocol including changes in testing, changes in the clinics, or shift to an opt-out strategy.

Chapter 4 explores whether the HIV differentials could be due to changes in the composition of the ANC clinic catchment population, particularly changes in the uptake of antenatal care, parity shifts, and/or in-migration from rural areas where HIV prevalence may be lower.

Chapter 5 reviews whether there is evidence that co-factors for HIV transmission, particularly syphilis and lack of circumcision, are higher in Blantyre than in Lilongwe.

Chapter 6 compares sexual behavior and marital patterns in Lilongwe and Blantyre and assesses their association with HIV infection.

Chapter 7 reviews the evidence regarding HIV prevention program coverage and assesses whether lower prevalence in Lilongwe may be associated with greater HIV prevention program coverage.

Chapter 8 reviews recommendations for HIV prevention strategies and suggests improvements in surveillance and evaluation.

Chapter 2: Review of HIV Prevalence Estimates

2.0   Overview of objective and methods

Objective: To confirm evidence of the difference in HIV prevalence in Lilongwe and Blantyre from several sources of prevalence data

Methods:

2.1   Trend analysis of ANC HIV surveillance data

2.2   Trend analysis among young people in ANC surveillance population

2.3   Analysis of HIV screening data from ANC clinics

2.4   Analysis of HIV prevalence estimates from Demographic and Health Surveys (DHS)

2.5   Comparison of any incidence estimates from research studies

2.6   Analysis of HIV prevalence estimates from Behavioural Surveillance Surveys (BSS)

2.7   HIV prevalence estimates from add-on questionnaire at surveillance sites in Blantyre and Lilongwe in 2005

2.1   Trend analysis of ANC HIV surveillance data 1999-2005

Methods	Result Summary
Trend analysis of ANC HIV surveillance data standardizing for age and parity	• Trend analysis, adjusting for age and parity, confirms HIV prevalence difference.

In each city there is a series of estimates available from a centrally located ante-natal clinic.   Data are available biannually from 1999 onwards. There are some differences in the age and gravidity of women attending the ANC in the two cities but standardizing for age and gravidity makes little difference to the overall estimate. Because standardizing for age and parity of the women attending the ANC did not affect the difference in prevalence, it is unlikely that the HIV prevalence differences evident between the cities are due to differences in age or fertility of the clinic populations.

The difference in prevalence remains evident in all age groups and appears to be widening over time (Table 2 and Figure 1). The 2007 results will be important because there was suggestion of an upturn in prevalence for Lilongwe in 2005.

Table 2   HIV prevalence estimates from the ANC population in Lilongwe at Bottom Hospital and in Blantyre at the Limbe Health Center, 1999-2005

Year/Clinic	Crude HIV prevalence	Age-standardized	Gravidity-standardized	Standardized for both	Under-25
2005[12]					
Lilongwe Surveillance Clinic	18.6	18.5	19.7	19.8	16.4
Blantyre Surveillance Clinic	27.0	26.7	26.7	26.3	21.4
2003					
Lilongwe	16.9	16.6	17.0	16.8	15.8
Blantyre	27.6	27.6	27.4	27.6	25.1
2001					
Lilongwe	20.1	20.6	20.0	20.4	15.0
Blantyre	28.5	28.2	28.4	28.1	28.9
1999					
Lilongwe	25.2	25.6	25.1	26.5	20.7
Blantyre	27.9	27.8	29.3	28.5	27.5

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[12] Gravidity information missing for 428 women from Lilongwe in 2005 compared with only 7 from Blantyre

Figure 1   Trends in HIV prevalence at Antenatal Clinics (ANC), 1994-2005
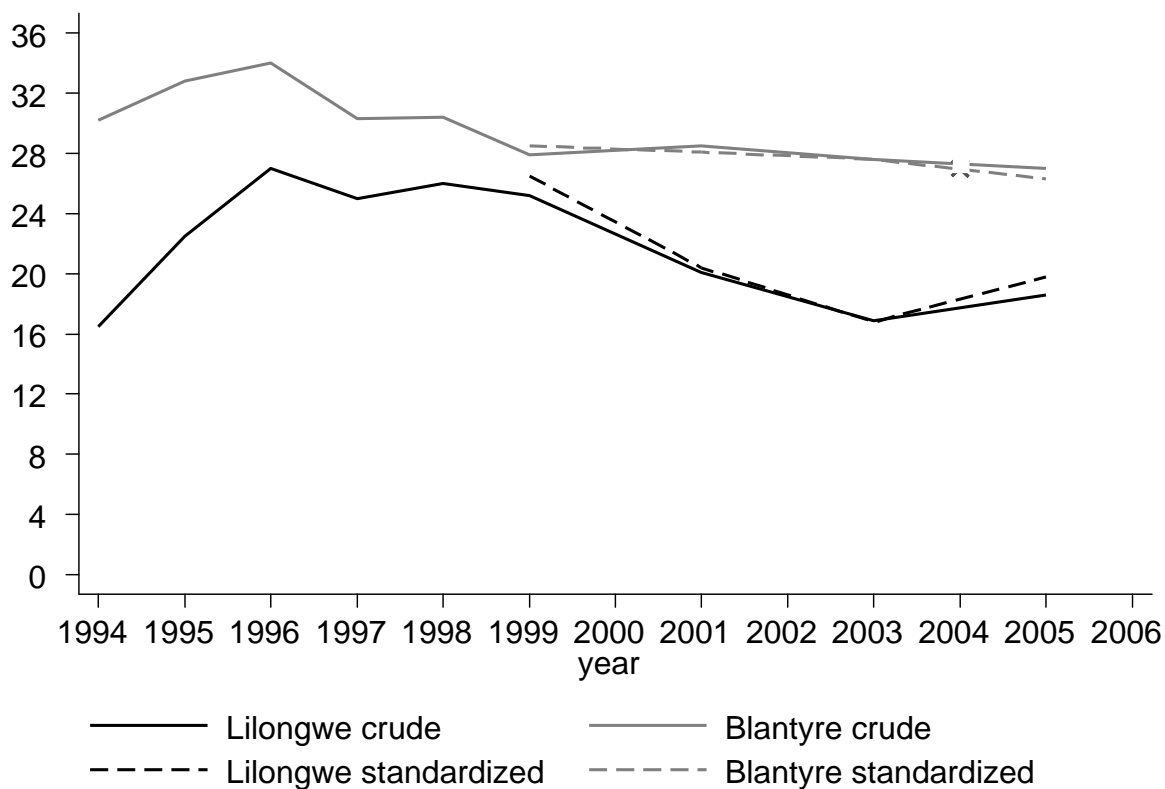
Note: The standardized ANC surveillance estimates are standardized to the age and parity distribution of women included in the surveillance in both Lilongwe and Blantyre (i.e. differences in age and parity between the two clinics are removed).

2.2   Trend analysis of HIV prevalence among young people from ANC surveillance data 1999-2005

Methods	Result Summary
Trend analysis among young people at ANC	• Trend analysis among young people confirms difference but the gap in prevalence among young people appears to be narrowing

Trends in young people are important because HIV infection in young people is more likely to be new infection. Consequently HIV prevalence trends among young people are less affected by mortality.

Figure 2   HIV prevalence (percent) among women less than 25 years old in ANC clinics in Lilongwe and Blantyre, 1999-2005
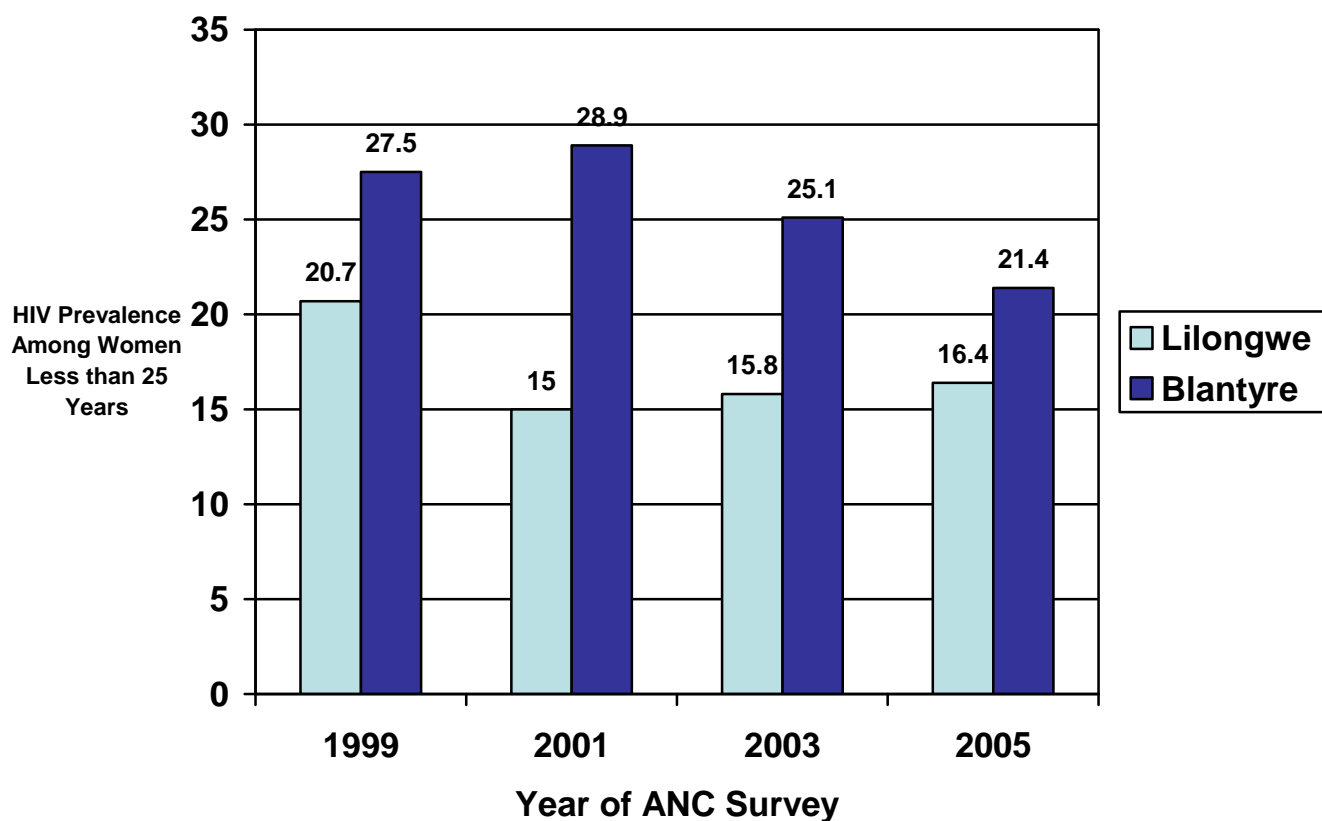
Figure 2 suggests that there is a gap in prevalence between Lilongwe and Blantyre, but that the gap is narrowing among the group of women under age 25. To further assess this, we compared trends among women under 20 with women age 20-24 (Figure 3 and Figure 4). The group younger than 20 appears to have an increasing prevalence from 2001 to 2005 in Lilongwe (from 8.2% to 14.1%). In Blantyre, there has been no clear pattern of decrease since 2001. Among women 20-24, prevalence appears to be decreasing, in contrast to prevalence among this age group in Lilongwe.

Figure 3   HIV prevalence among ANC patients under 20 over time, 1999-2005
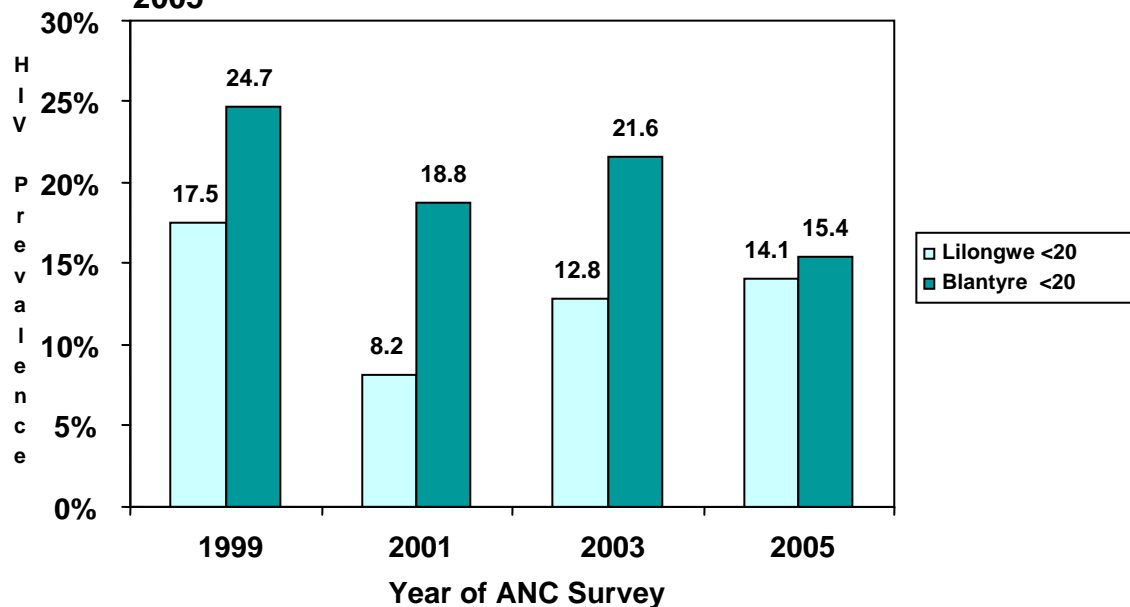
Figure 4   HIV prevalence among ANC patients 20-24 over time, 1999-2005
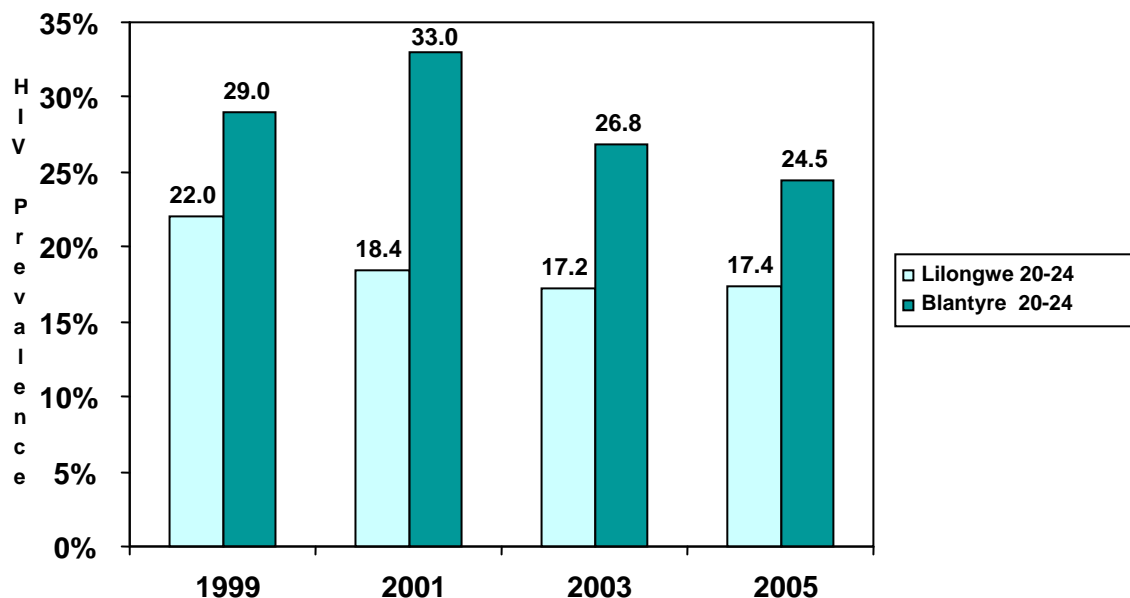
The crude odds of infection for women aged 20-24 compared with women less than 20 has been approximately 1.3 for 1999, 2003 and 2005 (Figure 5). It was higher in 2001. In Blantyre, the odds of infection among ANC surveillance population was also highest in 2001. In contrast to ANC clients in Lilongwe, however, the odds of infection increased at the Blantyre surveillance clinic between 2003 and 2004 – from 1.2 to 1.8.

Figure 5   Odds of infection for women aged 20-24 compared with women aged less than 20, at Lilongwe and Blantyre ANC surveillance clinics
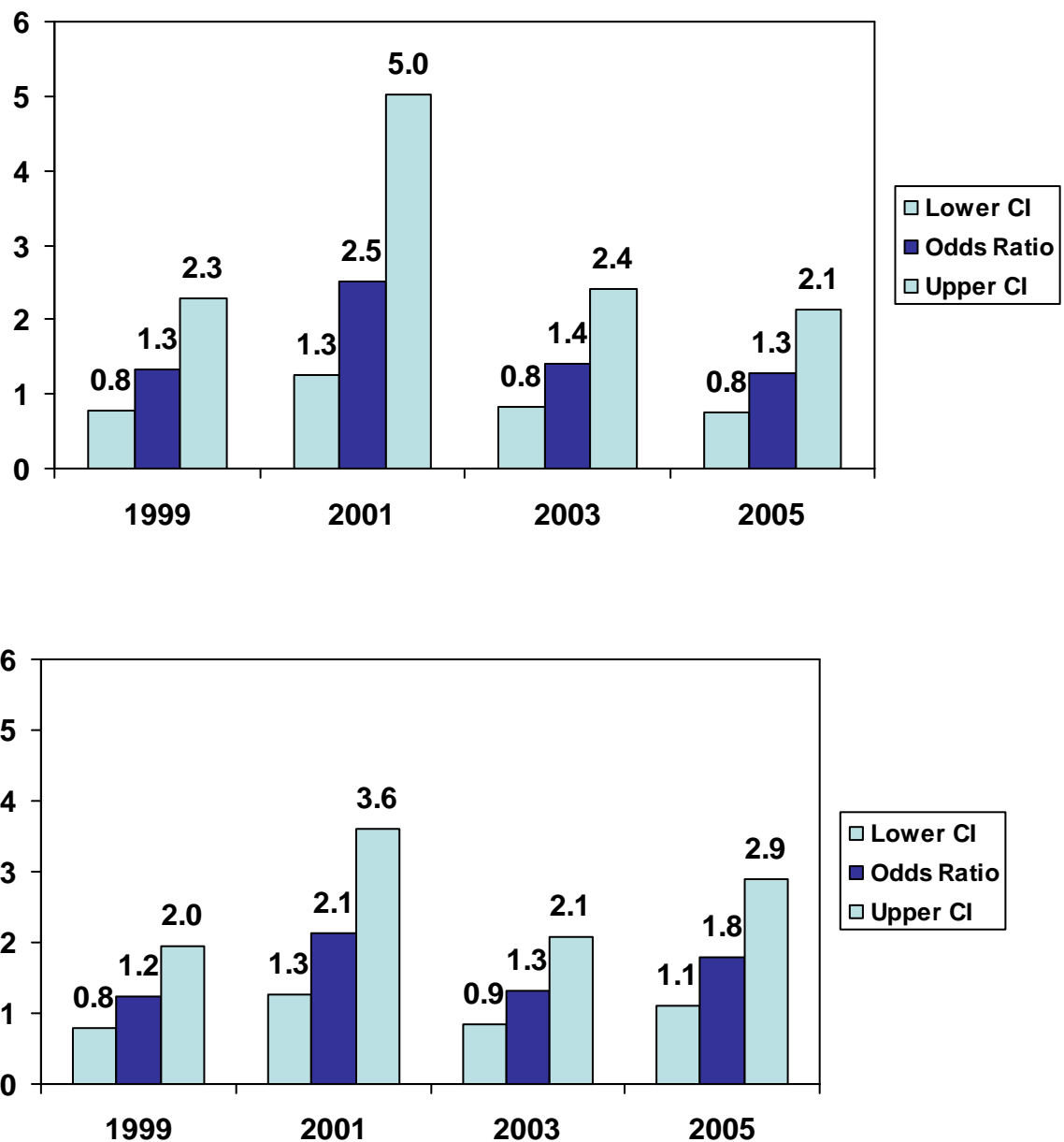
2.3 Analysis of data from ANC HIV screening

Methods	Result Summary
Analysis of HIV prevalence data from ANC screening and comparison of screening and surveillance data to confirm trend differences between Lilongwe and Blantyre:	• Prevalence estimates from ANC screening at Limbe Health Center in 2005 are virtually identical to estimates at Limbe from the 2005 ANC surveillance population (27%). • Other ANC clinics in Blantyre have lower prevalence than Limbe Health Center. • Prevalence estimates from screening at Bottom are lower than ANC surveillance (15.5% vs 18.6%) in 2005. • Other clinic prevalence estimates in Bottom are mostly lower than estimates from other Blantyre clinics.

Comparison of HIV prevalence from screening vs surveillance can be difficult to interpret. HIV prevalence estimates from surveillance may be more valid if participation is higher than in screening. Estimates from screening may be more valid if participation rates are high, if the numbers participating are high and throughout the year, and if more than one clinic is included. In the case of Lilongwe and Blantyre, it is possible that prevalence estimates from screening are more valid. This is because participation rates in HIV screening testing are high in Lilongwe and Blantyre and testing occurs over the entire year, reducing the effect of any bias due to seasonality. The ANC surveillance occurs during one period of the year and may reflect a seasonal bias, although the effect on trends of any seasonality bias would be reduced as the surveillance occurs during the same period each year.

Overall, however, the screening data show prevalence estimates in Lilongwe that are lower than the prevalence estimated in Blantyre. In 2005, of the four clinics shown in the table below, all have prevalence of 16.6% or lower. In the six Blantyre clinics, only one clinic had a prevalence under 16.6%.

Since 2001, the policy in Lilongwe has been to test every woman coming to the ANC clinic during her first prenatal visit. Therefore, the number of women approached should reflect the total number of women coming to the clinic. In Blantyre the number approached is a sub-set of the total number coming to the clinic. Information on the characteristics of those not tested is not available. By 2006, the proportion approached was much higher than previously.

Table 3   Numbers of persons tested in HIV screening at Lilongwe and Blantyre clinics in 2005 and 2006, HIV prevalence and participation rates

Year	Clinic	Approached	Total Tested	Total HIV+	HIV Prevalence	Participation
Lilongwe						
2005	Bwaila	6429	6311	1046	16.6%	98.0%
	Kawale	4745	4745	754	16.0%	100.0%
	A18	2551	2550	299	12.0%	100.0%
	A25	5008	4989	599	12.0%	99.6%
	Total	18733	18595	2698	14.5%	
2006	Bwaila	8436	8307	1435	17.30%	98%
	Kawale	4850	4850	753	16.0%	100.0%
	A18	2688	2687	360	13.0%	100.0%
	A25	5054	5054	611	12.0%	100.0%
	Total	21028	20898	3159	15.1%	
Blantyre						
2005	Ndirande	2523	2293	485	21.2%	90.9%
	QECH	852	654	153	23.4%	76.8%
	Limbe	794	794	217	27.3%	100.0%
	Bangwe	1633	1586	276	17.4%	97.1%
	Chilomoni	1656	1649	250	15.2%	99.6%
	Zingwangwa	1506	1157	224	19.4%	76.8%
	Total	8964	8133	1605	19.7%	90.7%
2006						
	Ndirande	5409	5365	1074	20.0%	99.2%
	QECH	1151	1088	259	23.8%	94.5%
	Limbe	1861	1859	392	21.1%	99.9%
	Bangwe	2816	2793	621	22.2%	99.2%
	Chilomoni	3635	3237	544	16.8%	89.1%
	Zingwangwa	3238	3227	750	23.2%	99.7%
	Total	18110	17569	3640	20.7%	97.0%

The crude HIV prevalence at Bottom Hospital from the surveillance population was 18.6% (Figure 6). This is higher than the screening prevalence at the other clinics in 2005 (Table 3). The ANC screening data in Blantyre and Lilongwe are similar to the ANC surveillance estimates and confirm the prevalence difference for 2005. The difference appears to be narrowing in 2006 (Figure 6).

Figure 6   Crude HIV prevalence among ANC patients of all ages at Lilongwe's Bottom Hospital and Blantyre's Limbe Health Center in 2005 and 2006, ANC surveillance vs ANC screening
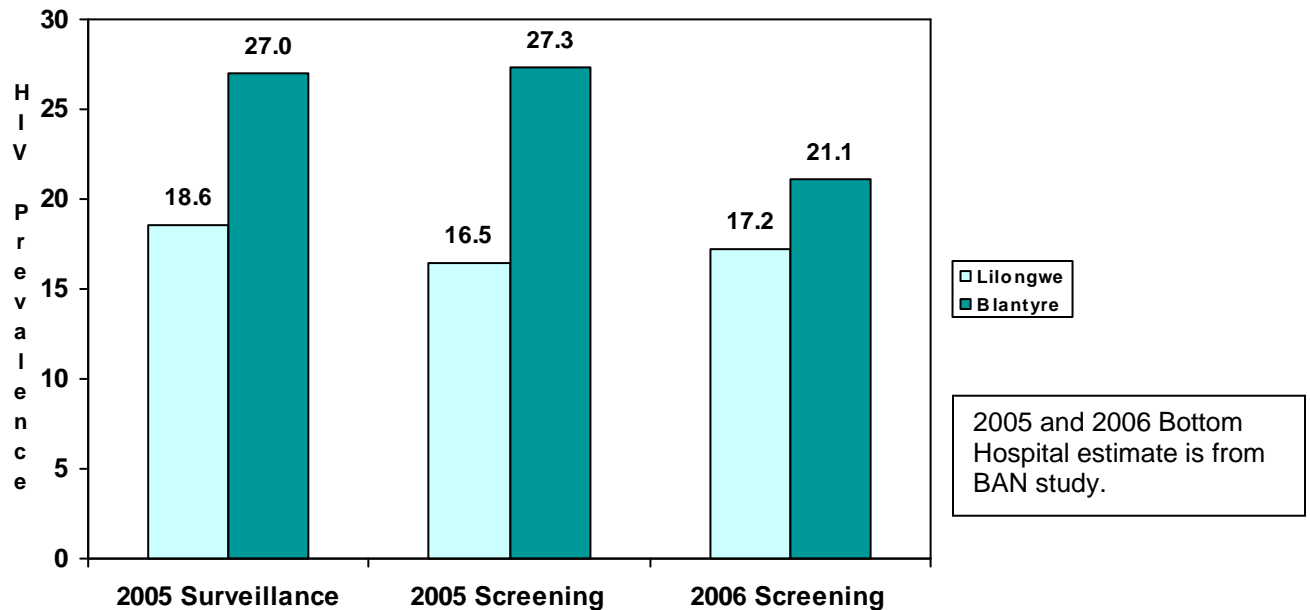
A comparison of 2005 HIV prevalence by age for the ANC surveillance population at Blantyre's Limbe Health Center with 2006 screening data by age at Limbe shows a consistently lower prevalence in the 2006 screening data (Figure 7). (ANC screening prevalence by age for 2005 are available and have been requested.) Prevalence data by age for Lilongwe from screening data are not available.

