UNIVERSITY OF THE WITWATERSRAND

FACULTY OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

RESEARCH REPORT

PROJECT TITLE

Assessment of risk factors and transmission for HIV comparing discordant and concordant couples in Hlabisa Demographic Surveillance System (DSS) site.

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Research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg in partial fulfillment of the requirements for the Degree of Master of Science in Medicine in the field of Population-based Field Epidemiology.

Johannesburg, South Africa 2006.

DECLARATION

I, George Adjei declare that this research report work is my own work. It is being submitted for the degree of Master of Science in Medicine in the field of Population-based Field Epidemiology in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

Signature: _____

Full Name: George Adjei

_____ day of November 2006.

DEDICATION

This research report is dedicated to my mother, Dora Mensah, for her unflinching support.

ABSTRACT

Objective

To compare risk factors between HIV-positive concordant and discordant couples.

Study design

This is a cross-sectional secondary data analysis study using data from Africa Centre Demographic Information System (ACDIS) database (June 2003 to December 2004) and data from the first round of population-based HIV surveillance conducted by the Africa Centre for Health and Population Studies.

Methods

Eighty-five HIV-positive concordant couples (both partners were HIV-positive) and 73 discordant couples (one partner was HIV-positive and other partner HIV-negative) were identified and selected from the first round of population-based HIV surveillance conducted from June 2003 to December 2004 in Hlabisa Demographic Surveillance System site. Partners health and sexual behaviour data were collected together with the blood sample for HIV test during the same round. Socio-economic and demographic data of partners were obtained from the ACDIS database and were collected within the same period (June 2003 to December 2004).

The behavioural, biological, demographic and socio-economic risk factors for HIV-positive concordance and transmission within discordant couples were analysed. Circumcision and area of residence respectively were the biological and demographic factors considered. Number of household assets was used as a proxy for socio-economic status. The behavioural factors considered were male condom-use, sexual debut (age at first sex), number of lifetime partners and premarital partners. The age and educational level of partners were considered as potential confounders.

RESULTS

The uncircumcised men were more likely to be in HIV-positive concordant couples than to be in discordant couples (OR =10.8, 95% CI [1.93 – 60.30], p=0.007). Partners living in urban area were 4.7 times more at risk of being in a HIV-positive concordant relationship than to be in discordant relationship (OR=4.7, 95% CI [2.09 - 10.39], p<0.001). Male not using condom on regular basis with female partners, early sexual debut, greater number of premarital partners, household assets and lifetime partners were found not to be significantly associated with HIV-positive concordance.

Conclusion

There are several biologic, socio-economic, demographic and behavioural risk factors for HIV-positive concordance. However, identifying some of them might be used to address transmission of HIV among discordant couples through intervention programs. Although cross-sectional studies are not ideal for establishing temporality, this study corroborates the findings of other studies that living in urban areas and circumcision are associated with HIV transmission.

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CHAPTER 1

1.0 INTRODUCTION AND LITERATURE REVIEW

Over ten percent of the world's population are living in sub-Saharan Africa and sub-Saharan Africa is home to almost two-thirds of all people living with HIV [1]. In 2003, it was estimated that three million people were newly infected with HIV and 2.2 million died of HIV related diseases in sub-Saharan Africa, constituting 75% of the three million AIDS related deaths globally in 2003 [1]. Most HIV transmissions in sub-Saharan Africa are due to heterosexual intercourse [2, 3]. A number of studies conducted in sub-Saharan Africa and other continents showed that HIV transmissions are partly due to a partner (married or in regular relationship) who is infected with HIV and transmits it to the spouse [4-8]. In Kampala, Uganda, a cross-sectional study of couples receiving voluntary HIV counselling and testing was carried out [9]. The findings of the study were that men living together with their sexual partner, those who were uncircumcised and those with higher viral loads were more likely to be in HIV-positive concordant relationships [9]. In addition, women living together with their sexual partner, with uncircumcised male partners and with higher viral loads were more likely to be in HIV-positive concordant relationships [9]. A cross-sectional study was conducted in four cities of sub-Saharan Africa to determine risk factors for HIV transmission within married couples in the four urban populations. It was found out that the only significant risk factor for HIV-positive concordance was herpes simplex virus type 2 (HSV-2) status[10].

HIV transmission among discordant couples is also influenced by behavioural, socio-economic, biological and demographic risk factors. A population-based cohort study conducted in the rural district of Uganda called Rakai, showed that there was an

association between a sero-positive partner and area of residence. Women in trading centres were found to be most at risk followed by those residing at the intermediate villages [8]. The women in the agricultural community were least at risk [8]. In Tanzania, a study conducted also showed that the area of residence was associated with HIV infection. In the study findings, those living in urban areas were more at risk of being infected than those in the rural areas [11]. A study carried out in Ethiopia also showed association of HIV infection with area of residence [12]. Moreover, various studies conducted showed that consistent male condom use was protective against HIV transmission [13-15]. Circumcision was found to reduce HIV infection and transmission in sero-discordant couples in a cohort study conducted in Rakai, Uganda [16]. In a population-based cross-sectional study in Kenya, uncircumcised men had higher risk of being HIV-positive [17]. A cohort study conducted in Mombasa, Kenya found uncircumcised status to be a risk factor for HIV infection [18]. In addition several other risk factors including polygamy, lifetime number of partners, education, age, sexual debut, religion, viral load and sexually transmitted infections had all been found out in studies to be risk factors for HIV transmission [6, 19-22].

The risk factors that lead to HIV-positive concordance (both partners are infected with HIV) and transmission of HIV among discordant partners (one partner infected with HIV) may not be the same in different countries in sub-Saharan Africa or even in different areas of a particular region in a country in sub-Saharan Africa [23, 24]. It therefore becomes imperative to investigate the risk factors associated with HIV-positive concordance and transmission among discordant partners in several areas in sub-Saharan Africa. With information about the risk factors that leads to HIV-positive concordance and transmission among discordant couples in a given geographical area,

thorough investigative studies could be done. The results of such studies will enable health planners in the region where the studies were conducted to design appropriate intervention strategies to reduce the rate of new HIV infections.

