GHANA FURTHER ANALYSIS

An In-Depth Analysis of HIV Prevalence in Ghana

Further Analysis of Demographic and Health Surveys Data

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This report presents findings from a further analysis study undertaken as part of the follow-up to the 2003 Ghana Demographic and Health Survey (GDHS). ORC Macro provided technical assistance for the project. Funding was provided by the U.S. Agency for International Development (USAID) under the terms of Contract No. HRN-C-00-97-00019-00. The opinions expressed herein are those of the authors and do not necessarily reflect the views of the USAID.

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

Additional information about the GDHS can be obtained from the Ghana Statistical Service, P.O. Box 1098, Accra, Ghana (Telephone: (233-21) 671-732 and Fax: (233-21) 671-731). Information about the DHS program can be obtained from MEASURE DHS, ORC Macro, 11785 Beltsville Drive, Suite 300, Calverton, MD, USA (Telephone: 301-572-0200; Fax: 301-572-0999; E-mail: reports@orcmacro.com; Internet: http://www.measuredhs.com).

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CONTENTS

ACRONYMS

ABC	Abstinence, be faithful, and condom use
AIDS	Acquired immunodeficiency syndrome
ANC	Antenatal care
ART	Antiretroviral treatment
CI	Confidence interval
DHS	Demographic and Health Surveys
EA	Enumeration area
GAC	Ghana AIDS/STI Commission
GDHS	Ghana Demographic and Health Survey
GHS	Ghana Health Service
GSS	Ghana Statistical Service
HIV	Human immunodeficiency virus
HSS	HIV Sentinel Surveillance
M&E	Monitoring and Evaluation
MTCT	Mother-to-child transmission of HIV
NACP	National AIDS/STI Control Program
NMIMR	Noguchi Memorial Institute for Medical Research
OR	Odds ratio
PLWHA	People living with HIV/AIDS
STI	Sexually transmitted infection
UNAIDS	Joint United Nations Programme on HIV/AIDS
USAID	United States Agency for International Development
WAPCAS	West Africa Project to Combat AIDS and STI
WHO	World Health Organization

1 INTRODUCTION

The 2003 Ghana Demographic and Health Survey (2003 GDHS) is the fourth national-level population and health survey conducted in Ghana as part of the global Demographic and Health Surveys (DHS) program supported by the United States Agency for International Development (USAID). The 2003 GDHS is the sixth survey in the DHS program to include HIV testing (the other studies being Mali 2001, Dominican Republic 2002, Zambia 2002, Kenya 2003, and Burkina Faso 2003), and the third, after Kenya and Burkina Faso, to anonymously link the HIV results with key demographic, social, and behavioral factors.

The 2003 GDHS final report summarized HIV/AIDS-related knowledge, attitudes, and behaviors (Chapter 12) and HIV prevalence and associated factors (Chapter 13) (GSS et al., 2004). Overall, 2.2 percent of the survey respondents tested were HIV positive (2.7 percent of women age 15-49 and 1.6 percent of men age 15-59). The report presented descriptive statistics on the proportion of respondents who had correct HIV/AIDS-related knowledge and accepting HIV/AIDS-related attitudes among those who had heard about AIDS (nearly universal in Ghana). This information was disaggregated by sociodemographic background characteristics. For respondents who were sexually experienced or active, the report presented descriptive statistics on sexual behaviors that are associated with HIV risk (also disaggregated by sociodemographic background characteristics). HIV prevalence was examined by background characteristics and higher risk sexual behaviors.

USAID/Ghana requested further analysis of the 2003 GDHS data to evaluate the HIV prevalence information and to characterize more fully HIV risk groups and behaviors. The purpose of this report is to present the findings of an examination of the HIV prevalence information and of a statistical analysis (bivariate and multivariate) of the 2003 GDHS data, specifically linking key sociodemographic characteristics, HIV/AIDS-related knowledge and attitudes, HIV risk behaviors, and HIV serostatus.

1.1 Background

1.1.1 Epidemiology of HIV/AIDS in Ghana

Though the first HIV/AIDS cases in Ghana were diagnosed in 1986, efforts to track prevalence were not instituted until 1990 when the Ministry of Health implemented the national HIV Sentinel Surveillance (HSS) system. Since 1994 an annual HIV sentinel survey has been conducted at antenatal care (ANC) clinics for pregnant women and sexually transmitted infection (STI) centers for patients with STIs. In 2003 the HIV sentinel survey consisted of 30 ANC sites (23 urban and 7 rural) strategically located in 28 of Ghana's 110 districts, and covering all 10 regions of the country (GHS, 2003).

UNAIDS estimated that between 210,000 and 560,000 adults and children in Ghana were living with HIV/AIDS at the end of 2003 (UNAIDS, 2004). According to estimates from the HSS, the national prevalence rate for HIV has increased from 2.4 percent in 1994 to 3.6 percent in 2003 (GHS, 2003). HIV prevalence rates are not uniform across the country; prevalence is high in densely populated areas, mining and border towns, and towns along main transportation routes. In 2003 prevalence was highest among pregnant women age 30-34 (4.2 percent).

The main mode of transmission of the virus in Ghana is through heterosexual intercourse, which accounts for 75 to 80 percent of all HIV/AIDS infections. Vertical transmission from mother to child—mother-to-child transmission (MTCT)—accounts for 15 percent, and transmission through blood and blood products accounts for 5 percent (GAC, 2001a). HIV-1 is the predominant infecting agent (94.4 percent); 5.1 percent of cases are dual infections with HIV-1 and HIV-2; and only 0.5 percent of all infections in 2003 were HIV-2 alone (GHS, 2003).

Other data sources, such as the West Africa Project to Combat AIDS and STI (WAPCAS), provide information on HIV prevalence for some higher risk population groups. For example, in 2001 among commercial sex workers in Ghana associated with an establishment ("seaters"), 76 percent were HIV positive; among seaters in Kumasi in 1999, 80 percent were HIV positive (CHUS, 2003).

HIV/AIDS has social, economic and development effects, and unless curtailed, could have a devastating effect on the overall wellbeing of the people of Ghana. The growing number of HIV/AIDS cases can overwhelm the health care system, overburden the social system, hinder educational development, and inhibit agricultural production. For instance, the Joint United Nations Programme on HIV/AIDS (UNAIDS) has estimated that in Ghana the number of children under age 17 who have lost their mother or father or both parents to AIDS at the end of 2003 was between 120,000 and 250,000 (UNAIDS, 2004). In some high prevalence areas, the social fabric (social support system) is no longer able to cope with the large number of orphans (USAID/Ghana, 2003; UNAIDS et al., 2004).

1.1.2 Ghana's Programmatic Response to HIV/AIDS

Ghana's response to the HIV/AIDS epidemic was initially characterized by a medical approach, whereby the disease was managed as an individual health issue. As the epidemic spread, a public health approach was taken. The first response was the formation of a technical committee in 1985 to advise the government. Working with the Ministry of Health and consultants from the World Health Organization (WHO), the committee was charged with the task to develop a short-term plan for HIV prevention and control. A medium-term plan was developed with the WHO's Global Program on AIDS in 1998.

In 1987 the National AIDS/STI Control Program (NACP) was established within the Disease Control Unit of the Ministry of Health for the prevention, management, and control of HIV in the country. The functions of NACP include the organization of educational campaigns through mass media, workshops, video shows, and other channels to inform the public on how to reduce HIV-related risky behaviors, particularly through the use of condoms. Condom promotion was given considerable attention in Ghana by the joint effort of the Ghana Ministry of Health, Ghana Social Marketing Foundation, and other private and nongovernmental organizations. For example, the Ministry of Health in Accra, in collaboration with Family Health International, embarked on an AIDS prevention program with condom promotion among commercial sex workers as its major goal. This program was initiated barely a year after the first AIDS case was reported in Ghana and continued through the early nineties.

HIV antibody testing and blood screening facilities were introduced in 1987. In 1990 NACP established the national HSS system (described above). At the beginning of 2000, government and non-government partners launched a major HIV/AIDS awareness campaign for adolescents.

In the 21st century, the government of Ghana adopted a multisectoral approach to HIV/AIDS programming, and in September 2000, the Ghana AIDS/STI Commission (GAC) was established as a supraministerial and multisectoral body under the leadership of the President to direct and coordinate all HIV/AIDS-related activities in the country. GAC was given the mandate to formulate national policies and strategies; to provide high-level advocacy for HIV/AIDS prevention and control; to provide effective leadership in the national planning of programs; to expand and coordinate the national response; to mobilize, manage, and monitor resource allocation and utilization; and to foster linkages and networks among stakeholders.

In 2001 GAC published the *Ghana HIV/AIDS Strategic Framework: 2001-2005* to guide the national response. Five key intervention areas are identified: prevention of new transmission; care and support for people living with HIV/AIDS (PLWHA); creation of an enabling environment for the national response; decentralized implementation and institutional arrangements; and research, monitoring, and

evaluation (GAC, 2001a). *The National Monitoring and Evaluation Plan for HIV/AIDS in Ghana 2001-2005* was developed in 2001 (GAC, 2001b).

In 2002, NACP published *Guidelines for Management of Sexually Transmitted Diseases* to improve the quality of STI management in health facilities in both the public and private sectors and to contribute to the reduction of transmission of STI including HIV. Also in 2002, prevention of mother-to-child transmission (MTCT) of HIV interventions were introduced on a pilot basis, and 2003 saw the beginning of national expansion.

A comprehensive *National HIV/AIDS and STI Policy,* approved by the cabinet**,** was published in August 2004. The policy is intended to create a favorable environment for all aspects of HIV/AIDS and STI prevention, care, and support; to address the complex range of policy issues such as the situation of orphans, AIDS education in the schools, human rights, treatment and care, and research ethics; and to ensure that all stakeholders would work toward a common goal to achieve the objectives of reducing the effects of HIV/AIDS on the individual, family, and the community at large.

Through the Ghana Poverty Reduction Strategy, the Global Fund, and USAID, antiretroviral treatment (ART) is available on a pilot basis through the public health system. At the end of October 2004, 1,615 HIV-positive people were on ART (GAC, 2004).

USAID/Ghana has been one of the strongest supporters of HIV/AIDS education since 1999. USAID/Ghana's program (USAID/GHANA, 2003) currently focuses on higher risk groups and bridging populations, such as commercial sex workers, youths, professional drivers, miners, police, porters and street children, teachers, market women, public servants, and members of the uniformed services, who are likely to engage in casual and paid sex.