Table 4   HIV prevalence by age in 5 ANC clinics in Blantyre, 2005 and 2006[13]

		QECH	Limbe	Bangwe	Chilomoni	Zingwangwa
2005						
	<20	15.50		9.80	8.80	9.20
	20-24	14.70		12.20	32.20	18.60
	25-29	28.80		24.40	25.10	21.90
	30-34	31.00		29.30	24.10	33.30
	35+	27.90		24.50	20.80	21.20
	total	23.30		17.40	22.70	19.40
2006						
	<20	4.62	8.00	8.30	8.00	9.90
	20-24	16.70	17.90	21.20	15.10	20.90
	25-29	27.10	28.60	27.90	23.70	24.10
	30-34	29.60	36.90	29.70	26.60	41.90
	35+	35.40	25.00	45.80	22.80	28.20
	total	23.80	21.10	22.20	15.20	23.20

Figure 7   Comparison of 2006 ANC surveillance & 2006 screening for Limbe Health Center in Blantyre
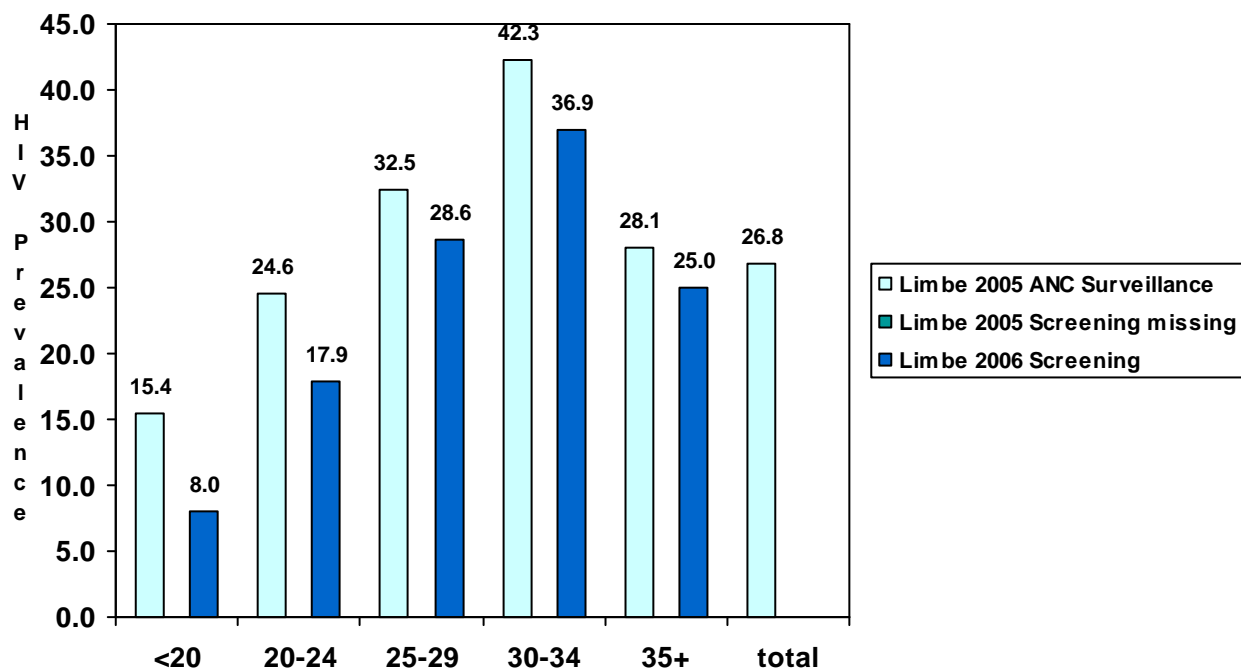
[13] Data provided by Dr. N Kumwenda

In all Blantyre clinics, the prevalence from screening data among women 20-24 is much higher than among women under 20. The odds of infection for women 20-24 compared to women less than 20 appears to be higher in the screening population than it was among the ANC surveillance population. The chart below shows the dramatic increase in prevalence among women 20-24 (Figure 8).

Figure 8 **Dramatic increase in HIV prevalence among women 20-24 screened for HIV in ANC clinics compared with women <20 in 2005 & 2006 in all Blantyre clinics except QECH.**
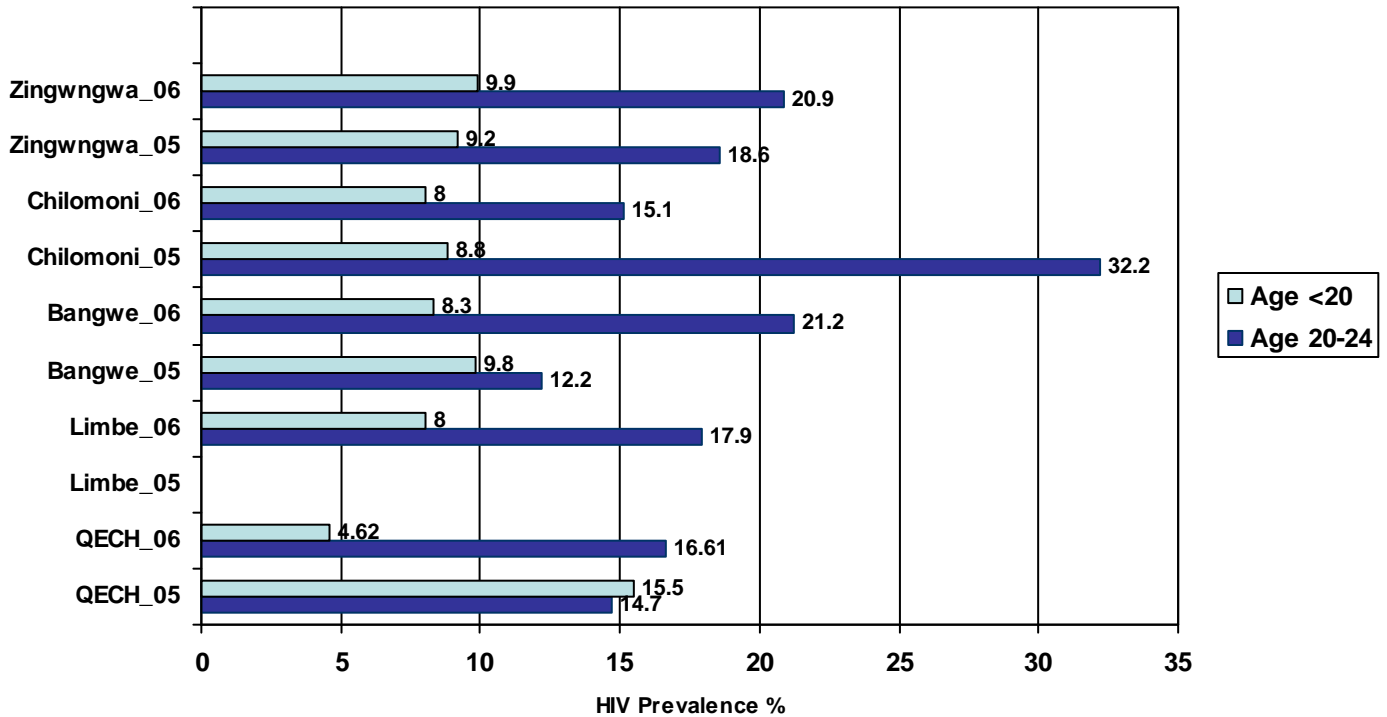
2.4 Data from 2004 DHS and 2006 re-survey in Lilongwe

Methods	Result Summary
Analysis of HIV prevalence data from other populations besides the ANC population ANC screening and comparison of screening as well as the effect of mortality on HIV prevalence estimates	• DHS estimates confirm difference although Lilongwe estimate is problematic • Mortality at the country level can be estimated from DHS data estimating mortality and the effect of mortality on HIV prevalence for Lilongwe and Blantyre requires a larger sample • Blood donor and VCT data not obtained

The 2004 DHS included HIV testing of a sub-sample of respondents (those in households selected for the male sample). Poor response rates for HIV testing in Lilongwe prompted an adjusted estimate and ultimately a re-survey of this area in 2006. We know that there were problems with the 2006 Lilongwe HIV data collection. The re-survey in 2006 resulted in an estimated prevalence of 11% among women which is still much lower than the ANC estimate for the previous year (crude HIV estimate for 2005 ANC population was 18.6%) and is similar to the estimate based on the 2004 survey data adjusted by DHS for non-response. The data for men from the re-survey have been mislaid. All the data show that prevalence in Blantyre has not declined as much as prevalence in Lilongwe.

Table 5   **HIV prevalence estimates from 2004 DHS and 2006 re-survey**

	Men (2004)	Women (2004)	Men (2006)	Women (2006)
Lilongwe	5.3 [9.2[14]] (0.7-10)	1.6 [11.5[15]] (0.0-3.9)	Not Available	10.9 (6.1-15.8)
Blantyre	22.1 (14.7-29.4)	22.5 (17.3-27.8)		
p-value for difference	0.0005	<0.0001		

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[14] Estimated by DHS after adjusting for non-response (MDHS 2004 Final Report Appendix G)
[15] Estimated by DHS after adjusting for non-response (MDHS 2004 Final Report Appendix G)

Table 5 shows that prevalence in Blantyre is much higher in Lilongwe for both men and women, even comparing the 2006 Lilongwe estimate for women with that 2004 estimate for women in Blantyre. Interestingly there appears to be no difference between the sexes in Blantyre.

In Blantyre the DHS estimates show good agreement with the ANC estimate but this is not so in Lilongwe. In Lilongwe, the ANC estimate is much higher than the DHS estimate for women and is arguably more plausible (Figure 9). Even after standardizing the DHS data by age and gravidity there is still a much larger difference between the two cities than in the ANC data.

Figure 9   Trends in HIV prevalence from ANC surveillance and the DHS
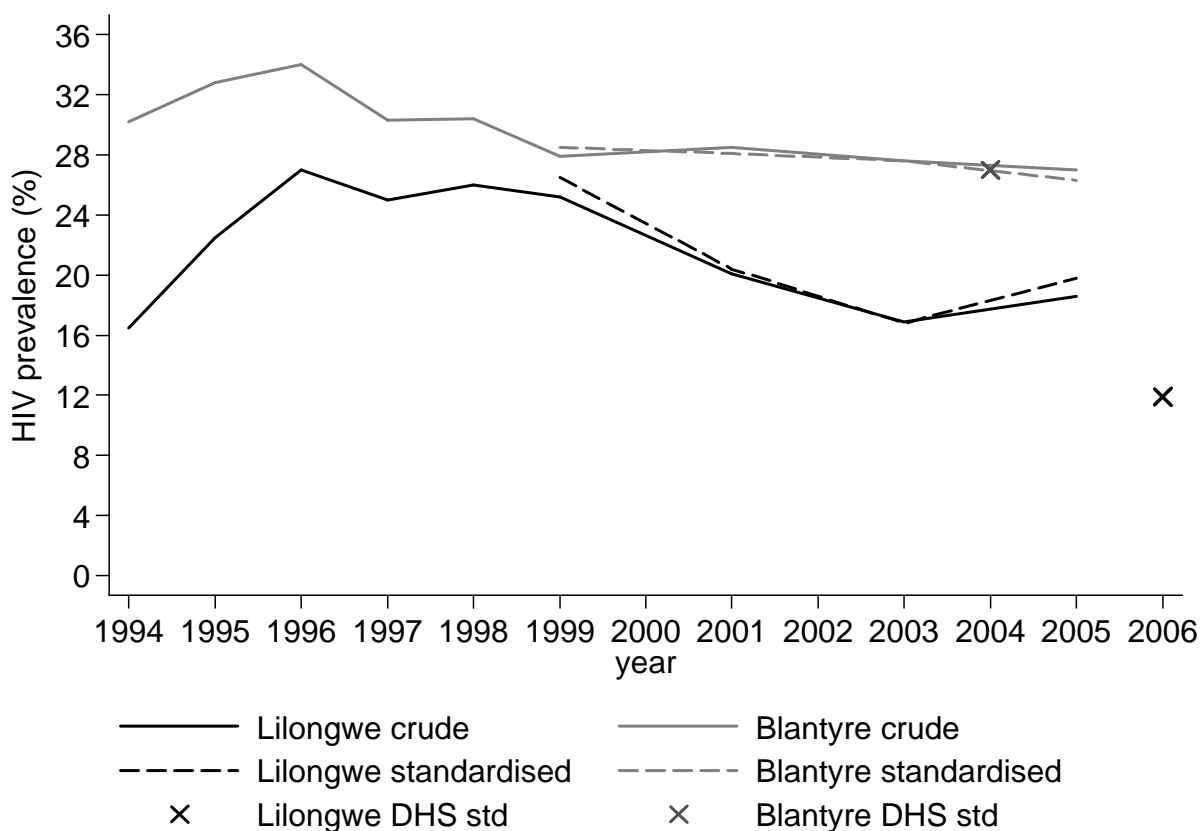
The standardized ANC estimates are standardized to the age and parity distribution of women included in the surveillance in both Lilongwe and Blantyre (i.e. differences in age and parity between the two clinics are removed). The DHS estimates are standardized by age and parity distribution to the population in the clinic in each city (i.e. differences between the DHS and ANC population are removed).

Although there is some question on the extent of difference in HIV prevalence between the two cities, available evidence from ANC and DHS data confirms that prevalence in Blantyre has not declined as much as prevalence in Lilongwe.

2.5 Comparison of incidence estimates

Methods	Result Summary
Secondary data analysis of available datasets containing HIV incidence	• HIV incidence is available in one study of family planning and post natal patients in the two cities. In this study, HIV incidence is only clearly higher among women less than 25 in Blantyre compared with Lilongwe.

HIV incidence estimates for Lilongwe and Blantyre are available from the HIVNET/HPTN 016A Condom Promotion and counseling study (Figure 10). Women of reproductive age were enrolled in a prospective study in which they received 3 intensive HIV counseling and condom promotion sessions over 2 months. The estimated incidence in Blantyre was 4.9/100 person years (95% CI 3.4-6.8) and in 4.3 (3.1-5.9), Lilongwe. Because the confidence intervals overlap, the difference in crude incidence between the two cities is not statistically significant.   The analysis was conducted in collaboration with Dr. Kumwenda and Irving Hoffman.

Figure 10   HIV Incidence (new cases per 100 person years) in Lilongwe and Blantyre among post natal and family planning clinic patients, August, 1999 – April 2001, HIVNET/HPTN 016A
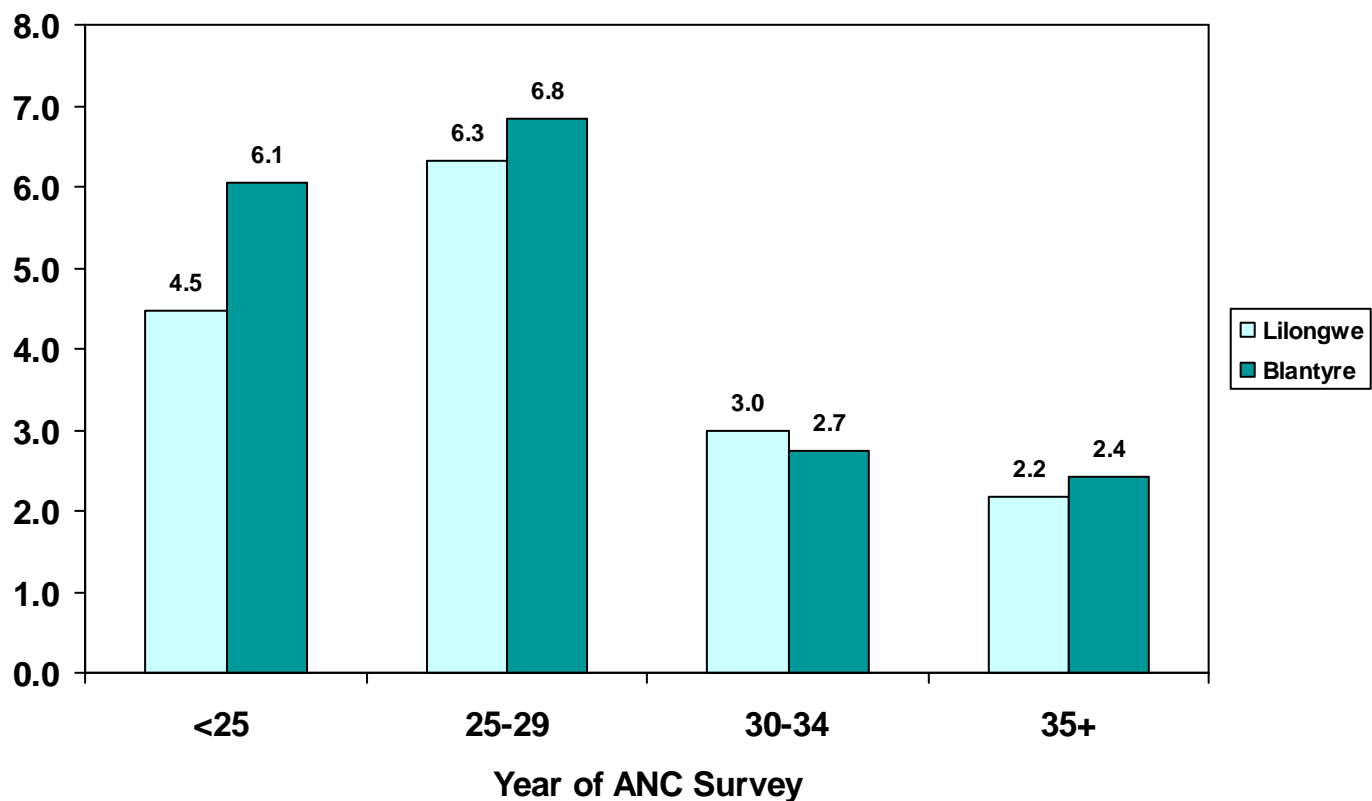
Findings: Risk factors for HIV incidence

Risk factors for HIV acquisition are shown in Tables 6 and 7 below for Lilongwe and Blantyre. There are several important differences between Lilongwe and Blantyre. First, although incidence is highest among women age 25-29 in both cities, incidence in Blantyre among women under 25 is nearly as high as the incidence among women 25-29 (6.05 per 100 py) whereas in Lilongwe incidence among younger women is lower (4.46 per 100 py). In both cities, those with the lowest level of education had the lowest incidence of HIV acquisition; however, the incidence among those with O-levels or higher in Blantyre was twice that of the similarly educated group in Lilongwe (10.33 per 100 py compared to 5.30 per 100 py). In both Blantyre and Lilongwe, people who were married and living with their husband had a lower incidence of infection than women who were either not married or not living with their husband. In Lilongwe, however, none of the women reported having two or more sexual partners. In Blantyre, however, two of the four women who reported having more than two sexual partners were infected with HIV.

Table 6   Factors Associated with incident HIV-1 infection in Lilongwe, HIVNET/HPTN 016-A condom promotion and counselling

Factor	n/N (%)	Incident Cases	Person Years (PY)	Incidence Rate (per 100 PY)	HR [95% C.I.]	P-value
Age group: 35+ years	121/ 685 (18%)	4	184.56	2.17	1.00	
Age group: 30-34 years	94/ 685 (14%)	4	133.92	2.99	1.39 [0.35, 5.57]	0.6396
Age group: 25-29 years	151/ 685 (22%)	13	205.84	6.32	3.09 [1.01, 9.49]	0.0484
Age group: <25 years	319/ 685 (47%)	18	403.73	4.46	2.20 [0.74, 6.49]	0.1547
Education: No school	125/ 685 (18%)	4	191.11	2.09	1.00	
Education: Primary school	403/ 685 (59%)	20	544.73	3.67	1.87 [0.64, 5.48]	0.2526
Education: Form 1-4	124/ 685 (18%)	13	154.49	8.41	4.46 [1.45, 13.72]	0.0090
Education: O-level exams or higher	33/ 685 (5%)	2	37.72	5.30	2.80 [0.51, 15.29]	0.2354
Married and living with husband	630/ 685 (92%)	32	854.02	3.75	1.00	
Not married or living with husband	55/ 685 (8%)	7	74.03	9.46	2.59 [1.14, 5.88]	0.0226
Missing	30/ 685 (4%)	0	0.00			
No sex partners (TV)	29/ 685 (4%)	0	38.62	0.00	0.00 [0.00,]	0.9871
One sex partners (TV)	625/ 685 (91%)	39	887.73	4.39	1.00	
Two or more sex partners (TV)	1/ 685 (0%)	0	1.70	0.00	0.00 [0.00,]	0.9940
Missing	2/ 685 (0%)	0	1.57	0.00		
Condom used with last sex act prior to CP1	58/ 685 (8%)	6	72.18	8.31	1.00	
Condom not used with last sex act prior to CP1	625/ 685 (91%)	33	854.30	3.86	0.45 [0.19, 1.08]	0.0724
Missing	17/ 685 (2%)	1	12.02	8.32		
Full condom use (100%) (TV)	391/ 685 (57%)	24	529.34	4.53	1.00	
Inconsistent condom use (1-99%) (TV)	165/ 685 (24%)	6	240.11	2.50	0.98 [0.38, 2.55]	0.9688
No condom use (0%) (TV)	112/ 685 (16%)	8	146.58	5.46	1.32 [0.57, 3.04]	0.5144

NOTES:
1) HR=1.00 signifies the reference category.
2) CT=Chlamydia, GC=Gonorrhea, Syp=Syphilis, Tric=Trichomonas, GL=Genital sores or ulcers
3) (TV) signifies a time-varying covariate (each was measured at visits 6-9; additionally, # sex partners, condom use, and STIs (except BV and syphilis) were measured at visit 5 for Blantyre participants, who were also tested for HIV at visit 5).

Table 7   Factors associated with incident HIV-1 infection in Blantyre, HIVNET/HPTN 016-A condom promotion and counselling

Factor	n/N (%)	Incident Cases	Person Years (PY)	Incidence Rate (per 100 PY)	HR [95% C.I.]	P-value
Age group: 35+ years	135/ 657 (21%)	4	164.96	2.42	1.00	
Age group: 30–34 years	81/ 657 (12%)	3	109.42	2.74	1.14 [0.26, 5.11]	0.8603
Age group: 25–29 years	111/ 657 (17%)	9	131.58	6.84	2.96 [0.91, 9.61]	0.0716
Age group: <25 years	330/ 657 (50%)	19	313.82	6.05	2.58 [0.88, 7.58]	0.0856
Education: No school	93/ 657 (14%)	2	102.62	1.95	1.00	
Education: Primary school	442/ 657 (67%)	27	481.98	5.60	2.93 [0.70, 12.30]	0.1430
Education: Form 1–4	101/ 657 (15%)	4	115.82	3.45	1.82 [0.33, 9.94]	0.4897
Education: O-level exams or higher	21/ 657 (3%)	2	19.36	10.33	6.15 [0.86, 43.84]	0.0697
Married and living with husband	599/ 657 (91%)	28	662.95	4.22	1.00	
Not married or living with husband	58/ 657 (9%)	7	56.84	12.32	3.00 [1.31, 6.90]	0.0097
Missing	98/ 657 (15%)	0	0.00			
No sex partners (TV)	47/ 657 (7%)	3	61.36	4.89	2.24 [0.77, 6.46]	0.1368
One sex partners (TV)	508/ 657 (77%)	30	652.22	4.60	1.00	
Two or more sex partners (TV)	4/ 657 (1%)	2	6.20	32.27	6.41 [1.94, 21.19]	0.0023
Condom used with last sex act prior to CP1	86/ 657 (13%)	5	87.85	5.69	1.00	
Condom not used with last sex act prior to CP1	571/ 657 (87%)	30	631.93	4.75	0.81 [0.31, 2.10]	0.6685
Missing	23/ 657 (4%)	0	0.16	0.00		
Full condom use (100%) (TV)	363/ 657 (55%)	18	451.14	3.99	1.00	
Inconsistent condom use (1–99%) (TV)	106/ 657 (16%)	9	126.17	7.13	1.82 [0.77, 4.29]	0.1717
No condom use (0%) (TV)	165/ 657 (25%)	8	142.32	5.62	1.17 [0.44, 3.11]	0.7462
Had no STI (CT, GC, Syp, Tric, GL) at CP1	535/ 657 (81%)	28	591.20	4.74	1.00	

NOTES:
1) HR=1.00 signifies the reference category.
2) CT=Chlamydia, GC=Gonorrhea, Syp=Syphilis, Tric=Trichomonas, GL=Genital sores or ulcers
3) (TV) signifies a time-varying covariate (each was measured at visits 6–9; additionally, # sex partners, condom use, and STIs (except BV and syphilis) were measured at visit 5 for Blantyre participants, who were also tested for HIV at visit 5).

2.6 Analysis of HIV prevalence estimates from Behavioural Surveillance Surveys (BSS)

Methods	Result Summary
Secondary data analysis of Behavioural Surveillance Surveys (BSS) from Lilongwe and Blantyre in 2006	• Within 6 of 8 risk groups, HIV prevalence is greater in Blantyre than in Lilongwe in 2006.

Thirteen risk groups were selected for inclusion in the Malawi Behavioral Sentinel Surveillance Surveys (BSS). For each group, a two stage cluster sampling design was used to select study participants nationally or within selected districts in Malawi. BSS data were generously provided by the National Statistical Office for this study. In this analysis we use a sub-set of BSS data from 8 of the 13 surveyed risk groups, from Lilongwe and Blantyre only, in 2004 and 2006. The original intent of the BSS survey was not to provide city-specific data; consequently, we are stretching the data past its original intent. In some cases, the sample sizes are quite small and in other analyses, there is an inconsistency between the sample sizes included in the survey data for 2006 and the survey data included in the testing data for 2006. We did not exclude from our analysis of survey data those who did not have an HIV result. The survey sample size for each of the 8 groups is given in Table 8. Future BSS studies may want to oversample risk groups in Lilongwe and Blantyre and increase the proportion tested.

Throughout this report, data are presented separately for each BSS risk group surveyed, because of differences in the ages of the groups sampled (for example, only male vendors between then ages of 15 and 24 were surveyed) and differences in the sampling strategies and districts sampled for each group. These differences mean that overall estimates of the prevalence of HIV or other factors combining data from each separately sampled risk group are difficult to interpret.

Table 8   Denominators of risk groups in Blantyre and Lilongwe

No.	Risk Group	District	Number (%) 2004	Number (%) 2006
1	Female Primary School Teachers	Blantyre	245 (35.2)	78 (40.0)
		Lilongwe	451 (64.8)	117 (60.0)
		Total	696	195
2	Male Primary School Teachers	Blantyre	145 (30.5)	47 (29.0)
		Lilongwe	330 (69.5)	115 (71.0)
		Total	475	162
3	Female Secondary School Teachers	Blantyre	166 (43.2)	76 (34.5)
		Lilongwe	218 (56.7)	144 (65.5)
		Total	384	220
4	Male Secondary School Teachers*	Blantyre		78 (28.4)
		Lilongwe		197 (71.6)
		Total		275
5	Female Police Officers	Blantyre	66 (49.9)	80 (32.1)
		Lilongwe	69 (50.1)	169 (67.9)
		Total	135	249
6	Male Police Officers	Blantyre	74 (50.7)	91 (33.0)
		Lilongwe	72 (49.3)	185 (67.0)
		Total	146	276
7	Female Sex Workers	Blantyre	71 (50.7)	204 (75.4)
		Lilongwe	69 (49.3)	65 (24.6)
		Total	140	269
8	Male Vendors	Blantyre	169 (44.8)	180 (47.2)
		Lilongwe	193 (55.2)	201 (52.8)
		Total	362	381

Missing data for male secondary school teachers in 2004

HIV prevalence was measured in the 2006 BSS only. For each risk group, the age distribution is different and comparisons are difficult due to small sample sizes. In 6 of the 8 groups, HIV prevalence is higher in Blantyre. HIV prevalence among female sex workers and female primary school teachers was higher in Lilongwe in 2006 (Table 9).