For this study, men and women in conjugal relationships participating in the first HIV survey round were selected. Conjugal relationship refers to any committed and long-term relationship between a man and woman and includes both marital and non-marital relationship [27]. The aim of this study was to investigate potential socio-economic, biological, behavioural and demographic risk factors for HIV-positive concordance. The study also investigated the potential risk factors as direct or indirect risk factors for HIV transmission among discordant couples. Potential risk factors for HIV were considered as direct if they were related to transmission due to sexual intercourse and this includes circumcision and male condom use. The indirect risk factors for HIV were the external factors that influence sexual behaviour and other life-styles that influence HIV transmission. These include area of residence, number of household assets, number of pre-marital partners, number of life-time partners and sexual debut. Here, number of household assets was used as a proxy for socio-economic factor.

1.1 Study Hypothesis

Discordant partners are more likely to: be circumcised, use condoms, have delayed sexual debut, have less pre-marital partners, have less lifetime partners, live in rural areas, have less household assets than concordant partners.

1.2 Aim and Specific Objectives

1.21 Aim

To undertake a comparative analysis of discordant and concordant HIV-positive partners.

1.22 Specific Objectives

1. To compare HIV- positive discordant and concordant couples in terms of circumcision, condom use, number of premarital partners, number of lifetime partners and delayed sexual debut.
2. To compare HIV- positive discordant and concordant couples in terms of area of residence and household assets.
3. To determine biological, demographic, behavioural and socio-economic factors as indicators of risk factors for HIV transmission among HIV-discordant couples.

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CHAPTER 2

2.0 METHODOLOGY

2.1 Study Design

This is a cross-sectional study using ACDIS database (June 2003 to December 2004) and data from the first round of population-based HIV surveillance conducted by Africa Centre for Health and Population Studies from June 2003 to December 2004.

2.2 Data source and study population

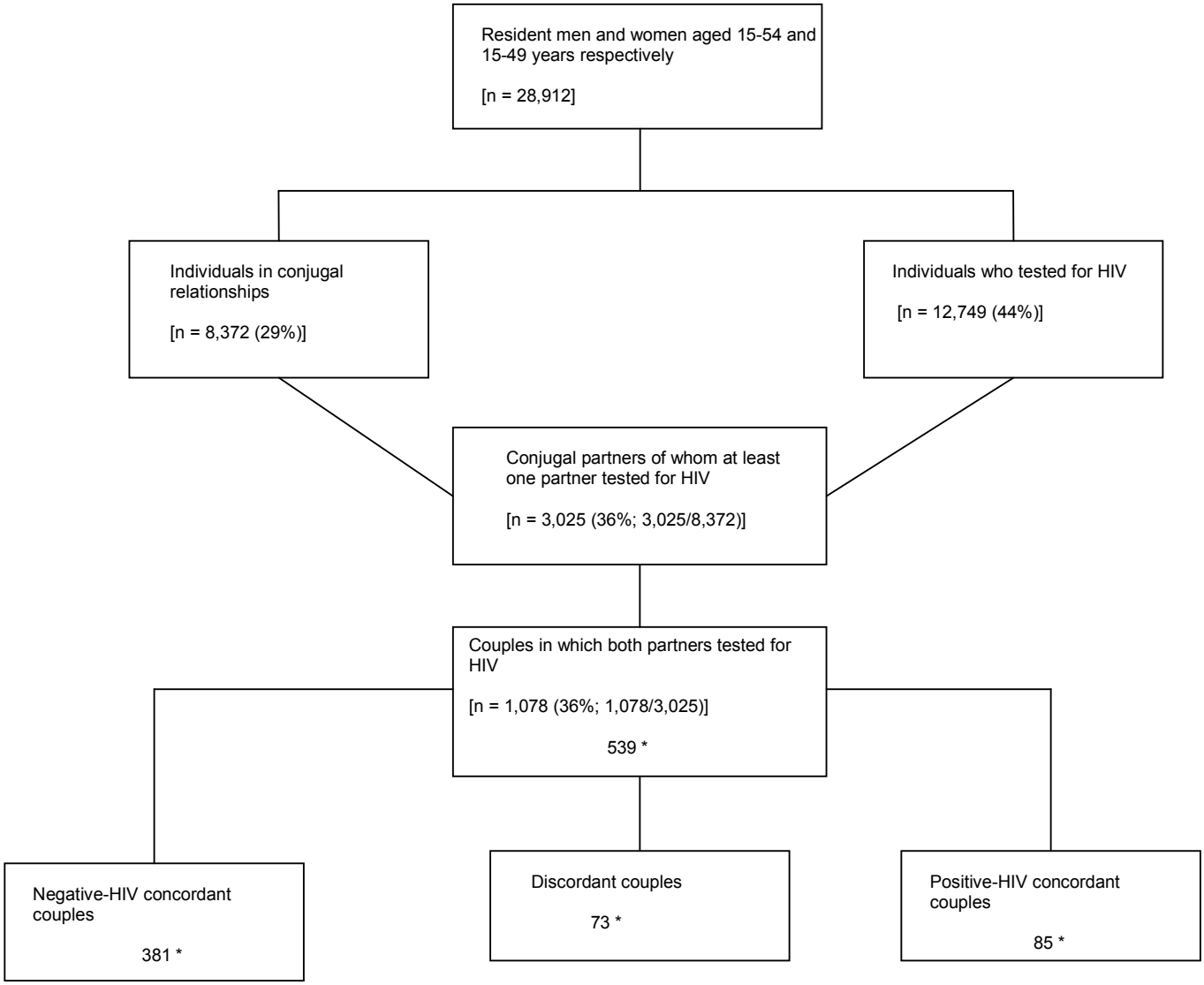
Hlabisa health sub-district is located in the Northern KwaZulu-Natal Province, South Africa. Africa Centre for Health and Population Studies established in 1997 has set up a Demographic Surveillance System (DSS) in the sub-district called Africa Centre Demographic Information System (ACDIS) [25]. ACDIS examines the population dynamics and its health-related issues in the site. The DSS site which is geographically located in parts of Hlabisa sub-district is to a large extent rural but it includes urban areas in KwaMsane reserve and township [26, 27]. Hence, the Hlabisa DSS includes both rural and urban settings. The total population of the site was 90,000 and comprised 65,000 resident members and 25,000 non-resident members. The non-resident members were those that belong to households in the site but were not living in the site [25]. The DSS has 11,000 households and only 50% of these households were connected to an electricity grid. Thirty-nine percent of the households had no toilet facilities and in 2001, only 8% of households had pipe-born water in their homes [55]. Labour migration in the demographic surveillance area is high and there is a high burden of death associated with HIV/AIDS [55, 56]. Fifty percent