1.2 Data and Methods

1.2.1 Description of the 2003 GDHS Data

The source of data for this analysis is the 2003 GDHS, a nationally representative survey of 5,691 women age 15-49 and 5,015 men age 15-59. The 2003 GDHS used a two-stage stratified sample design based on the 2000 Ghana Population and Housing Census. At the first stage, 412 enumeration areas (EAs) were selected, each with probability proportional to size, based on the number of households. The second stage of sampling involved systematic sampling of households. The sample selected per EA varied by the population size of each region. The sample was selected to provide estimates for key variables, such as HIV prevalence, with acceptable statistical precision for the country as a whole, for each of the 10 regions in Ghana, as well as for urban and rural areas separately. Because of the disproportional number of EAs and different sample sizes selected per EA among regions, the household sample for the 2003 GDHS is not self-weighted at the national level (GSS et al., 2004).

In households selected for the 2003 GDHS, all women age 15-49 and men age 15-59 were eligible for interview and HIV testing. The protocol for HIV testing was approved by the Ghana Health Service Ethical Review Committee in Accra and the ORC Macro Institutional Review Board in Calverton, Maryland. The procedure, the confidentiality of the data, and the fact that the test results would not be made available to the subject were explained to the respondents. Specimens were taken from respondents after they had consented to be tested. The testing procedure is discussed in detail in the final report (GSS et al., 2004). Dried blood spots for HIV testing were collected from 89 percent of the 5,949 eligible (interviewed and not interviewed) women and 80 percent of the 5,345 eligible men.

To determine the level of awareness and practice with regard to the transmission of the AIDS virus, female and male respondents who indicated that they had heard of AIDS (98 percent of women and 99 percent of men) were asked several questions on HIV/AIDS-related knowledge and attitudes. Sexual behavior questions were only asked of sexually experienced (ever had sex) respondents (82 percent of women and 77 percent of men), and those sexual behavior questions that required a recall period were asked of respondents who had been sexually active in the 12 months preceding the survey (68 percent of women and 67 percent of men) (GSS et al., 2004).

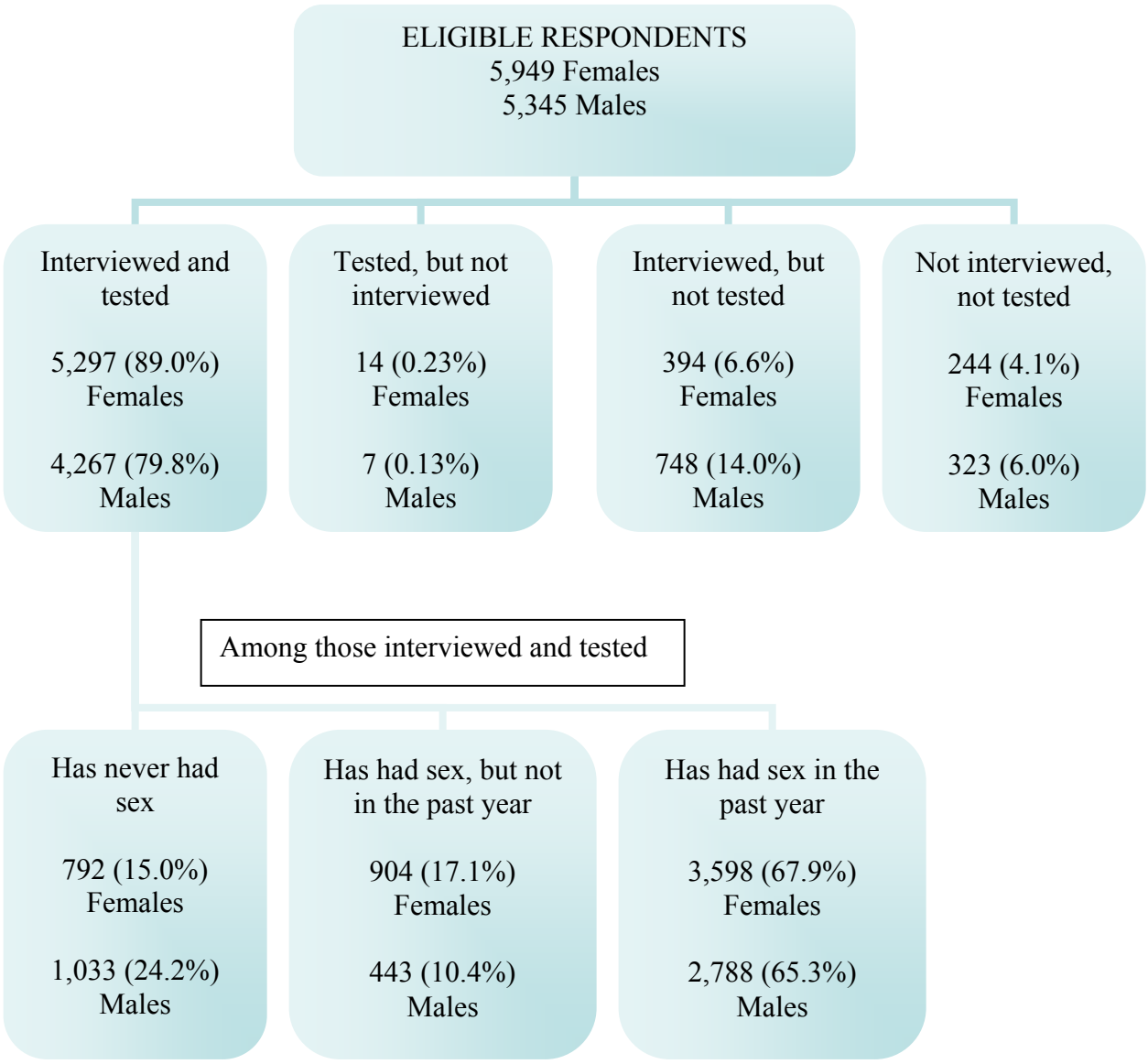
For this further analysis, a subsample of the 2003 GDHS sample was used: respondents who were sexually experienced or sexually active and who provided a sample for HIV testing. Because HIV sero-status was the outcome variable, respondents had to have been tested to be included in the analysis. The sample was further limited to those who were sexually experienced or active because the majority of HIV transmission in the adult population of Ghana occurs through sexual contact and because all of the women and virtually all of the men (97 percent) among those who tested HIV positive in the 2003 GDHS were also sexually experienced.[1] Table 1.1 presents the HIV prevalence for women and men by their sexual status. Figure 1.1 shows the number of eligible women age 15-49 and men 15-59 who were interviewed and tested for HIV, by sexual activity in the year preceding the survey.

Table 1.1 Proportion of interviewed women age 15-49 and men age 15-59 who tested positive for HIV, by sexual activity status, Ghana 2003

	Women		Men	
Sexual status	Percentage HIV positive	Number	Percentage HIV positive	Number
Never had sex	0.0	790	0.2	1,033
All sexually experienced respondents	3.2	4,499	2.1	3,232
Sexually experienced but not in past year	3.3	904	2.2	442
Sexually active in past year	3.5	3,592	2.1	2,787
Total	2.7	5,289	1.6	4,265

[1] Only three men who reported never having sex were HIV positive. Two of these men were in the 15-19 age group and the third was in the 35-39 age group.

Figure 1.1 Distribution of Eligible Respondents by Interview and HIV Testing Status, and by Sexual Activity in the Past Year



1.2.2 Variables

The primary outcome or dependent variable in this analysis was HIV serostatus. Three groups of independent variables were examined: sociodemographic characteristics (referred to as background characteristics in the 2003 GDHS final report), HIV/AIDS-related knowledge and attitudes, and HIV/AIDS-related sexual behavior. The sociodemographic variables examined were age, marital status, place of residence (categorized as urban or rural), region of residence, education, current employment

status, household wealth index (by quintile), religion, and mobility.[2] For the purposes of this analysis, people in cohabitating relationships are considered "married." Male circumcision was included as a sociodemographic variable because it is a social practice and not necessarily a personal, voluntary behavior. Prior HIV testing was also considered to be a background characteristic because it could affect knowledge, attitudes, and behavior.

The knowledge and attitude variables examined included: familiarity with AIDS, knowledge of HIV transmission methods, accepting attitudes toward PLWHA, and attitudes toward negotiating safer sex with husband.

The sexual behavior variables that were examined as factors potentially associated with HIV infection included primary and secondary abstinence, having more than one sexual partner, higher risk sex,[3] condom use, cross-generational sex, paid sex, and STI symptoms and treatment.

Additional analyses were done to look at the relationship between knowledge of abstinence, be faithful, and condom use (ABC) prevention methods and their related behaviors, and between HIV counseling and testing and ABC knowledge and behavior.

1.2.3 Analysis Methods

All estimates are weighted to be nationally representative (according to 2003 GDHS protocol) except where specifically stated. The two-stage cluster sample design was taken into account when calculating confidence intervals and all chi-square statistics for the bivariate analysis. The bivariate analysis was conducted using STATA version 8.1 and the multivariate analysis was conducted using SPSS release 11.0.1.

As in the 2003 GDHS final report, descriptive statistics were used to examine the bivariate relationships between HIV serostatus and sociodemographic characteristics as well as knowledge, attitudes, and sexual behavior variables. To determine statistical significance, $\boldsymbol{X^2}$ tests were used and their associated *P* values ($p<.05$ was considered statistically significant) are reported.

In the multivariate analysis, the authors examined the nature and strength of the association between knowledge, attitudes, and behavior variables and HIV serostatus, while controlling for the effects of background sociodemographic characteristics. Because the dependent variable, HIV serostatus, is a dichotomous/binary variable, logistic regression was used. In a hierarchical/sequential approach, blocks of variables (e.g., sociodemographic characteristics, and knowledge, attitudes, and behavior variables) were added in steps so as to determine the strength of each set. The overall fit of the model to the data was assessed with the maximum log likelihood ratio $\boldsymbol{X^2}$ statistics associated with the addition of that component. To facilitate interpretation, the logistics coefficients are presented as odds ratios (ORs). The OR gives an estimate of the magnitude of the association between the variables being compared. *P* values are calculated to identify the associations that are statistically significant ($p<.05$ was considered statistically significant).

[2] Two variables were used to examine mobility: 1) having moved in the past five years to current place of residence and 2) number of times respondent slept away from home in the past year.
[3] Higher risk sex is defined as sex with a nonmarital, noncohabitating partner.

2 ASSESSMENT OF 2003 GHANA DHS HIV DATA

Population-based seroprevalence surveys such as the 2003 Ghana Demographic and Health Survey (2003 GDHS) complement existing methods for estimating prevalence in the general population. During the 2003 GDHS, 89 and 80 percent of interviewed women and men, respectively, provided a sample for HIV testing. Of these, 2.7 percent of the female samples tested positive for HIV, a rate much lower than the published estimate of 3.6 percent published in the *HIV Sentinel Survey Report 2003* (GHS, 2004). This chapter aims to look at some issues related to compatibility between the results of the 2003 GDHS and the results of the antenatal care (ANC) sentinel surveillance. It will also examine whether response bias related to participation in the HIV testing component of the survey is evident in the 2003 GDHS.