Table 9 **Comparison of HIV prevalence for Blantyre and Lilongwe, by age and BSS risk group, 2006**

Group		Blantyre		Lilongwe	
	Age Group	% HIV Positive	Total	% HIV Positive	Total
Female Sex Workers	<25	64.1%	64	65.7%	35
	25-34	73.0%	63	91.7%	12
	35+	91.7%	24	100.0%	2
	Total	72.2%	151	73.5%	49
Male Primary Teachers	<25	-	0	0.0%	1
	25-34	30.8%	13	11.4%	35
	35+	40.0%	25	29.2%	65
	Total	36.8%	38	22.8%	101
Female Primary Teachers	<25	-	0	33.3%	3
	25-34	12.0%	25	24.4%	45
	35+	18.6%	43	18.0%	61
	Total	16.2%	68	21.1%	109
Male Secondary Teachers	<25	50.0%	2	12.5%	8
	25-34	29.4%	17	7.4%	68
	35+	17.4%	23	10.8%	93
	Total	23.8%	42	9.5%	169
Female Secondary Teachers	<25	0.0%	4	6.7%	15
	25-34	18.2%	11	17.6%	34
	35+	16.7%	24	6.0%	67
	Total	15.4%	39	9.5%	116
Male Vendors	<25	7.3%	248	4.8%	248
	25-34	-	0	-	0
	35+	-	0	-	0
	Total	7.3%	248	4.8%	248
Male Police Officers	<25	-	0	7.7%	13
	25-34	34.1%	41	22.7%	66
	35+	20.0%	20	32.7%	49
	Total	29.5%	61	25.0%	128
Female Police Officers	<25	14.3%	14	19.2%	26
	25-34	43.2%	44	36.5%	63
	35+	25.0%	4	39.1%	23
	Total	35.5%	62	33.0%	112

2.7 HIV prevalence estimates from add-on questionnaire at ANC surveillance sites in Blantyre and Lilongwe in 2005

Methods	Result Summary
Analysis of ANC surveillance add-on questionnaire data from Lilongwe and Blantyre in 2005	• Add-on survey HIV estimates are not reliable because they are not representative of total ANC surveillance HIV prevalence rates at the two sites.

The ANC surveillance sample in Lilongwe at Bottom Hospital was comprised of 867 women; in Blantyre, the Limbe Health Center sample was comprised of 847 women. Additional questions were asked of the women at these two clinics that were not asked at other ANC clinics participating in surveillance in Malawi. These questions were recommended by our study team based on experience in other research settings in Tanzania (Figure 11). The additional questions focused on duration of marriage, length of time residing in the district, occupation of the client, and the father of the baby (including his age and if the mother is currently living with the father).

Data from 457 women (53.9%) at Bottom Hospital in Lilongwe and 693 women (82%) from Limbe Health Center in Blantyre are available for analysis.   The HIV prevalence of the sub-sample in Lilongwe differed from the HIV prevalence in the full surveillance sample (21.9% in the sub-sample compared with 18.6 in the full sample.) In Blantyre, the difference was slight: 26% in the sub-sample compared with 27% in the full sample. Consequently, the findings from these sub-samples may be biased. The tables presenting add-on surveillance data in this report reflect the number actually keyed. A parallel weighted analysis was also done for the data from the sub-sample in Lilongwe. In the weighted analysis, the data were weighted such that the age-specific HIV prevalence in the sub-sample matched the age-specific HIV prevalence in the full sample. Odds ratios and tests of difference were done on the sub-sample without weighting the sample and are reported here. Weighted analyses were also carried out. Associations found significant in the un-weighted analysis were without exception also significant in the weighted analysis.

Comparison of the add-on sample with the ANC surveillance sample shows that the add-on survey sample from Bottom Hospital in Lilongwe has higher prevalence than the full ANC sample and many fewer records (847 vs 457). In the full sample, the prevalence between the two cities was significantly different (OR=1.6 96% CI=1.3 to 2.0). In the subsample, the difference remained but was not significant (Table 10).

Figure 11   Recommended questions for use in ANC add-on surveillance

Antenatal Sero-Prevalence Form

Data collection form PART B: for reference lab

put label here

1.	Clinic name	……………………..
2.	Date	………… dd/mm/yyyy
3.	Age	……….. years
4.	Gravidity	….. previous pregnancies
5.	Current residence (district in Malawi)	……………………..
6.	Current residence type (circle one)	City Town Rural
7.	How long lived at current residence?	Always (go to 10) …… years
8.	Previous residence (district in Malawi)	……………………..
9.	Previous residence type (circle one)	City Town Rural
10.	Do you know who is the father of the baby?	No (go to 15) Yes
11.	Age of father of baby	………. years Don't know
12.	Does father of baby live with you?	Yes (go to 15) No
13.	Father's residence (district in Malawi)	……………………..
14.	Father's residence type (circle one)	City Town Rural
15.	Marital status (circle one)	Never married (go to 23) Widowed (go to 21) Separated or divorced (go to 21) Currently married
16.	How long are you married to this husband?	<1 year = 0 (go to 20) …. years (go to 20) Don't know
17.	Age when you married this husband?	……. years
18.	Does your husband have other wives?	Yes No
19.	Does your husband have other girlfriends?	Yes No
20.	Is this your first marriage?	Yes (go to 23) No
21.	How old were you when you first married?	…. years
22.	How long did your first marriage last?	…. years
23.	How old were you when you first had sex?	…. years
24.	Apart from the father of this baby, have you had sex with anyone else in the last year?	Yes No

Reference Lab results

25.	VDRL	Non-reactive Reactive
26.	TPHA	Non-reactive Reactive
27.	SEROLOGY	Non-reactive Reactive

Table 10   Comparison of HIV prevalence in surveillance sample vs add-on survey sample

	Lilongwe		Blantyre			
	HIV-	HIV+	HIV-	HIV+	Lilongwe	Blantyre
Number of Respondents in ANC surveillance sample	706	161	616	229	867	847
HIV Prevalence Surveillance Sample	18.6		27.0		18.6	27.0
Number of Respondents in Add-on subsample (n)[16]	357	100	513	180	457	693
HIV Prevalence Add-on Subsample	21.9		26.0		21.9	26.0

In the add-on sample, there is not a clear difference between Lilongwe and Blantyre when the probability of HIV infection is modeled as a function of age (See Figure 12).

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[16] The sample size is lower than the number tested at the ANC clinics for surveillance. The HIV prevalence in the sub-sample in Lilongwe is higher than the prevalence in the entire 867 tested. Consequently, the findings from this comparison may be biased.

Figure 12   Probability of HIV infection by age, add-on survey of ANC surveillance patients in Lilongwe and Blantyre, 2005
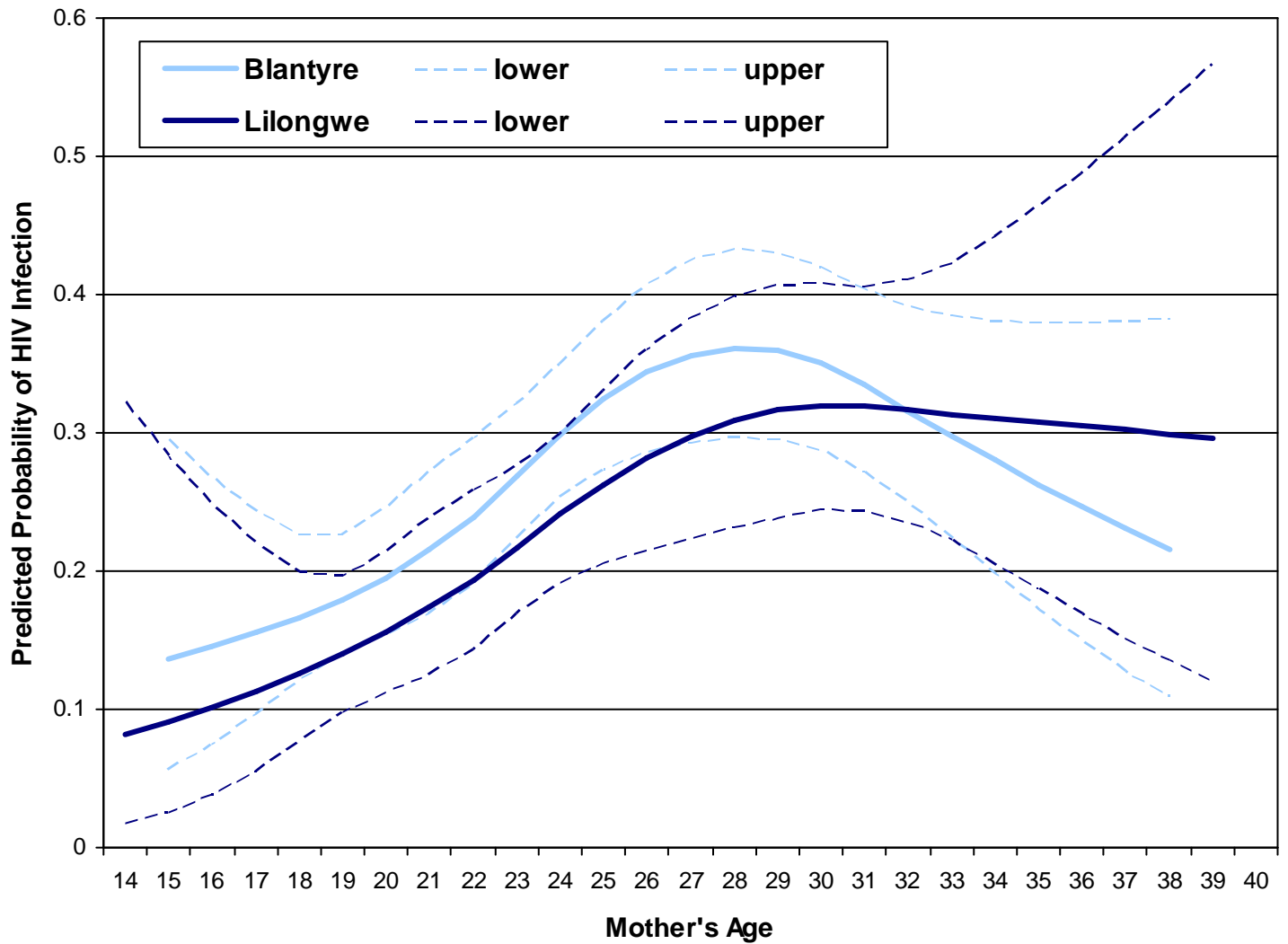
Chapter 3: Is the Difference in HIV Prevalence Due to Protocol Issues or Selection of Clinics for ANC Surveillance?

3.0 Overview of objective and methods

Objective: To explore whether the HIV trend differential in Lilongwe vs Blantyre is due to choice of clinic for ANC surveillance, changes in the clinic site, changes and improvements in diagnostic procedures, and/or shift to an opt-out strategy.

Methods:

3.1   Assessment of whether choice of clinic caused differences in HIV prevalence

3.2   Assessment of whether changes in the HIV surveillance protocol or implementation of the protocol caused differences in HIV prevalence

3.3   Assessment whether change to opt-out strategy could have had an effect on HIV prevalence estimates

3.1 Choice of clinic for ANC surveillance

Methods	Result Summary
Comparison of HIV prevalence at Limbe Health Center with prevalence at other ANC clinics in Blantyre, particularly QECH which was the first surveillance clinic for Blantyre.	• Using HIV screening data to compare HIV prevalence levels across clinic in Blantyre, Limbe had the highest HIV prevalence level in 2005. Thus it is possible that the change from QECH to Limbe would have contributed to an increase in the prevalence differential with Bottom Hospital in Lilongwe. However, without prevalence data over time from QECH, this remains speculation.

Clinic site has not change in Lilongwe. In Blantyre, the clinic site changed from the central hospital (QECH) to Limbe Health Center in 2003. QECH had a lower HIV prevalence in 2005 than Limbe Health Center. This was not the case in 2006 and it is unknown whether Limbe consistently had a higher prevalence than QECH prior to 2005.

3.2 ANC protocol issues: Inclusion criteria for HIV surveillance, laboratory methods, and protocol implementation

Methods	Result Summary
Assessment of whether other changes in the ANC HIV surveillance protocol or problems in implementation of the protocol could have contributed to an overestimate of prevalence in Blantyre or an underestimate in Lilongwe.	• There is no evidence that any changes increased or decreased prevalence estimates over time, however, undocumented problems in implementation of ANC surveillance protocols may have occurred.
Assessment whether participation increased or decreased when an opt-out strategy was adopted and whether this was likely to have an effect on HIV prevalence.	• In Lilongwe, change to an opt-out strategy increased participation but did not seem to affect HIV prevalence in the ANC screening population.

During the period when HIV surveillance sample collection is in session, consecutive women attending ANC services for the first time pregnancy are eligible for enrolment. Enrolment continues either until the predetermined sample sizes are reached or eight weeks (whichever is reached first), based on World Health Organization (WHO) recommendations. Since both Lilongwe Bottom Hospital and Limbe Health Center are urban surveillance sites, a total of 800 women are eligible to participate. Small sample size estimates are more likely to fluctuate due to chance.

From 1994 to 2003, residual whole blood samples collected for routine testing of syphilis were used for HIV testing. Surveillance site nurse-midwives were trained on the collection of the samples, storage and eventual submission for central HIV testing coordinated by the Community Health Sciences Unit (CHSU). Technical support was provided by the Centers for Diseases Control and Prevention (CDC)-Lilongwe, Malawi. HIV testing was done centrally using a single enzyme immunoassay (EIA assay; Vironostika HIV Uniform II Plus, Biomerieux, the Netherlands). In 2003, surveillance protocol was changed from using whole blood to dried-spot blood samples. Women were not offered the option to decline HIV testing when whole blood was used for testing or when the procedure changed to using a dried blood spot. Thus it is unlikely that this change in procedure decreased participation in surveillance, however, this could be explored in the April 1, 2008 meeting.

According to the guidelines, only women presenting for the first time for ANC care during the surveillance period should be included in the HIV surveillance estimates. However, this guideline was not always observed. For example, in 2005 at Lilongwe's Bottom Hospital, some women presenting for subsequent visits were recruited for surveillance. This happened because many women who had presented prior to the surveillance period had not received routine syphilis screening due to lack of supplies including reagents for testing. The availability of supplies during the surveillance period was perceived by nurse-midwives as opportunity to also offer syphilis testing to these women. While this was certainly a deviation from standardized protocol, a biased HIV prevalence estimate could only arise if HIV prevalence among women coming for subsequent visits is different from those coming for the initial visit. We do not know the extent to which this occurred and consequently the effect on the HIV prevalence estimate in Lilongwe is difficult to assess.

3.3 Assessment of whether change to opt-out strategy could have had an effect on HIV prevalence estimates

Some evidence that the change to an opt-out strategy did not have an effect on HIV prevalence is available in Lilongwe. When the percent tested increased at Bottom Hospital in early 2005 due to the shift to the opt-out strategy, there was no apparent effect on HIV prevalence. The surveillance prevalence estimate (18.6%) was slightly higher than the clinic screening rate in October 2005 (16.7%).

Figure 13   Effect of changing ANC screening strategy to opt-out on measured HIV prevalence in Lilongwe
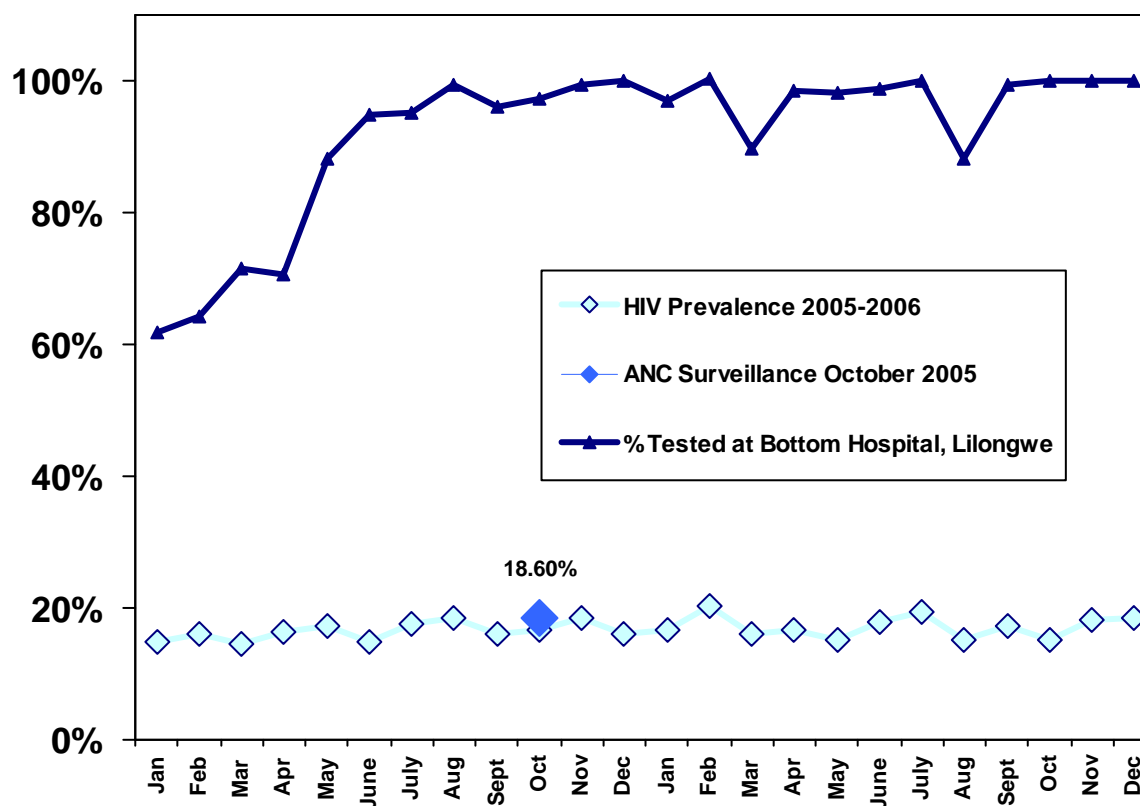
Chapter 4: Is the Difference in HIV Prevalence Due to Changes in the Composition of the ANC Clinic Population?

4.0 Overview of objective and methods

Objective: To assess whether the HIV prevalence trends in Lilongwe and Blantyre could be an artifact of changes in the composition of the ANC patient population included in the surveillance and/or changes in the risk profile of the population living in the catchment areas of ANC clinics (changes in previous residence, age, marital status or parity, migration from rural areas, migration, fertility, urbanicity).

Methods:

4.1   Trend analysis of ANC surveillance data by urban rural status

4.2   Trend analysis of DHS data to assess whether there was a difference in birth rate, uptake of ante-natal care, or parity in clinic catchment areas

4.3   Assessment of whether in-migration in Lilongwe diluted HIV prevalence

4.1 Urban-rural difference in surveillance clinic population

Methods	Result Summary
Trend analysis of urban rural residence	• ANC Surveillance data not available for this analysis; Add-on surveillance questionnaire in 2006 indicates higher percentage of urban residence among women at Lilongwe surveillance ANC

This analysis cannot be conducted in 1999-2005 data as all women are coded as urban. In 2006, a supplementary survey was carried out in conjunction with ANC surveillance (discussed below in section 4.3). While trend analysis is not possible from this data, we are able to describe possible urban-rural differences between the Blantyre and Lilongwe ANC surveillance populations in 2006.

In 2006, 99% of women in the add-on ANC surveillance in Lilongwe reported that they currently resided in Lilongwe district and 92.6% of women in the add-on ANC surveillance in Blantyre indicated that they resided in Blantyre. In Lilongwe, 91% of women reported currently living in a city, and in Blantyre, only 58.4% reported current residence in a city.

4.2 Difference in birth rate, uptake of ante-natal care, and/or parity in Lilongwe vs Blantyre

Methods	Result Summary
Trend analysis of DHS data for changes in birth rate, uptake of ante-natal care or parity in Lilongwe vs Blantyre, with parity analysis from ANC surveillance data	• Although age and parity did not differ much between the cities in both data sources (ANC and DHS) there is a difference in the coverage of ante-natal care. Among women reporting a birth in the last year, 10% in Lilongwe compared with 1% in Blantyre did not receive ante-natal care. It is unlikely that this explains the difference in HIV prevalence in the two cities' ANC populations. At national level there is no difference in HIV prevalence between those who receive ante-natal care and those who do not. • DHS data shed insight into the decreasing fertility rate of women in Blantyre. This could reflect lower fertility due to HIV.

Findings: Birth rate

In 1992 almost a quarter of all women in both cities had given birth in the year prior to the survey. By 2004 this percentage had declined to 21% in Lilongwe and 18% in Blantyre (the difference was not significant). In 2000 the difference between the cities was significant (Table 11).

Table 11   Percentage of all women who had a baby in the year before the survey, DHS 1992-2004

City	1992	1996	2000	2004
Lilongwe	24.8	n/a	23.6	21.0
Blantyre	24.2	n/a	15.2	18.1
p-value for diff between cities	0.7556		0.0037	0.2648

Findings: Ante-natal care

As shown below, most women receive ante-natal care. However, whilst in 1992 there was no difference between the cities there is now greater coverage in Blantyre than in Lilongwe. The difference between the cities is marked: 10% of women in Lilongwe who had a baby in the last year did not have antenatal care compared to 1% of women in Blantyre in 2004 (Table 12).

We can't compare the HIV status of those who did and didn't receive ANC because, of the 267 women in Blantyre and Lilongwe who had babies in the year before the 2004 survey, only 42 were tested for HIV. Nationally, prevalence is lower among women who did not get ante-natal care but the difference is not significant, so it doesn't seem a likely explanation for the differences.

Table 12   Percent of women who did not receive ante-natal care, among all women who had a baby in the year before the survey, DHS 1992-2004

City	1992	1996	2000	2004
Lilongwe	10.2	n/a	10.5	9.2
Blantyre	9.4	n/a	1.2	0.7
p-value for diff between cities	0.8221		0.0018	0.0020

Findings: Parity

The parity distributions for all DHS respondents were very similar in both cities in 1992 but were different for women in the two cities by 2004 (Figure 14). More women in Lilongwe than Blantyre had had 3 or more children but this difference was not significant. This is unlikely to have affected sentinel surveillance though since the parity distributions seen in the clinics in each city are similar (Figure 15). Standardizing for age and parity had no real effect on HIV prevalence.

Figure 14   Parity distribution among women by city and survey year, DHS 1992-2004
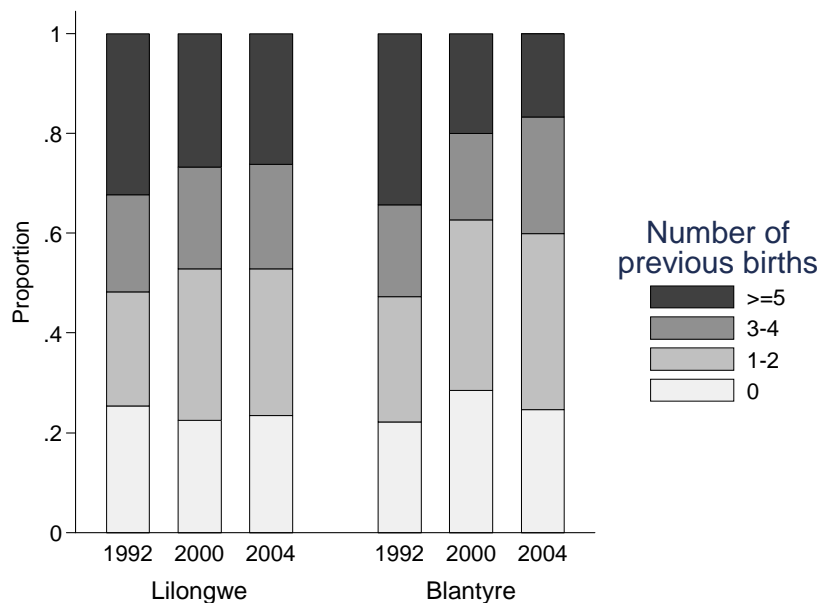
Figure 15   Parity distribution (based on gravidity-1) among women attending ANC by city in 2003 and 2005

4.3   Assessment of whether in-migration in Lilongwe diluted HIV prevalence

Methods	Result Summary
Analyze DHS data to determine proportion of residents in Lilongwe and Blantyre who moved into the city from a rural area and to determine whether moving from a rural area is associated with HIV status.	• The DHS data suggest a difference in migration history between the two cites. Men from Blantyre are more likely to report being from a rural area, however, it is difficult to establish whether there is any association between migration and HIV status using DHS data.
Assess from the add-on survey implemented during the 2005 ANC survey whether moving to Lilongwe or Blantyre was associated with HIV infection in 2005.	• Few people reported living their entire life in either Lilongwe or Blantyre. The odds of infection for those who had moved to the city was higher compared to those who had lived in the city all their life, but the association was not significant.

Findings: DHS assessment of migration data

According to Census data, the population of urban Blantyre and Lilongwe increased dramatically between 1987 and 1998 for both men and women (Table 13).

DHS asks about the length of time each respondent has lived in their current residence, and if they had not always lived there, the type of place they lived before. Using this information, it is possible to identify respondents who have moved into the cities from rural areas. Note that these are people who have moved from a rural area to an urban area at some point in their lives. Persons who moved from a rural to another urban area and then to their current place or moved from one urban area to another are not included in this analysis.

Table 13   Population of urban Blantyre and Lilongwe by Age, Census Data 1987 and 1998

Lilongwe Urban														
	Total	<1	1 - 4	5 - 9	10 – 14	15 - 19	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 - 54	55 +
Men														
87	120,954	4,213	17,873	16,265	12,408	11,436	12,317	13,740	9,923	7,731	5,000	3,948	2,228	3,872
98	231,516	8,265	26,556	27,664	25,530	26,989	29,445	28,215	18,704	13,242	9,077	6,756	4,384	4,118
Women														
87	104,892	4,142	15,247	16,720	15,162	11,186	12,105	9,895	6,297	5,148	2,922	2,115	1,263	2,690
98	208,955	8,316	26,359	28,881	29,586	26,952	29,382	19,528	12,777	9,335	5,779	4,216	2,635	2,682
Blantyre Urban														
Men														
87	178,942	5,708	20,535	23,214	18,630	17,386	18,298	20,610	15,132	13,161	8,723	6,775	4,161	6,609
98	262,816	7,954	27,476	30,148	29,144	30,903	32,608	32,430	6,308	15,533	11,024	8,602	5,747	5,544
Women														
87	153,754	5,621	20,560	23,934	21,946	17,372	18,483	15,029	9,735	8,007	4,339	3,013	1,893	3,822
98	239,238	7,844	27,692	31,473	32,966	32,637	34,642	24,012	15,934	11,346	6,966	5,418	3,019	2,884

There are differences between men and women and differences between the two cities (Table 14). Men are more likely than women to have moved from a rural area to the city. Men in Blantyre are consistently more likely than men in Lilongwe to report having moved into the city from a rural area whereas there is no consistent pattern for women.

Table 14   Percent of DHS respondents in Lilongwe and Blantyre who reported being migrants to the city, 1992-2004

City	1992	1996	2000	2004
Women				
Lilongwe	5.9	-	11.1	14.8
Blantyre	3.1	-	21.0	14.9
p-value for diff between cities	0.0004		0.0001	0.9551
Men				
Lilongwe	18.6	-	8.4	5.9
Blantyre	25.3	-	14.7	16.3
p-value for diff between cities	0.0514		0.0647	0.0092

For migration to partially explain differences in HIV prevalence between the cities, there must be a difference in HIV status between rural-urban migrants and other people. There are too few migrants in the HIV sub-sample to establish whether or not there is a difference. The data suggest that migrants in Blantyre are less likely to be HIV infected than people who have not moved from a rural area (Table 15). If this were the case, the increased migration into Blantyre ought to lower, not raise, the prevalence compared to

Lilongwe. Therefore, there is no evidence to suggest that these differences are due to migration.

Other variables that should be investigated such as duration of residence, childhood place of residence, and being a visitor, are compromised by small sample size, especially in Lilongwe. In the re-survey in 2006, these questions were not asked.

