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Internal migration and sexual partnerships and practices: Findings from a South African Cohort

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UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG



FACULTY OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

Title: Internal migration and sexual partnerships and practices: Findings from a South African Cohort

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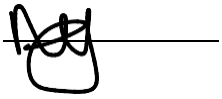
Supervisors: Dr Carren Ginsburg and Prof Jonathan Levin

A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of MSc Epidemiology and Biostatistics

October 2024

Declaration

I, Yandisa Nyanisa (student number 1654453) am submitting my research report in partial fulfilment of the requirements of the Master of Science in Epidemiology in the field of Epidemiology and Biostatistics at the University of Witwatersrand, School of Public Health. I declare that the work submitted for assessment for the above degree is my own unaided work. Where I have used the thoughts and ideas of others, I have followed conventional referencing requirements.

Signed: 

…….

Date: [21] day of [February] in the year [2024]

Abstract

Introduction

There are high levels of geographic movement of people within South Africa's borders, especially from rural to urban areas of the country. Such movements have an impact on sexual partnerships and practices. The aim of this study is to determine the relationship between internal migration and sexual partnerships and practices in a cohort of migrants and residents of the Agincourt study site (non-migrants) in South Africa's rural northeast over two survey waves from 2018 to 2019.

Methods

This study used data from the Migrant Health Follow-Up Study (MHFUS) which commenced in 2017. The MHFUS is a 5-year cohort study that is nested within the Agincourt Health and Demographic Surveillance System (HDSS) longitudinal research platform. The cohort is based on a simple random sample of 3800 Agincourt HDSS residents and migrants aged 18 – 40. The Agincourt HDSS is located in a 420 square kilometre area of the Bushbuckridge district, Mpumalanga Province. Descriptive statistics, logistic and ordinal regression models were used to describe the characteristics of migrants and non-migrants in the cohort as well as sociodemographic factors associated with the number of sexual partners reported by participants, their type of recent sexual partners (whether a partner was regular or casual) and their calculated risk score (based on condom use and HIV testing).

Results

Sexual partnerships and practices differed by migration status and gender. A larger proportion of migrants than non-migrants had more than one partner in the last 12 months in both study waves. Of those migrants who had sexual partners in the last 12 months (n=1265), 11.2% had partners in both their place of origin and their current place of residence (migrant destination) in Wave 1. Nine or more total sexual life partners were reported more frequently by migrants (16.8%) compared to non-migrants (8.9%) in Wave 1. More males (31.6%) than females (5.3%) had two or more partners in Wave 1 and there were more males (15.6%) who reported having partners in

both the origin and current locations compared to females (4.9%). Not using a condom was more common among non-migrants than migrants in both waves, with females being less likely to have used a condom in their last sexual intercourse compared to males. Ordinal logistic regression analysis indicated that the number of sexual partners in the last 12 months was associated with migration status, age, gender and employment status in Wave 1, while in Wave 2 it was also associated with level of education. Most recent partner (whether a partner was regular or casual) was associated with gender, education and employment in Wave 1 while associated with age, gender and employment in Wave 2. Risk score was associated with age and education in Wave 1 while associated with migration status, age, gender and education in Wave 2.

Conclusion

The study showed that sexual partnerships and practices differed by migration status and gender with non-migrants and females reporting more risky sexual practices compared to migrants and males. Internal migration can introduce risky behaviors that are related to sexual partnerships and practices. The study shows that the effect of migration can vary widely depending on factors such as gender dynamics, employment and education. A study of the relationship between internal migration and sexual relationships sheds light on this population's possible susceptibility to HIV/STIs. The evidence in this study also adds to the knowledge base needed for guidance in areas of prevention of STI, while future South African research focused on sexual partnerships and practices should incorporate measures of migration. Understanding these factors is essential for researchers, policymakers and health organizations involved in managing and providing support to migrants.

Keywords: internal migration, sexual partnerships, sexual practices, South Africa

Acknowledgements

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List of Abbreviations

ARV- Antiretroviral Therapy

CI-Confidence Interval

HDSS-Health and Demographic Surveillance System

HIV- Human Immunodeficiency Virus

LMICS -Low-and Middle-income Countries

MHFUS-Migrant Health Follow-Up Study

OR-Odds Ratio

Stats SA-Statistics South Africa

STI- Sexually Transmitted Infections

SSA- Sub-Saharan Africa

TB- Tuberculosis

Chapter one: Introduction

Globally, more people live in urban areas than in rural areas (1). In 2018, about 55% of the population in the world lived in urban areas and this is projected to rise to 68% in 2050 (1). There has been a considerable increase in internal migration in South Africa, that is human geographic movement within the country's borders, especially from rural to urban areas (2). During the pre-democratic era, the Apartheid government imposed laws that restricted movement of mainly black South Africans into the urban areas. Only individuals who were granted employment permits were allowed to reside in urban areas, while family and household members lived in rural homelands (3). After the apartheid ended, black South Africans were able to move freely to the cities without having to produce permits, leading to an increase in migration within the country particularly from rural areas towards cities (4). In the 1990s, about 16% of the rural population in South Africa migrated to urban areas (5). This increased to about 48% in 2001 (6). Despite the increases in rural to urban movements, there remains a high level of temporary and circular migration with people remaining connected to and ultimately going back to rural origin areas (6). In 2014, The United Nations estimated that 64% of the population in South Africa resided in urban areas (1). The United Nations has projected that by 2050, around 80% of South Africa's population will live in urban areas (1).

This urbanisation is motivated by the possibility of work and the availability of social services like health and education (7). Studies suggest that individuals in poor rural areas may migrate to seek opportunities for employment and improved standards of living in urban areas (8). While migration may be permanent for some South Africans, migration to urban areas is temporary for many (9). These temporary migrants remain connected to their household in the rural areas, with the intention of ultimately returning home (10). Migration in South Africa is most common among individuals of younger adult ages (11).

Studies have highlighted benefits and risks of rural-urban migration with benefits being employment opportunities, increased income, quality services such as education, health and better infrastructure (12–14). Risks associated with migration include psychological stress, engagement in risky behaviors, inadequate access to healthcare and increased risk of infectious diseases like Human immunodeficiency Virus (HIV)/AIDS and Tuberculosis (TB) as well as non-infectious diseases (15–17). Additionally, migration has been linked to risky sexual behaviors such having many partners, which can result in the transmission of STIs like

HIV. (18,19).The relationship between sexual partnerships and migration has been studied in different settings and evidence shows that temporary migrants who move to urban areas may acquire additional partners as many of them leave their partners behind (2). Being away from families and spouses may make migrants feel isolated and lacking social support, and this may lead to risky behaviors (18). The partners that remain behind may also have relationships while their partners are away, and this puts them and their partners at risk of contracting STIs (17). Therefore migration may lead to the spread of HIV among the population (19). Migrants often live in unfavourable circumstances due to unemployment and those who face challenges with employment may resort to getting involved in exchange of sexual services for money, thereby exposing themselves to STIs such as HIV/AIDS (20). In addition, migrants may be compelled to take physically demanding jobs and live under poor conditions, with restricted access to health care services and information related to healthcare (21).

Information on migration is often collected at the national level using population censuses. The definition of movement, and time frame attached to migration in censuses often fail to capture temporary movement prevalence. The prevalence of migration and relationship between migration and health outcomes can best be analysed using longitudinal data that capture information on changes in residence and health over time (22). There are few studies that have addressed the relationship between migration and health outcomes and behaviors using longitudinal data, many studies are cross-sectional and measurements are at a snapshot in time (23). Although cross-sectional studies on migration may have an advantage in providing larger sample sizes, and detailed population characteristics, they may fail to capture temporary migrants or identify return migrants (24). Some longitudinal data use a retrospective data collection method to capture migration histories and retrospective data may suffer from recall bias as respondents may not be able to recall events with accuracy (25). To examine migration and health relationships, longitudinal data that disentangle changes over time is needed.

Problem statement

There is a high burden of STIs in South Africa (26). Many studies have reported the association between sexual behavior and migration of people between and within countries (19,27,28). Mobility between rural and urban areas whereby migrants continue making frequent visits to their rural homes is common in South Africa (9). Migration results in changes in behavior as migrants are exposed to an unfamiliar and diverse setting with different norms (21). Being a migrant may lead to more risky sexual behaviors, like having

several partners, which raises the possibility of getting HIV and other STIs (21). Studies that are based on cross-sectional data tend to document retrospective information on movement and health status or behaviors at a single point in time. To shed light on the dynamics of migration and health, analysis of the relationship between migration and health requires data that capture information on changes in residence and health over time. These data are difficult to collect from mobile individuals (23). While many studies have reported the relationship between migration and sexual behavior and a greater susceptibility to HIV and other STIs faced by temporary migrants and their partners (21,29,30), further research is still required to better understand the relationship between sexual partnerships and internal migration, using data that explores movement and sexual behavior over time.

Justification

While several studies have examined migration and urbanisation trends and corresponding health and socio-economic associations, there is not enough population-based research in South Africa that explores the connection between sexual partnerships and internal migration. In particular, studies based on longitudinal data are scarce (23). Studies in other countries have shown a strong linkage between poverty, geographic mobility, sexual behavior and health outcomes (23,31,32). Providing evidence-based information on this topic will shed light on the patterns of sexual partnerships and on the sexual practices of internal migrants. We are further interested in this study in whether sexual partnerships and practices differ between migrants and those who do not move. A study of the relationship between internal migration and sexual relationships will shed light on this population's possible susceptibility to HIV/STIs. The evidence in this study will add to the knowledge base needed for guidance in areas of prevention of STIs, and inform policies which will help achieve the Sustainable Development Goal 3 of "targeting the end of AIDS and ensuring universal access to sexual and reproductive health-care services by 2030"(33).

Research Question

What is the relationship between internal migration and sexual partnerships and practices in a cohort of migrants and residents of the Agincourt study site in South Africa's rural northeast?

Aim

The aim of this study is to determine the relationship between internal migration and sexual partnerships and practices in a cohort of migrants and residents of the Agincourt Health and Demographic Surveillance System (HDSS) study site in South Africa's rural northeast over two survey waves from 2018 to 2019.

Objectives

1. To describe the characteristics of migrants and Agincourt study site residents in the cohort using data from two study waves collected in 2018 and 2019 and explore changes over time.
2. To describe patterns of sexual partnerships and practices among migrants and Agincourt study site residents over the two study waves.
3. To determine the associations between migration status and sexual partnerships and practices over the two study waves, controlling for sociodemographic characteristics.

Literature review

Both high and low-income countries are experiencing a substantial number of people moving to areas perceived to have better opportunities (12). This includes cross-border migration: movement between countries, and internal migration: movement within countries. More migrants move within their own country (internal migration) than move across borders (34).

In 2014, 54% of the world's population resided in urban areas. It is estimated that this will increase to 68% in 2050 (35) . It is estimated that urban residents will reach 1.3 billion in Africa by 2050, which will make it the most urbanizing continent in the world (36). The United Nations estimates that 71% of the population in South Africa will reside in urban areas by 2030 and further projects that this will increase to 80% of the population in 2050 (12). There are many reasons why people migrate and once at a new location, migrants' experiences may be different. These are shaped by social, political and economic factors.

Conceptual Framework

Gender, health, education, employment and age are all factors affecting a decision to migrate (determinants of migration) (37). In a study by Msigwa and Mbongo (2013) on determinants of internal migration, gender, level of education, level of skill and marital status were reported as determinants of migration in Tanzania (38). Age is one of the determinants of migration with young adults being the age group that is most mobile. The tendency to migrate often peaks in young adulthood and then gradually decreases with age (39). It is noted in literature that people who migrate within the country are more educated than the people who remain behind (40) and given that education increases the likelihood of employment and provides migrants with opportunities for employment, there appears to be a positive

correlation between education and migration. (41). In South Africa, the primary driver of rural-urban migration is economic, people choose to migrate to cities in pursuit of opportunity because rural areas do not offer enough work prospects. Employment possibilities are one of the causes of rural-urban migration in South Africa (12).Despite the commonly held belief that female migration in Africa is less prevalent than male migration and is mostly motivated by marriage, there is a feminization of internal migration taking place in South Africa as a result of women's growing engagement in the labor market (42).

The conceptual framework, adapted from Collinson, 2010 (43) below, shows that a set of structural factors (Underdevelopment, health environment, socio-demographic characteristics and gender roles) and household and individual level factors (household socio-economic status, age, gender and employment) are determinants of migration and then following migration and corresponding risks and benefits, there may be changes in health and well-being. Variables that were looked at in this study are highlighted in blue.

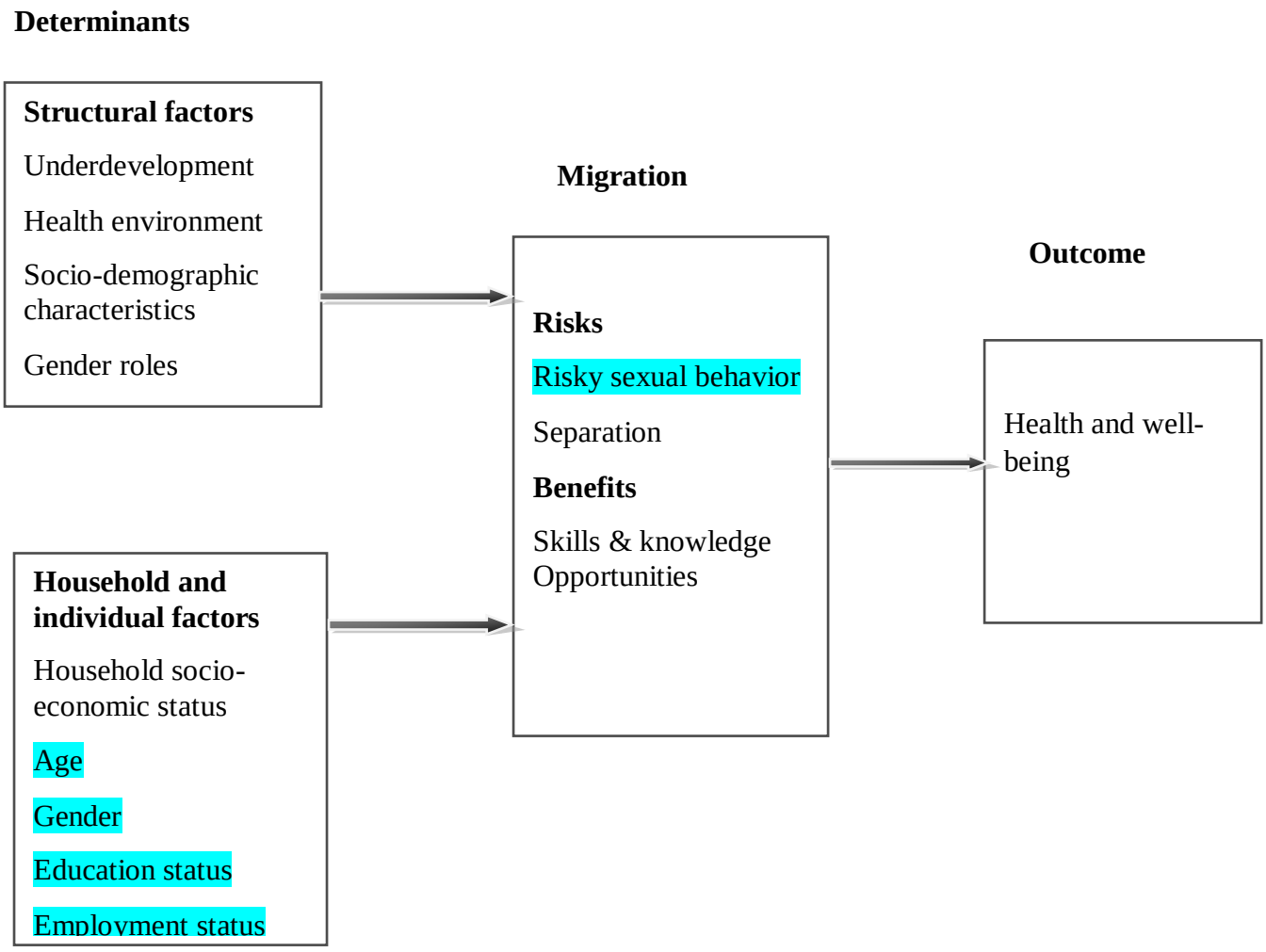


Figure 1: Conceptual framework adapted from Collinson, 2010.(43)

Benefits and risks associated with migration.

