UNIVERSITY OF THE WITWATERSRAND

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RESEARCH REPORT

PROJECT TITLE

BASELINE STUDY ON CONDOM USAGE, SAFE SEXUAL PRACTICES AND SEXUALLY TRANSMITTED DISEASES AMONG MEN AND WOMEN AGED 15-60 YEARS IN ORANGE FARM, SOUTH AFRICA 2002: A RETROSPECTIVE ANALYSIS

George Otieno Awuonda

RESEARCH REPORT SUBMITTED IN PARTIAL FULFILMENT FOR
THE DEGREE OF MASTER OF SCIENCE IN MEDICINE
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SUPERVISORS:

DR RENAY WEINER

DR ADRIAN PUREN

Gaborone, 2007

Declaration:

I Dr George O Awuonda declare that this research report is my own work; It is being submitted for the Degree of Master of Science in Medicine in the field of Epidemiology and Biostatistics in the University of Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

7th day of May, 2007

Dedication

I dedicate this degree to the almighty God who has made it possible for me to complete this course and to my wife *Flora Awuonda* and Children.

Abstract

Background

The global estimated adult and child deaths from HIV/AIDS in 2006 were 2.9 million and those living with HIV stood at 39.5 million. Of the HIV deaths, 72% (2.1 million) occurred in Sub-Saharan Africa (SSA). Two thirds (63%) of all adults and children with HIV globally live in, with its epicenter in Southern Africa. One third (32%) of all people with HIV globally live in Southern Africa and 34% of all deaths due to AIDS in 2006 occurred there.
In South Africa, a total of 5.5 million people, including 240,000 children younger than 15 years, were living with HIV in 2005. HIV data gathered in the country's antenatal clinic surveillance system suggest that HIV prevalence has not yet reached a plateau. There is a continuing trend nationally in HIV infection levels among pregnant women attending public antenatal clinics: from 22.4% in 1999 to 30.2% in 2005 (a 35% increase).

Aim

The aim of this study was to assess sexual practices, the prevalence of condom usage and sexually transmitted diseases, and their associations among 930 men and women aged 15-60 years in Orange farm South Africa.

Objectives:

1. To determine condom usage among males and females aged 15–60 year old.
2. To determine the number of new partners, short-term partners and unprotected sexual acts in this particular age group of men and women.
3. To assess the prevalence of sexually transmitted diseases in this age group.
4. To assess the relationship between sexual practices and sexually transmitted diseases in this community.

Methods:

The project was a secondary data analysis of a population-based, cross-sectional study was conducted in Orange Farm, South Africa in 2002. The original study involved 930 men and women respondents. A two-stage random sampling technique was used to select households. A self-weighting random sample of twenty households was chosen from clusters of 15 households. All men and women aged 15 to 60 years, who slept in the selected households the night before the study team's visit, were eligible for inclusion in the study. The main focus of this secondary study was to analyze the baseline data collected for the level and risk factors for sexually transmitted diseases in this age group. All 930 men and women were included in the analysis.

Results:

The risk factor under consideration viz: condom usage was not optimal, and the prevalence of sexually transmitted disease is high in this population with HIV prevalence at 21.8%. Women in the age-group 15-24 years were disproportionately more affected by HIV in this community as compared to men. Among the HIV positive respondents, 61.8% had at least single or over 2 non-spousal partners in the last year. At the time of the interviews, 34.7% had never used condoms and 84.3% did not use condoms in any of the sexual episodes of the last month.

Conclusion:

An important goal is to practice partner reduction and to encourage especially those who are single to use condoms consistently. Further qualitative research on sexual behaviours involving focus group discussions, in-depth interviews or participant observation should be conducted in this community to complement the quantitative methods. They produce results that directly represent how people feel and provide information on behaviour through the observation of events and activities.

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I must use this opportunity to thank all my class mates who encouraged and supported me to complete this work.

I would finally thank my family for providing the moral and financial support to pursue this course.

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Nomenclature:

Acronyms and Abbreviations

AIDS:	Acquired immunodeficiency Syndrome
HIV:	Human Immunodeficiency Virus
HSV-2:	Herpes Simplex Virus Type 2
NICD:	National Institute of Communicable Diseases
RHRU:	Reproductive Health Research Unit
STD:	Sexually Transmitted Diseases
UNAIDS:	United Nations AIDS programme

INTRODUCTION

This research report presents a retrospective analysis of data from a study conducted in Orange farm South Africa in 2002 involving 930 men and women aged 15-60 years[1].

This report attempts to describe the demography of the population under study, prevalences of sexually transmitted diseases (HIV, HSV-2 and *Chlamydial* infection) and an in-depth examination of associations that may exist between the outcome variables (STDs) and other exposure variables which measure the behaviour of this community that directly impacts on these STDs. These exposure variables include: has the respondent ever had sex, sexual activity in the last 12 months, and frequency of sexual activity. In particular other variables which place this community at risk of contracting STDs will be examined e.g. age of first sex, condom use in the last month and last year with non-spousal partners, number of non-spousal sexual partners and marital status. The data set in SPSS, questionnaires, draft report and list of all the variables for the original study came from the National Institute of Communicable Diseases, South Africa

BACKGROUND

Global picture and groups most affected

The global estimated adult and child deaths from HIV/AIDS in 2006 were 2.9 million and those living with HIV stood at 39.5 million[2] . The number of deaths occurring in Sub-Saharan Africa (SSA) was 2.1 million (72%), 590,000 in South and South-East Asia (20%), 65,000 in Latin America (2%), 43000 in East Asia (1.5%), 19,000 in the Caribbean (0.7%), 36,000 in North Africa and Middle East (1.2%), 84,000 in Eastern Europe and Central Asia (2.9%), 18,000 in North America (0.6%), 12,000 in Western and Central Europe (0.4%) and 4000 in Oceania (0.14%). The number of people living with HIV/AIDS in SSA was 24.7 million (63%), 7.8 million in South and South-East Asia (20%), 1.7 million in Latin America (4.3%), 1.7 million in Eastern Europe and Central Asia (4.3%), 750,000 in East Asia (1.9%), 1.4 million in North America (3.5%), 740,000 in Western and

Central Europe (1.9%), 460,000 in North Africa and Middle East (1.2%), 250,000 in the Caribbean (0.6%) and 81,000 in Oceania (0.2%)[2]

According to the UNAIDS there were 2.8 million new infections in adults and children in SSA during 2006 out of a total of 4.3 million globally. In many regions of the world, new HIV infections are heavily concentrated among young people 15-24 year olds. Among adults 15 years and older, young people accounted for 40% of new HIV infections in 2006[2]. SSA continues to bear the brunt of the global epidemic with its epicenter in Southern Africa. One third (32%) of all people with HIV globally live in Southern Africa and 34% of all deaths due to AIDS in 2006 occurred there[2].

In South Africa, a total of 5.5 million people, including 240,000 children younger than 15 years, were living with HIV in 2005[3]. HIV data gathered in the country's antenatal clinic surveillance system suggest that HIV prevalence has not yet reached a plateau. There is a continuing trend nationally in HIV infection levels among pregnant women attending public antenatal clinics: from 22.4% in 1999 to 30.2% in 2005 (a 35% increase)[4]. However, HIV prevalence among people may be stabilizing. Antenatal surveillance suggests that HIV prevalence among 15-24 year old pregnant women has remained relatively stable since 2000 at 14%-16% among 15-19 year olds and 28%-31% among 20-24 year olds[4].

The epidemic in South Africa disproportionately affects women. Young women 15-24 year old women are four times more likely to be HIV infected than are young men: in 2005, prevalence among young women was 17% compared with 4.4% among young men[5] . Those infection levels were similar to those found in the 2003 national survey of 15-24 year olds when 15.5% of young women and 4.8% of young men were found to be HIV infected[6]. One in three women aged 30-34 years were living with HIV in 2005, as were one in four men aged 30-39 years, according to the 2005 national HIV household survey. In addition, high infection levels were found among men older than 50 years, more than 10% of whom tested HIV positive[5]. A large proportion of South Africans do not believe they are at risk of becoming infected with HIV. About 13% of the respondents who took their HIV test in 2005 national household survey were found to be HIV- positive. Until then,

most of them had declined to take an HIV test because they felt they were at no risk of infection. Overall, half the respondents who were found to be infected with HIV had reported that they felt they were at no risk of acquiring HIV[5]. About two million South Africans living with HIV do not know that they are infected and believe they face no danger of becoming infected and therefore are unaware that they can transmit the virus to others. In the absence of an increase in HIV testing uptake, HIV infected persons typically would only become aware of their status when they become symptomatic, which can also limit the potential benefit of antiretroviral treatment[5].

Contributory factors increasing the spread of HIV

Factors that have enhanced the spread of HIV/AIDS in South Africa are many and complex. These include poverty, migration, the position of women, socio-economic conditions, unemployment, the challenge of development, illiteracy and poor education system. The above factors continue to fuel this epidemic in South Africa. The epidemic in turn exacerbates these factors, creating a cycle of infection and vulnerability, leading to more poverty[7]. In addition, through historical neglect there are high rates of sexually transmitted diseases amongst the population, a generally early age of sexual debut, a high number of concurrent sexual partners, low level of condom usage, poor rates of successful STD treatment, high mobility of the society, high rates of poverty and low levels of literacy. Also, from meager data available South Africa has one of the highest rates of sexual assault in the world, but this crime is notoriously underreported for many social reasons[7].