Table 15 **HIV prevalence, by sex and city, among migrants (people who have moved to the city from a rural area) and non-migrants, DHS 2004**

	Lilongwe			Blantyre		
Men	% HIV +	95% CI	N	% HIV +	95% CI	N
Non-migrant	4.3	(0.5 - 8.2)	214	23.7	(15.5 - 31.8)	179
Migrant	33.4	(0.0 – 88.7)	14	13.6	(0.0 - 29.8)	29
Women						
Non-migrant	1.9	(0.0 - 4.6)	602	25	(18.1 - 31.8)	595
Migrant	0		108	8.7	(0.0 – 21.4)	108

Findings: Assessment of migration from ANC 2005 add-on survey

In the add-on survey at Blantyre and Lilongwe ANC surveillance sites in 2005, women were asked how many years they had lived in the district. Those who had always lived in the district could respond that they had always lived in the district. Only 7 percent of women in Lilongwe and 11 percent of women in Blantyre reported that they had always lived in the district. Women who had moved to the district had a higher odds of infection with HIV, but the association was not statistically significant (Table 16).

Table 16   Differences in migration to district and length of residence in district between women in Lilongwe and Blantyre, ANC HIV surveillance add-on survey, 2005

	Lilongwe N=457	Blantyre N=693	
	%	%	p-value[17]
Whether mother moved to district or always lived here			
Moved	93.4	88.9	✓[18] p=.009
Always lived here	6.6	11.1	
Years mother living in current district			p=0.06
Less than 1 Year	16.0	13.7	
1-5 Years	57.3	54.4	
More than 5 Years	26.7	31.9	
Mean Years Residing in District	5.1	6.4	✓[19] p=0.003

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[17] Usually, if SAS Proc Ttest shows that the variances are equal, then we use the pooled variance estimator, and otherwise, when the variances are not equal, the Satterthwaite's method is used. There is actually not much difference in this study between the pooled and Satterthwaite's p values, so we will conservatively report Satterthwaite's p values for all t tests. About a third of the variables had unequal variances.

[18] Significantly different BH vs LHC (p=0.009, OR=1.8 95% CI=1.2, 2.9)

[19] Significantly different BH vs LHC (p=.003, t-test of means).

Those who had recently moved to the district, however, were not more likely to be infected with HIV than longtime residents (Table 17).

Table 17   Association between time living in district and HIV status among women in Lilongwe and Blantyre, ANC HIV surveillance add-on survey

	Lilongwe			Blantyre		
	HIV- %	HIV+ %	Selected ORs[20]	HIV- %	HIV+ %	Selected ORs
Mother's residence in district						
Moved to district	77.6	22.4	1.4 (0.5,3.8)	73.1	26.9	1.5 (0.8,2.8)
Always lived here	86.2	13.8	1.0	80.5	19.5	1.0
Years mother living in current district						
Less than 1 year	83.6	16.4		83.2	16.8	
1-5 years	79.4	20.6		71.1	28.9	
More than 5 years	72.1	27.9		75.1	24.9	
Mean years residing in district	4.9	6.0		6.5	6.1	✓[21] p=0.003

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[20] For t-tests, p values, and odds ratios, missings are excluded.
[21] Significantly different BH vs LHC (p=.003, t-test of means).

Chapter 5: Is the Difference in HIV Prevalence Due to Co-Factors for HIV Transmission?

5.0   Overview of objective and methods

Objective: To assess whether two co-factors for HIV transmission, infection with other STI and lack of circumcision, may have contributed to a decline in HIV transmission

Methods:

5.1   Trend analysis from ANC surveillance data of syphilis prevalence in the two cities

5.2   Comparison of syphilis prevalence in Lilongwe and Blantyre from other research studies.

5.3   Comparison of circumcision rates using DHS data

5.1   Trend analysis from ANC surveillance data of syphilis prevalence in the two cities

Methods	Result Summary
Trend analysis from ANC surveillance data of syphilis prevalence in the two cities.	• Syphilis prevalence among women appears similar in the two cities. Prevalence was extremely low in 2005. Syphilis does not appear to be a major co-factor for HIV acquisition at the population level.

Syphilis infection is uncommon in both cities and appears to be declining over time (Table 18 and Figure 16). There is virtually no difference in prevalence between the two cities, and the trends over time are similar.

Table 18 **Syphilis prevalence among ANC Populations in Lilongwe and Blantyre, 1999-2005**

Year/ Clinic	Crude syphilis prevalence	Age-standardized	Gravidity-standardized	Standardized for both	Under-25
2005					
Lilongwe	1.4	1.4	1.5	1.6	1.8
Blantyre	1.4	1.4	1.4	1.4	0.8
2003					
Lilongwe	3.2	3.3	3.3	3.4	3.9
Blantyre	4.9	4.8	4.8	4.5	4.5
2001					
Lilongwe	4.1	4.2	4.2	4.4	3.7
Blantyre	4.1	4.1	4.1	3.9	3.5
1999					
Lilongwe	5.7	5.7	5.9	5.9	5.8
Blantyre	4.0	4.1	4.4	4.3	4.5

Figure 16   Trends in ANC syphilis prevalence
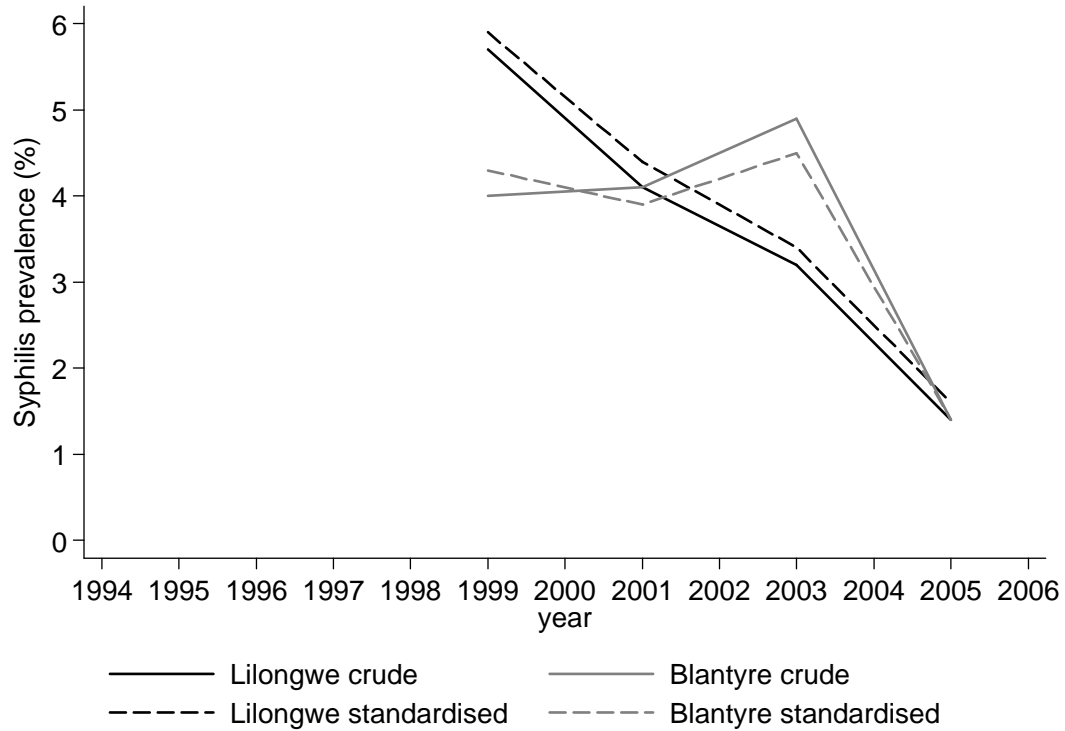
The standardized ANC estimates are standardized to the age and parity distribution of women included in the surveillance in both Lilongwe and Blantyre (i.e. differences in age and parity between the two clinics are removed).

5.2 Syphilis findings from other research

Methods	Result Summary
Comparison of syphilis prevalence in Lilongwe and Blantyre from other research studies.	• The HIVNET 024 trial included study populations in Lilongwe and Blantyre. Syphilis prevalence among pregnant study participants between July 2001 and February 2003 was slightly higher in Blantyre, but not statistically significant. Syphilis is unlikely to play a current role in the prevalence differentials.

We obtained site specific analyses for Lilongwe and Blantyre for the syphilis analysis reported by Potter D et al[22]. These data were collected between July 2001 and February, 2003. The prevalence of syphilis increased by age in both cities, and was consistently higher in Blantyre compared with Lilongwe, although the difference did not achieve statistical significance. Testing RPR+ was significantly associated with HIV infection in both cities. The syphilis estimates from the Potter HIVNET trial data are higher than the syphilis estimates provided by ANC surveillance.

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[22] Potter et al. Correlates of syphilis seroreactivity among pregnant women: the HIVNET 024 Trial in Malawi, Tanzania, and Zambia. (Reference: Sex Transm Dis. 2006 Oct;33(10):604-9).

Table 19   Association between syphilis and HIV infection in Lilongwe and Blantyre, 2001-2003

	Lilongwe				Blantyre			
	N	% of total population	% RPR + with characteristic	p-value	N	% of total population	% RPR + with characteristic	p-value
All	N=896		5.1		559		6.3	
HIV Status	N=896			0.0225	N=559			0.0214
Positive	748	83.5	5.9		464	83.0	7.3	
Negative	148	16.5	1.4		95	17.0	1.0	
Age	N=896			0.2589	N=559			0.2494
16-19	84	9.4	1.2		68	12.2	1.5	
20 – 24	367	41.0	6.0		216	38.6	7.9	
25 – 29	291	32.5	5.8		189	33.8	6.9	
30 – 45	154	17.2	3.9		86	15.4	4.7	
Years' Education	N=896			0.0515	N=559			0.0251
0	112	12.5	8.0		35	6.3	5.7	
1-5	301	33.6	6.6		134	24.0	11.2	
6-18	483	53.9	3.5		390	69.8	4.6	
Literate	N=896			0.0063	N=559			0.0036
Yes	677	75.6	4.0		455	81.4	4.8	
No	219	24.4	8.7		104	18.6	12.5	
Marital status	N=896			<0.0001	N=559			0.0500
Married/living with partner	868	96.9	4.7		527	94.3	6.1	
Never married/ not living w partner	13	1.5	0		17	3.0	0	
Divorced/sep/wid	15	1.7	33.3		15	2.7	20.0	

	Lilongwe				Blantyre			
	N	% of total population	% RPR + with characteristic	p-value	N	% of total population	% RPR + with characteristic	p-value
Electricity on premises	N=896			0.4081	N=559			0.4882
Yes	137	15.3	6.6		239	42.8	5.4	
No	759	84.7	4.9		320	57.3	6.9	
Running water on premises	N=896			0.3384	N=559			0.0455
Yes	256	28.6	6.3		234	41.9	3.9	
No	640	71.4	4.7		325	58.1	8.0	
Cook w paraffin stove	N=896			0.1869	N=559			0.7347
Yes	71	7.9	8.5		22	3.9	4.6	
No	825	92.1	4.9		537	96.1	6.3	
Number of lifetime sexual partners including spouse	N=895			0.4141	N=559			0.0631
1	268	29.9	3.7		140	25.0	2.9	
2	318	35.5	5.4		194	34.7	5.7	
3-25	309	34.5	6.2		225	40.3	8.9	
Treated for genital ulcers	N=896			0.0545	N=559			0.1004
Yes	21	2.3	14.3		20	3.6	15.0	
No	875	97.7	4.9		539	96.4	5.9	

	Lilongwe				Blantyre			
	N	% of total population	% RPR + with characteristic	p-value	N	% of total population	% RPR + with characteristic	p-value
Number of pregnancies, including this one	N=896			0.2159	N=559			0.0136
1	114	12.7	1.8		100	17.9	0	
2-4	566	63.2	5.7		390	69.8	8.0	
5-12	216	24.1	5.6		69	12.3	5.8	
Number of stillbirths	N=896			<0.0001	N=559			0.0001
0	817	91.2	4.2		524	93.7	5.2	
1	60	6.7	11.7		32	5.7	21.9	
2-5	19	2.1	26.3		3	0.6	33.3	
Number of children born >3 weeks early	N=896			<0.0001	N=559			<0.0955
0	844	94.2	4.4		516	92.3	5.6	
1	33	3.7	21.2		36	6.4	13.9	
2-8	19	2.1	10.5		7	1.3	14.3	

5.3 Circumcision

Methods	Result Summary
Comparison of circumcision rates using DHS data	• Similar prevalence of male circumcision in Lilongwe and Blantyre in 2004 DHS

In Malawi in 2004, 21% of men aged 15 to 49 were circumcised. Overall, HIV infection is more common among circumcised men. This is presumably because of confounding by geographic and/or cultural factors. Male circumcision is more common in Blantyre than in Lilongwe (22% versus 15%) but this difference is not significant (p=0.296).

Chapter 6: Is the Difference in HIV Prevalence Due to Differences in Sexual Behaviors?

6.0   Overview of objective and methods

Objective: To assess whether there are differences in sexual behavior in Lilongwe and Blantyre and whether these differences are associated with HIV infection

Methods:

6.1 Age at first sex in Lilongwe and Blantyre over time and implications for HIV prevalence

6.2 Comparison of marital patterns over time including the length of time spent unmarried and implications for HIV prevalence

6.3 Comparison of number and characteristics of partnerships in Lilongwe and Blantyre

6.4 A multivariable model of behavioral factors associated with HIV infection in DHS data

6.1 Age at first sex in Lilongwe and Blantyre over time and implications for HIV prevalence

Methods	Result Summary
Analysis of historical series of sexual behavior data collected in DHS surveys since the 1990's	• Women in 2004: The most recent DHS does not show a significant difference in age at first sex for women in Lilongwe vs Blantyre. • Women over time: Pooled data from all surveys show that there appears to have been an increase in the median age at first sex in Lilongwe; in Blantyre the age at first sex has decreased. • Men in 2004: Men in Blantyre began sex at a younger age. • Men over time: Pooled data for the men do not show an increase or decrease in age at first sex for men but the age at first sex is consistently lower in Blantyre than in Lilongwe.
Analysis using BSS data comparing 7 risk groups in 2004 and 2006	• No discernible trend.

Conclusion: Cohort analysis of DHS data are the most reliable source of information on trends in median age at first sex over time; men in Blantyre have a consistently lower age at first sex than men in Lilongwe. Women in Blantyre and Lilongwe had a similar age at first sex in 2004, though trend analyses show that female age at first sex has increased in Lilongwe and decreased in Blantyre over time.

Findings: DHS

In the most recent DHS the median age at first sex for men is 18.6 in Lilongwe and 17.5 in Blantyre. For women it is also 18.3 in Lilongwe and 17.4 in Blantyre. Figure 17 shows that, in 2004, there was a difference between the overall survival function for each city for men but not for women (p values 0.04 and 0.37 respectively).

Comparison of the median age at first sex reported by each birth cohort indicates whether the median age is changing over time (Table 20). Comparing the reports of the same cohort at different surveys shows whether changes in survey composition (different types of respondent, either real or as an artifact of survey design) or in reporting bias may have occurred.

The data from all surveys pooled show that, for women, there appears to have been an increase in the median age at first sex in Lilongwe but not in Blantyre. Examination of the hazard ratios (from a cox model) shows that there is good evidence for an increase in age at first sex in Lilongwe amongst those born in 1980-89 relative to those born in the 1960s. It also reveals that in Blantyre the opposite change has occurred and those born in the 1980s are more likely to have had sex at a given age than those born in previous decades. No changes are apparent for men.

Figure 17   Survival functions for men and women in each city, 2004 DHS
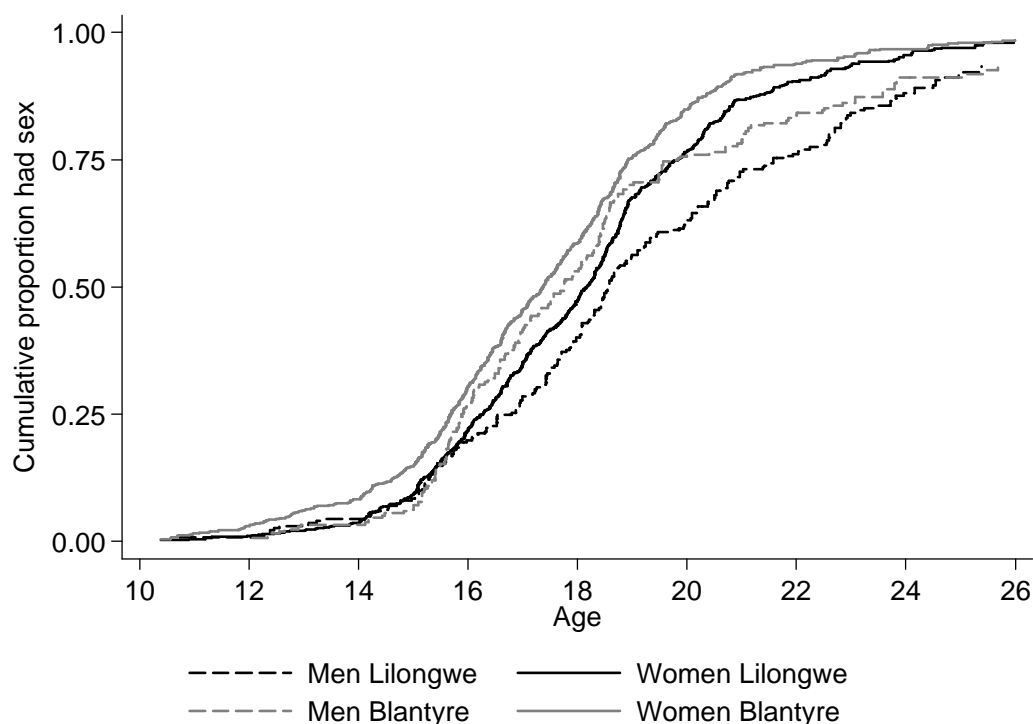
The age at first sex reported by respondents does seem to depend on the time of the survey for men in Blantyre and women in Lilongwe. When comparing the reports for people born 1950-79, who were in all the surveys with age at first sex (1996, 2000, 2004), and after controlling for year of birth, the survival functions are different depending on the year of the survey. In Blantyre, men interviewed in the earlier surveys reported an earlier age at first sex than those interviewed in 2004 (HR2000=1.4 p=0.007; HR1996=1.8 p<0.001). In Lilongwe, women interviewed in 2000 reported an earlier age than those interviewed in 2004 (HR=1.2 p=0.013), though there was no difference between the 1996 and 2004 reports.

Looking at the median ages reported in each survey, the reporting bias seems to have affected all birth cohorts and so is unlikely to be the only explanation for the observed trends over time.

Table 20 **Median age at first sex by birth cohort and year of survey for men and women in each city**

Birth cohort	1996	2000	2004	2006	Pooled	HR pooled	p-value
		WOMEN					
Lilongwe							
1950-1959	17.47	16.01	18.07	17.61	16.79	1.05	0.685
1960-1969	18.39	16.91	17.67	17.16	17.4	1	
1970-1979	18.21	17.08	17.97	17.46	17.51	1.02	0.783
1980-1989	.	17.53	18.46	17.01	18.01	0.87	0.076
Blantyre							
1950-1959	18.16	17.48	18.42	-	17.65	1.12	0.198
1960-1969	17.8	17.46	17.36	-	17.46	1	
1970-1979	17.83	17.85	17.62	-	17.78	0.98	0.827
1980-1989	16.05	17.43	17.04	-	17.15	1.30	0.001
		MEN					
Lilongwe							
1950-1959	20.14	19.99	18.56	-	19.85	0.79	0.123
1960-1969	18.03	19.15	18.04	-	18.45	1	
1970-1979	17.91	18.89	19.09	-	18.66	1.00	0.979
1980-1989	.	17.53	18.55	-	18.01	1.17	0.521
Blantyre							
1950-1959	14.83	17.98	17.74	-	17.12	1.08	0.577
1960-1969	15.39	16.77	18.32	-	17.02	1.00	
1970-1979	15.33	16.66	17.14	-	16.66	1.14	0.265
1980-1989	14.51	17.96	18.05	-	17.9	0.84	0.177

Findings: BSS

Analysis of Behavioural Surveillance Survey (BSS) data from 2004 and 2006 revealed no discernable trend in age at first sex over time among the seven risk groups for which data were available. Increases in median age at first sex from 2004 to 2006 in the two cities occur in some groups, while median age at first sex decreases in others. The median age at first sex among male police officers and female sex workers declined by one year between 2004 and 2006 in both cities (Figure 18). Female sex workers in Blantyre had the lowest median age at first sex in every year, with a declide from 16 years in 2004 to 15 years of age in 2006. Female school teachers had the oldest median age at first sex in both cities.

Figure 18   Median age at first sex from BSS data by group and city (Blantyre and Lilongwe), 2004 and 2006

6.2 Comparison of marital patterns over time including the length of time spent unmarried and implications for HIV prevalence

Methods	Result Summary
Trend analysis of time spent single before sex, time spent sexually active and single and time spent cohabitating/married before age 25 from DHS cohorts.	• Men report a longer gap between first sex and first marriage than women in both cities (6 vs 3 years). The length of the gap, however, is longer among men in Blantyre than in Lilongwe (7 vs 6 years).
Analyze data from DHS surveys from 1992-2006 to assess the differences between age at first marriage	• Although most people are married or cohabiting, there are some differences in the age at first marriage. Median age at first marriage is lower in Lilongwe for men and higher in Lilongwe for women.
Analyze data from BSS surveys of 7 groups in Lilongwe and Blantyre to compare median age at marriage and current marital status	• BSS surveys found a higher prevalence of marriage in Lilongwe for two of seven groups and a higher proportion of widowhood in Blantyre for six of six groups. • Median age at marriage was fairly similar within BSS groups over time and between Blantyre and Lilongwe.
Analyze BSS survey data from risk groups in the two cities to assess HIV prevalence by marital status	• HIV prevalence was highest among those who had ever been married in both cities.
Compare marital pattern in Lilongwe and Blantyre and assess whether marital pattern is associated with HIV infection	• Marital patterns were different in Lilongwe and Blantyre, confirming DHS findings.
Analyze data from add-on to ANC surveillance to assess HIV prevalence by marital status	• Mean age at marriage was higher among women infected with HIV in both cities. HIV prevalence was higher among married women not in their first marriage, and among women in their first marriage who were married at age 18 or older.

Conclusions: The pattern of marriage affects sexual networks in urban areas in Malawi. However, understanding pathways by which particular marriage patterns increase the risk of HIV transmission requires further study.

Findings: Gap between first sex and marriage in DHS Data

The time spent sexually active before marriage may be a period of high risk for the acquisition of HIV. The average length of this time for men and women also indicates something about the sexual culture in a population.

Figure 19 shows for men and women in each city the average number of person years spent single before having had sex, single after first sex but before first marriage and after first marriage. The figures are for the first 25 years of life and for two birth cohorts, those born 1970-74 who turned 25 between 1995 and 1999 and for people born 1975-79 who turned 25 between 2000 and 2004. Women born in the 1970s spent a median of 3 years between first sex and first marriage compared with a median of 6 years for men of the same age.

In both Lilongwe and Blantyre men report a longer gap between first sex and first marriage than women. There is little change over time and, for women, little difference between the cities. Men in Blantyre spend longer between first sex and marriage: a median of 7 years compared to 6 in Lilongwe and this difference is significant (HR 0.76, p=0.006 comparing Blantyre to Lilongwe and controlling for year).

Figure 19   Average number of person years spent in three different states: unmarried and never had sex, unmarried and sexually experienced and married
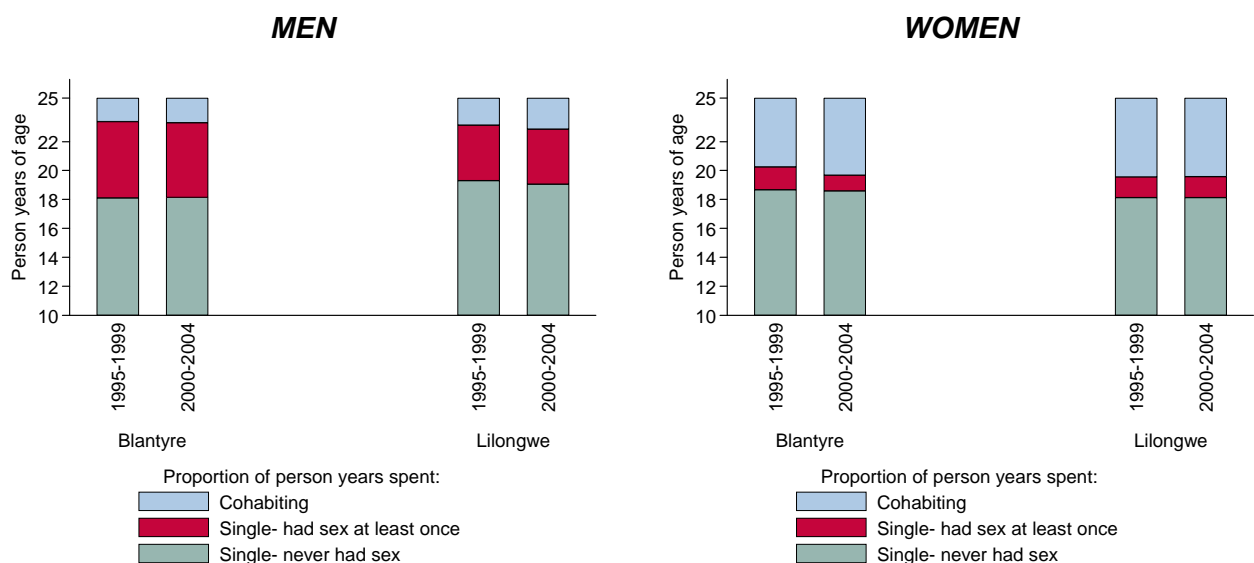
Findings: Marital status and age at first marriage in DHS Data

Most DHS respondents were married or cohabiting (Table 21). In all surveys a greater proportion of women than men were married or cohabiting. There were differences between the cities for men in 1996 and women in 2000 which suggest that marriage and cohabitation may be less common in Blantyre but the difference is not systematic.

Table 21   **Percentage of DHS respondents currently married or cohabiting in Lilongwe and Blantyre, 1996-2006**

	1996	2000	2004	2006
MEN				
Lilongwe	63.5	57.4	59.4	
Blantyre	54.8	57.4	63.1	
p-value for diff between cities	0.0171	0.9857	0.5930	
WOMEN				
Lilongwe	73.4	75.2	68.9	70.4
Blantyre	66.3	63.2	70.3	
p-value for diff between cities	0.1158	0.0000	0.7488	.

Median age at first marriage (based on data from all surveys) is shown in Table 22. Men marry later than women and there has not been a change in men's age at marriage. Women's age at marriage seems to be increasing with younger cohorts reporting older ages for first marriage.

Comparing the reports of the same cohort in successive surveys shows that men born before 1970 have reported progressively younger ages for first marriage as they themselves have aged. This effect is not apparent for women.

Using the pooled data there are clear differences between the cities for men (HR comparing Blantyre to Lilongwe 0.86, p=0.055) but not for women (Table 22).

