ETHIOPIA FURTHER ANALYSIS

Factors Associated with Prevalent HIV Infections among Ethiopian Adults

Further Analysis of the 2005 Ethiopia Demographic and Health Survey

This report presents findings from a further analysis study undertaken as part of the follow up to the 2005 Ethiopia Demographic and Health Survey (EDHS). Macro International Inc. provided technical assistance for the project. Funding was provided by the U.S. Agency for International Development (USAID) under the terms of Contract No. GPO-C-00-03-00002-00. The opinions expressed herein are those of the authors and do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

This report is part of the MEASURE DHS programme, which is designed to collect, analyse, and disseminate data on fertility, family planning, maternal and child health, nutrition, and HIV/AIDS.

Additional information about the 2005 EDHS may be obtained from the Central Statistical Agency (CSA), P.O. Box 1143, Addis Ababa, Ethiopia; Telephone: (251) 111 55 30 11/111 15 78 41, Fax: (251) 111 55 03 34, E-mail: csa@ethionet.et. Additional information about the DHS project may be obtained from Macro International Inc., 11785 Beltsville Drive, Calverton, MD 20705 USA; Telephone: 301-572-0200, Fax: 301-572-0999, E-mail: reports@macrointernational.com, Internet: www.measuredhs.com.

Recommended citation:

Rathavuth Hong, Vinod Mishra, and Pav Govindasamy. 2008. *Factors Associated with Prevalent HIV Infections among Ethiopian Adults: Further Analysis of the 2005 Ethiopia Demographic and Health Survey*. Calverton, Maryland, USA: Macro International Inc.

Factors Associated with Prevalent HIV Infections among Ethiopian Adults

Further Analysis of the 2005 Ethiopia Demographic and Health Survey

Rathavuth Hong
Vinod Mishra
Pav Govindasamy

April 2008

Contents

Tables and Figures

Acknowledgments

Financial assistance was provided by the United States Agency for International Development (USAID) and the President's Emergency Plan for AIDS Relief (PEPFAR) through the MEASURE DHS project (#GPO-C-00-03-00002-00) at Macro International Inc., Calverton, MD, USA.

Summary

The objective of this study is to examine the associations of demographic and socioeconomic characteristics, knowledge and attitudes, and risk and protective factors with HIV infection among adult men and women in Ethiopia. The study used data from the 2005 Ethiopia Demographic and Health Survey. The analysis included 4,358 women and 3,037 men aged 15 to 49 years, who ever had sexual experience, completed the interview, and had a valid HIV test result. HIV serostatus data for men and women, and for lower HIV prevalence (<3 percent) and higher HIV prevalence (□3 percent) regions, were analyzed using descriptive and multivariate statistical methods to determine factors associated with being HIV-positive.

The HIV prevalence among women and men included in the study was 2.4 percent and 1.4 percent, respectively. Women and men aged 35-49 were more likely to be HIV-positive than those aged 15-24. Compared with never married women and men, formerly married (widowed/divorced/ separated) women (odds ratio [OR] = 1.85) and men (OR = 3.41) were at higher risk for being HIV positive. Household wealth status was positively related to risk for HIV among women: women living in the wealthiest 20 percent of households were about 7 times more likely to be HIV positive than those in the poorest 20 percent households. Having 3 or more lifetime sexual partners was also significantly positively associated with HIV infection in women. Circumcised men were significantly less likely to be HIV positive (OR = 0.16) than uncircumcised men. HIV infection is also strongly associated with reported sexually transmitted infections (STIs) or STI symptoms among men. However, contrary to expectation, knowledge of HIV prevention methods, accepting attitudes toward people living with HIV (PLHIV), regular exposure to mass media, and condom use were positively associated with HIV infection.

This study demonstrates that HIV epidemic affects the Ethiopian society multi-dimensionally, with adults in some socioeconomic groups and practicing certain risk or protective behaviors having significantly higher or lower odds of infection than others. The findings are useful in identifying higher prevalence and higher-risk population groups, and for strengthening prevention, care and support, and treatment programs.

1 Introduction

Within the past two decades, like many other African countries, Ethiopia has experienced a growing HIV/AIDS epidemic. The first laboratory diagnosis of the infection in the country was confirmed in 1984 (Tsega et al., 1998) and AIDS cases were first diagnosed in Addis Ababa hospitals in 1986 (Lester et al., 1988). The infection started as a concentrated epidemic, where initial cases were found among commercial sex workers (Mehret et al., 1990a) and truck drivers (Mehret et al., 1990b). A few years later, the infections had spread to the general population, and HIV-positive cases were found among pregnant women visiting antenatal clinics and among blood donors, specifically in the capital city of Addis Ababa (Fontanet et al., 1998). Today, the HIV/AIDS epidemic in Ethiopia is considered a generalized epidemic, which has affected all demographic, socioeconomic, and institutional populations of the society. According to the latest estimates of the Joint United Nations Programme on HIV/AIDS (UNAIDS), in 2006 an estimated 1.3 million Ethiopians were currently living with HIV, 220,000 of whom were children (UNAIDS, 2006). Better understanding of the spread of the epidemic across various regions and population groups, and understanding how the knowledge of prevention methods, attitudes, sexual behaviors, and other behavioral factors affect the risk of HIV infection are critical in formulating effective prevention, treatment, and care and support programs and policies.

Previous research on the spread and correlates of HIV infection in sub-Saharan Africa has shown large differentials in the prevalence of HIV by age, sex, urban/rural residence, and geographical region within and between countries (Mishra et al., 2006). Some recent studies have linked socioeconomic status with HIV infection and demonstrated that wealth, operating through various underlying proximate factors, tends to be associated with higher risk of HIV infection (Mishra et al., 2007; Bingenheimer, 2007). Other socioeconomic factors, such as, education, occupation, and exposure to media, that may influence risk-taking behaviors, also tend to be associated with the risk of HIV infection. Individuals with little or no education tend to have poor access to information on safe-sex and are less likely to use condoms (Lagarde et al., 2001). Mobility has been shown to increase HIV-related risk because well educated men and women and those with higher incomes are more likely to travel and thus have more opportunities for casual sexual contacts (Stulhofer et al., 2006; Wardlow, 2007). In addition, gender inequities are believed to be important for HIV transmission because many women in developing countries face strong economic, legal, cultural, and social disadvantages that compromise their ability to control their sexual encounters. Women's economic dependency on their male partners and lack of power in their relationship make it difficult for them to negotiate safer sex, and may force them into transactional sex (Kim and Watts, 2005).

A number of studies have shown that having multiple sexual partners and having casual sexual partners increases the risk of getting infected with HIV and other sexually transmitted infections (Wilson, 2004; Shelton et al., 2004; Stoneburner and Low-Beer, 2004; Vermund, 1995; Chen et al., 2007). Other recent research has shown that being faithful to one's regular partner(s) can substantially reduce the risk of HIV infection (Mishra et al., 2007). More recently, considerable attention has been paid to the role of concurrent sexual partnerships and sexual networks in explaining widely varying levels of national and sub-national HIV prevalence. It has been argued that having concurrent sexual partners in a dense sexual network increases the risk of HIV infection by allowing the virus to spread rapidly to others (Halperin and Epstein, 2004; Kohler and Helleringer, 2006; Morris and Kretzschmar, 1997). It has also been argued that condom use, especially with casual, higher-risk sexual partners, can reduce the risk of HIV infection. The effect of condom use in the prevention of sexually transmitted infections has been demonstrated in prospective studies (e.g., Wald et al., 2001), but cross-sectional data collected in national household surveys have generally failed to find a negative association between condom use and HIV infection (for example, Cameroon, Uganda, and Zimbabwe). In these surveys, adults who reported using condom at last sex during the past year had higher prevalence of HIV, not lower (Institut National de la Statistique du Cameroun et ORC Macro, 2004; Ministry of Health Uganda and ORC Macro, 2006; Central Statistical Office Zimbabwe and Macro International, 2007).

Three recent clinical trials in sub-Saharan Africa have shown that male circumcision can significantly reduce the risk of HIV infection (NIH, 2006; Williams et al., 2006; Auvert et al., 2005). Also, there is growing evidence that the risk of sexual transmission of HIV increases considerably in the presence of other untreated sexually transmitted infections (STIs). For example, there is evidence that individuals with herpes and other STIs are more likely to also have HIV infection (Mbizvo et al., 1996; Auvert et al., 2001; Msuya et al., 2002; Colvin et al., 2004; Manning et al., 2007). The use of alcohol or other substances at sexual intercourse have been associated with higher-risk sexual behaviors, such as extramarital sex and sex with commercial sex workers, which in turn, increase the risk of HIV infection (Kongnyuy and Wiysonge, 2007; Hendershot et al., 2007).

Knowledge of HIV prevention methods and accepting attitudes toward people living with HIV (PLHIV) have been advocated to bring about a change in higher-risk sexual behaviors, and in turn reduce the spread of HIV infection (Perez et al., 2007). Despite considerable efforts in promoting knowledge of HIV prevention methods, reducing misconceptions, and promoting accepting attitudes toward PLHIV, stigma and discrimination against PLHIV remain common in many countries (Tarwireyi, 2007). Little is known about how better knowledge and positive attitudes affect HIV-related behaviors and modify the risk of infection.

The objective of this study is to describe the patterns and distribution of HIV infection among adult women and men age 15-49 in various population groups in Ethiopia. The study also examines the relationship between HIV infection and selected demographic and socioeconomic characteristics, HIV-related knowledge and attitudes, and associated risk and protective behaviors.

2 Methods

2.1 Study population

This study is based on a secondary analysis of data from the 2005 Ethiopia Demographic and Health Survey (EDHS). The survey was fielded from April 27 to August 30, 2005. The survey sample was designed to provide national, urban/rural, and regional estimates of key health and demographic indicators. The sample was selected using a two-stage stratified sampling process. In the first stage, 540 clusters were selected from the list of enumeration areas from the 1994 Population and Housing Census. Fieldwork was successfully completed in 535 of the 540 clusters. In the second stage, 24 to 32 households were selected systematically from each cluster for the survey sample. The survey administered the Women's Questionnaire to all eligible women age 15-49 in the sampled households. The Men's Questionnaire was administered to all eligible men age 15-59 in every other sampled household. In addition, the survey measured and recorded height and weight of all women age 15-49 and children under five years of age. The survey also collected blood specimens for HIV testing from all eligible women and men in the households selected for the male interview. The response rates for HIV testing were 83 percent among women and 76 percent among men (Central Statistical Agency [Ethiopia] and ORC Macro, 2006). The analysis in this study used data from the 4,358 women and 3,037 men age 15-49 who had a completed interview, who reported ever having had sexual intercourse (i.e., sexually experienced), and who had a valid HIV test result.

