

Understanding Patterns of HIV-Related Knowledge and Behaviors among People Living with HIV in Sub-Saharan Africa

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Introduction

As the region that has been hardest hit by the HIV epidemic, sub-Saharan Africa continues to suffer from the largest share of the global HIV burden. At the end of 2010, of the estimated 34 million people worldwide living with HIV, 68 percent resided in sub-Saharan Africa, a region with 12 percent of the world's population (UNAIDS 2011). One-third of the global population living with HIV in 2009 resided in ten countries in Southern Africa (WHO, UNICEF et al. 2011). Also, 70 percent of new infections were in sub-Saharan Africa.

With an average adult HIV prevalence rate of 5 percent, HIV/AIDS has become the leading cause of death in sub-Saharan Africa, accounting for at least one million lives lost every year since 1998. With greater availability of anti-retroviral therapy, however, the number of AIDS-related deaths has been decreasing annually (UNAIDS 2011).

Despite a decrease in the incidence of new HIV infections, the numbers are still quite high. Most HIV prevention programs have focused on the general population or people at high risk of HIV, paying little attention to those who are already infected with the virus. However, to limit the spread of the epidemic, it is necessary also to focus on the infectious source—people living with HIV (PLHIV). UNAIDS has recommended that comprehensive HIV prevention should include prevention programs focusing on PLHIV (UNAIDS 2006). In order to design effective prevention strategies, it is essential to understand HIV-related knowledge and behaviors among PLHIV and to assess their risk of HIV transmission to people who are not infected.

This study uses data from the Demographic and Health Surveys (DHS) and AIDS Indicator Surveys (AIS) in eight high HIV prevalence African countries (Kenya, Lesotho, Malawi, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe). The analysis identifies HIV-related knowledge and behavioral patterns of PLHIV across the eight countries and examines factors associated with selected outcomes.

Background

Correct knowledge on HIV transmission and prevention is important for avoiding infection. It is particularly crucial for HIV-positive people to have an accurate understanding of how HIV is transmitted and prevented in order to avoid or reduce risk of transmitting the infection to their sexual partners. Comprehensive knowledge about AIDS is an indicator commonly used to measure knowledge of the essential facts about HIV transmission and prevention. The indicator is defined as a person who knows the two major methods of HIV prevention (consistent use of condoms during sexual intercourse and having just one faithful partner who is uninfected), knows that a healthy-looking person can have HIV, and rejects the two most common local misconceptions about HIV transmission or prevention.

Despite efforts to improve knowledge about HIV, comprehensive knowledge remains low in sub-Saharan Africa. Among over 30 countries in this region with DHS data available, only in three countries—Kenya, Namibia and Swaziland—half the young people age 15-24 have comprehensive knowledge about AIDS (Central Statistical Office (CSO) [Swaziland] and Macro International Inc. 2008; Ministry of Health and Social Sciences (MoHSS) [Namibia] and Macro International Inc. 2008; Kenya National Bureau of Statistics and ICF Macro 2010). These levels are far below the target level for comprehensive knowledge of AIDS set by the United Nations General Assembly Special Session (UNGASS), at 95 percent of young people age 15-24 worldwide.

Few studies have examined comprehensive knowledge about AIDS among PLHIV. In one study, a clinical trial with postpartum women in urban Zambia, about a quarter of HIV-infected women reported

that they could tell whether a person had HIV by looking at them, and 57 percent said that HIV could be transmitted through kissing (Stringer 2004).

Heterosexual sex is the primary mode of HIV transmission in Africa (UNAIDS 2006). For instance, an analysis of survey and clinical data in Zambia and Rwanda showed that 55 percent or more of new HIV cases are attributed to heterosexual transmission within marriage or cohabitation (Dunkle, Stephenson et al. 2008).

Condom use has been universally accepted as one of the most effective means of protection against HIV and other sexually transmitted infections (STIs), if used correctly and consistently (Ahmed, Lutalo et al. 2001; Cayley 2004; Paz-Bailey, Koumans et al. 2005). For the HIV-positive, condom use is even more critical to protect their sexual partners than for the general population. While many studies have examined condom use in the general population, research on HIV-positive people's condom use is limited. Studies based on both clinic and convenience samples have found high rates of condom use among PLHIV, especially among those with high educational attainment, those living in urban areas, and those married or living together (Chama, Morrumpa et al. 2007).

Two studies have used nationally representative survey data to examine unprotected sex among HIV-positive individuals. One study in Uganda using the Uganda 2004-2005 HIV/AIDS Sero-behavioral Survey involved 18,525 adults who were tested for HIV (Bunnell, Opio et al. 2008). In contrast to the findings from most clinic-based studies, the authors found that non-use of condoms at last sex encounter was common among HIV-positive people and that unprotected sex mainly occurred between spouses or steady partners. The other study, using the Kenya 2003 DHS and Malawi 2004-05 DHS, also found that condom use was rare among individuals who were tested and found to be HIV positive in the surveys, and especially among those married or cohabiting (Anand, Shiraishi et al. 2009). After controlling for other factors, being married or cohabiting was still significantly associated with lower likelihood of condom use. Other factors found to be associated with the lack of condom use include lower educational attainment and younger age, in studies based on national samples, and multiple partnership, perception of partner's negative HIV status, rural residence, lower educational attainment, forced sex, having an HIV-positive partner, and alcohol use, in studies based on selective samples (Kiene, Christie et al. 2006; Kalichman, Ntseane et al. 2007; Kiene, Simbayi et al. 2008; Lurie, Pronyk et al. 2008).