Table 22   Age at first marriage by birth cohort, city and sex, 1992-2004

Birth cohort	1992	1996	2000	2004	Pooled	HR pooled	p-value
			MEN				
Lilongwe							
1950-1959	24.2	22.5	21.4	21.0	22.3	1.02	0.8848
1960-1969	24.6	24.0	22.8	22.6	23.5	1	
1970-1979	.	23.0	22.8	24.5	23.3	0.92	0.4966
1980-1989	*	.	.	23.8	23.8	0.51	0.0189
Blantyre							
1950-1959	24.6	22.9	25.0	25.4	24.6	0.97	0.8058
1960-1969	26.7	25.1	24.3	22.5	24.5	1	
1970-1979	.	24.3	24.6	23.5	24.2	1.09	0.4279
1980-1989	*	.	.	.	.	0.88	0.6712
			WOMEN				
Lilongwe							
1950-1959	17.6	18.8	17.6	18.5	18.1	0.97	0.6855
1960-1969	17.6	19.4	18.1	18.2	18.0	1	
1970-1979	18.4	18.7	18.7	18.6	18.6	0.93	0.2873
1980-1989	*	.	18.7	19.6	19.4	0.69	0.0004
Blantyre							
1950-1959	18.0	18.8	17.7	19.1	17.9	1.06	0.3066
1960-1969	17.9	18.7	18.2	17.6	17.9	1	
1970-1979	18.5	19.8	19.0	18.7	18.9	0.8	0.0001
1980-1989	-	.	18.9	18.6	18.8	0.78	0.0013

indicates that median age could not be calculated

Men in Blantyre start marrying earlier than men in Lilongwe but this initial difference reverses in the late teens (Figure 20). Entry into marriage rises more steeply in the early twenties for men in Lilongwe and by the age of 30 more men have been married in Lilongwe than in Blantyre. Below the age of 19, women in Blantyre are more likely to be married than women in Lilongwe, though at older ages, the time to first marriage is identical between the two cities (Figure 20).

Figure 20   Survival functions for time to first marriage for men and women in each city, based on pooled data from 1992-2004 DHS surveys for respondents born between 1950 and 1989
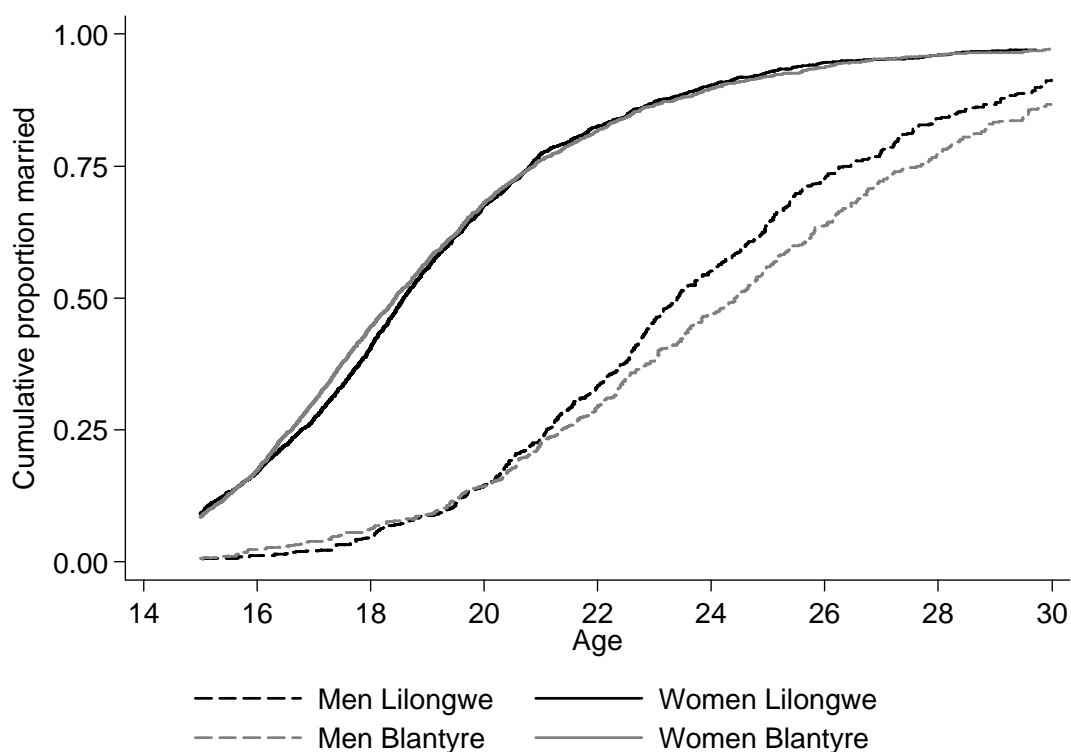
Findings: Marital status and age at first marriage in BSS Data

BSS Surveys among seven risk groups found a higher prevalence of marriage in Lilongwe than in Blantyre in both 2004 and 2006 for male and female primary school teachers, but the differences were not large (Table 23).

Table 23   Percentage of Behavioral Sentinel Survey respondents who report being currently married

No.	Risk Group	District	2004	2006
1	Female primary school teachers	Blantyre	73.5	65.4
		Lilongwe	79.8	74.1
2	Male primary school teachers	Blantyre	88.3	85.1
		Lilongwe	93.6	87
3	Female secondary school teachers	Blantyre	68.1	68.4
		Lilongwe	76.6	57.6
4	Female police officers	Blantyre	53	63.8
		Lilongwe	51.1	61.5
5	Male Police officers	Blantyre	74.3	79.1
		Lilongwe	86.1	77.3
6	Female sex workers	Blantyre	9.9	10.3
		Lilongwe	16.2	9.2
7	Male vendors	Blantyre	17.2	29.6
		Lilongwe	21.8	16

Except for female sex workers in 2004, the percentage reported being widowed is higher in Blantyre than in Lilongwe (Table 24).

Table 24   Percentage of Behavioral Sentinel Survey respondents who report being widowed

No.	Risk Group	District	2004	2006
1	Female primary school teachers	Blantyre	15.1	23.1
		Lilongwe	9.3	12.9
2	Male primary school teachers	Blantyre	2.1	4.3
		Lilongwe	0.6	0.9
3	Female secondary school teachers	Blantyre	15.7	15.8
		Lilongwe	7.3	11.1
4	Female police officers	Blantyre	6.1	7.5
		Lilongwe	1.4	2.4
5	Male Police officers	Blantyre		3.3
		Lilongwe		1.1
6	Female sex workers	Blantyre	2.8	17.6
		Lilongwe	11.8	15.4

Median age at first marriage was very similar within BSS groups in Lilongwe and Blantyre and remained the same within most groups between 2004 and 2006 (Table 25). Female sex workers had the lowest age at first marriage in both cities of around 18 years. Male vendors had the lowest age at first marriage among males and primary school teachers had the highest male age at first marriage of between 25 and 26 years.

Table 25   Median age at first marriage among Behavioral Sentinel Survey respondents

No.	Risk Group	District	2004	2006
1	Female primary school teachers	Blantyre	23	23
		Lilongwe	23	23
2	Male primary school teachers	Blantyre	26	26
		Lilongwe	25	25
3	Female secondary school teachers	Blantyre	23	23
		Lilongwe	23	23.5
4	Female police officers	Blantyre	22	23
		Lilongwe	22	23
5	Male Police officers	Blantyre	25	24
		Lilongwe	25	25
6	Female sex workers	Blantyre	18	18
		Lilongwe	18	17
7	Male vendors	Blantyre	19	20
		Lilongwe	20	20

Findings: Marital status and HIV infection in BSS

Within BSS risk groups, among those who had ever married, HIV prevelance was generally higher in Blantyre except among ever married female sex workers and female primary school teachers, among whom prevalence was higher in Lilongwe (Table 26).

Table 26   **Comparison of HIV prevalence for Blantyre and Lilongwe among those ever married for each BSS risk group, 2006**

Group		Blantyre		Lilongwe	
Group	Ever Married	% HIV Positive	Total	% HIV Positive	Total
Female Sex Workers	Yes	71.8	131	82.1	39
	No	75.0	20	40.0	10
	Total	72.2	151	73.5	49
Male Primary Teachers	Yes	40.0	35	25.0	92
	No	-	3	-	7
	Total	36.8	38	22.8	101
Female Primary Teachers	Yes	16.2	68	21.0	105
	No	-	-	25.0	4
	Total	16.2	68	21.1	109
Male Secondary Teachers	Yes	21.9	32	10.8	139
	No	30	10	3.3	30
	Total	23.8	42	9.8	169
Female Secondary Teachers	Yes	17.7	34	9.8	92
	No	-	5	8.3	24
	Total	15.4	39	9.5	116
Male Vendors	Yes	11.6	86	12.5	48
	No	4.9	162	4.0	202
	Total	7.3	248	5.6	250
Male Police Officers	Yes	29.5	61	28.4	102
	No	-	7	11.5	26
	Total	26.5	68	25.0	128
Female Police Officers	Yes	39.1	46	32.1	78
	No	25.0	16	36.4	33
	Total	35.5	62	33.0	112

Findings: Marital status differences and associations with HIV prevalence from add-on ANC surveillance data

Comparison of ANC clients in Lilongwe and Blantyre indicated that mothers were less likely to be married and less likely to be married to their baby's father in Blantyre. There was no difference in the number of years clients had been married. Women in Lilongwe were more likely to be married to a husband with multiple wives (Table 27).

Table 27   **Difference in marital patterns in Lilongwe and Blantyre and association of marital patterns with HIV status among women in the 2005 Add-On study of women at Lilongwe and Blantyre ANC Clinics[23]**

	Lilongwe			Blantyre			Lilongwe	Blantyre	
	HIV-%	HIV+%	Selected ORs	HIV-%	HIV+%	Selected ORs	%	%	p<0.05 for test of difference[24]
Number in add-on subsample (n)[25]	357	100		513	180		457	693	
Mother married to father			1.4			0.8			
Yes	77.9	22.1	(0.4,5.0)	74.4	25.6	(0.4,1.4)	96.1	90.8	✓
No	83.3	16.7	1.0	70.3	29.7	1.0	3.9	9.2	
Mean age at first marriage	18.0	18.7	✓	18.1	19.5	✓	18.2	18.5	
Mean Years Married	4.6	6.3	✓	5.1	4.9		5.0	5.1	
Marital pattern			✓			✓			✓
In first marriage and married at age<18	83.2	16.8		84.1	15.9		28.7	30.9	
In first marriage but married at age 18+	77.6	22.4		72.1	27.9		54.7	48.0	
Married but not in first marriage	67.2	32.8		57.8	42.2		12.7	13.0	
Not Married	83.3	16.7		73.2	26.8		3.9	8.1	
Woman in polyg. marriage			1.5			2.2			
Yes	71.1	28.9	(0.7,3.2)	57.6	42.4	(1.1,4.5)	8.3	4.8	✓
No	78.8	21.2	1.0	75.0	25.0	1.0	91.7	95.2	

✓ p-value > 0.05

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[23] For t-tests, pvalues, and odds ratios, missings are excluded.

[24] If variances are equal, a pooled variance estimator was used. When the variances are not equal, the Satterthwaite's method was used. There is very little difference in this study between the pooled and Satterthwaite's p values, so we conservatively reported Satterthwaite's p values for all t tests. About a third of the variables had unequal variances.

[25] The sample size is lower than the number tested at the ANC clinics for surveillance. The HIV prevalence in the sub-sample in Lilongwe is higher than the prevalence in the entire 867 tested. Consequently, findings from this comparison may be biased.

Further analyses compared differences in marital patterns in Lilongwe and Blantyre and their associations with HIV status (Table 27). Among the characteristics that were significantly associated with HIV infection were whether the mother currently is in her first marriage, mean years married, and mean age at first marriage.

6.3 Comparison of number and characteristics of partnerships in Lilongwe and Blantyre

Methods	Result Summary
Trend analysis in DHS data of number of partners	• No meaningful conclusions can be drawn from the data. Trends are not clear and few women reported more than one partner.
Trend analysis of type of partners in DHS data	• Partnership patterns differ in Lilongwe and Blantyre. Sexually active women in Blantyre were more likely to have a non-cohabitating partner. • In 1996 and 2000 more men in Blantyre also report a non-cohabiting partner than in Lilongwe.
Analysis of add-on ANC surveillance data in 2005 comparing partner age and multiple and concurrent partnerships in the two cities	• No difference between Blantyre and Lilongwe in partner age or partner age difference. Female concurrency higher in Blantyre and husband concurrency higher in Lilongwe. HIV increases with partner age and with concurrency in each city.
Analysis of BSS data on median number of sexual partners in past 12 months and HIV prevalence in the two cities	• HIV prevalence among persons reporting two or more partners in the past year is higher in Blantyre for most BSS groups; median number of sexual partners reported is similar for the two cities.
Analysis of BSS data on condom use in the two cities	• Condom use was more prevalent in Lilongwe for most groups.
Analysis of PLACE data on number of sexual partners and condom use	• Males and females in Lilongwe had more partners and more new partners than those in Blantyre. Condom use was slightly lower in Blantyre.

Conclusions: Patterns in sexual risk behaviors in the two cities are inconsistent between data sources; condom use appears to be less common in Blantyre according to PLACE and BSS data.

Findings: Comparing the number of sexual partners over time with DHS data

The proportion of all men and women who reported having had more than one partner in the year before the survey (as opposed to one or none) showed no clear trends over time. Differences between the cities were apparent for men in 2004 and for women in 1996 but these did not seem to be consistent (Table 28).

Table 28   Percentage of all men and women who reported more than one sexual partner in the year prior to the survey, by city, 1996-2006

	1996	2000	2004	2006
MEN				
Lilongwe	5.8	13.4	9.4	
Blantyre	7.7	19.8	3.8	
p-value for diff between cities	0.4679	0.1193	0.0370	
WOMEN				
Lilongwe	0.2	0.7	1.0	0.5
Blantyre	1.8	0.5	1.2	
p-value for diff between cities	0.0025	0.6307	0.6467	

Table 29   Mean number of partners in the year before the survey, by sex and city, 1996-2006

	1996	2000	2004	2006
MEN				
Lilongwe	3.274	2.212	2.290	
Blantyre	2.400	2.695	2.116	
p-value for diff between cities	0.003	0.036	0.382	
WOMEN[26]				
Lilongwe	4.667	2.0	2.0	2.0
Blantyre	2.167	2.0	2.0	
p-value for diff between cities	0.118	-	-	

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[26] Results for women very unreliable because there were fewer than 10 women in each cell.

Amongst those who had more than one partner, the mean number of partners for men was highest in Lilongwe in 1996 but again there was no clear pattern. So few women reported more than one partner (9 in 1996, 11 in 2000 and 15 in 2004) that no meaningful conclusions can be drawn from the data (Table 29).

Findings: Type of sexual partners over time in DHS data

There is more evidence for a difference between the cities in the types of partner reported by those who were sexually active. Sexually active women in Blantyre were more likely than those in Lilongwe to report having had a non-cohabiting partner (Table 30). This difference was also apparent for sexually active men in the 1996 survey but not in the later data.

Table 30   Percent of sexually active respondents who had sex with a non-cohabiting partner in the year before the survey, 1996-2006

	1996	2000	2004	2006
Men Lilongwe	21.8	35.7	29.5	
Men Blantyre	34.7	45.5	26.0	
p-value for diff between cities	0.0024	0.0959	0.5372	
Women Lilongwe	4.4	5.9	7.2	8.8
Women Blantyre	14.5	15.2	13.6	
p-value for diff between cities	0.0024	0.0000	0.0412	.

Overall in all years, more women in Blantyre report having had a non-cohabiting partner than in Lilongwe (Figure 21). In 2004 more women in Lilongwe reported never having had sex, and that difference balanced out the difference in the proportion reporting non-cohabiting partners. In the earlier surveys the difference was more general.

In 1996 and 2000 more men in Blantyre also report a non-cohabiting partner than in Lilongwe (Table 31). For men in 1996 this difference is balanced by more men in Lilongwe reporting having had a cohabiting partner but the difference between men in the two cities diminished over time and had disappeared by 2004.

Figure 21   Distribution of survey respondents by their reported partnerships in the year before the survey.

Men
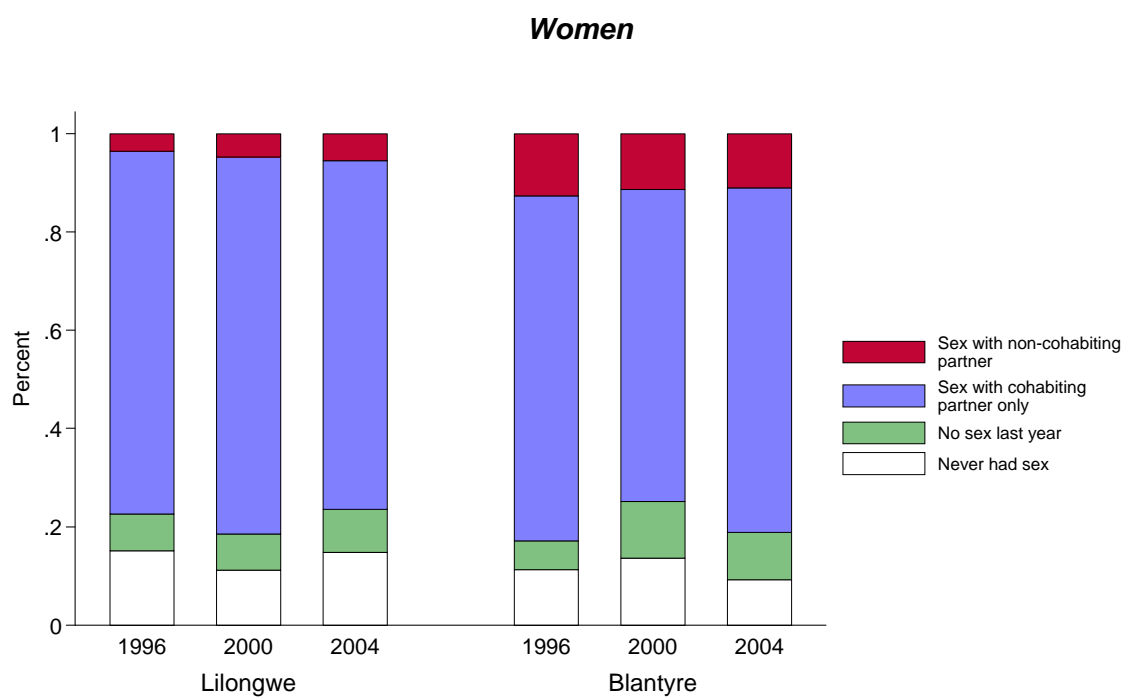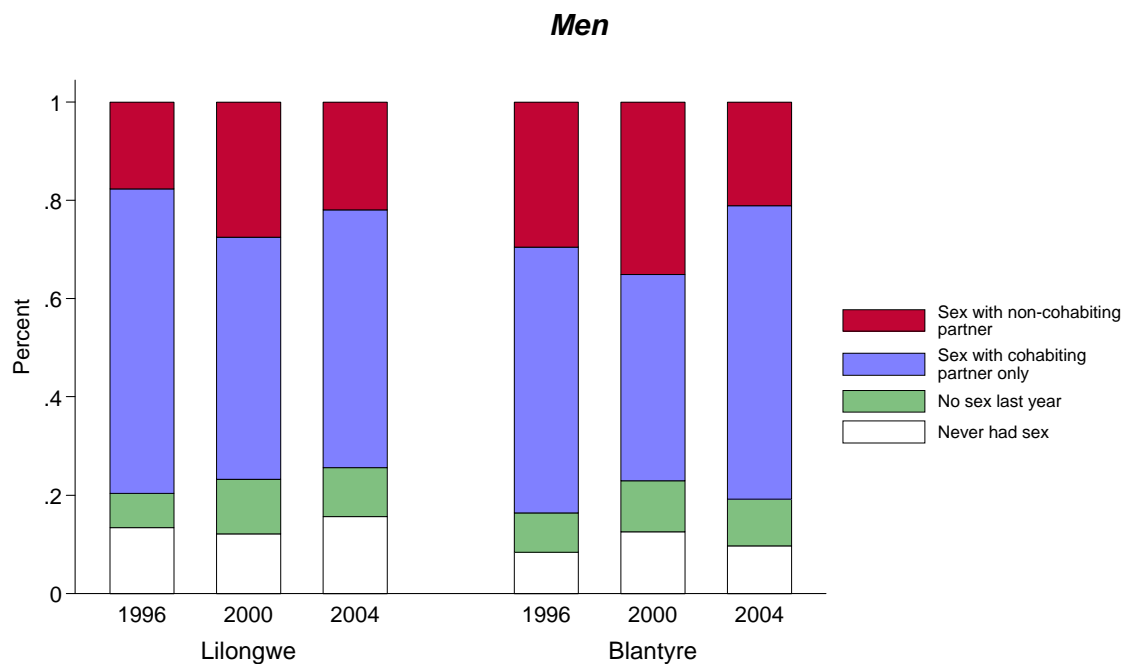
Women

Table 31   Distribution of survey respondents by their reported partnerships in the year before the survey, 1996-2004

	Lilongwe			Blantyre		
	1996	2000	2004	1996	2000	2004
WOMEN						
Non-cohabiting partner [27]	3.5*	4.7*	5.4*	12.6*	11.4*	11.0*
Cohabiting partner only	73.8	76.7*	71.0	70.2	63.4*	70.1
No sex last year	7.6	7.4*	8.8	5.8	11.6*	9.7
Never had sex	15.1	11.2	14.8*	11.3	13.7	9.2*
MEN						
Non-cohabiting partner	17.6*	27.4*	21.9	29.5*	35.1*	21.0
Cohabiting partner only	62.0*	49.3	52.4	54.0*	41.9	59.8
No sex last year	6.9	11.2	10.0	8.1	10.4	9.5
Never had sex	13.4	12.1	15.6	8.4	12.6	9.7

*p-value for difference between the cities (adjusted Wald test) ≤0.05.

Findings: Multiple partnerships and concurrency and HIV prevalence in add-on ANC surveillance data

Among ANC patients in 2005 in Blantyre and Lilongwe, there was no difference in the age of the baby's father or in partner age difference (Table 32). However, within each city, HIV infected women reported higher ages for their baby's father than women not infected with HIV. HIV prevalence was higher among women whose baby's father was ten or more years older and women who reported that their baby's father was age 30 or older.

Married ANC patients in Lilongwe were more likely to report that their husband has other girlfriends than women in Blantyre (Table 32). In contrast, married women in Blantyre were twice as likely as women in Lilongwe to report that they had had sex with a man other than their husband in the past year. Each of these types of concurrency was associated with a higher prevalence of HIV infection, although measures were imprecise.

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[27] Those who had non-cohabiting partners may also have had a cohabiting partner.

Table 32 **Difference in partner age and concurrency and association with HIV status among women in the 2005 add-on study of women at Lilongwe and Blantyre ANC clinics**

	Lilongwe			Blantyre			Lilongwe	Blantyre	
	HIV-%	HIV+%	Selected ORs	HIV-%	HIV+%	Selected ORs	%	%	p<0.05 for test of difference[28]
Number in add-on subsample (n)[29]	357	100		513	180		457	693	
Mean age of father	27.4	30.5	✓	26.8	29.6	✓	45.9	50.1	
Father is 10+ years older than mother			2.1			2.2			
Yes	64.5	35.5	(1.0,4.5)	57.6	42.4	(1.1,4.5)	6.8	4.8	
No	79.1	20.9	1.0	74.8	25.2	1.0	93.2	95.2	
Father is age 30+			2.6			2.0			
Yes	64.1	35.9	(1.6,4.2)	62.8	37.2	(1.3,2.9)	22.5	20.9	
No	82.2	17.8	1.0	77.0	23.0	1.0	77.5	79.1	
Husband has other girlfriends			1.8			1.1			
Yes	66.7	33.3	(0.7,4.7)	71.4	28.6	(0.2,5.9)	4.6	1.0	✓
No	78.7	21.3	1.0	74.0	26.0	1.0	95.4	99.0	
Sex with man other than husband, past year, married women									
Yes	75.6	24.4		67.9	32.1		8.8	16.6	✓
No	78.5	21.5		75.5	24.5		91.2	83.4	
Whether father and mother live together						0.6			
Yes	78.2	21.8		74.2	25.8	(0.3,1.2)	96.0	93.2	✓
No	72.2	27.8		64.4	35.6	1.0	4.0	6.8	

✓p-value < 0.05

Findings: Number of partners and HIV prevalence from BSS data

The median number of sexual partners in Blantyre and Lilongwe appears to be very similar and unchanged over time. For most BSS groups surveyed, median number of sexual partners in the past year is 1 in both 2004 and 2006 and in both cities. The quality of the data is questionable in that female sex workers report a median of 1 sexual partner in the past 12 months in 2006 in both cities (Table 33).

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[28] See Table 26 above for discussion of variance
[29] See Table 26 above for discussion of sample size

Table 33   Median number of sex partners in past 12 months in Blantyre and Lilongwe, BSS 2004-2006

No.	Risk Group	District	Number of partners	
			2004	2006
1	Female Primary School Teachers	Blantyre	1	1
		Lilongwe	1	1
2	Male Primary School Teachers	Blantyre	1	1
		Lilongwe	1	1
3	Female Secondary School Teachers	Blantyre	1	1
		Lilongwe	1	1
4	Female Police Officers	Blantyre	1	1
		Lilongwe	1	1
5	Male Police Officers	Blantyre	1	1
		Lilongwe	1	1
6	Female Sex Workers	Blantyre	1	1
		Lilongwe	3	1
7	Male Vendors	Blantyre		1
		Lilongwe		2

Overall, HIV prevalence is higher in Blantyre than Lilongwe for those with two or more sexual partners among risk groups surveyed in the BSS study. Because of small numbers within each risk group, comparisons are problematic.   HIV prevalence is higher in 5 of 8 groups in Blantyre overall. Prevalence among those with two or more sex partners is higher in Blantyre in 4 of 6 groups for which the comparison can be made (Table 34).

Table 34 Comparison of HIV prevalence for Blantyre and Lilongwe by number of sexual partners for each risk group

Group		Blantyre		Lilongwe	
Group	**# Partners**	**% HIV Positive**	**Total**	**% HIV Positive**	**Total**
Female Sex Workers	1	100	1	66.7	6
	2 or more	72	150	73.8	42
	Total	72.2	151	72.9	48
Male Primary Teachers	1	42.3	26	22.9	83
	2 or more	33.3	6	20.0	10
	Total	40.6	32	22.6	93
Female Primary Teachers	1	13.7	51	23.5	81
	2 or more	-	-	0	1
	Total	13.7	51	22.9	83
Male Secondary Teachers	1	21.4	28	9.9	132
	2 or more	33.3	6	11.8	17
	Total	23.5	34	10.0	150
Female Secondary Teachers	1	14.3	4	8.0	75
	2 or more	-	-	0	4
	Total	14.3	28	8.8	80
Male Vendors	1	3.9	102	0	56
	2 or more	10.3	78	9.4	106
	Total	6.7	180	6.2	162
Male Police Officers	1	22.7	16	26.6	94
	2 or more	33.3	46	31.6	19
	Total	25.8	62	27.4	113
Female Police Officers	1	36.2	20	31.4	86
	2 or more	33.3	37	50.0	4
	Total	35.1	57	32.2	90

Findings: Condom use in Blantyre and Lilongwe over time from BSS data

For most groups, condom use was consistently more prevalent in Lilongwe than in Blantyre over time (Figure 22). The large decrease in condom use among female sex workers from 2004 to 2006 is unexplained and may represent a data problem.