Studies from sub-Saharan Africa (SSA) have shown a positive correlation between migration and economic benefits, higher living conditions, and education. (44,45). Migration can help improve the economy by stimulating job growth and hence increase contributions to tax (46)**.** Return migrants can bring new skills and knowledge to their original location making migration an essential factor in meeting skills shortages (46). Migration may also influence gender equality, migrant women may gain confidence and independence. Nevertheless, migration has also been linked to risky sexual behavior, barriers to health care, poor living as well as working conditions and these can result in negative health and well-being outcomes (47). Studies have shown that women migrants experience challenges in terms of access to healthcare services and this may be due to institutional policies around migration status and access to public services (48). Other challenging factors may take place in the form of language barriers or lack of knowledge about services that are available to migrants (49). There is evidence that migrants who are exposed to new environments, including varied sexual norms and possibilities, are more likely to engage in risky sexual behaviors (17).

Migration and gender

While there are more men than women who migrate in South Africa, there is an increasing trend of internal migration among women, which is motivated by education and access to employment opportunities (17). Female migration grew threefold between 1997 and 2001 and the most mobile age group being those between 15 and 25 years (42). The foundation of gender pattens of internal migration in South Africa lies in its unique history and government laws during apartheid period which among other things restricted women from migrating from rural areas (42).

Reasons for migration differ between females and males. It is reported that migration for men is often motivated by work or education while migration for females is often motivated by marriage or because their partners are moving (50). The picture is rapidly changing and is influenced by changes in political, social norms relating to women and work, as well as economic conditions in developing countries (51).

Migration and age

Age has frequently been used to define migration trends, and studies have found that age profiles and mobility behavior are essentially similar among different population groups. Regarding age, the literature highlights that internal migration is high in young adults considering that some are students or graduates while some are first time employees (52).

Children may be required to migrate at an early age due to the move of their parents (53). In Census 2011, Statistics South Africa (Stats SA) reported the peak of internal migration in ages 25 to 29 years (11). The peak of internal migration in young adults was also reported in a study of rural to urban migrants of the Agincourt HDSS study site in South Africa, by Ginsburg *et al* (2016) which showed the highest levels of migration in ages between 20-24 years old (54). The likelihood of moving then decreases with age as people take on more responsibilities, such as having children or a partner who works, which makes relocation decisions more difficult and expensive (52).

Migration and Education

Education is recognised as a route out of poverty and has been reported to be a driver of migration as it creates opportunities for employment (55). Apart from employment opportunities, attaining education is increasingly becoming a reason for migration. Students who migrate usually have prospects of eventually securing a job in areas they migrate to (41)**.** Migrants in search of better opportunities are usually more educated than their peers who remain behind (7). This was also shown in a study by von Fintel Moses (2017) in South Africa, where migrants had higher levels of education compared to non-migrants in the origin location (3). In an analysis of eight sub-Saharan African countries more educated women were more likely to migrate from the rural areas to the cities compared to women without any formal education. (24). According to the human capital theory, migrants are selected on education meaning that educated individuals are more likely to migrate than uneducated individuals (38).

Migration and employment

While there are many reasons for migration, better economic opportunities and job seeking are important drivers of migration (37). A study by Thomas (2019) on motives behind internal migration in Great Britain showed that employment was the leading reason for migration and the highest migration rates for employment-related reasons was among the youngest and most educated population (56). Using data from Census 2011, Stats SA (11) reported that in Low-and Middle-income Countries(LMICS) employment is an important driver of migration and urbanisation. This was also observed in a cohort of internal migrants and permanent residents from the Agincourt study area in South Africa were more likely to be employed compared to rural-based non-migrants (15).

Migration and risky sexual behavior

In recent years, migration of young and single individuals from rural areas to an environment that is more sexually permissive has been reported to contribute to the increased levels of transmission of STIs in urban compared to rural areas in Africa (10). Studies have also reported that increased engagement in sexual activities of young people in high-income countries is attributed to access to western mass media and entertainment, and the weakening of traditional social control (10). Unprotected sex in temporary migrants may be more common due to the use of alcohol and drugs, which in turn are a consequence of the social isolation that migrants face when they feel emotionally distant from their usual social norms (18). Women may be more likely to make poor sexual decisions if they lack access to safe housing and face difficulties in finding employment (47).

In India, studies show that mobile male migrants are more likely to participate in risky sexual behaviours and make up the majority of sex worker's customers (57). Differences in sexual behaviours among male and female migrants was also examined in China by Yang and Xia (2015) and it was found that while male migrants did not differ from male non-migrants, female migrants were found to be likely to participate in casual and commercial sex, (58). In a study that was conducted in Gauteng, South Africa, migrant men were more likely to engage in risky sexual behavior compared to non-migrant men (27). These behaviors included engaging in unprotected sexual intercourse and casual partnerships (27). This may be explained by the different experiences males and female migrants face once at a new location. Female migrants are more likely to experience difficulties finding employment and are more susceptible to physical and sexual abuse compared to male migrants (50).

Sexual partnerships

The impact of multiple sexual partnerships in the transmission of STIs and HIV has been explored in research studies (19). Non-marital sexual relationships are widespread and include a variety of kinds of partnership, such as commercial sex, casual sex, and more committed partnerships. Previous studies in African countries have demonstrated that these partnerships can also be transactional, as they require financial commitments from male partners and offer a range of social and sexual favors in return (59). Studies suggest that the likelihood of informal sexual relations is higher among migrants compared to non-migrants (60). In a population-based survey by Gandhi et al (2015) in Honduras, temporary migration was associated with a higher chance of numerous sexual partnerships and concurrency (18).

Migration and HIV/AIDS

Migration has been a subject of discussion in relation to HIV/ AIDS in Africa, and studies have shown a rise in the prevalence of HIV among migrants in SSA (61,62). Migrants and their partners who remain behind, have been shown to be highly vulnerable to HIV/AIDS (27). Studies show evidence that migration has negative consequences on the HIV epidemic, and that people's mobility between urban to rural areas contribute to the spread of the virus. (5). It was also noted that women who migrate to cities such as Johannesburg or Pretoria have an increased their risk of contracting HIV (16).

In Malawi, HIV prevalence was higher among migrants (63). This study further observed that migrants who were HIV positive were more likely to move to other cities which may lead to further spread of HIV (63). A study by Dzomba and colleagues (2019) reported that HIV was significantly associated with internal migration in both males and females (27). HIV positive females were 2.4 times more likely to migrate than HIV negative females (27) With the evidence that shows the impact of migration on the risk of acquiring STIs like HIV/AIDS, this is an area that needs public health attention. HIV facilities face challenges of non-adherence to Antiretroviral Therapy (ART) from highly mobile individuals and this can potentially lead to HIV drug resistance (27).

Condom use

Consistent and correct condom use remains an effective method of prevention against HIV and STIs (64). People who use condoms consistently are said to be 10 -20 times less likely to acquire HIV when compared with inconsistent condom users (65). In China low condom use among young migrants, both women and men, was observed. The study reported that rural-to-urban migrants were 71% less likely to use condoms at first sex compared with urban permanent residents and 68% less likely to use condoms compared with urban-to-urban migrants (65).

In Cameroon low condom use (43.5%) among migrants who were construction workers was reported with 63.8% of respondents arguing that condoms decrease sexual pleasure while 37.4% did not believe in their effectiveness (66). Similar results were reported in Ethiopia, with only 46% consistent condom use among migrants who worked in mines (66). Inconsistent and uncommon use of condoms was also reported in India among migrants who came from Nepal, despite being aware of their effectiveness in HIV/STIs prevention (67). In South Africa, cultural and religious beliefs have been reported as factors that contribute to resistance to condom use (68). There are beliefs that condoms are used in casual relationships and not with regular partners while some believe that condom use reduces sexual pleasure

and may be an indicator of lack of trust (68). Although resistance to condom use is common in both men and women, women who are dependent on men may be less able to discuss condom use. In the event that they are migrants, their disadvantage becomes much greater (68). Factors associated with condom use among migrant farm workers in Limpopo and Mpumalanga provinces of South Africa were studied, and it was noted that financial stability has an impact on condom use (68).

Chapter two: Methods

Study setting

This study used data from the Migrant Health Follow-Up Study (MHFUS) which commenced in 2017. The MHFUS is a 5-year cohort study that is nested within the Agincourt Health and Demographic Surveillance System (HDSS) longitudinal research platform. The Agincourt HDSS is located in a 420 square kilometre area of the Bushbuckridge district, Mpumalanga Province (69). The HDSS method captures all birth, deaths and in- and out-migrations with respect to the surveillance population through a continuous census that is updated over time (70). The HDSS aids multiple investigations about health events and population and social transitions based on annually updated vital events and residential status (69). The Agincourt surveillance area is made up of 31 villages and approximately 116000 people. Migration is defined as a move that crosses geographic boundaries of the HDSS site (71). Temporary migration in this population is high as many Agincourt residents move to surrounding rural and most often urban areas for reasons related to employment or education (15). The area has high unemployment with men and women migrating to urban areas for work (43).

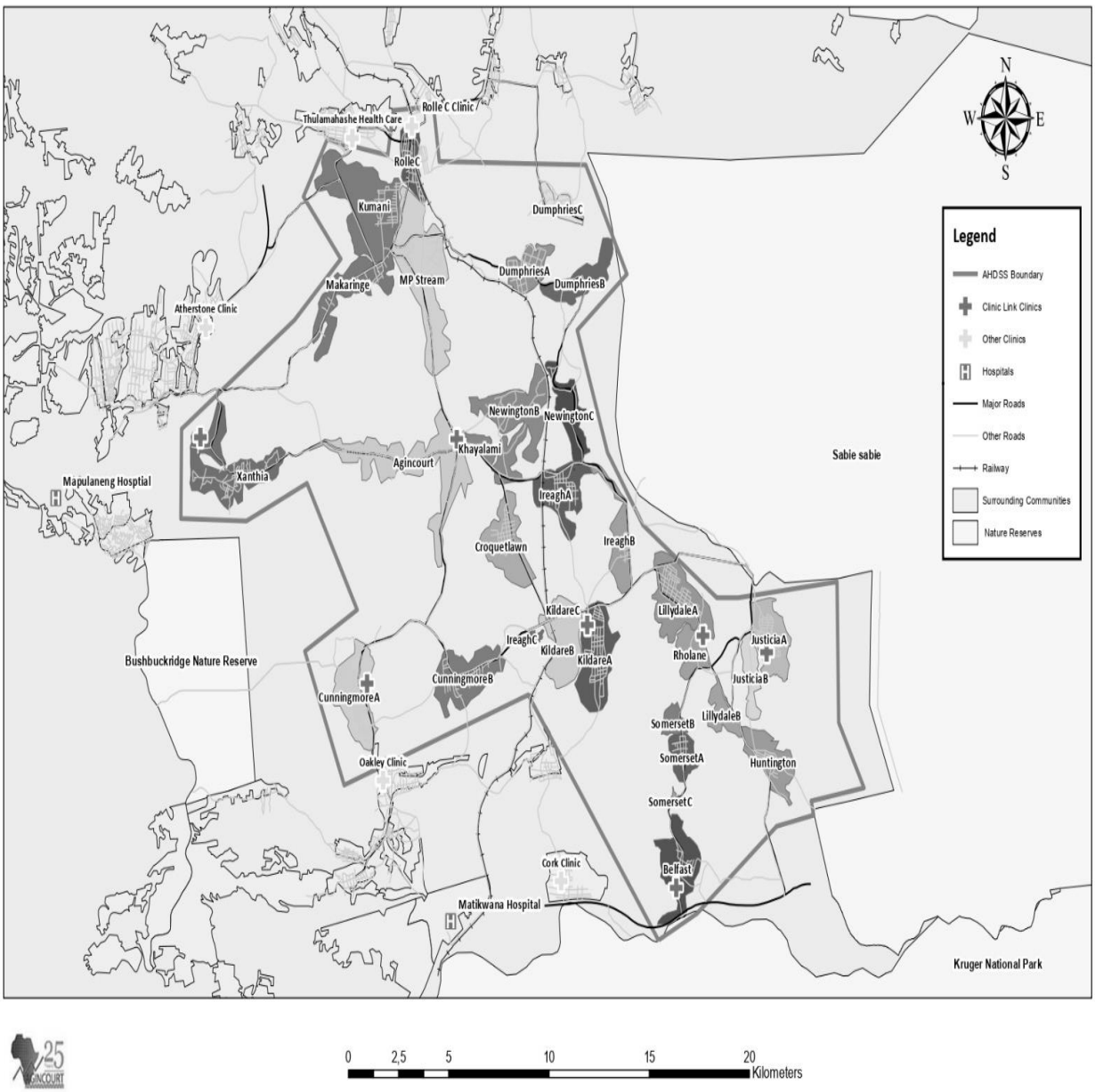


Figure1: The map of the HDSS study site (15)

Study design

This is a cohort study nested in the Agincourt HDSS

Study population

The MHFUS cohort is based on a simple random sample of Agincourt HDSS residents and migrants aged 18 – 40. The age range of 18 to 40 has the largest prevalence of temporary migration for both sexes (15). The sample of 3800 participants was randomly selected from the Agincourt surveillance population using the 2016 HDSS census with the intention of conducting 5-waves of follow-up on the cohort. The simple random sample means that the cohort was representative of 18–40-year olds in the surveillance population. The Agincourt HDSS method includes in the population both permanent residents of the surveillance area, as well as temporary migrants who spend 6 months or more away from their households of origin in the HDSS but maintain contact with these households (15). Therefore, included in the MHFUS study are residents of the Agincourt sub-district and temporary migrants who are living away, but maintain contact with their households of origin (71).

Study sample

The study sample includes all individuals aged 18 to 40-years old who were interviewed in the first wave (baseline) of the MHFUS study in 2018. Of the cohort of 3800, 3098 participants were interviewed, few participants were excluded due to falling outside of the age range. The 702 participants who were part of the original study population did not take part in the first wave of data collection due to refusal, ineligibility or because they were unreachable (15). The second wave of the study had a response rate of 97% with 3021 of the 3098 Wave 1 participants completing an interview. Participants who were lost to follow-up (n=77) were more likely to be migrants (52%) and there is a significant difference ($p<0.001$) in proportion of cohort members who were migrants and non-migrants between Wave 1 and 2.

Data collection

Data from the MHFUS were used in a secondary data analysis. This research was based on the first and the second waves of the MHFUS. The first wave of the study was conducted in 2018 through face-to-face interviews while the second wave took place in 2019 through telephonic interviews.

The first data collection wave was administered by two teams of fieldworkers, one operating in the Agincourt Unit offices targeting HDSS residents and those in surrounding areas of

Mpumalanga, and the other team was based in Johannesburg at the School of Public Health interviewing migrants (15). Fieldworkers scheduled appointments to interview participants mostly at their places of residence but also sometimes at workplaces. Prior to the start of the interviews, consent was obtained. The first interview included measurements: weight, height, blood pressure and dried blood spots (DBS) were collected for analysing HIV and blood glucose. In Wave 1 participants who elected to have DBS collected for HIV testing were offered an HIV rapid test via a trained councilor, or a self-test. In the second wave, participants were contacted and interviewed telephonically by a team based at the Agincourt Unit Offices. The questionnaire was translated into Xitsonga and interviews conducted in Xitsonga or English. The questionnaire was administered on tablets using the Redcap secure, web-based electronic data collection application (15). The questionnaire included sociodemographic information on participants, as well as questions on sexual partnerships and practices. Refer to the questionnaire section in the appendix 3.

Data management

Data management activities included combining the two years of study data to create a longitudinal dataset, and data cleaning on questionnaire responses. Data cleaning included exclusion of respondents that were out of age range for this study (n=2). New variables derived from existing variables were created and labelled using Stata. Statistical analysis was carried out using Stata version 17 (53).

Description of variables

A number of the variables used in analysis were categorized (see Table 1). The variables number of sexual partners in the last 12 months and total sexual partners in a lifetime were categorized. The variable "Type of recent sexual partner" was initially coded as "regular", "casual" and "anonymous" but was later changed to a binary variable (regular and casual) as there were very few participants under the "anonymous" option.

Primary outcome variables were "type of recent sexual partner" and the "number of sexual partners in the last 12 months". The binary outcome variable to differentiate type of recent sexual partners was coded as: "regular" and "casual" and the number of sexual partners in the last 12 months was coded as: none, 1 and 2 or more partners.