Prevention initiatives and their impacts

HIV prevention requires sustained efforts of social mobilization toward healthier and safer sexual behaviour in the sexually active population involved in high risk behaviour. The Department of Health has identified a range of key strategies for preventing the spread of HIV. These include:

1. Awareness campaigns to delay the age of sexual debut by encouraging primary sexual abstinence amongst youth

2. Life skills programmes for youth, both in and out of school, recognizing the potential of targeting pre-adolescent children in particular
3. Communication campaigns to popularize prevention concepts with a strong focus on condom promotion for prevention (but including abstinence, partner reduction – this is because unprotected sex with greater numbers of sexual partners increases the risk of HIV acquisition and this risk is increased in the context of a generalized epidemic where there is high HIV prevalence, promotion of voluntary counselling and testing (VCT), promotion of care and support
4. An extensive condom distribution system backed by a sophisticated, demand-based logistics system
5. Appropriate treatment and management of sexually transmitted infections
6. An expanding VCT programme, centred around VCT provision in clinics. Voluntary HIV counselling and testing are key components of prevention and care programmes. In prevention, VCT helps people learn about how HIV is transmitted, practise safer sex, get a HIV test, and depending on the result, take steps to avoid becoming infected or infecting others. HIV test results and follow-up counselling mean people can be directed, towards relevant care and support services, such as treatment for tuberculosis and sexually transmitted infections, family planning and where indicated, treatment for opportunistic infections, treatment with antiretrovirals and prevention of mother-to-child transmission.
7. An expanding home based care programme
8. An emerging post exposure prophylaxis programme
9. An emerging national level ARV programme
10. Provision of adequate care and support (hospice type care to basic home and community based care, and welfare aspects such as children in distress including those orphaned by AIDS
11. Legislation responses which include rights to non-discrimination in workplace settings and a number of emerging bills which focus on gender disparities and the needs and environment of children

LITERATURE REVIEW

Several studies on sexual behaviour and sexually transmitted disease treatment which are relevant to the objective of this study have been conducted in SSA and this report highlights some of the findings which can be compared with the present study. In South Africa, a national HIV and syphilis antenatal seroprevalence survey conducted in 2004 indicate that HIV prevalence among pregnant women is 29.5 % (CI 28.5%-30.5%) compared to the 27.9 % (CI 26.8%-28.9%) observed in 2003[8]. The HIV prevalence continues to differ by province with Kwa Zulu Natal, Gauteng Province and Mpumalanga recording higher prevalence rates(40.7%, 33.1%, and 30.8%) respectively. Nearly 40% of women aged 25 – 29 years old are HIV positive while women in their early twenties and early thirties show lower rates at around 30%. Older women and teenagers have prevalence rates of below 20%. There has been a decline in syphilis prevalence rates among teenagers between 2003 and 2004. This survey[8] showed syphilis rates of 1.6%, though high in Northern Cape (7.0%) with Kwa Zulu Natal showing the lowest rate at 0.8%.

A household survey[9] conducted in 2002 on South African national HIV prevalence, behavioural risks and mass media revealed the overall prevalence of HIV among persons aged two years and older is estimated at 11.4% in the general population. Among the 6086 youth and adults who had valid HIV results, the prevalence was 13.6% (95% CI: 12.1% - 15.2%)[9]. The national HIV prevalence was 9.5% among males and 12.8% among females. The median age at first sex for respondents 25 years and older was 18 years. Most respondents indicated that they had a single partner during the past 12 months and the proportion of those with more than one partner was lower for females (3.9%) than for males (13.5%) $p<0.001$[9]. Twenty-five percent of females and 30.3% of the male respondents reported to have used a condom during the last sexual intercourse. Almost half of the respondents who had more than one sexual partner over past 12 months had used a condom compared with less than 30% for respondents with only one partner ($p<0.001$). Respondents who were single were considerably more likely to use a condom than those who were married ($p<0.001$)[9]

Data from the South African Demographic and Health Survey of 1998 indicates that there is early onset of sexual activity and poor condom usage[10]. The survey showed that approximately 35% of non married women, aged 15-19, had at least one sexual partner in the last 12 months, and that only 16% of all women interviewed, who had sex in the last 12 months, had used a condom in their last sexual intercourse with their non-spousal partner[10].

There is evidence to suggest that people have a good knowledge of HIV/AIDS, its mode of transmission, and how it can be prevented but often fail to act on this. In a study conducted in the mining community of Carletonville[11] all questions asked regarding risk factors for HIV infection and modes of prevention were correctly answered by the majority of respondents. Men surveyed reported using condoms in less than twenty five percent of contacts with non-regular partners and less than five percent of contacts with their regular partner[11].

The national survey[6] on HIV and sexual behaviour among young South Africans aged 15–24 years found that the overall prevalence of HIV among 15–24 year olds was 10.2%. Prevalence was higher among females (15.5%) than males (4.8%) among the 15 – 24 year olds. The mean age of first sex was 16.4 years for males and 17 years for females. Thirty-five percent reported only having one lifetime sexual partner[6]. Fifty two percent of sexually experienced youth reported using condom at last sex. Males were more likely to report condom use at last sex than females especially in the 20–24 year olds (57% vs. 44%). Of the youths reporting, 33% always used a condom with their most recent sexual partner while 31% reported that they never used a condom[6]. In a study to establish the frequency of reported condom use and to validate the reliability of self-reporting among urban women in Malawi, a total of 6561 women in 1989 and 2460 women in 1993 answered questions about condom use and sexual activity[12]. Although between the two cross-sectional studies intermittent condom use increased from 6 to 15% ($p<0.001$) with no difference according to HIV infection, consistent use was reported by less than 1%. In the prospective study involving 6561 in 1989, where a subset of women were administered a questionnaire and tested for syphilis, *Neiserria gonorrhea*, and *Trichomonas vaginalis* infections every six months,

women reported a higher rate of condom use. This peaked at 62% in the first 6 months, but declined to as low as 8% in the second year of follow-up. Condom use at each visit, either intermittent or consistent, was higher in HIV-seropositive than HIV-seronegative women. Overall, the incidence of *gonorrhea, trichomoniasis*, and syphilis did not decline in women reporting consistent condom use. The presence of new sexually transmitted diseases suggests that this population of urban women over reports condom use or underreports sexual activity or both[12]. Although the rate of condom use remained low in the entire study population, there was an observed increase in current condom use over the four-year study from 4.4% to 7.4% reported by men; these values represent some of the highest reported rate of use in rural sub-Saharan Africa[12].

Sexual behaviour in males has been found to be changing as has been seen in a cohort study in Tanzania[13]. During the two years of observation, the proportion of men with more than one sexual partner during the month preceding the interview declined gradually from 22.3 to 12.3% and the proportion of men reporting casual sex partners during the last month was almost halved: from 9.8 to 5.2%. There were only minor changes in reported condom use, notably an increase in use with casual partners, and no changes in coital frequency. Data from in-depth interviews confirmed that reduction in numbers of new sexual partners was the predominant change, although condom use remained low[13].

A randomized trial was done to evaluate the impact of improved sexually transmitted disease (STD) case management at primary health care level on the incidence of HIV in the rural Mwanza region of Tanzania[14]. To provide data on behavioral change in this Mwanza trial, special surveys of sexual behaviour were conducted with a detailed questionnaire at both baseline and follow-up in random samples selected from the study cohort. From the data they discovered no change in sexual behaviour over the two year follow-up period[14]. Furthermore, condom use remained at a very low level in both groups. In the absence of sexual behaviour change the most plausible explanation for their results is that the STD programme by shortening the average duration of STDs, reduced HIV incidence. The data on STD prevalences were consistent showing a lower prevalence in the intervention group than in the comparison group[14].

Interventions that rely on behaviour change have not often been shown to be successful. One encouraging finding from a randomized control study[15] on control of sexually transmitted diseases for AIDS prevention carried out in Rakai, Uganda indicated that HIV incidence is declining, particularly in the 15-19 year age group. This was linked to changes in the sexual behaviors: younger people are waiting longer before they become sexually active, have fewer sexual partners and are using condoms more regularly[15].