2.1 Population-based versus ANC Sentinel Surveillance Estimates of HIV Prevalence

National HIV prevalence estimates in Ghana, as in most African countries, have been derived mainly from testing pregnant women who receive antenatal care at selected sentinel surveillance sites. Although the information from the ANC surveillance system has been found to be very useful for monitoring trends in HIV levels, it has several limitations. These limitations include the following:

i. ANC surveillance data do not capture information on HIV prevalence in nonpregnant women, nor in women who either do not attend a clinic for pregnancy care or receive ANC at facilities not represented in the surveillance system.
ii. Pregnant women are at a higher risk for HIV infection than women who may be avoiding both HIV and pregnancy through the use of condoms, or women who are less sexually active and are, therefore, less likely to become pregnant or to expose themselves to HIV.
iii. There may be biases in the ANC surveillance data because HIV infection reduces fertility and because knowledge of HIV status may influence fertility choices.
iv. The rates among pregnant women may not be a good proxy for male HIV rates. A World Health Organization (WHO) study of four cities in sub-Saharan Africa has shown a higher risk overall in women compared with men (Buve et al., 2001).
v. In a generalized epidemic, antenatal data tend to overestimate infection in younger age groups, while underestimating infections at older ages.
vi. ANC surveillance data is less accurate for estimating prevalence in rural communities because of the low number of rural antenatal sites.
vii. Nonresponse is not an issue for ANC sentinel surveillance because the blood is tested anonymously (though a woman could refuse to give blood) (Boerma et al., 2003).

Population-based surveys are, therefore, valuable additions to the surveillance system and complement ANC sentinel surveillance data because they provide nationally representative data from both pregnant and nonpregnant women, men, and rural residents. A comparison should be done with caution. The objective of the 2003 GDHS was not to validate ANC sentinel surveillance data, and this influences our ability to draw conclusions for this subgroup. While the 2003 GDHS estimate for all women (Table 1.1) is precise, 2.7 percent with a confidence interval (CI) of 2.2 to 3.2 percent, as Table 2.1 indicates, the relatively small number of pregnant women (414) results in a much wider confidence interval around the HIV prevalence estimate of 3.6 percent for pregnant women (CI: 2.1, 6.2). Despite not being a validation tool, the prevalence rate of 3.6 percent among pregnant women at the ANC sentinel surveillance sites reported by the GHS National AIDS/STI Control Programme in 2003 (GHS, 2003) falls within the confidence interval of the 2003 GDHS estimate.

Table 2.1 Prevalence of HIV among pregnant respondents age 15-49, 2003 GDHS and ANC sentinel surveillance sites

	2003 GDHS		2003 ANC sentinel surveillance	
Age	HIV prevalence (%)	Samples tested	Median HIV prevalence (%)	Samples tested
15-19	7.3[a]	49	1.1	1,499
20-24	2.0	101	3.0	3,699
25-29	4.0	104	3.8	3,819
30-34	1.0	75	4.2	2,708
35-39	5.3	59	3.7	1,335
40-44	--	18	0	324
45-49	--	8	0	43
Total	3.6	414	3.6	13,427

[a] Estimate for this age group is based on fewer than 50 unweighted cases.

The comparison shows that the 2003 GDHS and the 2003 ANC sentinel surveillance data are comparable for pregnant women. This may be because in Ghana coverage of ANC services is quite high. Of the female respondents who reported a live birth in the five years before the survey, 93 percent reported at least one ANC visit for their last pregnancy (GSS et al., 2004).

2.2 Rates for HIV Testing in the 2003 GDHS

When deriving national HIV prevalence estimates from 2003 GDHS data, nonresponse was taken into account when weighting the data. Overall, response rates for HIV testing during the 2003 GDHS were very high—93.1 percent of women and 85.1 percent of men provided a blood sample for HIV testing. To determine whether predicted prevalence among the nontested group was different from that of the tested group and to rule out response bias, a series of analyses were done to examine nonresponse bias. HIV testing rates were analyzed by 1) sociodemographic characteristics, 2) sexual activity status, and 3) prior HIV testing.

2.2.1 HIV Testing Rates by Sociodemographic Characteristics

Table 2.2 shows the response rates for HIV testing during the survey by sociodemographic characteristics. Among women, HIV testing rates did not vary significantly by marital status, religion, or knowledge of HIV status from test results in the past 12 months. However, women in rural areas, those in the Western, Central, and Volta regions, and those in the middle wealth quintile were more likely to provide blood samples for HIV testing during the 2003 GDHS. Also, women age 45-49 were more likely to be tested for HIV during the 2003 GDHS.

Table 2.2 Percentage of interviewed women age 15-49 and men age 15-59 tested for HIV, by background characteristics (weighted), Ghana 2003

Background characteristic	Women			Men		
	Percentage tested	Number	p-value	Percentage tested	Number	p-value
Age			0.03			<0.01
15-19	94.2	1,109		89.0	1,093	
20-24	94.4	993		84.8	690	
25-29	93.9	963		83.7	725	
30-34	91.7	816		82.6	627	
35-39	93.7	721		82.2	517	
40-44	91.2	571		81.9	409	
45-49	95.6	501		86.7	438	
50-54	na	na		83.0	299	
55-59	na	na		83.0	198	
Marital status			0.38			0.01
Never married	93.4	1,500		85.8	1,995	
Formerly married	92.6	497		76.5	287	
Monogamous	94.2	2,744		85.1	2,304	
Polygamous	92.6	931		83.5	410	
Residence			0.04			<0.01
Urban	92.6	2,362		80.1	1,890	
Rural	94.5	3,310		88.6	3,106	
Region			<0.01			<0.01
Western	97.3	524		84.1	457	
Central	96.4	352		96.1	300	
Greater	93.1	824		75.0	616	
Volta	95.9	442		86.6	386	
Eastern	88.5	505		75.1	450	
Ashanti	95.1	926		89.0	784	
Brong Ahafo	94.7	638		86.7	593	
Northern	90.2	606		90.5	629	
Upper East	91.2	395		84.3	395	
Upper West	88.4	460		81.0	386	
Education			0.10			0.48
No education	92.7	1,914		85.6	1,115	
Primary	95.2	1,108		85.9	847	
Secondary	93.5	2,650		84.3	3,036	
Currently employed			0.94			<0.01
No	93.5	1,353		87.9	1,160	
Yes	93.6	4,314		83.8	3,833	
Wealth index (quintile)			0.02			<0.01
Lowest	93.2	1,335		89.1	1,219	
Second	94.9	996		90.0	950	
Middle	95.7	989		86.8	879	
Fourth	93.4	1,078		83.9	904	
Highest	91.6	1,274		76.9	1,044	
Religion			0.93			0.99
None/Traditional	92.0	512		84.9	669	
Catholic	93.6	903		85.1	793	
Protestant	93.7	3,244		84.6	2,490	
Muslim	93.8	1,011		85.0	1,039	
Received HIV test results in the past 12 months			0.60			<0.01
No	93.5	5,502		85.1	4,825	
Yes	96.7	120		73.4	140	
Total	93.6	5,672		84.5	4,996	

na = Not applicable

Compared with interviewed women, interviewed men were less likely to be tested for HIV, and HIV testing rates varied by multiple sociodemographic characteristics. Among men, participation in HIV testing varied significantly by age, marital status, place of residence, region, employment status, wealth, religion, and by whether they had been tested for HIV and received the results of the test in the past 12 months. Young men (age 15-19) were most likely to have been tested for HIV (89 percent). Formerly married men were significantly less likely to have been tested for HIV during the survey compared with never married and currently married men. As with women, men in rural areas were more likely to be tested for HIV than those in urban areas. In the Central, Ashanti, and Northern regions, men were also more likely to be tested for HIV, while those living in the Greater and Eastern regions were less likely. Male respondents who were not employed were more likely to be tested, and male respondents living in housholds in the highest wealth quintile were the least likely to have been tested for HIV compared with those in other wealth quintiles. Men who had been tested for HIV and received the results in the past 12 months were significantly less likely to have had a blood sample tested for HIV compared with those who had not been tested in the past year.

2.2.2 HIV Testing Rates by Sexual Activity Status

Because sexual activity is a major risk factor for HIV infection in Ghana, the sexual activity status of respondents who were tested for HIV and those who were not were compared. Table 2.3 shows the distribution of respondents by their sexual activity and whether or not they were tested for HIV. Whereas the differences in sexual activity between women who were and were not tested for HIV was not significant, there was a significant difference for the men ($p<.01$). A greater proportion of men who were not tested were sexually active in the past year than those who were tested.

Table 2.3 Percent distribution of interviewed women age 15-49 and men 15-59 by whether they were sexually active in the past year, according to whether or not a blood sample was tested for HIV during the 2003 GDHS

	Women			Men		
Sexual activity status	Sample tested (%)	Sample not drawn (%)	p-value	Sample tested (%)	Sample not drawn (%)	p-value
Never had sex	16	16	0.54	24	18	<.01
Had sex, but not in the past year	16	19		10	11	
Sexually active in the past year	68	66		66	70	
Total	100	100		100	100	
Number	5,294	375		4,264	728	

2.2.3 Testing for HIV by Prior Knowledge of HIV Status

A hypothesis explaining the refusal to be tested during the 2003 GDHS is that people who know that they are HIV positive may not consent to being tested. Though respondents were not asked whether they were HIV positive or not, they were asked if and when they had been tested for HIV and whether they had received those results. Table 2.4 shows the proportion of women and men who had an HIV test in the 12 months preceding the 2003 GDHS and received the results of that test, by whether or not they were tested in the 2003 GDHS.

Table 2.4 Percentage of interviewed women age 15-49 and men age 15-59 who had an HIV test and received the results in the past 12 months, by whether or not they were tested for HIV during the 2003 GDHS

	Women			Men		
	Percentage tested	Percentage not tested	p-value	Percentage tested	Percentage not tested	p-value
Received HIV test results in past 12 months	2	1	0.18	3	6	<.01
Number	5,250	372		4,239	726	

Again there was no difference among women; however, among men, a smaller proportion of men who had knowledge of their HIV status from tests done in the 12 months preceding the survey were tested for HIV in the 2003 GDHS ($p<.01$).