The primary explanatory variables were age, sex, education and employment, while the exposure variable was migration status. In the education variable, the category less than matric includes participants who had primary education and those who had not completed matric. Age was only categorized for the purpose of descriptive analysis. For models, Age per 5-year increase was used because often with a small per-unit change such as 1-year

increase in age we will have an odds ratio very close to 1 which is difficult to interpret. Results were rather presented for age as 5-year increase. Migration status was analysed as a binary variable and defined at each study wave as people living within the Agincourt HDSS study site (non-migrants) and those living outside of the HDSS study site (migrants). The Migration variable was created by using information collected on participants regarding their current place of residence. Those who were living within the 32 villages in Agincourt surveillance area were coded as zero for non-migrants while those who lived outside surveillance area were coded as 1 for migrants. Total sexual partner was categorized due to some extreme values, e.g.: 1 participant reported 200 number of total life partners. The table below shows how explanatory variables were categorized.

Table 1. Primary explanatory variables

Variable name	**Type**	**Description**
Age	Continuous	Participant's age
Gender	Binary	Male, female
Education	Categorical	Less than matric, matric, tertiary
Employment	Categorical	Not in a labour force, unemployed, employed
Migration status	Binary	Migrant, non-migrant
Number of sexual partners in the last 12 months	Categorical	None 1 2 or more
Total sexual partners in a lifetime	Ordinal	None 1-2 3-5 6-8 9+ Missing
Type of recent sexual partners	Binary	Regular Casual

The questionnaire included questions such as whether participants knew their partners HIV status at the first time of sexual intercourse, whether they have been diagnosed or treated with

STIs in the last 12 months, whether they used a condom the last time they had sexual intercourse, whether they had an HIV test and results of the most recent HIV test for those who had an HIV test. A variable risk score was formulated from the questions on condom use and HIV testing. This variable was coded as 0 to 3 ranging from no risk, low risk, medium/ high risk.

Participants were considered to be at no risk if they knew their sexual partners' HIV status the first time they had sex with them and also if they have not been treated for STI in the last 12 months. Low risk was derived from participants who knew their sexual partners' HIV status the first time they had sex with them, if they have not been treated for STI in the last 12 months and if they didn't use a condom the last time they had sexual intercourse. Participants were considered to be at high or medium risk if they didn't know their sexual partners' HIV status the first time they had sex with them, if they have been treated for STI in the last 12 months and if they used a condom the last time they had sexual intercourse. Lastly, participants were considered to be at high risk if they didn't know their sexual partners' HIV status the first time they had sex with them, if they have been treated for STI in the last 12 months and if they did not use a condom the last time they had sexual intercourse. An illustration of how the risk score was formulated is shown in Table 2 below.

Table 2: Risk score for condom use and HIV testing.

Variable	Category	Risk cores	If participant response is	Total score	Risk score category
Did you know the partners HIV status the first time of sexual intercourse (for those with partners)	Yes No	0 1	No	3	Medium/High risk
In the last 12 months have you been diagnosed or treated with STIs	Yes No	1 0	Yes		
Did you use a condom the last time you had sexual intercourse (for those with partners)	Yes No	0 1	No		

Did you know the partners HIV status the first time of sexual intercourse (for those with partners)	Yes No	0 1	Yes	1	Low risk
In the last 12 months have you been diagnosed or treated with STIs	Yes No	1 0	No		
Did you use a condom the last time you had sexual intercourse (for those with partners)	Yes No	0 1	Yes		
Did you know the partners HIV status the first time of sexual intercourse (for those with partners)	Yes No	0 1	Yes	0	No risk
In the last 12 months have you been diagnosed or treated with STIs	Yes No	1 0	No		
Did you use a condom the last time you had sexual intercourse (for those with partners)	Yes No	0 1	Yes		

Data analysis

Descriptive statistics were used to compare migrants and non-migrants, and males and females and the data are presented as frequencies. Additional classifications of migrant status were explored in the second study wave to examine new migrants and return migrant groups. The distributions of the explanatory variables were compared between the different migrant status groups using chi-square tests, separately for Wave 1 and Wave 2. Missing values were excluded from the calculation of chi squared statistic. Changes in demographic characteristics, sexual partnerships, and sexual practices and questions on condom use and HIV testing between the first and second study waves were described. Due to the growing

recognition that gender is essential to understanding migration processes and consequences, and due to ample literature describing differences in sexual partnerships and practices between males and female migrants, the distributions of explanatory variables in this study were also compared between males and females in both waves.

A logistic regression model was fitted to analyze the variable "type of recent sexual partner" and ordinal logistic regression models were fitted to analyze the number of sexual partners in the last 12 months and the association between the risk score and migration and demographic variables. All these models controlled for the following potential confounders: age, gender, education and employment with migrant status being the primary exposure of interest. Models were analyzed cross-sectionally for each wave of the study, and longitudinally using a variable "wave" to explore changes over time between Waves 1 and 2 of the study. To account for intra-participant correlation, clustered standard error was used to adjust for the repeated measures within participants when exploring changes between Wave 1 and Wave 2. The analysis plan linked to the study objectives is illustrated in Table 3.

Ordinal Logistic regression

Ordinal Logistic regression was used to for analysis of variables that has 3 or more categories. The odds ratio for the ordered logit represents the odds of the higher category as compared to all the lower categories combined i.e. it is a cumulative odds ratio representing the increased likelihood of the next highest category relative to the lower categories for each unit increase in the predictor x. In our case of the 3-level outcome, there are two comparisons of levels and the model can be written as

"log {(p_hat_i1 + p_hat_i2) / p_hat_i0)} = α_1 + β x_i

"log {(p_hat_i2 / (p_hat_i0 + p_hat_i1)} = α_2 + β x_i

The proportional odds assumption is that the coefficient β is equal for the two comparisons. The α_j (α_1 and α_2) are the (unknown) intercept parameters satisfying the condition α_1<α_2. The estimates of these parameters α_1 and α_2 is what are called the cut points cut1 and cut2 in the Stata output. The odds ratio is exp(β) for both low and medium / high risk versus no risk and also for medium / high risk versus (no risk or low risk) (80).

Table 3. Analysis plan

Objective	Statistical test	Variables
To describe the characteristics of migrants and non-migrants in the cohort using data from two study waves collected in 2018 and 2019 and explore changes over time.	**Chi-square test**	**Outcome variables:** Age, gender, employment status, employment type, income, education, residence, province and settlement type. **Exposure variable:** Migration status Wave 1 (migrant, non-migrant), migration status Wave 2, new migrant Wave 2 and return migrant Wave 2
To describe patterns of sexual partnerships and practices among migrants and non-migrants over the two study waves (2018 and 2019).	**Chi-square test**	**Outcome variables:** Number of sexual partners, migrants with partners in the origin area, current or in both locations, sexual partners location, total sexual partners in a lifetime, most recent partner, type of relationship and location of the last sexual intercourse. **Exposure variable:** Migration status
To determine the associations between migration status and sexual partnerships and practices over the two study waves, controlling for sociodemographic characteristics.	**Logistic regression** Models were run for each study wave. Time variable (wave) was used to capture change between the two waves. **Ordinal logistic regression**	**Outcome variable:** Type of recent sexual partner **Explanatory variables:** migration status, age gender, employment status and education, **Outcome variable:** Number of sexual partners in the last 12 months, risk score **Explanatory variables:** migration status, age, sex, employment status and education,

Ethical consideration

The MHFUS study protocol was granted ethics approval on 27 March 2017 (Clearance Certificate # M170277). This study was also granted ethics approval on the 30 March 2022 (Clearance Certificate # M220324). Refer to Appendix 2.

Chapter three: Results

This chapter gives an overview of results of this study. It begins with describing the characteristics of the study population for both Wave 1 and Wave 2 of the study. It describes the transition in migration status from Wave 1 to 2. The chapter proceeds to describe the patterns of sexual partnerships and practices by migration status and by sex for both waves. The chapter also shows the distribution of responses to questions on condom use and HIV testing by migration status and sex in both waves.

Socio-demographic characteristics

Table 4 below shows socio-demographic characteristics of migrants and non-migrants in the first wave of the study. For the purpose of this descriptive table, age was categorized.

Table 4: Socio-demographic characteristics of participants by migration status in Wave 1

Variable	**Category**	**Wave 1 cohort n (%) 3098**	**Migrant n (%) 1337 (43.2)**	**Non-migrant n (%) 1761 (56.8)**	**Chi-square (X^2); p-value**
Age (years)	18-24 25-30 31-35 36-41	935 (30.2) 1009 (32.6) 724 (23.4) 430 (13.9)	303 (22.7) 505 (37.8) 332 (24.8) 197 (14.7)	632 (35.9) 504 (28.6) 392 (22.3) 233 (13.2)	X^2=90.1 p< 0.001
Gender	Female Male	1540 (49.7) 1558 (50.3)	561 (41.9) 776 (58.0)	979 (55.6) 782 (44.4)	X^2=56.5 P<0.001
Highest level of education	Less than matric Matric Tertiary Missing	1202 (38.8) 1424 (46.0) 464 (14.9) 8 (0.3)	330 (24.7) 723 (54.1) 279 (20.9) 5 (0.4)	872 (49.5) 701 (39.8) 185 (10.5) 3 (0.2)	X^2= 209.0 P<0.001
Employment status	Not in the labour force Unemployed Employed	586 (18.9) 1085 (35.0) 1427 (46.1)	179 (13.4) 272 (20.3) 886 (66.3)	407 (23.1) 813 (46.2) 541 (30.7)	X^2= 391.1 P<0.001
Employment contract (for those employed)	Permanent Contract Occasional Missing	902 (63.2) 362 (25.4) 150 (10.5) 13(0.9)	580 (65.5) 240 (27.1) 63 (7.1) 3 (0.3)	322 (59.5) 122 (22.6) 87 (16.1) 10(1.8)	X^2= 30.35 P<0.001
Income per month (for those employed)	R1-3200 R3201-12800 R12801 & more Missing	153 (10.7) 1160 (81.3) 40 (2.8) 74 (5.2)	32 (3.6) 762 (86.0) 37 (4.2) 55 (6.2)	121 (22.4) 398 (73.6) 3 (0.6) 19 (3.5)	X^2= 491.5 P<0.001
Province of residence	Mpumalanga Gauteng Limpopo Northwest Other	2273 (73.4) 688 (22.2) 63 (2.0) 44 (1.4) 30 (0.9)	512 (38.3) 688 (51.5) 63 (4.7) 44 (3.3) 30 (2.2)	1761 (100) 0 0 0 0	n/a
Settlement type	Rural Urban	2023 (65.3) 1075 (34.7)	262 (19.6) 1075 (80.4)	1761 (100) 0	n/a

Among the socio-demographic characteristics, 30.2 % of participants were aged between 18-24 years at Wave 1, while 13.9% of the cohort were aged between 36 to 41 years. The largest proportion of migrants were aged between 25-30 years (37.8%) and there was a significant difference ($p<0.001$) in age between migrants and non-migrants with migrants being on average slightly older than non-migrants. Migrants were more likely to be males (58.0%) while 41.9% of Wave 1 migrants were females. Levels of education differed significantly between migrants and non-migrants ($p<0.001$). There were more migrants with tertiary education (20.9%) compared with 10.5% of non-migrants. The majority of migrants were employed (66.3%) compared to non-migrants (30.7%). The difference in employment status between migrants and non-migrants was significant ($p<0.001$). Additionally, migrants who were employed were more likely to hold permanent positions (65.5%) than non-migrants (59.5%).

The majority of both migrants (86.0%) and non-migrants (63.6%) earned an income that ranged between R3201-R12800 per month for those who reported to be employed. At the time of the Wave 1 interview, 51.5% of migrants lived in the Gauteng province and the majority of migrants (80.3%) were based in urban areas with only 19.6% reporting living in a rural area.

Table 5 below shows socio-demographic characteristics of migrants and non-migrants at the second wave of the study. For the purpose of this descriptive table, age was categorized.

Table 5: Socio-demographic characteristics of participants by migration status in Wave 2

Variable	**Category**	**Wave 2 cohort n (%) 3021**	**Migrant n (%) 1594 (57.8%)**	**Non-migrant n (%) 1427 (47.2%)**	**Chi-square (X^2); p-value**
Age (years)	18-24 25-30 31-35 36-41	705 (23.3) 1025 (33.9) 711(23.5) 580 (19.2)	334 (20.9) 588 (36.9) 367 (23.0) 305 (10.1)	371 (25.9) 437 (30.6) 344 (24.1) 275 (19.3)	X^2= 17.3 p< 0.001
Gender	Female Male	1496 (49.5) 1525 (50.5)	673 (42.2) 921 (57.8)	823 (57.7) 604 (42.3)	X^2 = 71.9 P<0.001
Highest level of education	Less than matric Matric Tertiary Missing	1,041 (34.5) 1449 (47.9) 529 (17.5) 2 (0.1)	365 (22.9) 839 (52.6) 390 (24.5) 0	676 (47.4) 610 (42.7) 139 (9.7) 2 (0.1)	X^2 =239.5 P<0.001
Employment status	Not in the labour force Unemployed Employed	577 (19.1) 1051 (34.8) 1393 (46.1)	252 (15.8) 400 (25.1) 942 (59.1)	325 (22.8) 651 (45.6) 451 (31.6)	X^2 =493.3 P<0.001
Employment contract (for those employed)	Permanent Contract Occasional Missing	879 (63.1) 355 (25.5) 147 (10.6) 12 (0.8)	637 (67.6) 238 (25.7) 64 (6.7) 3 (0.3)	242 (53.7) 117 (25.9) 83 (18.4) 9 (2.0)	X^2 = 58.4 P<0.001
Income per month (for those employed)	R1-3200 R3201-12800 R12801 & more Missing	222 (15.9) 810 (58.1) 162 (11.6) 199 (14.3)	85 (9.0) 618 (65.6) 142 (15.1) 97 (10.3)	137 (30.4) 192 (42.6) 20 (4.4) 102(22.6)	X^2 =149.3 P<0.001
Province of residence	Mpumalanga Gauteng Limpopo Northwest Other	2093 (69.3) 734 (24.3) 93 (3.1) 54 (1.8) 37 (1.2)	666 (41.8) 734 (46.0) 93 (5.8) 54 (3.4) 37 (2.3)	1427 (100) 0 0 0 0	n/a
Settlement type	Rural Urban	1797 (59.5) 1224 (40.5)	370 (23.2) 1224 (76.8)	1427 (100) 0	n/a

At the time of the Wave 2 interview, only 23.3% of participants were aged between 18-24 years, while 19.2% were aged between 36-41 years. The largest proportion (33.9%) of participants were aged between 25-30 years. The gender composition of migrants and

Agincourt residents (non-migrants) differed significantly (p<0.001). The majority of migrants were males (57.8%) while 42.2% were females. There were more migrants with tertiary education (24.5%) compared with 9.7% of non-migrants and the difference in highest level of education between migrants and non-migrants was significant (p<0.001). The proportion of migrants who were employed in Wave 1 decreased from 66.3% to 59.1% in Wave 2 and there was a decrease in permanent employment for both migrants and non-migrants. The highest earned income ranged between R3201-R12800 as in Wave 1 for both migrants (65.6%) and non-migrants (42.5%) and there was a significant difference between the two groups (p<0.001). The number of migrants who lived in Gauteng decreased to 46.0% at Wave 2 while the number of migrants who lived in rural areas increased from 19.6% to 23.2%.

Table 6 below shows transitions in migration status from Wave 1 to Wave 2. Rural stayers are residents of the Agincourt HDSS community at both interviews. Continuing migrants remained outside HDSS community in Wave 1 and Wave 2. New migrants were resident within the HDSS at Wave 1 but resided outside the HDSS at Wave 2. Return migrants were resident outside the HDSS at Wave 1 and resided inside the HDSS at Wave 2. This table is based on the Wave 2 sample n = 3021.

Table 6: Migration status transitions of participants between Wave 1 and 2

Variable	**Category**	**n (%)** **3021**
Rural stayer	Non-migrants at both waves	1193 (39.5)
Continuing migrant	Migrants at both waves	1323(43.8)
New migrant	Non-migrant at W1 but migrant at W2	104 (3.4)
Return migrant	Migrant at W1 but non-migrant at W2	401(13.3)

From Wave 1 to Wave 2, 3.4% of participants moved from within the study site to outside destinations (new migrants) while 39.5% remained living within the study site at both waves (rural stayers). Additionally, 13.3% of the participants who were migrants in Wave 1 returned

to the study site (return migrants) while 43.8% continued being migrants from Wave 1 to Wave 2. The proportion of migrants in Wave 2 (2019) was 52.8% and non-migrants 47.2%.