Figure 22   Prevalence of condom use during last sex with partner in 2004 and 2006, by BSS group and city
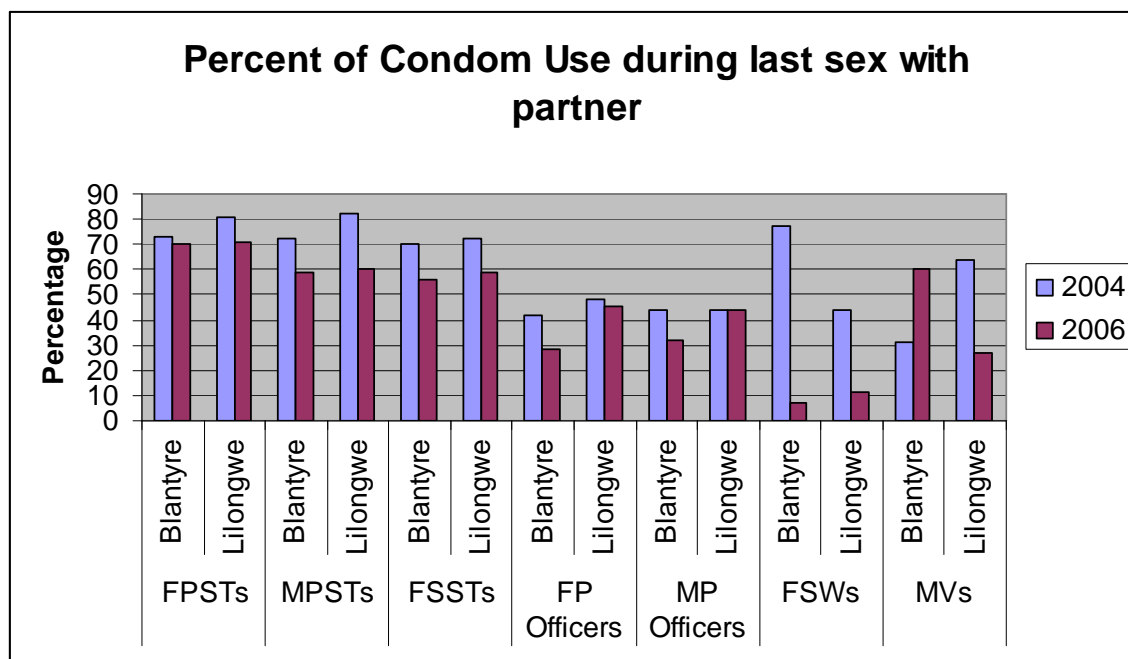
Findings: Analysis of PLACE data on number of sexual partners and condom use

Additional information comparing sexual behavior in Lilongwe and Blantyre was collected between June and August 2006 using the Priorities for Local AIDS Control Efforts (PLACE) protocol. PLACE is a rapid assessment method for identifying areas likely to have sexual partnership formation patterns that are capable of spreading and maintaining HIV and STI infections. The method also provides indications of the extent to which HIV/AIDS prevention programs and condoms are reaching these sites and provides data for future intervention programs at these sites.

Individual interviews were conducted with 4,386 patrons of venues where people find new sexual partners. Patrons were socializing (either drinking, dancing, searching for sexual partners or loitering or several combinations of these) at 241 sites in the two cities. Of the 4,386 patrons, 2404 were interviewed in Lilongwe (1977 males and 427 females) while 1982 were interviewed in Blantyre (1603 males and 379 females).

Male patrons in Lilongwe reported having had more sexual partners and more new sexual partners than males interviewed in Blantyre. Women in Lilongwe were more likely than women in Blantyre to have had 3 or more partners in the past 4 weeks and to have had 3 or more new partners in the past 4 weeks. Women in Blantyre were more likely to have had 1 or 2 new partners in the past 4 weeks than those in Lilongwe (Table 35).

Table 35   Proportion of PLACE patrons reporting multiple and new sexual partnerships in Blantyre and Lilongwe, by gender

		Lilongwe		Blantyre		Total
Characteristics		%	%	%	%	%
Number of partners in past 4 weeks including regular spouse	**None**	22.7	7.3	26.2	10.1	21.3
	One	46.8	20.7	50.1	27.3	43.7
	Two	16.3	10.3	13.6	14.3	14.5
	Three or more	14.3	61.7	10.1	48.3	20.5
Number of partners who were new in past 4 weeks	**None**	56.4	19.7	64.1	22.4	51.3
	One	25.3	13.4	23.0	21.2	22.7
	Two	8.7	5.8	6.6	10.0	7.8
	Three or more	9.6	61.0	6.3	46.3	18.2

Data on the number of sexual partners in the last 4 weeks and last 12 months was also considered in terms of average and median number of partners (Table 36). Males and females in Lilongwe had more partners and more new partners. Among female patrons, the mean number of sexual partners in the last four weeks was 14.2 partners in Lilongwe and 8.0 in Blantyre while among the male patrons, the mean was 1.8 partners in Lilongwe and 1.7 partners in Blantyre. A few female patrons reported having sex with approximately 120 patrons in the last 4 weeks in Lilongwe. In Blantyre, the highest reported figures of sexual partners in the last four weeks was among female patrons was 90 partners.

Respondents were also asked if they had a condom at the time of the interview. In both Lilongwe and Blantyre, female patrons were three times more likely to have carried a condom at the time of the interview than males. Females in Lilongwe were more likely to have shown a condom to the interviewer than females in Blantyre (Table 37).

Table 36 **Average and median number of sexual partners in last 4 weeks and last 12 months among PLACE patrons in Blantyre and Lilongwe, by gender**

		Lilongwe		Blantyre		Total
Characteristics		% n	% n	% n	% n	% n
Number of partners in past 4 weeks		(n=1483)	(n=385)	(n=1153)	(n=339)	N=3370
	Mean	1.8	14.2	1.7	8.0	3.9
	Median	1.0	5.0	1.0	3.0	1.0
	Minimum	1	1	1	1	1
	Maximum	30	120	30	90	120
Number of partners who were new in past 4 weeks		(n=646)	(n=317)	(n=414)	(n=263)	N=1640
	Mean	2.0	16.2	1.8	9.1	5.8
	Median	1.0	7.0	1.0	3.0	2.0
	Minimum	1	1	1	1	1
	Maximum	28	120	25	80	120
Number of partners in past 12 months		(n=1258)	(n=363)	(n=854)	(n=314)	N=2789
	Mean	5.7	98.1	5.6	58.1	23.6
	Median	3.0	16.0	3.0	8.5	3.0
	Minimum	1	1	1	1	1
	Maximum	250	400	250	400	400

Table 37 **Proportion of PLACE patrons carrying a condom at the time of interview in Blantyre and Lilongwe, by gender**

	Lilongwe		Blantyre		Total
	Male **(n=1913)** %	**Female** **(n=403)** %	**Male** **(n=1576)** %	**Female** **(n=369)** %	**N=4,261** %
Carrying a condom but refuse to show	2.5	12.7	2.2	12.7	4.2
Carrying a condom and shown	6.3	22.6	6.7	16.8	8.9
Without a condom	91.2	64.8	91.1	70.5	86.9

All the patrons were asked if they had other sexual partners in addition to their recognized spouses. For commercial sex workers, regular customers or boyfriends were considered to be non-spousal regular sexual partners. In Lilongwe, 34% of the male patrons and 63% of the female patrons reported having non-spousal regular sexual partners. In Blantyre, 27% of males and 57% of females reported having non-spousal regular sexual partners.

Patrons who had regular partners in addition to their spouses were asked about frequency of condom use within their non-spousal regular partnerships (Figure 23). Condom use with additional regular sexual partners occurs among less than 40% of patrons, regardless of gender and city. A third of the female patrons in Lilongwe and Blantyre (31% and 32%, respectively) reported never using condoms with their regular non-spousal sexual partners. Among the male patrons, the proportions were 25% and 23%, respectively, in Lilongwe and Blantyre. These findings suggest that condom use is slightly lower in Blantyre.

Figure 23   Proportion of PLACE patrons reporting use of condoms with their non-spousal regular sexual partners in Blantyre and Lilongwe, by gender
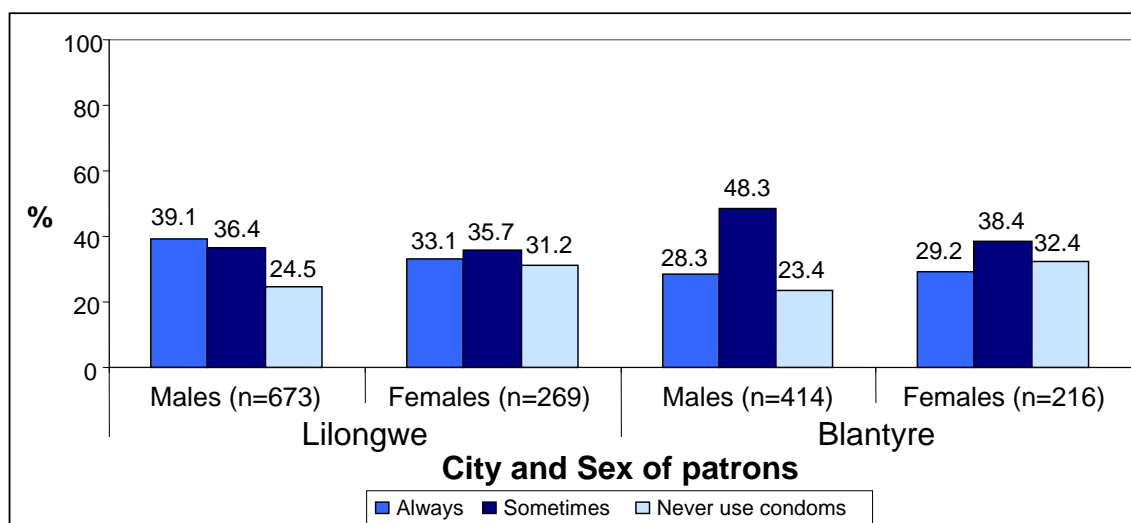
6.4   Multivariable model of behavioral factors associated with HIV infection in DHS data

Methods	Result Summary
Analyze new linked HIV and behavior data from 2004 DHS+ survey, to identify behavioral risk factors for HIV infection in the two cities and elsewhere.	• Overall, people in Blantyre have a higher odds of infection than people in Lilongwe. In each city, the odds of infection increase significantly for each year sexually active before marriage.

Findings: Model for the entire country of Malawi

Most of the factors which differ between the cities are important correlates of HIV infection in the whole country model (Table 38). People in Lilongwe have lower odds of infection, and people in Blantyre higher, than the rest of the country. Women are more likely to be infected than men.

Never having had sex is protective, which is consistent with HIV prevalence of 13% among those who reported having had sex and only 2% amongst those who said they had never had sex.

Older age at first sex was associated with an increased risk of HIV infection in this sample. Those who were older, and who said they had never had sex also had increased odds of infection.

The amount of time spent sexually active was also important. This was measured in two ways: years elapsed since first sex and the amount of time spent sexually active before marriage. Both were independent risks.

Those who have never married are less likely to be infected than those who are currently married. Ex-marrieds are most likely to be infected. Having had multiple partners, or a non-cohabiting partner, was not important but people who had only had a cohabiting partner in the past year had reduced odds of infection.

Findings: Blantyre model

The results from Blantyre are broadly consistent with those from the national model. It was not possible to include a term for those who have never had sex because none of these people were HIV positive, and would therefore have fallen out of the model.

However the other factors are in the same direction and of similar magnitude to the OR in the national model. The only differences are that measures are less precise, due to the smaller sample size, and the OR for people who reported only having had a cohabiting partner in the year before the survey is 9.5 in the Blantyre model compared to

0.66 in the national model. The overall impression from the Blantyre model is that all sexual exposure increases the odds of HIV infection.

Findings: Lilongwe model

The results from Lilongwe contrast somewhat with the results from the national model and from Blantyre.   The smaller sample size means that p-values are larger than in the other models. Time spent single and sexually active before marriage are the only behavioral exposures clearly associated with HIV infection. The number of years since first sex also shows an increased risk of HIV infection, although the p-value for this is large the OR is similar to that from the other models.

Having had more than one partner in the last year, and having had only a cohabiting partner in the last year are in the same direction as the other models but of different magnitude and are not significant. Having had a non-cohabiting partner is in the opposite direction to the other models and not significant. The relationship between behavioral factors and HIV is much less coherent and therefore forms a less plausible picture for Lilongwe.

Table 38 **Behavioral factors associated with being HIV positive in Malawi by Area (Lilongwe, Blantyre, and Elsewhere), from DHS data**

	National			Lilongwe[30]			Blantyre[14]			Elsewhere		
	OR	95% CI	p	OR	95% CI	p	OR	95% CI	p	OR	95% CI	p
Elsewhere	1											
Lilongwe	0.23	0.11 - 0.50	<0.001									
Blantyre	2.37	1.67 - 3.38	<0.001									
Male	1			1			1			1		
Female	1.65	1.28 - 2.13	<0.001	0.48	(0.05 - 4.98)	0.5289	2.36	(1.11 - 5.03)	0.0276	1.64	(1.27 - 2.13)	<0.001
Had sex	1									1		
Never had sex	0.16	0.03 - 0.94	<0.05							0.15	(0.02 - 1.20)	0.0745
Age first sex[31]	1.04	1.00 - 1.08	<0.05	0.80	(0.53 - 1.21)	0.2817	1.13	(0.98 - 1.31)	0.0823	1.04	(1.00 - 1.08)	0.0559
Current age, virgins only	1.10	1.00 - 1.21	<0.05							1.11	(0.99 - 1.24)	0.0666
Years since 1st sex	1.02	1.00 - 1.03	<0.001	1.04	(0.90 - 1.20)	0.5863	1.04	(0.99 - 1.09)	0.1497	1.02	(1.00 - 1.03)	0.0171
Years sexually active pre-marriage	1.07	1.04 - 1.10	<0.001	1.18	(1.04 - 1.34)	0.0113	1.17	(1.07 - 1.27)	0.0013	1.05	(1.02 - 1.08)	<0.001
Never married	0.17	0.09 - 0.31	<0.001				0.21	(0.03 - 1.49)	0.1143	0.18	(0.09 - 0.34)	<0.001
Currently married	1						1			1		
Ex-married	1.56	1.07 - 2.26	<0.05				2.52	(0.50 - 12.7)	0.2522	1.73	(1.21 - 2.48)	0.0029

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[30] None of the people in Lilongwe or Blantyre who reported never having had sex (50 in Lilongwe & 26 in Blantyre) were infected with HIV, and therefore "ever had sex" cannot be included in those models.

[31] Current age for those who have never had sex.

	National			Lilongwe[30]			Blantyre[14]			Elsewhere		
	OR	95%__CI__	*p*	OR	95%__CI__	*p*	OR	95%__CI__	*p*	OR	95%__CI__	*p*
0-1 partner past yr	1			1			1			1		
>1 partner past yr	1.24	0.78 - 1.98	*0.4*	1.67	(0.2 - 12.4)	*0.6068*	1.11	(0.11 - 11.4)	*0.9299*	1.32	(0.84 - 2.07)	*0.2353*
No sex last year	1			1			1			1		
Cohabiting partner only	0.66	0.43 - 1.00	*0.05*	0.11	(0.00 - 9.74)	*0.3235*	9.48	(1.97 - 45.5)	*0.0063*	0.68	(0.46 - 0.99)	*0.0471*
Non-cohab p'tner	1.27	0.82 - 1.96	*0.29*	0.36	(0.03 - 4.55)	*0.4143*	27.41	(4.0 - 185.7)	*0.0013*	1.02	(0.65 - 1.60)	*0.9197*
N	4695			175			272			4248		

Chapter 7: Effect of Prevention Programs on HIV Prevalence

7.0   Overview of objective and methods

Objective: To explore whether the HIV trend differential in Lilongwe vs Blantyre could be due to prevention program efforts

Methods:

7.1   Comparison of program expenditure data from Lilongwe and Blantyre

7.2   Comparison of HIV testing and receiving results in Lilongwe and Blantyre

7.3   Comparison of exposure to HIV/AIDS intervention programs in Lilongwe and Blantyre

7.4   Comparison of access to condoms and STI services, exposure to social marketing, and perceptions about factors facilitating the HIV epidemic in each city

7.1   Comparison of program expenditure data

Methods	Result Summary
Comparison of NAC spending levels **Comparison of process data for interventions**	• Spending was higher in Lilongwe. • Some program efforts are higher in Lilongwe and others are higher in Blantyre.

According to NAC reports, NAC spending per district for the 2006/7 Financial year as of December 2006 was MK 315 million in Lilongwe and MK 196 million in Blantyre. As shown in Table 28, some activities reach more people in Blantyre and some reached more in Lilongwe. A million more condoms were distributed in Blantyre by PSI than in Lilongwe.

Table 39   NAC spending per district for 2006/2007

Intervention	Period under review	Lilongwe	Blantyre
HIV and AIDS Booklets	Jan 05 to June 06	255, 153	242, 039
Young people exposed to LSBE	Jan 06 to June 06	112,702	189,113
Govt free condoms dist	Jan 05-Dec 05	866,800	271, 490
PSI Condoms dist	Jan05- Dec 05	1,653,102	2,695,955
Households with chronically ill assisted	Jan 05-July 06	64,856	32,265
Community HBC visits	Jan 05- Jun 06	69,321	13,798
OVC receiving external assist	Jan 05-Jun 06	45,391	32,020
Workplace interventions reach	Jan 05-Jun 06	12,574	5,986
Personnel trained in HIV and AIDS issues	Jan 05-Jun 06	29,341	58,874
Cumulative number of patients on HAART	To March 2007	14,917	1717

7.2   HIV testing and results: Have more people in Lilongwe been tested for HIV and received their results? Do people who know their results change their behavior?

Methods	Result Summary
DHS analysis for Lilongwe and Blantyre clusters	• No difference between Lilongwe and Blantyre in the proportion who had been tested and know their result
Exploratory analysis of ANC surveillance data to determine if there is any evidence that HIV positive women in Lilongwe are spacing their pregnancies more compared to women in Blantyre	• Findings are consistent with a reduction in parity among HIV+ women but impossible to determine from ANC data whether women who learn they are HIV+ are more likely to avoid or delay a future pregnancy.
BSS analysis	• Percent ever tested increased in both cities over time. Among those tested, more people received results and more people were infected in Lilongwe.

Findings: DHS

Overall, 18% of men in the two cities and 19% of women had taken an HIV test and received the results in 2004. There was no difference by city for either men or women (p=0.35 and 0.38 respectively)

Findings: Exploratory analysis

The uptake of HIV testing in a prevention of mother-to-child transmission program (PMTCT) in Lilongwe was assessed from April 2002 until December 2006.[32] The study population was pregnant women attending four urban antenatal clinics in Lilongwe. Rapid HIV testing using the opt-out method increased acceptance of HIV testing in the PMTCT program to 99% in four clinics. Women were invited to participate in a PMTCT program and given information and education on antenatal care and PMTCT in groups of 8 to 12. Written informed consent for HIV testing was obtained privately. Women returned for their test result 1-2 weeks later. Mothers and infants were given the HIVNET

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[32] Moses A, Zimba C, Kamanga E, Nkhoma J, Maida A, Martinson F, Mofolo I, Joaki G, Muita J, Spensley A, Hoffman I, van der Horst CM; UNC Project Call to Action Program. Prevention of mother-to-child transmission: program changes and the effect on uptake of the HIVNET 012 regimen in Malawi. AIDS. 2008 Jan 2;22(1):83-7.

012 regimen. Rapid HIV testing and 'opt-out' testing were instituted in July 2003 and April 2005, respectively. The program reached 20 000 pregnant women in the first 12 months. Acceptance of HIV testing increased from 45% to 73% (P < 0.001) when rapid, same day testing was instituted. When opt-out testing was instituted, 99% of the mothers agreed to testing. Of the infants tested, 15.5% were HIV positive.

 A pregnancy intention study among women who know their HIV+ status[33] was conducted at Kamuzu Central Hospital in Lilongwe. The study found that women who learned their HIV-positive status were less likely to desire future pregnancies and, among those not desiring future children, pregnancy incidence was lower. Women of unknown HIV status completed a questionnaire about pregnancy intentions and contraceptive use and then received HIV voluntary counseling and testing (VCT). Women who were HIV-positive and not pregnant were enrolled and followed for 1 year while receiving HIV care and access to family planning (FP) services. Before receiving their HIV test results, 33% of women reported a desire to have future children; this declined to 15% 1 week later (P < 0.0001) and remained constant throughout follow-up. Contraceptive use increased from 38% before HIV testing to 52% 1 week later (P < 0.0001) and then decreased to 46% by 12 months. The pregnancy incidence among women not reporting a desire to have future children after VCT was less than half of the incidence among women reporting this desire.

**Figure 24   Mean gravidity by age among HIV+ ANC patients in 2001 and 2005, Lilongwe and Blantyre**
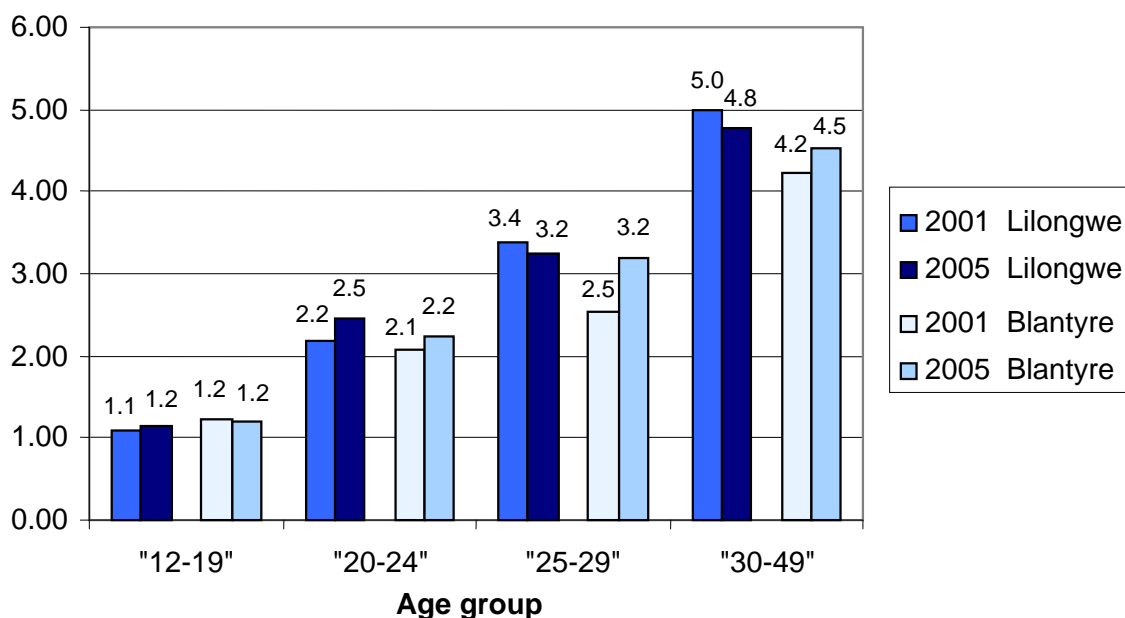
[33] Hoffman IF, Martinson FE, Powers KA, Chilongozi DA, Msiska ED, Kachipapa EI, Mphande CD, Hosseinipour MC, Chanza HC, Stephenson R, Tsui AO. 2008. The Year-Long Effect of HIV-Positive Test Results on Pregnancy Intentions, Contraceptive Use, and Pregnancy Incidence Among Malawian Women. J Acquir Immune Defic Syndr. 47(4):477-483.

Taken together, these two studies suggest that more women in Lilongwe may know their HIV status than in Lilongwe and that this knowledge may lead to a reduction in pregnancy among HIV+ women. It is difficult to assess whether this is the case using currently available ANC data. We conducted an exploratory analysis of ANC surveillance data from women who were HIV+. We do not know if or when they learned they were HIV+. Between 2001 and 2005, however, mean parity in the age groups 25-29 and 30-49 declined slightly at Bottom Hospital, whereas it increased at Limbe Hospital (Figure 24). Could this reflect an increased desire in Lilongwe to reduce fertility after learning earlier of an HIV+ status? Possibly, but the reduction is small and women who decided not to get pregnant based on a HIV+ test do not show up at the ANC clinic, making interpretation difficult.

Findings: BSS analysis

BSS findings show that the percent ever tested increased greatly across all eight BSS risk groups in both cities. The percent of primary school teachers who were tested doubled from 2004 to 2006 for both genders. It is difficult to identify differences between Blantyre and Lilongwe, however, across groups. In 5 of 8 groups, prevalence of testing was higher in one city in 2004 and higher in the other city in 2008. By 2006, among the three groups with the highest prevalence of testing (female primary school teachers, female police officers, and female sex workers), prevalence of testing was higher in Blantyre than in Lilongwe (Figure 25).

Figure 25   Percent ever tested for HIV among BSS risk groups in Blantyre and Lilongwe, 2004 and 2006
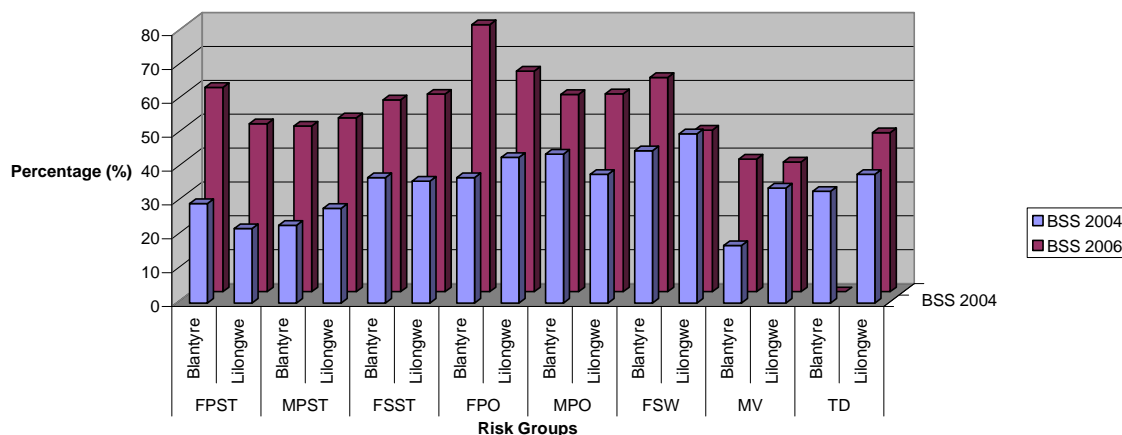
Among those who have ever been tested for HIV, the percent who received their result was higher in Lilongwe than in Blantyre in 2004, for 5 of the 8 BSS groups analyzed. By 2006, the difference in receiving results was much less pronounced between the two cities (Figure 26).

Figure 26 **Percent who received results among those ever tested for HIV among BSS risk groups in Blantyre and Lilongwe, 2004 and 2006**
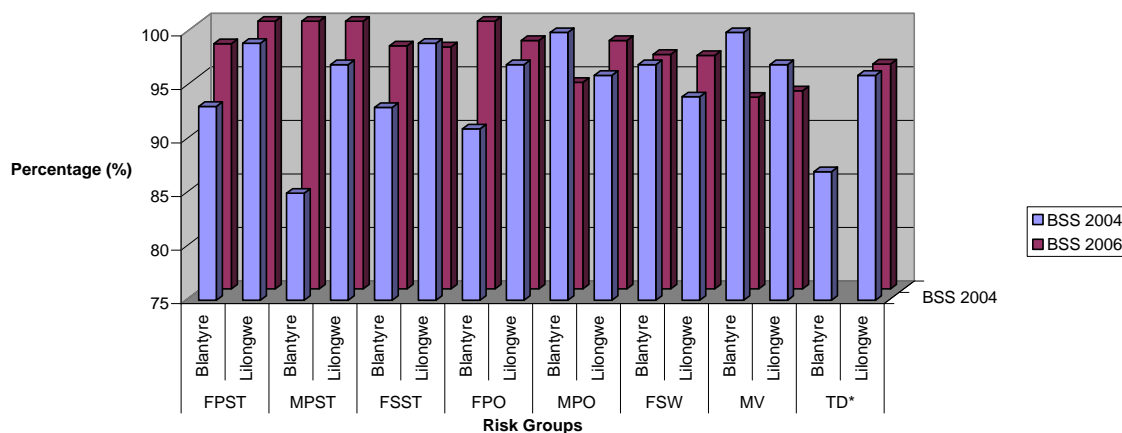
HIV prevalence was measured within each risk group in the two cities, among those who had ever been tested before the BSS survey in 2006. Prevalence among those who had ever been tested was higher in Lilongwe in every group except for male secondary school teachers (MSST) (Table 40)

Table 40 **HIV prevalence among those who had ever been tested prior to BSS, 2006**

Risk Group	Blantyre			Lilongwe		
	# Positive	% HIV Positive	Total	# Positive	% HIV Positive	Total
Female Sex Workers	67	**70.5**	95	18	**72.0**	25
Male Primary Teachers	4	**22.2**	18	14	**25.9**	54
Female Primary Teachers	8	**18.6**	43	14	**26.4**	53
Male Secondary Teachers	6	**24.0**	25	6	**7.7**	78
Female Secondary Teachers	2	**6.9**	29	9	**13.4**	67
Male Vendors	6	**6.1**	98	10	**9.6**	104
Truck Drivers	-	**-**	-	5	**21.7**	23
Male Police Officers	11	**26.8**	41	24	**32.4**	74
Female Police Officers	15	**31.3**	48	25	**32.9**	76

Among those who had ever received their results, the pattern was identical with HIV prevalence higher in Lilongwe than in Blantyre for every group except MSST.