The findings of the Mwanza trial were supported by a study done in a centre in Nairobi, Kenya on the relationship between HIV infection among men with sexually transmitted diseases, where a strong relationship between a history of genital-ulcer disease and HIV infection was found[16]. Sixty three percent of the men seropositive for HIV had a history of previous genital-ulcer disease, as compared with 19% of men seronegative for HIV (odds ratio, 7.2; 95% confidence interval, 3.8- 13.8;$p<0.001$). Chancroid was the primary cause of ulcers in their population and because chancroid is associated with prostitutes to a higher degree they examined the relationship among genital ulcers, HIV, and contact with prostitutes. After adjustment for the frequency of contact with prostitutes, a history of genital ulcers was still associated with HIV. They also found that a history of genital ulcer in the past 5 years was more frequent among men positive for HIV (odds ratio, 4.0; 95% confidence interval, 2.1-10.3; $p<0.001$) after all confounders were controlled for. A history of travelling to neighbouring countries remained strongly associated with HIV infection[16]. A similar study conducted in the Rakai district of Uganda at a much later stage of the epidemic showed minimal effect of STD treatment on HIV incidence, suggesting that this intervention is effective mainly early on in the epidemic and should be especially targeted at the youth[15].

A further cross sectional study[17] whose main objective was to estimate age and sex specific HSV-2 prevalence in four urban populations in Cotonou-Benin, Yaoundé – Cameroon, Kisumu – Kenya, and Ndola – Zambia was conducted. This study revealed that the HSV2 prevalence was over 50% among women and over 25% among men in Yaoundé, Kisumu, and Ndola with notably high rates of infection among young women in Kisumu and Ndola. (39% and 23% respectively

among women aged 15-19 years[17]). The prevalence in Cotonou was lower (30% in women and 12% in men). Further analysis showed that HSV2 prevalence was significantly associated with older age, ever being married and number of lifetime sexual partners in almost all cities and both sexes. There was also a strong consistent association with HIV infection[17].

Motivation

Given the continued importance of decreasing new sexually transmitted infections, including HIV, information on current preventive practices is required. However, there is a gap in knowledge of the level of condom use and unprotected sex in the 930 respondents aged 15-60 years old. The results of this study will be used to develop strategies to improve knowledge and safe sexual practices. Such strategies will help to contain the spread of the epidemic. The results will also inform health service planning to optimize the use of sexually transmitted disease services.

Study Question

What is the prevalence of sexually transmitted diseases, condom usage, sexual practices and their associations among 930 men and women aged 15-60 years in Orange Farm South Africa? A null hypothesis that was tested was that there is no association between condom use, sexual practices and sexually transmitted diseases in this population.

Objectives

1. To determine the prevalence of condom usage among males and females aged 15–60 year old.
2. To determine the average number of non-spousal partners and unprotected sexual acts in this particular age group of men and women.
3. To assess the prevalence of sexually transmitted diseases in this age group.
4. To assess the relationship between sexual practices and sexually transmitted diseases in this community.

Methods

The current data analysis draws on data from a population based, cross-sectional study conducted in Orange Farm, South Africa in April 2002[1] .

The original study

The original study[1] was conducted with the objective to estimate the proportion of the population needing HAART in a township in South Africa under WHO guidelines, to estimate the short term impact of providing ART on the spread of HIV and to assess the impact of using United States Department of Health and Human Services (USDHHS) guidelines on these estimates.

Study population

The study population consisted of a random sample of 930 men and women aged 15 to 60 years in Orange Farm, South Africa.

Sampling

A two-stage random sampling technique was used to select households. A map was obtained from the local municipal offices and index houses were randomly selected. Using each index house as a starting point, a cluster of households was identified by starting to the right of the index house and counting households around the street block and adjacent street blocks until fifty households had been reached. A self-weighting random sample of twenty households was then chosen from each cluster[1].

Eligibility Criteria

All men and women aged 15 to 60 years, who slept in the selected households the night before the study team's visit, were eligible for inclusion in the study.

Response rate

The investigators made every effort to ensure that the study[1] achieved a high response rate. The survey had a 68% response rate.

Measurements

The questionnaire used in the original study was based on a UNAIDS questionnaire[18]. The interviewers completed the questionnaire during a private interview in the preferred language of the interviewee. During the survey, participants with symptoms of sexually transmitted infections (STIs) were

encouraged to go to the local STI clinic for treatment. Participants who wished to know their HIV status were offered a separate free ELISA test with pre- and post-test counselling to be arranged through the normal clinical channels. Blood samples were tested for syphilis, HIV-1, $CD4^+$ count and plasma HIV-1 RNA load. Urine samples were tested for chlamydial infection. When results were available, a trained nurse delivered the syphilis and chlamydial infection test results directly to the participants. Participants with positive STI results were encouraged to seek treatment at the local STI clinics.

Laboratory procedures

Following the interview, trained nurses collected whole blood and urine (first flow) samples[1]

An ELISA screen (Genscreen HIV 1/2; version 2, BioRad, France and Wellcozyme HIV recombinant; Abbott Murex, Dartford, UK) and ELISA confirmation (Vironostika HIV Uni-Form II plus O; Bio Merieux, Boxtel, Netherlands) were carried out on plasma to test for HIV-1 infection. Amplification techniques of the DNA sequence from blood by polymerase chain reaction method (Ampiclor CT/NG test, Roche Diagnostics, New Jersey, USA) was used to test for HSV-2 infection. Urine samples were tested for Chlamydia infection using qualitative DNA amplification method.

Data management

Laboratory results and data[1] generated from questionnaires were entered twice into a data base (Microsoft Access, Redmond, WA) by different people. The 2 entries were compared, discrepancies were corrected. The data were checked for inconsistencies. The files were then imported into the Statistical Package for Social Sciences (SPSS 8.0 for Windows, Chicago, IL) and prepared for statistical analysis.

The secondary data analysis study

The focus of this secondary data analysis was to analyze the baseline data collected on background and behavioural characteristics of the 930 men and women aged 15 - 60 years.

Definitions

For the purpose of this study sexual partners were classified into spousal and non-spousal (new or short-term) partners.

1. The spousal partners were partners to whom the respondents were married or lived with as married.
2. The non-spousal partners were those one had had sex with, but are not married to, or living as married. This can include boyfriends/girlfriends, nyatsis, one night stands.
3. In this secondary analysis non spousal partners have been equated to short-term and new partners and are therefore used interchangeably although this may be technically incorrect.
4. Women, men, females or males are referred to and this is always among the survey participants aged 15-60 years in Orange Farm and not any other individuals.
5. Gender in this analysis indicates whether the respondent is a male or a female, although this might be technically incorrect as gender incorporates a much broader meaning.
6. It should be noted further that percentages may not add up to 100% due to rounding off in this analysis.
7. Youth in this study refers to young males and females aged 15-24 years.

The questionnaire allowed for a detailed description of all the non-spousal partners of the last twelve months, including those with whom the respondent had only one sexual contact. In addition, specific questions were asked about the use of condoms in the last months with non-spousal partners.

Measurement and method of analysis for the secondary study

A questionnaire, draft report, list of variables and data set from the original study were obtained from the National Institute of Communicable Diseases (NICD).

The data set which was in SPSS was then imported into STATA (Stata statistical software 1997: release 5. 0, College Statistics, TX: Stata Corp) by Stat/Transfer software (circle system, 1001 fourth Avenue, #3200, Seattle, WA 98154) was prepared for analysis. Variables were then extracted from the data set, by

dropping those variables that were not used based on the objectives of the secondary data analysis. The variables included are presented in the table below:

Table 1: summary of variables used in the analysis of secondary data

Variable type	Variable category	Variable
Explanatory	Demographic	Sex
		Age
		Ethnicity
		Religion
		Marital status
		Educational level
		Occupation
	Sexual behaviour	Ever had sex
		Age of first sex
		Ever used a condom
		Cost of a condom
		Where to buy a condom
		Condom use with non spousal partner in last 12 months
		Number of times used condoms in the last month with non spousal partners
		Number of non spousal partners in the last year
		Frequency of sexual intercourse with non spousal partners in the last month
Outcome		HIV
		HSV-2
		Chlamydia

Possible confounders of the relationship between condom use and STIs were also identified and listed as age, sex, number of partners, age of first sex and marital status. A framework for the relationship between exposures, confounders and outcomes was then considered. The original data sets were checked for any inconsistencies and outlying values and data cleaning was done.

Frequency distributions and cross tabulations for categorical variables were conducted with the outcome variables in the descriptive analysis for initial checks. Range checks and histograms were conducted for quantitative variables to check that all observations were within the expected range. Consistency checks were finally done to identify any errors. Quantitative variables e.g. age, number of non spousal partners in the last year, number of times one had sex with a non spousal partner in the last month and number of times one used a condom with non

spousal partner in the last month were recoded into categorical variables into groups of likely similar risks and that there was enough data in each category to provide statistically stable results.

Univariate analysis was done where cross tabulations of main exposures and outcomes with the recoded variables were repeated. Chi square tests were conducted and the p value at the level of 0.05 was assessed for significant differences and 95% confidence limits. Odds ratios as a measure of strength of association of exposures and outcome were also determined.

The confounders were cross tabulated with the three outcome variables mentioned above and significant association assessed at the p=0.05 value and 95% confidence interval. Mantel Haenzel test was done to estimate crude odd ratios. Stratum specific odds ratios were measured by choosing a baseline category. Stratification techniques were then done to analyse for any confounders once crude and strata specific odds ratios were measured.