Another important factor in HIV prevention is people's awareness of their own HIV status. PLHIV who are aware of their status are more likely to adopt protective measures and to seek treatment, care and support. HIV counseling and testing provides an opportunity for people to learn their HIV serostatus and an opportunity for those who are infected to obtain referrals for treatment care and other support. The studies in Uganda, Kenya and Malawi mentioned earlier found little HIV testing uptake and little knowledge of their partners' HIV status among respondents (Bunnell, Opio et al. 2008; Anand, Shiraishi et al. 2009). Twenty-one percent of HIV-infected people in Uganda knew their HIV status and 9 percent knew their partners'. In Kenya and Malawi, 20 and 16 percent, respectively, of the population reported being tested for HIV and receiving results prior to the survey. A majority of the Kenyans perceived a small risk of HIV infection.

Most studies on HIV-positive people's behaviors have employed highly selective samples: convenient samples recruited in ART clinics, hospitals or other clinical sites or AIDS supporting groups (Stringer, Sinkala et al. 2004; Olley, Seedat et al. 2005; Kalichman, Ntseane et al. 2007). There are similarities and discrepancies in the results of studies conducted in clinical sites and those using nationally representative samples. Both have found that HIV-infected people are highly sexually active. However, studies using convenient samples have found much higher levels of condom use compared with studies using national samples.

Studies using national samples also have found that respondents had little knowledge of their own HIV status (around or below 20 percent of the population), and one study also indicated lack of knowledge of their partners' status. In contrast, clinic-based studies have usually been based on HIV patients under treatment and found high disclosure of HIV status to partners, usually more than 70 percent (Lurie, Pronyk et al. 2008). The clinic-based studies also indicated high levels of HIV-related knowledge, such as knowledge of PMTCT. These discrepancies may result from the selection bias of convenient samples that include only ART patients who were already aware of their positive status, voluntarily seeking treatment, and exposed to counseling and support, and who therefore had better knowledge of HIV and were more likely to take protective measures such as condom use.

Some clinic studies also have found that support group interventions were associated with increased condom use (Jones, Weiss et al. 2006) and that HIV counseling was associated with positive health behaviors in general (Gaede, Majeke et al. 2006).

Most studies on HIV-infected people have been restricted to single-country analyses. Few have analyzed data from multiple countries with high HIV prevalence to identify knowledge or behavioral patterns across countries. Furthermore, no studies have assessed changes over time in HIV-related knowledge and behavior among PLHIV.

Hypotheses

Using DHS and AIS data from eight high HIV prevalence countries in sub-Saharan Africa, this analysis seeks to test the following hypotheses related to HIV related knowledge, sexual behavior, and prior testing for HIV.

Aim 1: To assess knowledge about HIV/AIDS among PLHIV and factors associated with improved knowledge.

Hypothesis 1: Prior HIV testing experience of PLHIV is positively associated with greater knowledge about HIV/AIDS.

Hypothesis 2: PLHIV who are better educated have greater knowledge about HIV/AIDS than PLHIV who are poorly educated.

Aim 2: To examine sexual risk behaviors among PLHIV and factors associated with condom use.

Hypothesis: PLHIV who are currently married are less likely to have used a condom at last sex in the last 12 months than those who are not currently married.

Aim 3: To determine uptake of HIV testing among PLHIV and factors associated with HIV testing behavior.

Hypothesis 2: PLHIV who received STI treatment and care are more likely to have tested for HIV and received results in the last 12 months.

Data and Analysis

Data

This study uses data from DHS and AIS conducted between 2003 and 2011 in eight sub-Saharan African countries - Kenya, Lesotho, Malawi, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe. Except Uganda, where the AIS was conducted in 2004, the most recent surveys in the other countries were

conducted between 2007 and 2011¹. These countries were selected for the following two reasons. First, HIV biomarker data are available and can be linked to the individual and household information gathered in the same survey. Second, the HIV prevalence rate is relatively high (i.e. greater than 5 percent either among men or women), and therefore the sample of HIV-positive individuals should be sufficient to yield reliable estimates.

HIV prevalence varies considerably by country. According to the most recent survey in each country, prevalence ranges from 7 percent in Tanzania to 31 percent in Swaziland among women, and from 5 percent in Uganda to 23 percent in Lesotho among men. In four countries—Lesotho, Swaziland, Zambia and Zimbabwe—HIV prevalence is over 10 percent among both women and men, and highest in Lesotho and Swaziland.

Since 2001, Measure DHS has included HIV testing in the DHS and AIS. HIV testing has been conducted anonymously in 39 DHS and 6 AIS. Among survey participants, usually all women age 15-49 and men age 15-54 who consented to be tested, blood specimens are collected and transported to a central lab where all samples are tested following a standard procedure to maximize the sensitivity and specificity of the test. Survey respondents are not provided with testing results but are given educational materials and offered referrals for free voluntary counseling and testing (VCT).

This analysis is restricted to women and men age 15-49 at the time of the survey who were successfully interviewed, tested HIV-positive, and have ever had sex. However, it is important to note that not all those who tested HIV-positive were aware of their HIV status. Table 1 presents background characteristics of the respondents in the most recent survey of each country

Table 1 about here

Measurement

The primary outcomes of interest include indicators of HIV-related knowledge, sexual risk behaviors and prior HIV testing experience that are defined below.

HIV-related knowledge indicators

Comprehensive knowledge about HIV/AIDS: Knowing that consistent condom use during sexual intercourse and having just one uninfected faithful partner can reduce the chances of contracting HIV, knowing that a healthy-looking person can have HIV, and correctly rejecting the two most common local misconceptions about HIV transmission or prevention. (Such misconceptions usually include “AIDS transmitted by mosquito bites,” “AIDS can be transmitted by supernatural means,” and “A person can become infected by sharing food with a person who has AIDS”).

Sexual behavior indicators

Condom use at last sex: Used a condom the last time had sex in the last 12 months.