Sexual partnerships and practices

Table 7a below shows sexual partnerships and practices at Wave 1 while table 7b shows sexual partnerships and practices at Wave 2 by migrant status. For the purpose of this analysis, the following variables were categorized: number of sexual partners in the last 12 months, total sexual partners in a lifetime.

Table 7a: Sexual partnerships and practices by migration status at Wave 1

Variable	**Category**	**Wave 1 Cohort 3098**	**Migrant n (%) 1337 (43.2)**	**Non-migrant n (%) 1761 (56.8)**	**Chi-square; p-value**
Number of sexual partners in the last 12 months	None 1 2 or more Missing	191 (6.2) 2326 (75.1) 578 (18.6) 3 (0.1)	71 (5.3) 913(68.3) 352 (26.3) 1 (0.1)	120 (6.8) 1413 (80.2) 226 (12.8) 2 (0.1)	X^2 =91.4 P<0.001
Total sexual partner(s) in a lifetime	None 1-2 3-5 6-8 9+ Missing	84 (2.7) 602 (19.4) 1555 (50.2) 469 (15.1) 382 (12.3) 6 (0.2)	33 (2.4) 224 (16.7) 611 (45.7) 241 (18.0) 225 (16.8) 3 (0.2)	51 (2.9) 378 (21.5) 944 (53.6) 228 (12.9) 157 (8.9) 3 (0.2)	X^2 = 70.2 P<0.001
Type of recent sexual partner (for those with number of sexual partners >=1)	Regular Casual Missing	2687 (92.5) 184 (6.3) 33 (1.1)	1,162 (91.9) 74 (5.8) 29 (2.3)	1525 (93.0) 110 (6.7) 4 (0.2)	X^2 = 0.6 P=0.422
What is your relationship with this regular partner (for those with regular partners)	Boyfriend/ girlfriend Living together without lobola Spouse Missing	1905 (70.9) 331 (12.3) 450 (16.7) 1 (0.0)	817 (70.3) 131 (11.3) 213(18.3) 1 (0.1)	1088 (71.3) 200 (13.1) 237 (15.5) 0	X^2 = 6.3 P=0.098

In Wave 1, 80.2% of non-migrants indicated that they had 1 partner in the last 12 months compared to 68.3% of migrants. There was a higher proportion of migrants with two or more partners reported (26.3%) than non-migrants (12.8%, p<0.001). Migrants were also asked whether they had partners in the origin, current or both locations. A higher proportion of migrants (49.5%) reported that they had partners in the current location. While 30.5%

reported having partners in the origin location and 11.2% reported having partners in both locations.

Participants were also asked about total lifetime partners and the highest proportion of respondents had 3-5 total sexual life partners. There were more non-migrants (53.6%) than migrants (45.7%) who indicated that they had 3-5 total sexual life partners, however a higher proportion of migrants (16.8%) reported having 9 or more total sexual life partners compared to non-migrants (12.9%). The vast majority of participants reported to have regular partners (approximately 90% of migrant and non-migrants). Very few participants reported having casual partners (6.3%).

The majority of participants reported that their most recent partners were either a boyfriend or girlfriend, 70.3% among migrants and 71.3% among non-migrants. Although there were more non-migrants (13.1%) who reported to be living with their partners than migrants (11.3%), the two groups did not differ significantly (P=0.098) in either wave. Migrants were also asked about the location of last sexual intercourse. The majority of migrants (65.3%) reported that they last had sexual intercourse in or near their current location.

Table 7b: Sexual partnerships and practices by migration status at Wave 2

Variable	**Category**	**Wave 2 Cohort 3021**	**Migrant n (%) 1594 (52.8)**	**Non-migrant n (%) 1427 (47.2)**	**Chi-square (X^2); p-value**
Number of sexual partners in the last 12 months	None 1 2 or more Missing	196 (6.4) 2104 (69.6) 693 (22.9) 28 (0.9)	87 (5.4) 1055 (66.2) 435 (27.3) 17 (1.1)	109 (7.6) 1049 (73.5) 258 (18.1) 11 (0.7)	X^2 =39.1 P<0.001
Total sexual partner(s) in a lifetime	None 1-2 3-5 6-8 9+ Missing	60 (1.9) 474 (15.7) 1351 (44.7) 706 (23.4) 400 (13.2) 30 (0.9)	30 (1.9) 189 (11.8) 719 (45.1) 392 (24.6) 246 (15.4) 18 (1.1)	30 (2.1) 285 (19.9) 632 (44.3) 314 (22.0) 154 (10.7) 12 (0.8)	X^2 =46.3 P<0.001
Type of recent sexual partner (for those with number of sexual partners >=1)	Regular Casual Missing	2635 (94.2) 141 (5.0) 21(0.8)	1399 (93.9) 81 (5.4) 10(0.7)	1236 (94.6) 60 (4.6) 11(0.8)	X^2 =1.0 P=0.313

What is your relationship with this regular partner (for those with regular partners)	Boyfriend/ girlfriend Living together without lobola Spouse Missing	1832 (69.5) 360 (13.7) 440 (16.7) 3 (0.11)	957 (68.4) 204 (14.6) 237 (16.9) 1 (0.1)	875 (70.8) 156 (12.6) 203(16.4) 2 (0.2)	X^2 =3.0 P=0.398

In Wave 2, 73.5% of non-migrants indicated that they had one partner in the last 12 months compared to 66.2% of migrants, while 18.1% of non-migrants and 27.3% of migrants indicated that they had two or more partners and the difference between migrants and non-migrants was significant ($p<0.001$). These numbers are slightly higher than the number of partners reported in Wave 1.

The majority of migrants (53.7%) reported that they had partners in the current location and this was followed by 19.9% of migrants who reported to have partners in the original location, while 12.4% of migrants reported to have partners in both locations.

A higher proportion of migrants (45.1%) indicated that they had 3-5 total sexual life partners compared to 44.3% of non-migrants, while 15.4% of migrants and 10.7% of non-migrants indicated that they had 9 or more total sexual life partners. There was a significant difference between migrants and non-migrants ($p<0.001$). The vast majority of participants reported having regular partners (94.2%) and there was no significant difference by migrant status ($p=0.313$) while very few participants reported having casual partners (5.0%).

Participants were asked about their relationship with their regular partner with options boyfriend/ girlfriend, spouse and living together without lobola. The majority of participants reported that their most recent partner was either a boyfriend or girlfriend, 68.4% among migrants and 70.8% among non-migrants. There was no significant difference ($P=0.398$) between migrants and non-migrants. Migrants were also asked about the location of last sexual intercourse. Most migrants (76.6%) reported that they last had sexual intercourse in or near the current location.

Tables 8a and 8b below show sexual partnerships and practices in Wave 1 and Wave 2 by gender.

Table 8a: Sexual partnerships and practices by gender in Wave 1

Variable	**Category**	**Wave1 Cohort 3098**	**Male n (%) 1,558 (50.3**	**Female n (%) 1,540 (49.7)**	**Chi-square (X^2); p-value**
Number of sexual partners in the last 12 months	None 1 2 or more Missing	191 (6.2) 2326 (75.1) 578 (18.6) 3 (0.1)	80 (5.1) 984 (63.2) 493 (31.6) 1 (0.1)	111 (7.2) 1,342 (87.1) 85 (5.3) 2 (0.1)	X^2 =348.0 p< 0.001
Migrants with partners in the origin, current or in both locations	Partner in the origin location Partner in current location Partner in both locations Missing	386(30.5) 626(49.5) 142(11.2) 111(8.8)	233(3) 334(44.5) 117(15.6) 67(8.9)	153(29.7) 292(56.8) 25(4.9) 44(8.6)	X^2 =58.1 p<0.001
Total sexual partner(s) in a lifetime	None 1-2 3-5 6-8 9+ Missing	84 (2.7) 602 (19.4) 1555 (50.2) 469 (15.1) 382 (12.3) 6 (0.2)	41 (2.6) 140 (8.9) 690 (44.3) 350 (22.4) 334 (21.4) 3 (0.2)	43 (2.8) 462 (30.0) 865 (56.2) 119 (7.7) 48 (3.1) 3 (0.2)	X^2 =519.8 p< 0.001
Type of recent sexual partner (for those with number of sexual partners >=1)	Regular Casual Missing	2687 (92.5) 184 (6.3) 33 (1.1)	1336 (90.5) 119 (8.1) 22(1.5)	1351(94.7) 65 (4.6) 11(0.8)	X^2 =15.4 p< 0.001
What is your relationship with this regular partner (for those with regular partners)	Boyfriend/ girlfriend Living together without lobola Spouse Missing	1905 (70.9) 331 (12.3) 450 (16.7) 1 (0.0)	1007 (75.4) 147 (11.0) 181 (13.5) 1 (0.1)	898 (66.5) 184 (13.6) 269 (19.9) 0	X^2 =28.5 p< 0.001
Where was your last sexual intercourse (for migrant with	In or near origin location In or near current location Other Missing	385(30.4) 826(65.3) 24(1.9) 30(2.4)	242(32.2) 481(64.0) 8(1.1) 20(2.7)	143(27.8) 345(67.1) 16(3.1) 10(1.9)	X^2 =7.9 P=0.019

number of sexual partners >=1)					

The majority of males (63.2%) indicated that they had one partner in the last 12 months compared to the 87.1% of females. There were more males (31.6%) than females (5.3) who reported two or more partners and the difference between the two groups was significant ($p<0.001$). There were more female migrants (56.8%) than male migrants (44.5%) who reported that they had partners in the current location. However, there were more male migrants (15.6%) than female migrants (4.9%) who reported that they had partners in both the origin and current location and there was a significant difference between males and females, $p<0.001$.

Participants were also asked about total lifetime sexual partners and the proportion of females who indicated that they had 1-2 partners in their lifetime was 30.0% compared to 8.9% of males. While a large proportion of both males (90.5%) and females (94.7%) indicated that they had regular partners, there was a significant difference ($p<0.000$) between the two groups.

There were more females (19.9%) who indicated that their most recent partner was a spouse than males (13.5%) while the majority of both males (75.4%) and females (66.5%) indicated that their most recent partner was either a boyfriend or girlfriend. The difference between males and females was significant ($p<0.001$). The majority of both females (67.1%) and males (64.0%) indicated that they last had sexual intercourse in or near the current location. However, there were more males (32.2%) than female (27.8%) who reported that they last had sexual intercourse in or near the origin location and there was a significant difference between male migrants and female migrants, $p=0.019$.

Table 8b: Sexual partnerships and practices by gender in Wave 2

Variable	**Category**	**Wave 2 Cohort 3021**	**Male n (%) 1525 (49.5)**	**Female n (%) 1496 (50.5)**	**Chi-square (X^2); p-value**
Number of sexual partners in the last 12 months	None 1 2 or more Missing	196 (6.4) 2104 (69.6) 693 (22.9) 28 (0.9)	90 (6.0) 858 (57.3) 562 (37.6) 15 (1.0)	106 (6.9) 1246 (81.7) 131 (8.6) 13 (0.8)	X^2 =340.7 p< 0.001
Migrants with partners in the origin, current or in both locations	Partner in the origin location Partner in current location Partner in both locations Missing	297(19.9) 800(53.7) 185(12.4) 208(13.9)	192(22.1) 407(46.8) 149(17.1) 121(13.9)	105(16.9) 393(63.3) 36(5.8) 87(14.0)	X^2 =63.9 p<0.001
Total sexual partner(s) in a lifetime	None 1-2 3-5 6-8 9+ Missing	60 (1.9) 474 (15.7) 1351 (44.7) 706 (23.4) 400 (13.2) 30 (0.9)	29 (1.9) 142 (9.4) 567 (37.5) 429 (28.7) 342 (22.8) 16 (1.1)	31 (2.0) 332 (21.7) 784 (51.4) 277 (18.2) 58 (3.8) 14 (0.9)	X^2 =345.2 p< 0.001
Type of recent sexual partner (for those with number of sexual partners >=1)	Regular Casual Missing	2635 (94.2) 141 (5.0) 21(0.8)	1294 (91.1) 117 (8.2) 9(0.6)	1341 (97.4) 24 (1.7) 12(0.9)	X^2 =61.4 p< 0.001
What is your relationship with this regular partner (for those with regular partners)	Boyfriend/ girlfriend Living together without lobola Spouse Missing	1832 (69.5) 360 (13.7) 440 (16.7) 3 (0.11)	930 (71.9) 179 (13.8) 183 (14.1) 2 (0.2)	902 (67.3) 181 (13.5) 257 (19.2) 1 (0.1)	X^2 =12.4 p= 0.006
Where was your last sexual intercourse (for migrants with	In or near origin location In or near current location Other Missing	342 (22.9) 1091 (73.2) 12 (0.8) 45(3.0)	224 (25.8) 619 (71.2) 5 (0.6) 21(2.4)	118 (19.0) 472 (76.0) 7 (1.1) 24(3.9)	X^2 =60.9 p=0.004

number of sexual partners >=1)					

The were more females (81.7%) than males (57.3%) who indicated that they had one partner in the last 12 months, while there were more males (37.6%) than females (8.6%) who reported having two or more partners.

The highest proportion of male migrants (46.8%) and female migrants (63.3%) reported that they had partners in the current location and as observed in Wave 1, there were more male migrants (17.1%) than female migrants (5.8%) who reported to have partners both locations. There was a significant difference between the two groups, $p<0.001$.

The proportion of females who indicated that they had 1-2 partners in their lifetime was 21.7% in contrast with 9.4% for males. The highest proportion of female (51.4%) and males (37.5%) reported having had 3-5 lifetime partners, and there were more males (22.8%) than females (3.8%) who reported having 9 or more sexual life partners. The difference was between males and females was significant ($p<0.001$).

As was the case in Wave1, in Wave 2 there were more females (97.4%) than males (91.1%) who indicated that they had regular partners, while there were more males (8.2%) than females (1.7%) who indicated that they had casual partners. The majority of respondents indicated that their most recent partners were either a boyfriend or girlfriend. However, there were more males (71.9%) than females (67.3%) who indicated that their most recent partners were either boyfriend or girlfriend. There were more females (19.2%) than males (14.1%) who reported that their most recent partner was a spouse and the difference between the two groups was significant, $p=0.006$.

Although there was a higher proportion among female migrants (76.0%) than male migrants (71.2%), the largest proportion of both groups reported that they last had sexual intercourse in or near the current location. There were more males (25.8%) than females (19.0%) who reported that they last had sex in or near their origin location. There was a significant difference between males and females, $p=0.004$.

HIV testing and condom use

Tables 9a and 9b below show questions on condom use, other STIs and HIV testing by migration status in Waves 1 and 2

Table 9a: Distribution of condom use, other STIs and HIV testing by migration status in Wave 1

Variable	**Category**	**Wave 1 cohort 3098**	**Migrant n (%) 1337(43.2)**	**Non-migrant n (%) 1761(56.8)**	**Chi-square (X^2); p-value**
Knew partners HIV status the first sex (if number of sexual partners >=1)	No Yes Missing	1948(67.1) 915 (31.5) 41 (1.4)	831 (65.7) 399 (31.5) 35 (2.8)	1117 (68.2) 516 (31.5) 6 (0.4)	X^2 =0.2 P=0.633
In the last 12 months have you been diagnosed or treated for an STIs?	No Yes Missing	2984 (96.3) 110 (3.6) 4 (0.1)	1299 (97.2) 36 (2.7) 2 (0.1)	1685 (95.7) 74 (4.2) 2 (0.1)	X^2 =5.0 P=0.025
Used condom the last sex (if number of sexual partners >=1)	No Yes Missing	1397 (48.1) 1476 (50.8) 31 (1.1)	586 (46.3) 650 (51.4) 29 (2.3)	811 (49.5) 826 (50.3) 2(0.1)	X^2 =1.3 P=0.258
Have you had an HIV test?	No Yes Missing	314 (10.1) 2779 (89.7) 5 (0.2)	171 (12.8) 1162 (86.9) 4 (0.3)	143 (8.1) 1617 (91.8) 1 (0.1)	X^2 =18.4 p<0.001
Results of the most recent HIV test (for those who had an HIV test)	Negative Positive Can't disclose Missing	2441 (87.8) 272 (9.8) 32 (1.1) 34 (1.2)	1049 (90.3) 73 (6.3) 22 (1.9) 18(1.5)	1392 (86.1) 199 (12.3) 10 (0.6) 16(1.0)	X^2 =36.0 p<0.001
Risk score	No risk Low risk Medium-high risk Missing	366 (11.8) 1654 (53.4) 945 (30.5) 133(4.3)	174 (13.0) 701 (52.4) 393 (29.4) 69(5.2)	192 (10.9) 953 (54.1) 552 (31.3) 64(3.6)	X^2 =10.8 P=0.132

The majority of both migrants (65.7%) and non-migrants (68.2%) reported that they did not know the HIV status of the partner at first sexual intercourse and the difference was not significant between the two groups, p=0.633. The majority of participants indicated that they had not been diagnosed with or treated for STIs and there was a significant difference (p=0.025) between migrants and non-migrants.