The Mantel Haenzel test provided estimates of odd ratios which were adjusted for a specified confounder. The adjusted odds ratio was then compared to the crude odds ratio and if there was a big change between the two, then there is confounding. Stratification can identify effect modifiers. If the stratum specific odds ratios are significantly different, then effect modification may be present. Since there were few confounders, stratification technique was adequate.

Ethics

In the original study[1], ethical standards were adhered to in all stages of the survey.

1. Informed consent was obtained from all the participants for completing the questionnaire and providing blood and urine sample. The consent form was presented in the language of the respondent, who was invited to take part in the study, and those who agreed were asked to sign the consent form.

2. Confidentiality was maintained by ensuring that interviews were conducted in private and that there was no coercion whatsoever. The interviewers were also trained on issues of confidentiality.
3. During recruitment to the study, the participants who wished to know their HIV status were offered a separate free ELISA test with pre- and post-test counselling to be arranged through the normal clinical channels.
4. For confidentiality, the data sets availed for the secondary analysis from National Institute of Communicable Diseases contained only identification numbers and therefore were anonymized.
5. Ethical clearance was obtained for the original study from University of Witwatersrand Committee for Research on Human Subjects on the 8 February 2002 (protocol study number M020103) and for this data analysis (protocol study number M030803).

Results

Demographic characteristics:

Table 2: Proportion of males and females in the different age group, ethnicity and religious affiliation in a sample of 930, 930 and 927 respondents respectively

Age group (years)	Male (n=438)	Female (n=492)	Total (n=930)
15-24	47.5	39.8	43.4
25-34	30.1	29.3	29.7
35-44	14.2	22.8	18.7
>44	8.2	8.1	8.2
Ethnicity	(n=438)	(n=492)	Total (n=930)
Sotho	33.8	36.6	35.3
Tswana	7.5	6.5	7.0
Xhosa	9.6	13.0	11.4
Zulu	36.8	35.4	36.0
Other	12.3	8.6	10.3
Religion	(n=437)	(n=490)	Total (n =927)
Protestant	43.3	54.1	49.0
Catholic	16.5	22.7	19.7
Muslim	0.9	0.6	0.8
African Traditional	15.8	11.0	13.3
Other	23.6	11.6	17.3

Chi square test: statistically significant p=0.007 for age group and religion but not for ethnicity p=0.160

At the time of the interview, the median age was 26 years with an interquartile range (IQR) of 20-35 years (mean 28 years, 95% CI: 27.6-28.9).

The median age for males was 25 years with an IQR 19-33 years (mean 27 years, 95% CI: 26.5-28.3) and 28 years with an IQR 20-36.5 years (mean 29 years, 95%

CI: 28.1-29.8) for females. There was a statistically significant difference between males and females (p value 0.012). Eighty four percent of the respondents had completed primary school education and on their usual occupation, 31% reported that they were students, 31% employed as workers in a mining company, domestic work at home and outside home, selling things, manual labour, professional or sex work, while 40% were unemployed.

Thirty-seven percent (n=341) were married or living with someone as married while 5% were separated/divorced widowed, 19% were committed with someone but not living together and 40% were single. Of the 341 who were married, married females accounted for 60% (n=206) and males 40% (n=135).

Sexual practices

At the time of the interview, 90.9% (n=845) reported to have ever had penetrative sexual intercourse. Of these, 79.2% of the 15- 24 year age group reported ever having sexual intercourse, while 100% were recorded in all the other age groups i.e. 25-34, 35-44 and over 44 years. The median age of first sex reported by the males and the females was 17 years (IQR 15 - 18 years). The median age of first sex for the 396 male respondents was 16 years (IQR 15-18 years) and for the 449 females was 17 years (IQR 16 - 18 years).

Number of partners

Table 3: Proportion of the number of partners one had sex with in the last year by gender (845)

Gender	Number of non-spousal partners you had sex with in the last 12 months				Total
	0	1	2-5	>5	
Males	31.3	34.1	30.6	4.0	396 (100)
Females	51.5	40.3	7.6	0.7	449 (100)
Total	355 (42.0)	316 (37.4)	155 (18.3)	19 (2.3)	845 (100)

Chi square test p=0.000

At the time of the interview, about two thirds of the males (68.7%) and half of the females (48.5%) experiencing sexual intercourse in the last year had at least one or more non-spousal partners.

Table 4: Proportion of the number of non spousal partners one had sex with in the last year by age group (845)

Age group	Number of non-spousal partners you had sex with in the last 12 months				Total
	0	1	2-5	>5	
15-24	21.6	47.2	27.2	4.1	320 (100)
25-34	42.8	36.2	19.2	1.8	276 (100)
35-44	64.7	27.8	6.9	0.6	173 (100)
>44	73.7	22.4	4.0	0.0	76 (100)
Total	355(42.0)	316(37.4)	155(18.3)	19(2.3)	845 (100)

Chi square test p=0.000

Seventy nine percent (79.4%) of the males and females in the age group 15-24 years had at least one or more non spousal partner in the last 12 months as compared to 27.3% in those over 44 years. Fifty eight percent (58%) of the men and women had at least one non spousal sexual partner in the last year.

Table 5: Percentage distribution of the number of non-spousal sexual partners in the last 12 months by gender among the age groups in a sample of 845 participants

Age group	Gender	Number of non-spousal partners you had sex with in the last 12 months				Total
		0	1	2-5	>5	
15-24	Male	15.1	35.5	42.2	7.2	166 (100)
	Female	28.6	59.7	11.0	0.7	154 (100)
25-34	Male	28.8	39.4	28.8	3.0	132 (100)
	Female	55.6	33.3	10.4	0.7	144 (100)
35-44	Male	59.7	22.6	17.7	0.0	62 (100)
	Female	65.6	30.6	0.9	0.9	111 (100)
>44	Male	66.7	27.8	5.6	0.0	36 (100)
	Female	80.0	17.5	2.5	0.0	40 (100)
Total		355 (42.0)	316 (37.4)	155 (18.3)	19 (2.3)	845 (100)

Chi square test p=0.000

Eighty five percent of the males and 71.4% of the females had at least one non spousal partner in the last year. (Table 5)

Table 6: Proportion of the number of non spousal partners one had sex with in the last year according to marital status by gender (845)

Marital status	Gender	Number of non-spousal partners you had sex with in the last 12 months				Total
		0	1	2-5	>5	
Married or living as married	Male	67.4	18.5	12.6	1.5	135 (100)
	Female	88.4	9.7	1.9	0.0	206 (100)
Separated divorced widowed	Male	16.7	66.7	16.7	0.0	12 (100)
	Female	34.3	54.3	8.6	2.9	35 (100)
Committed but not living together	Male	12.5	40.3	38.9	8.3	72 (100)
	Female	10.2	70.4	18.4	1.0	98 (100)
Single	Male	12.4	41.2	41.8	4.5	177 (100)
	Female	24.6	66.4	8.2	0.9	110 (100)
Total		355 (42.0)	316 (37.4)	155 (18.3)	19 (2.3)	845 (100)

Chi square test p=0.000

Among those who were married, 32.6% of the males and 11.6% of the females had at least one non spousal sexual partner in the last 12 months. 87.6% males and 75.4% females who were single had at least one non spousal partner in the last 12 months.

Table 7: Proportion of the number of times one had sex with a non spousal partner in the last month by gender (845)

Gender	Number of times you had sex with a non-spousal partner in the last month				Total
	0	1-10	11-20	>20	
Male	60.4	37.6	1.5	0.5	396 (100)
Female	73.1	26.3	0.2	0.5	449 (100)
Total	567 (67.1)	267 (31.6)	7 (0.8)	4 (0.5)	845 (100)

Chi square test p=0.000

Table 7 above shows that the frequency of sexual intercourse in the last month was higher in males (39.6%) as compared to 26.9% in the females.

Table 8: Percentage distribution of the number of times respondents had sex with non-spousal sexual partners in the last month by gender among the age groups in a sample of 845 participants

Age group	Gender	Number of times one had sex with a non-spousal partner in the last month				Total
		0	1-10	11-20	>20	
15-24	Male	49.4	47.6	2.4	0.6	166 (100)
	Female	62.3	37.0	0.7	0.0	154 (100)
25-34	Male	58.3	40.2	1.5	0.0	132 (100)
	Female	72.9	25.7	0.0	1.4	144 (100)
35-44	Male	82.3	17.7	0.0	0.0	62 (100)
	Female	82.0	18.0	0.0	0.0	111 (100)
>44	Male	80.6	16.7	0.0	2.8	36 (100)
	Female	90.0	10.0	0.0	0.0	40 (100)
Total		567 (67.1)	267 (31.6)	7 (0.8)	4 (0.5)	845 (100)

Chi square test p=0.000

The frequency of sexual intercourse in the last month was highest in the age group 15-24 years and lowest in those over 44 years.