of non-resident adults return for several days each month and many spent school holidays and annual leave with their households [57]. From June 2003 to December 2004, the first round of the population-based HIV surveillance was conducted by Africa Centre for Health and Population Studies in the DSS site and is designed as an open longitudinal survey.

Therefore apart from the Africa Centre Demographic Information System that collected data on population dynamics and health, the anonymous longitudinal population-based HIV surveillance was also conducted concurrently. Those eligible for the HIV study were females aged 15-49 years and males 15-54 years. HIV data can be linked anonymously to other data sets collected in ACDIS. The total number of resident males and females aged 15-54 years and 15-49 years respectively at the end of the first round HIV surveillance was 28,912. Of the 28,912 males and females 29% (8,372) were in conjugal relationships. Males and females who tested for HIV in the study were 12,749 (44.1%), of which the total males and females in conjugal relationships was 3,025. Of the 3,025 conjugal partners, couples of whom both partners tested for HIV in the first round were 539 and were all residents. Of the 539 couples 85 (15.8%) were found to be HIV-positive concordant and 73 (13.5%) to be discordant and the rest were HIV-negative concordant partners. HIV-positive men practising polygamy with both wives infected were included in the study. The latest wife was selected together with the husband in this study.

Below is a diagram depicting numbers in conjugal relationships during the study in Hlabisa DSS site.

Figure 1. Number of conjugal relationships amongst males and females aged 15-54 years and 15-49 years respectively in the DSS site: 2003/2004



*** Number of couples**

2.3 Measurement

The demographic and socio-economic data used in this study were obtained using structured questionnaires and face-to-face interviews of household informants by trained field workers. The individuals were not necessarily asked personally,

however one key household informant was asked about all household members. The questionnaires were administered by well-trained fieldworkers (interviewers) who were fluent in the Zulu language which was the common language spoken by the respondents. The health and sexual behaviour data were collected once per year together with the blood sample for HIV test by trained fieldworkers. These data were collected during household visits requiring direct contact with the eligible individuals. In appendix 5 are the relevant sections of the questionnaire.

HIV serology on dried blood spots (DBS) was determined by an algorithm using Vironostika ELISA (Organon Teknika) as first line and GAC ELISA (Abbott) for confirmatory test.

2.4 Data Collection

Supervisors validated interview findings by visiting at least 5% of homesteads visited by fieldworkers in the preceding period. Moreover, unannounced spot checks were made. All questionnaires from the field were checked by supervisors and the questionnaire records were entered into a large relational Microsoft SQL database, using a customized front end (programmed in Delphi 5) specifically developed for the Africa Centre for Health and Population Studies.

In this study 85 HIV-positive concordant and 73 discordant couples were selected from the round one HIV study and the couples characteristics were selected from the ACDIS database. In the analysis, number of household assets was used as a proxy for

socio-economic status. The household assets considered were bed net, bed, bicycle, block-maker, car, car battery, electric stove with oven, electric hot plate, electric kettle, fridge/freezer, gas cooker, lorry/tractor, motorcycle/scooter, radio, sofa/sofa set, sewing machine, table/chair, telephone, cell-phone, television set, video cassette recorder and wheelbarrow. The total number of these household assets owned by an individual were added and used as an index.

2.5 Sample Size

Eighty-five (85) HIV-positive concordant couples and 73 HIV-discordant couples were selected for this study. Hence, the sample size was 158.

2.6 Statistical Analysis

The characteristics of discordant and HIV-positive concordant couples were first compared. The means of the characteristics that were continuous and normally distributed were compared using the t-test. The chi-squared test was used for the categorical variables. Fisher's exact test was used for categorical variables where at least one of the cells had expected frequency less than 5.

The univariate logistic model was used to find the probability of the male or female partner being in a HIV-positive concordant relationship given that he or she was exposed to the set of potential risk factors being investigated. Multivariate logistic models were then used for the adjusted odds ratios. After the comparison of the partners' characteristics, the variable age was categorised into 18-29, 30-39 and 40-54 for partners. Since the distribution of the number of household assets was normal it was categorised into two groups based on the mean. Partners with number of assets greater than 6 were assigned higher socio-economic status and those with 6 and

below assigned lower socio-economic status. Sexual debut (age at first sex) variables for partners were normally distributed with mean sexual debut 17 years respectively. Hence, the categories for sexual debut variable of partners were <=17 and >17. Premarital partners' variables for both male and female partners were categorised into 0, 1 – 2, >=3. The variable called lifetime partners for male and female partners were grouped 1 – 2, >=3. Education variable was categorised depending on the partner's grade. Those with grade 8 and above were in the category 'High school and above' and those below grade 8 were in the category 'below high school'.