There was a slightly higher proportion of condom use between migrants (51.4%) and non-migrant (50.3%) but the difference was not significant, p=0.258.

HIV testing was significantly higher among non-migrants (91.8%) than migrants (86.9%), (p<0.001). Participants who had an HIV test were asked about their HIV results and the majority of both migrants (90.3%) and non-migrants (86.1%) reported HIV negative results. However, there were more non-migrants (12.3%) who reported HIV positive results than migrants (6.3%) and the difference was significant (p<0.001).

There was no significant difference in risk score between migrants and non-migrants (p=0.132). The majority of respondents were at low risk (53.4%). There were more non-migrants (31.3%) than migrants (29.4%) who were at medium/high risk.

Table 9b: Distribution of condom use, other STIs and HIV testing by migration status at Wave 2

Variable	**Category**	**Wave 2 cohort 3021**	**Migrant n (%) 1594 (52.8)**	**Non-migrant n (%) 1427 (47.2)**	**Chi-square (X^2); p-value**
Knew partners HIV status the first sex (if number of sexual partners >=1)	No Yes Missing	2018 (72.1) 680 (24.3) 99 (3.5)	1042 (69.9) 395 (26.5) 53(3.6)	976 (74.7) 285 (21.8) 46(3.5)	X^2 =8.5 P=0.004
In the last 12 months have you been diagnosed or treated for an STIs?	No Yes Missing	2965 (98.1) 30 (0.9) 26 (8.6)	1563 (98.1) 14 (0.9) 17 (1.1)	1402 (98.2) 16 (1.1) 9 (0.6)	X^2 =0.4 P=0.509
Used condom the last sex (if number of sexual partners >=1)	No Yes Missing	1313 (46.9) 1469 (52.5) 15 (0.5)	687 (48.8) 796 (51.6) 7 (0.5)	626 (47.9) 673 (51.5) 8 (0.6)	X^2 =1.0 P=0.325
Have you had an HIV test?	No Yes Missing	191 (6.3) 2799 (92.6) 31 (1.0)	113 (7.1) 1463 (91.8) 18 (1.1)	78 (5.4) 1336 (93.6) 13 (0.9)	X^2 =3.4 P=0.065
Results of the most recent HIV test (for those who had an HIV test)	Negative Positive Can't disclose. Missing	2459 (87.9) 273 (9.8) 24 (0.9) 43 (1.5)	1334 (91.2) 88 (6.0) 18 (1.2) 23(1.6)	1125 (84.2) 185 (13.8) 6 (0.4) 20(1.5)	X^2 =52.8 p<0.001
Risk score	No risk Low risk Medium-high risk Missing	280 (9.3) 1610 (53.3) 932 (30.8) 199(6.6)	161 (10.1) 874 (54.8) 452 (28.3) 107(6.7)	119 (8.3) 736 (51.6) 480 (33.6) 92(6.4)	X^2 =10.8 P=0.004

In Wave 2, again the majority of migrants (69.9%) and non-migrants (74.7%) reported that they did not know the HIV status of the partner at first sexual intercourse and there was a

significant difference between the two groups p=0.004. The majority of migrants (98.1%) and non-migrants (98.2%) reported that they have not been diagnosed with STI In the last 12 months and there was no significant difference (p=0.509) between the two groups.

The proportion of migrants (51.6%) and non-migrants (51.5%) who reported condom use were very similar (p=0.325). HIV testing was higher among non-migrants (93.6%) than migrants (91.8%), but the difference was not significant, p=0.065. The majority of both migrants (91.2%) and non-migrants (84.2%) reported HIV negative results. However, there were more non-migrants (13.8%) who reported HIV positive results than migrants (6.0%) and the difference was significant (p<0.001).

There was a significant difference in risk score between migrants and non-migrants (p=0.004). The majority of respondents were at low risk (53.3%). There were more non-migrants (33.6%) than migrants (28.3%) who were at medium/high risk.

Tables 10a and 10b show the distribution of responses to questions on condom use and HIV testing by gender in Wave 1 and 2

Table 10a: Distribution of condom use, other STIs and HIV testing by gender in Wave 1

Variable	**Category**	**Wave 1 cohort 3098**	**Male n (%) 1558(50.3)**	**Female n (%) 1540 (49.7)**	**Chi-square (X^2); p-value**
Knew partners HIV status the first sex (if number of sexual partners >=1)	No Yes Missing	1948 (67.1) 915 (31.5) 41 (1.4)	1058 (71.6) 394 (26.7) 25 (1.7)	890 (62.4) 521 (36.5) 16 (1.1)	X^2 =31.5 p<0.001
In the last 12 months have you been diagnosed or treated with STIs	No Yes Missing	2984 (96.3) 110 (3.6) 4 (0.1)	1512 (97.0) 45 (2.9) 1 (0.1)	1472 (95.6) 65 (4.2) 3 (0.2)	X^2 =4.0 p=0.044
Used condom the last sex (if number of sexual partners >=1)	No Yes Missing	1397 (48.1) 1476 (50.8) 33(1.1)	627 (42.5) 830 (56.2) 20(1.4)	770 (54.0) 646 (45.3) 11(0.8)	X^2 =37.0 p<0.001
Have you had an HIV test	No Yes Missing	314 (10.1) 2779 (89.7) 5 (0.2)	245 (15.7) 1308 (83.9) 5 (0.3)	69 (4.5) 1471 (95.5) 0	X^2 =108.2 p<0.001
Results of the most recent HIV test (for those who had an HIV test)	Negative Positive Can't disclose Missing	2441 (87.8) 272 (9.8) 32 (1.2) 34 (1.2)	1216 (93.0) 57 (4.4) 15 (1.1) 20 (18.5)	1225 (83.3) 215 (14.6) 17 (1.2) 14 (1.0)	X^2 =81.8 p<0.001

Risk score	No risk Low risk Medium-high risk Missing	366 (11.8) 1654 (53.4) 945(30.5) 133(4.3)	172 (11.0) 876 (56.2) 438 (28.1) 72(4.6)	194 (12.6) 778 (50.5) 507(32.9) 61(4.0)	X^2 =12.2 p=0.002

There were more males (71.6%) than females (62.4%) reported that they did not know their partners HIV status and there was a significant difference ($p<0.001$) between males and females. The majority of both males (97.0%) and females (95.6%) indicated that they had not been diagnosed with STIs and there was a significant difference ($p=0.044$) between males and females. There was a significant difference ($p<0.001$) in non-condom use between males and females with 42.5% of males reporting no condom use compared to the 54.0% of females.

HIV testing was significantly higher in females (95.5%) compared to males (83.9%), ($p<0.001$). There were more females (14.6%) who reported HIV positive results compared to males (4.4%) and the difference between the two groups was significant ($p<0.001$). There was a significant difference ($p=0.002$) in risk score between males and females. There were more males (56.2%) than females (50.5%) who were at low risk and more females (32.9%) than males (28.1%) at medium/high risk.

Table 10b: Distribution of condom use, other STIs and HIV testing by gender at Wave 2

Variable	**Category**	**Wave 2 cohort 3021**	**Male n (%) 1525 (50.5)**	**Female n (%) 1496 (49.5)**	**Chi-square (X^2); p-value**
Knew partners HIV status the first sex (if number of sexual partners >=1)	No Yes Missing	2018 (72.1) 680 (24.3) 99(3.5)	1012 (71.3) 366 (25.8) 42(3.0)	1006(73.1) 314 (22.8) 57(4.1)	X^2 =2.7 p=0.097
In the last 12 months have you been diagnosed or treated with STIs	No Yes Missing	2965 (98.1) 30 (0.9) 26 (0.9)	1494 (97.9) 16 (1.1) 15 (1)	1471 (98.3) 14 (0.9) 11 (0.7)	X^2 =0.1 p=0.748
Used condom the last sex (if number of sexual partners >=1)	No Yes Missing	1313 (46.9) 1469 (52.5) 15 (0.5)	623 (43.9) 791 (55.7) 6 (0.4)	690 (50.1) 678 (49.2) 9 (0.7)	X^2 =11.4 p<0.001
Have you had an HIV test	No Yes Missing	191 (6.3) 2799 (92.7) 31 (1.0)	153 (10.0) 1359 (89.1) 13 (0.9)	38 (2.5) 1440 (96.3) 18 (1.2)	X^2 =71.2 p<0.001
Results of the most recent HIV test (for those who had an HIV test)	Negative Positive Can't disclose Missing	2459 (87.9) 273 (9.8) 24 (0.9) 43 (1.5)	1281 (94.3) 43 (3.2) 8 (0.6) 27 (12.0)	1178 (81.8) 230 (16.0) 16 (1.1) 16 (1.1)	X^2 =132.1 p<0.001
Risk score	No risk Low risk Medium-high risk Missing	280 (9.3) 1610 (53.3) 932 (30.8) 199(6.6)	145 (9.5) 878 (57.6) 406 (26.6) 96(6.3)	135 (9.0) 732 (48.9) 526 (35.2) 103(6.9)	X^2 =28.4 p<0.001

Unlike in Wave 1, in Wave 2 there were more females (73.1%) than males (71.3%) who reported that they did not know the HIV status of their partner at first sexual intercourse, however the difference was marginally significant (p=0.097). The majority of both males

(97.9%) and females (98.3%) indicated that they had not been diagnosed with STIs and there was no significant difference (p=0.748) between males and females. There was a significant difference (p<0.001) in condom use between males and females with 43.9% of males reporting no condom use compared to the 50.1% of females.

As was the case in Wave 1, in Wave 2 HIV testing was significantly higher in females (96.3%) compared to males (89.1%), (p<0.001). There were more females (16.0%) who reported HIV positive results compared to males (3.2%) and the difference between the two groups was significant (p<0.001). There was a significant difference (p<0.001) in risk score between males and females. There were more males (57.6%) than females (48.9%) who were at low risk and more females (35.2%) than males (26.6%) at medium/high risk.

Models for sexual partnerships and practices

This section aims to determine the associations between the explanatory variables; migration status, education, age, gender, employment and sexual partnerships and practices over the two study waves. The first set of models present results of ordinal logistic regression analyses that investigated the number for sexual partners in the last 12 months. The second set of models present results of logistic regression analyses that investigated whether the type of recent sexual partner was a regular or a casual partner. The third set of models present the ordinal regression analyses which investigated risk score. These models were run for Wave 1, Wave 2 and when both waves were combined. To account for intra-participant correlation on the combined waves, clustering method was used.

In Table 11 below, ordinal logistic regression analysis was used to model the outcome variable, number of sexual partners in the last 12 months which was classified into 3 categories: None, 1 partner, and 2 or more partners. The analysis was performed for Wave 1, Wave 2 and then both waves were combined.

Table 11a: Ordinal logistic regression model for number for sexual partners in the last 12 months in Wave 1

Variable	**Level**	**Adjusted OR**	**95% C.I.**	**P-value**
Migration Status	Non-Migrant Migrant	1 1.63	Reference (1.36-1.96)	 p<0.001
Age	Per 5-year increase	0.87	(0.80-0.94)	P<0.001
Gender	Female Male	1 4.01	Reference (3.27-4.93)	p<0.001

Education	Less than matric Matric Tertiary	1 0.98 0.92	Reference (0.81-1.18) (0.71-1.20)	P=0.933
Employment	Employed Unemployed Not in a labour force	1 0.75 0.48	Reference (0.61-0.91) (0.36-0.65)	P=0.002

n=3090

In Wave 1, the odds of having a higher number of sexual partners in the past year differed between migrants and non-migrants (p<0.001). The odds of having more sexual partners were 1.63 times higher among migrants compared to non-migrants. Number of sexual partners also differed between males and females (p<0.001) and males had higher odds (OR=4.01) of having a higher number of sexual partners compared to female. Also, the unemployed participants (OR=0.75) and those who were not in the labour force (OR=0.48) had lower odds of having a higher number of sexual partners compared to those who were employed and the odds of having a higher number of sexual partners significantly differed between the three employment groups (p=0.002).

Table 11b: Ordinal logistic regression model for number for sexual partners in the last 12 months in Wave 2

Variable	**Level**	**Adjusted OR**	**95% C.I.**	**P-value**
Migration Status	Non-Migrant Migrant	1 1.33	Reference (1.12-1.58)	 p<0.001
Age	Per 5-year increase	0.90	(0.84-0.98)	P<0.001
Gender	Female Male	1 3.56	Reference (2.95-4.29)	 p<0.001
Education	Less than matric Matric Tertiary	1 1.10 0.78	Reference (0.92-1.32) (0.61-0.99)	p=0.009
Employment	Employed Unemployed Not in a labour force	1 0.85 0.68	Reference (0.70-1.04) (0.53-0.87)	p=0.052

n=3019

In Wave 2, the number of sexual partners differed between migrants and non-migrants (p<0.001). The odds of having more sexual partners were 1.33 higher among migrants compared to non-migrants. The odds of having more of sexual partners decreased with age (OR=0.90, p<0.001). The number of sexual partners also differed between males and females (p<0.001) and males had higher odds (OR=3.56) of having a higher number of sexual

partners compared to females. Those with tertiary education had lower odds (OR=0.78) of having a higher number of sexual partners compared to those with less than matric, however there was a small difference in odds between those with matric and those with less than matric. The number of sexual partners significantly differed between the three education groups (p=0.009). Among unemployed participants (OR=0.85), and those who were not in the labour force (OR=0.68) there were lower odds and of having a higher number of sexual partners compared to those who were employed and employment status was significant in the model (p=0.052).

Table 11c: Ordinal logistic regression model for number for sexual partners in the last 12 months - combined waves

Variable	**Level**	**Adjusted OR**	**95% C.I.**	**P-value**
Migration Status	Non-Migrant Migrant	1 1.46	Reference (1.28-1.67)	p<0.001
Wave	Wave1 Wave 2	1 1.27	Reference (1.14-1.41)	p<0.001
Age	Per 5-year increase	0.89	(0.84-0.94)	p<0.001
Gender	Female Male	1 3.72	Reference (3.22-4.31)	p<0.001
Education	Less than matric Matric Tertiary	1 1.05 0.84	Reference (0.92-1.19) (0.70-0.99)	p=0.056
Employment	Employed Unemployed Not in a labour force	1 0.80 0.58	Reference (0.69-0.93) (0.47-0.72)	p<0.001

n=6109

Over the two waves of the study, the odds of having a higher number of sexual partners differed between migrants and non-migrants (p<0.001). The odds of having a higher number of sexual partners were 1.46 times higher among migrants compared to non-migrants. The odds of having a higher number of sexual partners decreased with age (OR=0.89, p<0.001). The odds of having a higher number of sexual partners also differed between males and females (p<0.001) and males had higher odds (OR=3.72) of having a greater number of sexual partners compared to females. Also, unemployed participants and those who were not in the labour force had lower odds (OR=0.80) and (OR=0.58) of having a higher number of sexual partners compared to those who were employed and employment status was significant (p<0.001). The significant p value (p<0.001) of the Wave variable shows that the odds of having more sexual partners changed between waves. Wave 2 showed higher odds

(OR=1.27) of having more sexual partners compared to Wave 1. There was no evidence of an interaction between the wave variable and any other variables.

In Tables 12 below the results of fitting a series of logistic regression models are shown with the outcome variable being "type of recent sexual partner" classified as 0 for regular and 1 for casual. The analysis was performed for Wave 1, Wave 2 and then both waves were combined.