Table 9: Percentage distribution of the number of times respondents had sex with non-spousal sexual partners in the last month according to marital status by gender in a sample of 845 participants

Marital status	Gender	Number of times you had sex with a non-spousal partner in the last month				Total
		0	1-10	11-20	>20	
Married or living as married	Male	85.9	13.3	0.0	0.7	135 (100)
	Female	94.2	5.8	0.0	0.0	206 (100)
Separated divorced widowed	Male	75.0	25.0	0.0	0.0	12 (100)
	Female	57.1	42.9	0.0	0.0	35 (100)
Committed but not living together	Male	44.4	54.2	1.4	0.0	72 (100)
	Female	48.0	50.0	1.0	1.0	98 (100)
Single	Male	46.3	50.3	2.8	0.6	177 (100)
	Female	60.9	38.2	0.0	0.9	110 (100)
Total		567 (67.1)	267 (31.6)	7 (0.8)	4 (0.5)	845 (100)

Chi square test p=0.0000

Condom usage

Ninety five percent (95%) of the respondents revealed that condoms were cheap and only 3.6% did not know where to buy them.

Table 10: Proportion of respondents in the different age groups reporting to have ever used condoms during intercourse (845)

Age group	Gender	Ever used a condom		Total (n)
		Yes (%)	No (%)	
15-24	Male	78.9	21.1	166 (100)
	Female	85.7	14.3	154 (100)
25-34	Male	72.0	28.0	132 (100)
	Female	60.4	39.6	144 (100)
35-44	Male	58.1	41.9	62 (100)
	Female	45.0	55.0	111 (100)
>44	Male	33.3	66.7	36 (100)
	Female	22.5	77.5	40 (100)
Total		552 (65.3)	293 (34.7)	845 (100)

Chi square test p=0.000

From the table above, 34.7% (n=293) had never used condoms. There were more females than males reporting not to have ever used condoms in the age group 25->44 years. These differences were statistically significant with a p value of 0.000. (Using condom is protective)

Table 11: Percentage distribution of number of times condom was used in non-spousal relationship in the last one month by gender in the different age groups (845)

Age group	Gender	Number of times you used a condom with a non-spousal partner in the last month				Total
		0	1-3	4-6	>6	
15-24	Male	66.9	27.7	2.4	3.0	166 (100)
	Female	79.9	18.2	1.3	0.6	154 (100)
25-34	Male	78.8	17.4	1.5	2.3	132 (100)
	Female	93.0	5.6	1.4	0.0	144 (100)
35-44	Male	95.2	4.8	0.0	0.0	62 (100)
	Female	96.4	3.6	0.0	0.0	111 (100)
>44	Male	94.4	5.6	0.0	0.0	36 (100)
	Female	100.0	0.0	0.0	0.0	40 (100)
Total		712 (84.3)	114 (13.5)	10 (1.2)	9 (1.0)	845 (100)

Chi square test p=0.000

Eighty four percent of the respondents did not use condoms in any of the episodes in the last month of sexual intercourse as is evident in the table above.

Table 12: Percentage distribution of number of times condom was used in non-spousal relationship in the last one month according to marital status by gender (845)

Marital status	Gender	Number of times you used a condom with a non-spousal partner in the last month				Total
		0	1-3	4-6	>6	
Married or living as married	Male	93.3	5.9	0.7	0.0	135 (100)
	Female	97.6	1.9	0.5	0.0	206 (100)
Separated divorced widowed	Male	100.0	0.0	0.0	0.0	12 (100)
	Female	97.1	2.9	0.0	0.0	35 (100)
Committed but not living together	Male	69.4	25.0	2.8	2.8	72 (100)
	Female	76.5	19.4	3.1	1.0	98 (100)
Single	Male	67.8	27.1	1.7	3.4	177 (100)
	Female	85.5	14.6	0.0	0.0	110 (100)
Total		712 (84.3)	114 (13.5)	10 (1.2)	4 (1.0)	845 (100)

Chi square test: P=0.000

Table 13: Percentage distribution of condom use with non-spousal partners in the last year by gender in the different age groups (488)

Age group	Gender	Condom use with non spousal partners of the last 12 months			Total
		Never	Sometimes	Always	
15-24	Male	30.3	27.5	42.2	142 (100)
	Female	28.2	35.5	36.3	110 (100)
25-34	Male	46.2	21.5	31.3	93 (100)
	Female	59.7	25.8	14.5	62 (100)
35-44	Male	64.0	16.0	20.0	25 (100)
	Female	63.9	22.2	13.9	36 (100)
>44	Male	66.7	8.3	25.0	12 (100)
	Female	75.0	0.0	25.0	8 (100)
Total		207 (42.4)	127 (26.0)	154 (31.6)	488 (100)

Chi square test: P=0.000

Forty two percent reported never to have used condoms in the last year with non spousal partner (Table 13).

Table 14: Percentage distribution of condom use with non-spousal partners in the last year according to marital status by gender (488)

Marital status	Gender	Condom use with non spousal partners of the last 12 months			Total
		Never	Sometimes	Always	
Married or living as married	Male	56.8	15.9	27.3	44 (100)
	Female	56.6	21.7	21.7	23 (100)
Separated divorced widowed	Male	60.0	0.0	40.0	10 (100)
	Female	78.3	8.7	13.0	23 (100)
Committed but not living together	Male	27.0	31.8	41.2	63 (100)
	Female	41.4	29.9	28.7	87 (100)
Single	Male	40.0	23.9	36.1	155 (100)
	Female	36.1	36.1	27.8	83 (100)
Total		207 (42.4)	127 (26.0)	154 (31.6)	488 (100)

Chi square test: P=0.001

Prevalence of sexual transmitted diseases

Table 15: Percentage distribution of HIV, HSV-2, and Chlamydia infection according to gender in different age groups

Positive disease	Gender	Age group (years)				Total
		15-24	25-34	35-44	>44	
HIV	Males	5.3	31.1	27.4	20.0	76 (17.4)
	Females	20.8	37.1	23.9	12.8	124 (25.7)
Total testing(n=919)		51 (12.8)	94 (34.2)	43 (25.2)	12 (16.2)	200 (21.8)
HSV-2	Males	7.2	44.7	62.9	71.4	138 (31.6)
	Females	36.7	85.1	89.9	92.1	322 (67.7)
Total testing(n=913)		84 (21.2)	179 (65.6)	157 (80.1)	60 (82.2)	460 (50.4)
Chlamydia	Males	7.2	7.6	3.2	0.0	27 (6.2)
	Females	9.7	6.3	4.5	2.5	34 (6.9)
Total testing(n=928)		34 (8.4)	19 (6.9)	7 (4.0)	1 (1.3)	61 (6.6)

The overall prevalence of HIV, HSV-2 and Chlamydia was 21.8% (19.1% - 24.4%) 50.4% (47.1% - 53.6%) and 6.6% (5% - 8.2%) respectively with women having a high prevalence of HIV than men 25.7% (21.8% - 29.6%) vs.17.4% (13.9% - 21.0%). The prevalence of HIV in the age-group 15-49 years was 21.7% (males 17.3%, women 25.6%). The prevalence of HIV in females aged 15-24 years was four times that of their male counterparts while the highest prevalence of HIV (34.2%) among the males and females was in the age group 25-34 years.

The prevalence of HIV in males over 35 years was higher compared to their female counterparts. There was a statistical significant difference between males and females p=0.0000 having HIV and HSV-2 and a non statistical significant difference for Chlamydia p= 0.055

Assessing associations between prevalence of sexually transmitted diseases and various risk factors of sexual behaviours.

Age of first sex

Table 16: The prevalence of HIV, HSV-2 and Chlamydia infection according to age of first sex by gender

Positive disease	Gender	Age of first sex (years)					Total
		5-10	11-15	16-20	21-25	>26	
HIV	Males	0.0	13.7	23.3	24.1	0.0	76 (19.3)
	Females	100	24.5	27.2	43.5	100	124 (28)
Total testing(n=837)		1 (14.3)	42 (18.0)	138 (25.7)	17 (32.7)	2 (28.6)	200 (23.9)
HSV-2	Males	16.7	24.5	38.9	48.3	80.0	137 (34.7)
	Females	100	69.9	73.4	82.6	100	321 (73.3)
Total testing(n=833)		2 (28.6)	99 (42.7)	318 (59.4)	33 (63.5)	6 (85.7)	458 (55.0)
Chlamydia	Males	0.0	5.0	6.5	13.8	0.0	25 (6.3)
	Females	0.0	7.4	7.7	4.2	0.0	33 (7.4)
Total testing(n=843)		0 (0.0)	14 (6.0)	39 (7.2)	5 (9.4)	0 (0.0)	58 (6.9)

Chi square test: p=0.000 for HSV-2 statistically significant and not statistically significant for HIV p=0.09 and Chlamydia p=0.74.

Table 16 shows that the prevalence of HIV is highest (32.7%) in those respondents whose age of first sex is between 21-25 years and prevalence in females is almost doubled as compared to males although the association is not significant.