In the analysis the variables were assigned dummy variables. The table 1 in appendix 4 depicts the dummy variables and the variables used.

This analysis was restricted to discordant and HIV-positive concordant couples and HIV concordance was treated as a binary outcome variable (discordant or concordant). The analysis was done by comparing the partners in discordant couples with partners in concordant couples with respect to the potential risk factors. The potential socio-economic, behavioural, biological and demographic risk factors of discordant and HIV-positive concordant couples were examined using univariate and multivariate logistic regression. Potential confounders and other risk factors were adjusted for using the multivariate logistic regression. Stata 8.0 software package was used for the analysis

2.7 ETHICAL CONSIDERATIONS

The research protocol was approved by University of Witwatersrand Committee for Research on Human Subjects (Medical) with ethics approval number M060340. The research protocols for the Africa Centre Demographic Information System (ACDIS) and Africa Centre Population-based HIV Surveillance were approved by the University of KwaZulu-Natal Ethics Committee (E009/00 and E029/03, respectively). The datasets used for this research report was approved by Africa Centre for Health and Population Studies (ACHPS). Attached in appendices 1, 2 and 3 are the approval forms.

Eligible individuals' consent was sought before a finger prick of blood sample was taken for HIV test. HIV test results could be obtained confidentially in any of the 18 counselling centres in the Africa Centre Demographic Surveillance Area. Pre- and post-result counselling were offered to study participants.

CHAPTER 3

3.0 RESULTS

Baseline socio-demographic characteristics of the discordant and HIV-positive concordant partners were compared for any significant differences.

3.1 Baseline socio-demographic factors

The number of HIV-positive discordant males and females were almost equal. Of the 73 discordant couples, there were 37 (50.7%) males and 36 (49.3%) females who were HIV positive. For both males and females selected in the study the mean age of the females was 36 years (range: 18 - 49 years) and that of the males was 40.9 years (range: 21 - 54 years). Mean ages of discordant and concordant males were 42.2 years and 39.9 years respectively but was not statistically significant (p=0.06, 95% CI [-0.069 - 4.674]). There was also no significant difference in mean ages of discordant and concordant females (37.4 vs 35.1 years, p=0.05, 95% CI [-0.023 - 4.63]) respectively.

The proportions of the sexual history respondents in concordant and discordant relationships were estimated. The proportion of male and female respondents in concordant relationships with known premarital-partners status were 34% and 27% respectively. Similarly, the proportion for males and females in discordant relationships were 34.2% and 36.9%. In addition, the respective proportions for male condom-use were 70.6% and 63% for males in concordant and discordant relationships. In concordant relationships, the proportions of male and females whose life-time partners status were known were 31.8% and 27.1% respectively. The proportions for life-time partners in discordant relationships were 36.9% and 39.7% in males and females respectively. Finally, the proportions of respondents for sexual

debut were 17.6% and 74.5% in concordant male and female respectively. Moreover, that of males and females in discordant relationships were 23.3% and 56.1% respectively.

Of the 93 concordant and discordant males whose circumcision status was known, 84 (90.3%) were uncircumcised and 9 (9.7%) circumcised. Fifty-seven percent of the uncircumcised males were in concordant couples and 43% in discordant couples.

The proportion of concordant males (58.0%) whose educational level was below high school was almost the same as discordant men (58.7%). This was not significant (p=0.93) and only involves men whose educational level was known. In the same vein, there was no significant difference in educational level for 'below high school' between concordant (58.1%) and discordant (57.8%) females (p=0.97). One hundred and thirty-five (44.6%) of the partners recruited were living in the rural area and 168 (55.4%) were living in the urban area. Table 1 gives the distribution of socio-demographic and sexual behavioural characteristics of couples in the study.

Table 1: Characteristics of partners in HIV-discordant and concordant relationships

Factors	Concordant (n=85)	Discordant (n=73)	p-value
Age (years) Mean (std)			
Male	39.9 (7.6)	42.2 (7.4)	0.06
Female	35.1 (7.5)	37.4 (7.3)	0.05
Education (below high school)			
Male % (n)	58.0 (40)	58.7 (37)	0.93
Female % (n)	58.1 (43)	57.8 (37)	0.97
Residence			
Rural % (n)	34.0 (55)	56.7 (80)	<0.001
Urban % (n)	66.0 (107)	43.3 (61)	
Household assets			
Mean no. of assets	6.5	5.9	0.12
Circumcision			
Male			
Circumcised % (n)	5.7 (3)	15.0 (6)	
Uncircumcised % (n)	94.3 (50)	85.0 (34)	0.17
Age sexual debut (years)			
Mean (range)			
Male	19.7 (14 – 27)	18.6 (15 – 23)	0.26
Female	17.1 (14 – 26)	17.6 (14 – 26)	0.37
Premarital partners			
Male % (n)			
0	27.6 (8)	24.0 (6)	0.86
1 – 2	27.6 (8)	20.0 (5)	
3 – 4	17.2 (5)	20.0 (5)	
>4	27.6 (8)	36.0 (9)	
Female % (n)			
0	6.1 (6)	25.9 (7)	0.77
1 – 2	69.6 (16)	63.0 (17)	
3 – 4	4.4 (1)	7.4 (2)	
>4	0.0 (0)	3.7 (1)	
Male condom use			
Regular usage % (n)	33.3 (20)	21.7 (10)	0.19
Irregular usage % (n)	66.7 (40)	78.3 (36)	
Lifetime partners			
Male % (n)			
1	11.1 (3)	0.0 (0)	0.23
2	11.1 (3)	14.8 (4)	
3 – 4	29.6 (8)	18.5 (5)	
>4	48.2 (13)	66.7 (18)	
Female % (n)			
1	26.1 (6)	34.5 (10)	0.51
2	43.5 (10)	27.6 (8)	
3 – 4	30.4 (7)	31.0 (9)	
>4	0.0 (0)	6.9 (2)	