Prior HIV testing indicators

Tested and received results in the last 12 months: Tested and received results for HIV in the 12 months before the survey.

¹ For five of the countries with two recent surveys approximately five years apart (Kenya (2003,2009), Lesotho (2004, 2009), Malawi (2004, 2010), Tanzania (2003-04, 2007-08) and Zimbabwe (2005-06, 2010-11)), we include both surveys in the regression analysis. All descriptive analyses are however based on the last survey year.

Independent variables include respondents' socio-demographic characteristics: age, education, marital status, urban-rural residence, wealth status and employment status. Wealth status is a composite measure based on the household's ownership of selected assets, housing construction materials, water sources and sanitation facilities (Rutstein and Johnson 2004). The variable is pre-calculated and included in DHS data files.

Analysis Method

Separate analyses are performed for women and men in each country. The descriptive analysis is based on the most recent survey in each country. In Kenya, Lesotho, Malawi, Tanzania and Zimbabwe, where survey data are available at two time points, data from both surveys are pooled for the regression analysis. In addition to the other control variables, a survey variable is included in the regression model to adjust for the effect of the time of the survey. All analyses are performed using Stata12 software. We apply sampling weights in all the analyses to enable us to generalize the results to the country's population. The weight variable is the pre-existing sampling weight in the DHS datasets. When two surveys from the same country are pooled together, we adjust the weights to obtain an equal weight between two surveys in order to avoid dominance of one survey with a larger sample size. The effect of stratification and clustering used in DHS sample design is also adjusted in the analysis.

Descriptive Analysis Results

Table 2 shows the levels of indicators of knowledge of HIV transmission, sexual behavior and HIV testing among HIV-positive women and men who ever had sex. Overall, for most indicators, the highest levels of knowledge among HIV-positive women are found in Zimbabwe in 2010-11 and in Kenya in 2008-09.

In three countries—Kenya, Swaziland and Zimbabwe—more than half of HIV-positive women have comprehensive knowledge about AIDS. In Kenya, Malawi, Tanzania and Zimbabwe, more than half the HIV-positive men have comprehensive knowledge about HIV/AIDS. In contrast, the lowest levels of comprehensive knowledge are in Lesotho and Uganda, based on the most recent data, at around 35 percent for women and 29-37 percent for men.

Table 2 about here

With regard to sexual activity, condom use at last sex in the last 12 months is not common among women infected with HIV, ranging from 18 percent in Uganda to 47 percent in Lesotho. In three countries, Tanzania, Uganda and Zambia, more than 80 percent of women reported having unprotected last sex in the 12 months before the survey. Condom use among HIV-positive men is generally higher than among HIV-positive women. Lesotho and Swaziland show the highest condom use at last sex, at 49 and 47 percent, respectively. The lowest rates are in Uganda (15 percent), from the 2004-05 survey. In all other countries, more than 20 percent of HIV infected men who had sex in the last 12 months used a condom at last sex.

In four countries (Kenya, Lesotho, Malawi and Zimbabwe), at least three-fourths of HIV-positive women had previously tested, and more than 70 percent had tested and received results. In terms of testing experience among HIV-positive women in the last 12 months, the range of testing and receipt of results is from 8 percent in Uganda to 43 percent in Lesotho. For survey implementation reasons, Malawi does not have data on testing in the last 12 months in the most recent survey. In most other countries, most people who tested for HIV in the 12 months before the survey also received results.

In Uganda, almost all of those who tested for HIV received results. However, a much smaller percentage of people (10 percent among women and 5 percent among men) tested for HIV in the last 12 months. Even fewer (8 percent among men and 4 percent among women) received test results.

Multivariate Analysis Results

HIV Related Knowledge

The bivariate analysis results above indicate that education and prior HIV testing have a positive association with HIV-related knowledge measured as comprehensive knowledge about AIDS. We conduct multiple regression analysis for each country to test if this association remains after controlling for potential confounders including age, education, marital status, urban-rural residence, wealth status and employment status. For countries with two sets of data (Kenya, Lesotho, Malawi, Tanzania and Zimbabwe), both sets are included in the analysis. Given the binary nature of the outcome variables, results of the logistic regressions are presented as odds ratios.

Results of the regression analysis presented in Table 3 show the odds of greater comprehensive knowledge about AIDS as a result of higher educational attainment and prior HIV testing. Men and women with less than secondary education, and those with no prior HIV testing, are treated as the reference group in results presented in both tables.

Table 3 about here

Secondary education has a strong positive relationship with comprehensive knowledge about AIDS among HIV-positive women in all countries. The odds of having comprehensive knowledge are 3.2 times higher in Kenya and 3.0 times higher in Tanzania for women with secondary education compared with women with no education or primary education. The positive association is also consistent among men across the countries. The odds ratios range from 1.6 in Zimbabwe to 4.0 in Kenya, although some countries such as Kenya and Tanzania show wide 95 percent confidence intervals.

The results for prior HIV testing are more mixed. Only in half the countries (Lesotho, Malawi, Swaziland and Zimbabwe) is prior HIV testing significantly related to comprehensive knowledge about AIDS among HIV-positive women. The odds ratios range from 1.3 to 1.9, which means that HIV-positive women with prior HIV testing experience are 30 to 90 percent more likely to have comprehensive knowledge about AIDS than those who had never tested. A significant association between HIV testing and comprehensive knowledge among men is observed in Kenya, Malawi and Swaziland.