7.3 Comparison of exposure to HIV/AIDS intervention programs in Lilongwe and Blantyre

Methods	Result Summary
Analysis of BSS data from Lilongwe and Blantyre on exposure to prevention programs.	• There was no clear evidence that prevention programs reached a greater proportion of people in Lilongwe compared with Blantyre. Television became more popular and radio less popular as a main source of information
PLACE study	• Access to HIV prevention interventions was more prevalent among PLACE patrons in Lilongwe; access to information was associated with reduced partnership formation in Blantyre

Findings: Exposure to an HIV program at work or attendance at an HIV/AIDS workshop from BSS data

Most of the BSS risk groups surveyed in Lilongwe reported a higher prevalence of exposure to an HIV program at work or attendance at an HIV/AIDS workshop in 2004, relative to Blantyre. However, in 2006, 5 of 7 risk groups in Blantyre reported higher levels of exposure. Overall, the largest declines in exposure to a program were among female sex workers and male vendors (Table 41). Declines between 2004 and 2006 were evident in these groups for both cities.

Table 41   Percent that have HIV programme at work or have attended an HIV/AIDS workshop, by BSS risk group and city, 2004 and 2006

No.	Risk Group	District	Percent (%)	
			2004	2006
1	Female Primary School Teachers	Blantyre	76	90
		Lilongwe	81	70
2	Male Primary School Teachers	Blantyre	73	79
		Lilongwe	84	67
3	Female Secondary School Teachers	Blantyre	80	78
		Lilongwe	76	58
4	Female Police Officers	Blantyre	46	67
		Lilongwe	52	64
5	Male Police Officers	Blantyre	38	67
		Lilongwe	60	73
6	Female Sex Workers	Blantyre	60	14
		Lilongwe	74	15
7	Male Vendors	Blantyre	25	12
		Lilongwe	42	5

Use of the radio as a main source of information about HIV/AIDS and other STIs decreased from 2004 to 2006 in every risk group within both cities, except for among female sex workers in Blantyre (Figure 27). No information was available for male vendors in 2004.

Figure 27   Percent that indicated radio as main source of information on STIs and HIV/AIDS, by BSS risk group and city, 2004 and 2006
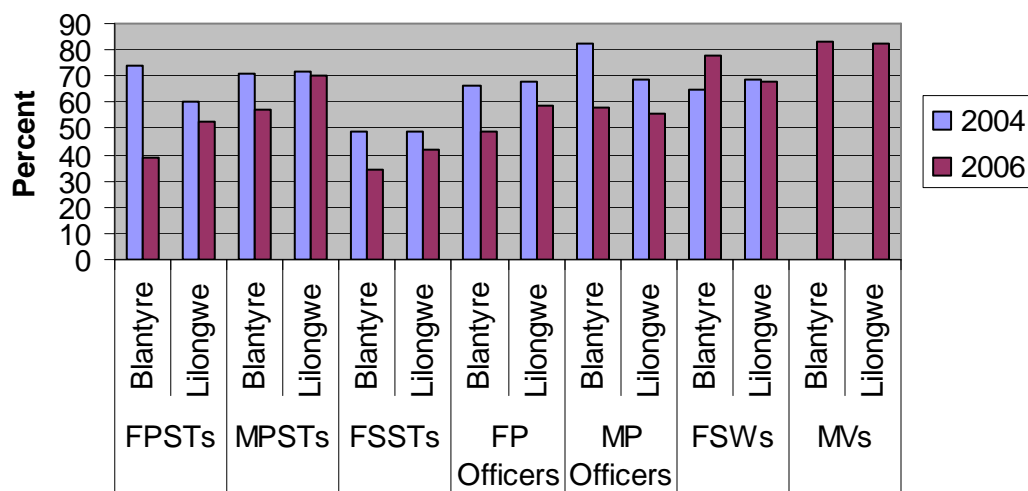
In contrast, the use of television as a main source of information about HIV/AIDS and other STIs increased dramatically in every group in each city from 2004 to 2006, except for among male primary school teachers and female sex workers in Lilongwe (Figure 28). No information was available for male vendors in 2004.

Figure 28   Percent that indicated television as main source of information on STIs and HIV/AIDS, by BSS risk group and city, 2004 and 2006
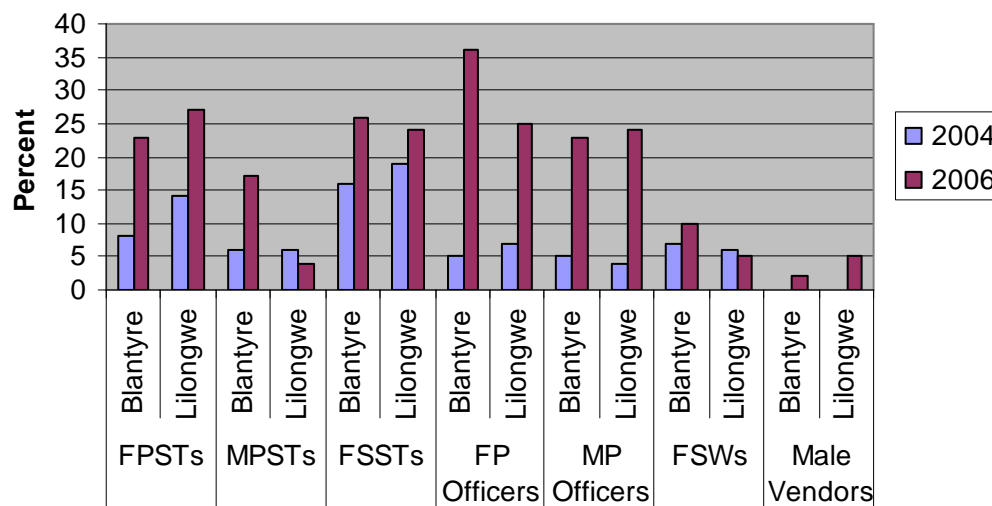

Findings: Exposure to interventions on HIV and AIDS among PLACE patrons

More information on people's exposure to HIV and AIDS prevention interventions is available from data that was collected between June and August 2006 using a PLACE protocol in the urban areas of Lilongwe and Blantyre. Individual interviews were conducted with patrons who were found socializing at 241 sites in the two cities of which bottle stores constituted nearly half of the sites (47%), formal taverns constituted 26%, informal taverns 9% while the rest were night clubs (8%), rest houses (7%) and hotels/motels (4%).

Access to information on HIV and AIDS was generally lower among the patrons who were interviewed in Blantyre. PLACE patrons in Blantyre were more likely to have never accessed any intervention on HIV and AIDS in the last year (7%) compared to the patrons in Lilongwe (4%) and more patrons in Lilongwe had accessed four or more interventions (81%) compared to 78% of the patrons in Blantyre (Figure 29). A chi-square test that was conducted to detect if the differences in the proportions which never accessed any interventions and those that accessed various numbers of interventions were significant confirmed that the proportions were significant ($p < 0.05$), implying that access to prevention interventions on HIV and AIDS was significantly higher among the patrons in Lilongwe than among the patrons in Blantyre.

Figure 29   Proportion of PLACE patrons reporting accessing or not accessing HIV/AIDS prevention interventions in last 12 months, 2006
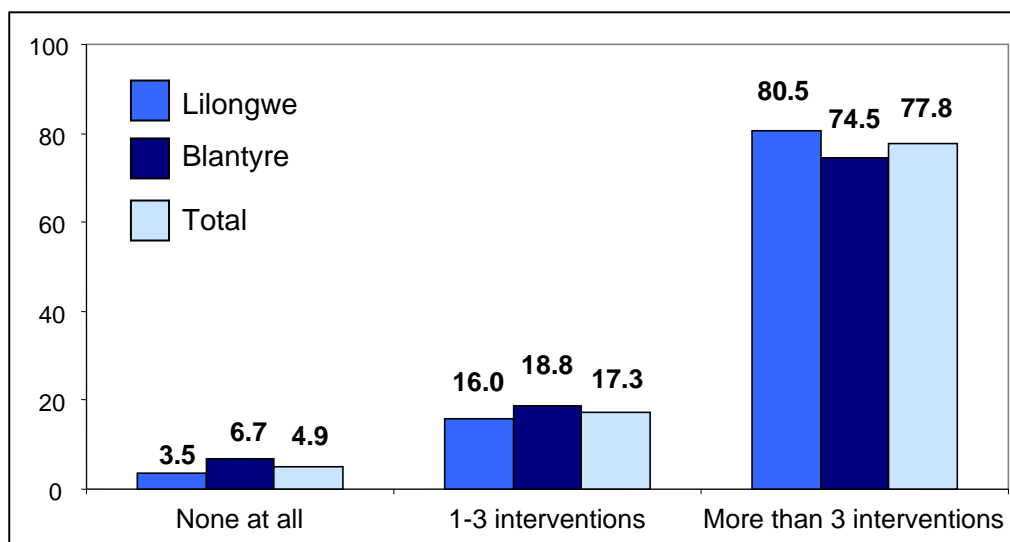
Patrons who had no access to any information on HIV and AIDS in the last 12 months were significantly more likely to report having ever attracted a sexual partner (or partners) from the sites than their counterparts and this was more pronounced in Blantyre (50%) than in Lilongwe (34% versus 33%) (Figure 30).

Figure 30   Percentage of patrons reporting attracting a sexual partner at PLACE sites, among patrons with access to information from interventions compared to those with no access to information, by city, 2006
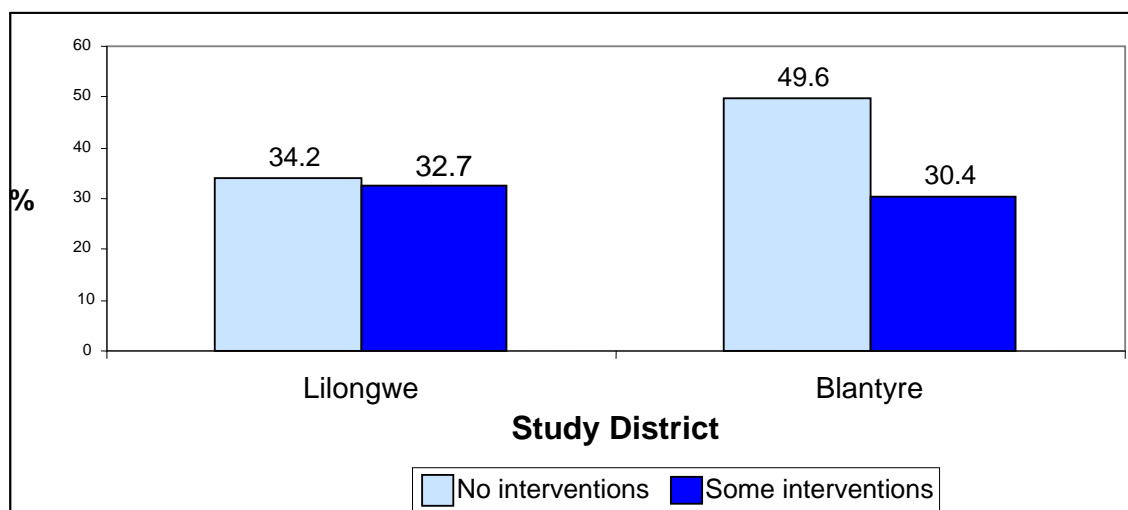
7.4 Comparison of access to condoms and STI services, exposure to social marketing, and opinions about the HIV epidemic in each city

Methods	Result Summary
Analysis of BSS data from Lilongwe and Blantyre about knowledge of where to get condoms and access to condoms and STI services	• No clear evidence that condom accessibility and knowledge about STI services differed by city; access to condoms and STI services appears to have increased over time in both cities
DHS analysis for Lilongwe and Blantyre clusters of questions related to social marketing	• More men than women exposed. More women in Blantyre exposed than in Lilongwe
Analysis of PLACE patron opinions about factors driving the HIV epidemic	• Patron opinions about factors driving the epidemic are similar in the two cities

Findings: Knowledge and ability to access male condom from BSS data

Five of the seven groups in Blantyre reported greater understanding that condoms could be obtained at shops. However, the differences between the two cities were not significant. In most groups for most years, over 80% identified shops as a place where condoms could be accessed (Figure 31).

Figure 31   Percent that know shops as a place to access condoms, by BSS risk group and city, 2004 and 2006
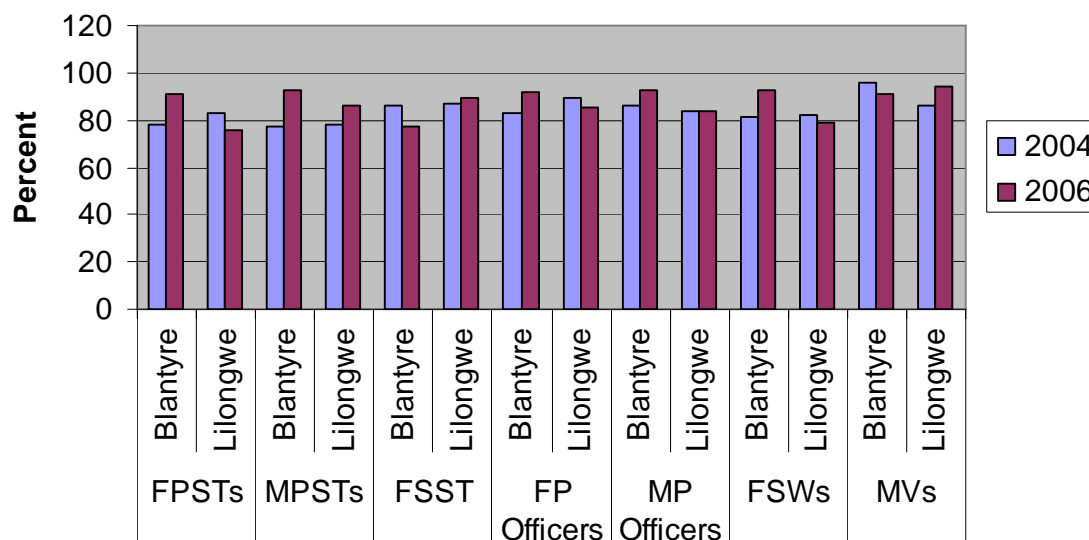
The percentage of persons who could access a condom in less than 15 minutes increased from 2004 to 2006 in most risk groups within each city, with the exception of female sex workers and male vendors (Figure 32). There was no discernible overall pattern in the percentage of persons who could access condoms between the two cities.

Figure 32   Percent that could obtain a condom in less than 15 minutes from their home or business, by BSS risk group and city, 2004 and 2006
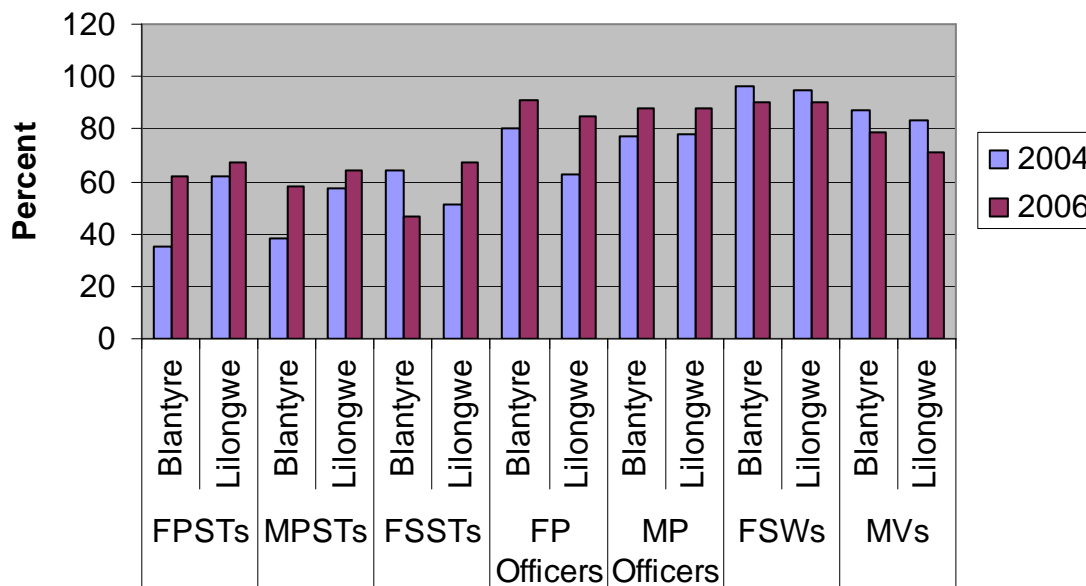
Findings: Knowledge of where to access STI services from BSS data

The prevalence of knowledge about where to access STI services was similar among risk groups in Blantyre and Lilongwe. In almost every risk group in both cities, knowledge about where to access STI services increased between 2004 and 2006 (Figure 33).

Figure 33   Percent that know of sites offering STI services, by BSS risk group and city, 2004 and 2006
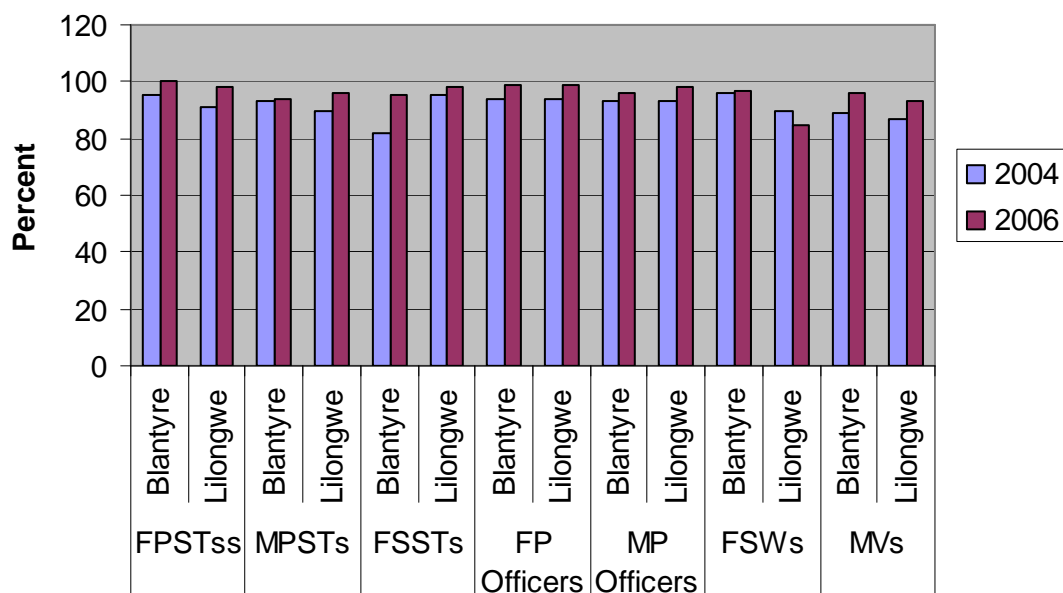
Findings: Exposure to social marketing from DHS surveys

In 2000 and 2004 identical questions were asked on exposure to family planning social marketing activities. Most men and women report having been exposed to some sort of social marketing activities in the few months before the survey (Table 42). More men than women report having been exposed. Women in Lilongwe are less likely to have been exposed than women in Blantyre.

Table 42   Exposure to social marketing in last few months, DHS, by city, year and gender

City	2000	2004
MEN		
Lilongwe	97.6	93.3
Blantyre	98.2	92.0
p-value for diff between cities	0.6637	0.6995
WOMEN		
Lilongwe	83.3	66.1
Blantyre	96.0	81.7
p-value for diff between cities	0.0000	0.0001

Findings: PLACE patron opinions about factors driving the HIV epidemic in each city

At the end of each interview session, patrons identified factors they thought were fueling HIV infections in their area (Figure 34). Low use of condoms during sexual intercourse was cited by a fifth of the patrons (21%), followed by poverty and unemployment (19%) which force some people to indulge in transactional or commercial sex work. Multiple sexual partnerships were mentioned by 18% of the patrons while 17% cited inadequate sensitisation about HIV and AIDS as a factor fueling the transmissions. The other factors that were mentioned are high cash flow or social life (10%), high consumption of alcohol (10%), high population and mobility (3%) and peer pressure (3%).

In Blantyre, multiple sexual partnerships followed by low use of condoms and poverty and unemployment were the top three most cited factors driving the epidemic. These same three factors were most often cited in Lilongwe, though low use of comdoms was most commonly cited there (Figure 30).

Figure 34   Perceptions of PLACE patrons about factors that are fuelling HIV infections in Lilongwe and Blantyre, 2006
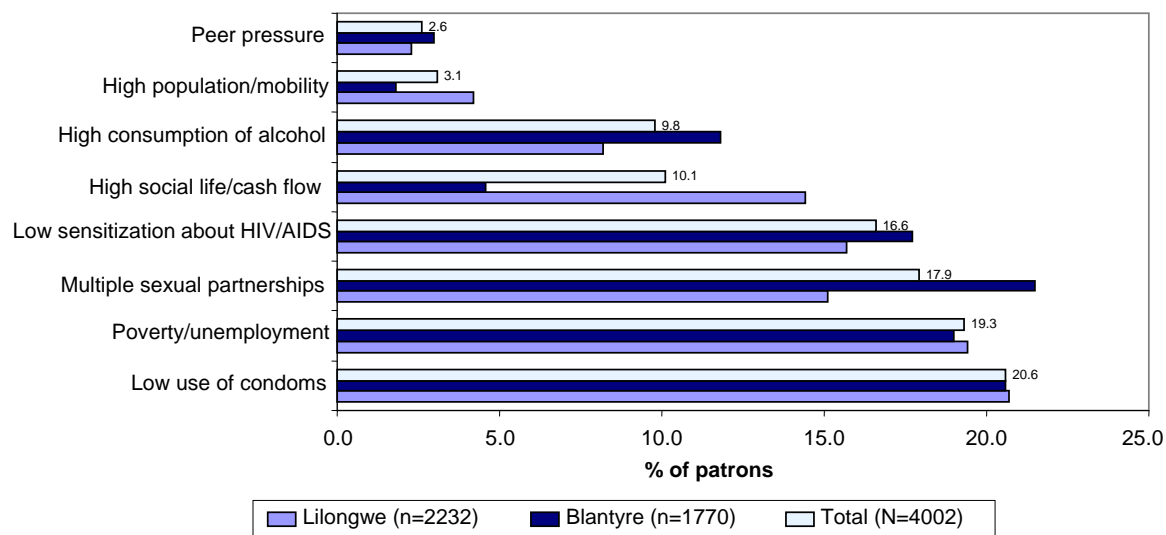
Chapter 8: Recommendations

The HIV epidemic in Malawi has been devastating in both of the urban areas, Lilongwe and Blantyre, that are the focus of this report. Although the high prevalence levels evident in previous decades have abated, both cities suffer from an ongoing epidemic. In this chapter, we will review the strategies available for slowing HIV epidemics in general and identify specific strategies appropriate for Lilongwe and Blantyre. These recommendations are submitted in a spirit of humility. Although we can all agree that HIV prevention programs should aim to reduce the sexual transmission of HIV, the achievement of this objective remains elusive worldwide. Many HIV prevention programs have been implemented, but few have documented success. In fact, the only prevention program with clear evidence of effectiveness from more than one well implemented randomized trial is reduction of HIV transmission via male circumcision. In addition, although study team members from Malawi can claim knowledge of the people and culture of Malawi, those of us on the study team from outside Malawi are unfamiliar with the language, culture, and living situation of people in Malawi. For both of these reasons—the lack of evidence for behavior change interventions and the lack of familiarity with the culture—these recommendations are offered in the spirit of a shared commitment to HIV prevention and an acknowledgement of the limitations of the study team and limitations of the data available to us.

8.0   Ground HIV prevention strategies in epidemiologic models of sexual transmission of HIV

No two HIV epidemics are exactly alike. Although Malawi is not a large country, even within Malawi there are different local epidemics. This study has shown differences in the epidemics in Lilongwe and Blantyre. In spite of these differences, HIV prevention strategies in both cities should rely on the same HIV transmission model. We propose the proximate determinants model of HIV transmission[34] as a reasonable model. This model is an extension of the basic HIV transmission model:

$$R= B * c * D^{35}$$

Where:

- R is the number of other persons infected on average by a person infected with HIV over his or her lifetime
- B is the probability of transmission of HIV given discordant contact (either sexual or by needle sharing)
- C is the probability of exposure via contact between the an infected and uninfected person and
- D is the length of time an infected person is infectious.

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[34] Adapted from Boerma JT, Weir SS. Integrating demographic and epidemiological approaches to research on HIV/AIDS: the proximate-determinants framework. *J Infect Dis.* 2005;191(Suppl 1):S61-67.
[35] Anderson, R. (1999) Transmission dynamic of sexually transmitted infections. In Sexually Transmitted Disease, 3rd Ed. K. Holmes (Ed.).

An epidemic will continue to spread unless "R" is reduced through reductions in these three biological determinants of HIV transmission: the probability of exposure, "c"; the probability of transmission given exposure, "B"; or the duration of infectiousness, "D".

In the proximate determinants model of HIV transmission (Figure 35), the three biological determinants of HIV transmission can only be reduced by a reduction in one or more of the proximate determinants. The proximate determinants are the hinge between the biological determinants and the underlying determinants of HIV transmission. The proximate determinants of the probability of exposure to HIV are the rate of new sexual partnerships, the age of sexual debut, the extent of concurrent or overlapping partnerships, the extent of age mixing among sexual partners, and injecting drug use. The proximate determinants for the transmission of HIV given exposure to HIV are condom use, the presence of co-factor infection, the type of sex (anal or vaginal), the extent to which contaminated needles are shared, and the extent to which anti-retroviral treatment reduces viral load and thus reduces the infectiousness of the infected.