There is evidence to suggest that there is some nonresponse bias in the 2003 GDHS HIV sero-status results for men but not for women. Not only were there differences in a variety of socio-demographic characteristics between men who were tested for HIV and those who were not, men who were tested were more likely to have never had sex and less likely to have prior knowledge of their HIV status. Despite these differences in response rates, the proportion of men who were not tested is relatively small and the HIV prevalence for men may not be affected.

In a comparative analysis of the effects of nonresponse on HIV prevalence estimates in five DHS countries (Ghana, Kenya, Burkina Faso, Tanzania, and Cameroon), Mishra and others (2005) estimated predicted prevalence among nontested men and women based on information on those who were tested and found that in Ghana nontested men were somewhat more likely to be HIV infected (1.9 percent) than men who were tested (1.6 percent), but there was no such bias for nontested women. If anything, the nontested women had a somewhat lower predicted prevalence (2.4 percent) than women who were tested (2.7 percent). The overall effect of nonresponse on the national HIV prevalence estimates based on the tested individuals was small. The adjusted prevalence (a weighted average of the prevalence levels in the tested and the nontested) was 1.7 percent among men and 2.7 percent among women.

In a more refined analysis, Mishra and others (2005) also looked at "nontested interviewed" and "nontested noninterviewed" groups separately. For the nontested noninterviewed group, the predicted prevalence was based only on the variables in the household file, but for the nontested interviewed group they also included the individual-level risk factors. The three categories—tested, nontested non-interviewed, and nontested interviewed—were then combined to obtain the overall adjusted prevalence for men and women. Even after this more refined adjustment, the basic premise remained unchanged. The overall adjusted prevalence levels come out to be the same as those from the simpler analysis.

3 SOCIODEMOGRAPHIC CHARACTERISTICS AND HIV SEROSTATUS

The 2003 Ghana Demographic and Health Survey (2003 GDHS) final report presented the results of HIV prevalence by background characteristics for all respondents who were tested for HIV (GSS et al., 2004: Table 13.4). These background or sociodemographic characteristics included age, marital status, place of residence, education, employment, wealth index, and mobility. In the first section of this chapter, the results of a bivariate analysis of HIV-positive serostatus among sexually experienced respondents by these sociodemographic characteristics are presented. Types of employment were also explored for significant associations with HIV serostatus.

In the second section of this chapter, prior HIV testing and receipt of results are examined in relation to HIV serostatus. Whereas sociodemographic characteristics may explain HIV serostatus and related knowledge, attitudes, and behavior, prior HIV testing and receipt of results are unlikely to explain HIV serostatus but may be related to knowledge, attitudes, and behavior in that the counseling will affect these attributes irrespective of the test results.

3.1 HIV Serostatus by Sociodemographic Factors

Table 3.1 presents the results of the bivariate analysis of sociodemographic characteristics and HIV serostatus among sexually experienced women and men. Overall, 3.2 percent of sexually experienced women age 15-49 and 2.1 percent of sexually experienced men age 15-59 tested positive for HIV.

Among sexually experienced women and men, age, marital status, wealth index (women only), and region of residence (women only) are the only sociodemographic variables that are significantly associated with HIV serostatus. As seen in Figure 3.1, the proportion of women and men infected with HIV is not evenly distributed by age group. For women it peaks at age 35-39 and for men age 40-44. Given the lag time between infection and death, the women and men in these peak age groups were probably infected during their early to mid-30s.

Formerly married women and men in the 2003 GDHS had the highest rates of HIV infection. It is likely that some of the formerly married respondents are AIDS widows and widowers. However, there is also the possibility that, among women at least, being formerly married, because of death or divorce, increases their vulnerability to HIV infection by placing them in positions where they may be sexually exploited.

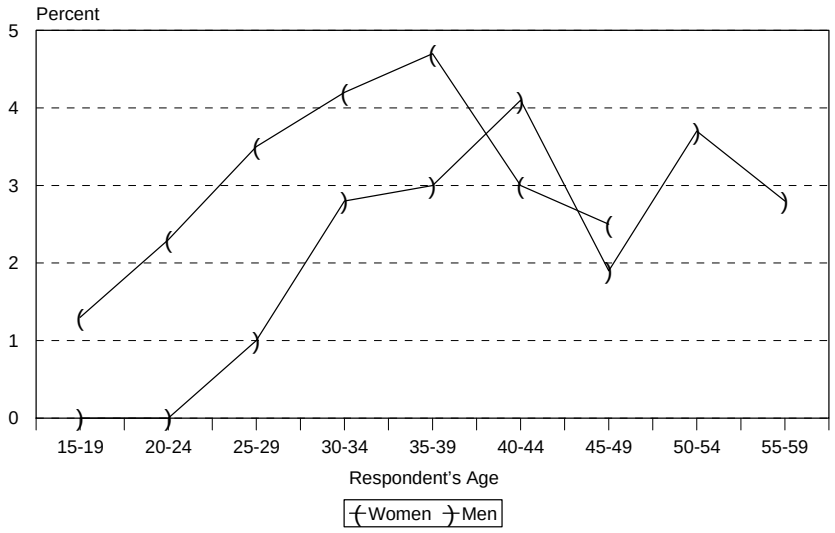
Wealth index and region of residence were significantly associated with HIV serostatus for women though not significantly for men. Women in households in the middle wealth quintile were most likely to be HIV positive (4.5 percent). A greater proportion of women living in Eastern (5.0 percent), Western (4.7 percent), and Brong Ahafo (4.4 percent) were HIV positive. Antenatal care (ANC) sentinel surveillance data support some of these findings. A high prevalence rate (above 5 percent) was observed in 2003 at the ANC sentinel site in Eikwe, a rural community in the Western region (GHS, 2003:23). ANC sentinel surveillance shows that between 1999 and 2003 HIV prevalence doubled at the Wenchi site in Brong Ahafo region (GHS, 2003:18).

Table 3.1 Percentage of sexually experienced women age 15-49 and men 15-59 who tested positive for HIV, by sociodemographic characteristics, 2003 GDHS

Background characteristic	Women			Men		
	Percentage HIV positive	Number	p-value	Percentage HIV positive	Number	p-value
Age			0.04			<0.01
15-19	1.3	403		0.0	177	
20-24	2.3	803		0.0	415	
25-29	3.5	884		1.0	567	
30-34	4.2	745		2.8	522	
35-39	4.7	671		3.0	424	
40-44	3.0	516		4.1	340	
45-49	2.5	477		1.9	380	
50-54	na			3.7	244	
55-59	na			2.8	163	
Marital status			<0.01			<0.01
Never married	2.5	605		0.3	697	
Formerly married	6.1	450		3.1	221	
Monogamous	2.8	2,575		2.6	1,971	
Polygamous	3.4	859		2.2	343	
Residence			0.52			0.81
Urban	3.7	1,706		2.0	1,129	
Rural	2.8	2,793		2.1	2,103	
Region			<0.01			0.48
Western	4.7	425		1.8	307	
Central	2.0	292		2.0	214	
Greater	3.4	591		2.2	366	
Volta	2.0	370		1.1	259	
Eastern	5.0	392		4.0	270	
Ashanti	3.6	741		1.8	542	
Brong Ahafo	4.4	521		2.3	379	
Northern	1.0	504		0.9	433	
Upper East	1.0	312		2.8	244	
Upper West	2.4	351		2.4	218	
Education			0.06			0.35
No education	2.3	1,679		1.4	833	
Primary	3.9	886		2.8	463	
Secondary	3.5	1,934		2.2	1,936	
Currently employed			0.86			0.20
No	3.1	695		1.1	325	
Yes	3.2	3,799		2.2	2,906	
Wealth index (quintile)			0.02			0.85
Lowest	1.5	1,112		1.6	801	
Second	3.0	857		2.3	657	
Middle	4.5	821		2.6	580	
Fourth	3.6	834		2.0	572	
Highest	3.2	875		1.9	622	
Religion			0.21			0.56
None/Traditional	1.5	445		2.7	474	
Catholic	3.8	689		1.3	512	
Protestant	3.4	2,550		2.3	1,586	
Muslim	2.8	813		1.8	658	
Moved in the past five years			0.71			0.06
No	3.3	3,309		1.8	2,558	
Yes	3.0	1,129		3.1	648	
Number of times slept away from home in the past year						0.44
None	na			2.4	1,204	
1-2	na			1.5	761	
3-4				1.5	545	
5 or more				2.4	711	
Circumcision						0.70
No	na			1.8	238	
Yes	na			2.1	2,994	
Total	3.2	4,499		2.1	3,232	

na = Not applicable

Figure 3.1 HIV Prevalence by 5-year Age Groups, Ghana 2003



Various reasons have been suggested for the high prevalence of HIV/AIDS in different regions. For example, some parts of the Eastern region include high rates of in-migration and out-migration (CHUS, 2003), which may contribute to HIV transmission. The Western region is noted for its mining towns, which attract migrant and temporary workers. Both the Western and Brong Ahafo regions are on the border with Côte d'Ivoire, a country with high HIV prevalence (6.4 percent in Abidjan in 2002) (UNAIDS, 2004:28). The Western region has areas known for having a high volume of human movement through transborder trading activities with Côte d'Ivoire (GHS, 2003:23). The lack of significant findings for men may be because of nonresponse bias (described in Chapter 2). For example, men in the Eastern region had one of the lowest rates of HIV testing (75 percent) in the 2003 GDHS; nationally, the range was from 75.0 to 96.1 percent (Table 2.2).

Respondents in the 2003 GDHS were asked to state their occupation, allowing for a comparison of HIV prevalence by occupation. More than 100 occupations were mentioned, some of which were practiced by only a few respondents. This made it impossible to calculate prevalence for all the occupations mentioned. Table 3.2 presents prevalence data by occupation for categories mentioned by 25 or more respondents. The only significant association found is that compared with sexually experienced women in the other occupation categories examined, a significantly higher proportion of women working as proprietors were HIV positive (4.6 percent). Among men, there were no differences in HIV serostatus by the occupations examined.

Many studies have linked the spread and diffusion of HIV/AIDS to migratory processes. Population mobility or migration has been found to facilitate partner change and introduction of new infections into less mobile populations. In its various forms (permanent, seasonal, circular) population migration may be a risk factor for HIV infection. Prothero (1977, 1994, 1996), for example, has reported significant interactions between disease and population mobility in tropical Africa in recent decades. Similarly, Hunt (1996) points to migration as a key predictor for the higher AIDS prevalence rates in the African countries with a higher concentration of labor migrants. Konotey-Ahulu (1989) reports that at the early stages of the AIDS epidemic in Ghana in the mid-1980s most of the people identified as HIV carriers had a history of migration. In Uganda and Burkina Faso, Wawer and others (1991) linked truck drivers (who got infected through contacts with sex workers) to the spread of AIDS to their partners (girlfriends and wives).