Table 12a: Logistic regressions model for type of recent sexual partner in Wave 1

Variable	**Level**	**Adjusted OR**	**95% C.I.**	**P-value**
Migration Status	Non-migrant Migrant	1 1.03	Reference (0.74-1.44)	p=0.765
Age	Per 5-year increase	0.89	(0.76-1.04)	p=0.131
Gender	Female Male	1 2.00	Reference (1.44-2.77)	 p<0.001
Education	Less than matric Matric Tertiary	1 0.63 1.02	Reference (0.45-0.88) (0.65-1.59)	p=0.012
Employment	Employed Unemployed Not in a labour force	1 1.43 1.74	Reference (0.98-2.09) (1.11-2.73)	p=0.034

n= 2971, gof (p=0.434)

In Wave 1, there was no significant difference in odds of having a casual partner between migrants and non-migrants (p=0.765). The odds of having a casual partner differed between males and females (p<0.001). Males (OR=2.00) were more likely to have casual partners than females. The odds of having a casual partner also differed between three education groups (p=0.012). Those with matric were less likely to have a casual partner (OR=0.63) than those with less than matric, however there was little difference between the odds of having a casual partner for those with incomplete high school and those with tertiary education (OR=1.02). Additionally, the odds of having a casual partner also differed between the employment status groups (p=0.034). Those who were not in the labour force (OR=1.74) and those who were unemployed (OR=1.43) were more likely to have a casual partner than those who were employed. The Hosmer-Lemeshow goodness of fit test showed no evidence of lack of fit (p=0.434).

Table 12b: Logistic regressions model for type of recent sexual partner in Wave 2

Variable	Level	Adjusted OR	95% C.I.	P-value
Migration Status	Non-migrant	1	Reference	p=0.999
	Migrant	1.00	(0.71-0.14)	
Age	Per 5-year increase	1.19	(1.02-1.38)	p=0.030
Gender	Female	1	Reference	p<0.001
	Male	5.75	(3.77-8.76)	
Education	Less than matric	1	Reference	p=0.887
	Matric	0.91	(0.69-1.30)	
	Tertiary	0.86	(0.53-1.39)	
Employment	Employed	1	Reference	p=0.008
	Unemployed	1.45	(0.97-2.17)	
	Not in a labour force	2.04	(1.27-3.27)	

n= 2904, gof (p=0.078)

In Wave 2, The was no significant difference in odds of having a casual partner between migrants and non-migrants (p=0.999). The odds of having a casual partner increased with age (OR=1.19, p=0.030). The odds of having a casual partner differed between males and females (p<0.001). Males, (OR=5.75) were more likely to have casual partners than males. The odds of having a casual partner also differed across the three employment categories (p=0.008). Those who were unemployed (OR=1.45) and those who were not in the labour force (OR=2.04) were more likely to have a casual partner than those who were employed. Goodness of fit test showed no evidence of lack of fit (p=0.078).

Table 12c: Logistic regressions model for type of recent sexual partner in combined waves with interaction term between wave and gender

Variable	Level	Adjusted OR	95% C.I.	P-value
Migration Status	Non-migrant Migrant	1 1.00	Reference (0.78-1.28)	p=0.877
Wave	Wave 1 Wave 2	1 0.42	Reference (0.27-0.65)	p=0.218
Age	Per 5-year increase	1.02	(0.91-1.13)	p=0.075
Gender	Female Male	1 2.03	Reference (1.48-2.79)	p<0.001
Gender#Wave	Female Male	1 2.89	Reference (1.72-4.85)	p<0.001
Education	Less than matric Matric Tertiary	1 0.74 0.92	Reference (0.58-0.95) (0.66-1.29)	p=0.052
Employment	Employed Unemployed Not in a labour force	1 1.43 1.83	Reference (1.07-1.90) (1.30-2.59)	p<0.001

n= 5875, gof (p=0.152)

Over the two waves of study, there was no significant difference in the odds of having a casual partner between migrants and non-migrants (p=0.877). The odds of having a casual partner differed between males and females (p<0.001). There was an interaction between Wave and gender which means that the odds ratio for having a casual partner for males *vs.* females differed between waves. In Wave 1 the OR was 2.03, while in Wave 2 it had increased to 5.87 (2.03*2.89). The odds of having a casual partner also differed between the education groups (p<0.052). Those with matric (OR=0.92) and those with tertiary education (OR=1.43) were less likely to have a casual partner than those with less than matric. The odds of having a casual partner also differed between the employment groups (p<0.001). Those who are not in the labour force (OR=1.83) and those who were unemployed (OR=1.43) were more likely to have a casual partner than those who were employed. There was no evidence of interaction between the wave and other variables. Goodness of fit test showed no evidence of lack of fit (p=0.152).

In Table 13 below, ordinal logistic regression analysis was used to model the outcome variable "risk score" which was classified into 4 categories: No risk, low risk, medium risk and high risk. The analysis was performed for Waves 1 and 2.

Table 13a: Ordinal logistic regression model for risk score in Wave 1

Variable	**Level**	**Adjusted OR**	**95% C.I.**	**P-value**
Migration Status	Non-migrant Migrant	1 0.91	Reference (0.77-1.06)	p=0.230
Age	Per 5-year increase	1.28	(1.19-1.37)	p<0.001
Gender	Female Male	1 0.91	Reference (0.78-1.05)	p=0.206
Education	Less than matric Matric Tertiary	1 0.78 0.65	Reference (0.66-0.91) (0.52-0.81)	p<0.001
Employment	Employed Unemployed Not in a labour force	1 1.01 0.87	Reference (0.84-1.20) (0.69-1.09)	p=0.363

n=2958

In Wave 1, there was no significant difference in the odds of being at higher risk between migrants and non-migrants (p=0.230). The odds of being at higher risk increased with age (OR= 1.28, P<0.001). Those with matric and those with tertiary education had lower odds (OR=0.78) and (OR=0.65) of being at higher risk compared to those with less than matric and difference between the three education groups was statistically significant (p<0.001).

Table 13b: Ordinal logistic regression model for risk score in Wave 2

Variable	**Level**	**Adjusted OR**	**95% C.I.**	**P-value**
Migration Status	Non-migrant Migrant	1 0.83	Reference (0.71-0.97)	p=0.028
Age	Per 5-year increase	1.26	(1.17-1.35)	p<0.001
Gender	Female Male	1 0.70	Reference (0.60-0.82)	p<0.001
Education	Less than matric Matric Tertiary	1 0.82 0.76	Reference (0.69-0.97) (0.61-0.96)	p=0.030
Employment	Employed Unemployed Not in a labour force	1 0.84 0.71	Reference (0.70-1.00) (0.56-0.89)	p=0.008

n=2820

In Wave 2, the odds of being at a higher risk differed between migrants and non-migrants (p=0.028). Migrants had lower odds (OR=0.83) of being at higher risk compared to non-migrants. The odds of being at higher risk increased with age (OR=1.26, p<0.001). Males had lower odds (OR=0.77) of being at higher risk compared to females and gender was statistically significant (p<0.001). Those with matric and those with tertiary education had lower odds (OR=0.82) and (OR=0.76) of being at higher risk compared to those with less than matric. The odds of being at higher risk differed significantly between the three education groups (p=0.030). The unemployed participants and those who were not in the labour force had lower odds (OR=0.84) and (OR=0.71) of being at a higher risk compared to those who were employed and employment status was statistically significant in the model (p=0.008).

Table 13c: Ordinal logistic regression for risk score - combined waves with interaction term between gender and wave.

Variable	**Level**	**Adjusted OR**	**95% C.I.**	**P-value**
Migration Status	Non-migrant Migrant	1 0.87	Reference (0.77-0.97)	p=0.013
Wave	Wave 1 Wave 2	1 1.19	Reference (01.03-1.38)	p=0.172
Age	Per 5-year increase	1.27	(1.21-1.34)	p<0.001
Gender	Female Male	1 0.89	Reference (0.77-1.03)	p<0.001
Gender#Wave	Female Male	1 0.81	Reference (0.66-0.99)	P=0.042
Education	Less than matric Matric Tertiary	1 0.79 0.70	Reference (0.71-0.89) (0.59-0.83)	p<0.001
Employment	Employed Unemployed Not in a labour force	1 0.92 0.79	Reference (0.81-1.05) (0.67-0.93)	p=0.012

n= 5778

Over the two waves of study, the odds of being at higher risk significantly differed between migrants and non-migrants (p=0.013). Migrants had lower odds (OR=0.87) of being at higher risk compared to non-migrants. The odds of being at higher risk increased with age (OR=1.27, p<0.001). The odds being at higher risk also differed between males and females (p<0.001) and males had lower odds (OR=0.89) of being at higher risk compared to females. The OR for males (vs females) in Wave 2 will be 0.89*0.81 which is 0.72 so in Wave 2 males are even less at risk compared to females than in Wave 1. Those with matric and those with tertiary education had reduced odds (OR=0.79) and (0.70) of being at higher risk compared to those with less than matric. The odds of being at higher risk score significantly differed between the three education groups (p<0.001) and unemployed participants, and those who were not in the labour force had lower odds (OR=0.92 and OR=0.79) of being at higher risk compared to those who were employed. Employment status was significantly associated with risk score (p=0.012). There was no evidence of interactions between the wave and other variables.

Chapter four: Discussion

In SSA, the majority of migrants move within their own country rather than across the borders and they often move without their partners (72). Being separated from their usual sexual partners can make migrants form newer sexual relations at the destination while they still maintain contact with their families at their origin location (16). Mobility can also make it harder for people to reach interventions, whether for HIV testing, condom provision, or preventive education (73). Hence there was a need for this research on migration and sexual partnerships and practices.

This study investigated the relationship between internal migration and sexual partnerships and practices in a cohort of migrants and residents of the Agincourt HDSS study site in South Africa's rural northeast over two survey waves from 2018 to 2019. This chapter provides a discussion based on the three objectives of this study. Major findings will be discussed and compared to previous studies.

Characteristics of migrants and non-migrants

In this cohort, the highest proportion of migrants were between the ages 25-30 years, they were more likely to be males, they had higher levels of education and they were also more likely to be employed compared to non-migrants. These findings are in line with results from other parts of the SSA (24,42). Although there were more male migrants than female migrants in this study, there was a slight increase in female migrants between Wave 1 (41.9%) and Wave 2 (42.2%). These findings highlight a noticeable trend in South Africa and other low-middle income countries regarding feminization of internal migration (3,42,74). As more women access education and acquire skills, they are better equipped to participate in the formal labor market. This leads them to migrate from rural to urban areas where skilled employment opportunities are more prevalent.

In both waves, there were more non-migrants than migrants. However, a proportion of participants moved from the study site to become migrants while others had returned to the study site in Wave 2. These results show a notable trend of internal migration in South Africa with people moving from rural to urban areas while also highlighting the fluidity of movement among participants in the form of circular mobility between migrants' destinations and origin households.

Going back to the conceptual framework we see that under household and individual factors, the highest proportion of migrants were aged between 20-30 years, they were more likely to be males and were more likely to be employed. Following migration, risky sexual behavior was reported in non-migrants and males. The results highlight the significance of taking these factors into consideration in the relationship between migration and health.

Sexual partnerships and practices among migrant and non-migrants

There was a higher proportion of migrants than non-migrants who reported having more than one sexual partner in the last 12 months in both waves. These findings highlight the potential impact mobility has on risky sexual partnerships and they are in agreement with findings of Tamiru et al (29), where a significantly higher proportion of rural to urban migrants compared to non-migrants had a higher number of sexual partners (31.4% *vs.* 7.4%) in an Ethiopian study. Similar results were also shown by Dzomba *et al*. (27) in a systematic review of 29 studies in South Africa, where a higher rate of multiple partnerships among migrants compared to non-migrants was reported. Although a higher proportion of migrants reported that they had sexual partners in their current location, 11.2% had partners in both the origin and current location in Wave 1. This proportion increased to 12.4% in Wave 2. Dzomba et al.'s (27) systematic review showed that women who were married to men who were migrants reported having other partners other than their spouse. Possible reasons for this may be that migrants moving leaving their partners behind, may start new sexual relations at their destination and partners left behind may also form new sexual relations.

Participants were asked about their most recent partners and this variable was initially coded as three-level variable with levels "regular," "casual" and "anonymous" but was later changed to a binary variable (regular and casual) as there were very few participants indicating an anonymous partner. Results showed very few participants who reported having casual partners in both waves, the majority of participants' type of recent sexual partners were regular partner. Although there was a slight difference between migrants and non-migrants, the difference was not significant. However, a study by Dzomba et al. (27), showed that migrant mineworkers at Carletonville and Khutsong were more likely to report casual encounters compared to non-migrants (53% vs. 32%). In the same study, migrant women reported higher rates of casual sexual relations in the past 12 months (37% vs. 17%) than non-migrant women. Similarly, the likelihood of having casual sex in the previous year was 1.6 times higher for migrant women than for non-migrant women, $p<0.05$ (27).

Migration status, sociodemographic characteristics and sexual partnerships

This study also investigated factors associated with the number of sexual partners in the last 12 months and whether the type of recent sexual partner was a regular or a casual among both migrants and non-migrants. Explanatory variables were migration status, age, gender, level of education and employment.

Ordinal logistic regression analysis in Wave 1 showed that migrants were more likely to have more sexual partners than non-migrants, judging from the odd ratio of 1.63. The analysis also showed that males were more likely to have a higher number of sexual partners compare to females and those who were unemployed and those who were not in a labour force were also less likely to have a higher number of sexual partners compared to participants who were employed.

Again, in Wave 2, higher odds of having a higher number of sexual partners were observed among migrants compared to non-migrants while having a higher number of sexual partners decreased with age. Those with tertiary education were less likely to have more sexual partners compared to those with matric or lower levels of schooling. Consistent with Wave 1, participants who were unemployed and those who were not in a labour force were less likely to have more sexual partners than those who were employed. The combined wave analysis showed that the odds of having more sexual partners changed between waves. The odds of having a higher number of sexual partners were 1.27 times higher in Wave 2 compared to Wave 1. This finding might be due to participants being more willing to respond in Wave 2 than they were in Wave 1.

Sexual partnerships by gender

Migration patterns and experiences can vary significantly by gender and understanding these differences are important for addressing the unique challenges and experiences faced by male and female migrants. Sexual partnerships were also explored by gender, and notable difference between males and females were observed. Our findings showed that there were more males than females who had 2 or more partners in both waves. A higher proportion of males reported casual partners than females and there were more male migrants than female migrants who had partners in both the origin and the current location in both waves. Similar findings about males who were more likely to engage in casual partnerships were observed in China in a study by Yang and Xia et al (58). Sexual partnership concurrency was also observed by Gutin et al (75) in rural Kenya and Uganda, where a higher proportion of men (22.5%) were more likely than women (4.6%) to report having multiple sexual partners

concurrency in the past 6 months. Our logistic regression model for type of sexual partnerships showed that the odds for the two outcomes casual partners for males were higher in wave two than in wave one while the odds were lower for risk score for males in wave two compared to wave one. This may be due to the fact that risk score questions were generated from the HIV testing and condom used questions and males reported a lower proportion of HIV positive results than females and condom use was mostly reported by males compared to females. This led to males being at lower risk than females. A difference between males and females was also observed in number of sexual partners where males reported a higher number of 2 or more partners than females. It was noted in SSA that mobile men were more likely to be in riskier sexual partnerships such as concurrent sexual partnerships (75). A study by Wang et al. (76) which looked at prevalence and risks for sexually transmitted infections among migrants and non-migrants in China showed that a higher proportion of male migrants reported having had casual partners . However, in a study by McGrath et al (30) the proportion of female migrants who had casual partners in the past year was significantly higher than that of non-migrants, whereas the proportion of men who had casual partners did not differ between migrants and non-migrants. Given some diversity in trends concerning gendered patterns of sexual partnerships among migrants and non-migrants in South Africa, further research would be valuable.

Migration, HIV and condom use and risk score

Self-reported HIV testing was higher among non-migrants than migrants and more non-migrants reported HIV positive status compared to migrants. The reason could be that people chose not to migrate since they are receiving HIV treatment in health facilities located in their place of residence and do not want to compromise this. A higher proportion of participants reported having had an HIV test in Wave 2 compared to Wave 1. This may be due to the fact that participants were offered self-test or a rapid test administered by a trained counselor which may have influenced the higher proportion of HIV testing in Wave 2. It is also possible that participants were more comfortable to give truthful answer in the second wave because it was done telephonically, while the Wave 1 interview was conducted face-to-face. Although people in the MHFUS cohort who self-reported as HIV positive were almost always indeed positive in a study by Yorlets et al. (77), HIV status self-report can be restricted by the sensitivity of questions as well as stigma and discrimination around it.