Marital status

Table 17: The prevalence of HIV, HSV-2 and Chlamydia infection according to marital status by gender

Positive disease	Gender	Marital status				Total
		Married or living as married	Separated divorced widowed	Committed but not living together	Single	
HIV	Males	26.9	41.7	13.3	11.6	76 (17.4)
	Females	24.8	31.4	29.8	22.5	124 (25.7)
Total testing(n=919)		86 (25.6)	16 (34.0)	41 (22.9)	57 (16.0)	200 (21.8)
HSV-2	Males	61.2	66.7	17.1	16.3	138 (31.6)
	Females	82.1	97.1	56.4	47.9	322 (67.7)
Total testing(n=913)		247 (73.7)	41 (89.1)	70 (39.6)	102 (28.7)	460 (50.4)
Chlamydia	Males	7.4	0.0	8.0	5.1	27 (6.2)
	Females	5.9	2.9	11.5	6.1	34 (6.9)
Total testing(n=928)		22 (6.5)	1 (2.1)	18 (10.1)	20 (5.5)	61 (6.6)

There was a statistical significant association between the outcomes (HIV and HSV-2 p=0.001) while for Chlamydia p=0.13 a non statistical significant association and the exposure (marital status)

Married males had a high prevalence of HIV and Chlamydia as compared to women 26.9% vs. 24.8% and 7.4% vs.5.9% respectively. The prevalence of HIV in single women was double that of the males 22.5% vs. 11.6 %.(Table 17)

Number of non-spousal partners in the last year

Table 18: The prevalence of HIV, HSV-2 and Chlamydia infection according to number of non spousal sexual partners one had sex with in the last 12 months by gender

Positive disease	Gender	Number of non-spousal partners one had sex with in the last 12 months				Total
		0	1	2-5	>5	
HIV	Males	38.2	31.6	27.6	2.6	76 (100)
	Females	44.4	40.3	5.0	0.6	124 (100)
Total testing(n=837)		84 (24.1)	74 (23.6)	39 (25.2)	3 (15.8)	200 (23.9)
HSV-2	Males	41.6	34.3	22.6	1.5	137 (100)
	Females	54.8	37.4	7.2	0.6	321 (100)
Total testing(n=833)		233 (67.2)	167 (53.5)	54 (34.8)	4 (21.1)	458 (55.0)
Chlamydia	Males	28.0	32.0	32.0	8.0	25 (100)
	Females	33.3	51.5	15.2	0.0	33 (100)
Total testing(n=843)		18 (5.1)	25 (7.9)	13 (8.4)	2 (10.5)	58 (6.9)

Chi square test: p=0.000 for HSV-2 (statistically significant), p= 0.84 for HIV 0.35 for Chlamydia (not statistically significant).

Among men and women testing positive for HIV, 61.8% had sexual intercourse at least once with non-spousal sexual partner in the last year.

Condom use with non-spousal partners in the last year

Table 19: The prevalence of HIV, HSV-2 and Chlamydia infection in situations where a condom was used during intercourse in the last 12 months with non-spousal partners by gender

Positive disease	gender	Condom use in the last 12 month with non-spousal partners			Total
		Never	Sometimes	Always	
HIV	Males	26.6	9.4	12.2	47 (17.3)
	Females	40.2	28.6	20.0	68 (31.6)
Total testing(n=486)		68 (33.0)	24 (18.9)	23 (15.0)	115 (23.7)
HSV-2	Males	36.4	29.7	21.4	80 (29.4)
	Females	89.6	54.0	43.4	143 (67.5)
Total testing(n=484)		126 (61.2)	53 (41.7)	44 (29.1)	223 (46.1)
Chlamydia	Males	8.2	7.8	4.1	18 (6.6)
	Females	11.3	4.8	14.3	22 (10.2)
Total testing(n=487)		20 (9.7)	8 (6.3)	12 (7.8)	40 (8.2)

Chi square test: p=0.000 for HIV and HSV-2 statistically significant and not statistically significant for Chlamydia p=0.54.

Twenty seven percent of males and 40% of females with HIV never used condoms in the last year with non-spousal partners. (Table 19)

Assessing confounding factors between the association of condom use with non-spousal partners in the last 12 months and sexually transmitted diseases

The association between condom use or not in the last 12 months with non-spousal partners during sexual intercourse and sexually transmitted diseases (HIV, Chlamydia, and HSV-2) was assessed while controlling for potential confounders (table 8), using stratification techniques. There is no statistical test for confounding and we compare the crude and adjusted results to conclude whether confounding is present or not.

Table 20: Confounding factors associated with HIV, HSV-2 and Chlamydia infection.

Condom Use Crude ORs (95%CI)	**Sexually transmitted Diseases**		
	HIV/AIDS	Chlamydia	HSV-2
	0.4(0.3,0.6)	**0.7(0.4,1.4)**	**0.3 (0.2,0.5)**
Confounders			
Age of first sex			
<14 years	0.4(0.1,1.2)	2.4(0.2,24.8)	0.6(0.3,1.5)
>14 years	0.4(0.3,0.7)	0.6(0.3,1.3)	0.3(0.2,0.5)
Adjusted OR	**0.4(0.3, 0.6)**	**0.7(0.4,1.4)**	**0.3(0.2,0.5)**
Age			
<24 years	0.3(0.1,0.5)	0.5(0.2,1.2)	0.3(0.2,0.6)
>24 years	0.8(0.5,1.4)	0.7(0.2,2.2)	0.7(0.4,1.3)
Adjusted OR	**0.5(0.3,0.8)**	**0.8(0.4,1.7)**	**0.5(0.3,0.7)**
Sex			
Male	0.3(0.2,0.7)	0.7(0.3,1.7)	0.6(0.3,1.0)
Female	0.5(0.3, 0.9)	0.8(0.3,1.9)	0.1(0.1,0.3)
Adjusted OR	**0.4(0.3,0.7)**	**0.7(0.4,1.4)**	**0.3(0.2,0.5)**
Marital status			
Single	0.3(0.2,0.6)	0.7(0.3,1.3)	0.3(0.2,0.5)
Married	1.3(0.4,5.0)	1.3(0.3,7.3)	1.6(0.5,5.0)
Adjusted OR	**0.4(0.3,0.7)**	**0.7(0.4,1.4)**	**0.4(0.3,0.5)**

The crude odds ratio for the three diseases with their 95% confidence intervals are as shown in the table suggesting an association exists between condom use and risk of HIV, HSV-2 and Chlamydia infection. Potential confounders considered included age of first sex, age, sex and marital status and these were stratified as shown in the table. Specific strata and adjusted odds ratios were also determined. In all the cases, the adjusted and crude odds ratios were not very different concluding that the association was truly protective for HIV and HSV-2 (p=0.000) and not for Chlamydia (p=0.3) and there was no confounding. Condom use with non-spousal partners in the last year sex was protective only for HIV and HSV-2

Discussion

Risky sexual behaviour will place individuals at a higher risk of contracting Sexually Transmitted Diseases. A reduction of such risky behaviours is important as it will lead to a significant reduction over time the prevalence of these diseases. Individuals must strive to practice partner reduction, use condoms consistently and delay age of first sex.

Summary of findings

This study of risk factors for sexually transmitted diseases in a South African community found that:

1. The prevalence of HIV was 21.8% and the highest prevalence was recorded in the age group 25 – 34 years at 34.2%. The prevalence was higher in females as compared to males (25.7% vs. 17.4%) and it was four times in females in the age-group 15-24 years as compared to males (20.8% vs. 5.3%)
2. Among those who were HIV positive, 26.2% men and 40.2% women never used condoms with non spousal partners in the last year
3. The prevalence of HSV-2 infection and Chlamydia were 50.4%, and 6.6%.
4. Among those who had experienced sex, 34.7% of the respondents reported that they had never used a condom
5. Among the 15-24 year old reporting to have had sex in the last year, 29.4% never used condoms with their most recent non spousal partner and 39.9% indicated they always used condoms with their most recent partner. The males were significantly more likely to report always using a condom than the women (42.2% vs. 36.3%)
6. Among the respondents, 68.7% of the men and 48.6% of the females reported having at least one or more non-spousal partner in the last year
7. Among those who were married 32.6% of the males and 11.7% of the females reported having had at least one or more non-spousal partner in the last 12 months.
8. Among those who were married, 93.3% of the males and 97.6% of the women never used condoms with non-spousal partners in the last month.

9. At the time of the interview, the proportion of those testing positive for HIV, HSV-2 and Chlamydia who had never used a condom in the last year was 33%, 61.2% and 9.7% respectively.

Study limitations

This study being based on cross sectional data implies that the direction of relationships could not be determined. The interpretation of the results limits it to associations between variables rather than cause and effect relationships.

The data being secondary, many other variables that could influence their behaviours could not be investigated e.g. there was no data to get a further measure of consistency of condom use because we are not told in how many episodes did the respondents use condoms in the last month. Again secondary abstinence[28] has not been measured by this questionnaire i.e. the number of sexually active respondents who have abstained from sex for the past year. This measure of sexual activity is more sensitive to behaviour change as it is a better measure of recent sexual activity and therefore exposure to HIV infection, and it captures people who may have chosen to change their behaviour by refraining from sex.

Since concurrency is now thought to be a major factor in the high HIV prevalence experienced in many Sub Saharan African countries, there is a limitation in the use of UNAIDS questionnaire to explore this phenomenon.