Table 3.2 Percentage of sexually experienced women age 15-49 and men age 15-59 who tested positive for HIV, by occupation, 2003 GDHS

	Women			Men		
Occupation	Percentage HIV positive	Number	p-value	Percentage HIV positive	Number	p-value
Not currently employed	3.1	695	0.86	1.1	325	0.20
Teachers	5.1	65	0.43	1.6	141	0.70
Working proprietors	4.6	619	0.03	4.9	64	0.15
Salesman/shop assistant	8.1	30	0.10	--	0	--
Retail market traders	3.4	116	0.90	--	0	--
Sales workers unclassified	3.4	308	0.87	1.8	54	0.88
Cooks/waiters/bartenders	4.2	71	0.50	--	0	--
Security watchmen	--	0	--	4.8	46	0.25
Hairdressers/barbers	3.6	165	0.79	--	0	--
Farmers	2.5	1,592	0.08	2.3	1,614	0.51
Agriculture/animal husbandry	--	0	--	2.2	27	0.97
Fisherman/hunters	1.6	72	0.32	2.4	97	0.83
Spinners/weavers/knitters	--	0	--	0.0	25	0.64
Food/beverage processing	2.7	373	0.60	--	0	--
Tailors/dressmakers	1.9	226	0.21	0.0	47	0.36
Machinery fitters/precision	--	0	--	0.0	56	0.35
Electrical fitters	--	0	--	0.0	45	0.35
Plumbers/welders	--	0	--	0.0	37	0.41
Bricklayers/carpenters/other construction	--	0	--	1.3	148	0.51
Transportation equipment	--	0	--	3.8	143	0.14
Laborers (unclassified)	3.6	26	0.91	2.4	43	0.88

Two variables were used to examine the association between population mobility and HIV serostatus: living in current residence less than five years (women and men) and number of times slept away from home in the past year (men only). In the bivariate analysis, mobility was not associated with HIV serostatus.

A strong association has been found between HIV prevalence and male circumcision (Buve et al., 2001). This association is not seen for sexually experienced Ghanaian men age 15-59, most likely because so few men are uncircumcised. Only 8 percent of men tested for HIV in the 2003 GDHS were uncircumcised (data not shown).

3.2 HIV Serostatus by Prior HIV Testing and Receipt of Results

The relationship between HIV serostatus in the 2003 GDHS and knowledge of serostatus from tests done in the 12 months preceding the survey is shown in Table 3.3. Prevalence is significantly higher among women who know their status from HIV tests conducted in the 12 months before the survey than women who did not. In contrast, none of the men who had prior knowledge of their HIV status tested positive in the 2003 GDHS.

Table 3.3 Percentage of sexually experienced women age 15-49 and men age 15-59 who tested positive for HIV in the past 12 months, by whether they received the test results, 2003 GDHS

	Women			Men		
Received HIV test results	Percentage HIV positive	Number	p-value	Percentage HIV positive	Number	p-value
			<0.01			<0.01
No	2.6	4,345		2.2	3,111	
Yes	8.1	109		0.0	96	

Table 3.4 shows HIV prevalence rates according to the reasons respondents gave for being tested (without necessarily receiving the results). While there are no significant differences among men by reasons for HIV testing, women who asked for the test were significantly more likely to be HIV infected.

Table 3.4 Percentage of sexually experienced women age 15-49 and men age 15-59 who tested positive for HIV in the past 12 months, by reason for being tested, 2003 GHDS

	Women			Men		
Reason for being tested for HIV	Percentage HIV positive	Number	p-value	Percentage HIV positive	Number	p-value
			0.23			0.94
Asked for the test	6.3	143		1.6	146	
Test was offered	5.2	216		1.4	98	
Test was required	2.0	122		2.2	84	

Note: Among those who were ever tested, estimates are weighted, but standard errors were not adjusted for the sample design when calculating the chi-square statistic.

Counseling and testing is the initial step in identifying pregnant women who are HIV positive and eligible for interventions to reduce mother-to-child transmission of HIV. During the 2003 GDHS, women who had had a live birth in the past five years and who attended ANC for the most recent birth were asked if they had been tested for HIV when they received antenatal care for their most recent birth. Twelve percent of women who had a live birth in the five years preceding the survey had been tested for HIV. Though more women who indicated that they had been tested for HIV during ANC were HIV positive (3.1 percent) than women who were not tested for HIV during ANC (2.3 percent), the difference is not statistically significant (Table 3.5). The relatively small number of pregnant women tested during ANC may have limited our ability to detect a significant difference.

Table 3.5 Percentage of women age 15-49 who are HIV positive by whether they were tested for HIV during antenatal care for the last pregnancy in the past five years that resulted in a live birth, 2003 GDHS

Tested for HIV during ANC	Percentage HIV positive	Number	p-value
			0.27
No	2.3	1,864	
Yes	3.1	266	
Don't know	0.4	69	

Note: Among those who were tested, estimates are weighted, but standard errors were not adjusted for the sample design when calculating the chi-square statistic.

4 KNOWLEDGE AND ATTITUDES ABOUT HIV/AIDS AND HIV SEROSTATUS

General awareness of HIV/AIDS in Ghana is high. More than 98 percent of all respondents have heard of HIV/AIDS. About 37 percent of women and 38 percent of men know someone with the disease (GSS et al., 2004).

The ABC (abstinence, be faithful to one uninfected partner, condom use) prevention methods are promoted in Ghana to reduce the risk of HIV infection. Knowledge of these prevention methods is quite high among the general population. In response to prompted questions, 79 percent of women and 83 percent of men know that abstinence can reduce the risk of becoming infected. Eighty-six percent of women and 90 percent of men know that being faithful to one uninfected partner reduces the risk of HIV infection, and 73 and 82 percent, respectively, know that use of condoms is a way to reduce the risk of HIV infection (GSS et al., 2004).

Whereas knowledge of HIV prevention is high, HIV/AIDS-related attitudes are mixed. For instance, in the general population, only 26 percent of women and 36 percent of men would buy fresh vegetables from a vendor with AIDS (GSS et al., 2004). The 2003 GDHS provides evidence of positive attitudes about a woman's right to refuse sex or propose condom use. Among women, 86 percent said that a woman has the right to refuse sex with her husband if she believes that he has a sexually transmitted infection (STI). Among men, 97 percent said that a woman has the right to either refuse sex or propose condom use in the same situation (GSS et al., 2004). The following sections explore the relationship between these and other knowledge and attitude variables and HIV prevalence in sexually experienced respondents to the 2003 GDHS. The last section attempts to determine if HIV testing is related to HIV knowledge and attitudes because of the emphasis on counseling with HIV testing.

4.1 Awareness of HIV and AIDS

This analysis showed no significant difference in the proportion of women and men who are HIV positive by whether they know someone who is living with HIV or who has died of AIDS (data not shown).

4.2 Knowledge of HIV Prevention Methods

Besides examining knowledge about the ABC prevention methods, international indicators of HIV knowledge examine incorrect knowledge about HIV transmission (mosquito and casual contact). This analysis showed that there is no statistically significant difference in HIV prevalence among the sexually experienced respondents tested, by whether they had correct knowledge of transmission methods and whether they reject common misconceptions (data not shown).

4.3 Attitudes toward Sexual Negotiation

People's ability to negotiate safer sex practices with their partners is a vital link in the prevention of HIV transmission. To examine attitudes of people toward negotiating safer sex in Ghana, both women and men were asked if they think a woman is justified in refusing to have sex with her husband if she suspects he has an STI. When this is examined in relation to HIV serostatus (Table 4.1), HIV prevalence among respondents who believe that a woman can refuse sex if she suspects her husband has an STI compared with those who do not believe in such a statement is not significantly different for women but it is for men. A higher proportion of men who agreed with the statement were HIV positive (2.3 percent) compared with men who did not agree with the statement (0 percent).

Table 4.1 Percentage of sexually experienced women age 15-49 and men age 15-59 who are HIV positive by attitudes toward a woman's right to refuse sex or negotiate condom use if she suspects that her husband has an STI, 2003 GDHS

Attitudes toward a woman's right to refuse sex or negotiate condom use	Women			Men		
	Percentage HIV positive	Number	p-value	Percentage HIV positive	Number	p-value
Believes a woman can refuse sex if she suspects her husband has an STI			0.17			0.03
No	4.2	605		0.0	257	
Yes	3.1	3,893		2.3	2,974	
Believes a wife is justified in asking her husband to use a condom if she suspects he has an STI						0.73
No	na			1.7	249	
Yes	na			2.1	2,960	

Note: Those who responded "don't know" to the prompted question were classified as not believing that a woman had the right to refuse sex or negotiate condom use if she suspected that her husband had an STI.
na = Not applicable

4.4 Accepting Attitudes toward People Living with HIV/AIDS

Stigma and discrimination associated with HIV/AIDS influence how people living with and affected by HIV/AIDS are treated in society. As Wood and Aggleton have aptly stated, "A stigmatizing social environment poses barriers to HIV prevention and care at many different levels by virtue of being, by definition, a non-supportive environment" (Wood and Aggleton, 1999:7). An examination of the association between HIV serostatus and answers to four questions related to HIV/AIDS stigma and discrimination found that HIV prevalence among sexually experienced women and men with accepting attitudes toward people living with HIV/AIDS compared with those who do not have accepting attitudes was not statistically different (data not shown).

4.5 Knowledge of ABC Prevention Methods and HIV Testing

During the 2003 GDHS, respondents were asked whether they had ever been tested for HIV. Because voluntary counseling and testing (VCT) is an integral part of HIV testing, it provides an opportunity to educate respondents about HIV prevention methods and stigma and discrimination associated with HIV. However, in reality the quality of counseling varies. This section explores the existence of any association between HIV testing (regardless of whether or not the test results were obtained) and HIV-related knowledge and attitudes.

Table 4.2 shows that there are significant associations between HIV testing outside of the 2003 GDHS and knowledge of the ABC prevention methods. Sexually experienced women age 15-49 who had ever been tested for HIV were more knowledgeable about abstinence, limiting sex to one uninfected partner, and condom use for infection prevention compared with those that had never been tested. Among women who were sexually active in the year preceding the survey, HIV testing was also associated with greater knowledge of use of condoms for HIV prevention. On the other hand, sexually experienced men who had been tested for HIV were only more knowledgeable about limiting sex to one uninfected partner.