2.2 HIV testing procedure

In a random sub-sample of 50 percent of the households selected for the survey, all eligible women and all eligible men were asked to provide their consent for a blood draw and subsequent testing for HIV; in the case of young adults (15-17) consent was obtained from a parent or guardian. Each individual for whom consent was obtained provided three to four drops of blood from a finger prick collected on a filter paper with a special bar code label. The blood samples were dried overnight and stored in zipper-locked bags. The blood samples were transported to Addis Ababa to be tested for HIV at the Ethiopia Health and Nutrition Research Institute (EHNRI), a national laboratory. HIV testing was conducted using standard laboratory and quality control procedures. The blood collection

and HIV testing protocol allowed anonymous linking of the HIV test result to an individual's socio-demographic and behavioral characteristics obtained from the individual questionnaires. Bar codes were used to make this link, after household and cluster identification codes were scrambled to ensure that all potential identifiers had been destroyed.

2.3 Predicting characteristics, knowledge, attitudes and behaviors

To study the factors associated with HIV infection, this study used a number of variables and constructed indicators available from the 2005 EDHS.

Demographic and socioeconomic characteristics included in the analysis were age (15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49 years); number of years living in the current place of residence (<3 years, 3-9 years, 10+ years); educational attainment (no education, primary, secondary or higher); occupation (not working, professional/services, agriculture, manual); regular exposure to mass media (reads newspaper, listens to the radio, or watches television at least once per week (none, one medium, two or three media); marital status (never married, monogamous union, polygynous union, widowed/divorced/separated); child birth in past 5 years, for women only (no, yes); household wealth status, represented by household wealth quintiles (lowest, lower, middle, higher, highest); urban/rural residence (urban, rural); and geographical region (9 regions: Tigray, Affar, Amhara, Oromiya, Somali, Benishagul-gumuz, SNNP, Gambela, Harari; 2 urban areas: Addis Ababa, Dire Dawa).

The study also analyzed several HIV-related knowledge, attitude, and behavior indicators. The knowledge indicators included knowing that abstaining from sexual intercourse (A), having just one uninfected and faithful partner (B), and using a condom at every sexual intercourse (C) can reduce the risk of getting HIV (knows none of the methods, knows one method, knows two methods, knows all three methods). Another indicator was having accepting attitudes toward people living with HIV (PLHIV). This indicator was constructed from four variables: would care for a relative who was sick with AIDS in own household, would not want to keep HIV-positive status of a family member secret, would allow a person with HIV to continue teaching, and would buy vegetables from a vendor with HIV (lowest: none, lower: any one, middle: any two, higher: any three, highest: all four). The analysis also examined the opinion on the ability of a woman to negotiate safer sex with spouse, including she could refuse having sex with the husband or partner or could ask him to use a condom if he had an STI (cannot negotiate, refuse sex or ask partner to use condom, refuse sex and ask partner to use condom). Another indicator was woman's participation in household decision-making (for women only), the woman participates in at least two of the four major household decisions, including having a final say on decisions regarding her own health care, on making large household purchases, on making household purchases for daily needs, and on visiting family or relatives (no, yes).

Risk and protective factors included in the analysis were: age at first sexual intercourse (<15, 15-17, 18-19, 20+ years); number of lifetime sexual partners (1, 2, 3+ partners); non-spousal sex (sex with a non-marital, non-cohabiting partner) in the past 12 months (no sex in the past 12 months, sex with spouse, sex with other), condom use at last sex in the past 12 months (no sex in the past 12 months, had sex and used condom, did not use condom); alcohol use at last sex in the past 12 months (no sex in the past 12 months, not used, either or both partners used); smokes cigarettes or uses tobacco (no, yes); circumcision, for men only (no, yes); sexually transmitted infection (STI) or STI symptoms (genital sore/ulcer or genital discharge) in the past 12 months (no, yes); number of times slept away in the past 12 months, for men only (not been away, 1-2 times, 3-4 times, 5+ times); away from home for more than one month at a time in the past 12 months, for men only (not been away, away less than 1 month, away more than 1 month); and previously tested for HIV (never tested, ever tested).

2.4 Statistical analysis

The survey data were entered and processed using CSPro statistical software that was developed jointly by the U.S. Census Bureau, Macro International Inc., and Serpro, SA (Census and Survey Processing System, 2007). The final data were analyzed using STATA statistical package

(StataCorp, 2003). The analysis was carried out for women and men separately, and then separately for the lower HIV prevalence regions (<3 percent) and the higher HIV prevalence regions (>3 percent) for both women and men. The lower HIV prevalence regions include: Amhara, Oromiya, Somali, Benishangul-Gumuz, and SNNP; and the higher HIV prevalence regions include: Tigray, Affar, Gambela, Harari, Addis Ababa, and Dire Dawa.

To examine factors associated with HIV infection; the study used both the descriptive and multivariate statistical methods. Multivariate analysis was conducted using logistic regression models. In the descriptive analysis, the prevalence of HIV was presented by the categories of each predicted variable. In the multivariate or adjusted logistic regression models, the outcome variable (HIV negative, HIV positive) was regressed on the selected predictor variables. Separate models were estimated for women and men and for the lower and higher prevalence regions. The descriptive results are presented as proportions and the regression results are presented as adjusted odds ratios (aORs) with 95 percent confidence intervals (95% CI) and p-values. The statistical tests were reported as significant if the level of confidence was 95 percent or greater.

For a few of the predictor variables, there were too few or no HIV-positive cases in some of the categories. In the logistic regression models, such categories were combined with other categories to stabilize the models and to keep all tested respondents in the analysis. The variables with combined categories were age group (15-24, 25-34, 35-49 years), geographical area (Tigray, Afar/Somali, Amhara, Oromiya, SNNP, Gambela/Benishagul-Gumuz, Harari, Addis Ababa, Dire Dawa); and marital status (never married, currently in union, widowed/divorced/separated). For men, occupation variable was not included in the logistic regression analysis because there were no HIV-positive cases in the "not working" category.

In a few cases, two or more predictor variables had a common category. In these variables, the common category was combined with another category to avoid perfect collinearity in the models. The variables with combined categories included: away from home for more than one month at a time in the past 12 months (not been away/away less than 1 month, away more than 1 month); non-spousal sex in the past 12 months (no sex in the past 12 months/sex with spouse, sex with other); and condom use at last sex in the past 12 months (no sex in the past 12 months/used condom, did not use condom).

Since the sample was not allocated in proportion to the population size of each region, the EDHS sample was not self-weighted at the national level. Consequently, weighting factors were applied to the data in both bivariate and multivariate analyses to produce nationally representative results.

3 Results

3.1 Descriptive analysis

Table 3.1 shows the sample distribution of the study population (i.e., sexually experienced women and men age 15-49 who were interviewed and tested for HIV in the EDHS), by selected background characteristics. There were proportionately more women at younger ages (15-29) than men, mainly reflecting a lower age at sexual debut among women than men. An overwhelming majority of women (82 percent) and men (91 percent) lived in their current place of residence for 10 or more years. Only 5 percent of women and 3 percent of men lived in their current place of residence for less than three years. More than three-quarters (76 percent) of women in the study population had no education, 17 percent had primary education, and only 7 percent had secondary or higher education. The educational attainment among men was better than among women, where 34 percent had primary education and 17 percent had secondary or higher education. Sixty-three percent of men had no education. Distribution by marital union revealed that only 2 percent of sexually experienced women had never been in a union, compared with 11 percent of sexually experienced men. Seventy-three percent of women and 80 percent of men were currently in a monogamous union, while 10

percent of women and 5 percent of men were in a polygynous union. The proportion of women who were widowed, divorced, or separated was more than three times greater than that for men (14 percent versus 4 percent, respectively). A large majority of women (86 percent) and men (87 percent) lived in rural areas; and were mostly concentrated in the Oromiya (34 percent of women and 37 percent of men), Amhara (27 percent of women and 25 percent of men), and SNNP (21 percent of women and 21 percent of men) regions.

Table 3.1 Sample distribution of sexually experienced women and men age 15-49 who were interviewed and tested for HIV by selected background characteristics, Ethiopia DHS 2005

Characteristic	Distribution (%) Women	Men
Age group		
15-19	9.2	2.7
20-24	17.1	13.3
25-29	21.4	17.4
30-34	16.3	21.0
35-39	14.8	18.9
40-44	11.2	14.3
45-49	10.1	12.4
Number of years living in current residence		
<3 years	4.5	2.7
3-9 years	12.7	6.2
10+ years	82.3	90.5
Educational attainment		
No education	75.8	48.7
Primary	17.2	34.4
Secondary or higher	7.1	16.9
Regular exposure to mass media		
None	84.4	63.3
One medium	12.1	27.5
Two or three media	3.5	9.2
Marital status		
Never in union	2.1	10.9
In monogamous union	73.1	79.7
In polygynous union	10.4	5.0
Widowed/divorced/separated	13.5	4.4
Wealth status (quintiles)		
Lowest	20.4	18.1
Lower	20.7	20.5
Middle	19.8	20.8
Higher	18.5	18.9
Highest	20.6	21.8
Residence		
Urban	13.8	12.6
Rural	86.2	87.4
Region		
Tigray	6.9	5.6
Affar	1.2	1.3
Amhara	27.2	25.3
Oromiya	34.2	37.1
Somali	3.7	3.3
Benishangul-Gumuz	1.1	1.0
SNNP	21.2	20.8
Gambela	0.4	0.4
Harari	0.3	0.3
Addis Ababa	3.4	4.4
Dire Dawa	0.5	0.5
Number	4,358	3,037

3.1.1 HIV prevalence by demographic and socioeconomic characteristics

In the 2005 EDHS, 2.4 percent of sexually experienced women and 1.4 percent of sexually experienced men age 15-49 tested positive for HIV. As expected, HIV prevalence rates among sexually experienced women and men were higher than those among all women and men age 15-49 (1.9 percent and 0.9 percent, respectively) (Central Statistical Agency [Ethiopia] and ORC Macro, 2006). HIV prevalence peaked at age 35-39 among women (4.5 percent) and at age 40-44 among men

(2.9 percent) (Table 3.2). At younger ages (15-29), women were much more likely to be HIV positive than men. HIV prevalence among women was strongly and negatively associated with duration in the current place of residence. HIV prevalence was 7.5 percent among sexually experienced women who have lived for less than three years in the current place of residence, compared with 3.8 percent among those who had lived for 3-9 years and 1.8 percent among those who had lived for 10 or more years. For men, HIV prevalence was highest among those having lived 3-9 years in the current place of residence (3.3 percent), compared with 1.5 percent among those who had lived for less than 3 years and 1.3 percent among those who had lived for 10 or more years in the current place of residence.