Our finding on gender disparity showed that HIV testing was higher in females compared to males and there were more females who reported HIV positive results compared to males in both waves. These findings suggest that men are less likely to undergo HIV testing due to the difference in health seeking behavior between men and women. Women are more likely to

seek healthcare than males as they may also be exposed to antenatal care which offers HIV testing (77). It was also found in the MHFUS cohort that men are less likely to access health services (15). Additionally, a prospective study conducted in rural South Africa, KwaZulu Natal showed that in nearly one-third of discordant couples, the HIV infection was found in the female partner who "stayed at home.". This suggests that the relationship between migration and HIV transmission might be more complicated than initially thought, and that additional studies are necessary to fully understand the nature of the HIV pandemic in rural areas (78).

There was no significant difference in condom use between migrants and non-migrants in both waves. When comparing females and males, a higher proportion of females did not use a condom during the last sexual intercourse compared to males in both waves. Findings by McGrath et al, (30) in a general population cohort in rural KwaZulu Natal in South Africa, showed that migrant women used condoms more often with regular partners than non-migrant women, however these finding were reversed in men. A systematic review by Dzomba *et al* (27) revealed that migrants were less likely to report condom use compared to non-migrants and most non-migrant women were more likely to report condom use compared to migrants.

This study also investigated factors associated participants risk score (based on condom use and HIV testing) among both migrants and non-migrants. Migrants were less likely to be at higher risk in both waves. Females were more likely to be associated with risk score. In addition, ordinal logistic regression showed that migrants, males, participants with higher levels of education and participants who were unemployed were less likely to be at a higher risk.

Limitations

Since more risky sexual behaviors are not regarded as socially acceptable, in this study, individuals may not have been honest about having multiple sexual partners or sexual activity that was unprotected. This may have been further influenced by the mode of interview, face-to-face in Wave 1 versus telephone interview in Wave 2, potential interviewer effects and/or social desirability bias. Other limitations relevant to longitudinal studies is the potential for loss to follow-up (where those who continue to participate in the survey have characteristics different to those who are not followed up). In the case of the MHFUS, attrition has been very low (79). Other than this there may have been some recall biases where responses were based on recollection of past events (such as total lifetime sexual partners). In addition, while the Agincourt HDSS is a typical rural South African sub-district, the results may not be

generalisable to all parts of South Africa. This research can be expanded to other parts of South Africa to contrast these findings with those from other regions. Further research will include continuing to gather longitudinal data on sexual partnerships and migration so that impact of migration and change over time can be studied. Whilst the study is looking at migrates and non-migrants in the geographic study area only, it would be interesting as well to see if there where non-immigrates in the study area who had migrant partners in other geographic locations outside the study area and to assess if the risk for this group is the same for non-migrants who live with their spouses/partners. Qualitative studies that look at more in-depth experiences concerning sexual partnerships and practices in the context of rural-urban migration may also yield valuable insights.

Chapter Five: Conclusion

This research is based on data from Wave 1 and Wave 2 of the MHFUS, providing evidence on whether sexual partnerships and practices differ between migrants and those who have not moved from the Agincourt rural study site. This study provides insight on potential vulnerability of this population to HIV and other health risks. The study showed that sexual partnerships and practices differed by migration status and gender. Females reported fewer number of sexual partners and were less likely to have casual partners than males, but they had a higher risk score based on condom use and HIV testing. The study shows that the effect of migration can vary widely depending on factors such as gender, employment and education. Male gender, higher levels of education and unemployment were associated with lower risk scores. Researchers, policymakers, and healthcare providers need to consider these factors when addressing the sexual health needs of internal migrants. Further insight into the relationship between internal migration and sexual pairings is still required, using data that focus on movement and sexual partnerships and practices over time. The data from such studies will contribute to the body of information required to provide direction in STI prevention and will also guide policy, which will help achieve the Sustainable Development Goal 3 of "targeting the end of AIDS and ensure universal access to sexual and reproductive health-care services by 2030".

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Appendices

Appendix 1: Plagiarism declaration report



PLAGIARISM DECLARATION TO BE SIGNED BY ALL HIGHER DEGREE STUDENTS

SENATE PLAGIARISM POLICY: APPENDIX ONE

I Yandisa Nyanisa_____ (Student number: 1654453_____) am a student

registered for the degree of MSc Epidemiology and Biostatistics in the academic year 2024

I hereby declare the following:

- I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.
- I confirm that the work submitted for assessment for the above degree is my own unaided work except where I have explicitly indicated otherwise.
- I have followed the required conventions in referencing the thoughts and ideas of others.
- I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I have failed to acknowledge the source of the ideas or words in my writing.
- I have included as an appendix a report from "Turnitin" (or other approved plagiarism detection) software indicating the level of plagiarism in my research document.

Signature: _____ Date: 21 February 2024

Appendix 2: Ethical Approval letter

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R14/49 Miss Yandisa Nyanisa

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M220324 MED22-03-037

NAME: (Principal Investigator)	Miss Yandisa Nyanisa
DEPARTMENT:	Epidemiology and Biostatistics
PROJECT TITLE:	Internal migration and sexual partnerships and practices: Findings from a South African Cohort
DATE CONSIDERED:	Ad hoc
DECISION:	Approved unconditionally
CONDITIONS:	Sub-study M170277 (PI Dr MA Collinson and Prof M White et al) Resubmission M210357 MED21-03-03-057
SUPERVISOR:	Dr Carren Ginsburg and Prof Jonathan Levin
APPROVED BY:	Dr C Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	30/03/2022

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary in Room 301, Third floor, Faculty of Health Sciences, Phillip Tobias Building, 29 Princess of Wales Terrace, Parktown, 2193, University of the Witwatersrand. I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report**. The date for annual re-certification will be one year after the date of convened meeting where the study was initially reviewed. In this case, the study was initially reviewed March and will therefore be due in the month of March each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature _____ Date _____

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix 3: Questionnaire

Extract from the Migrant Health Follow-Up Study Wave 1 Questionnaire

43	dbs_consent_hiv Show the field ONLY if: [interview_consent]=1 and [dbs_consent]=1	dbs_consent Has the participant read, signed, and dated the informed consent for the collection of the dry blood spot to test for HIV	radio, Required 1 Yes 0 No
44	hiv_referral Show the field ONLY if: [interview_consent]=1 and [dbs_consent_hiv]=1	hiv_referral Has the participant indicated they want a referral for HIV testing?	radio, Required 1 Yes 0 No
45	self_test_provided Show the field ONLY if: [interview_consent]=1	Self-test provided?	yesno, Required 1 Yes 0 No
46	q_1_12 Show the field ONLY if: [interview_consent]=1	Has the participant informed consent been signed and dated by fieldworker?	radio, Required 1 Yes 0 No
47	q_1_12_1 Show the field ONLY if: [interview_consent]=1	Has the participant been given the information sheet?	radio, Required 1 Yes 0 No
48	consent_complete	Section Header: *Form Status* Complete?	dropdown 0 Incomplete 1 Unverified 2 Complete
Instrument: **Education and Employment** (education_and_employment)			Collapse
49	educ_start		text Field Annotation: @NOW @READONLY @HIDDEN
50	q_1_11	Section Header: *Form Status* Interview date and start time	text (datetime_dmy) Field Annotation: @NOW @READONLY @READONLY @HIDDEN
51	q_2	Now I am going to ask you some questions about your educational history	descriptive
52	q_2_1	Are you currently enrolled in school/completing any studies/training/certificates?	radio, Required 1 Yes 0 No 98 Don't know

53	q_2_1_1 Show the field ONLY if: [q_2_1]=1	In what level of education are you currently engaged?	dropdown 5 Std 1/Grade 3 6 Std 2/Grade 4 7 Std 3/Grade 5 8 Std 4/Grade 6 9 Std 5/Grade 7 10 Std 6/Grade 8 11 Std 7/Grade 9 12 Std 8/Grade 10 13 Std 9/Grade 11 14 Std 10/Matric 16 Technicon- Incomplete 17 Technicon-Complete 18 University - Incomplete 19 University - Complete 20 Adult Basic Education and Training Level 1 (ABET 1) 21 ABET 2 22 ABET 3 23 ABET 4 24 National Qualification Framework Level 1 (NQF 1) 25 NQF 2 26 NQF 3 27 NQF 4 28 Other certificate or diploma 97 Other 98 Don't know
54	q_2_1_1_other Show the field ONLY if: [q_2_1_1]=97	Please specify	text
55	q_2_1_1_2 Show the field ONLY if: [q_2_1]=1	Are these studies full or part-time?	radio 1 Full-time 2 Part-time 98 Don't know

56	q_2_2	What is the highest level of education you have completed?	5 Std 1/Grade 3 6 Std 2/Grade 4 7 Std 3/Grade 5 8 Std 4/Grade 6 9 Std 5/Grade 7 10 Std 6/Grade 8 11 Std 7/Grade 9 12 Std 8/Grade 10 13 Std 9/Grade 11 14 Std 10/Matric 16 Technikon-incomplete 17 Technikon-complete

			18 University-incomplete 19 University-complete 20 Adult Basic Education and Training Level 1 (ABET 1) 21 ABET 2 22 ABET 3 23 ABET 4 24 National Qualification Framework Level 1 (NQF 1) 25 NQF 2 26 NQF 3 27 NQF 4 28 Other certificates or diploma 97 Other 98 Don't know
57	q_2_2_other Show the field ONLY if: [q_2_2]=97	Please specify	text
58	q_2_2_matric Show the field ONLY if: [q_2_2]>=14	Have you passed matric?	1 Yes 0 No
60	q_3_1	What is your employment status?	pdown, Required 0 Unemployed, not looking for work 1 Unemployed, looking for work 2 Employed full time, formal sector 3 Employed part time, formal sector 4 Employed full time, informal sector 5 Employed part time, informal sector 6 Self-employed, formal sector 7 Self-employed, informal sector
63	q_3_1_2 Show the field ONLY if: [q_3_1]>=2	Is your employment permanent, fixed/period or contract work, or occasional/irregular?	1 Permanent 2 Fixed period/Contract work

			3 Occasional/irregular 98 Don't know
64	workhours Show the field ONLY if: [q_3_1]>=2	On average, how many hours do you work in a typical week?	dropdown 1 1-10 2 11-20 3 21-30 4 31-40 5 41-50 6 51-60 7 61-70 8 71-80 9 81 or more

65	q_3_2	How much did you (as an individual) earn in total last month? *This means take home salary*	dropdown, Required 0 No income 1 R1 - R400 2 R401 - R800 3 R 801 - R1 600 4 R1 601 - R3 200 5 R3 201 - R6 400 6 R6 401 - R12 800 7 R12 801 - R19 200 8 R19 201 - R25 600 9 R25 601 - R38 400 10 R38 401 - R51 200 11 R51 201 - R76 800 12 R76 801 - R102 400 13 R102 401 - R153 600 14 R153 601 - R204 800 15 R204 801 - R500 000 16 More than R500 000 98 Don't know 99 Respondent refused
66	q_3_3	Mark as "Complete" and select "Save and go to next instrument" when complete	descriptive
67	education_and_employment_complete	Section Header: *Form Status* Complete?	dropdown 0 Incomplete 1 Unverified 2 Complete
Instrument: **Current Residence** (current_residence)			Collapse
68	curres_start		text Field Annotation: @NOW @READONLY @HIDDEN
69	q_4	Section Header: *CURRENT RESIDENCE* I want to ask you some questions about your residence and employment history. We will start with your current place of residence. *By usual place of residence, I mean the place where you typically spend 4 or more nights a week.*	descriptive
70	current_residence	Where do you currently live? Please be specific:	text, Required
71	resp_currentaddress	If possible, collect the address or detailed location of the respondent's current residence:	notes
72	q_4_1_province	What province is [current_residence] in?	dropdown, Required 1 Mpumalanga 2 Gauteng 3 Limpopo 4 Free State 5 KwaZulu Natal 6 Eastern Cape 7 Western Cape 8 Northern Cape 9 North West 97 Other country
73	q_4_1_other Show the field ONLY if: [q_4_1_province] = '97'	Please specify:	text

74	q_4_1_mpumalanga Show the field ONLY if: [q_4_1_province] = '1'	Where within Mpumalanga is [current_residence]?	dropdown 1 Agincourt study site 2 Barberton 3 Bushbuckridge 4 Dwarsloop 5 Game Park Mpumalanga 6 Gemu/Hazyview 7 Graskop/Pilgrim's rest 8 Kangwane 9 Kiepersol 10 Komatipoort 11 Machadodorp 12 Malelane 13 Mapuleng 14 Marite / Alexandria 15 Matsulu 16 Middleburg 17 Mkhuhlu 18 Nelspruit 19 Pienaar 20 Sabie 21 Thulamahashe 22 White River 23 Witbank 24 Zwelitsha 97 Other Mpumalanga 98 Don't know

76	q_4_1_gauteng Show the field ONLY if: [q_4_1_province] = '2'	Where within Gauteng is [current_residence]?	dropdown

1	Akasia
2	Alberton
3	Alexandra
4	Atteridgeville
5	Babelegi
6	Bapsfontein
7	Bashewa
8	Baviaanspoort
9	Bekkersdal
10	Benoni
11	Bhongweni
12	Boipatong
13	Boksburg
14	Bon Accord
15	Bophelong
16	Boschkop
17	Bosplaas Mathabe
18	Bothasgeluk
19	Brakpan
20	Breswol
21	Bronkhorstspruit
22	Bultfontein
23	Carletonville
24	Centurion

25	Chartwell
26	Cheetah Park
27	Chief A Luthuli Park
28	City of Johannesburg
29	Clayville
30	Cullinan
31	Dainfern
32	Daveyton
33	Deelkraal Gold Mine
34	Derdepoort
35	Devon A
36	Devon B
37	Diepsloot
38	Dilopye
39	Donkerhoek
40	Doornfontein
41	Doornkraal
42	Downbern
43	Drie Ziek
44	Duduza
45	Dukathole
46	East Driefontein
47	East Village
48	Ebony Park
49	Edenvale
50	Eersterust
51	Ekangala
52	Ekurhuleni
53	Elandsfontein
54	Elandsrand
55	landsrand
56	Elsburg Gold Mine
57	Emfuleni
58	Endicott
59	Ennerdale
60	Etwatwa
61	Evaton
62	Farmall
63	Fochville
64	Ga-Rankuwa
65	Geluksdal
66	Germiston
67	Glen Harvie

68	Golden Gardens
69	Goudvlakte West
70	Green Park
71	Grootfontein
72	Grootvlei
73	Haakdoornboom
74	Hallgate
75	Hammanskraal
76	Harry Gwala
77	Hartebeesfontein
78	Hebron
79	Heideburg
80	Hillshaven
81	Impumelelo
82	Itsoseng
83	Ivory Park
84	Johandeo
85	Johannesburg
86	Kaalfontein
87	Kagiso
88	Kameeldrift
89	Kameelfontein
90	Kameelkraal
91	Kanana
92	Kanana Park
93	Katlehong
94	Keinfontein
95	Kekana Garden
96	Kempton Park
99	Khutsong
100	Kleinfontein
101	Kokosi
102	Krugersdorp
103	Kungwini Part 2
104	Kwa-Thema
105	Lakeside
106	Langaville
107	Lanseria
108	Laudium
109	Lawley

110	Leeufontein
111	Leeuport
112	Lehae
113	Lenasia
114	Lenasia South
115	Lenz
116	Lesedi
117	Ltsatsing
118	Lindelani Village
119	Mabopane
120	Magaliesburg
121	Majaneng
122	Makanyaneng
123	Malatjie
124	Mamello
125	Mamelodi
126	Mandela Village
127	Marokolong
128	Mashemong
129	Mayibuye
130	Merafong City
131	Meyerton
132	Midrand
133	Midvaal