3.2 Univariate Analysis of Potential Risk Factors for HIV Concordance

HIV concordance which was treated as a binary outcome variable (discordant (0) or HIV-positive concordant (1)) was examined with regards to the potential risk factors. Table 2 summarizes potential risk factors and confounders for HIV acquisition and transmission among discordant and concordant couples. Uncircumcised males were almost three times more likely to be in concordant couples than to be in discordant couples (OR =2.9, 95% CI [0.69 - 12.57], p=0.15), however this was not statistically significant. Partners living in urban area were 2.6 times more likely of being in a concordant relationship than to be in discordant relationship (OR=2.6, 95% CI [1.60 – 12.57], p<0.001). The partners with greater number of household assets were more likely to be in a concordant relationship than to be in a discordant relationship, though the association was not significant (OR=1.3, 95% CI [0.82 - 2.04], p=0.27). Males not using condom on regular basis with female partners (OR=0.6, 95% CI [0.23 – 1.34], p=0.19), early sexual debut (OR=0.4, 95% CI [0.09 – 1.56], p=0.17), greater number of pre-marital (OR=0.4, 95% CI [0.14 – 1.26], p=0.12) and lifetime partners (OR=0.5, 95% CI [0.15 – 1.39], p=0.17) were found not to be associated with HIV-positive concordance. Age and educational level were considered as potential confounders. Although young ages (p=0.005) were independently associated with HIV-positive concordance that of high educational level was not (p=0.97).

Table 2: Potential risk factors for partners in concordant relationships compared to those in discordant relationships.

Factor	Univariate model OR (95% CI)	p-value	Multivariate model OR (95% CI)	p-value
Residence				
Rural	1	< 0.001	1	< 0.001
Urban	2.6 (1.60 – 12.57)		4.7 (2.09 – 10.39)	
Household assets				
<=6	1	0.27	1	0.70
>6	1.3 (0.82 – 2.04)		1.2 (0.5 – 2.8)	
Circumcision				
Male				
Circumcised	1	0.15	1	0.007
Uncircumcised	2.9 (0.69 – 12.57)		10.8 (1.93 – 60.30)	
Age sexual debut (years)				
Male				
>17	1	0.34	-	-
<=17	0.5 (0.09 – 2.29)			
Female				
>17	1	0.61	1	0.52
<=17	1.2 (0.55 – 2.76)		0.5 (0.053 – 4.34)	
Premarital partners				
Male				
0	1	0.70	1	
1 – 2	1.2 (0.26 – 5.59)		0.4 (0.05 – 4.00)	0.47
>=3	0.7 (0.19 – 2.56)		0.2 (0.03 – 1.79)	0.16
Female				
0	1	0.66	1	
1 – 2	1.1 (0.30 – 3.98)		1.7 (0.14 – 19.45)	0.69
>=3	0.4 (0.03 – 4.80)		-	
Male condom use				
Regular usage	1	0.19	1	0.53
Irregular usage	0.6 (0.23 – 1.34)		0.8 (0.31 – 1.83)	
Lifetime partners				
Male				
1 – 2	1	0.49	1	0.77
>=3	0.6 (0.15 – 2.46)		0.7 (0.04 – 10.31)	
Female				
1 – 2	1	0.57	1	0.90
>=3	0.7 (0.22 – 2.20)		0.8 (0.04 – 15.91)	
Age				
40 - 54	1	0.005	1	
30 - 39	2.2 (1.17 – 4.33)		1.9 (0.80 – 4.47)	0.15
18 - 29	2.1 (1.25 – 3.35)		6.5 (1.91 – 22.17)	0.003
Education				
Below high school	1	0.97	1	0.67
>= high school	1.01 (0.62 – 1.64)		0.8 (0.37 – 1.88)	

3.3 Multivariate Analysis

Partners' area of residence was the only risk factor that remained in the multivariate logistic model after putting all the variables in the model and eliminating them one after the other, based on the magnitude of their respective p-values in the univariate model with significance level of 0.1. The partners living in urban area were more likely to be in concordant couples than in discordant couples (OR=2.6, 95% CI [1.60-12.57], $p<0.001$). After controlling for age, educational level, condom use and circumcision, area of residence (OR=4.7, 95% CI [2.09 – 10.39], $p<0.001$) and circumcision (OR=10.8, 95% CI [1.93 – 60.30], $p=0.007$) were significant in the multivariate logistic regression model. Table 2 summarizes these results. There was no interaction between age nor educational level and the effect of area of residence on positive-HIV concordance.

CHAPTER 4

4.0 DISCUSSION

This study compared discordant to concordant positive-HIV couples with respect to potential risk factors. Hence, risk factors for HIV-positive concordance are also risk factors that could convert discordant couples to positive-HIV concordant couples. These risk factors within discordant couples could influence transmission of HIV from the infected partner to the uninfected partner and that will change the discordant couple's status to HIV-positive concordant couple. In a retrospective cohort study conducted in Mwanza region of Tanzania, partners in discordant were found to have higher risk of HIV infection as compared to HIV-negative concordant couples [51]. Studies conducted in Trinidad and Uganda also found that HIV-positive concordance was associated with partners living together [4,9]. In a study in Uganda, HIV-discordant couples living together had more than a 10-fold risk of HIV transmission [9]. Considering the findings of the afore-mentioned studies and the fact that the couples in this study were staying together, these suggest that risk factors for concordance are indicators of HIV transmission in discordant couples.