Table 4.2 Percentage of sexually experienced women age 15-49 and men age 15-59 that have correct knowledge of methods of HIV/AIDS prevention, by whether they have ever been tested for HIV, 2003 GHDS

	Women			Men		
Correct knowledge of HIV/AIDS prevention	Had HIV test (%)	Did not have HIV test (%)	p-value	Had HIV test (%)	Did not have HIV test (%)	p-value
Knows that AIDS can be avoided by abstaining from sex	83.1 (n=488)	79.1 (n=3,911)	0.05	86.6 (n=332)	84.5 (n=2,877)	0.41
Knows that AIDS can be avoided by limiting sex to one uninfected partner	93.7 (n=488)	86.7 (n=3,914)	<0.01	98.2 (n=332)	92.0 (n=2,879)	<0.001
Knows that AIDS can be avoided by using condoms	80.7 (n=488)	73.0 (n=3,912)	<0.01	88.6 (n=332)	84.6 (n=2,879)	0.06
Knows that AIDS can be avoided by using condoms[1]	81.5 (n=406)	74.1 (n=3,116)	<0.01	88.3 (n=300)	85.1 (n=2,474)	0.19

[1] Sexually active respondents

Table 4.3 shows that the relationships between HIV-related attitudes and HIV testing are not as strong. Sexually experienced women who had gone for testing were significantly more willing to care for an HIV-positive family member and also more likely to have accepting attitudes toward female teachers with HIV. Men who had gone for an HIV test were more likely to say they would buy food from an HIV-positive vendor.

Table 4.3 Percentage of sexually experienced women age 15-49 and men age 15-59 who have positive attitudes toward people living with HIV/AIDS and women's rights to sexual negotiation, by whether they have ever been tested for HIV, 2003 GDHS

	Women			Men		
Positive attitudes	Had HIV test (%)	Did not have HIV test (%)	p-value	Had HIV test (%)	Did not have HIV test (%)	p-value
Would not want HIV positive family member to keep diagnosis a secret	62.3 (n=488)	61.2 (n=3,913)	0.66	69.9 (n=332)	70.6 (n=2,878)	0.80
Willing to care for an HIV-positive family member	72.1 (n=488)	66.8 (n=3,915)	0.04	72.0 (n=332)	71.7 (n=2,880)	0.92
Believes a female HIV-positive teacher should continue teaching	42.7 (n=488)	34.4 (n=3,913)	<0.01	52.3 (n=332)	47.8 (n=2,881)	0.16
Would buy food from an HIV-positive food vendor	27.7 (n=488)	23.9 (n=3,914)	0.10	44.7 (n=332)	35.3 (n=2,881)	<0.01
Believes a woman can refuse sex if she suspects her husband has an STI	87.5 (n=488)	86.5 (n=3,913)	0.54	93.3 (n=332)	92.2 (n=2,881)	0.49

One of the limitations of this cross-sectional data set is that it is not possible to determine whether the knowledge and attitudes associated with HIV testing were acquired before or after the HIV testing occurred. However, our results indicate that more knowledgeable people and those with more positive attitudes are more likely to get tested.

5 SEXUAL BEHAVIOR AND HIV SEROSTATUS

The promotion of safe sexual behaviors is an important component of Ghana's HIV/AIDS prevention programme. As the 2003 GDHS shows, knowledge of methods of HIV prevention, particularly abstinence, being faithful to one uninfected partner, and condom use, is relatively high in Ghana. However, the link between this knowledge and reducing HIV prevalence lies in the adoption of lower risk sexual behaviors. This chapter examines the relationship between knowledge of HIV prevention methods and the practice of preventive behaviors. It answers the key question, "Are people who know how to protect themselves against HIV infection doing so?" It then looks to see if the ABC prevention behaviors—abstinence, be faithful, and condom use—are related to HIV testing. In the final section, the chapter examines the relationship between HIV serostatus and other higher risk sexual behaviors (cross-generational sex, paid sex, and STI symptoms as a marker for higher risk sex). One limitation of this analysis is that the data are cross-sectional and thus do not allow us to examine whether adoption of the behavior occurred before or after the acquisition of knowledge. Similarly, when looking at respondents' serostatus vis-à-vis their behavior, the cross-sectional data does not allow the assessment of which occurred first, the behavior or seroconversion.

5.1 ABC Prevention Knowledge and Behavior

Table 5.1 shows the percentage of women and men who practice ABC methods by whether or not they mentioned these HIV prevention methods when asked what a person can do to avoid getting HIV. There was no difference in abstinence[4] among women by whether or not they knew it reduced their risk of infection, but abstinence was significantly higher among men who did not mention it as a prevention method. These results suggest that men who practiced abstinence may not have been doing so for HIV prevention purposes.

There were no significant differences in the percentage of sexually experienced women and men who had more than one partner in the previous year by whether they knew that being faithful to one partner could reduce their risk of HIV infection.

Among sexually active women and men, there is a significant association between knowledge of condoms and condom use. Sexually active women who mentioned condoms as an HIV prevention method were significantly ($p<0.01$) more likely to have used one at last sex compared with sexually active women who did not mention this prevention method. Among sexually active men, the differences in the percentage who used condoms by whether they had correct knowledge was also highly significant ($p<0.01$). Sexually active men who had correct knowledge about the protection that condoms provide were more than twice as likely to have used one at last sex compared with those who did not have correct knowledge about condoms.

[4] Two variables were used to describe abstinence. Primary abstinence was determined by the age of sexual debut and secondary abstinence by whether or not a person was sexually active in the 12 months preceding the survey.

Table 5.1 Percentage of interviewed women age 15-49 and men age 15-59 who practice preventive behaviors by whether they have correct knowledge that the selected behavior reduces their chances of becoming infected with HIV, 2003 GDHS

	Women			Men		
Correct knowledge of preventive behavior	Percentage HIV positive	Number	p-value	Percentage HIV positive	Number	p-value
Knows abstinence (all respondents)			0.65			0.02
No	32.5	1,066		38.2	721	
Yes	31.7	4,111		33.2	3,496	
Knows limiting sex (being faithful) to one uninfected partner (sexually experienced)			0.06			0.80
No	99.5	589		86.5	280	
Yes	98.6	3,817		87.2	2,931	
Knows condom use (sexually active)			<0.01			<0.01
No	5.3	908		7.5	442	
Yes	9.3	2,618		19.9	2,331	

Note: Respondents who said "don't know" in response to the prompted question were classified as not having correct knowledge about this mode of transmission.

5.2 ABC Prevention Behavior and HIV Testing

The associations between ABC prevention behavior and prior HIV testing were examined. The analysis showed no association between ABC behaviors and HIV testing among both women and men (data not shown).

5.3 ABC Prevention Behavior and HIV Serostatus

5.3.1 Abstinence: Delaying Sexual Debut (Primary Abstinence) and No Sexual Activity in Past 12 Months (Secondary Abstinence)

Because HIV is usually a sexually transmitted infection, abstinence reduces the risk of transmission. Primary abstinence (delaying the age of sexual debut) and secondary abstinence (abstinence among people who are already sexually experienced) are both promoted as HIV prevention messages.

For people not yet sexually active, choosing to abstain will result in later sexual debut, which in Ghana occurs on average at age 18 for females and 20 for males (GSS et al., 2004). Delaying sexual debut reduces the risk of HIV infection by limiting the number of years that a person is at risk of exposure to HIV. It may further reduce the risk of HIV by resulting in fewer lifetime sexual partners. Among sexually experienced women, age at sexual debut is significantly associated with HIV serostatus. Sexually experienced women who became sexually active by age 15 are nearly twice as likely to be infected with HIV compared with those who experienced later sexual debut ($p<0.01$).

Fewer men have experienced sexual debut as early as age 15 or 18 because the median age at first sex among Ghanaian men is 20 years. For this reason, we compared the HIV serostatus of men who

experienced sexual debuted before age 20 with those who became sexually active later. Among men, early sexual debut is not associated with HIV serostatus.

Aside from delaying sexual debut, people who are already sexually experienced may choose to abstain from sex (secondary abstinence), which may reduces their risk of exposure to HIV. HIV prevalence rates among sexually experienced respondents do not differ by whether they were sexually active in the past 12 months (data not shown).

5.3.2 Be Faithful: Multiple Partners and Higher Risk Sex

Being faithful to one partner is another component of the ABC message. This section explores whether respondents who have more than one partner are more likely to be infected and whether sex with nonmarital, noncohabiting partners (referred to as higher risk sex) is associated with HIV serostatus. In the 2003 GDHS only 1 percent of women and 10 percent of men reported having more than one sex partner in the 12 months before the survey (GSS et al., 2004). The analysis shows that respondents with more than one sexual partner in the past 12 months were more likely to report having sex with a nonmarital, noncohabiting partner: about one in five women (21 percent) and almost two in five men (38 percent) (GSS et al., 2004). Among sexually experienced women and men there are no significant associations between being faithful and HIV serostatus, although women who had more than one sexual partner were more likely to be HIV positive (8.2 percent) than women who did not have more than one sexual partner (3.1 percent) (data not shown). However, the difference was only marginally significant.

5.3.3 Condom Use: Condom Use at Last Sex and Condom Use at Last Higher Risk Sex

Condom use is one of the most effective ways to prevent HIV infection and transmission. Table 5.2 presents HIV prevalence rates among sexually active respondents in relation to their condom use. Although there is a clear association between condom knowledge and condom use, there is no difference in HIV serostatus by whether respondents used a condom at last sex. Even among respondents who had higher risk sex, condom use at last sex was not associated with HIV serostatus.

Table 5.2 Percentage of sexually active women age 15-49 and men age 15-59 who are HIV positive, by condom use, Ghana 2003

	Women			Men		
Condom use	Percentage HIV positive	Number	p-value	Percentage HIV positive	Number	p-value
Condom use at last sex with any partner			0.77			0.90
No	3.1	3,315		2.1	2,324	
Yes	3.4	277		2.2	462	
Condom use at last higher risk sex[1]			0.40			0.88
No	4.1	481		1.7	625	
Yes	2.8	190		1.6	415	

[1] Respondents who had at least one nonregular partner in the past 12 months

5.4 Other Sexual Behavior

Besides early sexual debut, frequency of sex, sex with multiple partners, and sex without a condom, other sexual behaviors are also thought to be associated with HIV serostatus. For example, the two-year difference in the average age at sexual debut between women and men suggests that women are more likely to have sex with men older than themselves. This may increase women's risk for HIV infection because older men are more likely than younger men to be HIV infected. Commercial sex is also associated with a high risk of HIV infection. In this section the relationship between HIV serostatus among women and cross-generational sex (i.e., sex with a man at least ten years older), and HIV serostatus among men and sex with commercial sex workers, are examined.