HIV prevalence increased with the level of educational attainment, from 1.2 percent among women with no education to 4.4 percent among women with primary education, and 11.3 percent among women with secondary or higher education. For men, it increased from 0.9 percent among those with no education and with primary education to 3.8 percent among those with secondary or higher education. HIV prevalence rates were higher among women and men who worked in the professional, services, or manual sectors than among women and men who did not work or worked in the agricultural sector. Regular exposure to mass media was positively associated with HIV infection. HIV prevalence was 14.8 percent among women and 2.8 percent among men who were regularly exposed to at least two of the three media sources (radio, television, and newspaper/magazine), compared with 1.2 percent among women and 0.9 percent among men not regularly exposed to these three media sources.

By marital status, HIV prevalence rates were much higher among formerly married (widowed/divorced/separated) women and men than among those currently in union. Women and men in polygynous unions had similar HIV prevalence rates to those in monogamous unions. The highest HIV prevalence was observed among never married women, but it was the lowest among never married men. Women who gave birth in the past five years had a lower HIV prevalence (1.8 percent) compared with women who did not (3.9 percent).

HIV prevalence was much higher among women and men in the highest wealth quintile (9.3 percent and 3.6 percent, respectively) than among women and men in the lower wealth quintiles (between 0.3 percent to 1.2 percent among women, and 0.4 percent to 1.1 percent among men). HIV prevalence was much higher in urban areas than in rural areas, and particularly so for women; 12.4 percent of women and 4.2 percent of men living in urban areas were HIV positive, compared with only 0.8 percent of women and 1.0 percent of men living in rural areas. The prevalence of HIV infection among women varied widely from one-tenth of 1 percent in the SNNP Region to more than 10 percent in Addis Ababa (10.9 percent). Women in Gambela (6.2 percent), Harari (5.5 percent), Dire Dawa (5.3 percent), Affar (3.7 percent), Tigray (3.3 percent), and Oromiya (3.0 percent) regions also had relatively higher HIV prevalence. The prevalence of HIV infection among men showed a similar pattern, except that prevalence was highest in Gambela (8.4 percent), followed by Addis Ababa (4.5 percent). Distribution of HIV infection among women and men by region allowed distinguishing regions with lower HIV prevalence (<3 percent) from regions with higher HIV prevalence (≥3 percent).

Table 3.2 Prevalence of HIV infection among sexually-experienced women and men age 15-49 by selected characteristics, Ethiopia DHS 2005

Characteristic	HIV prevalence			
	Women		Men	
	%	n	%	n
Demographic and socioeconomic characteristics				
Age group				
15-19	2.1	400	0.0	83
20-24	2.3	743	0.5	403
25-29	2.3	932	0.9	527
30-34	1.5	711	2.0	638
35-39	4.5	647	1.8	575
40-44	3.1	487	2.9	436
45-49	0.9	438	0.0	376
Number of years living in current residence				
<3 years	7.5	194	1.5	83
3-9 years	3.8	553	3.3	187
10+ years	1.8	3,586	1.3	2,750
Educational attainment				
No education	1.2	3,303	0.9	1,480
Primary	4.4	748	0.9	1,045
Secondary or higher	11.3	307	3.8	512
Occupation				
Not working	2.1	2,797	0.0	101
Professional/services	6.5	506	4.0	265
Agriculture	0.6	883	0.9	2,472
Manual	4.6	159	5.1	171
Regular exposure to mass media				
None	1.2	3,677	0.9	1,923
One medium	7.3	528	2.0	835
Two or three media	14.8	153	2.8	279
Marital status				
Never in union	9.3	92	1.0	330
In monogamous union	1.5	3,186	1.4	2,422
In polygynous union	1.5	455	1.3	152
Widowed/divorced/separated	6.6	590	3.3	133
Childbirth in past 5 years				
No	3.9	1,321	na	na
Yes	1.8	3,037	na	na
Wealth status (quintiles)				
Lowest	0.4	889	1.1	549
Lower	1.2	902	0.4	622
Middle	0.6	864	1.0	631
Higher	0.3	807	0.7	575
Highest	9.3	898	3.6	661
Residence				
Urban	12.4	601	4.2	382
Rural	0.8	3,757	1.0	2,655
Region				
Tigray	3.3	300	2.5	170
Affar	3.7	54	2.9	38
Amhara	2.2	1,184	2.4	767
Oromiya	3.0	1,492	0.7	1,127
Somali	1.5	161	0.0	101
Benishangul-Gumuz	1.1	46	0.0	31
SNNP	0.1	925	0.4	633
Gambela	6.2	16	8.4	13
Harari	5.5	11	2.9	10
Addis Ababa	10.9	149	4.5	135
Dire Dawa	5.3	20	1.9	14
Knowledge and attitude indicators				
Knowledge of HIV prevention methods				
None of the methods	1.5	1,219	0.1	199
One method	0.8	812	0.1	337
Two methods	2.2	1,238	0.5	872
Three methods	4.9	1,090	2.3	1,630
Accepting attitudes toward PLHIV				
Lowest	0.5	1,448	0.2	607
Lower	0.9	1,342	0.5	849
Middle	3.2	938	1.4	827
Higher	9.1	542	3.5	662
Highest	6.5	89	2.7	92

Continued…

Table 3.2—*Continued*

Characteristic	HIV prevalence			
	Women		Men	
	%	n	%	n
Woman's ability to negotiate safer sex				
Cannot negotiate	0.6	711	0.2	272
Refuse sex or ask partner to use condom	1.7	2,153	0.2	828
Refuse sex and ask partner to use condom	4.3	1,495	2.1	1,938
Woman participates in 2+ major household decisions				
No	3.8	1,275	na	na
Yes	1.8	3,083	na	na
Risk and protective factors				
Age at first sex (years)				
<15	1.9	1,365	0.2	64
15-17	3.1	1,617	1.7	566
18-19	2.7	609	1.3	701
20+	2.2	539	1.3	1,659
Number of lifetime sexual partners				
1	1.4	3,145	0.6	1,417
2	4.7	860	1.8	679
3+	5.6	338	2.1	917
Non-spousal sex in the past 12 months				
No sex in the past 12 months	5.4	636	2.1	259
Sex with spouse	1.6	3,612	1.3	2,551
Sex with other	12.3	106	1.8	218
Condom use at last sex in the past 12 months				
No sex in the past 12 months	5.4	636	2.1	259
Had sex and used condom	22.4	40	1.6	117
Did not use condom	1.7	3,675	1.3	2,654
Alcohol use at last sex in past 12 months				
No sex in the past 12 months	5.4	636	2.1	259
Not used	1.9	3,473	1.2	2,559
Either or both partners used	2.6	243	3.6	212
Smokes cigarettes or uses tobacco				
No	2.5	4,284	1.2	2,578
Yes	0.3	74	2.4	459
Male circumcision				
No	na	na	1.7	172
Yes	na	na	1.4	2,856
STI or STI symptoms in the past 12 months				
No	2.4	4,257	1.4	2,992
Yes	3.4	96	(2.2)	41
Number of times slept away in the past 12 months				
Not been away	na	na	1.3	2,005
1-2 times	na	na	1.2	586
3-4 times	na	na	0.7	179
5+ times	na	na	3.1	266
Away from home for more than one month at a time in the past 12 months				
Not been away	na	na	1.3	2,005
Away less than one month	na	na	1.8	827
Away more than one month	na	na	1.1	196
Previously tested for HIV				
Never tested	2.3	4,238	1.3	2,840
Ever tested	7.4	120	3.2	198
Number	2.4	4,358	1.4	3,037

Note: Figures in parentheses are based on 25-49 unweighted cases.
na = Not applicable

3.1.2 HIV prevalence by knowledge and attitude indicators

The prevalence of HIV infection increased as the knowledge of HIV prevention methods increased. The HIV prevalence among women who knew one, two, or all three prevention methods (abstinence, being faithful, using condom) was 0.8 percent, 2.2 percent, and 4.9 percent, respectively. Correspondingly, HIV prevalence among men who knew one, two, or all three methods was 0.1 percent, 0.5 percent, and 2.3 percent, respectively. Also, there was a positive association between accepting attitudes toward HIV-infected people and being HIV positive. HIV prevalence among women increased from 0.5 percent among those with lowest acceptance to 9.1 percent among those

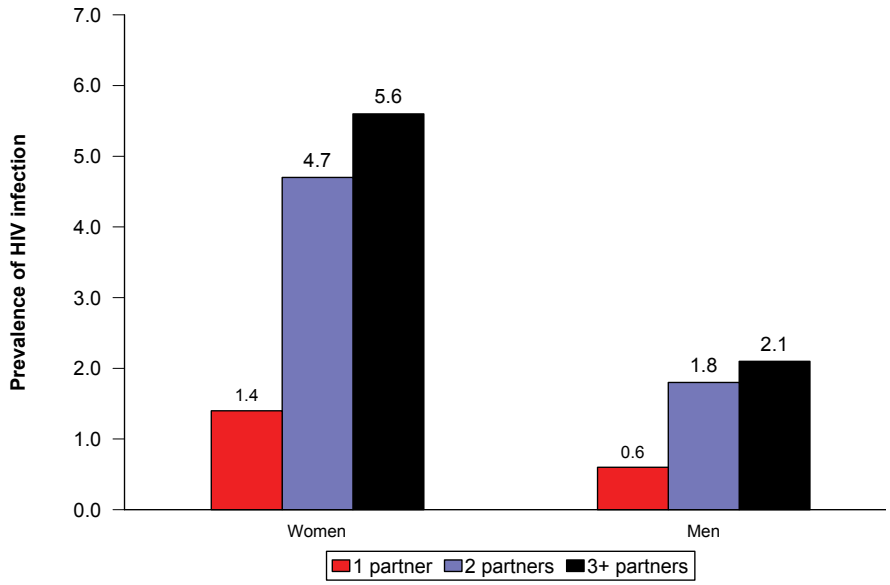
with “higher” acceptance, and then declined to 6.5 percent among those with “highest” acceptance of PLHIV. There was a similar pattern of association among men (Table 3.2).