Partners' area of residence was found to be a significant risk factor for HIV-positive concordance. The association of living in urban areas with HIV-positive concordance was statistical significant in both the univariate and multivariate logistic models. This finding is consistent with studies carried out in Rakai, Uganda where the risk of being HIV-positive in discordant partners was associated with area of residence [8]. Studies have shown that HIV prevalence in urban areas is higher than in rural areas and some studies attribute this to high risk behaviour in urban areas. Means of entertainment such as drinking bars, hotels and activities of sex-workers may influence sexual

behaviours of discordant partners in urban areas. This could influence HIV transmission within discordant couples. Living in an urban area is therefore an indicator of risk factor that could influence transmission among discordant couples and results in HIV concordance. However, the presence of other factors such as herpes simplex virus type 2 (HSV-2) and high viral loads may confound these results since findings of studies have shown that HSV-2 and high viral loads are risk factors for HIV transmission within discordant couples [6, 9, 10]. Hence, there may be high risk sexual contacts in the urban area as a result of presence of HSV-2 and high viral loads. However, data on viral load and HSV-2 were not available in this study.

The uncircumcised males were 10.8 times more likely to be in HIV-positive concordant relationships. Hence, circumcision might prevent the transmission and acquisition of HIV within discordant couples. This finding is supported by two different studies conducted in Uganda. In the findings of the studies, lack of circumcision is a risk factor for HIV transmission in couples [6,9]. The results of several other studies which are not peculiar to couples have shown circumcision to prevent the transmission and acquisition of HIV [17, 18, 30, 31]. A randomised controlled trial carried out in Orange Farm, South Africa showed that circumcision reduces HIV infection among males by 60% [30]. Male circumcision has a protective effect against ulcerative sexually transmitted diseases that are risk factors for HIV infection themselves [32, 33]. Although, the sample size in this study is small the result is consistent with the findings in other studies. We found in this study that lack of circumcision is associated with HIV-positive concordant relationships and it therefore suggests that uncircumcised male partners in discordant relationships have more than 10-fold risk of acquisition and transmission of HIV.

HIV prevalence was high among women with husbands doing business or had white-colour jobs (one of the proxies for high socio-economic status) in a study conducted in Tanzania [37]. In Rwanda, a cross-sectional survey conducted has shown that women whose husbands have high income have high risk of HIV infection [50]. In the finding of a study conducted in South Africa, migrant men did not only infect their wives left behind at home but the wives also infected the migrant men [7]. The male partners with high social economic status have means of travelling and as a result engage themselves in risky life styles [38]. Therefore the male partner who is infected could transmit HIV to her female partner. In the same vein, a female partner who is not given attention could be HIV-positive and transmit it to the male partner. In this study partners having greater number of household assets, which is a surrogate for high socio-economic status, were not more likely to be in HIV-positive concordant relationships.

The study did not find that males who were not using condoms regularly with their female partners were more likely to come from concordant couples. This may be due to the fact that the proportion of respondents with regards to this variable is small. In studies conducted in Uganda and Tanzania regular use of condom was found to be associated with high-risk sexual behaviour [28, 39]. In the finding of a study in Hlabisa district, South Africa, whilst 85% of study participants in Hlabisa health sub-district believed regular condom use was protective against HIV acquisition only partners of 12 % of women who were sexually active used condoms during their last sexual intercourse [40]. This suggests that condom use in relationships may be associated with high-risk sexual behaviour. However, the findings in other studies involving couples

showed regular condom-use to be a protective factor against HIV-positive concordance and transmission within discordant couples [9, 10].

We did not find any association between female partners with early sexual debut and HIV-positive concordance. Moreover, early sexual debut in male partners was not associated with HIV-positive concordance. However, other studies have shown that women tend to have higher risk of being HIV-positive than men in young ages [41, 42]. In South Africa, the prevalence of HIV in females aged 15-24 is almost four times the prevalence of males aged 15-24 [41]. These findings may be explained by the fact that young women engage in sexual intercourse with older men with high risk behaviour and the young men engage in sexual intercourse with young girls who do not have high risk sexual behaviour [49]. The finding of a study carried out in Zambia confirmed that females with early sexual debut have high risk of being HIV-positive. Females who were HIV-positive when young are likely to infect their male partners in the relationship. This will result into HIV-positive concordant relationship. In the finding of a study conducted in Ghana, HIV infection was associated with having first sexual intercourse before 17 years of age [52]. This suggests that males can also be infected at a very young age before getting married. Hence males with early sexual debut can also transmit HIV to female partners in marriage and result into HIV concordance. Although early sexual debut in this study is below 17 years of age, the study did not support this finding. This may be due to the fact that this study involved only couples and also did not have a larger sample size.

A greater number of lifetime partners has been shown to influence HIV transmission [39]. In the finding of a study in Uganda, greater number of lifetime partners was

associated with HIV transmission [53]. Men and women in discordant relationship with greater number of lifetime partners are more likely at risk of acquisition and transmission of HIV. This is because the frequency of sexual contact is high among those with greater number of lifetime partners. Hence, concordance may result from couples where one partner is infected with HIV as a result of greater number of lifetime partners and subsequently transmitting it to the other. Studies have shown that presence of sexually transmitted diseases in couples enhances HIV transmission [10, 54]. Partners in discordant couples with greater number of lifetime partners are more likely to have sexually transmitted diseases which may facilitate the acquisition and transmission of HIV that will eventually lead to concordance. The findings of this study did not show any association between greater number of life partners and risk of HIV transmission among discordant couples.

A study conducted on marriage in Senegal showed that the number of pre-marital partners had increased considerably during the past three decades [43]. This can influence HIV-positive concordance and the risk of transmission among discordant partners where one partner got infected through pre-marital sexual intercourse. However, the study findings did not show any association of greater number of pre-marital partners with HIV-positive concordance. The percentages recorded for premarital partners in this study are small and this could affect the outcome.

Age considered as potential confounder in this study was significantly associated with HIV-positive concordance. The highest risk group was 18-29 for both male and female partners. Although this study involves only couples it corroborates the findings in South African National HIV Survey, 2005 where the prevalence of 30-39

year group was greater than that of those who were 40 years and above [41].This finding might be influenced by AIDS-related mortality in the older age group. However, with increased availability and accessibility of anti-retroviral treatment an alteration of this association can be expected.