Sexual Behavior

With regard to sexual behavior, multiple regression analysis examines if being currently married is associated with condom use after controlling for other background variables—age, education, urban-rural residence, work status and household wealth status. Separate regressions are run for women and men. Table 4 shows the effect of current marital status in comparison to the reference group of never-married or formerly married women and men. Among HIV-positive women, the likelihood of condom use at last sex in the last 12 months is significantly smaller among currently married women compared with never-married or formerly married women in all countries. The odds ratios range from 0.1 to 0.4, which means that currently married women have 60 to 90 percent lower odds of using a condom at last sex compared with the reference group. As for men, the negative relationship between currently married status and condom use is also statistically significant in all countries, with odds ratios ranging from 0.1 to 0.6. The strongest association is found in Tanzania, Uganda and Zimbabwe, where currently married men have 90

percent lower odds of using a condom at last sex than the control group of men who are not currently married.

Table 4 about here

Prior HIV Testing

Regression results for the effect of STI treatment and care on HIV testing and receipt of results in the last 12 months are presented in Table 5. Results indicate that there is a statistically significant positive relationship with STI care only among women, and only in two countries (Swaziland and Zimbabwe). In Zimbabwe the odds of HIV testing in the last 12 months and receiving results for women who received STI care are twice the odds for women who did not receive STI care.

Table 5 about here

Summary and Discussion

Using data from the DHS and AIS in eight high HIV prevalence African countries, this study contributes to an understanding of HIV-related knowledge, sexual behavior and previous HIV testing uptake among HIV-positive people. Although the study refers to PLHIV, it is important to note that not all these individuals were aware of their HIV status as survey respondents are not provided with testing results. The findings from this analysis are expected to inform policies and programs in sub-Saharan Africa to develop comprehensive HIV prevention strategies that include prevention with PLHIV.

HIV Related Knowledge

Overall, PLHIV's comprehensive knowledge about AIDS is poor in almost all countries, including Swaziland and Lesotho, which have the highest HIV prevalence rates in sub-Saharan Africa. Moreover, a greater percentage of HIV-positive men than women have comprehensive knowledge about AIDS.

In all countries only small percentages of PLHIV have comprehensive knowledge about AIDS, which is particularly worrisome for countries with high HIV prevalence, for example, Lesotho and Swaziland. Other analysis not presented here however show some encouraging results that comprehensive knowledge has increased in most of the countries where trend data are available. This improvement could be the result of program efforts to disseminate necessary and accurate knowledge on HIV prevention and transmission. Research based on the general population has shown significant improvement in comprehensive knowledge about AIDS, for example, from 9 percent in 1993 to 54 percent in 2008-09 among young men in Kenya (Ochako, Ulwodi et al. 2011).

Overall, there is a strong association between higher education and comprehensive knowledge about AIDS among HIV-positive men and women. The odds of having comprehensive knowledge about AIDS are as high as 3.2 times for women and 4.0 times for men with secondary education compared with less educated women and men. The finding of the positive impact of education on HIV knowledge is consistent with previous studies based on the general population. A study using data from four DHS surveys in Kenya found that the level of schooling plays a significant role for young urban women's comprehensive knowledge about AIDS (Ochako, Ulwodi et al. 2011). While it is important to improve the education level of the population, it is going to be a long-term effort. In the short term, our findings underscore the need to focus on men and women who have little formal education to increase their knowledge of HIV prevention and transmission and knowledge on PMTCT.

Prior HIV testing has a positive relationship with comprehensive knowledge about AIDS in only around half the countries studied, for both men and women. Although it is impossible to determine the direction of the association due to the cross-sectional nature of the DHS data, this finding is promising for HIV prevention regardless of the direction of causality, whether HIV testing leads to better knowledge of HIV/AIDS or better knowledge results in HIV testing uptake.

Sexual Behavior

In all countries, a larger percentage of men than women used a condom at last sex in the last 12 months. Even so, in four countries (Malawi, Tanzania, Uganda and Zambia) more than 75 percent of men reported having unprotected last sex. The highest levels of condom use for both women and men were in Lesotho and Swaziland, where HIV prevalence rates are 26 percent and 31 percent, respectively. Therefore, a large proportion of PLHIV have unprotected sex, which brings a great risk of transmission to their partners. The transmission risk is even greater if the infected person also has multiple partners. Mathematical modeling shows that concurrent partnership exponentially increases the number of infected individuals and the growth rate of the HIV/AIDS epidemic (Morris and Kretzschmar 1997).

Being married or in a cohabiting relationship is significantly associated with less condom use for both women and men. A study based on the Kenya 2003 DHS and the Malawi 2004-05 DHS had a similar finding (Anand, Shiraishi et al. 2009). In the same study, researchers also found that half of the married or cohabiting HIV-infected people in Kenya and more than 40 percent in Malawi had HIV-negative spouses. The lack of condom use within marriage is not unique to PLHIV. Several studies in different cultural settings have found that people are less likely to use condoms with their spousal partners than with non-spousal partners (Macaluso, Demand et al. 2000; Chatterjee, Hosain et al. 2006; Lescano, Vazquez et al. 2006).

For married couples, condom use is more likely to serve as protection from pregnancy instead of protection from HIV/STI infections. If they are already using other contraceptive methods, married couples tend not to use condoms. Research has shown that women view non-use of condoms as a symbol of trust in sex partners, faith in their partner's monogamy, and commitment to the relationship (Sobo 1995; Sherman and Latkin 2001).

Lack of condom use among HIV-discordant couples (one partner HIV-positive, the other HIV-negative) is a serious problem because it exposes the HIV-negative partner to a high risk of HIV infection. A study based on data from 12 sites in Southern and Eastern Africa indicates that about half of couples with one HIV-positive partner were HIV-discordant (Lingappa, Lambdin et al. 2008). Research in Rwanda and Zambia has shown that the majority of new heterosexual HIV infections occur within marriage or cohabiting relationships (Dunkle, Stephenson et al. 2008).