Agreeing that a woman is able to negotiate safer sex (can refuse sex or ask partner to use condom if the woman suspects the partner has an STI) was positively associated with HIV prevalence. HIV prevalence was 4.3 percent among women and 2.1 percent among men who agreed that a woman can both refuse sex and ask her partner to use a condom, compared with 0.6 percent among women and 0.2 percent among men who did not agree that a woman can refuse sex or ask her partner to use a condom. Women who reported that they participated in making at least two of the four major household decisions had lower prevalence of HIV infection (1.8 percent) than those who reported that they participated in fewer than two household decisions (3.8 percent).

3.1.3 HIV prevalence by risk and protective factors

In Ethiopia women have their first sexual intercourse at a younger age than men. According to the 2005 EDHS, the median age at first sexual intercourse among women age 25-49 was about 16 years, while the median age at first sexual intercourse among men of the same age group was about 21 years. About one-third (31 percent) of women had first sexual intercourse before age 15, compared with only 2 percent of men. The relationship between HIV infection and age at first sexual intercourse revealed a reversed asymmetric U shape, with HIV prevalence being highest among women and men who had first sex at 15-17 years of age.

Figure 3.1 HIV prevalence and number of lifetime sex partners among sexually experienced women and men age 15-49, Ethiopia 2005



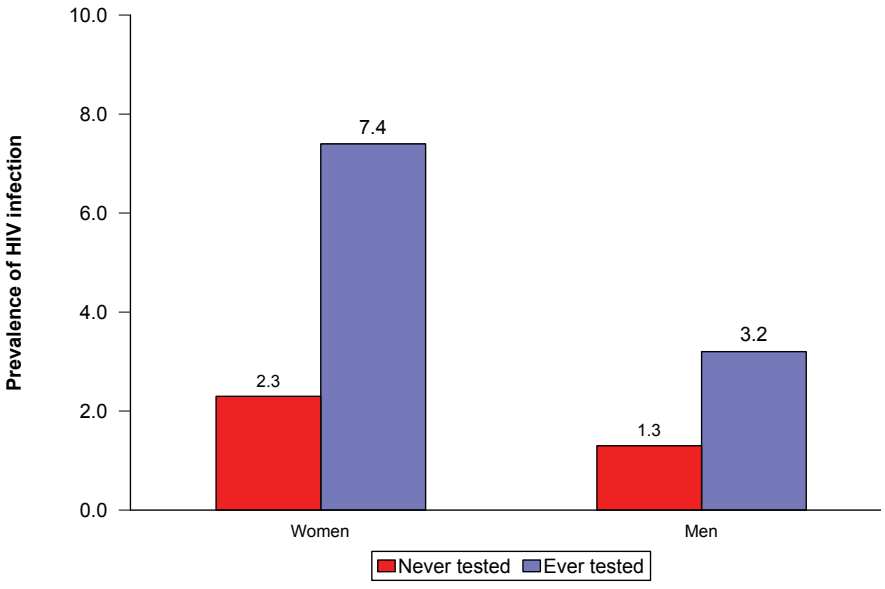
The prevalence of HIV infection was strongly and positively associated with the number of lifetime sexual partners among both women and men. HIV prevalence among women increased from 1.4 percent for those who had only one lifetime sexual partner, to 4.7 percent among those with two lifetime partners, and 5.6 percent among those with three or more lifetime partners. Among men, it correspondingly increased from 0.6 percent to 1.8 percent, and 2.1 percent (Figure 3.1). Women and men who had sex with a nonmarital or noncohabiting partner in the past 12 months were more likely to be HIV positive (12.3 percent of women and 1.8 percent of men, respectively) than women and men who had sex only with their marital or cohabiting partner (1.6 percent for women and 1.3 percent for men, respectively). Women who reported using condom at last sex in the past 12 months were much more likely to be HIV positive (22.4 percent) than women who did not report using condom at last sex (1.7 percent). A similar, but much weaker, association was also observed among men.

The survey also asked about alcohol consumption during sexual encounters with the last three partners in the past 12 months prior to the survey. Sexually experienced women and men who reported consuming alcohol at last sex (either or both partners) in the past 12 months were more likely to be HIV positive (2.6 percent of women and 3.6 percent of men, respectively) than those who did not use alcohol at last sex (1.9 percent of women and 1.2 percent of men, respectively). Less than 2 percent of women and 15 percent of sexually experienced men reported smoking cigarettes or using tobacco. Men who reported smoking or using tobacco were more likely to be HIV positive (2.4 percent) than those who did not (1.2 percent), but this pattern was reversed among women.

A large majority of sexually experienced men (94 percent) were circumcised. However, the survey did not gather information on why, when, and how the circumcision was done and who performed the circumcision. The HIV prevalence among circumcised men was slightly lower (1.4 percent) than among uncircumcised men (1.7 percent). The percentage of women and men who reported having had an STI or experienced STI symptoms in the past 12 months were more likely to be HIV positive (3.4 percent and 2.2 percent, respectively) than women and men who did not report an STI or STI symptoms (2.4 percent and 1.4 percent, respectively).

Men who slept away from home five or more times in the past 12 months were more likely to be HIV positive (3.1 percent) than those who had not been away from home (1.3 percent), slept away for 1-2 times (1.2 percent), or slept away for 3-4 times (0.7 percent). However, HIV prevalence among men who reported having been away from home more than one month at a time in the past 12 months was lower (1.1 percent) than among those who had been away for less than one month at a time (1.8 percent). Women and men who had ever tested for HIV prior to the survey were much more likely to be HIV positive (7.4 percent of women and 3.2 percent of men, respectively) than those who had never tested for HIV (2.3 percent of women and 1.3 percent of men, respectively) (Figure 3.2).

Figure 3.2 HIV prevalence and prior HIV testing status among sexually experienced women and men age 15-49, Ehiopia 2005



3.2 Multivariate analysis

Table 3.3 shows the adjusted associations of selected demographic and socioeconomic characteristics, knowledge and attitude indicators, and risk and protective factors on the likelihood of HIV infection among sexually experienced women and men. The adjusted association for a given factor was estimated after statistically controlling for all the remaining factors in the table. The results are presented as adjusted odds ratios with 95 percent confidence intervals and associated p-values (showing the level of statistical significance).

Table 3.3 Adjusted effects (odds ratios) of selected characteristics on the likelihood of HIV infection among sexually experienced women and men age 15-49, Ethiopia DHS 2005

	Women			Men		
Characteristic	aOR	95% CI	p-value	aOR	95% CI	p-value
Demographic and socioeconomic characteristics						
Age group						
15-24	1.00	-	-	1.00	-	-
25-34	1.64	(0.75, 3.60)		2.97	(0.70, 12.55)	
35-49	3.14	(1.21, 8.13)	*	3.31	(0.84, 12.96)	
Number of years living in current residence						
<3 years	1.00	-	-	1.00	-	-
3-9 years	0.79	(0.30, 2.08)		2.16	(0.14, 34.00)	
10+ years	0.31	(0.11, 0.88)	*	1.79	(0.13, 25.36)	
Educational attainment						
No education	1.00	-	-	1.00	-	-
Primary	2.29	(1.02, 5.18)	*	1.41	(0.55, 3.61)	
Secondary or higher	1.88	(0.75, 4.69)		3.23	(0.75, 13.90)	
Occupation						
Not working	1.00	-	-	na	-	-
Professional/services	0.80	(0.40, 1.59)		na	na	na
Agriculture	0.30	(0.07, 1.33)		na	na	na
Manual	0.51	(0.13, 2.06)		na	na	na
Regular exposure to mass media						
None	1.00	-	-	1.00	-	-
One medium	2.50	(1.25, 4.99)	*	1.48	(0.65, 3.38)	
Two or three media	1.96	(0.82, 4.67)		0.77	(0.21, 2.88)	
Marital status						
Never in union	1.00	-	-	1.00	-	-
Currently in union	0.18	(0.02, 1.35)		2.46	(0.29, 21.03)	
Formerly in union	1.85	(0.60, 5.74)		3.41	(0.55, 21.15)	
Childbirth in past 5 years:						
No	1.00	-	-	na	-	-
Yes	1.64	(0.76, 3.55)		na	na	na
Wealth status (quintiles)						
Lowest	1.00	-	-	1.00	-	-
Lower	4.50	(0.61, 33.07)		0.26	(0.04, 1.64)	
Middle	2.41	(0.29, 19.88)		0.70	(0.16, 3.09)	
Higher	0.79	(0.08, 7.51)		0.33	(0.06, 1.84)	
Highest	6.60	(0.90, 48.54)		0.81	(0.16, 4.20)	
Residence						
Urban	1.00	-	-	1.00	-	-
Rural	0.40	(0.14, 1.13)		0.93	(0.20, 4.30)	
Region						
Tigray	1.00	-	-	1.00	-	-
Afar/Somali	1.71	(0.42, 6.93)		0.30	(0.05, 1.74)	
Amhara	0.75	(0.26, 2.21)		0.89	(0.26, 3.07)	
Oromiya	1.40	(0.50, 3.92)		0.23	(0.05, 1.05)	
SNNP	0.04	(0.00, 0.32)	*	0.18	(0.02, 1.61)	
Gambala/Ben-Gumz	1.57	(0.53, 4.65)		0.85	(0.23, 3.15)	
Harari	0.36	(0.11, 1.15)		0.42	(0.08, 2.19)	
Addis Abeba	0.52	(0.19, 1.45)		0.52	(0.11, 2.53)	
Dire Dawa	0.29	(0.09, 0.97)	*	0.26	(0.03, 2.29)	
Knowledge and attitude indicators						
Knowledge of ABC prevention methods						
None of method	1.00	-	-	1.00	-	-
One method	0.67	(0.19, 2.34)		0.48	(0.05, 4.61)	
Two methods	1.14	(0.42, 3.15)		2.64	(0.30, 22.85)	
Three methods	1.50	(0.57, 3.92)		5.69	(0.88, 36.76)	