Education was considered in this study to be a potential factor since highly educated partners may have access to information and will be able to read and understand HIV prevention methods better. However, higher educational level has also been found in other studies to be a risk factor for HIV transmission [45]. In this study, it was not found to be a risk factor for HIV transmission among discordant couples. Partners with higher educational level are likely to be gainfully employed. These partners are sometimes being sponsored by their employers outside their area of residence. This could influence their sexual behaviour and can lead to HIV transmission among their relationships.

4.1 LIMITATIONS

This study has some limitations. Firstly it is a cross-sectional study and therefore the risk factors can not be established to precede the outcome. Moreover, HIV-positive concordant relationship could be due to both partners of concordant couple being infected outside the relationship or the negative partner of the discordant partner being infected by someone other than the HIV-positive partner.

There were several biological and social risk factors which were linked with transmission of HIV that were not included in the analysis since data on them were not available. The biological factors were viral load, presence of other sexually transmitted infections (STI's), while the social factors were number of casual sex partners and duration of marriage. Recent studies have also shown migration to be a risk factor for HIV transmission but because of the broad nature of migration this study did not add it to the risk factors considered [7, 46].

There was higher refusal rate in the urban areas (>60%) than in the rural parts (<20%) so the study was prone to selection bias.

Due to the small sample size, the study lacked power and this could affect the precision of the outcomes.

CHAPTER 5

5.0 CONCLUSION AND RECOMMENDATIONS

The results of this study are partly consistent with those of other studies. A study which was not restricted to couples and was recently conducted in Hlabisa health sub-district also showed that urban residence was significantly associated with HIV infection [29]. There is therefore the need for further studies to investigate the behavioural and attitudinal background that distinguishes rural and urban dwellers with regards to HIV infection. Studies of this nature will help to explain the current observations. Even within one district, different geographic areas could have different environmental, social and economic conditions that might determine individual sexual behaviour and attitude towards HIV. This makes it critical for the design of HIV intervention programs to stress the need for effective area-specific intervention programs. This approach may have an influence on partners in discordant relationships to avoid transmission of HIV from the infected to the uninfected partner.

Since mid-nineteenth century circumcision has not been practised in this study population[46] and lack of circumcision was associated with HIV transmission within discordant couples in this study. Other studies in sub-Saharan Africa found male circumcision protective against HIV transmission from men to women and vice versa [9, 30]. Hence, promoting circumcision in the area might reduce transmission of HIV within discordant couples. The issue of circumcision in the area could be investigated further using a larger sample size, by designing specific case-control or intervention studies.

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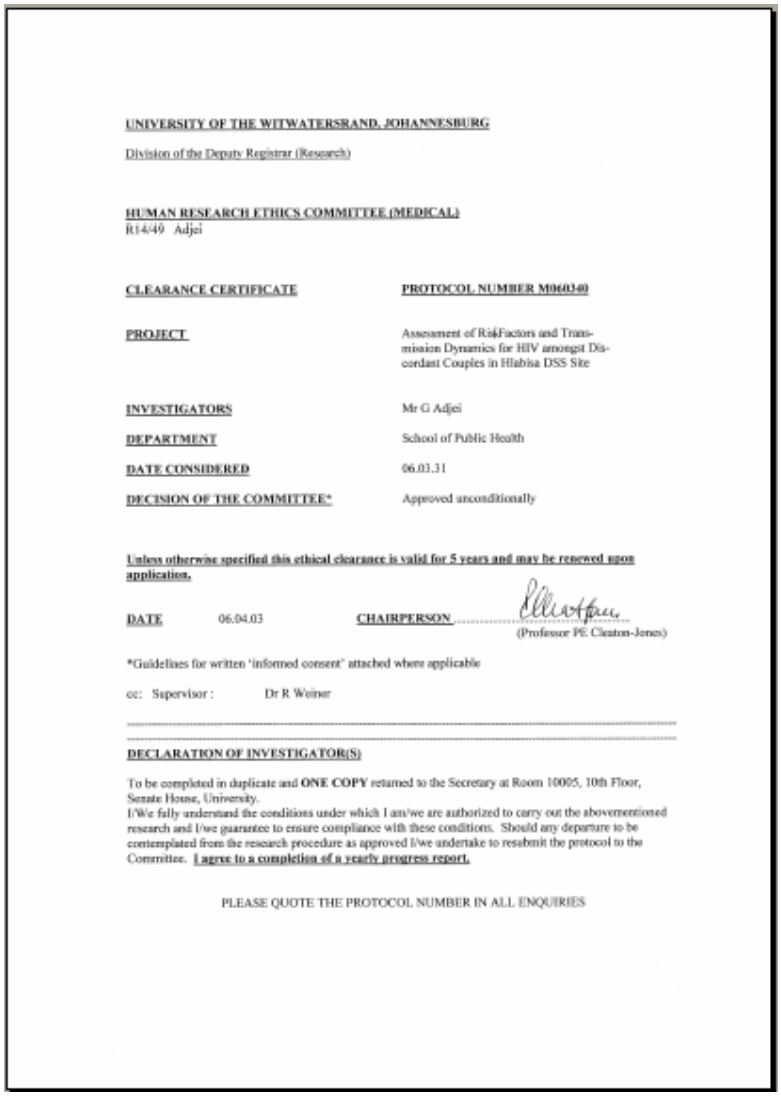
APPENDIX 1



UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Adjei

CLEARANCE CERTIFICATE	**PROTOCOL NUMBER M0603-03**
PROJECT	Assessment of RiskFactors and Transmission Dynamics for HIV amongst Discordant Couples in Hlabisa DSS Site
INVESTIGATORS	Mr G Adjei
DEPARTMENT	School of Public Health
DATE CONSIDERED	06.03.31
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 06.04.03 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable

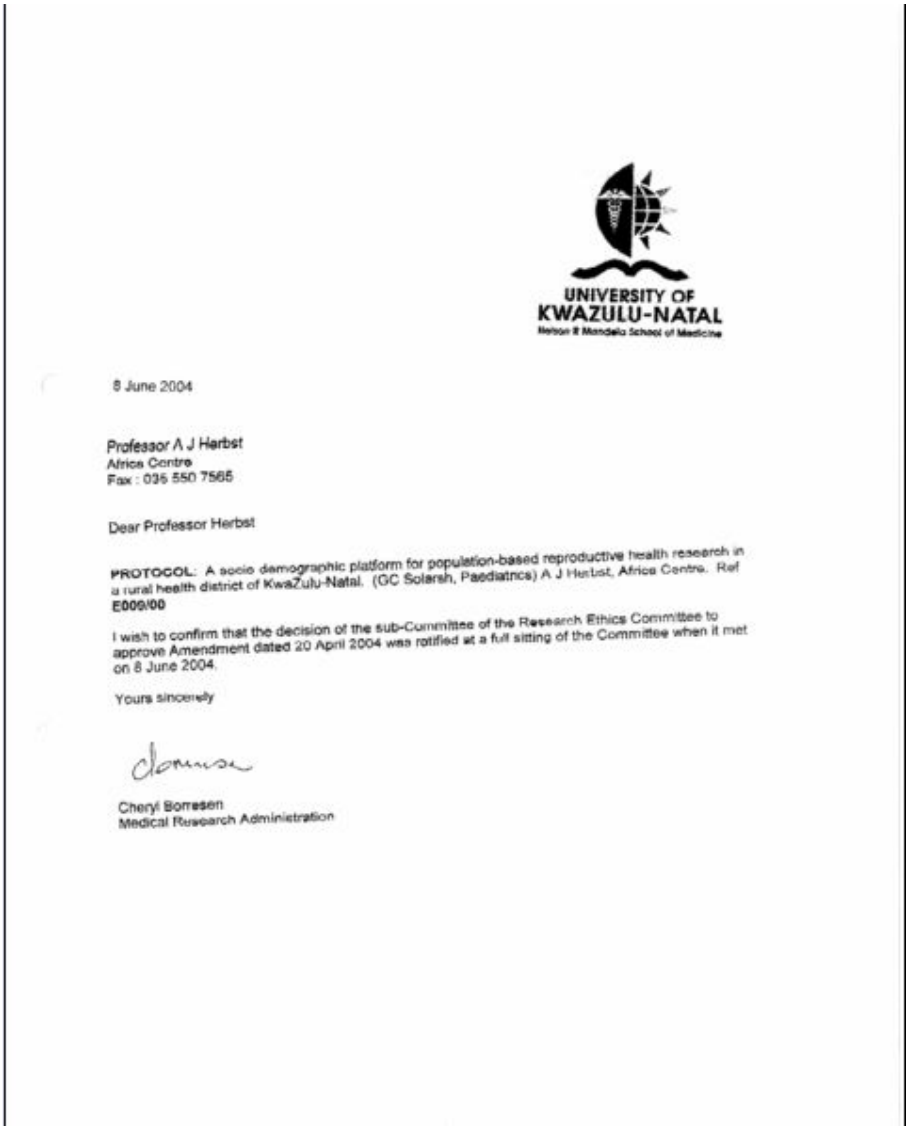
cc: Supervisor : Dr R Weiner

DECLARATION OF INVESTIGATOR(S)

To be completed in duplicate and **ONE COPY** returned to the Secretary at Room 10005, 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 report.**

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

APPENDIX 2



UNIVERSITY OF
KWAZULU-NATAL
Nelson R Mandela School of Medicine

8 June 2004

Professor A J Herbst
Africa Centre
Fax : 035 550 7565

Dear Professor Herbst

PROTOCOL: A socio demographic platform for population-based reproductive health research in a rural health district of KwaZulu-Natal. (GC Solarsh, Paediatrics) A J Herbst, Africa Centre. Ref **E009/00**

I wish to confirm that the decision of the sub-Committee of the Research Ethics Committee to approve Amendment dated 20 April 2004 was ratified at a full sitting of the Committee when it met on 8 June 2004.

Yours sincerely

Cheryl Borresen
Medical Research Administration

APPENDIX 3

UNIVERSITY OF NATAL

FACULTY OF MEDICINE

MEMORANDUM

TO:	FROM:
Professor GC Solarsh Paediatrics & Child Health Faculty of Medicine	Mrs Anita Walker Postgraduate Administration Faculty of Medicine

15 February 2000

PROTOCOL: A socio-demographic platform for population-based reproductive health research in a rural health district of KwaZulu-Natal. GC Solarsh. Paediatrics. Ref E009/00

The above study was reviewed by all members of the Ethics Committee. Ethical approval was given on 14 February 2000 subject to the submission of a Zulu translation of the E9 – information given to subjects section.

pp Anita Walker
Postgraduate Administration
Aw/ethics/solarsh.9

APPENDIX 4

Variables and dummy variables used for male and female partners in discordant and HIV-positive concordant relationships

Factor	Dummy variable
Residence	
Rural	0
Urban	1
Household assets	
<=6	0
>6	1
Circumcision	
Male	
Circumcised	0
Uncircumcised	1
Age sexual debut (years)	
Male	
>17	0
<=17	1
Female	
>17	0
<=17	1
Premarital partners	
Male	
0	0
1 – 2	1
>=3	2
Female	
0	0
1 – 2	1
>=3	2
Male condom use	
Regular usage	0
Irregular usage	1
Lifetime partners	
Male	
1	0
2	1
>=3	2
Female	
1	0
2	1
>=3	2