In light of couples' needs for both family planning and HIV prevention, integrating family planning services with HIV services—for example, HIV testing and counseling—could be an effective way to increase condom use among HIV-discordant couples. Barrier contraceptive methods can be promoted for the purpose of dual protection from pregnancy and STIs, including HIV. Research has also suggested that intervention programs directed to couples are effective in changing risky behaviors and reducing HIV transmission (Wilkinson and Rutherford 2001; Allen, Meizen-Derr et al. 2003).

Increasing individual awareness of own HIV status as well as partner's status could potentially lead to increased condom use within marriage or cohabitation. Our results based on the Malawi 2010 DHS show that awareness of HIV-positive status can increase the likelihood of condom use. (Similar analysis could not be done with other surveys because data on self-reported HIV status were unavailable).

Prior HIV Testing

The extent of recent HIV testing varies by country ranging from 4 percent in Uganda to 36 percent in Kenya and Lesotho. It is possible that more recent data (to be added later) may show an increase in recent HIV testing. Prior testing rates are generally higher for women than men.

There is some evidence that there is an increase in the percentages of HIV testing over time possibly a result of recent policy and program efforts in improving HIV testing uptake. In 2010, 37 countries in sub-Saharan Africa reported having national guidelines on the implementation of provider-initiated testing and counseling in health facilities (WHO, UNICEF et al. 2011). More health facilities provide HIV testing and counseling. Among countries reporting data in 2010, the median number of facilities providing HIV testing was 12 per 100,000 population, an increase from 8.6 in 2009. In Kenya, Lesotho, and Zimbabwe the 2010 figures are much higher than the average, at 22.5, 19.4 and 19.2 per 100,000, respectively. Malawi is about at the average level of the region.

Continued program effort is needed to increase HIV testing uptake, particularly in high HIV prevalence countries. In Swaziland, about one-third of the population is HIV-positive, but only half the number of HIV-infected women and one-third of the HIV-infected men have ever been tested. For men and women alike, knowing their HIV status is a first and critical step to obtain appropriate care and support and to adopt safer-sex behaviors.

This study also attempts to identify factors that affect HIV testing uptake among HIV-positive individuals. Although a positive association between receiving STI care and HIV testing in the last 12 months was found only for women and only in three of the eight countries, it may suggest that there is another strategy to increase HIV testing. Partially due to the stigma associated with HIV, many people are reluctant to go to a health facility for HIV patients for testing. Thus integrating HIV testing service with STI treatment in clinics could be an effective approach for scaling up HIV testing. The integration of HIV testing into syphilis services in six STI clinics in Guangdong province in China is a good example of an approach that resulted in a high HIV testing rate, up to 80 percent (Tucker, Yang et al. 2010; Tucker, Yang et al. 2011).

In reviewing the results of this analysis, a number of limitations need to be considered. The sample sizes in some countries are small, especially for men. This influences the power of the study, reflected by the wide 95 percent confidence intervals and the limited ability to detect significance in the regression analysis. Although the DHS and AIS provide high-quality comparable information, under-reporting of respondents' sexual behaviors is quite possible due to the sensitive personal nature of the information. Finally, the use of cross-sectional data makes it impossible to infer causal relationships.

References

- Ahmed, S., T. Lutalo, M. Wawer, D. Serwadda, N. K. Sewankambo, F. Nalugoda, F. Makumbi, F. Wabwire-Mangen, N. Kiwanuka, G. Kigozi, M. Kiddugavu, and R. Gray. 2001. "HIV Incidence and Sexually Transmitted Disease Prevalence Associated with Condom Use: A Population Study in Rakai, Uganda." *AIDS* 15(16): 2171-2179.
- Allen, S., J. Meinzen-Derr, M. Kautzman, I. Zulu, S. Trask, U. Fideli, R. Musonda, F. Kasolo, F. Gao, and A. Haworth. 2003. "Sexual Behavior of HIV Discordant Couples after HIV Counseling and Testing." *AIDS* 17(5): 733-740.
- Anand, A., R. W. Shiraishi, R. E. Bunnell, K. Jacobs, N. Solehdin, A. S. Abdul-Quader, L. H. Marum, J. N. Muttunga, K. Kamoto, J. M. Aberle-Grasse, and T. Diaz. 2009. "Knowledge of HIV Status, Sexual Risk Behaviors and Contraceptive Need among People Living with HIV in Kenya and Malawi." *AIDS* 23(12): 1565-1573.
- Bunnell, R., A. Opio, J. Musinguzi, W. Kirungi, P. Ekwaru, V. Mishra, W. Hladik, J. Kafuko, E. Madraa, and J. Mermin. 2008. "HIV Transmission Risk Behavior among HIV-Infected Adults in Uganda: Results of A Nationally Representative Survey." *AIDS* 22(5): 617-624.
- Cayley, W. E. Jr. 2004. "Effectiveness of Condoms in Reducing Heterosexual Transmission of HIV." *Am Fam Physician* 70(7): 1268-1269.
- Central Statistical Office (CSO) [Swaziland], and Macro International Inc. 2008. *Swaziland Demographic and Health Survey 2006-07*. Mbabane, Swaziland: CSO and Macro International Inc.
- Chama, C., J. Morrumpa, and W. Gashau. 2007. "Sex and Reproduction among HIV-Infected People in Maiduguri, Nigeria." *J Obstet Gynaecol* 27(8): 812-815.
- Chatterjee, N., G. M. Hosain, and S. Williams. 2006. "Condom Use with Steady and Casual Partners in Inner City African-American Communities." *Sex Transm. Infect.* 82(3): 238-242.
- Dunkle, K. L., R. Stephenson, E. Karita, E. Chomba, K. Kayitenkore, C. Vwalika, L. Greenberg, and S. Allen. 2008. "New Heterosexually Transmitted HIV Infections in Married or Cohabiting Couples in Urban Zambia and Rwanda: An Analysis of Survey and Clinical Data." *Lancet* 371(9631): 2183-2191.
- Gaede, B. M., S. J. Majeke, R. R. Modeste, J. R. Naidoo, M. J. Titus, and L. R. Uys. 2006. "Social Support and Health Behaviour in Women Living with HIV in KwaZulu-Natal." *SAHARA J* 3(1): 362-368.
- Jones, D. L., S. M. Weiss, G. J. Bhat, and V. Bwalya. 2006. "Influencing Sexual Practices among HIV-Positive Zambian Women." *AIDS Care* 18(6): 629-634.
- Kalichman, S. C., D. Ntseane, K. Nthomang, M. Segwabe, O. Phorano, and L. C. Simbayi. 2007. "Recent Multiple Sexual Partners and HIV Transmission Risks among People Living with HIV/AIDS in Botswana." *Sex Transm Infect* 83(5): 371-375.
- Kenya National Bureau of Statistics, and ICF Macro. 2010. *Kenya Demographic and Health Survey 2008-09*. Calverton, Maryland, USA: KNBS and ICF Macro.