Continued…

Table 3.3—*Continued*

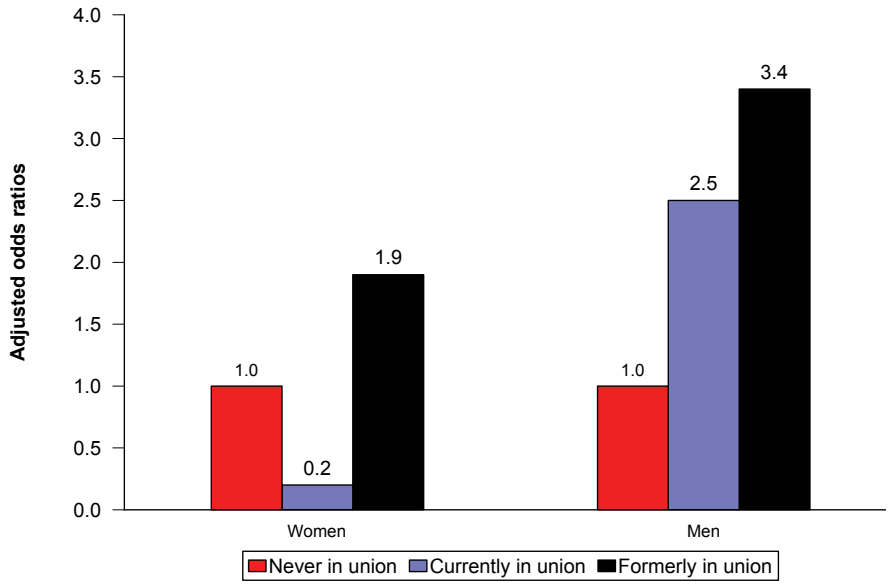
Characteristic	Women aOR	Women 95% CI	Women p-value	Men aOR	Men 95% CI	Men p-value
Accepting attitude toward PLHIV						
Lowest	1.00	-	-	1.00	-	-
Lower	1.42	(0.36, 5.58)		2.16	(0.30, 15.58)	
Middle	2.22	(0.59, 8.39)		3.86	(0.58, 25.68)	
Higher	2.87	(0.78, 10.53)		5.83	(0.85, 39.94)	
Highest	1.64	(0.34, 7.97)		5.36	(0.40, 71.18)	
Agreeing that a women is able to negotiate safer sex						
Can not negotiate	1.00	-	-	1.00	-	-
Refuse sex or ask partner to use condom	1.61	(0.63, 4.11)		0.41	(0.09, 1.83)	
Refuse sex and ask partner to use condom	1.04	(0.40, 2.70)		2.91	(0.89, 9.56)	
Participating in 2+ major household decisions						
No	1.00	-	-	na	-	-
Yes	4.44	(1.22, 16.12)	*	na	na	na
Risk and protective factors						
Age at first sex (year)						
<15	1.00	-	-	1.00	-	-
15-17	1.63	(0.76, 3.51)		5.75	(0.85, 38.92)	
18-19	2.16	(0.97, 4.81)		5.05	(0.78, 32.50)	
20+	0.76	(0.28, 2.05)		7.13	(1.11, 45.91)	*
Number of lifetime sex partners						
1	1.00	-	-	1.00	-	-
2	2.71	(1.18, 6.19)	*	2.79	(0.93, 8.33)	
3+	4.03	(1.60, 10.19)	*	1.54	(0.52, 4.51)	
Higher-risk sex in the past 12 months						
No sex in past 12 months/sex with spouse	1.00	-	-	1.00	-	-
Sex with other	1.31	(0.16, 10.61)		2.39	(0.34, 16.78)	
Condom use at last sex in past 12 months						
No sex in past 12 months/had sex and used condom	1.00	-	-	1.00	-	-
Did not use condom	0.60	(0.12, 3.12)		2.23	(0.47, 10.61)	
Alcohol use at last sex in past 12 months						
No sex in past 12 months	1.00	-	-	1.00	-	-
Not used	1.23	(0.17, 9.22)		0.54	(0.04, 7.23)	
Either or both partners used	1.68	(0.15, 18.55)		0.59	(0.04, 8.97)	
Smokes cigarettes or uses tobacco						
No	1.00	-	-	1.00	-	-
Yes	0.13	(0.02, 0.85)	*	2.53	(0.82, 7.75)	
Male circumcision						
No	na	-	-	1.00	-	-
Yes	na	na	na	0.16	(0.02, 1.06)	
STI or STI symptom in the past 12 months						
No	1.00	-	-	1.00	-	-
Yes	0.96	(0.27, 3.38)		4.99	(0.41, 60.83)	
Number of times slept away in the past 12 months						
Not been away	na	-	-	1.00	-	-
1-2 times	na	na	na	0.97	(0.36, 2.67)	
3-4 times	na	na	na	0.24	(0.06, 1.05)	
5+ times	na	na	na	1.32	(0.36, 4.87)	
Away from home for more than one month at a time in the past 12 months						
Not been away/away less than 1 month	na	-	-	1.00	-	-
Away more than 1 month	na	na	na	0.57	(0.14, 2.37)	
Previously tested for HIV						
Never tested	1.00	-	-	1.00	-	-
Ever tested	0.44	(0.17, 1.13)		1.28	(0.39, 4.22)	
Number		4,040			2,923	

Note: An asterisk indicates significance at p value ≤ 0.05.
na = Not applicable

3.2.1 Associations of demographic and socioeconomic characteristics

With other factors controlled, age was positively associated with the likelihood of HIV infection in both women and men. The adjusted odds of HIV infection were more than three times greater among women and men age 35-49 than among those age 15-24 (aOR=3.14, 95% CI: 1.21-8.13 for women; aOR=3.31, 95% CI: 0.84-12.96 for men). Number of years living in current place of residence was significantly negatively associated with the likelihood of HIV infection among women (aOR=0.31, 95% CI: 0.11-0.88 for 10 or more years relative to less than 3 years in the current place of residence), but not among men. Educated women and men were more likely to be HIV positive than non-educated women and men, but these effects were not statistically significant when other factors were controlled. Women who were regularly exposed to mass media had significantly higher adjusted odds of being HIV-infected than women who were not exposed to mass media (aOR=2.50, 95% CI: 1.25-4.99 for regular exposure to any one media source; aOR=1.96, 95% CI: 0.82-4.67 for regular exposure to two or all three media sources). There was no clear pattern of relationship between exposure to the mass media and the likelihood of HIV infection among men. Married men were more than two times as likely (aOR=2.46) and formerly married (widowed/divorced/separated) men were more than three times as likely (aOR=3.41) to be HIV positive as unmarried men, but these effects were not statistically significant (Figure 3.3).

Figure 3.3 Adusted odds ratios of marital status and HIV infection among experienced women and men age 15-49, Ehiopia 2005



Women who had a birth in the past five years were more likely to be HIV positive (aOR=1.64). This effect was reversed from the bivariate association where women who gave birth in the past five years were less likely to be HIV positive. Women living in the wealthiest 20 percent of households were more than six times as likely to be HIV positive as women living in the poorest 20 percent of households (aOR=6.60), but this effect was not statistically significant. Also, there was no significant adjusted association between household wealth status and HIV prevalence among men. The adjusted odds of HIV infection among rural women were lower than the odds of HIV infection among urban women (aOR=0.40), but not among rural men (aOR=0.93). By geographic region, the adjusted odds of HIV infection were higher for men living in the Tigray Region than in other regions; and for women living in Tigray, Afar/Somali, Oromiya, and Gambala/Benishangul-Gumuz regions than in other regions. The adjusted odds were significantly lower only for women living in the SNNP Region (aOR=0.04, 95% CI: 0.00-0.32) and the Dire Dawa region (aOR=0.29, 95% CI: 0.09-0.97) than those living in the Tigray Region. It is noteworthy that with other factors controlled, women and

men living in Addis Ababa did not have higher HIV prevalence as observed in the bivariate associations discussed above.

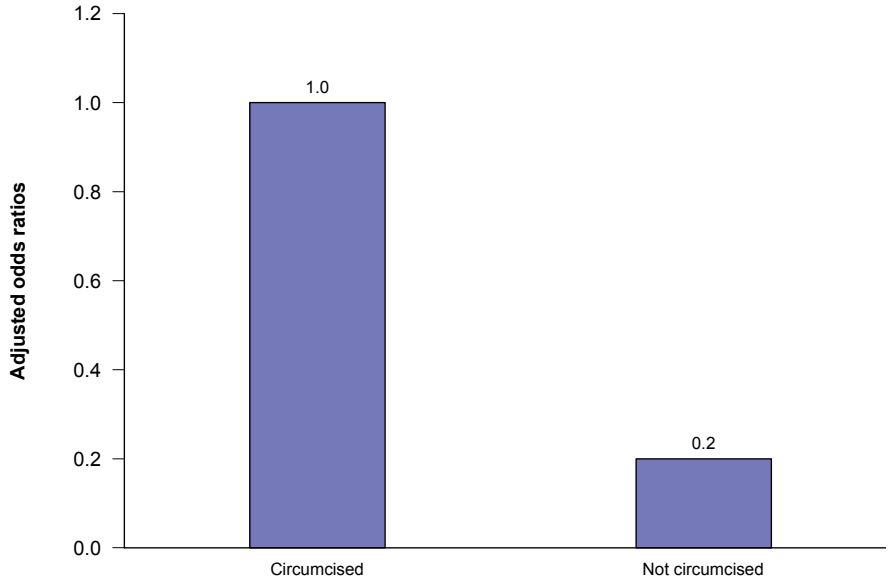
3.2.2 Associations of knowledge and attitude indicators

Controlling for other factors, higher knowledge of HIV prevention methods and accepting attitudes toward PLHIV were positively associated with greater likelihood of HIV infection in both women and men, but none of these adjusted associations were statistically significant. In the bivariate analysis, the belief that a woman should be able to negotiate safer sex was strongly positively associated with HIV prevalence among both women and men, but with other factors controlled, this association was much reduced. Men who agreed that a woman can refuse to have sex and can request condom use if she suspects the partner of having an STI still had a higher likelihood of being HIV positive than those who agreed that a woman cannot negotiate safer sex with spouse (aOR=2.91), but this effect was not significant statistically. With other factors controlled, the odds of HIV infection were greater among women who participated in two or more major household decisions than women who participated in only one of the four decisions or did not participate in any of the four household decisions (aOR=4.44, p=0.023). It is noteworthy that in bivariate analysis, women who participated in two or more household decisions had a much lower HIV prevalence.

3.2.3 Effects of risk and protective factors

Independent of other factors and sexual behaviors, women and men who initiated sex before age 15 had a lower likelihood of being HIV positive at the time of the survey than those who initiated sex at older ages. The adjusted odds of HIV infection were about three times greater among women who reported having two lifetime sexual partners (aOR=2.71, 95% CI: 1.18-6.19) and four times greater among women who reported having three or more lifetime sexual partners (aOR=4.03, 95% CI: 1.60-10.19) than among women who reported having only one lifetime partner. Having multiple lifetime sexual partners was also positively associated with the likelihood of HIV infection in men, but the adjusted effects were smaller and not statistically significant. Adjusted odds of HIV infection were also greater for both women and men who reported having non-spousal sex in the past 12 months (aOR=1.47 for women and aOR=2.37 for men), but not statistically significant. In the bivariate analysis, not using condom at last sex was associated with a lower HIV prevalence among both women and men, but with other factors controlled this association diminished considerably for women but was associated with a higher prevalence among men. Controlling for other factors, alcohol use at last sex had a small insignificant association with the likelihood of HIV infection among both women and men. Cigarette smoking or tobacco use was negatively associated with HIV infection among women (aOR=0.13, 95% CI: 0.02-0.85), but positively among men (aOR=2.53, 95% CI: 0.82-7.75).