78	q_4_1_limpopo Show the field ONLY if: [q_4_1_province] = '3'	Where within Limpopo is [current_residence]?	dropdown 1 Aganang 2 Ba-Phalaborwa 3 Bela-Bela 4 Blouberg 5 Elias Motsoaledi 6 Fetakgomo 7 Greater Giyani 8 Greater Letaba 9 Greater Marble Hall 10 Greater Tubatse 11 Greater Tzaneen 12 Lepelle-Nkumpi 13 Lephalale 14 Makhado 15 Makhuduthamaga 16 Malamulele 17 Maruleng 18 Modimolle 19 Mogalakwena 20 Molemole 21 Mookgopong 22 Musina 23 Polokwane 24 Thabazimbi 25 Thulamela 97 Other 98 Don't know
79	q_4_1_limpopo_other Show the field ONLY if: [q_4_1_limpopo]='97'	Please specify:	text
80	q_4_1_western_cape Show the field ONLY if: [q_4_1_province] = '7'	Where within Western Cape is [current_residence]?	text
81	q_4_1_eastern_cape Show the field ONLY if: [q_4_1_province] = '6'	Where within Eastern Cape is [current_residence]?	text
82	q_4_1_northwest Show the field ONLY if: [q_4_1_province] = '9'	Where within North West is [current_residence]?	text
83	q_4_1_kwazulu_natal Show the field ONLY if: [q_4_1_province] = '5'	Where within KwaZulu Natal is [current_residence]?	text
84	q_4_1_northern_cape Show the field ONLY if: [q_4_1_province] = '8'	Where within Northern Cape is [current_residence]?	text
85	q_4_1_free_state Show the field ONLY if: [q_4_1_province] = '4'	Where within Free State is [current_residence]?	text
86	q_4_2	Is it rural or urban? *Rural meaning locations like villages, agricultural areas, or game farms*	radio, Required 1 Rural 2 Urban (city or town) 98 Don't know

674	q_19_2 Show the field ONLY if: [anthro_consent]=1 and [respondent_sex]="Male"	Are you pregnant? (Only ask of women)	radio 1 Yes 0 No 98 Don't know
675	q_19_3 Show the field ONLY if: [anthro_consent]=1	Weight (kgs) *Weight must include one decimal (e.g. 97.8). Enter 111.1 if too heavy for scale; make a note in the interview notes as well)*	text (number_1dp, Min: 0, Max: 150)
676	bmi Show the field ONLY if: [anthro_consent]=1	Body Mass Index:	calc Calculation: ([q_19_3]/ ([q_19_1]/100)) / ([q_19_1]/100)
677	q_19_4	Waist circumference (cm):	text (number, Min: 10, Max: 300)
678	q_20 Show the field ONLY if: [dbs_consent]=1	Section Header: *DRY BLOOD SPOTS* (FOR INTERVIEWER) Collect the Dry Blood Spots now.	descriptive
679	q_20_1 Show the field ONLY if: [dbs_consent]=1	(FOR INTERVIEWER) Have the dried blood spots been collected?	yesno 1 Yes 0 No
680	dbs_glucosereport Show the field ONLY if: [dbs_consent]=1	Does the respondent want the results of the blood glucose test reported back to them? *Note: respondent must give a phone number and/or email address to have results reported back*	yesno 1 Yes 0 No
681	dbs_barcode Show the field ONLY if: [q_20_1]=1	Scan DBS Barcode	text Field Annotation: @BARCODE-APP
682	dbs_barcode_manual Show the field ONLY if: [dbs_consent]=1	Manually enter barcode if barcode scanner is not working:	text
683	dbs_barcode_manual_confirm Show the field ONLY if: [dbs_consent]=1	Confirm manually entered barcode:	text
684	q_18_10 Show the field ONLY if: [anthro_consent]=1	Mark as "Complete" and select "Save and go to next instrument" when complete	descriptive
685	anthropometrics_and_biomarkers_complete	Section Header: *Form Status* Complete?	dropdown 0 Incomplete 1 Unverified 2 Complete
Instrument: **Sexual Partnership** (sexual_partnership)			Collapse
686	sexpart_start		text Field Annotation: @NOW @READONLY @HIDDEN
687	q_21	Section Header: *SEXUAL PARTNERSHIP* The following section asks questions about your sexual practices over the last 12 months. Because a broad range of men and women are participating in this study, some of the questions may not apply to you. However, we ask the same questions to all participants. Your answers are completely confidential.	descriptive Custom alignment: LH
688	q_21_1	During the last 12 months, how many sexual partners have you had?	text (integer), Required
689	q_21_1_1 Show the field ONLY if: [q_21_1]>=1	Of the [q_21_1] of partners you've had in the last 12 months, how many lived in or near [q_1_5]?	text (integer)
690	q_21_1_2 Show the field ONLY if: [q_samelocation]=0 and [q_21_1]>=1	Of the [q_21_1] of partners you've had in the last 12 months, how many live in [current_residence] or outside [q_1_5]?	text (integer)
691	q_21_1_3 Show the field ONLY if: [q_21_1]>=1	Note to interviewer: Total is [q_21_1_3]. Total should be [q_21_1].	calc Calculation: [q_21_1_1]+[q_21_1_2]
692	q_21_2	How many TOTAL sexual partners have you had in your lifetime?	text (integer), Required

695	q_21_4 Show the field ONLY if: [q_21_2]>=1	For the next question(s), follow these definitions: Regular partner: is someone who is special to you, like a husband / wife / boyfriend / girlfriend, or lover. Casual partner: is a person you know but are not in a relationship with, whether you had sex only once or many times.	descriptive
696	q_21_5 Show the field ONLY if: [q_21_2]>=1	Was your most recent sexual partner:	1 Regular 2 Casual 3 Anonymous 98 Don't know
697	q_21_6 Show the field ONLY if: [q_21_2]>=1	Where was your most recent sexual intercourse with this partner? *If the answer categories repeat (i.e. origin location and current residence are the same), select the answer from the first two options (unless other or don't know)*	1 Same village/neighborhood in [q_1_5] 2 Village/neighborhood nearby [q_1_5] 3 Same village/neighbourhood in [current_residence] 4 Village/neighbourhood nearby [current_residence] 97 Other 98 Don't know
698	q_21_6_other Show the field ONLY if: [q_21_6]=97	Please specify	text
699	q_21_7 Show the field ONLY if: [q_21_2]>=1	Did you use a condom the last time you had sexual intercourse?	radio 1 Yes 0 No 98 Dont know
702	q_21_9 Show the field ONLY if: [q_21_2]>=1	The first time you had sex with this partner, did you know his or her HIV status?	1 Yes 0 No 98 Dont know
703	q_21_10 Show the field ONLY if: [q_21_5]=1	What is your relationship with this partner?	1 Boyfriend 2 Girlfriend 3 Living together without lobola 4 Spouse (civil married) without lobola

5	Spouse with lobola done
98	Don't know

706	q_21_10_3 Show the field ONLY if: [q_21_5]=1	Is this relationship ongoing?	radio 1 Yes 0 No 98 Dont know
707	q_21_11	In the last 12 months have you had symptoms of, been diagnosed with, or have you been treated for a sexually transmitted disease? [such as trichomonas, gonorrhea or Chlamydia, drop, or any bad smelling/abnormal vaginal or penile discharge, sore or ulcer]	radio, Required 1 Yes 0 No 98 Dont know
708	q_21_12	Mark as "Complete" and select "Save and go to next instrument" when complete	descriptive
709	sexual_partnership_complete	Section Header: *Form Status* Complete?	dropdown 0 Incomplete 1 Unverified 2 Complete
Instrument: **HIV** (hiv)			Collapse
710	hiv_start		text Field Annotation: @NOW @READONLY @HIDDEN
711	q_22_1	Section Header: *HIV* Have you ever had an HIV test?	radio, Required 1 Yes 0 No 98 Dont know
712	q_22_1_1 Show the field ONLY if: [q_22_1]=1	When were you tested the last time? MONTH *if respondent does not know exact date, use best estimate*	dropdown 1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Don't know

Extract from the Migrant Health Follow-Up Study Wave 2 Questionnaire

Instrument **Sexual Partnership** (sexual_partnership)			Collapse
714	sexpart_start		text Field Annotation: @NOW @READONLY

715	q_21	Xiyenge lexi landzelaka xi vutisa swivutiso mayelana na mahanyelo eka timhaka ta masangu eka tin'hweti ta khume-mbirhih leti nga hundza. Hikuva vavanuna ni vavasati vo tala va nghenelela eka ndzavisiso lowu, swin'wana swa swivutisio a swi nga mi khumbi. kambe, hi vutisa swivutiso leswi fanaka eka vangheneleri hinkwavo. tinhlamulo ta n'wina i xihundla. The following section asks questions about your sexual practices over the last 12 months. Because a broad range of men and women are participating in this study, some of the questions may not apply to you. However, we ask the same questions to all participants. Your answers are completely confidential.	descriptive Custom alignment: LH

716	q_21_1	Eka tin'hweti ta khume-mbirhi leti nga hundza, xana mi vile na varingani vangani? During the last 12 months, how many sexual partners have you had?	text (integer), Required
717	q_21_1_1 Show the field ONLY if: [q_21_1]>=1	Eka [q_21_1] va varingani lava mi veke na vona eka tin'hweti ta khume-mbirhi leti nga hundza, I vangani lava tshameke e [q_1_5]? Of the [q_21_1] partners you've had in the last 12 months, how many lived in or near [q_1_5]?	text (integer)
718	q_21_1_2 Show the field ONLY if: [q_4_1_mpumalanga]!=1 and [q_21_1]>=1	Eka [q_21_1] va varingani lava mi veke na vona eka tin'hweti ta khume-mbirhi leti nga hundza, I vangani lava tshamaka eka [current_residence] kumbe ehandle [q_1_5]? Of the [q_21_1] partners you've had in the last 12 months, how many live in [current_residence] or outside [q_1_5]?	text (integer)
719	q_21_1_3 Show the field ONLY if: [q_21_1]>=1	Mahungu eka muburisani: Nhlayo hinkwayo I [q_21_1_3]. Nhlayo hinkwayo yi fanele yi va [q_21_1]. Note to interviewer: Total is [q_21_1_3]. Total should be [q_21_1] .	calc Calculation: [q_21_1_1]+[q_21_1_2]
720	q_21_2	Xana hi yihi nhlayo ya varingani lava mi veke na vona evuton'wini bya n'wina? How many TOTAL sexual partners have you had in your lifetime?	text (integer), Required
721	q_21_3_1 Show the field ONLY if: [q_21_2]>=1	Xana mi hetelele rini ku endla timhaka ta masangu? N'HWETI When was the last time you had sexual intercourse? MONTH	dropdown 1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Don't know

722	q_21_3_2 Show the field ONLY if: [q_21_2]>=1	Xana mi hetelele rini ku endla timhaka ta masangu? LEMBE When was the last time you had sexual intercourse? YEAR	dropdown

43	2019
1	2018
2	2017
3	2016
4	2015
5	2014
6	2013
7	2012
8	2011
9	2010
10	2009
11	2008
12	2007
13	2006
14	2005
15	2004
16	2003
17	2002
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21	1998
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26	1993
27	1992
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29	1990
30	1989
31	1988
32	1987
33	1986
34	1985
35	1984
36	1983
37	1982
38	1981
39	1980
40	1979
41	1978
98	Don't Know

723	q_21_4 Show the field ONLY if: [q_21_2]>=1	Eka xi/swivutiso leswi landzelaka, landzelela tinhlamuselo leti: Muringani wa minkarhi yo tala: I munhu loyi a nga wa nkoka eka n'wina, ku fana na nuna/nsati/munghana waxinuna/munghana waxisati, kumbe murhandziwa wa wena. Muringani wo ka a nga ri wa nkarhi hinkwawo: i munhu loyi mi n'wi tivaka kambe a nga ri na vuxaka na n'wina, hambi mi nga va mi endlile timhaka ta masangu kan'we ntsena kumbe minkarhi yo tala. muringani loyi a nga tivekiki: i munhu loyi a mi nga tivi vito ra yena mi nga si endla timhaka ta masangu. muringani wa swamasangu loyi a xavisaka miri a nga va loyi a nga riki wa nkarhi hinkwawo kumbe loyi mi nga n'wi tiviki. For the next question(s), follow these definitions: Regular partner: is someone who is special to you, like a husband / wife / boyfriend / girlfriend, or lover. Casual partner: is a person you know but are not in a relationship with, whether you had sex only once or many times. Anonymous partner: is someone whose name you did not know the day before you had sex. A sex partner who is a prostitute could be either casual or anonymous	descriptive
724	q_21_5 Show the field ONLY if: [q_21_2]>=1	Xana muringani wa wena wa swamasangu wa sweswi a ri: Was your most recent sexual partner:	radio 1 Regular 2 Casual 3 Anonymous 98 Don't know
725	q_21_6_mig_w2 Show the field ONLY if: [q_21_2]>=1 and [q_4_1_mpumalanga]!=1	Xana mi endlile kwihi timhaka ta masangu na muringani wa n'wina wa sweswi? Where was your most recent sexual intercourse with this partner?	radio 1 Same village/neighbourhood in [q_1_5] 2 Village/neighbourhood nearby [q_1_5] 3 Same village/neighbourhood in [current_residence] 4 Village/neighbourhood nearby [current_residence] 97 Other 98 Don't know
726	q_21_6_nonmig_w2 Show the field ONLY if: [q_21_2]>=1 and [q_4_1_mpumalanga]=1	Where was your most recent sexual intercourse with this partner?	radio 1 Same village/neighbourhood in [current_residence] 2 Village/neighbourhood nearby [current_residence] 97 Other 98 Don't know
727	q_21_6_other Show the field ONLY if: [q_21_6_mig_w2]=97 or [q_21_6_nonmig_w2]=97	Please specify Please specify	text
728	q_21_7 Show the field ONLY if: [q_21_2]>=1	Did you use a condom the last time you had sexual intercourse?	radio 1 Yes 0 No 98 Dont know
729	q_21_8 Show the field ONLY if: [q_21_7]=0 and [q_21_2]>=1	Hikokwalaho ka yini mi nga tirhisanga khondomu? Why did you not use a condom?	radio 1 Didn't have one 2 Convenience 3 Decreased pleasure 4 Didn't want to ruin the "mood" 5 Trusted partner 6 Trying to get pregnant 97 Other 98 Dont know
730	q_21_8_other Show the field ONLY if: [q_21_8]=97	Hi kombela mi hlamusela Please specify	text

731	q_21_9 Show the field ONLY if: [q_21_2]>=1	Ro sungula loko mi endla timhaka ta masangu na munhu loyi, xana a mi xi tiva xiyimo xa yena xa HIV? The first time you had sex with this partner, did you know his or her HIV status?	1 Yes 0 No 98 Dont know
732	q_21_10 Show the field ONLY if: [q_21_5]=1	Xana hi byihi vuxaka bya n'wina na munhu loyi? What is your relationship with this partner?	1 Boyfriend 2 Girlfriend 3 Living together without lobola 4 Spouse without lobola 5 Spouse with lobola 98 Don't know
735	q_21_10_3 Show the field ONLY if: [q_21_5]=1	Xana vuxaka lebyi hi lebyi yaka emahlweni? Is this relationship ongoing?	1 Yes 0 No 98 Dont know

736	q_21_11	Eka tinhweti ta khume-mbirhi leti nga hundza xana u ve tshama uri na swikombekiso,ku kumiwa, kumbe kutshunguriwa swa ma vabyi yo tlulela hiti mhaka ta masangu? [ku fana na trichomonas, gonorrhea, chlamydia, drop, or any bad smelling/abnormal vaginal or penile discharge, sore, or ulcer] In the last 12 months have you had symptoms of, been diagnosed with, or have you been treated for a sexually transmitted disease? [such as trichomonas, gonorrhea or Chlamydia, drop, or any bad smelling/abnormal vaginal or penile discharge, sore or ulcer]	radio, Required 1 Yes 0 No 98 Dont know
737	sexualpatner_notes	Notes	notes
738	q_21_12	Mark as "Complete" and select "Save and go to next instrument" when complete Mark as "Complete" and select "Save and go to next instrument" when complete	descriptive
739	sexual_partnership_complete	Section Header: *Form Status* Complete?	dropdown 0 Incomplete 1 Unverified 2 Complete
Instrument: **Hiv** (hiv)			Collapse
740	hiv_start	Section Header: *HIV*	text Field Annotation: @NOW @READONLY @HIDDEN
741	q_22_1	Xana mi tshame mi nga kamberiwa HIV? Have you ever had an HIV test?	radio, Required 1 Yes 0 No 98 Dont know
742	q_22_1_1 Show the field ONLY if: [q_22_1]=1	Xana mi kamberiwile rini ro hetelela? N'HWETI When were you tested the last time? MONTH *if respondent does not know exact date, use best estimate*	dropdown 1 January 2 February 3 March 4 April 5 May 6 June 7 July 8 August 9 September 10 October 11 November 12 December 98 Don't know

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