- Kiene, S. M., S. Christie, D. H. Cornman, W. A. Fisher, P. A. Shuper, S. Pillay, G. H. Friedland, and J. D. Fisher. 2006. "Sexual Risk Behaviour among HIV-Positive Individuals in Clinical Care in Urban Kwazulu-Natal, South Africa." *AIDS* 20(13): 1781-1784.
- Kiene, S. M., L. C. Simbayi, A. Abrams, A. Cloete, H. Tennen, and J. D. Fisher. 2008. "High Rates of Unprotected Sex Occurring among HIV-Positive Individuals in a Daily Diary Study in South Africa: The Role of Alcohol Use." *J Acquir Immune Defic Syndr* 49(2): 219-226.
- Lescano, C. M., E. A. Vazquez, L. K. Brown, E. B. Litvin, D. Pugatch, and Project SHIELD Study Group. 2006. "Condom Use with 'Casual' and 'Main' Partners: What's in A Name?" *J. Adolesc. Health* 39(3): 443-447.
- Lingappa, J. R., B. Lambdin, E. A. Bukusi, K. Ngunjiri, L. Kavuma, M. Inambao, W. Kanweka, S. Allen, J. N. Kiarie, J. Makhema, E. Were, R. Manongi, D. Coetzee, G. de Bruyn, S. Delany-Moretlwe, A. Magaret, N. Mugo, A. Mujugira, P. Ndase, C. Celum, and Partners in Prevention HSV-2/HIV Transmission Study Group. 2008. "Regional Differences in Prevalence of HIV-1 Discordance in Africa and Enrollment of HIV-1 Discordant Couples into An HIV-1 Prevention Trial." *PLoS One* 3(1): e1411.
- Lurie, M., P. Pronyk, E. de Moor, A. Heyer, G. de Bruyn, H. Struthers, J. McIntyre, G. Gray, E. Marinda, K. Klipstein-Grobusch, and N. Martinson. 2008. "Sexual Behavior and Reproductive Health among HIV-Infected Patients in Urban and Rural South Africa." *J. Acquir. Immune. Defic. Syndr.* 47(4): 484-493.
- Macaluso, M., M. J. Demand, L. M. Artz, and E. W. 3rd Hook. 2000. "Partner Type and Condom Use." *AIDS* 14(5): 537-546.
- Ministry of Health and Social Sciences (MoHSS) [Namibia], and Macro International Inc. 2008. *Namibia Demographic and Health Survey 2006-07*. Windhoek, Namibia and Calverton, Maryland, USA: MoHSS and Macro International Inc.
- Morris, M., and M. Kretzschmar. 1997. "Concurrent Partnerships and the Spread of HIV." *AIDS* 11(5): 641-648.
- Ochako, R., D. Ulwodi, P. Njagi, S. Kimetu, and A. Onyango. 2011. "Trends and Determinants of Comprehensive HIV and AIDS Knowledge among Urban Young Women in Kenya." *AIDS Res. Ther.* 8: 11.
- Olley, B. O., S. Seedat, F. Gxamza, H. Reuter, and D. J. Stein. 2005. "Determinants of Unprotected Sex among HIV-Positive Patients in South Africa." *AIDS Care* 17(1): 1-9.
- Paz-Bailey, G., E. H. Koumans, M. Sternberg, A. Pierce, J. Papp, E. R. Unger, M. Sawyer, C. M. Black, and L. E. Markowitz. 2005. "The Effect of Correct and Consistent Condom Use on Chlamydial and Gonococcal Infection among Urban Adolescents." *Arch. Pediatr. Adolesc. Med.* 159(6): 536-542.
- Rutstein, S., and K. Johnson. 2004. *The DHS Wealth Index*. Calverton, Maryland, USA: ORC Macro.
- Sherman, S. G., and C. A. Latkin. 2001. "Intimate Relationship Characteristics Associated with Condom Use among Drug Users and Their Sex Partners: A Multilevel Analysis." *Drug Alcohol Depend.* 64(1): 97-104.