Figure 3.4 Adjusted odds ratios of male circumcison and HIV infection among sexually experienced men age 15-49, Ehiopia 2005



The effect of male circumcision on the likelihood of HIV infection is statistically striking when other factors were controlled. In the bivariate analysis, circumcised men were only slightly less likely to be HIV positive than uncircumcised men, but when other factors were controlled, the odds of HIV infection among circumcised men reduced considerably (aOR=0.16, 95% CI: 0.02-1.06) (Figure 4). Controlling for other factors, men who reported having an STI or STI symptoms in the past year were more likely to be HIV positive (aOR=4.99), but this effect was not statistically significant. There was no adjusted association between reported STI or STI symptoms and HIV infection among women. There was no clear pattern of relationship between the number of times slept away and being away for more than one month at a time in the past year and the adjusted odds of HIV infection among men. Controlling for other factors considerably diminished the strong positive bivariate association between ever tested for HIV and the likelihood of HIV infection in both women and men. The adjusted odds of HIV infection among ever-tested women became lower than the odds for never-tested women (aOR=0.44, 95% CI: 0.17-1.13).

3.3 Separate analysis for the lower and the higher HIV prevalence regions

The regions where HIV prevalence among sexually experienced adults (women and men combined) age 15-49 was less than 3.0 percent were Amhara (2.3 percent), Oromiya (2.0 percent), Somali (0.9 percent), Benishangul-Gumuz (0.7 percent), and SNNP (0.2 percent). The overall HIV prevalence in the lower prevalence regions was 1.6 percent. The regions where the HIV prevalence was 3.0 percent or higher were Tigray (3.0 percent), Affar (3.4 percent), Gambela (7.1 percent), Harari (4.3 percent), Addis Ababa (7.9 percent), and Dire Dawa (3.8 percent). The overall HIV prevalence in the higher prevalence regions was 4.7 percent.

3.3.1 Descriptive analysis

Table 3.4 presents HIV prevalence among adults age 15-49 by selected factors applicable to both sexes. The distribution of HIV prevalence in the lower and higher prevalence regions by demographic characteristics, such as residence, education, marital union, number of years living in the current place of residence, and media exposure was similar to the distributions observed separately among women and men in the earlier section. However, while HIV prevalence in the lower prevalence regions was higher among adults age 35-49 (2.2 percent), the prevalence in the higher prevalence regions was higher among youth age 15-24 (4.8 percent) and among young adults age 25-34 (5.9 percent).

Table 3.4 Prevalence of HIV infection among sexually experienced women and men age 15-49 by selected characteristics, in the regions with lower HIV prevalence (<3%), and the regions with higher HIV prevalence (≥3%), Ethiopia DHS 2005

	HIV prevalence			
	Lower prevalence regions		Higher prevalence regions	
Characteristic	%	n	%	n
Demographic and socioeconomic characteristics				
Age group				
15-24	1.2	1,392	4.8	237
25-34	1.2	2,468	5.9	341
35-49	2.2	2,605	3.5	353
Number of years living in current residence				
<3 years	3.8	211	11.6	66
3-9 years	2.4	602	9.3	137
10+ years	1.4	5,617	3.3	719
Educational attainment				
No education	1.0	4,318	2.2	465
Primary	1.9	1,608	6.5	186
Secondary or higher	6.0	540	7.7	280
Occupation				
Not working	1.6	2,571	5.9	327
Professional/services	5.0	565	7.5	206
Agriculture	0.8	3,084	1.5	271
Manual	5.1	208	4.3	121
Regular exposure to mass media				
None	0.9	5,046	3.3	553
One medium	3.6	1,168	6.8	196
Two or three media	7.3	252	6.8	181
Marital status				
Never in union	1.6	274	5.0	148
Currently in union	1.2	5,567	3.9	649
Formerly in union	5.5	599	8.0	124
Wealth quintile				
Lowest	0.5	1,220	1.7	218
Lower	0.9	1,393	0.2	130
Middle	0.6	1,395	3.2	99
Higher	0.3	1,323	4.4	59
Highest	6.5	1,135	8.1	424
Residence				
Urban	9.7	573	8.4	411
Rural	0.8	5,893	1.8	519
Knowledge and attitude indicators				
Knowledge of ABC prevention methods				
None of method	1.1	1,302	3.4	116
One method	0.3	1,062	4.5	87
Two methods	1.1	1,892	4.9	218
Three methods	3.0	2,210	5.0	509
Accepting attitude toward PLHIV				
Lowest	0.3	1,960	2.4	96
Lower	0.6	1,939	1.8	252
Middle	2.1	1,519	3.7	246
Higher	5.6	921	7.5	282
Highest	1.1	127	12.5	54
Agreeing that a women is able to negotiate safer sex				
Cannot negotiate	0.1	889	3.9	94
Refuse sex or ask partner to use condom	1.1	2,697	2.7	283
Refuse sex and ask partner to use condom	2.5	2,879	5.9	553

Continued…

Table 3.4—*Continued*

Characteristic	HIV prevalence			
	Lower prevalence regions		Higher prevalence regions	
	%	n	%	n
Risk and protective factors				
Age at first sex (year)				
<15	1.6	1,224	3.3	206
15-17	2.2	1,927	7.2	257
18-19	1.5	1,154	5.7	156
20+	1.2	1,912	3.4	286
Number of lifetime sex partners				
1	0.9	4,047	3.4	515
2	3.2	1,334	4.9	205
3+	2.1	1,056	7.7	200
Higher-risk sex in the past 12 months				
No sex in past 12 months/sex with spouse	1.5	6,241	4.4	817
Sex with other	4.1	212	7.4	112
Condom use at last sex in past 12 months				
No sex in past 12 months/had sex and used condom	4.5	808	5.9	244
Did not use condom	1.2	5644	4.3	685
Alcohol use at last sex in past 12 months				
No sex in past 12 months	4.2	715	5.7	179
Not used	1.2	5,337	4.2	695
Either or both partners used	2.4	401	8.0	54
Smokes cigarettes or uses tobacco				
No	1.6	5,999	4.9	863
Yes	2.1	467	2.3	67
STI or STI symptom in the past 12 months				
No	1.6	6,339	4.5	911
Yes	0.8	120	18.0	18
Previously tested				
Never tested	1.5	6,267	4.7	810
Ever tested	4.8	198	4.8	120
Total	1.6	6,466	4.7	930

na = Not applicable

In the higher prevalence regions, HIV prevalence increased with household wealth, but in the lower prevalence regions it was higher only among adults living in the wealthiest households. In both lower and higher prevalence regions, HIV prevalence was lowest among adults working in the agricultural sector.

In the higher prevalence regions, HIV prevalence increased as the level of knowledge of HIV prevention methods and the level of accepting attitudes toward PLHIV increased. However, in the lower prevalence regions, only adults with knowledge of all three prevention methods and those with a "higher" level of accepting attitudes toward PLHIV had a higher prevalence of HIV. In both the lower and higher prevalence regions, HIV prevalence was highest among adults who agreed that a woman can refuse sex with her spouse and can ask for the use of a condom if the spouse had an STI.

In both the lower and higher HIV prevalence regions, adults who had their first sex at age 15-17 years had higher HIV prevalence than others who initiated sexual activity at a younger or older age. Patterns of association between number of lifetime sexual partners, non-spousal sex, and condom use at last sex were similar in both the lower and higher prevalence regions to those observed for women and men separately. In both the lower and higher HIV prevalence regions, HIV prevalence was higher among adults who had more lifetime sexual partners, who had non-spousal sex, and who reported using a condom at last sex in the past year. Alcohol use at last sex was also positively associated with HIV prevalence in both the lower and higher prevalence regions. However, smoking cigarettes or using tobacco was positively associated with HIV prevalence only in the lower prevalence region, having an STI or STI symptoms in the past year was strongly and positively associated with HIV prevalence only in the higher prevalence regions, and prior testing for HIV was positively associated with HIV only in the lower prevalence regions.

3.3.2 Multivariate analysis

Adjusted associations of the variables discussed in Table 3.4 and the likelihood of HIV infection separately for the lower and higher prevalence regions are presented in Table 3.5. With other factors controlled, only marital union, and number of lifetime sexual partners had statistically significant associations with the likelihood of HIV infection in both the lower and higher prevalence regions. Formerly married adults (widowed/divorced/separated) were significantly more likely to be HIV positive than those never in union (aOR=5.34, 95% CI: 1.00-28.38 in the lower prevalence regions; aOR=3.19, 95% CI: 1.36-7.49 in the higher prevalence regions). Compared with adults with only one lifetime sexual partner, adults with two lifetime partners in the lower prevalence regions (aOR=2.68, 95% CI: 1.26-5.73) and those with three or more partners in the higher prevalence regions (aOR=3.00, 95% CI: 1.63-5.51) were significantly more likely to be HIV positive.