5.4.1 Cross-generational Sex

In the 2003 GDHS cross-generational sex was explored in two ways: women in union were asked the age of their marital/cohabiting partner and young (15-19) sexually active women were asked the age of their last two nonmarital/noncohabitating sexual partners. For the latter group, the number of young women who had older partners was so small that the findings were not significant (data not shown).

5.4.2 Paid Sex

During the 2003 GDHS, sexually active men were asked if they had ever paid for sex and if so, they were asked how long before the survey they last paid for sex. Women were not asked questions about paid sex and, therefore, were excluded from this analysis. The association between paid sex and HIV prevalence for men is presented in Table 5.3. Whereas ever paying for sex was not significantly associated with HIV serostatus for sexually experienced men, there is a highly significant ($p \leq 0.01$) difference in HIV prevalence among sexually active men who reported having paid for sex (7.3 percent) in the past year compared with men who did not report paying for sex recently (1.9 percent).

Table 5.3 Percentage of sexually experienced men age 15-59 who are HIV positive, by whether they reported having paid for sex, Ghana 2003

Payment for sex	Percentage HIV positive	Number	p-value
Ever paid for sex			0.07
No	1.9	2,968	
Yes	3.8	262	
Paid for sex in the past 12 months[1]			<0.01
No	1.9	2,722	
Yes	7.3	65	

[1] Sexually active men

5.4.3 STI Symptoms and Treatment

Having an STI is considered a risk factor for HIV infection and reflects unsafe sexual behaviors (Buve et al., 2001). STI treatment may also be an opportunity for counseling that results in acquisition of knowledge and changes in behavior. An analysis of sexually experienced women and men who are HIV positive by whether or not they reported having an STI or symptoms finds that this relationship is not statistically significant (data not shown).

6 MULTIVARIATE ANALYSIS

The results from the bivariate analyses suggest that several factors are significantly associated with HIV serostatus. Among women, age, marital status, region of residence, and age at sexual debut are associated with HIV serostatus. Being HIV positive is also associated with having received results of an HIV test in the previous year. This would not necessarily lead to HIV infection but may have important effects on knowledge and behavior changes and access to HIV/AIDS-related services. Among men, key factors include age, marital status, and paying for sex in the past year. In this chapter the relationship between HIV serostatus and many of the variables presented in this report are explored using logistic regression analysis. This technique allows us to assess the independent association between each variable and HIV serostatus while controlling for the effects of other variables.

In previous chapters, the analysis was restricted to sexually experienced respondents and in some cases, the analysis was further restricted to respondents who were sexually active in the year preceding the survey. The multivariate analysis focuses on sexually experienced respondents who were tested for HIV during the 2003 GDHS. This forces the exclusion of some behavioral variables (e.g., condom use) from the models because data on these variables were only collected from sexually active respondents. Restricting the models to sexually active respondents would have forced the exclusion of other behavioral variables such as secondary abstinence. Because condom use is such a large component of the ABC strategy (abstinence, be faithful, condom use), the variable condom use at last sex was added to the full model, which was refitted among sexually active respondents (data not shown). Condom use was not significantly associated with HIV serostatus; hence it did not significantly improve the explanatory power of the model and would not have changed the interpretation of the association between other variables and HIV serostatus. Thus, only the models for sexually experienced respondents are presented and discussed.

Tables 6.1 and 6.2 present the odd ratios (ORs) from multivariate logistic regression analysis for HIV serostatus among women and men. An OR gives an estimate of the magnitude of the association between the variables being compared. In this analysis an OR of 1.0 indicates no difference between the variable and HIV serostatus, a ratio below 1.0 indicates a negative association between the variable and being HIV positive, and a ratio above 1.0 indicates a positive association. The first model in each table shows the effects of sociodemographic characteristics (SD), the second shows the effects of knowledge and attitude variables (KA), and the third shows sexual behavior variables (BE). The fourth, fifth, and sixth models are combinations of two of the sets of characteristics (SD+KA, SD+BE, KA+BE), and the seventh shows the full main effects model.

6.1 Women

The first model of sociodemographic characteristics (Table 6.1, column 1) demonstrates that among sexually experienced women, age, marital status, and living in the Eastern region are significantly associated with being HIV positive. When only the knowledge and attitude variables are examined (column 2), none of the knowledge and attitude characteristics are associated with HIV serostatus. Among the behavioral characteristics, having more than one sexual partner and sexual debut before the age of 15 are associated with being HIV positive (column 3).

When the effects of sociodemographic variables are controlled for (columns 4 and 5), there are no changes in the associations between HIV-related knowledge, attitudes, and behavior and HIV serostatus. After controlling for knowledge variables, living in the Western and Brong Ahafo regions becomes significantly associated with being HIV positive, and after controlling for selected sexual behavior variables, younger age (15-19) becomes significantly associated with being HIV negative.

In the fully adjusted model (column 7) when all the variables are included, age, marital status, living in certain regions, knowledge about partner reduction, early sexual debut, and having multiple sexual partners remain significantly associated with HIV serostatus.

Consistent with the bivariate results, women under age 20 are significantly less likely (OR=0.28) to be HIV positive compared with women age 40-44. Though not significant, women age 35-39 have the highest odds of being HIV positive.

Overall, marital status was significantly associated with HIV serostatus, but no specific category of marital status was significant. Compared with women who have never been married or in union, women in a monogamous marriage are 1.4 times more likely to be HIV positive. The bivariate analysis had shown that formerly married women are significantly more likely to be HIV positive than other women. Because age and marital status are correlated, controlling for age seems to weaken the association between any one marital status category and HIV serostatus.

As in the bivariate analysis, there is a statistically significant association between HIV serostatus and region of residence. Women from the Eastern (OR=2.9), Western (OR=2.7), and Brong Ahafo (OR=2.4) regions have significantly higher odds of being HIV positive compared with those from the Volta region (reference category).

The knowledge that having sex with one uninfected partner reduces the risk of HIV infections is associated with being HIV negative in the full model. Women who have this knowledge are less likely to be HIV positive (OR=0.57), even after controlling for sexual behavior characteristics.

Being sexually active by age 15 is the variable most strongly associated with HIV-positive serostatus among women. Even after controlling for age and other sociodemographic characteristics and knowledge and attitude variables, women who have been sexually active by age 15 are 2.4 times more likely to be HIV positive compared with women who experience sexual debut at a later age.

Table 6.1 Adjusted odds ratios (OR) for HIV positive serostatus among sexually experienced women age 15-49, by sociodemographic characteristics, knowledge and attitudes, and behavior indicators, Ghana 2003

Variable	SD (1)	KA (2)	BE (3)	SD & KA (4)	SD & BE (5)	KA & BE (6)	All (7)
SOCIODEMOGRAPHIC (SD)							
Age	†*			**†***	**†***		**†***
15-19	0.36			0.34	0.30*		0.28*
20-24	0.73			0.69	0.69		0.66
25-29	1.29			1.24	1.33		1.28
30-34	1.54			1.48	1.54		1.47
35-39	1.74			1.69	1.73		1.68
40-44 (Reference)	1.00			**1.00**	1.00		**1.00**
45-49	0.78			0.78	0.84		0.83
Marital status	†*			**†***	**†***		**†***
Never married (Reference)	1.00			**1.00**	1.00		**1.00**
Formerly married	0.83			0.87	0.82		0.85
Monogamous	1.37			1.40	1.35		1.37
Polygynous	0.65			0.66	0.66		0.67
Residence	ns			ns	ns		ns
Region							
Western	2.23			2.47*	2.45		2.67*
Central	1.01			1.09	1.10		1.17
Greater Accra	1.77			1.73	1.82		1.77
Volta (Reference)	1.00			**1.00**	1.00		**1.00**
Eastern	2.53*			2.66*	2.79*		2.92**
Ashanti	1.74			1.86	1.83		1.94
Brong Ahafo	2.33			2.45*	2.34		2.44*
Northern	0.55			0.57	0.58		0.63
Upper East	0.49			0.60	0.54		0.64
Upper West	1.24			1.36	1.26		1.34
Education	ns			ns	ns		ns
Employment	ns			ns	ns		ns
Wealth quintile	ns			ns	ns		ns
Religion	ns			ns	ns		ns
Moved in past 5 years	ns			ns	ns		ns
Ever had an HIV test	1.23			1.24	1.24		1.24
KNOWLEDGE AND ATTITUDES (KA)							
Composite knowledge of AIDS		0.77		0.79		0.79	0.83
Knowledge of abstinence		1.13		1.01		1.16	1.01
Knowledge of limiting sex to one uninfected partner		0.7		0.58		0.69	0.57*
Knowledge of condom use		1.25		1.22		1.23	1.19
Attitude to woman's right to refuse sex		0.74		0.78		0.76	0.81
BEHAVIOR (BE)							
Sexual debut by age 15			2.13***		2.36***	2.10***	2.35***
Multiple partners			2.68*		2.80*	2.74*	2.93*
Self-reported STI			1.6		1.59	1.53	1.50
Constant	0.029***	0.037***	0.084***	0.037***	0.11***	0.092***	0.095***
-2 log likelihood	1,126.9	1,208.6	1,203.1	1,117.9	1,109.5	1,193.2	1,100.9
Nagelkerke R Square	0.064	0.005	0.015	0.068	0.081	0.020	0.084

* P value <.05
** P value <.01
*** P value <.001
† = Significant value for entire variable
ns = Not significant

Women who have more than one sexual partner are almost three times as likely to be HIV positive relative to women who have one partner or abstained from sexual intercourse in the previous year.

6.2 Men

Results for sexually experienced men are presented in Table 6.2. Among the sociodemographic characteristics (column 1), age and having moved in the past five years are associated with HIV serostatus. Young men age 15-29 are significantly less likely to be HIV positive than men age 40-44. Compared with men who have lived in their current residence longer than five years, men who have moved in the past five years are more likely to be HIV positive. Among the knowledge and attitudes variables examined none were significantly associated with HIV serostatus (column 2). When only the behavior variables are examined (column 3), men who have paid for sex are more likely to be HIV positive compared with men who have not paid for sex.

When knowledge and attitudes or behavior characteristics are added to sociodemographic characteristics, the strength of the association between age range 15-29 and being HIV negative increases, and having moved in the past five years remains associated and being HIV positive (columns 4 and 5). Once sociodemographic and knowledge and attitude variables are controlled for, the association between HIV serostatus and having paid for sex (column 5) becomes nonsignificant.

In the full model (column 7), even after controlling for all the other factors, age and having moved in the past five years remain significantly associated with HIV prevalence among sexually experienced men. Men age 15-29 are significantly less likely to be HIV positive (OR=0.17) compared with men age 40-44. Men who have moved in the past five years are 2.3 times as likely to be HIV positive as those who have not moved.