Another limitation that may have arisen is due to lack of test-retest of the questionnaire where sensitive questions about sexual behaviours are asked.
Three studies have recorded limitations in the validity of self-reported survey data on sensitive information such as that collected on sexual behaviour[19,20,21] given that respondents will provide socially acceptable answers rather than reality and this will affect assessments of trends in behaviour over time. The original study[1] must have attempted to overcome this problem by;

1. Ensuring that confidentiality was stressed during the informed consent sessions and throughout interviews

2. Ensuring that the interviewers (nurses) were trained to be non judgemental and neutral with regard to various sexual behaviours documented in the questionnaire

Sexual experience

Overall 79.2% of those in the 15-24 year old age group had had penetrative sexual intercourse and this is higher when compared to the RHRU study[6] at 67%. This age group might have had a high opportunity to engage in sex in this community.

Sexual debut

The finding that the median age of sexual debut was 17 years for both sexes in the present study and usually males lag behind females by at least a year is similar to other studies.

For example, the nationwide survey on South African youths revealed the median age of sexual debut to be 16.5 years[22], while another study in Cape Town showed that by the age of 19 years, a higher proportion of students had participated in sexual activities[23]. In Zimbabwe, there was an early sexual debut of 18 years with women experiencing coital debut at 15 years[24].

This is in contrast with the study[23] conducted in Cape Town that revealed that a higher proportion of males had participated in sexual intercourse by the age of 14 years as compared to females.

This early age of first sex could be explained in part by modernization where the majority of youth are exposed to Television and movies with explicit content. Targeted response to those who have not started sex in this group should include total abstinence or delayed age at which they engage in sex or if they have to, they must use condoms consistently.

Further research should also be conducted to determine the factors that can delay age of first sex in this community through health education in clinics and schools. Opinion leaders should also be engaged as they have influence on cultural issues.

Overall STD prevalence and prevalence of HIV in the different age groups

The HIV tests were done on plasma extracted from blood. Although this procedure is invasive and respondents might not be comfortable with it, the results are

normally valid with high specificity and sensitivity. Sensitivity is the percentage that measures positive with the test among those who have HIV antibodies. Specificity is the percentage that measures negative with the test among those who do not have HIV antibodies. It is also important to note that the kind of HIV testing employed in this study i.e. unlinked anonymous testing is more likely to produce an estimate of HIV prevalence that is not biased by refusal to participate.

We realize that out of the 930 respondents, only 919 tested for HIV, 913 tested for HSV-2 and 928 tested for Chlamydia. The reasons for this are unclear but could be due to spoilt samples of blood and urine during storage and transportation or may be the respondents refused to participate in the tests at all.

This study has also demonstrated that women have a higher HIV prevalence than men (25.7% vs. 17.4%) and women in the age group 15-24 years are four times more likely to be HIV infected than are young men (20.8% vs. 5.3%). This finding is supported by the Nelson Mandela study[5] at (17% vs. 4.4%) and the RHRU study[6] (15.5% of women vs. 4.8% of men).

Factors which could explain these differences are:

1. Women reproductive systems make it easier for them to be infected with HIV and are more likely to have undetected sexually transmitted infections
2. Younger women are more biologically vulnerable than men because of immature genital tracts and or as a result of risky sexual practices[25].
3. Men are more effective at transmitting HIV because men's semen is more infectious than vaginal fluids because of its cellular contents and HIV needs live cells in order to be transmitted
4. Gender imbalance is also a problem
    - Deep seated emphasis of multiple sexual partners for men
    - Male control over barrier methods
    - Women economic situation which make them and their families dependent entirely on men

The overall prevalence of HIV at 21.8% in this community can be compared with data from other studies conducted in South Africa. The Nelson Mandela study[5] of

2005 revealed the overall prevalence of HIV to be 16.2% in the age group 15-49 years which is less than that found in this community.

The HIV prevalence for women at 25.7% is higher than that found in Nelson Mandela study[5] of 2005 which was 20.2% and less than that of the antenatal survey[8] of 2004 which stood at 29.5%. A study carried out in Carletonville revealed the prevalence rate of HIV to be 20.2% for men and 37.1% for females[26]. The national HIV prevalence rate stood at 29.5% with Kwa Zulu Natal Province at 40.7%, Gauteng Province at 20.3%, and Mpumalanga at 30.8%[3]. In yet another study[4], the prevalence rate for HIV was 28.4%.

Data from a study done in four African cities[17] revealed that the prevalence rate of HSV-2 is comparable to this finding. In yet another study[27], women who were 24 years had prevalence rates higher than 90%. The reasons for such a difference when compared with this study are unclear. It could be due to the fact that women at this age are more at risk due to high sexual activity and it is at this age that majority of women start conceiving.

All the studies above support the finding of higher prevalence rates in females than males. This may suggest women to be having sex with older men and physiologically young women being more susceptible to sexually transmitted infections. For instance in Kisumu Kenya, the prevalence rate of HIV infection among women aged 15-19 years was 23% while males of the same age showed 3.5%[17]. Social cultural systems in many cases limit women's control over their sexual lives as explained above.

Among respondents aged 15-24 years, the overall prevalence was 12.8% and the prevalence of HIV in females is almost four times that of males (20.8% vs. 5.3%). This result confirms the findings of the Nelson Mandela study[5] of 2005 where the overall prevalence was 10.3% and for females vs. males (16.9% vs.4.4%) and the youth survey[6] of 2003 (15.5% vs. 4.8%).

The importance of behaviour change through health education should be emphasized in this community especially in young women who are more

vulnerable. Strategies could include encouraging younger people waiting longer before becoming sexually active, having fewer sexual partners and consistent condom use as these were shown to be effective in Uganda[15].

Number of non spousal partners in the last year

The spread of HIV depends upon unprotected sex with people who also have or have had other partners[28]. Most monogamous relationships are cohabiting, although the reverse is not necessarily true. Partners who do not live together - who are irregular or occasional - are those who are most likely to have other partners over the course of the year. These partnerships therefore carry a higher risk of HIV transmission than partnerships that do not link in to a wider sexual network. AIDS prevention programmes try to discourage high numbers of partnerships and to encourage mutual monogamy[28].

From the results we note that 37.4% of the respondents had sex with at least one non spousal partner in the last year while 20.6% had sex with 2 or more non spousal partners in the last year. The majority of those who had sex with one or more non spousal partner in the last year were respondents aged between 15-24 years, males accounting for 35.5% with one non spousal sexual partner compared to females 59.7%. These findings are lower when compared with the Nelson Mandela study of 2005, (94.0% females vs.72.8% males). Women were significantly more likely to report having at least a single partner than men as can be seen in both studies. However, it is possible that those with these many partners were more likely to use condoms to protect themselves from HIV infection.

Results on the number of partners might be subject to information bias as the 15-24 year olds might be over-reporting that they have had sex with many different partners, or they might have had sex many times with the same partner and report this partner as a different one. Alternatively there was a lot of sexual opportunity for this group as compared to the over 44 year old respondents. The over 44 years might also have a problem of recall bias leading to under-reporting of the

number of non spousal partners they might have had sex with in the last year as well as social desirability bias.

A notable finding is that married people had few non spousal partners as compared to those who were separated, committed or single. The single respondents reporting to have had sex with over 2 non spousal partners in the last year must be encouraged to practice partner reduction. The finding that the large majority of respondents who were sexually active had only one partner over the past year and that 42% abstained from having sex with any non spousal partner are similar to Nelson Mandela study[9] of 2002 and the Demographic and Health survey[10] of 1998.

Condom use

Unprotected sex spreads HIV in most countries and therefore increasing condom use has been a central intervention strategy for many AIDS programmes. Availability and easy access to condoms are a prerequisite for their use and the fact that they are available does not mean they are used.

This study revealed that 94.6% of respondents reported that condom was cheap and very few (3.6%) did not know where to buy them. This demonstrates the high levels of effectiveness of the condom distribution system that has been a cornerstone of the Department of Health's policy since the mid 1990's. The finding that 34.7% had never used a condom in this study is worrying, and changes to risky behaviour through behavioural change communication needs to be encouraged, along with consistent condom use. Condom use at last risky sex is the percentage of respondents who report using a condom the last time they had risky sex with non marital, non cohabiting partner, of those who have had sex with such a partner in the last year[28]. Asking about the most recent act of non-cohabiting sex minimizes recall bias and gives a good cross-sectional picture of levels of condom use and therefore all if not most studies will adopt this as a conventional way of measuring condom use[28].

A higher percentage has been recorded in this study on always using condoms with their most recent partner by the 15-24 year old who had sex in the last year as compared to the RHRU[6] study (39.9% vs. 33%). Those reporting never to have used condoms in this study as compared to the RHRU study[6] were 29.4% vs. 31%.

In both studies, the males were significantly more likely to report always using condoms than the women (42.2% vs. 36.3%) as compared to the RHRU[6] study (39% vs. 28%). Data supporting this finding is from the national HIV prevalence household survey[9] of 2002, where condom use stood at 57.1% for males and 46.1% for females for the 15-24 year old respondents. These percentages are slightly higher than the above 2 studies.