Table 3.5 Adjusted effects (odds ratios) of selected characteristics on the likelihood of HIV infection among sexually experienced adults age 15-49 in the regions with lower HIV prevalence (<3%) and the regions with higher HIV prevalence (≥3%), Ethiopia DHS 2005

	Lower prevalence regions			Higher prevalence regions		
Characteristic	aOR	95% CI	p-value	aOR	95% CI	p-value
Demographic and socioeconomic characteristics						
Age group						
15-24	1.00	-	-	1.00	-	-
25-34	1.88	(0.70, 5.03)		1.39	(0.66, 2.90)	
35-49	3.77	(1.40, 10.13)	*	0.79	(0.36, 1.72)	
Number of years living in current residence						
<3 years	1.00	-	-	1.00	-	-
3-9 years	1.17	(0.26, 5.39)		0.70	(0.30, 1.63)	
10+ years	0.66	(0.15, 2.93)		0.34	(0.16, 0.76)	*
Educational attainment						
No education	1.00	-	-	1.00	-	-
Primary	1.53	(0.63, 3.72)		2.31	(1.07, 5.00)	*
Secondary or higher	1.16	(0.39, 3.42)		2.13	(0.83, 5.49)	
Occupation						
Not working	1.00	-	-	1.00	-	-
Professional/services	0.64	(0.25, 1.63)		0.47	(0.25, 0.91)	*
Agriculture	0.43	(0.16, 1.14)		0.74	(0.30, 1.84)	
Manual	0.66	(0.16, 2.77)		0.43	(0.18, 1.01)	
Regular exposure to mass media						
None	1.00	-	-	1.00	-	-
One medium	2.05	(0.93, 4.52)		1.03	(0.52, 2.04)	
Two or three media	1.83	(0.69, 4.83)		0.65	(0.29, 1.48)	
Marital status						
Never in union	1.00	-	-	1.00	-	-
Currently in union	2.23	(0.31, 16.24)		1.33	(0.29, 6.13)	
Formerly in union	5.34	(1.00, 28.38)	*	3.19	(1.36, 7.49)	*
Wealth status (quintiles)						
Lowest	1.00	-	-	1.00	-	-
Lower	1.48	(0.34, 6.55)		0.12	(0.03, 0.55)	*
Middle	1.14	(0.23, 5.58)		1.90	(0.62, 5.84)	
Higher	0.30	(0.04, 2.05)		2.32	(0.68, 7.89)	
Highest	2.28	(0.53, 9.85)		1.18	(0.26, 5.27)	
Residence						
Urban	1.00	-	-	1.00	-	-
Rural	0.41	(0.16, 1.07)		0.25	(0.07, 0.97)	*
Knowledge and attitude indicators						
Knowledge of HIV prevention methods						
None of the methods	1.00	-	-	1.00	-	-
One method	0.23	(0.04, 1.54)		0.80	(0.32, 1.99)	
Two methods	0.76	(0.23, 2.55)		0.57	(0.24, 1.37)	
Three methods	1.29	(0.43, 3.87)		0.68	(0.28, 1.63)	

Continued…

Table 3.5—*Continued*

Characteristic	Lower prevalence regions aOR	95% CI	p-value	Higher prevalence regions aOR	95% CI	p-value
Accepting attitudes toward PLHIV						
Lowest	1.00	-	-	1.00	-	-
Lower	1.80	(0.43, 7.52)		0.88	(0.24, 3.31)	
Middle	3.55	(1.02, 12.33)	*	0.89	(0.25, 3.10)	
Higher	4.99	(1.40, 17.78)	*	1.55	(0.44, 5.52)	
Highest	0.75	(0.05, 12.32)		2.86	(0.69, 11.82)	
Woman's ability to negotiate safer sex						
Cannot negotiate	1.00	-	-	1.00	-	-
Refuse sex or ask partner to use condom	6.58	(0.84, 51.25)		0.51	(0.21, 1.23)	
Refuse sex and ask partner to use condom	5.83	(0.79, 43.04)		0.81	(0.35, 1.85)	
Risk and protective factors						
Age at first sex						
<15	1.00	-	-	1.00	-	-
15-17	1.37	(0.50, 3.78)		1.54	(0.74, 3.23)	
18-19	1.04	(0.33, 3.29)		1.19	(0.51, 2.80)	
20+	0.91	(0.31, 2.69)		0.94	(0.39, 2.29)	
Number of lifetime sexual partners						
1	1.00	-	-	1.00	-	-
2	2.68	(1.26, 5.73)	*	1.46	(0.80, 2.66)	
3+	1.11	(0.40, 3.11)		3.00	(1.63, 5.51)	*
Higher-risk sex in the past 12 months						
No sex in past 12 months/sex with spouse	1.00	-	-	1.00	-	-
Sex with other	1.89	(0.14, 26.09)		1.49	(0.34, 6.59)	
Condom use at last sex in past 12 months						
No sex in past 12 months/had sex and used condom	1.00	-	-	1.00	-	-
Did not use condom	0.93	(0.13, 6.59)		2.56	(0.94, 6.98)	
Alcohol use at last sex in past 12 months						
No sex in past 12 months	1.00	-	-	1.00	-	-
Not used	0.70	(0.06, 8.24)		0.57	(0.11, 2.83)	
Either or both partners used	0.93	(0.05, 17.13)		0.74	(0.11, 5.15)	
Smokes cigarettes or uses tobacco						
No	1.00	-	-	1.00	-	-
Yes	1.40	(0.38, 5.21)		0.34	(0.12, 1.00)	*
STI or STI symptom in the past 12 months						
No	dropped	-	-	1.00	-	-
Yes	-	-	-	4.47	(1.35, 14.74)	*
Previously tested						
Never tested	1.00	-	-	1.00	-	-
Ever tested	0.98	(0.30, 3.22)		0.40	(0.16, 0.99)	*
Number			6,093			871

Note: An asterisk indicates significance at p value ≤ 0.05.
na = Not applicable

Age and attitudes toward PLHIV had statistically significant associations with HIV infection only in the lower prevalence regions. Whereas, duration of residence, education, occupation, wealth status, urban/rural residence, tobacco use or smoking, having STI or STI symptoms, and prior HIV testing had significant associations with HIV infection only in the higher prevalence regions. In the lower prevalence regions, controlling for other factors: adults age 35-49 were about four times as likely to be HIV infected as youth age 15-24 (aOR=3.77, 95% CI: 1.40-10.13) and adults with a middle level of accepting attitudes toward PLHIV were more than three times (aOR=3.55, 95% CI: 1.02-12.33) and those with a "higher" level of accepting attitudes toward PLHIV were about five times (aOR=4.99, 95% CI: 1.40-17.78) as likely to be HIV infected as those with "lowest" level of accepting attitudes.

In the higher prevalence regions, controlling for other factors: adults living in the current place of residence for 10 or more years were significantly less likely to be HIV positive compared

with those living in the current place of residence for less than three years (aOR=0.34, 95% CI: 0.16-0.76); adults with primary education were significantly more likely to be HIV positive than non-educated adults (aOR=2.31, 95% CI: 1.07-5.00); adults working in the professional or services sector were significantly less likely to be HIV positive than those not working (aOR=0.47, 95% CI: 0.25-0.91); adults living in rural areas were significantly less likely to be HIV positive than those living in urban areas (aOR=0.25, 95% CI: 0.07-0.97); adults who smoke cigarettes or use tobacco were significantly less likely to be HIV positive (aOR=0.34, 95% CI: 0.12-1.00); adults with an STI or STI symptoms in the past year were significantly more likely to be HIV positive that those with no STI or STI symptoms (aOR=4.47, 95% CI: 1.35-14.74); and adults who had ever tested for HIV prior to the survey were significantly less likely to be HIV positive than those who had never tested (aOR=0.40, 95% CI: 0.16-0.99).

With other factors controlled, household wealth status, knowledge of HIV prevention methods, agreeing that a woman is able to negotiate safer sex, age at first sexual intercourse, non-spousal sex, condom use at last sex, and alcohol use at last sex had no significant effects on the likelihood of HIV infection in either the lower or the higher prevalence regions.

4 Discussion

This study analyzed the national and regional prevalence of HIV infection in Ethiopia using individual-level data collected in a recent nationally-representative survey that included HIV testing of adult women and men. The study examined the spread and correlates of the HIV epidemic in the adult population.

One of the key demographic characteristics was age. Women and men age 35-49 were three times more likely to be HIV-infected compared with women and men age 15-24. The effect of age was more pronounced in the lower HIV prevalence regions. Another key demographic factor was the duration of stay in the current place of residence, with shorter duration of stay in the current place of residence associated with higher HIV infection rates. This is consistent with the evidence that mobility and migration tend to be associated with higher-risk behaviors and greater vulnerability to STIs including HIV (Stulhofer et al., 2006; Wardlow, 2007). Urban residence was associated with much higher HIV infection rates, and there were large differentials by geographic region and ethnicity. Large regional differences in HIV prevalence have also been observed in other countries in sub-Saharan Africa (Mishra et al. 2006; Johnson and Way 2006).

The study found that formerly married (widowed/divorced/separated) women and men had a higher likelihood of HIV infection. This was to be expected as some of the widows may be infected by their spouses who died of AIDS and others may have divorced or separated as a result of HIV infection. Higher education and higher household wealth status were found to be positively associated with HIV infection, particularly in the higher HIV prevalence regions. However, as expected, controlling for urban/rural residence, sexual behavior, and other factors that tend to be correlated with higher socioeconomic status diminished these associations considerably. Positive associations of HIV infection with higher socioeconomic status have also been observed in other countries in sub-Saharan Africa (Mishra et al., 2007).

One of the strongest correlates of HIV infection among both women and men was having multiple lifetime sexual partners, which was strongly associated with the likelihood of HIV infection independent of other factors. Having a non-spousal (non-marital, non-cohabiting) sexual partner in the past year was also positively associated with the likelihood of HIV infection, but this association was much diminished when the number of lifetime sexual partners and other socio-demographic and behavioral factors were statistically controlled.

Another strong correlate of HIV infection in men was male circumcision. With other factors controlled, male circumcision had a strong protective effect on the likelihood of being HIV-infected.

This is consistent with recent clinical trials in South Africa, Kenya, and Uganda that showed that male circumcision can significantly reduce the risk of HIV infection (NIH, 2006; Williams et al., 2006; Auvert et al., 2005). Also, consistent with previous evidence of greater risk of HIV infection in the presence of other sexually transmitted infections (Colvin et al., 2004; Manning et al., 2007), this study found that adults who reported having an STI or STI symptoms in the past year were at a much higher risk of HIV infection, particularly in the higher HIV prevalence regions.

Knowledge of HIV prevention methods, accepting attitudes toward PLHIV, regular exposure to mass media, and condom use were associated with higher likelihood of HIV infection. These unexpected findings were probably due to the reverse causality from people engaging in higher-risk behaviors or those suspecting of being already infected may be more likely to seek prevention information, use preventive methods, and subsequently change their attitudes toward PLHIV. However, as expected, prior HIV testing was positively associated with HIV infection, as people suspecting of HIV infection may be more likely to have sought testing.

There are several limitations of this study that should be kept in mind when interpreting the findings.

A major limitation is that the analysis is based on the self-reporting of sexual and other related high-risk behaviors. There is evidence that women tend to underreport and men tend to exaggerate their premarital and extramarital sexual activity (Zaba et al., 2002). The findings of this study may be biased to the extent men and women misreport the number of sexual partners, sex with non-regular partners, condom use, and other related higher-risk behaviors, or to the extent that the degree of misreporting is different across various socio-demographic groups of people.

Another limitation is that the cross-sectional data used in this study only allow looking at associations; it is not possible to identify any causal effects between various characteristics and behaviors and the risk of HIV infection. Moreover, the analysis correlates many recent (for the past 12 months) behaviors with HIV infection status at the time of the survey. It is quite possible that for many HIV-positive adults, the infection preceded their sexual and other behaviors recorded in the survey. Some of the associations may have been biased to the extent that some of the characteristics and behaviors of the infected people may have changed since getting infected.