Table 6.2 Adjusted odds ratios (OR) for HIV-positive serostatus among sexually experienced men age 15-59, by sociodemographic characteristics, knowledge and attitudes, and behavior indicators, Ghana 2003

Variable	SD (1)	KA (2)	BE (3)	SD & KA (4)	SD & BE (5)	KA & BE (6)	All (7)
SOCIODEMOGRAPHIC (SD)							
Age	**†***			**†***	**†***		**†***
15-29	0.23*			0.19*	0.18**		0.17**
30-34	0.98			0.83	0.81		0.79
35-39	0.96			0.84	0.80		0.80
40-44 (Reference)	**1.00**			**1.00**	**1.00**		**1.00**
45-49	1.45			1.29	1.27		1.29
50-54	0.64			0.55	0.54		0.53
55-59	1.15			0.98	0.92		1.02
Marital status	ns			ns	ns		ns
Residence	ns			ns	ns		ns
Region	ns			ns	ns		ns
Education	ns			ns	ns		ns
Employment	ns			ns	ns		ns
Wealth quintile	ns			ns	ns		ns
Religion	ns			ns	ns		ns
Moved in past 5 years	2.30**			2.33*	2.29**		2.33**
Time slept away from home in past year	ns			ns	ns		ns
Ever had an HIV test	ns			ns	ns		ns
Circumcised	ns			ns	ns		ns
KNOWLEDGE AND ATTITUDES (KA)							
Composite knowledge of AIDS		0.75		0.83		0.76	0.86
Knowledge of abstinence		0.66		0.54		0.68	0.56
Knowledge of limiting sex to one uninfected partner		0.86		0.69		0.85	0.70
Knowledge of condom use		2.42		2.23		2.38	2.14
Attitude to woman's right to refuse sex		1.19		1.28		1.61	1.27
BEHAVIOR (BE)							
Sexual debut by age 15			1.12		1.44	1.10	1.38
Multiple partners			1.01		0.84	1.01	0.83
Has paid for sex			1.97*		1.79	1.91	1.65
Self-reported STI			1.17		1.67	1.21	1.76
Constant	0.030***	0.017*	0.029***	0.023**	0.36**	0.023***	0.34**
-2 log likelihood	608.3	675.9	679.8	596.9	602.8	672.3	592.4
Nagelkerke R Square	0.103	0.011	0.006	0.116	0.112	0.017	0.123

* P value <.05
** P value <.01
*** P value <.001
† = Significant value for entire variable
ns = Not significant

7 SUMMARY AND PROGRAMMATIC IMPLICATIONS

This study was undertaken to examine the association between the HIV prevalence data and the data on sociodemographic characteristics and HIV/AIDS-related knowledge, attitudes, and sexual behavior from the 2003 Ghana Demographic and Health Survey (2003 GDHS).

7.1 Estimates of National HIV Prevalence

Our comparison of population-based estimates of HIV prevalence with antenatal care (ANC) sentinel surveillance estimates suggests that ANC sentinel surveillance data accurately estimate the prevalence among pregnant women: the prevalence rate among pregnant women in the 2003 GDHS was 3.6 percent, comparable to the prevalence rate of 3.6 percent reported by the National AIDS/STI Control Programme for the same year. The HIV prevalence rates from the 2003 GDHS for the general population of women age 15-49 (2.7 percent) and men age 15-59 (1.6 percent) are lower than the rate for pregnant women, suggesting that information from the Ghana ANC sentinel surveillance may require adjustments in order to be used for estimating the HIV prevalence rate for the general population, and that those adjustments are slightly different from the set of assumptions that the World Health Organization (WHO) uses to estimate HIV prevalence for the general population.

During the review of the 2003 ANC sentinel surveillance data for this analysis, it was noted that WHO-recommended assumptions for estimating national prevalence rates from ANC sentinel surveillance were not used. National prevalence is reported to be the same as that among pregnant women without regard to potential male-female or urban-rural differences in infection rates. The 2003 national estimates based on ANC sentinel surveillance should be recalculated according to the Joint United Nations Programme on HIV/AIDS (UNAIDS) recommendations.

Having said that, the assumptions used in the UNAIDS Estimation and Projection Package to estimate and project national HIV epidemics may not be applicable to Ghana. For countries with a generalized epidemic (such as Ghana) the estimates have been calculated based on ANC sentinel surveillance results. In their article, Boerma and others summarize the UNAIDS method for estimating HIV-1 prevalence from ANC data (Boerma et al., 2003:1,929). The steps in the estimation method are as follows:

1. Use a curve-fitting approach with all available data over time to develop an estimate of prevalence for pregnant women in urban and nonurban areas
2. Adjust the median HIV-1 prevalence in nonurban sites down by 20 percent because of under-representation of remote rural clinics
3. Assume that HIV-1 prevalence in pregnant women is a good proxy for prevalence in all adults age 15-49
4. Calculate the national estimate of HIV-1 prevalence by weighting urban and rural estimates
5. Assume that the female-to-male ratio of HIV-1 prevalence is 1.2 to 1
6. Calculate HIV-1 prevalence in men and women from the national estimate.

For Ghana, the 2003 GDHS does not support the assumptions in Step 3 (why these disagree should be explored further) and Step 5 (ratio in 2003 GHDS is 1.8 to 1). A consultation could be held to discuss whether these assumptions should be applied to ANC sentinel surveillance data from prior years.

Given that DHS surveys are done only about every four to five years and that ANC sentinel surveillance has a wealth of historical information, ANC sentinel surveillance should remain the primary tool for monitoring trends in the HIV epidemic among pregnant women. However, because the prevalence estimated in the 2003 GDHS was calculated based on a representative sample of the

population, it is a much better estimate of the national level of HIV prevalence in Ghana, and can proxy for trends in the general population. Because funding for HIV/AIDS programming has been based on estimates of HIV prevalence among pregnant women in ANC sentinel surveillance, which show an increasing trend, funding should continue to be based on the results of ANC sentinel surveillance for pregnant women.

There is a suggestion that the 2003 GDHS estimate of the HIV prevalence rate for men age 15-59 and the adult population may be biased by nonresponse to the HIV testing component of the survey among men. However, a detailed analysis showed that the overall effect of nonresponse on the national HIV prevalence estimates based on the tested individuals was small because the overall prevalence is low and the proportion of men not tested is low. The adjusted prevalence (a weighted average of the prevalence levels in the tested and the nontested) was 1.7 percent among men and 2.7 percent among women. The overall prevalence remained unchanged.

7.2 Program Implications

This in-depth analysis uncovered strong associations between HIV serostatus and a few socio-demographic and behavior variables. As a result, the analysis was only able to explain about 12 percent of the variance seen in the 2003 GDHS HIV serostatus results, and the cross-sectional nature of the survey does not allow for the determination of a temporal or causal relationship between the explored variables and HIV infection. Despite these limitations some areas of further investigation and program development or reevaluation were identified and are discussed below.

International perception of higher risk populations in a generalized epidemic (where intravenous drug users and men who have sex with men are not driving the epidemic) emphasizes prevention targeted to youth and commercial sex workers and their clients (UNAIDS, 2001; Morin et al., 2000; Global HIV Prevention Working Group, 2002).

In Ghana, however, youth were not found to be a higher risk population. The highest HIV prevalence was seen in women age 35-39 and men age 40-44. Given an average ten-year latency period between infection and death, it is unlikely that these older adults were in their youth (age 15-24) when they were infected. These "older" adults may need different prevention messages and interventions than those directed at younger people. Also, men get infected at a much later age, and we need to understand which factors predispose them to infection.

Sexual debut at an early age (15 years) is strongly associated with HIV infection among women. Further analysis of the circumstances surrounding sexual initiation is needed to answer the many questions that underlie this behavior: What circumstances brought this group of women to initiate sex at a young age? Is rape, violence, or compensation involved? Are they, as a result of these early sexual experiences, more likely to engage in transactional sex later in life? Are they from certain societal groups? Were they in- or out-of-school youth? Is there a cohort effect? Answers to these questions would ensure that effective interventions are designed that would reach the specific subgroup at risk rather than instituting blanket programs that may have no effect on the particular group.

Marital status was significantly associated with HIV serostatus for women. After controlling for other factors, women in monogamous relationships were more likely to be HIV positive than women in other types of relationships. There is a need to study marital patterns among monogamous women to identify additional factors that may explain higher prevalence among these women. A study may address the following questions: Are women lying about being in a monogamous relationship? Are women who are HIV positive and have partners who are HIV negative claiming to be monogamous and denying the existence of other sexual partners? Are women who are HIV positive and have partners who are HIV

negative recently married to the partner after her first partner died of AIDS? The 2003 GDHS has recode data that can link couples so that their serostatus can be associated with individual behaviors. A further study into the association between marital status and HIV serostatus should be conducted and appropriate interventions developed to prevent HIV infection in women in monogamous relationships.

In the bivariate analysis, formerly married women and men had higher rates of HIV prevalence than never married and currently married people. Even though this association was lost in the multivariate analysis, further study of the relationship between formerly married, particularly the widowed, and HIV prevalence may enable us to answer questions about why they are formerly married and when they became infected. Are they formerly married because their spouses have died of AIDS and they too are infected? Are they formerly married because their spouses found out they were infected and divorced them? For women, are they formerly married for non-HIV-related reasons but a change in marital status and associated economic status has made them vulnerable to sexual exploitation? Such a study may help to design prevention efforts that address culturally driven sexual behaviors and gender norms.

Mobility was found to be a significant risk factor for HIV infection among men. Further investigation is warranted to educate and inform men who are mobile and to design appropriate interventions.

Promotion of the ABC prevention methods (abstinence, be faithful, and condom use) needs further examination and evaluation. This analysis did not identify strong links between knowledge, behavior, and HIV serostatus. Though there is a high level of ABC-related knowledge in Ghana, there is little translation of that knowledge into behavior. Only condom use knowledge was related to behavior. Findings from the multivariate analysis show that for women, knowledge of partner reduction was the only ABC-related knowledge to be associated with being HIV negative, and primary abstinence and limiting sex to one partner were the only ABC-related behaviors associated with being HIV negative. None of the ABC-related knowledge and behaviors was found to be associated with HIV serostatus for men. A reexamination of the ABC approach, an evaluation of the interventions used to promote ABC, and an investigation into the contextual barriers to adopting ABC behaviors may be needed to improve the success of this approach.

This analysis showed no association between HIV counseling and HIV prevention knowledge and behavior. Further investigation is needed to determine the temporal relationship between infection and testing and to determine the effectiveness of counseling on the adoption of HIV risk-reducing behavior. Such an investigation would take into consideration the contextual barriers that prevent people from adopting HIV risk-reducing behaviors.

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