Figure 35   Proximate determinants of HIV transmission: General
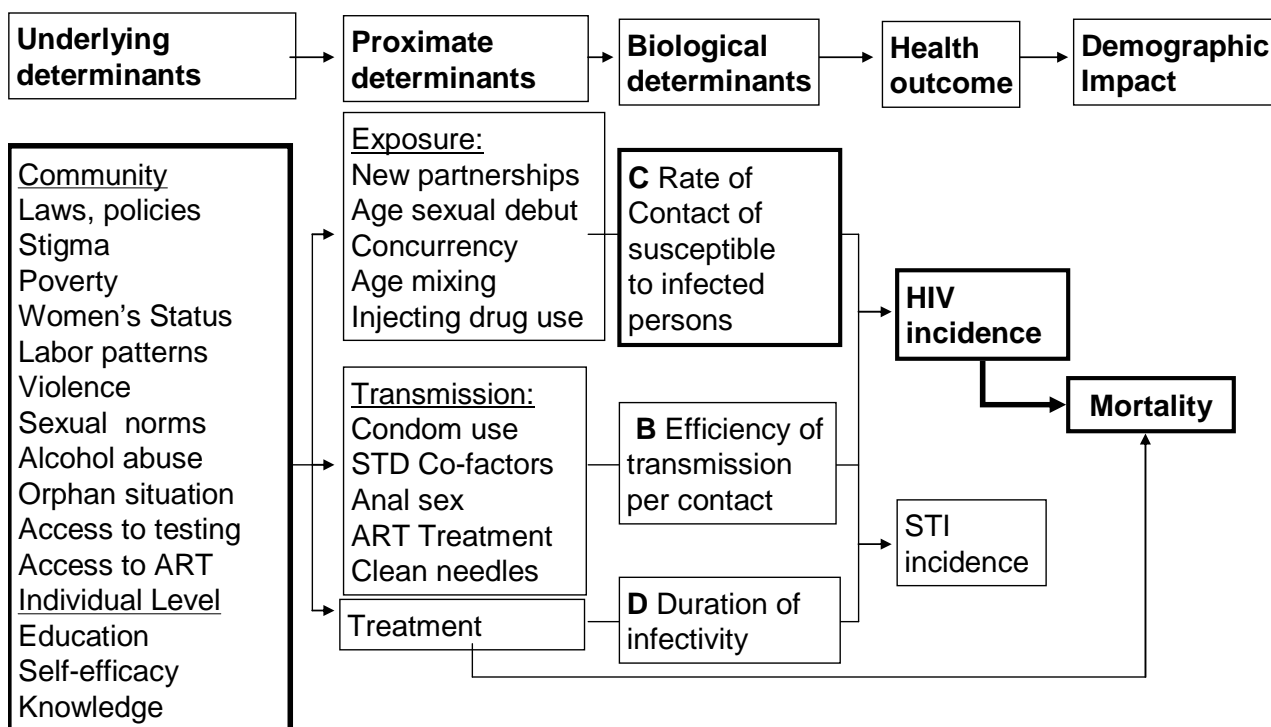
Because the epidemic in Blantyre and Lilongwe does not appear to be strongly affected by blood or needle-sharing transmission, we recommend focusing prevention on the proximate determinants of the sexual transmission of HIV (Figure 36).

Figure 36   Proximate determinants of HIV infection: Urban Malawi

| Underlying determinants | Proximate determinants | Biological determinants | Health outcome | Demographic Impact |

Exposure:
New partnerships
Age sexual debut
Concurrency
Age mixing
Sex-Marriage Gap

Community
Laws, policies
HIV Stigma
Poverty
Marital Patterns
Labor patterns
Sexual norms
Alcohol consumption
Access to testing
Access to ART
Mobility
Religion
Individual Level
Education
Self-efficacy
Knowledge

C Rate of Contact of susceptible to infected persons

HIV incidence

Mortality

Transmission:
Condom use
STD Co-factors
ART Treatment
Circumcision

B Efficiency of transmission per contact

STI incidence

Treatment

D Duration of infectivity

Based on the findings from this report, we recommend that HIV prevention in Malawi focus on reducing sexual exposure to HIV. Strategic prevention objectives include the following:

1. Increase the proportion of sexually active men and women who know their own HIV status and increase condom use among those who are HIV infected
2. If HIV testing is not available or acceptable, increase the proportion of all sexual contacts protected by condoms.
3. Reduce the number of lifetime sexual partnerships engaged in by men and women.
4. Reduce the number of over-lapping sexual partnerships in favor of sequential monogamous relationships.
5. Reduce the prevalence of other sexually transmitted infections that may increase susceptibility to HIV infection or increase infectiousness among persons with co-infection.
6. Increase the prevalence of circumcision among men.
7. Increase condom use in all sexual contacts of persons most likely to be engaged in more than one sexual partnership per year.
8. Delay sexual debut among young people and decrease the numbers of years between age at first sex and age at first marriage.
9. Reduce the age difference in non-marital sexual partnerships to decrease the likelihood of HIV discordant contacts among the young.

Malawi could reduce HIV transmission through active promotion of a reduction in the number of sexual partnerships, a decrease in the age of sexual debut, a reduction in sexual partner overlap (concurrent partnerships), a reduction in age mixing among

young women and older men, and a reduction in the number of years between sexual debut and marriage. We also recommend that the effective decrease in syphilis reduction be maintained, that condom use increase in all partnerships where there is the likelihood that either partner has had another recent sexual partner, that access to testing be increased so that persons can learn their HIV infection status. In addition, although circumcision has not been associated in Malawi with HIV infection, the prevention strategy for urban Malawi should include a willingness to include a circumcision strategy if data in Malawi suggest that circumcision could save lives.

8.1 More research is needed to identify and assess underlying factors of HIV transmission

Although this report has shed some light into the underlying factors associated with the probability of exposure to and transmission of HIV, more understanding is needed to identify underlying pathways and the pathways through which the underlying factors influence the proximate determinants of transmission. For example, our study found that the age of sexual debut among women is apparently decreasing among women in Blantyre. What are the underlying factors related to this decline?

There are other areas for additional research including the effect of mobility from a rural to urban area on exposure to HIV. What is the pattern of sexual behavior among people newly arrived in an urban area? Where are they most likely to make contact with sexual networks in the urban area? What is the pattern of health care seeking among newly arrived people from rural areas? Are they likely to seek care if they have symptoms of sexually transmitted infection?

Another critical area for research is to increase our understanding of the patterns of marriage in Malawi and whether the patterns are amenable to change in a way that would decrease the number of years between first sex and first marriage. It is during this period of time that HIV incidence may be highest due to the higher rate of new partnerships, the higher prevalence of other STI, and a lack of consistent condom use that may partially be due to sexual negotiation in the setting of finding a marital and child-bearing partner.

This report has focused on behavioral factors in the HIV epidemic and did not pay sufficient attention to other underlying factors such as education and poverty. While some information on educational status is available, data were insufficient to assess the relationship between education and HIV acquisition. The 2006 add-on questionnaire to ANC surveillance found that women in Blantyre were more likely to have completed standard 6 than were women in Lilongwe (OR=1.4, 95% CI of 1.1, 1.8). However, there was no relationship between HIV infection and this level of education among women in either Blantyre or Lilongwe.
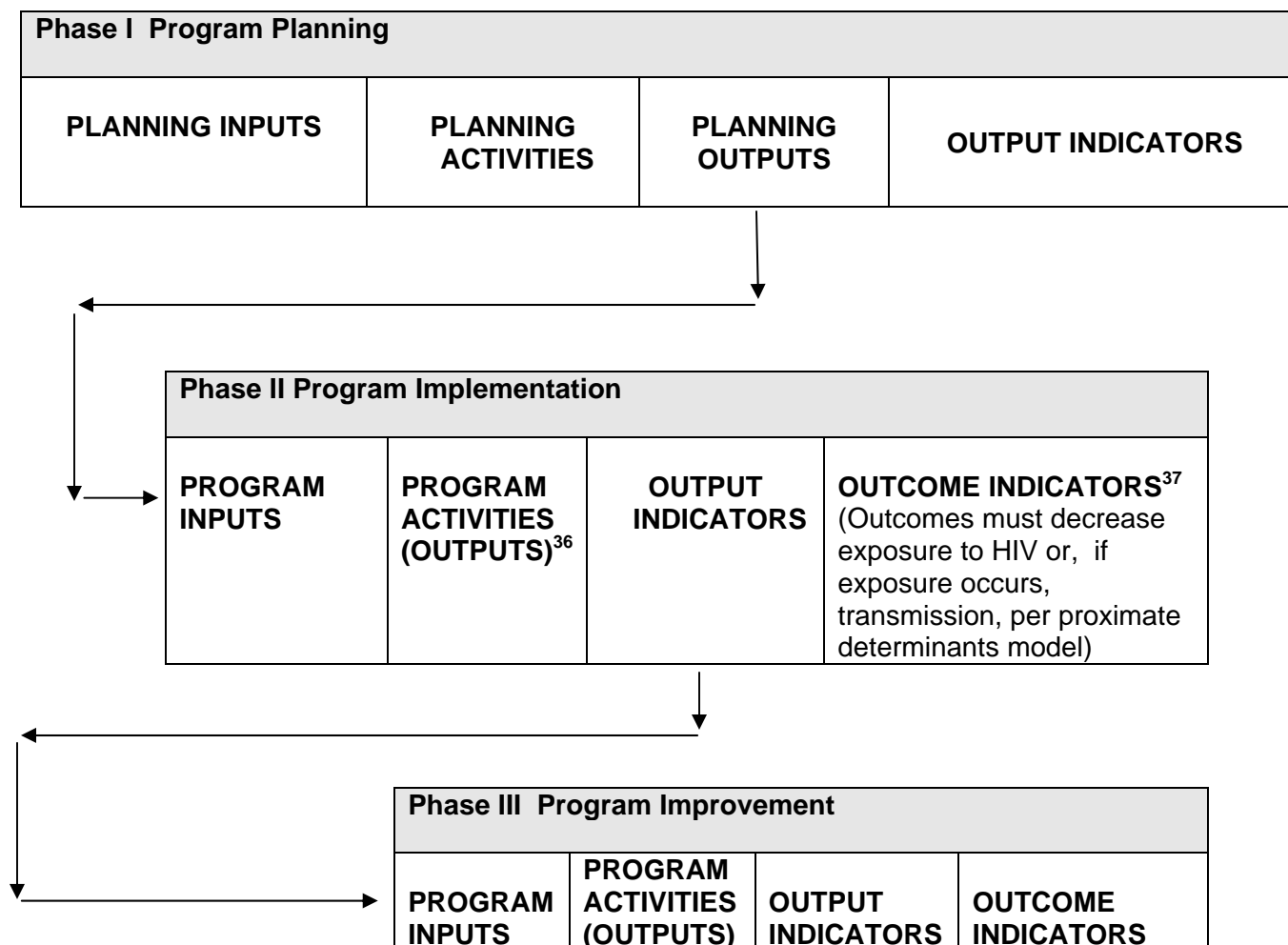
8.2 Consider focusing prevention programs in urban areas where there is a clustering of venues where people meet new sexual partners

According to the PLACE reports from Lilongwe and Blantyre and the BSS studies from Lilongwe and Blantyre, there are geographic areas within these two urban areas where the proximate determinants of HIV infection are higher than in the general population in these two cities. Respondents in the Lilongwe and Blantyre PLACE studies reported higher rates of sexual partnerships than in household surveys. Outreach testing, condom distribution, community education, stigma reduction and improving employment opportunities in these areas might reduce the transmission of HIV in these areas and have an add-on effect to reduction of HIV transmission in the general population in these areas as well as in neighboring areas.

8.3 Consider a phased-in approach to prevention that monitors indicators from the proximate determinants model

We have developed a prevention program framework and associated program monitoring indicators on the next few pages that are based on the proximate determinants model. Outcome indicators for the prevention framework are indicators related to the proximate determinants in the model above. This is because there can only be a change in HIV incidence (impact) if one of the proximate determinants is reduced. There are two types of proximate determinants: factors related to the probability of exposure and factors related to transmission given exposure. These are separated here and separated in the framework. Many programs target underlying determinants such as education. The education however is usually linked to a change in a proximate determinant. This prevention framework assumes that: (1) the planning phase is time and resource intensive and usually includes a pilot phase; (2) the proximate determinants model facilitates impact indicator planning; and (3) that prevention requires monitoring indicators at the planning phase, the implementation phase, and the program improvement phase. The figure below is an overview of the three phases of prevention program planning.

Figure 37   Prevention program cascade and associated indicators overview

Phase I Program Planning			
PLANNING INPUTS	**PLANNING ACTIVITIES**	**PLANNING OUTPUTS**	**OUTPUT INDICATORS**

Phase II Program Implementation			
PROGRAM INPUTS	**PROGRAM ACTIVITIES (OUTPUTS)**[36]	**OUTPUT INDICATORS**	**OUTCOME INDICATORS**[37] (Outcomes must decrease exposure to HIV or, if exposure occurs, transmission, per proximate determinants model)

Phase III Program Improvement			
PROGRAM INPUTS	**PROGRAM ACTIVITIES (OUTPUTS)**	**OUTPUT INDICATORS**	**OUTCOME INDICATORS**

An overview of the first two phases of planning and implementing prevention are shown in Table 43 below. A more detailed overview follows at the end of this section (Table 48).

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[36] To save space, program activities are described in terms of outputs.

[37] Outcome indicators are tied to the proximate determinants of HIV transmission—these are factors such as age of sexual debut, number of sexual partners, injecting drug use that directly increase the probability of exposure to HIV or increase the probability that transmission will occur given exposure (e.g., having genital ulcers increases the likelihood of HIV transmission during sex with a person who is infected with HIV)

Table 43   Prevention program cascade and indicators for Phase I and II

Phase I Program Planning			
PLANNING INPUTS	**PLANNING ACTIVITIES**	**PLANNING OUTPUTS**	**OUTPUT INDICATORS**
1 Program Leadership 2 Understand Epidemic 3 Time, staff, resources to prepare Prevention Program Framework Document 4 Resources to print	1.1 Develop Team 1.2 Convene Stakeholders 1.3 Establish CAB 1.4 Establish program linkages 2.1 Review data 3.1 Geographic scope 3.2 Proximate determinants 3.3 Underlying determinants 3.4 Target population 4.1 Print, distribute plan	Prevention Program Framework	1.1 Director, staff hired 1.2 Stakeholder meetings held 2.1 Local epidemic report 3.1 Map of prevention area 3.2 List of proximate determinants targeted 3.3 List of underlying determinants targeted 3.4 List of populations targeted 4.1 Prevention Framework Document Distributed

Phase II Program Implementation		
PROGRAM INPUTS: Prevention Program Framework Document, Time, Funding, Resources, Expertise, Other Planning Outputs from Phase I		
PROGRAM ACTIVITIES (OUTPUTS)	**OUTPUT INDICATORS**	**OUTCOME INDICATORS**
1 Locations for intervention identified 2 Key messages identified 3 Services to be provided identified 4 Training materials developed 5 Other program materials developed 6 Staff trained and evaluated 7 Implementation schedules made 8 M&E system operational 9 Financial system operational	Example For each product provided: • Number of products provided in past 12 months • Number of products provided in past 4 weeks	Example: By proximate determinant for each target population: Exposure: 1 Rate of new sexual partnerships: • % with X or more partners in the past 12 months

Phase III Program Improvement (Not shown in this table).

Stakeholder involvement is critical. There are 3 objectives of involving the community appropriate for any prevention program: 1) To ensure that planning and implementation of intervention occurs with support and input from community; 2) To coordinate with other related local and national programs; and 3) To ensure that objectives of intervention are consistent with the characteristics of the local HIV epidemic as revealed by available epidemiologic, social and economic data.

One of the key outputs of the planning phase is a Prevention Framework Document that defines the prevention strategy. The planning activities are intended to result in the framework document. The document is the place where decisions regarding prevention are recorded. In the Framework, for example, is the map of the prevention area, the identification of the target populations, and the rationale for the prevention strategy in terms of the proximate determinants. There are many populations that can be usefully targeted for prevention programs. Some of the most common target populations are listed below in Table 44.

Table 44   List of target populations

Population	Indicator
General Population	• General population all men in geographic scope • General population all women in geographic scope • General population all youth age X to X in geographic scope
Govt and Community Groups	• Local officials • Clergy • Church members • Youth Club leaders • Youth Club members • Sport Club Leaders • Sport Club members • Business Leaders • Women's Groups • Other
School Based	• Youth in Primary School • Youth in Secondary School • Post-secondary school students • Teachers In Primary School • Teachers in Secondary School • Teachers in Post-Secondary School
Workplace / Institutional Populations	• Prisoners • Military • Police • Migrant labor camps
Special Populations	• Unemployed men • Mobile Populations

Population	Indicator
	• MSM
	• PLWHA
	• Refugees
	• CSW- Brothel Based
	• CSW-Street Based
	• CSW-Other
	• Pimps/Madams of CSW
	• IDU
	• Clients of CSW
	• Non-Paying partners of CSW
	• Partners of IDU
	• Live-in Partners of HIV+
	• Persons socializing at venues with alcohol
	• Bar owners and managers
	• Orphan girls
People in Health Care Settings	• Clinicians /Staff in FP Clinic
	• Patients in FP Clinic
	• Clinicians/ Staff in STD Clinic
	• Patients in STD Clinic
	• Clinicians/Staff in ANC Clinic
	• Patients in ANC Clinic
	• Clinicians/Staff in TB Clinic
	• Patients in TP Clinic
	• Clinicians/Staff in AIDS Clinic
	• Patients in AIDS Clinic
	• Clinicians/Staff in Other Clinic (Specify)

The framework also requires selecting the type of intervention locations. A list of possible intervention locations is provided in Table 45.

Table 45   Type of intervention locations

Intervention Type	Location
General Population	• TV Broadcast • Radio Broadcast • Billboards • Internet
Health Related	• Clinics (FP, ANC, AIDS, TB, District general clinic, STD) • Special clinics • Needle exchange centers • VCT centers • Hospitals • Private Practitioner Offices • Traditional healer locations
Institutions/Organizations	• Schools (Primary, Secondary, Post) • Workplaces • Churches, Religious Organizations • Government Legislature • Courts • Jail / Prison • Military Camp • Business groups • Women advocacy group • Tourism Board • Youth organizations
Social Venues	• Bars • Brothels • Hotels • Truck stops • Border crossings • MSM Venues • Streets • Shooting galleries • Parks • Entertainment Venues • Social venues for youth • Beaches • Sports events
Vulnerable Communities	• Urban slums • Refugee camp • Migrant worker camp

In the program planning stage, the specific messages can be developed and formative research used to define the messages. See Table 46 for a list of key messages.

Table 46   List of key messages

Level	Messages
Proximate Determinant	• Abstain until age X • Abstain until marriage • Be faithful • Carry a condom • Use condoms every sex-anal sex • Use condoms every sex-vaginal sex • Use female condom • Use family planning • Get tested if pregnant • Don't share needles • Use clean needles • Know your status • Get your partner tested • Disclose status to partner • No sex w older partners • Get STD checkup • Say "NO" with your body as well as your voice
Underlying Determinant	• Know transmission routes • Know prevention methods • You CAN use a condom and here is how • Do not stigmatize HIV+ • Increase self-efficacy for condom use and partner selection • Improve human rights • Don't drink and sex • Talk with partner about sexual risk • Protect yourself from a vulnerable setting of sexual risk • You have the power to choose

In this framework, outcome indicators are tied to the proximate determinants of HIV transmission—these are factors such as age of sexual debut, number of sexual partners, injecting drug use that directly increase the probability of exposure to HIV or increase the probability that transmission will occur given exposure (e.g., having genital ulcers increases the likelihood of HIV transmission during sex with a person who is infected with HIV). Outcome indicators for key proximate determinants for Malawi might include the indicators listed below. For each indicator the key population must be specified (Table 47).

Table 47 **Outcome indicators in each key population for each proximate determinant of HIV infection**

Proximate Determinant	Outcome Indicator in Key Population
Rate of new sexual partnerships	• % of key population with 2 or more partners in the past 12 months
Age of sexual debut	• and % of all men and women age 15 and younger who have not had sex
Rate of concurrent partnerships	• % of population age 15-44 with 2 or more partners in the past 4 weeks
Age mixing	• % who have had sex with partner 10+ years different in age in the past 12 months
Condom use	• % using condom at last coitus

Specification of the geographic scope of the prevention programs facilitates use of spatial data. If scope is defined in terms of political boundaries such as a district, then district data can be used to inform the program and facilitate specification of size of target populations.

Table 48   Prevention program cascade and indicators: Expanded

Phase I Program Planning Expanded		
Phase I PROGRAM PLANNING INPUTS	Phase I PROGRAM PLANNING ACTIVITIES	Phase I PROGRAM PLANNING OUTPUT INDICATORS
1 Program Leadership	1.1.Organization of intervention team comprised of persons with expertise in HIV prevention, program design, training, implementation, management, monitoring and evaluation 1.2 Recruitment, coordination of Stakeholders 1.3 Establishment of Community Advisory Board if necessary and regular meetings 1.4 Establishment of program linkages to other related national and local programs including OVC, PMTCT, Ministry of Education, Ministry of Tourism and regular communication and information sharing	1.1 Intervention director and staff hired 1.2 Calendar of stakeholder meetings, stakeholder names, and program affiliation
2 Understanding of Epidemic	2.1 Collection, review and interpretation of epidemiologic and social information and data about the local HIV epidemic	2.1 Report that synthesizes the state of the local epidemic including identification of local underlying and proximate determinants of HIV transmission
3 Time, staff, access to experts and resources needed to prepare an informed Prevention Framework to Guide Intervention Development	3.1 Planning meetings to determine the geographic scope of intervention	3.1 Map of geographic scope of the planned prevention program, preferably in terms of geo-political boundaries for which census/other data are available.
	3.2 Planning meetings to identify proximate determinants of HIV transmission to be addressed by the intervention. Specifically, which of the 11 Proximate Determinants below will he addressed by intervention: Proximate Determinants of Exposure: 1 To lower rate of new sexual partnerships 2 To increase age of sexual debut 3 To reduce rate of concurrent partnerships 4 To reduce age mixing in partnerships 5 To reduce injecting drug use	3.2 A list of the specific proximate determinants that are focus of intervention taking into consideration the synthesis of the local epidemic, the geographic scope of the intervention, and gaps identified by stakeholders. Justification for each proximate determinant based on review of local epidemic.

Phase I Program Planning Expanded		
Phase I **PROGRAM PLANNING** **INPUTS**	**Phase I** **PROGRAM PLANNING** **ACTIVITIES**	**Phase I** **PROGRAM PLANNING** **OUTPUT INDICATORS**
	<u>Proximate Determinants of Transmission If Exposed:</u> 6 To increase condom use in vaginal sex 7 To increase condom use in anal sex 8 To increase condom use in partnerships known to include HIV+ partner 9 To treat STD Co-Factors 10 To stay on HIV treatment 11 To use clean needles when injecting drugs	
	3.3 Planning meetings to identify underlying determinants of HIV transmission, if any, that will be addressed by the intervention:	3.3 Specification of underlying determinants addressed and for each the related proximate determinant(s)
	3.4 Meetings to determine the type of population(s) that will be targeted by the intervention in the area that is the geographic scope of the program (See list in Table 34)	3.4 Specify each target population and for each specify the proximate and underlying determinant targeted by the intervention
4. Resources to print and distribute final prevention framework to stakeholders and others.	4.1 Synthesis of above into a prevention framework for the prevention program	Prevention Framework to Guide Intervention Development printed copied and distributed.

Phase II Implementation of Program Components Based on Framework Developed During Planning Phase		
Phase II **PROGRAM ACTIVITIES (OUTPUTS)**	**Phase II** **PROGRAM IMPLEMENTATION** **OUTPUT INDICATORS**	**Phase II** **OUTCOME** **INDICATORS**
1 Locations for intervention identified For each type of target population, identification of locations where intervention will be implemented For each target population, specify type and number of locations where intervention will be delivered. See Table 35 above for list of locations.	For each type of target population identified in Phase I: • the number of total locations where full or partial interventions were planned in the past 12 months • the percent of the above total number where interventions were fully delivered in the past 12 months, were partially delivered, and not delivered at all • the percent of the above total number where interventions were in operation in the past 4 weeks	By proximate determinant for each target population: <u>Exposure:</u> 1 Rate of new sexual partnerships: • % with X or more partners in the past 12 months

Phase II Implementation of Program Components Based on Framework Developed During Planning Phase		
Phase II **PROGRAM ACTIVITIES (OUTPUTS)**	**Phase II** **PROGRAM IMPLEMENTATION** **OUTPUT INDICATORS**	**Phase II** **OUTCOME** **INDICATORS**
2 Key Messages Identified Identify the key messages at the proximate determinant and the underlying determinant level that are included in the intervention. See Table 36 above for a list of messages.	• For each targeted proximate and underlying determinant, the percent linked to a key message	2 To increase age of sexual debut • % who have not had sex by age 15
3 Services / Products Identified <u>Provision of Products</u> • Female condoms • Free male condoms • For sale male condoms • Lubricants • Meals (Food) , Shelter for night • Transportation (per journey) • Medicine (per dose) <u>Referral and Testing</u> • Voluntary & confidential HIV Testing at VCT Center • Outreach HIV testing • STD Referral • STD Diagnosis and Treatment • Treatment for HIV+ • Methodone treatment	For each product provided: • Number of products provided in past 12 months • Number of products provided in past 4 weeks For each test and referral • Number of tests performed • Of these, the number where client received result • Of those receiving positive test result, the number who were referred for treatment • Of those referred, the number who obtained appropriate treatment	3 Rate of concurrent partnerships • % with fewer than 2 different partners in the past 4 weeks 4 Age mixing in partnerships • % who have not had sex with partner 10+ years different in age 5 Injecting drug use • % who have injected in past 12 months •
4 Training materials developed	• For each target population, training materials for each key message printed • For each target population, training materials for each product service developed (by location if necessary)	<u>Transmission:</u> 6 To increase condom use in vaginal sex • % using condom at last coitus
5 Program materials developed for education, counseling, awareness raising, advocacy , support, outreach: • Mass media education • Small media (leaflets) education • Life skills education • School based education • Peer education • General risk reduction education • Tailored messages for risk reduction • One-on-one risk reduction counseling	For each type of material provided: • Number of persons in target population group at intervention locations in geographic scope of intervention • Of these, number fully exposed [38]to material in past 12 months • Of these, number partially exposed to material in past 12 months	7 To increase condom use in anal sex • % using condoms at last anal sex

Phase II Implementation of Program Components Based on Framework Developed During Planning Phase		
Phase II PROGRAM ACTIVITIES (OUTPUTS)	**Phase II PROGRAM IMPLEMENTATION OUTPUT INDICATORS**	**Phase II OUTCOME INDICATORS**
• One-time community mobilization / awareness raising events • Community discussions • Small group discussions • Interventions using the arts including music and drama • Condom demonstrations • Advocacy for policy change • Development of private partnerships for prevention • Support for people HIV+ • Alternative employment • Refuge from violence • Legal assistance		8 To increase condom use in partnerships known to include HIV+ partner • % using condoms last time with most recent HIV+ partnership 9 To treat STD Co-Factors • % of those with symptoms treated for STI
6 Staff trained and evaluated	• Number of persons trained to provide services in past 12 months • Of these, the number actually providing services in the past 4 weeks	10 Staying on HIV treatment • % maintaining treatment
7 Implementation schedules made	• Calendar of implementation activities showing services provided by location	
8 M&E system operational	• System operational for tracking output indicators • Reports from system provided at least annually to stakeholders	11 Clean needles when injecting • % of those injecting using clean needle last time
9 Financial system operational	• System operational for tracking output indicators	

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[38] "Fully exposed" to a poster might be seeing the poster one time. "Fully exposed" to school based education might require attending 12 sessions.

8.4   Improve surveillance system and evaluate prevention programs

Interpretation of ANC surveillance data is much improved when additional questions are asked about marriage patterns, age at first sex and migrations. These questions should be standardized and added to the ANC surveillance instrument.

Rigorous evaluation of prevention programs is needed so that lessons can be learned from effective programs. It is unknown what programs are currently effective in preventing HIV acquisition in Lilongwe or Blantyre. Strengthening of prevention programs at PLACE sites is urgently needed in both cities. Condoms were not always available at PLACE sites and should be available in these high risk places.