Differential non-response and exclusion of non-household populations could also bias the results of this study to some extent. An analysis of the non-response bias in the 2005 EDHS data indicated that non-responders tend to have higher HIV prevalence than those who participated in the survey, but since the response rates were high, the non-response did not bias the national HIV prevalence estimates for women and men significantly (Mishra et al., 2007). Finally, the study is limited due to the small numbers of HIV-positive cases in the EDHS sample, especially among men. Had the survey included more adults in the sample, many of the associations reported may have been more robust and statistically significant.

In spite of these limitations, this study provides a closer look at the spread and correlates of HIV infection in Ethiopia. The findings are useful in identifying higher-prevalence and higher-risk populations, and for strengthening prevention, care and support, and treatment programs.

References

Auvert B, Ballard R, Campbell C, Carael M, Carton M, Fehler G, et al. HIV infection among youth in a South African mining town is associated with herpes simplex virus-2 seropositivity and sexual behavior. AIDS 2001;15:931-4.

Auvert B, Taljaard D, Lagarde E, Sobngwi-Tambekou J, Sitta R, Puren A. Randomized controlled intervention trial of male circumcision for reduction of HIV infection risk: the ANRS 1265 Trial. PLoS Med 2005;2:e298.

Bingenheimer, J. B. (2007). Wealth, wealth indices and HIV risk in East Africa. *International Family Planning Perspective, 33,* 83-4

Census and Survey Processing System. (2007)**.** Census and Survey Processing System. Retrieved October 10, 2007 from http://www.cspro.org/cspro/start.cfm?CFID=4768222&CFTOKEN=23847412

Central Statistical Agency [Ethiopia] and ORC Macro. (2006). *Ethiopia Demographic and Health Survey 2005.* Addis Ababa, Ethiopia and Calverton, Maryland, USA: Central Statistical Agency and ORC Macro.

Central Statistical Office (CSO) [Zimbabwe] and Macro International Inc. (2007). *Zimbabwe Demographic and Health Survey 2005-06.* Calverton, Maryland: CSO and Macro International Inc.

Chen L, Jha P, Stirling B, Sgaier SK, Daid T, Kaul R, et al. (2007). Sexual Risk Factors for HIV Infection in Early and Advanced HIV Epidemics in Sub-Saharan Africa: Systematic Overview of 68 Epidemiological Studies. *PLoS ONE, 2,* e1001.

Colvin, M., Shisana, O., Connolly, C., Simbayi, L. (2004). *The association between HIV and sexually transmitted infections in South Africa.* Presentation at the XIV International AIDS Conference, Bangkok, Thailand.

Fontanet, A. L., Messele, T., Dejene, A.; Enquselassie, F., Abebe, A., Cutts, F. T., et al. (1998). Age- and sex-specific HIV-1 prevalence in the urban community setting of Addis Ababa, Ethiopia. *AIDS, 12,* 315-322

Halperin DT, Epstein H. Concurrent sexual partnerships help to explain Africa's high HIV prevalence: implications for prevention. Lancet 2004;364:4-6.

Hendershot, C. S., Stoner, S. A., George, W. H., Norris, J. (2007). Alcohol use, expectancies, and sexual sensation seeking as correlates of HIV risk behavior in heterosexual young adults. *Psychology of Addictive Behaviors, 21,* 365-72.

Institut National de la Statistique (INS) et ORC Macro. (2004). *Enquête Démographique et de Santé du Cameroun 2004.* Calverton, Maryland, USA : INS et ORC Macro.

Johnson, K., Way, A. (2006). Risk factors for HIV infection in a national adult population: evidence from the 2003 Kenya Demographic and Health Survey. *Journal of Acquired Immune Deficiency Syndrome, 42,* 627-36.

Kim JC, Watts CH. Gaining a foothold: tackling poverty, gender inequality, and HIV in Africa. BMJ 2005;331:769-72.

Kohler, Hans-Peter and Stéphane Helleringer. 2006. *The Structure of Sexual Networks and the Spread of HIV in Sub-Saharan Africa: Evidence from Likoma Island(Malawi).* University of Pennsylvania, Population Aging Research Center Working Paper WPS 06-02.

Kongnyuy, E. J., Wiysonge, C. S. (2007). Alcohol use and extramarital sex among men in Cameroon. *BMC International Health and Human Rights, 3,* 7:6.

Lagarde E, Auvert B, Chege J, Sukwa T, Glynn JR, Weiss HA, et al. Condom use and its association with HIV/sexually transmitted diseases in four urban communities of sub-Saharan Africa. AIDS 2001;15 Suppl 4:S71-8.

Lester FT, Ayehunie S, Zewdie D: Acquired immunodeficiency syndrome: seven cases in Addis Ababa hospital**.** *Ethiopian Medical Journal*, 1988 *26***,** 139-145.

Manning, S. E., Pfeiffer, M. R., Nash, D., Blank, S., Sackoff, J., Schillinger, J. (2007). Incident Sexually Transmitted Infections Among Persons Living With Diagnosed HIV/AIDS in New York City, 2001-2002: A Population-Based Assessment. *Sexually Transmitted Diseases,* (Epub ahead of print).

Mbizvo MT, Machekano R, McFarland W, Ray S, Bassett M, Latif A, et al. HIV seroincidence and correlates of seroconversion in a cohort of male factory workers in Harare, Zimbabwe. AIDS 1996;10:895-901.

Mehret M, Khodakevich L, Shanko B, Ayohunie S, Gizaw G, Shanko B, et al. (1990a). HIV-1 Infection and related risk factors among female sex workers in urban areas of Ethiopia. *Ethiopian Journal of Health Development, 4,* 163-170

Mehret M, Khodakevich L, Shanko B, Ayohunie S, Gizaw G, Shanko B, et al. (1990b). HIV-1 infection among employees of the Ethiopian Freight Transport Corporation. *Ethiopian Journal of Health Development, 4,* 177-182.

Ministry of Health (MOH) [Uganda] and ORC Macro. (2006). *Uganda HIV/AIDS Sero-behavioural Survey 2004-2005.* Calverton, Maryland, USA: Ministry of Health and ORC Macro.

Mishra V, Vaessen M, Boerma JT, Arnold F, Way A, Barrere B, Cross A, Hong R, Sangha J. HIV testing in national population-based surveys: experience from the Demographic and Health Surveys. Bull World Health Organ. 2006 Jul;84(7):537-45.

Mishra, V, Bignami S, Greener R, Vaessen M, Hong R, Ghys P, et al. (2007). A study of the association of HIV infection with wealth in sub-Saharan Africa AIDS 2007; 21(Suppl 7):S17-S28.

Mishra V, Hong R, Govindasamy P. (2007) Evaluating HIV Seroprevalence Estimates from Ethiopia. Analytical report No. 48. Macro International Inc., Calverton, MD, USA

Morris M, Kretzschmar M. Concurrent partnerships and the spread of HIV. AIDS 1997;11(5):641-8.

Msuya SE, Mbizvo E, Stray-Pedersen B, Sundby J, Sam NE, Hussain A. Reproductive tract infections among women attending primary health care facilities in Moshi, Tanzania. East Afr Med J 2002;79:16-21.

National Institute of Health. 2006. Adult Male Circumcision Significantly Reduces Risk of Acquiring HIV. Trials Kenya and Uganda Stopped Early. Accessed on Nov 9, 2007, at *http://www3.niaid.nih.gov/news/newsreleases/2006/AMC12_06.htm*

Perez, V. R., Barrales, C. I., Jara, P. J., Palma, R. V., Ceballos, M. A. (2007). Knowledge of HIV/AIDS among adolescents in Chillan, Chile. *Midwifery*, [Epub ahead of print]

Shelton JD, Halperin DT, Nantulya V, Potts M, Gayle HD, Holmes KK. Partner reduction is crucial for balanced "ABC" approach to HIV prevention. BMJ. 2004 Apr 10;328(7444):891-3.

StataCorp. (2003). Stata Statistical Software: Release 8.0. College Station, Texas: Stata Corporation.

Stoneburner RL, Low-Beer D. Sexual partner reductions explain human immunodeficiency virus declines in Uganda: comparative analyses of HIV and behavioural data in Uganda, Kenya, Malawi, and Zambia. Int J Epidemiol. 2004 Jun;33(3):624

Stulhofer, A., Brouillard, P., Nikolic, N., Greiner, N. (2006). HIV/AIDS and Croatian migrant workers. *Collegium antroplogicum, Suppl 2,* 105-14.

Tarwireyi, F. (2005). Stigma and discrimination: coping behaviours of people living with HIV and AIDS in an urban community of Mabvuku and Tafara, Harare, Zimbabwe. *Central African Journal of Medicine, 51,* 71-6.

Tsega, E., Mengesha, B., Nordenfelt, E., Hansson, B. G., Lindberg, J. (1988). Serological survey of human immunodeficiency virus (HIV) in Ethiopia. *Ethiopian Medical Journal***,** *26*, 179-184.

UNAIDS. 2006. *Epidemiological Fact Sheets on HIV/AIDS and Sexually Transmitted Infections, Ethiopia.* Retrieved October 10, 2007 from http://www.who.int/GlobalAtlas/ predefinedReports/EFS2006/index.asp?strSelectedCountry=ET

Vermund, S. H. (1995). Casual sex and HIV transmission**.** *American Journal of Public Health ,85,* 1488–1489.

Wald, A., Langenberg. A. G., Link, K., Izu, A. E., Ashley, R. Warren, T., et al. (2001). Effect of condoms on reducing the transmission of herpes simplex virus type 2 from men to women. *Journal of American Medical Association, 285,* 3100-6.

Wardlow, H. (2007). Men's extramarital sexuality in rural Papua New Guinea. *American Journal of Public Health, 97,* 1006-14.

Williams BG, Lloyd-Smith JO, Gouws E, Hankins C, Getz WM, Hargrove J, et al. The potential impact of male circumcision on HIV in Sub-Saharan Africa. Plos Med 2006;3:e262

Wilson D. Partner reduction and the prevention of HIV/AIDS. BMJ. 2004 Apr 10;328(7444):848-9.

Zaba B, Boerma JT, Pisani E, Baptiste N. Estimation of levels and trends in age at first sex from African demographic surveys using survival analysis. Paper presented at the Annual Meeting of the Population Association of America, 2002 May 9-11; Atlanta, Georgia.