- Sobo, E. J. 1995. "Finance, Romance, Social Support, and Condom Use among Impoverished Inner-City Women." *Human Organizations* 54(2): 115-127.
- Stringer, E. M., M. Sinkala, R. Kumwenda, V. Chapman, A. Mwale, S. H. Vermund, R. L. Goldenberg, and J. S. Stringer. 2004. "Personal Risk Perception, HIV Knowledge and Risk Avoidance Behavior, and Their Relationships to Actual HIV Serostatus in an Urban African Obstetric Population." *J. Acquir. Immune. Defic. Syndr.* 35(1): 60-66.
- Tucker, J. D., L. G. Yang, B. Yang, H. P. Zheng, H. Chang, C. Wang, S. Y. Shen, Z. J. Zhu, Y. P. Yin, S. V. Subramanian, X. S. Chen, and M. S. Cohen. 2011. "A Twin Response to Twin Epidemics: Integrated HIV/Syphilis Testing at STI Clinics in South China." *J. Acquir. Immune. Defic. Syndr.* 57(5): e106-111.
- Tucker, J. D., L. G. Yang, Z. J. Zhu, B. Yang, Y. P. Yin, M. S. Cohen, and X. S. Chen. 2010. "Integrated Syphilis/HIV Screening in China: A Qualitative Analysis." *BMC Health Serv Res* 10: 58.
- UNAIDS. 2006. Report on the Global AIDS Epidemic. Geneva, Swaziland: UNAIDS.
- UNAIDS. 2010. Towards Universal Access to PMTCT. Geneva, Swaziland: UNAIDS.
- UNAIDS. 2011. UNAIDS World AIDS Day Report, UNAIDS. Geneva, Swaziland: UNAIDS.
- WHO, UNAIDS, and UNICEF. 2011. Global HIV/AIDS Response Progress Report. Geneva, Swaziland: WHO.
- Wilkinson, D., and G. Rutherford. 2001. "Population-Based Interventions for Reducing Sexually Transmitted Infections, Including HIV Infection." *Cochrane Database Syst. Rev.* 2: CD001220.

Table 1: Background characteristics of HIV-positive men and women age 15-49 who have ever had sex

Background characteristics	Kenya 2009		Lesotho 2009		Malawi 2010		Swaziland 2006-07		Tanzania 2007-08		Uganda 2004-05		Zambia 2007		Zimbabwe 2010-11	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
Age																
15-24	9.1	21.1	9.2	21.4	7.8	21.4	13.3	32.4	5.7	20.9	8.8	23.8	10.4	19.3	6.9	14.6
25-29	22.9	23.6	16.3	20.7	14	20.7	21.4	23.6	16.4	21.0	17.6	20.8	15.7	24.2	15.2	21.5
30-34	23.6	19.7	29.7	19.7	18.4	19.7	23.2	18.1	23.7	22.7	24.4	23.8	23.3	24.8	20.3	23.3
35-39	23.4	11.3	19.2	17.1	26.7	17.1	20.1	12.5	28.6	17.9	21.3	14.5	23.5	17.0	25.1	19.5
40-49	20.9	24.2	25.6	21.1	33	21.1	22	13.4	25.7	17.5	27.9	17.1	27.1	14.7	32.6	21.1
Education																
None or primary	63.5	70.5	65	54.7	66.2	54.7	43.7	46.6	89.9	93.3	73	80.3	43.6	59.2	26	36.3
Secondary or higher	36.5	29.5	35	45.3	33.8	45.3	56.3	53.4	10.1	6.7	27	19.7	56.4	40.8	74	63.7
Residence																
Urban	22.4	31.4	33.5	38	31.3	38.0	37.6	31.3	31.7	39.7	19.4	26.1	56	61.0	31.8	34.2
Rural	77.6	68.6	66.5	62	68.7	62.0	62.4	68.7	68.3	60.3	80.6	73.9	44	39.0	68.2	65.8
Marital status																
Never or formerly married	31.7	49.5	32.6	46.2	17.3	46.2	46.3	56.0	26.9	40.1	28.2	49.7	27.4	42.3	22.4	41.1
Currently married	68.3	50.5	67.4	53.8	82.7	53.8	53.7	44.0	73.1	59.9	71.8	50.3	72.6	57.7	77.6	58.9
Occupation																
Unemployed	3.7	23.1	15.2	43.6	1.7	21.8	20.8	49.2	6.1	14.6	6.0	21.6	5.6	42.5	19.6	50.5
Agriculture	36.5	22.2	32.2	10.6	37.9	29.9	13.1	5.9	62.6	50.8	47.9	36.7	30.6	16.6	22.7	11.2
Non-agriculture	59.8	54.8	52.6	45.7	60.4	48.4	66.2	44.9	31.3	34.6	46.1	41.7	63.8	40.9	57.7	38.3
Wealth quintile																
Lowest	7.5	14.0	13.7	10.8	10.2	11.8	15.0	16.4	15.3	14.0	12.1	10.7	10.7	9.2	20.5	18.6
Second	19.2	19.3	19.1	16.2	15.7	14.4	15.8	18.4	16.4	18.1	17.3	17.7	11.1	10.9	19.0	17.9
Middle	17.0	13.2	22.2	18.5	19.0	16.1	17.9	20.0	16.9	15.0	18.9	16.9	16.1	14.1	19.6	22.5
Fourth	31.1	20.5	21.5	29.5	20.8	20.8	24.5	22.6	20.6	18.2	24.5	18.8	34.2	31.3	21.0	23.0
Highest	25.2	33.0	23.5	25.0	34.3	36.8	26.8	22.7	30.9	34.7	27.1	35.9	27.9	34.4	19.9	18.0
Total number of individuals	128	283	479	954	514	894	716	1337	298	533	374	691	579	859	713	1251