This is in contrast with data from various studies for example, the low percentages found by the South Africa demographic health survey[10] in 1998 and data from a rural South African community with high prevalence of HIV, only 40% used condoms[29]. Similarly, men reported using condoms in less than 25% of contacts with non-regular partners and less than 7% of contacts with their regular partners[11]. In Malawi, there was an observed increase in current condom use from 4.4% to 7.4% reported by men[12]

A notable finding is that among those who are HIV positive, 26.2% males and 40.2% females never used condoms in the last year with non-spousal partners. Reasons for not using condoms are not clear and these respondents are likely to be contributing to the spread of HIV. They might not even be aware of their status and therefore this community must be encouraged to go for voluntary counselling and testing. Another discouraging finding is that about 57% of married men and women never used condoms with non spousal partners of the last year and therefore consistent condom use should be emphasized. Condom use in non-spousal relationships of the last 12 months was clearly protective as is evidenced by the low prevalence of the two sexually transmitted infections in those who used condoms as compared to those who never used condoms. HIV 40.9% vs. 59.1% OR 0.4(0.3, 0.6) and for HSV 43.5% vs. 56.5% OR 0.3(0.2, 0.5) and the

association was significant p<0.0001. This means they were truly using condoms and condoms if used consistently can prevent spread of HIV.

The association of condom use with non spousal partner of the last year and Chlamydia was not significant p=0.32 with 50% prevalence for those who used or never used condoms OR 0.7(0.4, 1.4). The reason for this is unclear, and maybe a result of reporter bias where respondents might not have been using condoms as they suggested during the interviews.

Conclusion

In this population under study, the majority of respondents had had sex at an early age, prevalence of HIV and Chlamydia was high and condom use is not optimal in non spousal partnerships. Prevention efforts to reduce the spread of HIV in this community needs to be strengthened, especially:

1. Encouraging those who have not had sex to abstain or use condoms consistently.
2. The single respondents should also practice partner reduction.
3. This community must visit the nearest voluntary counselling and testing centers so that they can know their status and stop risky sexual behaviour.

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

COMMITTEE FOR RESEARCH ON HUMAN SUBJECTS (MEDICAL)
Ref: R14/49 Awuonda

CLEARANCE CERTIFICATE **PROTOCOL NUMBER** M03-08-03

PROJECT	Baseline Study on the Knowledge of Condom Use, Safe Sexual Practices and Ulcerative Genital Diseases Among Men Aged 18-24 Years Old in Orange Farm, South Africa
INVESTIGATORS	GO Awuonda
DEPARTMENT	School of Public Health, Wits Medical School
DATE CONSIDERED	03-08-29

DECISION OF THE COMMITTEE Approved unconditionally

Unless otherwise specified the ethical clearance is valid for 5 years but may be renewed upon application
This ethical clearance will expire on 1 January 2008.

DATE 03-09-01 CHAIRMAN.....(Professor P E Cleaton-Jones)

* Guidelines for written "informed consent" attached where applicable.

c c Supervisor: Dr R Weiner
Dept of School of Public Health, Wits Medical School
Works2\Iain0015\HumEth97.wdb\M 03-08-03
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DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and ONE COPY returned to the Secretary at Room 10001, 10th Floor, Senate House, University.

I/we fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee. I agree to a completion of a yearly progress form. I/we agree to inform the Committee once the study is completed.

DATE 22/10/2003 SIGNATURE .....

PLEASE QUOTE THE PROTOCOL NO IN ALL QUERIES .: M 03-08-03
PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

References:

1. Auvert B, Males S, Puren A, *et al*. Can HAART reduce the spread of HIV? A study in a township of South Africa. *J acquired Immune Deficiency Syndrome* 2004, 36: 613-621

2. UNAIDS. *AIDS epidemic update, special report on HIV/AIDS*: *December 2006*. Geneva: UNAIDS.

3. UNAIDS (2006). *Report on the global AIDS epidemic*. Geneva, UNAIDS

4. Department of Health South Africa (2006). *National HIV and syphilis antenatal prevalence survey, South Africa 2005*. Pretoria, Department of Health South Africa.

5. Shisana O, Rehle T, Simbayi L, *et al. South African National HIV prevalence, HIV incidence, Behaviour and Communication Survey, 2005*. Cape Town. HRSC Press

6. Pettifor E, Rees V, Hlongwa-Madikizela L, *et al*. *HIV and sexual behaviour among young South Africans: A National survey of 15-24 year olds.* Johannesburg: Reproductive Health Research Unit, University of Witwatersrand, 2004.

7. *The South African Health review* 2000 HIV/AIDS current issues. Ntuli A, Health systems trust 14: 287-299. Pretoria

8. Department of Health South Africa (2005). *National HIV and Syphilis antenatal seroprevalence survey in South Africa 2004*. Pretoria, Department of Health South Africa.

9. Shisana O, Simbayi L. *Nelson Mandela/ HRSC study of HIV/AIDS South African National HIV Prevalence, Behavioural Risks and Mass Media Household Survey 2002*. Cape Town: Human Sciences Research Council 2002.

10. Department of Health 1998a. *The South African demographic and health survey.* Pretoria, Department of Health South Africa

11. Auvert B, Ballard R, Campbell C, *et al*. High prevalence of HIV infection among youth in a South African town is associated with HSV2 seropositivity and sexual behaviour. *AIDS* 2001; 15(7): 885-98.

12. Taha T, Canner J, Chiphangwi J, *et al*. Reported condom use is not associated with incidence of sexually transmitted diseases in Malawi. *AIDS* 1996, 10: 207 – 212.

13. Ng'weshemi J, Boerma T, Pool R, *et al*. Changes in male sexual behavior in response to the AIDS epidemic: evidence from a cohort study in urban Tanzania. *AIDS* 1996, 10: 1415 – 1420.

14. Grosskurth H, Mosha F, Todd J, Mwijaburi E, Klokke A, Senkoro K, *et al*. Impact of improved treatment of sexually transmitted diseases on HIV infection in rural Tanzania. Randomized Controlled Trial. *Lancet* 1995, 346: 530-36.

15. Wawer M, Sewankambo N, Serrwada D, *et al*. Control of sexually transmitted diseases for AIDS prevention in Uganda:a randomized community trial. *Lancet* 1999; 353: 525-35.

16. Simonsen J, Cameron.W, Gakinya M, *et al* Human Immunodeficiency Virus infection among men with sexually transmitted diseases. Experience from a centre in Africa. *N Engl J Med* 1998: 274 – 277.

17. Weiss A, Buve A, Robinson J, *et al*. The epidemiology of HSV2 infection and its association with HIV infection in four urban African populations. Study group on heterogeneity of HIV epidemics in African cities. *AIDS* 2001 15 suppl4: S97-108.

18. UNAIDS. Looking deeper into the HIV epidemic: a questionnaire for tracing sexual networks. In: *Best Practice Collection, Key Material* 98/27. Geneva: UNAIDS;

19. Buve A, Lagarde E, Carael M, *et al*. Interpreting sexual behaviour data: validity issues in the multicentre study on factors determining the differential spread of HIV in four African towns. *AIDS* 2001, 15 (4): S117-S126

20. Dare O, Cleland J. Reliability and validity of survey data on sexual behaviour. *Health trans review* 1997, 4 (suppl.): 93-110

21. Gregson S, Zhuwau T, Ndlovu J, Nyamukapa A. Methods to reduce social desirability bias in sex surveys in low development settings: an experience in Zimbabwe. *STD* 2002, 29:568-575

22. Simbayi L, Chauveau J, Shisana O. Behavioural responses of South African youth to the HIV/AIDS epidemic: a nationwide survey. *AIDS care* 2004. 16(5): 605-18.

23. Flisher J, Reddy P, Muller M, Lombard C. Sexual behaviour of Cape Town high-school students. *S Afr Med J.*2003; 93(7): 537-41.

24. Pettifor E, van de Straten A, Dunbar S, *et al*. Early age of first sex: a risk factor for HIV infection among women in Zimbabwe. *AIDS* 2004 18(10): 1435-1442.

25. Glynn R, Carael M, Auvert B *et al*. Why do young women have a much higher prevalence of HIV than young men? A study in Kisumu, Kenya and Ndola, Zambia *AIDS* 2001:15 (4): S51-S60

26. Williams B, Taljaard D, Campbell C, *et al*. Changing patterns of knowledge, reported behaviour and sexually transmitted infections in a South African gold mining community. *AIDS* 2003 17(14): 2099-2107

27. Auvert B, Ballard R, Campbell C, *et al*. HIV infection among youth in a South African mining town is associated with herpes simplex virus-2 seropositivity and sexual behaviour. *AIDS* 2001, 15: 885-898.

28. USAID: *Handbook of Indicators for HIV/AIDS/STI Programs,* 2000 Bureau for Global Programs Washington

29. Hartung K, Nash J, Ngubane N, Fredlund G. AIDS awareness and sexual behaviour in a high HIV prevalence area in rural northern Kwazulu-Natal, South Africa. *Int J STD AIDS* 2002;13(12): 829-32.