Table 2: Among HIV-positive women and men age 15-49 who have ever had sex, percentage who had comprehensive knowledge about AIDS, who used condom at last sex, and who tested for HIV and received results in the last 12 months								
	<u>Kenya</u>	<u>Lesotho</u>	<u>Malawi</u>	<u>Swaziland</u>	<u>Tanzania</u>	<u>Uganda</u>	<u>Zambia</u>	<u>Zimbabwe</u>
	2009	2009	2010	2006-07	2007-08	2004-05	2007	2010-11
Women								
Comprehensive knowledge about AIDS	56.3	35.4	46.3	50.3	42.3	35.1	42.0	60.5
Total number of women	283	954	894	1337	533	691	859	1251
Percentage who used condom at last sex	28.5	47.0	21.5	45.9	19.9	17.8	19.6	31.8
Total number of women	212	852	689	1110	444	524	669	911
Tested and received results in the last 12 months	38.5	42.5	NA*	27.5	23.9	8.4	23.8	35.8
Total number of women	283	954	894	1337	533	691	859	1251
Men								
Comprehensive knowledge about AIDS	63.4	28.8	54.7	48.1	50.8	37.2	47.1	55.9
Total number of men	128	479	514	716	298	374	579	713
Percentage who used condom at last sex	35.7	48.5	28.2	46.2	21.1	14.9	27.4	33.6
Total number of men	114	455	476	661	283	332	520	658
Tested and received results in the last 12 months	36.2	36.3	30.8	17.2	22.0	4.3	13.2	28.8
Total number of men	128	479	514	716	298	374	579	713
NA=data not available								

Table 3: Results of logistic regression of having comprehensive knowledge about AIDS

Country	Women					Men				
	Education Secondary or higher		Prior HIV testing Tested before		Total number of women	Education Secondary or higher		Prior HIV testing Tested before		Total number of men
	Odds ratio	95% CI	Odds ratio	95% CI		Odds ratio	95% CI	Odds ratio	95% CI	
Kenya	3.2***	2.0 - 5.0	1.6	0.9 - 2.7	578	4.0***	2.0 - 8.2	2.8***	1.4 - 5.5	254
Lesotho	2.0***	1.5 - 2.6	1.8***	1.3 - 2.6	1,737	2.3***	1.5 - 3.6	1.1	0.7 - 1.7	822
Malawi	1.8**	1.1 - 3.0	1.9***	1.3 - 2.7	1,287	1.9***	1.2 - 3.1	1.7**	1.1 - 2.6	707
Swaziland	2.3***	1.8 - 3.0	1.3**	1.0 - 1.7	1,396	1.9***	1.3 - 2.7	1.8***	1.2 - 2.5	682
Tanzania	3.0***	1.5 - 6.2	1.3	0.9 - 1.9	816	5.7***	2.3 - 14.2	1.2	0.7 - 2.0	441
Uganda	2.5***	1.5 - 4.1	1.3	0.9 - 2.0	653	2.8***	1.6 - 5.0	1.1	0.5 - 2.1	348
Zambia	2.0***	1.4 - 2.9	1.0	0.7 - 1.3	918	3.4***	2.1 - 5.4	0.8	0.5 - 1.2	575
Zimbabwe	1.9***	1.6 - 2.3	1.3***	1.1 - 1.6	2903	1.6***	1.2 - 2.1	1.2	0.9 - 1.6	1387

***p<0.01 **p<0.05

Reference group for education is no education or primary education; reference group for prior HIV testing is no prior HIV testing

Variables that are controlled in the regression are: age, urban/rural residence, marital status, occupation, and wealth quintile.

For countries with two surveys available, survey variable is also included in the regression

Table 4: Results of logistic regression on using condom at the last sex in the last 12 months

Country	Women			Men		
	Currently married		Total number of women	Currently married		Total number of men
	Odds ratio	95% CI		Odds ratio	95% CI	
Kenya	0.1***	0.0 - 0.1	459	0.2***	0.1 - 0.4	235
Lesotho	0.3***	0.2 - 0.4	1491	0.5***	0.3 - 0.8	756
Malawi	0.2***	0.1 - 0.3	998	0.2***	0.1 - 0.4	656
Swaziland	0.4***	0.3 - 0.5	1171	0.3***	0.2 - 0.5	634
Tanzania	0.2***	0.1 - 0.3	677	0.1***	0.1 - 0.3	408
Uganda	0.2***	0.1 - 0.3	486	0.1***	0.1 - 0.3	305
Zambia	0.3***	0.2 - 0.5	722	0.6**	0.3 - 1.0	518
Zimbabwe	0.2***	0.1 - 0.2	2119	0.1***	0.1 - 0.2	1260

***p<0.01 **p<0.05

Reference group is not currently married (never married or formerly married)

Variables that are controlled in the regression are: age, urban/rural residence, marital status, occupation, and wealth quintile.

For countries with two surveys available, survey variable is also included in the regression

Table 5: Results of logistic regression on being tested for HIV and received results in the last 12 months

Country	Women			Men		Total number of men
	STI treatment		Total number of women	STI treatment		
	Odds ratio	95% CI			Odds ratio	95% CI
Kenya	1.3	0.5 - 3.1	459	0.9	0.2 - 3.8	235
Lesotho	1.3	0.8 - 1.9	1491	1.4	0.8 - 2.3	756
Malawi *	1.5	0.8 - 2.6	337	1.8	0.9 - 3.7	656
Swaziland	1.5**	1.1 - 2.1	1171	1.6	0.9 - 2.8	634
Tanzania	1.8	0.8 - 4.0	677	2.1	0.8 - 5.6	408
Uganda	1.7	0.9 - 3.6	486	2.1	0.6 - 7.3	305
Zambia	0.9	0.4 - 2.2	722	0.9	0.4 - 2.2	518
Zimbabwe	2.1***	1.4 - 3.2	2119	1.2	0.7 - 2.2	1260

***p<0.01 **p<0.05

Reference group for STI treatment is no treatment received in the last 12 months

Variables that are controlled in the regression are: age, urban/rural residence, marital status, occupation, and wealth quintile.

For countries with two surveys available, survey variable is also included in the regression

* Due to unavailability of data on testing in the 12 months in 2010 DHS, the regression is solely based on the 2004 DHS data